Greater Dublin Drainage Project

Irish Water

Environmental Impact Assessment Report: Volume 2 Part A of 6

Chapter 4 Description of the Proposed Project

June 2018

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4. Description of the Proposed Project

4.1 Introduction

The Greater Dublin Drainage Project (hereafter referred to as the Proposed Project) will form a significant component of a wider strategy to meet future wastewater treatment requirements within the Greater Dublin Area as identified in a number of national, regional and local planning policy documents and outlined in the *Planning Report* (Proposed Project Planning (AOS June 2018)). The Proposed Project will serve the projected wastewater treatment requirements of existing and future drainage catchments in the north and north-west of the Ringsend agglomeration (i.e. catchments draining to Ringsend Wastewater Treatment Plant (WwTP)), up to the Proposed Project's 2050 design horizon.

In keeping with sustainable development principles, the Proposed Project will also have the capacity to provide sustainable treatment for municipal wastewater sludge and domestic septic tank sludges generated in Fingal to produce a 'biosolid' end-product. The Proposed Project will utilise the biogas produced during the treatment process as an energy source, on-site.

This Chapter provides a description of the individual Proposed Project elements and the existing environment in which the Proposed Project would be constructed. It also provides a summary of the Outline Construction Environmental Management Plan (CEMP) for each of the Proposed Project elements and an outline of the operation of the Proposed Project post-construction.

Planning Drawing Nos. 32102902 – 2000 to 32102902 – 2208 provided as a separate document should be read in conjunction with this Chapter.

4.2 Proposed Project Elements

The Proposed Project, the subject of this planning application, is illustrated in Figure 4.1 Proposed Project Overview, and will comprise the following interlinked elements:

- Proposed WwTP to be located on a 29.8-hectare (ha) site in the townland of Clonshagh (Clonshaugh) in Fingal;
- Sludge Hub Centre (SHC) to be co-located on the same site as the WwTP;
- Proposed orbital sewer route from Blanchardstown to the proposed WwTP at Clonshagh;
- Proposed odour control unit (OCU) at the interface between the rising main and gravity sewer elements of the proposed orbital sewer route;
- Proposed North Fringe Sewer (NFS) diversion sewer to the proposed WwTP;
- Proposed Abbotstown pumping station to be located in the grounds of the National Sports Campus (NSC);
- Proposed outfall pipeline route from the proposed WwTP to the outfall point approximately 1km north-east of Ireland's Eye; and
- Regional Biosolids Storage Facility (RBSF) to be located on an 11.4ha site at Newtown, Dublin 11.

4.3 Location of the Proposed Project

The Proposed Project will be located along the southern fringe of Fingal in north County Dublin, between Blanchardstown and Baldoyle, and in the marine environment off north County Dublin between Baldoyle Bay and Ireland's Eye. An overview is presented in Figure 4.1 Proposed Project Overview and the Proposed Project is shown in detail on Planning Drawings Nos. 32102902 – 2000 to 32102902 – 2014.

The proposed site for the proposed WwTP is located in the townland of Clonshagh, in Fingal. It is situated in open agricultural land approximately 2.4km south-east of Dublin Airport (Terminal 2) and approximately 500m north of the R139 Road. The Cuckoo Stream (a tributary of the Mayne River) lies immediately north, with the Mayne River itself approximately 400m south of the proposed WwTP site.

The proposed orbital sewer route, which will run from Blanchardstown to Clonshagh, will transfer flows from the existing Blanchardstown drainage catchment, which includes Blanchardstown and its environs, and towns and villages in Meath, including Ashbourne, Ratoath, Kilbride, Dunboyne & Clonee, to the proposed WwTP at Clonshagh. The proposed orbital sewer route will commence in the grounds of Waterville Park, Blanchardstown, where it will intercept the existing Blanchardstown main sewer line, known as the 9C Sewer. From this point, it will be routed through the grounds of Connolly Hospital and the grounds of the NSC to the proposed Abbotstown pumping station, located adjacent to the M50 Motorway. From the proposed Abbotstown pumping station, the proposed orbital sewer route will be routed north of, and generally parallel to, the M50 Motorway to Clonshagh, and will pass south of Dublin Airport complex. The lands along the length of the proposed orbital sewer route are generally open fields, and agriculture is the main land use pattern. The total length of the proposed orbital sewer route will be approximately 13,700m. There are no environmentally designated sites within the proposed orbital sewer route.

The proposed OCU will be located adjacent to the R122 Road at the interface between the rising main and gravity sewer elements of the proposed orbital sewer route.

The proposed NFS diversion sewer will transfer flows in the NFS upstream of the point of interception to the proposed WwTP. It is proposed to intercept the NFS in the vicinity of the junction of the proposed access road to the proposed WwTP with the R139 Road. From this point, the proposed NFS diversion sewer will be routed to the proposed WwTP along the proposed access road. The total length of this diversion sewer will be 600m.

The proposed outfall pipeline route will consist of a land based section (Clonshagh to Baldoyle), a marine section (Baldoyle to Ireland's Eye) and a multiport marine diffuser. The proposed outfall pipeline route (land based section) will commence at the proposed WwTP and will be routed in an easterly direction towards the coast between Baldoyle and Portmarnock. The lands along the length of the proposed outfall pipeline route (land based section) are generally open fields and agriculture is the main land use pattern. There are no environmentally designated sites within the proposed outfall pipeline route (land based section).

The proposed outfall pipeline route (marine section) will commence at the R106 Coast Road, north of Baldoyle, and will be routed in a north-easterly direction across Baldoyle Estuary to the public car park immediately north of Portmarnock Golf Club, where it will turn in an easterly direction and will terminate approximately 1km north-east of Ireland's Eye.

The proposed multiport marine diffuser will be located on the final section of the proposed outfall pipeline route (marine section) and will consist of a number of vertical risers from the proposed outfall pipeline (marine section) to above seabed level. Diffuser valves will be attached onto the vertical risers to allow the treated wastewater to achieve the required initial dilution on discharge to the marine environment.

The total length of the proposed outfall pipeline route will be approximately 11,400m, with the land based section comprising 5,400m and the marine section, including the multiport diffuser, comprising 6,000m.

The coast in the vicinity of the proposed outfall pipeline route (marine section) is characterised by sandy beaches. Water depths in this area range from 0m to 25m Lowest Astronomical Tide. The seabed is gradually sloping eastward and the bottom is sandy in nature with a varying depth to bedrock.

The proposed outfall pipeline route (marine section) will terminate within the Irish Sea Dublin (HA 09) Coastal Water Body as defined under the Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive (WFD)).

Designated areas within the vicinity of the proposed outfall pipeline route (marine section) are illustrated on Figure 4.2 Designated Areas in the Vicinity of the Proposed Project and include:

- Baldoyle Bay Special Area of Conservation (SAC) (000199);
- Baldoyle Bay Special Protection Area (SPA) (004016);
- Rockabill to Dalkey Island SAC (003000);
- Ireland's Eye SAC (002193);
- Ireland's Eye SPA (004117); and
- Malahide Shellfish Waters.

The proposed outfall pipeline route (marine section) will cross under the estuary habitats of Baldoyle Bay SAC (site code: 000199) and Baldoyle Bay SPA (site code: 004016) and will terminate within the Rockabill to Dalkey Island SAC (site code: 003000).

The proposed RBSF will be located in the townland of Newtown, Dublin 11. The proposed site is 11.4ha in area, situated adjacent to the R135 Finglas Road and north-east of Huntstown power station. Fingal County Council (FCC) has partially developed the proposed site (i.e. road infrastructure, drainage, power, boundary treatments, access/egress gates to the R135 Finglas Road and some administration buildings) for a waste recycling centre, in accordance with planning permission PLO6F.EL.2045.

There are no environmentally designated sites within or adjacent to the proposed RBSF site.

4.4 Description of the Proposed Regional Wastewater Treatment Plant

4.4.1 Proposed Site

The proposed site for the proposed WwTP is located in the townland of Clonshagh in Fingal, as shown in Figure 4.3 Proposed Wastewater Treatment Plant Site. It is situated on 29.8ha of open agricultural land, approximately 2.4km south-east of Dublin Airport and approximately 500m north of the R139 Road. The Cuckoo Stream (a tributary of the Mayne River) lies immediately north of the proposed WwTP site, with the Mayne River itself lying approximately 400m to the south of the proposed WwTP site. The southern boundary of the proposed WwTP site is defined by a future road, the Malahide Road to Stockhole Lane section of the proposed East–West Distributor Road, as set out under Road Construction and Improvement Measures (Objective MT41, Table 7.1 and Drawing 11) in the *Fingal Development Plan 2017 – 2023* (FCC 2017).

The lands slope in a west-east direction from 45.00 metres above Ordnance Datum (mOD) to 39.00mOD with a central elevation of approximately 42.30mOD.

The *Fingal Development Plan 2017 – 2023* (FCC 2017) zoning objectives for the proposed site include Greenbelt, High Technology and Open Space, as illustrated in Figure 4.4 Land Use Zoning Objectives at the Proposed Wastewater Treatment Plant Site.

4.4.2 Proposed Treatment Capacity

As outlined in Section 3.6.3 in Chapter 3 The Need for the Proposed Project in Volume 2 Part A of this EIAR, the wastewater treatment capacity to be provided under the Proposed Project is 500,000 Population Equivalent (PE).

4.4.3 Proposed Design Basis

Using the Proposed Project wastewater treatment capacity of 500,000 PE, which includes domestic, non-domestic and industrial loadings, provisional design flows are provided in Table 4.1 below. Future flow and load monitoring, in the catchments which will be diverted to the proposed WwTP, will confirm the split between industrial, non-domestic and domestic flow and load. These groups have been estimated from available data at this stage.

Table 4.1 tabulates the Design Basis using the following typical unit loads: 60g Biochemical Oxygen Demand (BOD) per head per day (BOD/hd/d); 70g Total Suspended Solids (TSS)/hd/d; 12g Total Kjeldahl Nitrogen (TKN)/hd/d; 9g Ammoniacal Nitrogen (AmmN)/hd/d; and 2.5 g/hd/d Total Phosphorus (TP). A maximum week peaking factor of 1.5 is applied to the average daily loadings.

Table 4.1: Proposed Design Basis

Design Parameter	Design Value	Unit of Measurement
Population equivalent (PE)	500,000	PE
Domestic per Capita Design Flow (G)	0.225	m^3/hd/day
Dry Weather Flow (DWF)	112,500	m^3/d
Flow to Full Treatment (FFT)	281,250 3.26	m^3/d m^3/s
Average Dry Weather Flow (ADWF)	140,625	m^3/d
BOD	30,000	Kg/d
TSS	35,000	Kg/d
Ammonia (N)	4,500	kg/d
TKN	6,000	kg/d
TP	1,250	kg/d

4.4.4 Proposed Treatment Standards

A system for the licensing or certification of wastewater discharges from areas served by water services authorities was brought into effect on 27 September 2007 with the introduction of the Waste Water Discharge (Authorisation)

Regulations 2007 (S.I No. 684 of 2007). This licensing or certification process gives effect to a number of European Union Directives by imposing restrictions or prohibitions on the discharge of dangerous substances and implementing measures required under the WFD, thus preventing or reducing the pollution of waters by wastewater discharges. All discharges to the aquatic environment from treated wastewater systems owned, managed and operated by water services authorities require a wastewater discharge licence or certificate of authorisation from the Environmental Protection Agency (EPA).

The authorisation process requires the EPA to place conditions on the operation of such discharges to ensure that potential impacts on the receiving water bodies are limited and controlled with the aim of achieving good surface water status and good groundwater status no later than December 2015.

The proposed WwTP will require a wastewater discharge licence to be granted by the EPA under the Waste Water Discharge (Authorisation) Regulations 2007 (S.I No. 684 of 2007) prior to commissioning of the proposed WwTP.

Treatment standards for treated wastewater from the proposed WwTP to be discharged into the marine environment of the Irish Sea off the coast of North County Dublin were examined and reported on in the *Key Wastewater Treatment Standards Report* (Jacobs Tobin 2018a) which is appended as Appendix A4.1

This report proposed, subject to the granting of a wastewater discharge licence by the EPA, that the final treated wastewater produced at the proposed WwTP should conform to the standards outlined in Table 4.2.

Table 4.2: Final Effluent Emission Limits for the Proposed WwTP

Parameter		Emission Limit
pH		6 – 9
Temperature		25°C (max)
BOD_5[1]	95th Percentile	25mg/l O_2
	Not to be exceeded	50mg/l O_2
Chemical Oxygen Demand (COD)	95th Percentile	125mg/l O_2
	Not to be exceeded	250mg/l O_2
TSS	95th Percentile	35mg/l
	Not to be exceeded	87.5mg/l

The extensive modelling studies undertaken on the expected discharge have confirmed that, for the identified proposed outfall location and the emission limit values set out in Table 4.2, the receiving water will meet good status criteria and will meet the environmental quality objectives for coastal water nutrients levels. The modelling studies have also confirmed that:

- The Proposed Project will have a negligible impact on the water quality of the coastal waters off County Dublin;
- The Proposed Project will have no impact on achieving the goals of the WFD (i.e. reaching good status in all water bodies);
- The proposed discharge location will not negatively impact any designated bathing waters; and
- The Proposed Project will have a negligible impact on the quality of shellfish waters.

[1] BOD 5 day limit

4.4.5 Indicative Design

A range of different treatment processes are currently available which would satisfy the treated wastewater requirements for the proposed WwTP, including:

- Conventional Activated Sludge Plant (ASP);
- ASP in Sequencing Batch Reactors (SBR);
- Submerged Attached Growth Processes (e.g. Biological Aerated Flooded Filters);
- Integrated Fixed Film Activated Sludge Processes (e.g. IFAS); and
- Aerated Granular Sludge (AGS).

Contractors will be appointed to design, build and operate the proposed WwTP to achieve the required emission limit values listed in Table 4.2 or as conditioned by the EPA, within defined design constraints. Therefore, the exact details regarding the design of the Proposed Project and processes to be used are not confirmed at this stage.

Nevertheless, an indicative design has been undertaken to assess the environmental impacts of the Proposed Project. Where different treatment processes are possible, the maximum impact is assessed with respect to the potential impact of the design.

The proposed WwTP will consist of a number of buildings and tanks of various shapes, sizes and heights, part below ground and part above ground. The maximum height of buildings will be 18m above ground level. The design of these structures will largely be dictated by the type of treatment process which will be ultimately proposed, within a design envelope defined by the wastewater discharge licence, planning and the Environmental Impact Assessment Report, and by the successful Design, Build, Operate contractor.

Three preliminary indicative layouts for the proposed WwTP have been developed for the site based on a conventional ASP plant, a Sequencing Batch Reactor plant and an Aerated Granular Sludge plant, as shown on Planning Drawing Nos. 32102902 – 2120, 32102902 - 2138 and 32102902 - 2139 respectively.

Each of the indicative layouts have been broken into three zones, as illustrated in Figure 4.5 Zonal Arrangement of the Proposed Wastewater Treatment Plant, with the western zone (Zone 1) containing the inlet works, which includes the preliminary unit treatment processes, and the primary sedimentation tanks. The middle zone (Zone 2) contains the biological treatment tanks and final settlement tanks (clarifiers). The sludge treatment facilities are contained in the eastern zone (Zone 3).

Typical unit treatment processes will include:

- Preliminary Treatment (Zone 1), which is a physical/mechanical process which is designed to remove gross suspended and floating materials from the raw wastewater before they damage/clog the pumps or downstream treatment processes. Preliminary treatment involves screening (coarse and fine screens) to remove papers and plastics as well as fats, oils, grease and grit removal, prior to sedimentation;
- Primary Sedimentation (Zone 1) which is a settling process where the larger solids in the wastewater are settled out by gravity in large tanks (settlement or sedimentation tanks). The settled solids are removed from the tanks by mechanical scrapers and transferred to the sludge treatment facilities;

- Biological Treatment (Zone 2) where organic matter in the wastewater is broken down through the action of bacteria which is facilitated by the addition of air (aeration). Sludge produced during this process is removed from the tanks and transferred to the sludge treatment facilities;
- Final Settlement (Zone 2) where any organic matter carried over from the biological treatment is settled out in large tanks, removed from the tanks by mechanical scrappers and transferred to the sludge treatment facilities; and
- Testing of final treated wastewater (Zone 2) prior to discharge.

The maximum height for any building at the proposed WwTP site will be 18m.

4.4.6 Description of the Proposed Sludge Hub Centre

The proposed SHC will be co-located with the proposed WwTP on the site at Clonshagh. The proposed SHC will occupy the eastern zone (Zone 3) of the proposed WwTP site.

The proposed SHC will have the capacity to provide sustainable treatment for municipal wastewater sludge and domestic septic tank sludges generated in Fingal to produce a ‘biosolid’ end-product. In addition, the proposed SHC will be designed to accept sludge from private property owners within the area of Fingal who are currently served by septic tank or individual domestic wastewater treatment systems.

The sludge treatment capacity to be provided under the Proposed Project is 18,500 tonnes of dry solids (TDS)/annum to provide for a projected 750,000 PE at the design year horizon of 2050. This figure caters for the import of sludge from other municipal WwTPs in Fingal.

The construction of the proposed SHC will include all the necessary buildings, tanks, ancillary structures, and mechanical and electrical plant that will be required to provide the required design treatment capacity. The maximum height of buildings in the SHC will be 18m above ground level.

The wastewater sludges generated at other municipal WwTPs, septic tanks and individual domestic wastewater treatment systems will be transported to the proposed SHC via the road network in tankers and/or covered skips.

In accordance with the *National Wastewater Sludge Management Plan* (NWSMP) (Irish Water 2016), it is proposed to treat the sludge using advanced anaerobic digestion to produce a ‘biosolid’ end-product suitable for reuse in agriculture, with the biogas produced during the treatment process used on-site for energy recovery.

The ‘biosolid’ end-product will be transported to the proposed RBSF via the road network in covered trucks for seasonal storage.

The proposed SHC will be included as part of the overall Design, Build, Operate Contract for the proposed WwTP, whereby the appointed contractor(s) will be appointed to design, build and operate the plant to achieve the required design standards. Therefore, the exact details regarding the design of the proposed SHC element of the Proposed Project and processes to be used are not confirmed at this stage.

Nevertheless, an indicative design has been undertaken in order to assess the environmental impacts of the Proposed Project. Indicative unit processes in the SHC include:

- Buffer tanks;

- Dewatering (centrifuges);
- Thermal hydrolysis (providing pasteurisation) tanks;
- Mesophilic anaerobic digestion tanks;
- Sludge/biosolid operational storage building; and
- Biogas storage.

4.4.7 Landscape Treatment for the Proposed Wastewater Treatment Plant

Visual screening (organic embankments) of the proposed WwTP site will be provided for boundaries adjoining the rural context to the east, north and west of the proposed WwTP site. Embankments will be planted with dense bands (approximately 15m to 20m wide) of hedgerow tree species and will rise to a maximum height of 4m. This will be achieved using a buffer zone width of approximately 60m. Between the mounds, specimen trees will be provided rising from a more open wildflower meadows context. The dense but linear bands of hedgerow vegetation topping the mounds will reference the hedgerows and tree-lined field boundaries of the agricultural fields in the vicinity. The meadow and specimen trees between the dense sections of hedgerow planting will reference the parkland aesthetic of the nearby demesne landscapes to the east.

In deliberate contrast to the organic and semi-rural boundary treatments of all other site boundaries, the southern boundary will be presented as a bold architectural landscape treatment in order to tie in with the future development of the lands to the south (future IDA Business Park). The buildings along this boundary of the proposed WwTP site will be aligned to provide a consolidated facade to front the future East–West Distributor Road between the proposed WwTP site and the IDA Business Park lands. The buildings will be set back to a sufficient degree in order to reduce their perceived height and bulk within the future street scene. This area will incorporate geometric blocks of dense ornamental shrubs and a ‘bosque’ or grid of tall narrow specimen trees such as poplars. A plinth wall and system railing will be provided and will be an attractive, subtle and secure physical boundary.

Semi-mature tree planting (minimum 14cm to 16cm girth) will be used for all planting along the southern boundary to aid early establishment. Mixed-age classes ranging from semi-mature (minimum 14cm to 16cm girth) down to feathered whips (approximately 1.25m tall) will be utilised for perimeter berms in order to establish a dense screen over a longer period of time. It is envisaged that it will take up to seven years for all planting to reach a maturity that will afford the intended screening effectiveness.

4.4.8 Access

Construction and operation access for the proposed WwTP will be from the R139 Road (formerly the N32 National Road) with egress to the Clonshaugh Road. A comprehensive Traffic Management Plan will be put in place for the Construction Phase and it will incorporate a left turn in/left turn out policy i.e. entry to site would be limited to left turn only from the R139 Road and egress from the site would be limited to left turn out only to the Clonshaugh Road.

4.4.9 Odour Control

An odour control system will be designed to ensure that odour does not give rise to any nuisance beyond the boundary of the WwTP. The system will involve extracting air from within the various buildings and tanks on a continuous basis. Fans located outside, adjacent to the odour control unit, will draw air though ducting to the odour control units comprising an organic filer media. The treated air will be emitted to the atmosphere through vertical stacks which will extend to a height of maximum height of 24m above ground level.

4.4.10 External Lighting

External lighting will be provided along the access and egress roads, internal roads, pedestrian routes and around the buildings and other plant rooms. Road-side lighting columns will be approximately 6m high.

4.4.11 Construction Methodology

Construction of the proposed WwTP will involve:

- Excavation for building foundations and tanks;
- Reinforced concrete works;
- Erection of structural steel/concrete building frames;
- Erection of building walls (concrete/blockwork)
- Erection of prefabricated cladding panels to walls and roofs of buildings;
- Erection of prefabricated steel tanks;
- Mechanical and electrical fit out of buildings and tanks;
- Installation of below and above ground pipework;
- Construction of screening berms;
- Construction of access/egress roads to/from site; and
- Internal circulation roads, car parks and footpaths, landscaping and final planting.

Over the three-year construction period, these activities will be sequentially scheduled by the appointed contractor to optimise resources and programme, moving various work crews from building to building in a sequential manner. A typical sequence of work is outlined below (refer to the Outline CEMP for further detail):

- Erect fencing to site and access roads;
- Strip topsoil from site and access roads, set aside for reuse;
- Grade site/access roads to finished profile. Excavated material deposited in screening berms;
- Establish appointed contractor’s compound on-site;
- Construct access roads and site circulation roads to subbase level;
- Excavate foundations for first building/tank, move to next building/tank;
- Pour concrete foundations/base to first building tank, move to next structure;
- Erect structural steel/concrete building frame, or reinforced concrete walls of tanks, move to next structure;
- Erect inner/outer walls and roof of building (prefabricated panels), move to next building;
- Install doors/windows and make building weather proof, move to next building;
- Commence first fix mechanical/electrical fit out of structure (building/tank), move to next building;

- Commence second fix mechanical/electrical fit out of structures;
- Erect prefabricated steel tanks (e.g. mesophilic anaerobic digesters);
- Erect biogas holding tanks;
- Install below ground pipework;
- Install above ground pipework;
- Test tanks and pipework for watertightness;
- Commence commissioning work on wastewater and sludge treatment systems;
- Finish construction of access/egress roads and internal circulation roads, car parks and footpaths;
- Erect permanent site security fencing;
- Landscape and plant site;
- Remove temporary construction fencing;
- Remove/demobilise appointed contractor’s compound; and
- Hand-over of site to Client/operator.

Excavated material will be reused on-site in construction of the screening berms and landscaping, where possible, such that quantities of excavated material will balance the fill material required in the screening berms and site landscaping.

4.5 Description of the Proposed Orbital Sewer Route, North Fringe Sewer Diversion Sewer Connection and Outfall Pipeline Route

This Section provides a description of the entire route for the proposed orbital sewer route, NFS diversion sewer and outfall pipeline route (land based section and marine section).

4.5.1 Proposed Orbital Sewer Route

As discussed in Section 4.3 above, the proposed point of interception/diversion of the 9C Sewer in Blanchardstown lies in the grounds of Waterville Park, Blanchardstown, in the townland of Deanestown.

The proposed orbital sewer route (Blanchardstown to Clonshagh) will commence at the proposed point of interception/diversion (chainage 0,000m). From here, it will be routed for 1.00km in an easterly direction through the grounds of Connolly Hospital towards the proposed Abbotstown pumping station (chainage 1,000m), which will be located adjacent to the M50 Motorway in the grounds of the NSC at Abbotstown.

At the proposed Abbotstown pumping station, the proposed orbital sewer route will turn north-east to run generally parallel to the M50 Motorway for approximately 3.6km before diverting at chainage 4,600m, in the townland of Kildonan, in a northerly/north-easterly direction, to avoid the electricity substation located at the junction of the M50 Motorway and the N2 National Road. The proposed orbital sewer route will cross the N2 National Road (at chainage 5,500m) immediately north of the electricity substation.

At chainage 6,000m, the proposed orbital sewer route will turn eastwards again and will continue in an easterly direction for 2.4km, crossing north of Dubber Cottages to chainage 8,400m in the townland of Silloge.

At this point, the proposed orbital sewer route will turn in a south-easterly direction, passing through North Point Business Park, to chainage 9,100m in the townland of Ballymun, at the M50 Motorway/R108 Road interchange.

Between chainage 9,100m and chainage 10,200m, the proposed orbital sewer route will run parallel to and immediately north of the M50 Motorway through the Dardistown Local Area Plan lands.

At chainage 10,200m, in the townland of Turnapin Great, the proposed orbital sewer route will turn north and will be routed through Ballystruan townland and immediately east of the proposed Metro North Depot, until chainage 11,100m at the 'Old Airport Road' in the townland of Collinstown.

At chainage 11,100m, the proposed orbital sewer route will then turn in an easterly direction for the final 2.6km to the proposed WwTP site at Clonshagh. En route, this section will run parallel to the southern edge of the Old Airport Road, crossing the R132 Swords Road at Collinstown Cross (chainage 11,650m). The proposed orbital sewer route will then run along the northern boundary of Dardistown Cemetery, crossing the M1 Motorway (chainage 12,700m) and the Clonshaugh Road (chainage 13,390m) before entering the western side of the proposed WwTP site (chainage 13,700m) in the townland of Clonshagh.

The topography along the proposed orbital sewer route will rise from Tolka River Valley, at approximately the 40mOD contour, to in excess of 84mOD in the vicinity of the R122 Road (chainage 6,200m), before gradually dropping towards the proposed WwTP site at Clonshagh at a ground level of the order of 44mOD.

Between chainage 0,000m and chainage 1,000m, the proposed orbital sewer route will operate as a gravity sewer. Between chainage 1,000m and chainage 6,250m, the proposed orbital sewer route will operate as a pumped rising main. Between chainage 6,250m and chainage 13,700m, the proposed orbital sewer route will again operate as a gravity sewer.

An OCU is proposed to be installed at chainage 6,250m adjacent to the R122 Road at the interface between the rising main and the gravity sewer to mitigate against the potential for odours to be released from the proposed orbital sewer route at this location.

4.5.2 Proposed North Fringe Sewer Diversion Sewer

The proposed NFS diversion sewer will transfer flows in the NFS upstream of the point of interception to the proposed WwTP. It is proposed to intercept the NFS near the junction of the proposed access road to the proposed WwTP and the R139 Road in lands within the administrative area of Dublin City Council. From this point, the proposed NFS diversion sewer will be routed in a northerly direction to the proposed WwTP along the proposed access road. The length of the proposed NFS diversion sewer from the point of interception to the WwTP will be 600m, with a required diameter of 1,500mm.

Within the proposed WwTP site, the proposed NFS diversion sewer will be routed in a westerly direction to the proposed inlet works. The length of this section of the proposed NFS diversion sewer will be 570m, with a required diameter 800mm.

The topography along the proposed NFS diversion sewer will generally be a rising profile from 36.30mOD at the point of interception to 40.20mOD at the main gate of the proposed WwTP site and 44.50mOD at the inlet works.

The proposed NFS diversion sewer will operate as a gravity sewer between the point of interception and the proposed WwTP and as a pumped rising main within the proposed WwTP site.

4.5.3 Proposed Outfall Pipeline Route (Land Based Section)

Commencing at the northern boundary of the proposed WwTP, the proposed outfall pipeline route (land based section) will be routed in a northerly direction for 0.7km to chainage 0,700m in the townland of Baskin. At this point, the proposed outfall pipeline route (land based section) will turn eastwards for 1.95km to chainage 2,650m in the townland of Kinsaley (Kinsealy), crossing the R107 Malahide Road (chainage 1,870m) en route. At chainage 2,650m, the proposed outfall pipeline route (land based section) will turn in a southerly direction for 0.75km to chainage 3,400m in the townland of Saintdoolaghs. At this point, the proposed outfall pipeline route (land based section) will again turn in an easterly direction for approximately 2km and will be routed parallel to and north of the R123 Moyne Road before reaching the R106 Coast Road (chainage 5,400m) in the townland of Maynetown. En route, the proposed outfall pipeline route (land based section) will cross the R124 Road (chainage 3,900m) and the Dublin – Belfast Rail Line (chainage 4,570m) in the townland of Drumnigh.

The topography along the proposed outfall pipeline route (land based section) is generally a falling profile from 39.00mOD at the boundary fence of the proposed WwTP to 9.00mOD at the R106 Coast Road.

The proposed outfall pipeline route (land based section) will operate as a pressurised gravity sewer.

4.5.4 Proposed Orbital Sewer Route (Marine Section)

The proposed outfall pipeline route (marine section) (Baldoyle to Ireland's Eye) will commence at chainage 0,000m in the townland of Maynetown in open fields immediately west of the R106 Coast Road and approximately 90m north of R123 Moyne Road.

From here, the proposed outfall pipeline route (marine section) will be routed in a north-easterly direction for approximately 1km across Baldoyle Estuary to the grassed area (chainage 1,010m) adjacent to the public car park (refer to Diagram 4-1) in the townland of Burrow, immediately north of Portmarnock Golf Club. En route, the proposed outfall pipeline route (marine section) will cross the R106 Coast Road (chainage 0,090m), and the Golf Links Road (chainage 0,850m). From this grassed area, the proposed outfall pipeline route (marine section) will turn in an easterly direction and will be routed out to sea for approximately 5km before terminating at the discharge location (chainage 5,940m), located approximately 1km north-east of Ireland's Eye.

Diagram 4-1: Grassed Area North of Portmarnock Golf Club

The topography along the proposed outfall pipeline route (marine section) is generally a falling profile from 9.00mOD at the R106 Coast Road to 2.80mOD in the green area at section chainage 1,010m, and -22.84mOD at the discharge location north-east of Ireland's Eye.

The proposed outfall pipeline route (marine section) will operate as a pressurised gravity sewer.

4.5.5 Townlands Crossed by the Proposed Pipeline Routes

The various townlands traversed by the proposed pipeline routes, which include the proposed orbital sewer route, the NFS diversion sewer and the outfall pipeline route (land based section and marine section), are outlined in Table 4.3 below.

Table 4.3: Townlands Crossed by the Proposed Pipeline Routes

Proposed Pipeline Route	Townland Name	Approximate Chainage	
		From	To
Proposed orbital sewer route (Blanchardstown to Clonshagh)	Deanestown	0,000m	0,200m
	Abbotstown	0,200m	1,200m
	Dunsink	1,200m	1,250m
	Sheephill	1,250m	2,500m
	Cappogue	2,500m	4,200m
	Kildonan	4,200m	4,900m
	Part of Huntstown	4,900m	5,200m
	Coldwinters	5,200m	5,500m
	Balseskin	5,500m	6,200m
	Dubber	6,200m	7,000m
	Merryfalls	7,000m	7,700m
	Silloge	7,700m	8,600m
	Ballymun	8,600m	9,980m
	Ballystruan	9,980m	10,000m
	Turnapin Great	10,000m	11,100m
	Collinstown	11,100m	11,600m
	Commons	11,600m	11,670m
	Dardistown	11,670m	11,750m
	Commons	11,750m	11,800m
	Toberbunny	11,800m	12,600m
	Clonshagh	12,600m	13,745m
Proposed outfall pipeline route (land based section)	Clonshagh	0,000m	0,050m
	Middletown	0,050m	0,700m
	Bohammer	0,700m	1,900m
	Kinsaley	1,900m	3,400m
	Saintdoolaghs	3,400m	3,700m
	Snugborough	3,700m	4,100m
	Drumnigh	4,100m	4,840m
	Maynetown	4,840m	5,379m
Proposed outfall pipeline route (marine section)	Maynetown	0,000m	0,100m
	Burrow	0,800m	1,400m
Proposed NFS diversion sewer	Dublin City	0,000m	0,050m
	Belcamp	0,050m	0,300m
	Clonshagh	0,290m	0,580m

4.5.6 Crossings of Watercourses and Infrastructure by the Proposed Pipeline Routes

The routing of the proposed orbital sewer route, NFS diversion sewer and the outfall pipeline route (land based section and marine section) discussed in Section 4.5.1 to Section 4.5.4 above will necessitate the crossing of watercourses and infrastructure which occur within the proposed pipeline routes. Further details are provided in Section 4.5.10. The significant crossings are summarised in Table 4.4 and Table 4.5. Full details, including drawings indicating the location of such crossings are available in the Engineering Specialist Report for Crossings (Jacobs Tobin 2018b), provided in Appendix A4.2.

Table 4.4: Infrastructure Crossed by the Proposed Pipeline Routes

Infrastructure	Proposed Pipeline Route	Approx. Chainage	Description
Aviation transmission infrastructure	Orbital sewer route (Blanchardstown to Clonshagh)	13,370m	Aviation fuel pipeline
Gas transmission infrastructure	Orbital sewer route (Blanchardstown to Clonshagh)	2,160m	900mm diameter gas main
		2,600m	900mm diameter gas main
		11,700m	450mm diameter gas main
Electrical power transmission infrastructure	Orbital sewer route (Blanchardstown to Clonshagh)	1,980m	38kV power overhead line (OHL)
		2,300m	38kV power OHL
		3,400m	38kV power OHL
		4,550m	38kV power OHL
		4,820m	110kV power OHL
		4,840m	38kV power OHL
		4,870m	220kV power OHL
		4,890m	220kV power OHL
		4,900m	110kV power OHL
		5,070m	110kV power OHL
		5,110m	110kV power OHL
		5,110m	110kV power OHL
		5,150m	38kV power OHL
		5,150m	110kV power OHL
		5,180m	220kV power OHL
		5,370m	110kV underground cable
		11,680m	38kV power OHL
		12,410m	38kV power OHL
	NFS diversion sewer	0,485m	38kV power OHL
	Outfall pipeline route (land based section)	2,300m	38kV power OHL
		3,150m	38kV power OHL
		3,530m	38kV power OHL
Strategic trunk sewer pipelines	Orbital sewer route (Blanchardstown to Clonshagh)	11,700m	900mm trunk sewer
		13,380m	300mm sewer (TBC)
	Outfall pipeline route (marine section)	0,100m	300mm rising main (TBC)
Strategic trunk water supply pipelines	Orbital sewer route (Blanchardstown to Clonshagh)	3,550m	24”, 450mm and 800mm North Fringe trunk main from Ballycoolin to Cappagh, Dublin City (2No)
		10,650m	400mm supply to Dublin Airport along the R132 Swords Road (3No)
		13,380m	24” trunk main between Swords and Clonshagh, Dublin City (1No)
	Outfall pipeline route (land based section)	4,800m	450 and 560mm trunk main between Swords and Donaghmede, Dublin City (2No)

Infrastructure	Proposed Pipeline Route	Approx. Chainage	Description
Existing Rail Infrastructure	Outfall pipeline route (land based section)	4,570m	Dublin to Belfast rail line
Planned Rail Infrastructure	Outfall pipeline route (land based section)	4,570m	Dublin to Belfast rail line
		4,570m	Dublin to Belfast rail line
		4,570m	Dublin to Belfast rail line
Submarine Fibre Optic Cable	Outfall pipeline route (marine section)	4,500m	Submarine fibre optic cable
National Primary Roads & Motorways	Orbital sewer route (Blanchardstown to Clonshagh)	5,500m	N2 National Road
		12,650m	M1 Motorway
Regional & Other Roads	Orbital sewer route (Blanchardstown to Clonshagh)	3,440m	Cappagh Road
		5,350m	R135 Finglas Road
		6,250m	R122 Road
		9,100m	R108 Road
		11,650m	R132 Swords Road
		13,380m	Clonshaugh Road
	Outfall pipeline route (land based section)	1,860m	R107 Malahide Road
		3,890m	R124 Road
	Outfall pipeline route (marine section)	0,090m	R106 Coast Road
		0,850m	Golf Links Road
Local Roads	Orbital sewer route (Blanchardstown to Clonshagh)	2,620m	Local Road west of Premier Business Park
		2,860m	Premier Business Park
		6,780m	Dubber Cottages
		7,990m	Silloge Green

Table 4.5: Watercourses Crossed by the Proposed Pipeline Routes

Watercourse/Infrastructure	Proposed Pipeline Route	Approx. Chainage	Description
Watercourses	Orbital sewer route (Blanchardstown to Clonshagh)	0,680m	Tributary of Tolka River
		8,310m	Santry River
		10,560m	Mayne River
	Outfall pipeline route (land based section)	0,050m	Cuckoo Stream
	NFS diversion sewer	0,025m	Mayne River

4.5.7 Chambers on the Proposed Pipeline Routes

Access chambers, manholes, air valves, scour valves and vent stacks are required to be constructed for the proper functioning, maintenance and operation of the proposed orbital sewer route and the proposed outfall pipeline route (land based section and marine section). The proposed pipeline routes are shown on Planning Drawing Nos. 32102902 – 2100 to 32102902 – 2108.

Air Valves

Air valves in pumped rising main systems serve two primary functions: the regular release of accumulated air that comes out of solution within a pressurised system, and to discharge large volumes of air from the pumped rising system when the pipeline is initially filled. Air valves are generally located at high points along the pumped rising main length.

Scour Valves

Scour valves are required at the low points on pumped rising main systems to facilitate the drain down of the pumped rising main system during maintenance.

Manholes

Access manholes will be constructed to facilitate access to the gravity sections of the proposed orbital sewer route (chainage 6,250m to 13,700m) for maintenance purposes. Manholes will be located at bends, changes in gradient and at approximately 200m centres along the proposed orbital sewer route.

Access Chambers

Access chambers will be constructed to facilitate access to the proposed outfall pipeline route (land based section) for maintenance purposes.

4.5.8 Proposed Construction Corridor and Proposed 20m Wayleave

A proposed construction corridor will be temporarily acquired for the construction of all proposed pipeline routes, including the proposed orbital sewer route, outfall pipeline route (land based section and marine section) and the NFS diversion sewer. The proposed construction corridor will be a temporary corridor, approximately 40m wide along all land based elements of the Proposed Project, and 250m wide for the dredged section of the proposed outfall pipeline route (marine section) which commences at the low tide mark. A proposed wayleave will be acquired for permanent access to all proposed pipeline routes for future operation and maintenance. The proposed 20m wayleave will lie within the proposed construction corridor and a permanent right of access for maintenance during operation will be acquired.

In addition, proposed temporary construction corridors will be required for the proposed temporary construction compounds along all proposed pipeline routes and at the proposed Abbotstown pumping station site and proposed WwTP site.

Fencing will be provided on both sides of the proposed construction corridor along all proposed pipeline routes. A typical arrangement of construction activities within the proposed construction corridors is illustrated in Figure 4.6 Typical Detail of the Proposed Pipeline Route Construction Corridor.

4.5.9 Access and Proposed Temporary Construction Compounds

Access to the proposed pipeline routes for construction and operation will be via the public road network and along the permanent wayleave, where practicable. However, in certain circumstances it will not be possible to access the proposed pipeline routes along the proposed construction corridor, and in these circumstances access will be along permanent wayleaves acquired through third party lands, as shown on Planning Drawing Nos. 32102902 – 2001 to 32102902 - 2011.

To facilitate the construction of the Proposed Project, proposed temporary construction compounds will be required at various locations (e.g. at the proposed Abbotstown pumping station site, various locations along the proposed pipeline routes, trenchless crossing locations, etc.). The proposed temporary construction compounds will be in place for periods of one to 12 months, depending on their location and the construction activity taking place at that particular location. The proposed temporary construction compounds will have a site office, welfare facilities, parking and a materials storage area. The proposed locations for the proposed temporary construction compounds are identified on Planning Drawing Nos. 32102902 – 2001 to 32102902 - 2011.

4.5.10 Proposed Construction Methodology

The proposed orbital sewer route, NFS diversion sewer and outfall pipeline route (land based section and marine section) have been designed and will operate as a combination of gravity sewers, pressurised gravity sewers and pumped rising mains.

The Outline CEMP provides an outline construction methodology for the Proposed Project, with key elements summarised in the following paragraphs.

Proposed Orbital Sewer Route, North Fringe Sewer Diversion Sewer and Outfall Pipeline Route (Land Based Section)

The construction methodology for the proposed land based pipeline routes will be a combination of open cut and trenchless methods. A conventional open cut methodology will be employed for the majority of the proposed land based pipeline routes. A typical work sequence for a conventional open cut methodology is as follows:

- Fence pipeline wayleave;
- Fence proposed temporary construction compound area;
- Establish the proposed temporary construction compounds;
- Strip topsoil carefully and store to one side of the proposed construction corridor for later reinstatement;
- Import pipes and string along the proposed construction corridor;
- Excavate pipeline trench and store to side of the proposed construction corridor (opposite side to topsoil storage) for later reinstatement;
- Import granular pipeline bedding material and place in excavated trench;
- Place pipeline on bedding material in excavated trench;
- Import granular pipeline surround material and place around pipeline in excavated trench;
- Test pipeline for watertightness;
- Backfill pipeline trench with suitable excavated material;
- Remove excess excavated material off site;
- Reinstate land drains; and
- Reinstatement of the proposed construction corridor to pre-construction condition (e.g. replacement of topsoil, seeding and replanting as appropriate) in accordance with the Outline CEMP for the Proposed Project.

Open cut methodology will not be suitable for all of the proposed pipeline routes, as a number of areas will require the use of trenchless techniques. In particular, the crossing of physical, natural and manmade obstructions, such as significant watercourses, significant topographical features, major roads, railways and major infrastructure, will necessitate the use of trenchless techniques.

Suitable trenchless techniques include pipe jacking and microtunnelling methods. Trenchless techniques require drive shafts to be constructed at the start of each trenchless section and reception shafts at the end of each section. These shafts will be constructed within the proposed temporary construction compounds located within the proposed construction corridor. At watercourse crossings, the drive and reception shafts will be located a minimum of 20m from the watercourse.

Locations where trenchless techniques will be employed are indicated on Planning Drawing Nos. 32102902 – 2100 to 32102902 - 2107.

Proposed Outfall Pipeline Route (Marine Section)

The proposed outfall pipeline route (marine section) will be constructed using microtunnelling and subsea pipe laying (dredging) techniques.

Microtunnelling techniques will be used between section chainage 0,000m and chainage 2,000m, from the open fields immediately west of the R106 Coast Road to approximately 600m offshore terminating below the low tide water mark.

The microtunnelled section will have an internal diameter of 2m and will be constructed at depths between 15m and 20m below ground level using a microtunnelling machine, with pipe sections installed as the microtunnelling machine progresses.

The microtunnelled section will require two proposed temporary construction compounds onshore, in the open field immediately west of the R106 Coast Road (chainage 0,000m) (proposed temporary construction compound no. 9) and in the grassed space (chainage 1,000m) adjacent to the public car park off the Golf Links Road, immediately north of Portmarnock Golf Club (proposed temporary construction compound no. 10). At proposed temporary construction compounds no. 9 and no. 10, the drive/reception shafts will be constructed, tunnelling equipment will be located and the tunnel materials will be stored temporarily. Waste material from the tunnel will be removed and disposed of in accordance with waste management legislation. Preliminary analysis estimates that microtunnelling will progress at a rate of approximately 60m per week and that the tunnelling will take in the region of 12 months, which includes for site mobilisation.

On completion of the construction works, proposed temporary construction compounds no. 9 and no. 10 will be dismantled and the ground will be reinstated to its original condition.

The proposed area for temporary construction compounds no. 9 and no. 10 will require a plan area of approximate dimensions of 150m x 100m and will contain the following plant and facilities:

- Office area including car parking;
- Launch (Jacking) shaft with Jacking station;
- Tunnelling equipment including:
    - Tunnel Boring Machine (TBM);
    - Control unit;

- Hydraulic pump units;
- Generators;
- Bentonite mixing plant; and
- Water separation plant;

- Storage area for jacking pipes, fuel, bentonite;
- Crane; and
- Excavator.

A typical arrangement for a microtunnelling compound is illustrated in Figure 4.7 Typical Arrangement for Proposed Microtunnelling Compound.

Microtunnelling will operate on a continuous 24-hour/7-day basis for the duration of the tunnelling works.

Subsea pipe laying (dredging) techniques will be used between chainage 2,000m and the final outfall location (chainage 5,940m).

A 5m deep trench of trapezoidal section, as illustrated in Figure 4.8 Typical Cross Section of the Proposed Pipeline Route Trench Dredged in the Seabed, will be excavated using a combination of backhoe dredger in the shallower areas and trailer suction hopper dredger (TSHD) where the water depths are beyond the limits of the backhoe dredger.

Excavated material from the backhoe dredger will be placed in a barge and subsequently deposited and stockpiled parallel to the proposed outfall pipeline route (marine section) trench, within the 250m wide proposed construction corridor. Where the TSHD is used it will deposit and stockpile the excavated material parallel to the proposed outfall pipeline route (marine section) trench, within the 250m wide proposed construction corridor. The stockpiled material will be subsequently reused to refill the trench over and around the pipe once it is installed in the trench.

Long length large diameter (LLLD) polyethylene pipe will be utilised on this dredged section of the proposed outfall pipeline route (marine section). These pipes will be constructed at the factory in the required diameter in continuously extruded strings up to 650m long. The pipe strings will then be towed to a pipe assembly/ballasting area in close proximity to the proposed outfall location.

Potential pipe assembly/ballasting areas identified include Dublin Port and adjacent to the pipeline trench.

At the pipe assembly/ballasting areas, the pipe lengths will be joined together into longer pipeline strings and a concrete ballast will be placed over the pipe.

The typical method for connecting pipe strings is flanged connections. However, alternatives such as mechanical couplings or welding of sections may also be used.

Diagram 4-2: Typical Diffuser Valve at Seabed Level (courtesy of Tideflex (2018))

It is noted that there are a number of alternatives for concrete ballast, and the concrete ballast design will be project specific depending on the installation scenario, pipeline parameters and contractor preferences. Options include rectangular, circular or starred ballast blocks or, alternatively, continuous concrete collars.

The assembled pipeline strings will then be towed to the proposed outfall location and surface positioned over the dredged trench. The pipeline will then be installed in the dredged trench in a continuous operation involving:

- Surface to seabed transfer utilising the polyethylene pipe's flexible properties (the 'S-bend' installation method); and
- Submersion by water filling/air evacuation.
- Connecting the pipeline strings together, using mechanical joints, as the installation progresses.

Once the pipe is confirmed to be in place at the bottom of the trench, the previously excavated material will be replaced around and over the pipe.

The diffuser valves will be installed (bolted) on the vertical risers using marine divers. These valves are integral to the final section of the proposed outfall pipeline route (marine section).

The interface between the tunnelled and the subsea pipeline sections will be constructed either by:

- Option 1 – TBM driven into pre-dredged reception pit and direct connection between tunnel and dredged pipeline; or
- Option 2 – TBM driven into structure (caisson/cofferdam) and connection between tunnel and dredged sections at this structure.

Preliminary analysis indicates that the construction period for the subsea pipe-laying element would take six months. However, it should be noted that all marine operations are weather dependent.

4.6 Description of the Proposed Abbotstown Pumping Station

4.6.1 Proposed Abbotstown Pumping Station

The Proposed Site

The proposed Abbotstown pumping station site will be located in the grounds of the NSC, Abbotstown, adjacent to the M50 Motorway as indicated on Planning Drawing No. 32102902 – 2140.

Required Pumping Capacity

The estimated pumping capacity required for the proposed Abbotstown pumping station is indicated in Table 4.6.

Table 4.6: Pumping Requirement from 9C Sewer Catchment to the Proposed WwTP at Clonshagh

Scenario	Peak Pumped Flow	Rising Main Diameter	Rising Main Length	Static Lift	Friction and Form Losses	Pump Power Requirements
Pumped Flow @ 3 times the dry weather flow (DWF)	2.5m³/s	1,400mm	5,200m	46m	14m	2,300kW
Inlet Pump Station	5.3m³/s	-	-	7m	5m	970kW

Proposed Abbotstown Pumping Station Arrangement

The pumping capacity required will dictate the geometry of the proposed Abbotstown pumping station (i.e. the number of pumps will vary depending on pumping capacity).

The proposed Abbotstown pumping station will consist of a single 1-storey building over basement. The above ground building will have a floor area of 305m2 and maximum height above ground level of 10m and will house the control room, welfare facilities, back-up diesel generator, surge vessels, odour control equipment, septicity control dosing equipment and storage facilities.

The basement will be 17m in depth with floor area of 524m2 incorporating the wet/dry wells housing the pumps, suction pipework and rising main manifold pipework.

The proposed Abbotstown pumping station will be constructed in reinforced concrete with finishes as shown on Drawing No 32102902 - 2144

Architectural Treatment

The proposed Abbotstown pumping station site will be located in the grounds of the NSC. The nearest building will be St. Francis' Hospice, a timber and brick building embracing nature through large glass windows.

The planning and architectural response to this will be to design a modern interpretation of a timber Victorian garden gazebo, set in a carefully designed landscape. In visual terms, this design seeks to integrate itself into the architectural curtilage of St. Francis' Hospice.

The building is designed with attractive but robust finishes over a hardened concrete shell to prevent potential vandalism and to minimise noise and odour impacts, as illustrated on Planning Drawing Nos. 32102902 – 2141 to 32102902 - 2145.

Ancillary Equipment

In order to provide for correct operation and maintenance, the proposed Abbotstown pumping station will require the following ancillary facilities all of which will be housed within the above ground structure:

- A control room to provide for the required power and control instrumentation;
- Welfare facilities;
- A back-up diesel generator;
- Surge vessels;
- Storage for spare parts and equipment;
- Odour control and treatment; and
- Septicity control dosing equipment.

Access

Construction and operation access for the proposed Abbotstown pumping station will be through the grounds of the NSC, as shown on Planning Drawing No. 32102902 – 2140.

Odour Control

An odour control system will be designed to ensure that odour does not give rise to any nuisance beyond the boundary of the Abbotstown Pumping Station site. The system will involve extracting air from the wet well and dry well on a continuous basis. Fans located in the odour control room, will draw air though ducting to the odour control unit comprising an organic filer media. The treated air will be emitted to the atmosphere through vertical stacks which will extend to a height of maximum height of 10m above roof level of the building.

External Lighting

External lighting will be provided along the access road, parking area and around the building. Road-side lighting columns will be approximately 6m high

4.6.2 Construction Methodology

The preliminary design of the proposed Abbotstown pumping station indicates that the invert level of the inlet sewer is approximately 17m deep, and as a result, the base slab for the wet well and dry well will be constructed significantly below the existing ground level.

Construction of the Abbotstown pumping station will be undertaken using conventional construction methodologies and will involve deep excavation for basement wet well/dry well, reinforced concrete works, erection of reinforced concrete building frame, erection/building walls (concrete/blockwork); erection of prefabricated cladding panels to walls and roofs of building, mechanical and electrical fit out of building, construction of access road car park and footpaths, landscaping and final planting.

Preliminary site investigation indicates rock at approximately 2.5m below ground level. The rock shall be excavated to the required invert level in such a manner as to minimise noise generation. Overburden above the rock will most likely be retained using a temporary concrete retaining wall. All excavated material will be removed off site to an appropriately licenced facility.

4.7 Construction Phase Programme

An estimated timeline for the Proposed Project is provided in Diagram 4-3. The total construction period for the overall Propose Project will be approximately 48 months, including 12 months of commissioning. However, individual activities will have shorter durations. The programme identifies the critical path activities (proposed WwTP construction and commissioning of the Proposed Project) and the estimated duration of the other activities.

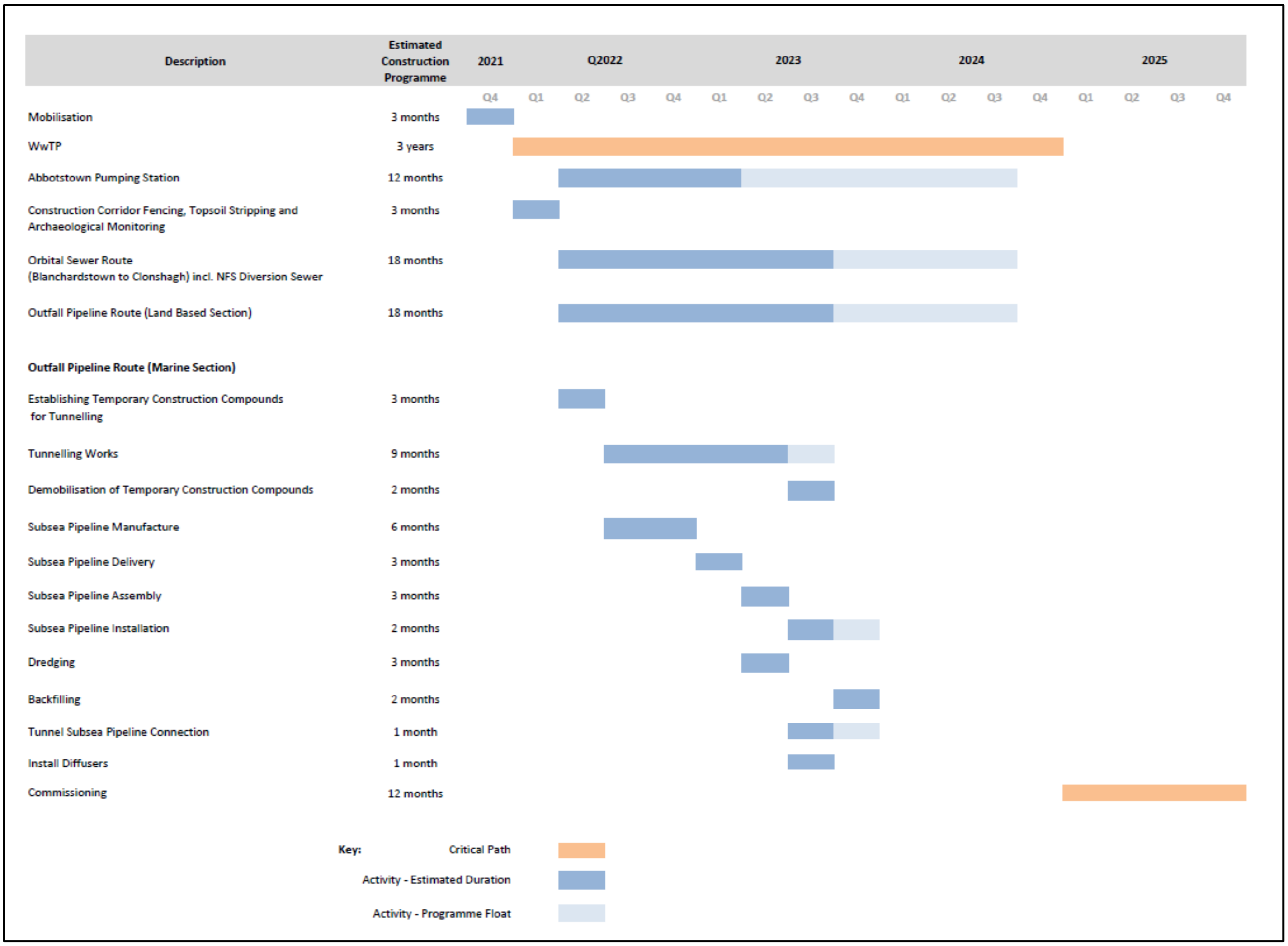

Diagram 4-3: Proposed Project Construction Programme

4.8 Operational Phase of the Proposed Project

The normal operation of the Proposed Project and its constituent elements will be fully automated, which will be monitored, controlled and managed from a control centre located at the proposed WwTP.

The automated control systems will report through Supervisory Control and Data Acquisition (SCADA) and telemetry systems to the control centre. The proposed WwTP and SHC will be manned 24 hours a day, 7 days a week. Between 30 and 40 operations staff will be employed, working in normal shift patterns, to ensure the continued and efficient operation of all elements of the Proposed Project.

Maintenance activities will typically include the following:

- General maintenance (daily);
- Preventative maintenance (as scheduled by operator);
- Pumping station inspections (weekly visit);

- Inspection of chambers on pipelines (annual visit); and
- Inspection of multiport diffusers (annual dive survey).

Monitoring activities will typically include:

- Influent and treated wastewater discharges (quality and quantity);
- Sludge/septic tank sludge imports and biosolids produced;
- Individual elements of the treatment processes;
- Individual elements of the pumping stations;
- Depth of flow in the orbital sewers and outfall pipeline;
- Pressure in the pumped rising mains;
- Emissions to air; and
- Noise emissions.

Regular deliveries to site will typically include:

- Chemicals;
- Municipal wastewater sludge;
- Domestic septic tank sludges;
- Leachate; and
- Office consumables.

Exports from site will typically include:

- Screenings and grit removal (estimated at three to four vehicles per week); and
- Biosolids (estimated at between 70 vehicles per week to the RBSF).

4.9 Energy Sources

Power and energy sources for the proposed WwTP will be provided through a combination of electricity, natural gas and biogas. Electricity and natural gas will be supplied from suitable connection points off the national grid, which are in close proximity to the proposed WwTP site. Biogas generated on-site during the anaerobic digestion of sludge will be used to generate electricity and recover heat through the Combined Heat and Power (CHP) system as discussed in Section 4.9.2. The CHP system will also generate electricity from natural gas. The availability of electricity, natural gas and biogas at the site will ensure security of an uninterrupted power supply to the proposed WwTP site.

Power and energy sources for the proposed Abbotstown pumping station will be provided primarily by electricity fed from suitable connection points off the national grid, which are in close proximity to the proposed Abbotstown pumping station site. Back-up diesel generators are also proposed at the proposed Abbotstown pumping station site. The diesel generators will be test run for a number of hours at regular intervals throughout the year.

4.9.1 Energy Efficient Design

Irish Water is committed to designing, building and operating assets to ensure energy efficiency. The plant, equipment, buildings and systems associated with the Proposed Project will be designed, equipped, operated and maintained in such a manner to ensure a high level of energy performance and that energy is used efficiently. The Proposed Project will be designed following the requirements set out in standard, I.S. 399 Energy Efficient Design and Management (Sustainable Energy Authority of Ireland (SEAI) and National Standards Authority of Ireland 2014). This standard requires that any design features or methods that may reduce energy consumption are considered and the process of their consideration is clearly documented. Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD) requires Near Zero Energy Buildings (NZEB) by 2020 and significantly increases the amount of on-site renewable energy used in buildings. This requires consideration in the lifecycle assessment and embodied carbon calculation. It will be relevant to all buildings constructed as part of the Proposed Project. The detail design will account for this and also follow SEAI guidelines, including:

- Development of energy balances;
- Determination of the minimum achievable energy performance indicator (EnPi) for the design;
- Energy benchmarks; and
- Energy variables for the design that quantify variables that impact energy performance and preparation of Measurement and Verification (M&V) Plans to detail how the energy performance of the design will be measured and verified as per ISO5 0015.

4.9.2 Renewable Energy Options

Policy objective PM30 of the *Fingal Development Plan 2017 – 2023* (FCC 2017) states to '*Encourage the production of energy from renewable sources, such as from Bio-Energy, Solar Energy, Hydro Energy, Wave/Tidal Energy, Geothermal, Wind Energy, Combined Heat and Power (CHP), Heat Energy Distribution such as District Heating/Cooling Systems, and any other renewable energy sources, subject to normal planning considerations and in line with any necessary environmental assessments*'.

The Proposed Project proposes to maximise energy recovery from the proposed WwTP and sludge treatment processes. This will be achieved using thermal hydrolysis and anaerobic digestion in the treatment of the sludge and using the biogas produced from this process to fuel on-site CHP generators to produce electrical and thermal energy. Primary and secondary sludge produced at the proposed WwTP can be mixed with the sludge imported to the proposed SHC prior to undergoing the treatment process. Use of thermal hydrolysis with anaerobic digestion will reduce the dry matter and increase production of biogas.

A well-designed CHP system will produce power at a cost below that of retail electricity, which will reduce the overall energy consumption of the proposed WwTP and reduce emissions of greenhouse gases. Typical CHP systems can have total efficiencies of up to 80%.

4.10 Surface Water Management

The surface water runoff during construction activities will be managed to prevent flow of silt-laden surface water flowing into watercourses, in accordance with the Outline Surface Water Management Plan, which forms an Appendix to the Outline CEMP.

Surface Water runoff during the Operational Phase of the Proposed Project will be managed and controlled to limit discharges to pre-development green field runoff rates, and to prevent pollution of watercourses through the implementation of on-site Sustainable Urban Drainage Systems (SuDS) including swales, filter drains, underground attenuation tanks and rainwater harvesting, in accordance with the outline Surface Water Management Plan. All SuDS systems will be designed in accordance with the *SuDS Manual (C753)* (CIRIA 2015).

At the proposed WwTP site, the attenuated surface water runoff will be discharged to the Cuckoo Stream, which bounds the northern edge of the proposed WwTP site. Stored rainfall will also be used as a site wash water, where applicable.

Surface water runoff from the proposed access road from the R139 Road to the proposed WwTP site will be attenuated using swales and infiltration drains prior to discharge to the Mayne River.

At the proposed Abbotstown pumping station site, surface water runoff will be attenuated on-site through means of a filter drain system prior to discharge to the existing watercourse to the south of the proposed Abbotstown pumping station site, which is a tributary of the Tolka River.

4.11 Description of the Proposed Regional Biosolids Storage Facility

The RBSF is described in further detail in this section. The purpose of the development of the RBSF is to provide a facility, serving the Greater Dublin region, for the storage of treated wastewater sludge (biosolids) prior its re-use on agricultural lands. The sources of biosolids to be stored at the RBSF are the Ringsend WwTP and the GDD WwTP.

4.11.1 Location

The location for the proposed RBSF is at a site in Newtown, Dublin 11. It comprises approximately 11 hectares of partially developed land and is situated off the R135 road, on the western side of the N2 national road. It is approximately 1.6km north of Junction 5 (Finglas) on the M50 motorway and 1.5km west of Dublin Airport. The proposed site is to be known as the Regional Biosolids Storage Facility (RBSF). The location of the RBSF is shown in Diagram 4-4.

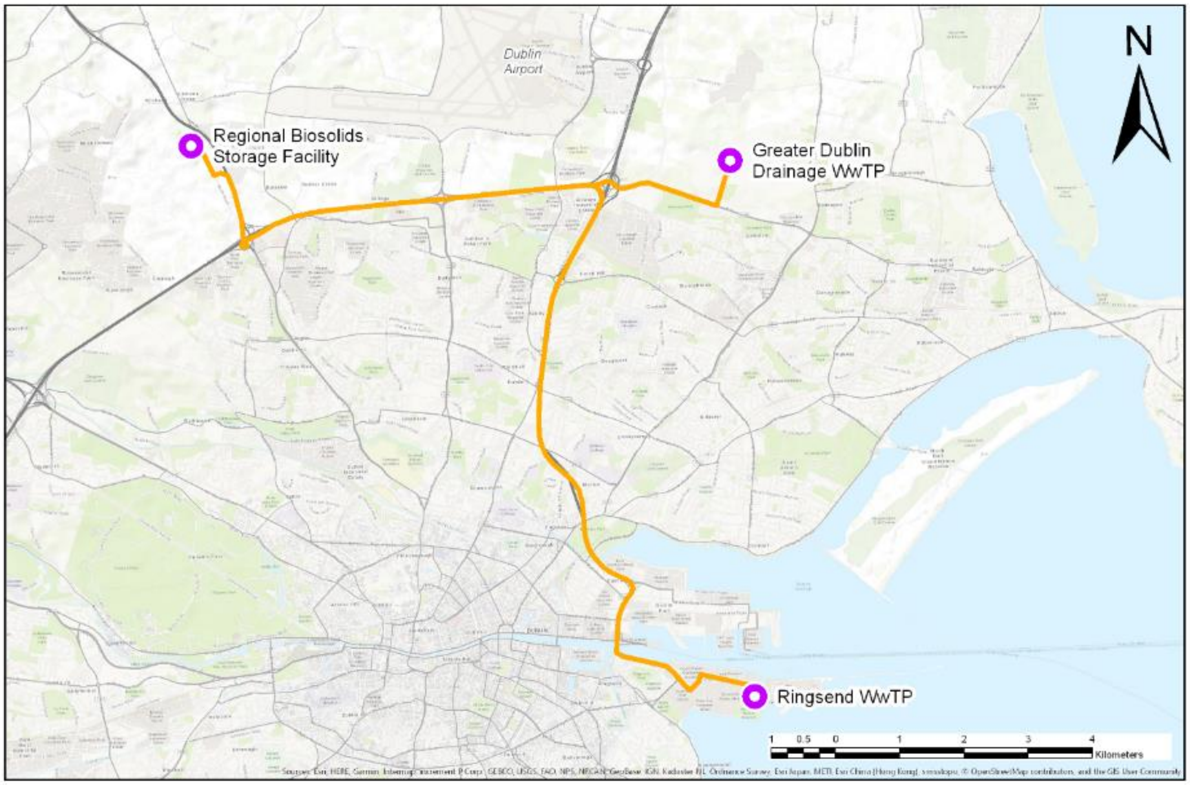

Diagram 4-4: Location of Regional Biosolids Storage Facility and Biosolids Sources

4.11.2 Characteristics of the Regional Biosolids Storage Facility

Need for the Regional Biosolids Storage Facility

The purpose of the RBSF is to store treated biosolids that will be produced at the Ringsend WwTP and the proposed WwTP for the Proposed Project. The NWSMP (Irish Water 2016) identifies reuse of treated wastewater sludge (biosolids) as a fertiliser on agricultural land as the preferred outlet in the short to medium term. Constraints on land spreading due to legislation and due to demand for the product require that biosolids must be stored during certain times of the year. The development of regional facilities for the storage of biosolids from WwTPs is recommended in the NWSMP. In relation to sludge storage in greater Dublin the NWSMP concluded:

> "*In line with the approach taken to other facilities in this Plan, the development of Sludge Storage Facilities will no longer be considered solely on a per-plant or per-county basis. Where appropriate, Sludge Storage Facilities will be developed to serve a number of local plants and/or a wider regional need. In particular, the upgrade to the Ringsend WwTP sludge hub and the proposed GDD WwTP will result in a significant increase from current sludge volumes with a consequent increase in storage requirements. Therefore, a dedicated sludge storage facility should be developed in conjunction with the expansion of Ringsend to meet its requirements and take account of other future needs in the region"*.

The proposed facility will be used solely for storage purposes. No treatment of the biosolids will take place at the facility.

Biosolids Description

Organic and inorganic matter in the wastewater (both solid and dissolved) end up in a sludge arising from the treatment process which is subject to further separate treatment on the relevant WwTP site. The sludge is treated to recover gas (the energy from which is used to run the plant), to reduce its volume, and to kill pathogens (bacteria and viruses). The treatment process results in 'biosolids', a biologically stable product with pathogens (viruses, bacteria) reduced to the extent that renders it safe for use in agriculture, and containing high levels of plant nutrients, e.g. nitrogen and phosphorus. The level of pathogen reduction from the treatment process is such that the treated sludge material can be transported and stored without any further health protection measures being necessary, subject however to compliance with all applicable waste regulations.

The treated sludge is also dewatered or dried to give two products for transport to storage: a 'cake' (approximately 26% dry solids) or a dry granular material (approximately 92% dry solids). Both of these materials are high in nutrients and are used as soil conditioners and fertilisers in agriculture. Both are generically termed 'biosolids', i.e. a fully treated sludge product which is biologically stable, has a low odour with pathogens reduced to the extent that renders it safe for use in agriculture. The cake material is known as "biocake" and the drier granular material is known as "biofert".

Storage Requirements

The Applicant is applying to ABP for planning approval for development of the RBSF based on a 20-year design horizon (up to 2040), that the facility will have the capacity to store already treated wastewater sludge from Ringsend WwTP and the Proposed Project WwTP[2], giving a total requirement of approximately 3.0 million PE. Irish Water will review the storage requirements within the Greater Dublin Area in the medium to long term and develop the proposed RBSF further within the space provided on the selected site if and as required. This further development would require planning consent before it could proceed, but the site has capacity for further storage facilities should they be needed.

The estimated quantities of biosolids generated at the Proposed Project WwTP and Ringsend WwTP based on the estimated wastewater load (including headroom), from each source is provided in Table 4.7

[2] Sludge at GDD WwTP will be treated at a Sludge Hub Centre (SHC) on the site of the WwTP. In addition to the sludge from the WwTP, the SHC which will treat wastewater sludge imported from the WwTPs serving other towns and villages in the area of Fingal.

Table 4.7: Storage Volume Requirement for Biosolids

Year	Source	Biosolids Type	Annual		Storage Period	
			Dry Tonnes (tDS)	Wet (Tonnes)	Wet (Tonnes)	Volume (m^3)
2021	Ringsend WwTP	Biocake	11,400	43,700	14,000	13,340
		Biofert	15,300	16,650	5,400	12,200
	Total					**25,540**
2025	Ringsend WwTP	Biocake	7,700	29,640	9,500	9,100
		Biofert	15,300	16,650	5,400	12,200
	Proposed Project WwTP	Biocake	4,880	19,520	6,250	6,000
	Total					**27,300**
2040	Ringsend WwTP	Biocake	10,900	42,000	13,460	12,800
		Biofert	15,300	16,650	5,400	12,100
	Proposed Project WwTP	Biocake	7,900	31,700	10,200	9,700
	Total					**34,600**

Notes: Figures are rounded. Bulk density of biofert is approximately 440 kg/m3 and biocake is approximately 1050 kg/m^3.

Fertilisers, such as biosolids, are not permitted to be spread on land between 15 October and 12 January in the areas of the country where there is the most likely demand, for the biosolids to be stored at the RBSF. These rules are set out by the Department of Agriculture, Food and Marine to comply with the European Union's Nitrates Directive. Storage volumes will be provided at the RBSF to cater for a 4-month period to allow for the non-growing periods in winter and summer.

Table 4.7 shows that the total storage required at the RBSF by 2040 is estimated at 35,400m^3. Storage will be provided in two buildings at the RBSF site and will be provided on a phased basis, as described in more detail in the following sections.

Additionally, struvite will be produced at the Ringsend WwTP as a by-product to wastewater treatment process following the commissioning of the phosphorus recovery system at the beginning of 2021. Irish Water may not be in a position to apply for the "end-of-waste" approvals and/or REACH approvals until the P-recovery technique is selected as the standard to be attained and quality of product cannot be assessed unless specific techniques are known. There will be a need for an alternative disposal route pending these approvals, and for an interim period there is a requirement to facilitate its reuse under traditional waste regulated channels of land-spreading.

In the short term, it is likely that struvite will be stored in segregated bays at the RBSF until market arrangements are firmly established. Unlike biocake and biofert, struvite will typically be bagged on the WwTP site to facilitate transfer to the fertiliser industry. However, in the interim situation, the product will be delivered in bulk to the RBSF. The annual quantities of struvite are expected to be in the region of 6,000 tonnes per year based on the design load for the Ringsend WwTP. Sufficient storage can be provided at RBSF for the required storage months in the expected interim period.

4.12 Proposed Works for the Regional Biosolids Storage Facility

4.12.1 Site Layout

The site is owned by FCC and the local authority was granted approval by ABP in 2006 for a waste recovery facility at the proposed RBSF site. The planned activities included recovery of construction and demolition waste, wastewater sludge treatment, biological waste treatment and waste transfer for municipal waste. Details of the previous planning application are provided in Volume 4, Section 2 of this EIAR. Certain enabling works, including drainage works, internal access roads, boundary fencing, and electricity and telecommunications infrastructure have been carried out at the proposed RBSF on the basis of the 2006 approval.

The site is accessed from the R135 Road. Vehicles arriving to the site from the M50 Motorway approach from the south and turn left into the site. The road outside the site includes a clearly marked left turning slip lane for the site. Vehicles leaving the site turn left on to the R135 Road for all routes.

The site comprises mainly sections of grassland separated by a road network. The development works that were completed include a road network, boundary fencing, administrative building, weighbridge areas, drainage systems, and other site services. An Electricity Supply Board (ESB) 110kV overhead transmission line and a 38kV underground cable both cross the southwestern corner of the site. The existing site layout is shown in Diagram 4-5 and drawing Y17702-PL-003 in Volume 5, Part of this EIAR. The site boundary is shown as a purple line.

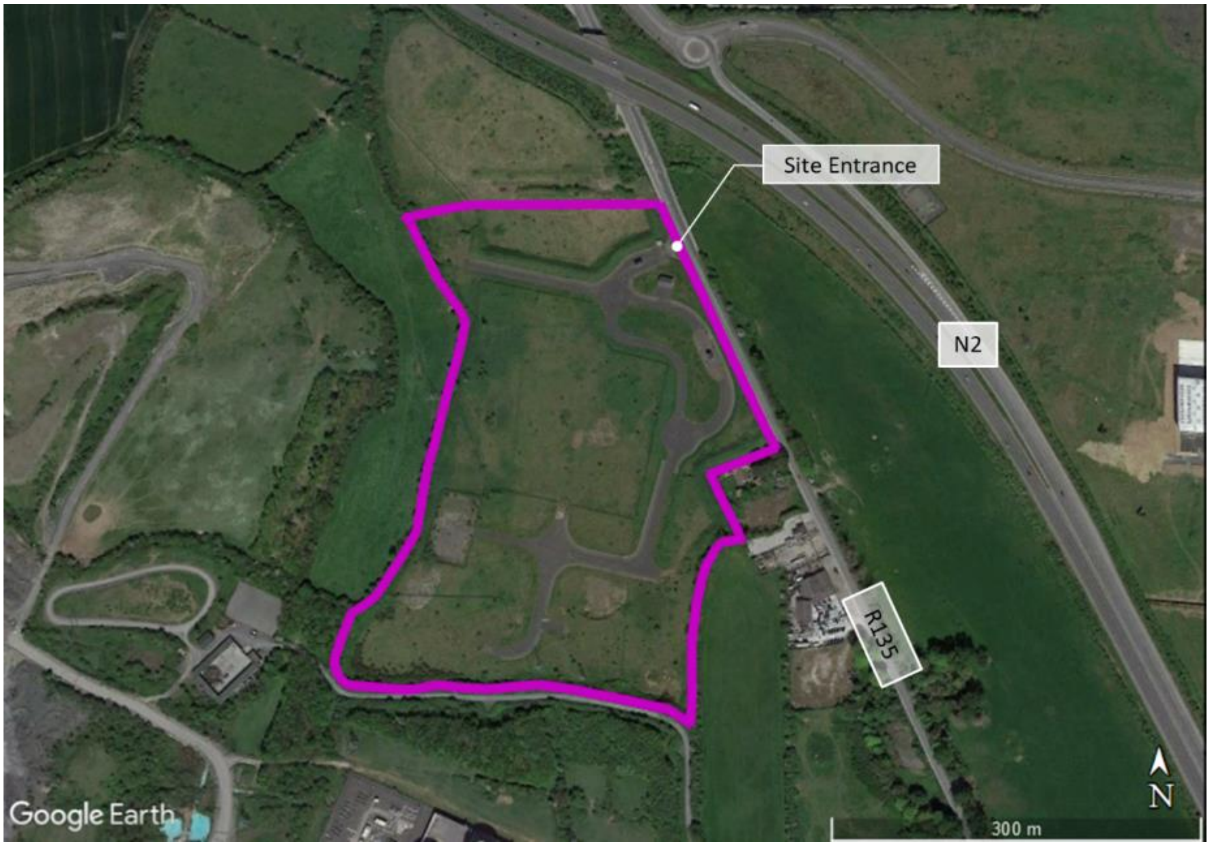

Diagram 4-5: Existing Site

The site generally slopes from east to west. There is a difference of approximately 2m to 3m between the highest and lowest areas on the site. A tributary of the Huntstown Stream, which in turn is a tributary of the Ward River, flows along the western and southern boundary of the site. The site naturally drains to this watercourse.

The proposed RBSF will be located in the northern part of the site as shown in Diagram 4-6. There is no development proposed in the southern part. This area is reserved for possible future requirements, which would require planning consent under a separate application before it could proceed.

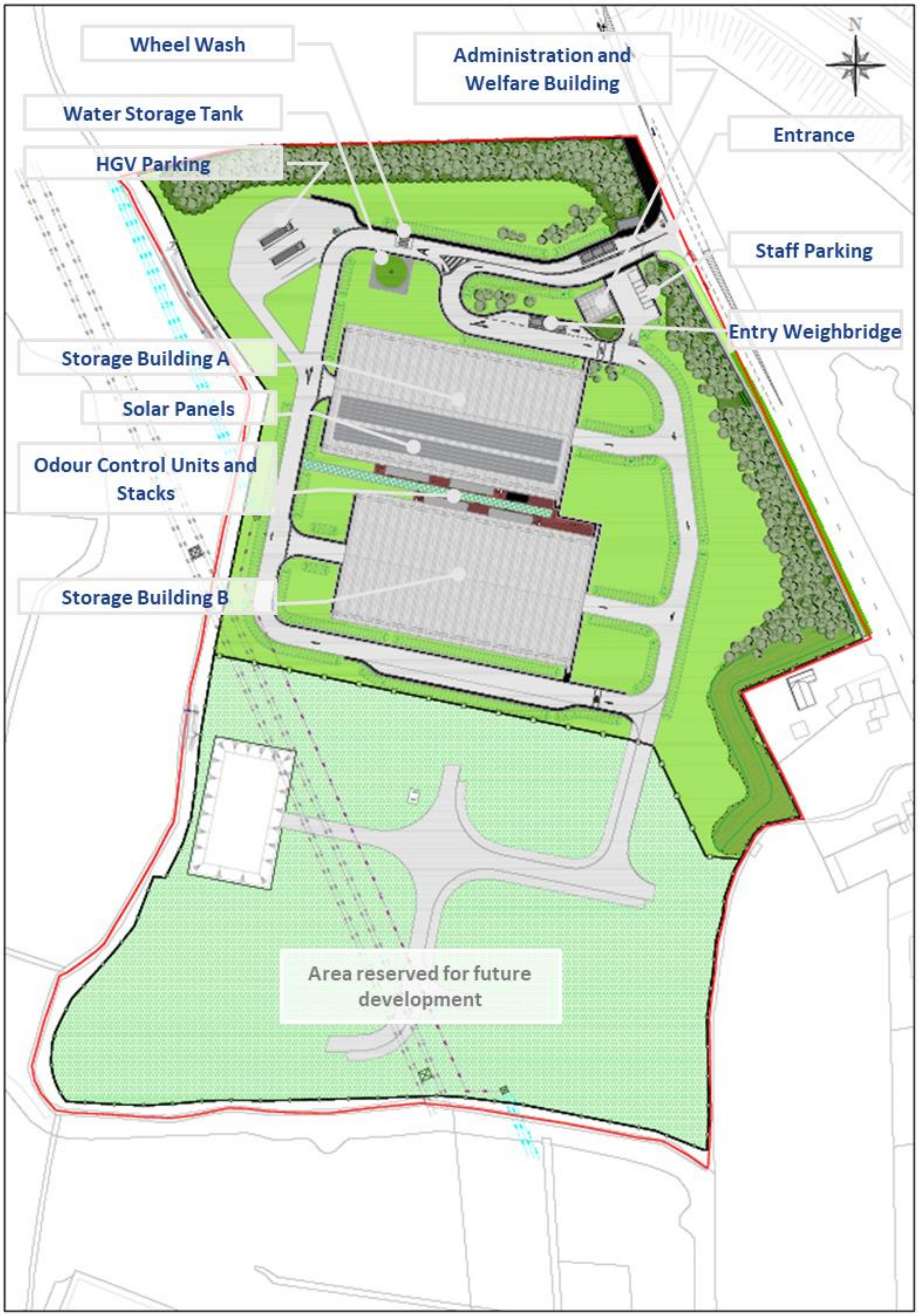

Diagram 4-6: Regional Biosolids Storage Facility Proposed Site Layout

4.12.2 Biosolids Storage Buildings

The required storage volume requirements will be provided in two storage buildings. Each building will be approximately 105m long and approximately 50m wide.

The two storage buildings will be located centrally, toward the northern end of the site. Their location allows the utilisation of some of the existing infrastructure on the site and is such that, a new internal road can be provided around the perimeter of the buildings. The road will allow vehicular access to the storage buildings and for vehicles to travel past the buildings and around the site in one direction. The distance from the site boundary and the buildings is at least 25m on the western side of the site and 70m on the eastern side. The longest side of each building will be orientated north-west to south-east and the buildings will be parallel to one another. The location of the storage buildings is shown in Diagram 4-6 and on drawing Y17702-PL-004 in Volume 5, Part B of this EIAR.

At the highest point, the roof level will be approximately 15.2m above ground level and the eaves level of the building will be approximately 12m above ground level. Haulage vehicles bringing biosolids to and from the storage facility will access the buildings from the eastern end and will exit from the western end. Entry and exit doors for vehicles will be located at either end of each building. In addition to security doors at each entry and exit point for HGVs, a lightweight inner door (known as a fast-action door) that can be opened and closed quickly will be provided so that the duration that the doors are open is minimised. Separate doors will be provided for pedestrian access.

Haulage vehicles will tip biosolids inside the buildings (only) during operation. The building height is determined by the tipping height of the trailers of the haulage vehicles when they are within the building.

The architectural design of the storage buildings incorporates a curved roof. The curved roof profile results in a visual blurring of the buildings' roof apex. The roof is visually separated from the walls by a 'shadow band' and the footprint of the buildings is staggered. The slanting front façade of both buildings extends beyond the side walls of the building into the landscape. The external envelope will comprise insulated metal cladding panels, which will clad the entire perimeter of the building. As shown in the architectural drawings, Y17702-PL-007 and Y17702-PL-009, provided in Volume 5, Part B of this EIAR, the colour of the panels will generally be grey and silver. This architectural design is provided to enhance the visual perception of the development from the most prominent views of the site.

The architectural design is described in further detail in the Architectural Concept Statement, which is enclosed with the Strategic Infrastructure Development application for the Proposed Project.

Storage Capacity

The storage capacity of the buildings is related to the quantities of biocake and biofert expected be stored at the facility. Biocake can be stacked between 3m to 4m high and biofert can be stacked approximately 7m high, thus making the storage of biofert more efficient.

The two storage buildings could store over 48,000m^3 of biofert. On the other hand, the storage buildings will have an approximate capacity of 26,200m^3 if all biosolids were in the form of biocake.

4.12.3 Administration and Welfare Building

A building for general management of operations and welfare facilities for staff working at the facility will be provided near the entrance gate. The building will contain an office, a meeting room, a canteen, toilets and a changing room with shower. A parking area will be provided beside the Administration and Welfare Building and will provide up to 10 parking spaces for staff and visitors.

The architectural design incorporates a curved roof to compliment the design of the storage buildings. The overall dimensions of the one-story building will be 10m wide and 13m long. The height of the ridge will be approximately 3.8m above ground level.

4.12.4 Weighbridges

The operator of the RBSF will be required to keep records of biosolids quantities arriving to, and departing from, the site. Two weighbridges will be provided at the RBSF. A weighbridge for weighing haulage vehicles will be located on the entrance road approximately 150m from the entrance to the site, allowing arriving vehicles to queue safely away from the public road. A separate lane will be provided at the weighbridge to allow vehicles to pass by parked vehicles.

A second weighbridge will be provided on the exit route from the site to weigh vehicles leaving the RBSF. The design proposes that the weighbridges will be automatically operated and controlled from the administration building. Neither of the existing weighbridge kiosks will be retained.

4.12.5 Heavy Goods Vehicle Parking Area

A parking area for 4 haulage vehicles will be provided in the north-west corner of the site. This area is provided for HGVs to park during working breaks or for checking vehicles before recommencing their journeys.

4.12.6 Electrical Services

The existing electricity substation at the northeast corner of the site is 4.8m long by 4.3m wide. It will be rebuilt at the same location to bring it into line with current ESB standards. A new customer electrical room will adjoin the substation. This room is a requirement identified during consultation with ESB. Overall, the footprint of the substation and customer electrical room will be approximately 9.2m long and 4.4m wide. They are shown on drawing Y17702-PL-006 in Volume 5, Part B of this EIAR.

Electrical supply will be brought from the customer electrical room to a mechanical and electrical control building (referred to hereafter as ‘Control Building’) and onward to the mechanical and electrical equipment within the storage buildings. Where feasible existing underground ducting routes on the site will be retained. The Control Building will be located between the storage buildings.

Solar Panels are proposed on the roof of Storage Building A to contribute to the energy requirements of the RBSF. These are discussed in Section 0.

4.12.7 External Lighting

External lighting will be provided along the internal roads, pedestrian routes and around the buildings and other plant rooms. It is possible that a portion of the existing lighting columns and associated ducting and chambers on the site will be retained and incorporated in the proposed site layout. This will be subject to review at detailed design stage. Road-side lighting columns will be approximately 6m high and the lighting columns in the HGV parking area will be 8m high. They are shown on drawing Y17702-PL-014 and Y17702-PL-023 in Volume 5, Part B of this EIAR.

4.12.8 Water Supply

An existing water supply on the site will provide potable water to the Administration and Welfare Building and it will supplement the supply to the Wheel Cleaning Area. The watermain will be extended around the storage buildings to provide a water supply for firefighting purposes as shown on drawing Y17702-PL-020 and Y17702-PL-021 in

Volume 5, Part B of this EIAR. The watermain will be supplied by a fire water holding tank located to the south-west corner of the two storage buildings, as shown on drawing Y17702-PL-020 and Y17702-PL-024 in Volume 5, Part B of this EIAR.

4.12.9 Wheel Cleaning Area

A wheel cleaning area will be provided in the north-east corner of the site beside the HGV parking area, near the exit route for HGVs. Within the storage buildings, biosolids will be stored in bays either side of the vehicle route through each building, therefore minimising the amount of biosolids material that can get caught in the tyres of the HGVs passing through. Nonetheless, there is potential for HGVs to track the material out of the building as they exit. The wheel cleaning will be provided to clean the HGVs and prevent tracking biosolids beyond this area or on to the public road.

Details of an indicative system is provided on drawing Y17702-PL-024 in Volume 5, Part B of this EIAR. Water for wheel cleaning equipment will be mainly supplied from a rainwater harvesting system, in accordance with Irish Water policy to incorporate water conservation designs for non-potable applications within its facilities, where appropriate. The supply may be supplemented by a mains water, when required. Typical wheel cleaning systems recycle approximately 50% of the water used. The wash down material from HGVs will be collected in a silt chamber, in which silt and solids will settle out. The overflow water from the silt chamber will flow to a wash-down separator where oil and fuel will be captured. It will then flow to the foul drainage system on the site and in turn, will discharge to the public sewer. Solid material collected in the settlement chamber will be removed by a licenced contractor who will haul the material to an appropriate waste facility.

4.12.10 Surface Water Drainage

Rainfall runoff from building roofs, road surfaces and other impermeable areas within the area of the proposed RBSF will be conveyed in a new drainage system, incorporating a treatment train comprising of sustainable drainage systems (SuDS). The surface water treatment train approach follows guidance from the Greater Dublin Strategic Drainage Study and SuDS Manual (C753) (CIRIA 2015). The proposals are summarised as follows:

Rainwater Harvesting System

A rainwater harvesting system, incorporating a storage tank, will collect run off from the roofs of both storage buildings and will be designed in accordance with Section 11.3 of the SuDS Manual.

Permeable Pavement

A maintenance access road between the buildings will be constructed of reinforced grass or a similar permeable pavement.

Swales

Dry Swales (a grassed channel with a filter drain directly beneath) will convey other surface run-off, including roads and footpaths, to an underground attenuation area at the northwest corner of Storage Building A. Dry swales are proposed following consultation with daa (the authority responsible for the operation of Dublin Airport). daa raised concern regarding the potential for areas of open water to develop and attract birds. The incorporation of a filter drain (referred to as a 'dry swale') will avoid standing water within the swales.

There is an existing underground attenuation area, comprising of plastic storage units surrounded in filter stone, in the north-west corner of the site. It will be expanded to cater for the RBSF element of the Proposed Project. There is an existing discharge point from this attenuation area into the adjacent watercourse which will be retained. At the discharge point to the stream a flow control device will be provided to limit discharge flows to acceptable levels (equivalent to the greenfield runoff). An emergency shut-off device will also be provided in order to prevent discharge to the stream in the event of a fuel spillage from a vehicle or wash-out from the storage buildings due to firefighting water.

Swales and detention basins will be lined with a geotextile membrane to mitigate against risk of pollution to groundwater. In addition to the SuDS features, grit traps will be provided in the sumps of road gullies. Furthermore, and oil/fuel separator will be provided prior to the connection to the existing retention area to capture pollutants in run-off on roads and parking areas within the site.

The swales, permeable pavement and detention basin will be constructed in accordance with details provided in the SuDS Manual (C753). Chambers and surface water pipes will be in accordance with the Greater Dublin Area Code of Practice for Drainage Works (Dublin Region Local Authorities).

4.12.11 Foul Drainage

Foul drainage requirements will be accommodated in the existing foul drainage network on the site. Foul drainage pipes currently drain to a pump station in the southern part of the site. This pump station is connected to the public sewer via an existing rising main, which connects to a pump station outside the site on the opposite side of the R135 Road.

Provision of foul drainage is required for the following elements of the proposed RBSF:

Administration and Welfare Building

Wastewater from the Administration and Welfare Building from general daily activities, such as showers, toilets and canteen.

Wheel Cleaning Area

Wastewater from the Wheel Cleaning Area, as described in the earlier paragraphs in this Section.

Storage Buildings

Surface runoff at the entrance to the storage buildings will be connected to the foul drainage network, rather than the surface water network, due to the potential for biosolids content. Any runoff due to cleaning or other water usage within the buildings will be directed to the same foul drainage system in the same manner.

4.12.12 Odour Control

An odour control system has been designed to ensure that odour does not give rise to any nuisance beyond the boundary of the RBSF. The system will involve extracting air from within the storage buildings on a continuous basis. Fans located outside, between the storage buildings, will draw air though ducting to an outside odour control unit comprising an organic filer media. The treated air will be emitted to the atmosphere through vertical stacks which will extend to a height of approximately 3m above the roof level of the storage buildings. Furthermore, each building will be split into two zones, which can be operated independently. This results in a total of four separate stacks. The indicative location of the stacks of shown in drawing Y17702-PL-004, provided in Volume 5, Part B of this EIAR. The assessment of odour at the RBSF is provided in Volume 4 Part A, Section 10 of this EIAR. In conjunction with the odour control units, separate entrance and exit routes for HGVs are provided in the design of the storage buildings and the doors at these access/egress points will be fitted with fast action doors to minimise the length of time that the doors will be open.

4.12.13 Landscape

The most prominent view of the site by the public is from the R135 Road along the boundary on the eastern side of the site. Landscaped berms and planting will be provided in the areas between the buildings on the site and the eastern boundary to provide a visual screen. The visual impact of the proposed RBSF is assessed in Volume 4 Part A, Section 14 of this EIAR.

4.13 Regional Biosolids Storage Facility Construction Phase

4.13.1 Programme

It is proposed to transition to the use of the RBSF from the existing storage facility at Thornhill, County Carlow. The initial phase of construction for the RBSF will involve the construction of one storage building in 2020. The construction works are estimated to last 12 months. The second building is likely to be constructed in 2024 to meet requirements at that stage following the transition from the Thornhill facility and will last for approximately 9 months. An indicative programme for the construction works for the initial phase is shown in Diagram 4-7.

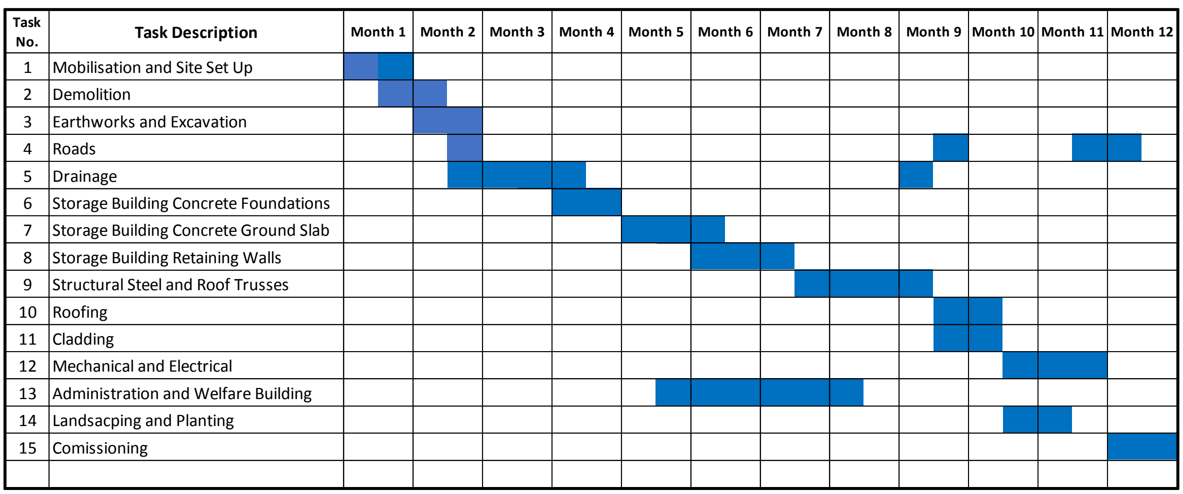

Diagram 4-7: Regional Biosolids Storage Facility Construction Works Programme – Initial Phase

If necessary, it is expected that both buildings can be constructed in 2020 with little or no extension to the overall construction programme presented in Diagram 4-7. However, additional construction staff and resources would be required during the construction period. The assessment of this scenario is considered in Volume 4 and in particular, in relation to traffic which is discussed in Volume 4 Part A, Section 13: Traffic.

4.13.2 Construction Activities

FCC was granted section 175 approval by ABP (Ref. 06F.EL2045) dated 21 April 2006 for a waste recovery facility at the proposed RBSF site. Certain enabling works, including drainage works, internal access roads, boundary fencing, and electricity and telecommunications infrastructure have been carried out at the proposed RBSF site on the basis of that approval. Generally, there are few constraints on the site that will confine access, establishment of site offices and welfare facilities and general construction operations. The design for the RBSF is relatively straightforward. The construction of the RBSF will involve works similar in nature to works for a warehouse or a large storage unit in an industrial estate.

A summary of the main construction activities is summarised as follows:

Mobilisation and Site Set-Up

Mobilisation and site set-up will involve erection of site offices (portacabins), staff welfare and temporary lighting. The site can be accessed at the exiting entrance on the R135. Internal roads are already in place on part of the site.

Demolition Works

The existing structures on the site proposed for demolition are identified on drawing Y17702-PL-003 in Volume 5 Part B of this EIAR and include the security/weighbridge kiosk at the site entrance, the weighbridge kiosk near the eastern boundary, an electrical substation (not commissioned) near the site entrance and the existing administration building. These buildings are small relative to the scale of the proposed development at the RBSF site, as shown in Table 4.8. Therefore, the material arising from the demolition works can be processed on site and reused in the proposed works. The demolition work is likely to be carried out by an excavator, using a specialist grab device if required.

Table 4.8: Dimensions of Buildings to be Demolished

Building	Dimensions (metres)		
	Length	Width	Height
Administration Building	12	7	4.8
Security/Weighbridge Kiosk	6.5	3.5	5
Weighbridge Kiosk	5.5	3.5	5
Electrical Substation	4.8	4.3	3

In addition, approximately 400m of internal roads will be reconstructed or removed. This will be carried out by pavement milling machines which will grind the road surface and convey the material to a nearby tipper truck. A high proportion of existing road surface and construction sublayers can be reused in the construction of the new roads on the site. If there is a surplus of reclaimed road surfacing material on the RBSF site it can be provided to a pavement contractor and re-used elsewhere.

While the demolition works are shown at the early stage of the programme in Diagram 4-7 the appointed contractor may consider using the existing administration building as a temporary site office and sections of the existing roads as temporary construction routes. This would result in the demolition of the building and removal of roads occurring later in the in the programme.

Earthworks and Excavation

Earth moving machinery such as tipper trucks and large excavators will excavate topsoil and high ground. A large proportion of topsoil material can be retained on site for use in landscaping.

A site investigation carried out in 2017 indicates that the ground conditions are relatively stable, and it is expected that this will provide good bearing capacity for construction of the buildings proposed for the proposed RBSF.

Foundations for the Storage Buildings will be approximately 1m below the finished ground level at the deepest locations. The design of the buildings does not require deep excavations and piling is not expected. At the highest point of the site, the existing ground level is approximately 1.5m above the proposed finished ground levels.

The proposed floor levels of the buildings are such that the volumes of excavated and fill material will be generally balanced. Therefore, if the excavated material is suitable it is possible that it could be used on the site as fill material or to form landscaped areas.

Roads

While the design has incorporated as much of the existing roads as is practical, new roads will be constructed around the storage buildings and will link back to the entrance. Excavations to less than 0.5m below finished road level will be required in order to build the road foundation and pavement layers. In low areas, suitable fill material obtained from the excavations or imported to the site, if necessary, will be used to build up the roads to an appropriate level. Bulldozers, compaction rollers and paving machines will be required to construct the roads.

Drainage

Sustainable drainage systems such as swales and detention basins to be provided as part of the drainage regime are shallow grass or planted depressions in the ground and do not require deep excavation. The underground attenuation area and the rainwater harvesting storage tank will be located to the northwest corner of the storage buildings. The construction of both will involve excavations to a depth of approximately 2.5m and will extend over an area of approximately 1200m^2.

Storage Building Concrete Foundations, Floor Slab, Retaining Walls

The foundations for the storage buildings will be constructed with a stone aggregate fill and reinforced concrete. The concrete floor slab will be approximately 300mm deep and increased in depth at the perimeter and internal retaining walls. Aggregate will be delivered to site in tipper trucks and compacted in-situ with compaction rollers. Reinforcement steel is expected to be pre-formed before delivery to site and assembled on site. A small portion will be cut on site using cutting saws. Concrete will be delivered in concrete delivery trucks and poured using concrete pumps or from concrete buckets lifted by a crane.

Retaining walls will be 7m high and will be constructed from reinforced concrete. Reinforcement steel is expected to be pre-formed before delivery to site but a small portion will be cut on site. Concrete shutters will be assembled on site. Concrete will be delivered in concrete delivery trucks and poured using concrete buckets lifted by a crane.

Structural Steel and Roof Trusses

Structural steel columns will be prefabricated before delivery and installed on top of the concrete retaining walls using a crane. Steel roof trusses are expected to be assembled on site and lifted into location using a crane and assemble using hand-held power tools.

Roofing and Cladding

Prefabricated insulated metal cladding and roof cladding panels will be installed after structural steel assembly and will involve the use of mobile elevated working platforms and hand-held power tools.

Administration and Welfare Building

The Administration and Welfare Building is similar in scale to three-bed domestic bungalow. The construction of the building will involve standard construction techniques for a building of this nature. The external cladding, which is a material similar to the proposed storage buildings, and the curved roof are the most unique features of its design.

Ancillary Works

The electrical substation will be rebuilt at its existing location in accordance with latest ESB specifications. ESB will bring an underground cable across the R135 Road from a connection point on the opposite side of the road. The cable will cross site boundary and travel a short distance to the proposed substation.

Both weighbridges and the wheel washing system will be proprietary systems that will be supplied and, it is expected, installed by specialist subcontractors.

It is not expected that tower cranes will require to be erected for the RBSF construction. The large footprint of the two buildings and the relatively short programme would make it unsuitable for the erection of tower cranes. Concrete pours, erection of structural steel columns and roof trusses are expected to be achieved by use of mobile cranes. The contractor will be required to consult with daa in relation to the potential height of cranes.

Construction traffic numbers are discussed in Volume 4 Part A, Section 13 Traffic of this EIAR. It is worth noting that there is a potential concrete supplier (Huntstown Quarry) 1km to the south of the RBSF site. Concrete delivery vehicles will comprise a large proportion of the peak construction traffic.

4.13.3 Operational Phase

Processes

There will be no processes at the RBSF. The main activities will be the delivery, loading/unloading and storage of biosolids all within the storage buildings. There will be no treatment of the biosolids.

Biosolids Haulage Traffic

Biosolids will be transported to the RBSF from the Ringsend WwTP (and GDD WwTP if permitted) in articulated trucks with tipping trailers. The trailers each have a capacity of approximately 40m^3. These haulage vehicles, referred to hereafter as HGVs, are approximately 14 m long and have 6 axles. In transporting biosolids to the RBSF, HGVs will operate throughout the year and the generated traffic volumes will be relatively constant.

The transportation of biosolids from the RBSF to spread lands or local storage facilities will be seasonal. The spread lands currently used for application of biosolids produced at the existing Ringsend WwTP are located in South Leinster and parts of Munster. There is currently no proposal to change the location of the spread lands. The peak periods for traffic will be the spring and autumn. Past records from the existing storage facility show that approximately 80% of the total annual trips to spread lands occur during the months of February, March, August and September. The remaining traffic occurs mainly in January, April, May and October.

The estimated traffic volumes to the RBSF is provided in Volume 4 Part A, Section 13 Traffic of this EIAR.

Heavy Goods Vehicle Circulation

The HGVs will enter the site and circulate around the RBSF on a one-way route. HGVs will be weighed at the entrance weighbridge and will travel onwards to the eastern end of one of the storage buildings.

The HGVs will be confined to a central 10m wide corridor within the storage buildings. Storage bays will be located on either side of the corridor. Biosolids will be unloaded and a loader vehicle will move the biosolids to a nearby bay. Conversely, when transporting to spread lands, the loader will move biosolids from a storage bay to a waiting HGV in the central corridor.

The haulage trailers can reach a height of over 10m when raised up for tipping out materials. The roof level of the buildings is designed to accommodate this requirement.

HGVs will exit the building at the western end and travel on the one-way road to the exit weighbridge to be weighed before leaving site.

Odour Control

Odour will be managed through the operation of an odour control system, which will involve extracting air from the storage buildings through an organic filter material. In addition, the following measures will be implemented during the operation phase of the project:

- HGV trailers will be covered until entering the Storage Buildings.
- HGVs will enter the storage buildings through fast-action doors.
- Pedestrian access will be provided through separate self-closing pedestrian doors.
- Implementation of odour monitoring plan in conjunction with Operation Environmental Management Plan (OEMP).

Monitoring

The biosolids will be loaded/unloaded and stored within storage buildings. The biosolids material and the atmosphere within the buildings will be monitored by operations staff for levels of odour, heat and dust. Similarly, the environment will be monitored within the boundary of the RBSF site.

Operations staff will also ensure that the conditions of the Certification of Registration issued by the National Waste Collection Permit Office (NWCPO) under the Waste Management (Facility Permit and Registration) Regulations, SI No. 821 of 2007 (as amended) will be adhered to.

The Operation Environmental Management Plan (OEMP) will document the necessary procedures for monitoring to be followed by operations staff.

Energy Efficiency

Irish Water’s commitments, in terms of energy efficiency, are designed to reflect the national target set out in the Public-Sector Energy Efficiency Strategy (DCCAE 2017). As set out in “*The National Framework for Sustainable Development in Ireland – Our Sustainable Future*” energy efficiency is one of the key areas of opportunity in the transition to an innovative, low carbon and resource efficient society. Irish Water’s Energy Policy sets aims to be “33% more energy efficient in the abstraction, treatment, distribution, collection, treatment and the return to the environment of every cubic meter of water and wastewater against a 2009 baseline”.

Photovoltaic (PV) technology, commonly referred to as solar panels, is incorporated within the design to generate clean renewable energy to contribute to the power requirement at the RBSF facility. This aligns with the existing energy management regime at Ringsend WwTP. By providing such technology, the project satisfies specific Development Plan objectives of the local authority in terms of a renewable energy contribution to the development.

A feasibility study into the solar contribution potential was carried out by specialists as part of the initial design phase. This study will be re-examined at detailed design stage in order to capture advances in solar technology, thus increasing efficiencies in the power output available from solar panels.

From the initial study, the optimum solution found that a solar panel area of approximately 1,545m² would be required. This arrangement is shown on drawing Y17702-PL-004 in Volume 5 Part B of this EIAR. The design model predicts an energy yield from such a system of 219,930kWh per annum, which equates to a carbon footprint reduction of 113,704kg of CO_2 per annum. The fans for the odour control units will operate continuously and so PV technology cannot provide the total energy demand. However, it is estimated the inclusion of PV technology will contribute to in the order of 40% of the sites annual energy demand.

4.14 References

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