5.0 HYDROLOGY

5.1 INTRODUCTION

This chapter assesses and evaluates the potential impacts of the proposed development described in Chapter 2 (Description of the Proposed Development) on the surrounding hydrological environment. The impact on land, soils, geology & hydrogeology is addressed in Chapter 6. Chapter 13 (Material Assets) addresses the impacts on water supply, wastewater and storm water drainage.

5.2 METHODOLOGY

5.2.1 General

The methodology used in this assessment follows current Irish guidance as outlined in:

- Environmental Protection Agency (EPA) Draft *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (2017);
- National Roads Authority (NRA) '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes',* by the National Roads Authority (2009).

5.2.2 Criteria for Rating Impacts

In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

The quality, significance and duration of potential impacts defined in accordance with the criteria provided in the EPA *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (2017) for describing effects are summarised in Table 1.2 in Chapter 1. In addition, due significance is also given to the document entitled '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'* by the National Roads Authority (NRA, 2009) where appropriate. The NRA Guidelines is summarised in Table 1 Appendix 5.1.

5.2.3 Sources of Information

This assessment was considered in the context of the available baseline information, potential impacts, consultations with statutory bodies and other parties, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Latest EPA *Maps & Envision* water quality monitoring data for watercourses in the area;
- Eastern River Basin District (ERBD) Management Plan – Liffey Water Management Unit and Programme of Measures – ERBD;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));
- Flood points & Historical Floods – Office of Public Works (OPW) floods website www.floodmaps.ie;

- Relevant Eastern Catchment Flood Risk Assessment and Management (CFRAM) Flood Reports;
- Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites (Eastern Regional Fisheries Board (ERFB);
- Dublin City Council (2005) Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council;
- Greater Dublin Regional Code of Practice for Drainage Works: Version Draft 6.0 (Wicklow County Council, South Dublin County Council, Meath County Council, Kildare County Council, Fingal County Council, Dún Laoghaire- Rathdown County Council & Dublin City Council); and
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001);

Other relevant documentation consulted as part of this assessment included the following:

- Environmental Impact Statement for 'Proposed Environmental Remediation Scheme for a 22 years old unauthorized waste landfill' on lands at Clonshaugh, Belcamp, Dublin 15. O'Laoire Russell Associates Environmental Consulting, January 2006;
- Environmental Remediation: Environmental Impact Assessment (EIS), AECOM, 2008. This report is based on a historic unauthorised illegal landfill in close proximity of the N32 Carriageway;
- Diamond Innovations Ireland Operations (DIIO) Independent Closure Audit, AWN 2014 and licence information on EPA licence file;
- AWN (April 2016) Due Diligence report for the site entitled '*Environmental due diligence, Dublin 17".*' Prepared for Clifton Scannell Emerson Associates;
- Environmental Impact Statement for 'Proposed Data Centre – DUB64' on lands at Clonshaugh Business & Technology Park, Belcamp, Dublin 15. Prepared for Clifton Scannell Emerson Associates, January 2017; and
- Environmental Impact Assessment Report for 'Proposed Data Centres – DUB74 & DUB84' on lands at Clonshaugh Business & Technology Park, Belcamp, Dublin 15. Prepared for Clifton Scannell Emerson Associates, May 2018.

5.3 RECEIVING ENVIRONMENT

5.3.1 Existing Environment

The site is located just north of the Clonshaugh Business and Technology Park in Dublin 17. The proposed development will comprise the laying of an underground double circuit 110 kilovolt (kV) transmission cable installation between the two substations i.e. the permitted Darndale substation and Belcamp substation. The two substations are located c. 1.9 kilometres apart, and are separated by industrial buildings, greenfield lands, parklands and roadways. See Figure 5.1 Rivers Map, below.

There are two rivers located in close proximity of the proposed route. The Santry River is located approximately 1km south of the proposed route. The Turnapin Great (Mayne River) is located along the proposed route. The proposed route transects the Mayne River at the entrance of the Belcamp Substation along the N32 Carriageway. The Cuckoo Stream flows to the north and is a tributary of the Mayne. The Mayne River flows west to east and discharges into the Baldoyle Estuary (an SPA and pNHA) 4.2km east of the proposed development site. The majority of the river is culverted under the M50/M1

interchange and local roads/housing estates, such as the local road for the Belcamp substation and Balgriffin residential area. The Belcamp illegal landfill is located to the north of the R139. The known extent of the illegal landfill will be discussed in further detail in Section 6 – Land, Soils, Geology and Hydrogeology.

Figure 5.1 Surface Water – Rivers map. (source: www.epa.envision / *ww.gsi.ie*)

There are two remnant overgrown drainage ditches in the redundant farmland immediately north of the Darndale substation. The ditches are stagnant and are described further in Chapter 7 Biodiversity.

5.3.2 Hydrology (Surface Water)

The site is relatively flat in terms of topography with an elevation to Ordnance Datum (AOD Malin) ranging between 52.7m AOD – 39.3m AOD west to east. A detailed topographical survey has been completed for the site and is being utilised in the design process.

5.3.2.1 Surface Water Quality

The proposed development is located within the ERBD, as defined under the European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy – this is commonly known as the Water Framework Directive (WFD).

The WFD requires *'Good Water Status'* for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both *'Good Ecological Status'* and *'Good Chemical Status'*. In 2009 the ERBD River Management Plan (RMP) 2009-2015 was published. In the ERBD RMP, the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The

purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015 and include a programme of measures to address and alleviate these pressures by 2015. The 2nd cycle River Basin Management Plans for Ireland (2018-2021) was published in April 2018.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010); and
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011).

Figure 5.2 below presents the EPA surface water quality monitoring points in the context of the site and other regional drainage setting, together with hydrometric gauges along the respective stage of each river body shown.

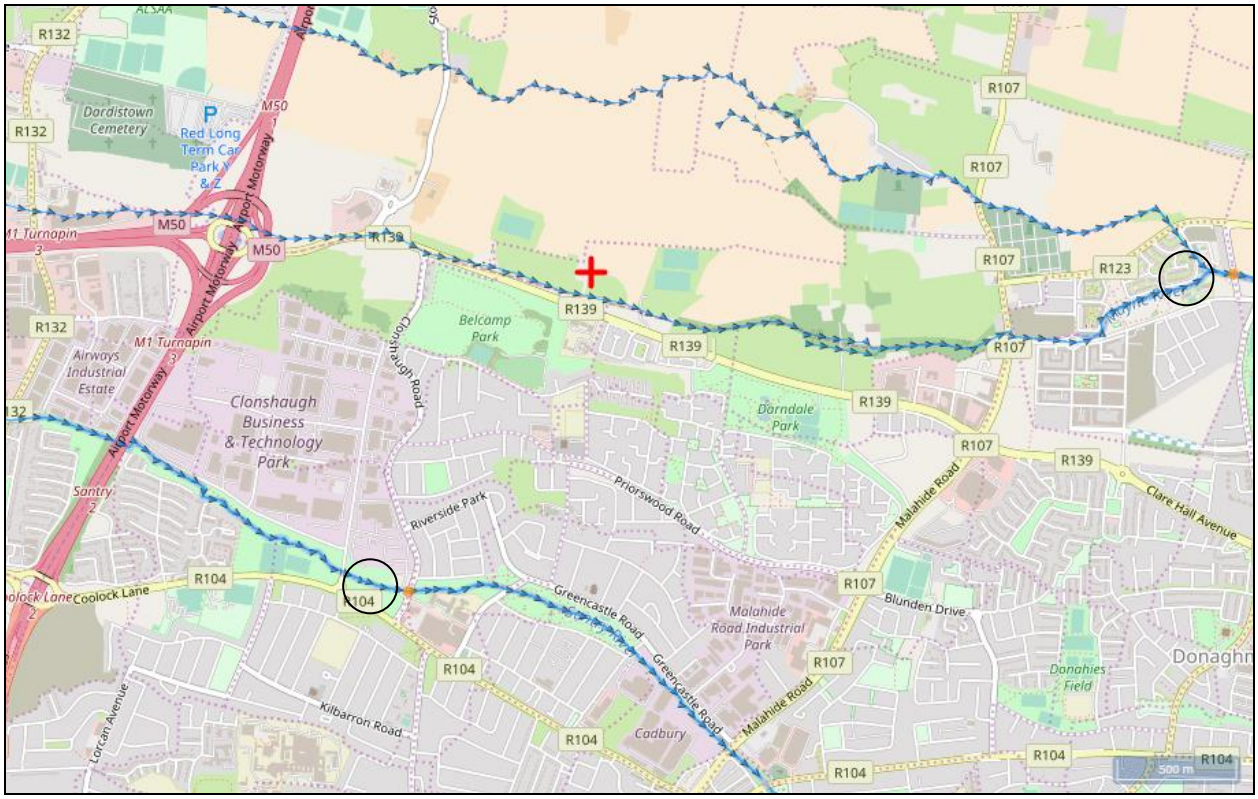

Figure 5.2 Surface Water Quality Monitoring Points (source: www.epa.envision). The red cross represents the location of the Belcamp Substation. There are two monitoring points – one located along the Santry River, south of the proposed site. The other located east and downstream of the proposed development site. Both have 'Poor' status.

Surface water quality is monitored continuously by the EPA at various regional locations along principal and other smaller watercourses. With reference to the site setting, the nearest EPA monitoring station is situated along the Santry River to the south of the site. The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse. The biological indicators range from Q5 - Q1. level Q5 denotes a watercourse with good water quality and high community diversity, whereas Level Q1 denotes very low community diversity and bad water quality. There is one water quality monitoring station located on the Mayne River which obtained a Q2-3; Poor Status at the most recent measurement in 2016. There are two water quality monitoring stations located on the Santry River which obtained a Q3-Poor Status & Q1-Bad Status at last measurement (both in 2016).

In accordance with the WFD, each river catchment within the ERBD was assessed and a water management plan detailing the programme of measures was put in place for each. Currently, the EPA classifies the WFD Ecological Status for both the Mayne and Santry waterbodies as having 'Poor Status', with a WFD River Waterbody risk score (period for WFD Status 2010-2015) of 1a, '*At risk of not achieving good status'.* Figure 5.3 presents the drainage for the area. The Mayne river is within RWB Code: IE_EA_09MO30500, River Basin Code:166.

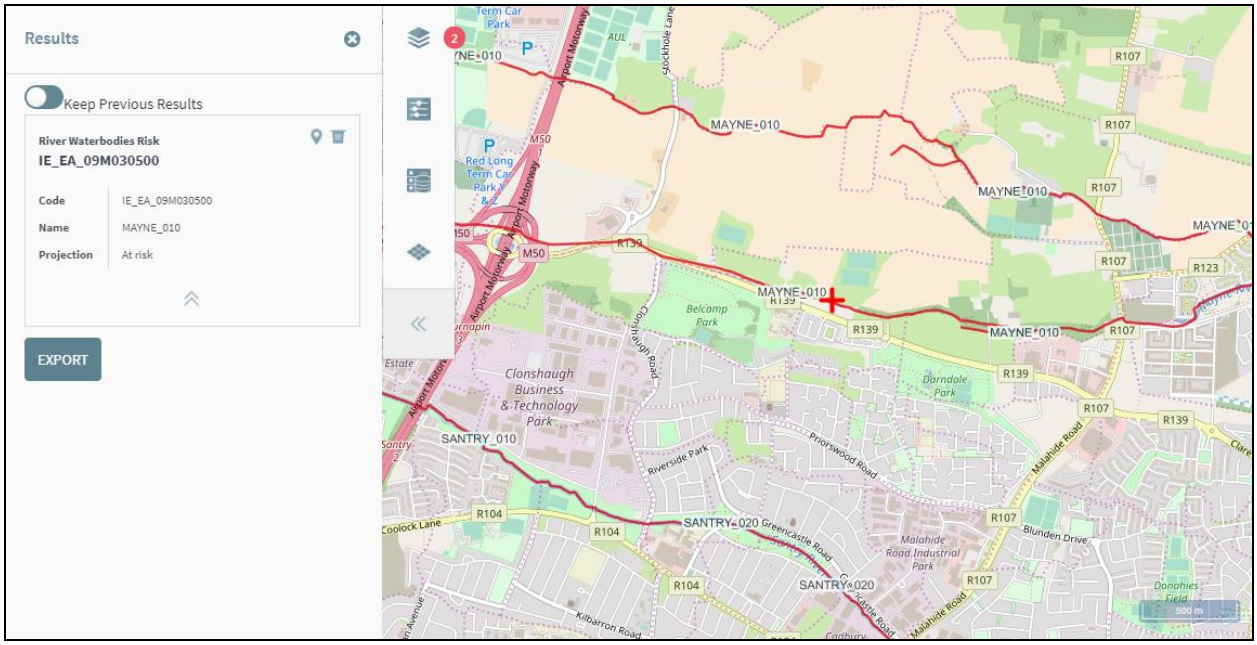

Figure 5.3 River Waterbody Score - 1a 'At risk of not achieving good status', WFD Ecological Status: Poor.

5.3.2.2 Flood Risk

The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was completed and is in included as Appendix 5.2. The assessment identified no flood hazards for the proposed development. The proposed development resides within Flood Zone B (suitable for this type of development) and is not at risk of flooding from a 1% or 0.1% AEP event. Due to the nature of the development, the proposed development is 'appropriate' for this flood zonation. Refer to Appendix 5.2 for further details.

5.3.2.3 Rating of site importance of the hydrological features

Based on the NRA methodology (refer to Appendix 5.1), the criteria for rating the importance of hydrological features, the importance of the hydrological features at this site is rated as ***Low Importance***. This is based on the assessment that the attribute has a low-quality significance or value on a local scale. The Mayne River is the receiving waterbody for the site, it is not a source of local potable water, and is not widely used as a local water amenity i.e. not regionally significant. The River Mayne discharges to Baldoyle Bay c. 4.2 river km downstream.

5.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development will comprise the laying of an underground double circuit 110 kilovolt (kV) transmission cable installation between the two substations (Darndale Substation to the Belcamp Substation).

A detailed description of the proposed development is provided in Chapter 2 of this EIA Report. There are a number of elements associated with the construction of the proposed development which could have potential to impact on the environment with respect to the hydrological environment. There will be no potential impacts on the hydrological environment during the operational phase of the proposed development.

The characteristics of the proposed development with regard to the hydrological environment, relate to the construction activities and are described below.

5.4.1 Construction Phase

The key civil engineering works which will have potential impact on the hydrological environment during the construction phase are:

(i) Shallow excavations within the topsoil/overburden are required for installation of the cable installation and the ducting for the cable installation. The optimum depth of excavation required to facilitate installation of the ducting is 1.25m below ground level (bgl) but may increase to up to c. 3m at utility crossings. The optimum width of each trench is 0.6m, however this may vary depending on ground conditions and existing services. Due to the depth to bedrock it has been confirmed that no rock breaking will be required;

(ii) Based on available site investigation information on the former Diamond Site, the natural overburden deposits (glacial clays) had minor inflows only, mostly localised perched water or pore water only. However, much of the excavation will be in more permeable infill deposits beneath the R139 where a perched water table may be encountered. Based on the shallow depth of excavation minimal dewatering (if any) will be required during excavation works and groundworks. Should localised pumping of the excavations due to rainfall be required, settlement through a siltbuster or similar will be undertaken prior to release to stormwater or foul sewer;

(iii) Construction activities will necessitate storage of cement and concrete materials, temporary oils, and fuels at the existing construction compound at the former Diamond Innovations site (Unit 1C), Clonshaugh Business & Technology Park, and adjacent lands. As such there is only potential for small localised accidental releases of contaminating substances including hydrocarbons from construction traffic and vehicles operating on site if not mitigated adequately. Mitigation measures are set out in Section 5.6 below; and

(iv) Access to the Belcamp substation will be by means of a temporary (< 1 week) river crossing which is undertaken by damming a short section of the stream at the entrance to Belcamp and over pumping of stream water which negates any impact on stream flow.

5.4.2 Operational Phase

There are no potential hydrological impacts during the operational phase of this development.

5.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

The potential impacts in relation to surface water during the construction and operational phases are outlined below and the assessment of effects defined based on the description of effects as set out in the Draft EPA *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (2017); (Table 1.2 Chapter 1) and the NRA criteria detailed Appendix 5.1. is provided in section 5.7.

5.5.1 Construction Phase

Increased Run-off and Sediment Loading

Surface water run-off from site preparation, levelling and excavations during the construction phase may contain increased silt levels or become polluted from construction activities if not adequately mitigated. Apart from a single crossing (described below), there is no direct hydraulic connection between the construction area and the River Mayne. The distance from the river to the proposed cable route will be a

minimum of between 7 – 13 meters. There will be a sediment management plan in place as per the Schedule of Mitigation in Appendix 1.1, measures include the use of a silt fence between the construction area and the river. There is also no requirement for storage or stockpiling of excavated material on site as it will be loaded into disposal trucks daily for licenced disposal.

Crossing of the River Mayne

Access for the underground cable to the Belcamp substation will be by a temporary (c. one week) open cut across the River Mayne. To manage the water flow within the river it is planned to dam a section of the river, with an over pumping arrangement in place, thus minimising the potential for direct release of any contaminants or suspended solids.

Excavations

The proposed development will require site preparation and excavations. Excavations are shallow and will not extend to bedrock. The natural clays are unlikely to have any inflow other than pore water while a perched water table may be encountered in the infill deposits, but it is not expected that any significant dewatering will be required during excavation works. Some removal of rain water from the excavation may be required.

Contamination Events

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of fuels (and oils) from construction machinery or site vehicles; and
- Alkaline run-off from cement works.

To minimise the potential for anything other than a vehicle leak, refuelling will be undertaken offsite in the already approved construction compound located at the existing data centre which minimises the potential for more significant spills.

5.5.2 Operational Phase

There are no potential impacts in relation to surface water during the operational phase due to the type of development.

5.5.3 Do Nothing Scenario

The proposed cable installation route will encompass industrial buildings, open greenfield lands (not used for agriculture) and roadways. Should the proposed development not take place, the hydrological regime will be unchanged.

5.6 REMEDIAL AND MITIGATION MEASURES

5.6.1 General

The design of the proposed development has taken account of the potential impacts of the development and the risks to the water environment specific to the areas where construction is taking place.

There is one main water course, the Mayne River, running through the site. The river is approximately 7-13 metres from the northern line of the route apart from where the transmission cable installation crosses the river at the entrance to Belcamp substation. Apart from the crossing there is no direct linkage between the construction site and the

river. Caution will be taken to mitigate the potential effects on indirect pathways via public drainage along the R139 due to surface run-off. These mitigation measures are described below. These will seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

5.6.2 Construction Phase

Construction Environmental Management Plan (CEMP)

A project-specific CEMP will be prepared and maintained by the appointed contractors during the construction phase of the proposed project. This CEMP will include measures outlined to protect water as identified in this chapter and the Schedule of Mitigation Measures included with this EIAR. The CEMP will include a reference to this Biodiversity Chapter which establishes the connectivity of the River Mayne and Baldoyle Bay and the requirement for avoidance in terms of both direct and indirect construction activity.

The Plan will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. At a minimum, the manual will be formulated in consideration of the standard best international practice including, but not limited, to:

- CIRIA, (2001), *Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (C532)* Construction Industry Research and Information Association;
- CIRIA (2002) *Control of water pollution from construction sites: guidance for consultants and contractors (SPI56)* Construction Industry Research and Information Association;
- CIRIA (2005), *Environmental Good Practice on Site* (C650); Construction Industry Research and Information Association;
- BPGCS005, *Oil Storage Guidelines*;
- CIRIA 697 (2007), *The SUDS Manual*; and
- *UK Pollution Prevention Guidelines,* (PPG) UK Environment Agency, 2004.

Surface Water Run-off

There is no significant dewatering anticipated during the construction works due to the shallow nature of the excavation. The excavation will not intercept the natural water table and as such dewatering will only be required for stormwater which may collect in the open trench following rainfall. Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for water ingress into excavations. Should any discharge of construction water be required, discharge will be to surface water/foul sewer drainage system. The water will be treated before it will be discharged, with the use of a sediment trap or siltbuster to avoid any siltation of the drainage system. Discharge will require a Section 4 permit (Council) or licence to discharge (Foul Sewer) (Irish Water) and may include a requirement for monitoring for simple parameters such as suspended solids, and pH as set out by the appropriate regulator. Weather conditions will be considered when planning construction activities to minimise risk of run-off from the site.

No temporary storage of soil will be allowed along the cable route. Excavated soil will be directly transferred to licenced waste vehicles operated by a licenced waste contractor and taken off site to a licenced facility.

Foul Sewer

Temporary facilities will be set up for workers at the construction compound on Applicant's current site at the former Diamond Innovations site (Unit 1C), Clonshaugh Business & Technology Park, and adjacent lands. Additional foul sewer capacity will not be required.

There will be no construction near and therefore no impact on the North Fringe sewer during the construction and operation of the proposed development.

Fuel and Chemical Handling

To minimise any impact from material spillages, all oils, paints etc. used during construction will be stored within temporary bunded areas at the construction compound at the Applicant's current site. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/ container within the bunded area(s) (plus an allowance of 30mm for rainwater ingress). Drainage from the bunded area(s) if required shall be diverted for collection and safe disposal.

Refuelling of construction vehicles will take place at the construction compound. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double-skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters or contaminated storm water to the underlying subsoil. Wash-down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.

In the case of drummed fuel or other chemicals, which may be used during construction, these will be stored in the construction compound within a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

Accidental Releases

In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:

- All re-fuelling of plant, equipment and vehicles will be carried out at the construction compound at the former Diamond Innovations site (Unit 1C), Clonshaugh Business & Technology Park, and adjacent lands, Dublin 17. All fuels, chemicals, liquid and solid waste will be stored in areas bunded in accordance with established best practice guidelines at the construction compound also;
- Provision of spill kits;
- Training of staff in emergency response and
- Provision of a water and sediment management plan, to ensure that surface water run-off is controlled such that no silt or other pollutants enter local water courses or drains.
- At the Mayne River Crossing, the site contractor will provide a method statement which will address damming the stream upstream and over pumping of water

Soil Removal and Compaction
It is envisioned that all soil/stones arising on the site will be removed from the site and disposed of as a waste or, where appropriate, as a by-product by a licensed contractor and disposed to a licenced waste facility. Movement of material will be minimised to reduce degradation of soil structure and generation of dust. There will be no stockpiling or storage of excavated soil on site.

River Crossing
Access to the Belcamp substation will be by a temporary open cut across the River Mayne. To manage the water flow within the river it is planned to dam the river, with an over pumping arrangement in place, thus minimising the potential for direct release of any contaminants or suspended solids. The length of time for construction of the river crossing is at most one week. The contractor will be required to provide a method statement for this aspect of the construction programme.

5.6.3 Operational Phase

During the operational phase of the underground transmission cable installation there is no potential for site activities to impact on the natural hydrological regime. There will be no emissions to surface water from operational activities.

5.7 PREDICTED IMPACT OF THE DEVELOPMENT

This section describes the predicted impact of the proposed development before and following the implementation of the remedial and mitigation measures.

5.7.1 Construction Phase

For all of the route, apart from a single crossing there is no direct linkage between the main construction works and the River Mayne. The instream works will require less than one week and will require at most two construction vehicles in a dry open cut created by a temporary dam with over pumping ensuring continuity of stream flow. Without mitigation measures highlighted in Section 5.6.1 the predicted local impact in Mayne River will be ***temporary-non significant-neutral***. There is no likely measureable impact anticipated at the Baldoyle Bay SAC which is over 4.2 km downstream, based on the low hazard potential, the shallow river gradient, low velocity and hydrological distance to the SAC

The implementation of construction design for the river crossing and the mitigation measures highlighted in Section 5.6.1 will provide additional protection to the surface water environment and the predicted impact is assessed as ***temporary-imperceptible-neutral***.

5.7.2 Operational Phase

No mitigation measures are required during operation as there are no likely discharges to receiving waters. The predicted impact will be ***long-term-imperceptible-neutral.***

5.8 RESIDUAL IMPACTS

The residual impacts relate to those impacts that would occur after the mitigation measures, as outlined in Section 5.6 above, have taken effect. In the case of the

proposed development, there is no evidence of any significant residual impacts on surface water. The residual impact is considered to be ***long term, imperceptible*** and ***neutral***.

The cumulative impact assessment is addressed Chapter 15 of this EIA Report.

Interactions are addressed in Chapter 16 of this EIA Report.

5.9 REFERENCES

- Environmental Impact Statement for 'Proposed Environmental Remediation Scheme for a 22 years old unauthorized waste landfill' on lands at Clonshaugh, Belcamp, Dublin 15. O'Laoire Russell Associates Environmental Consulting, January 2006.
- Environmental Remediation: Environmental Impact Assessment (EIS), AECOM, 2008. This report is based on a historic unauthorized illegal landfill in close proximity of the N32 Carriageway.
- EPA, (2017). *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (August 2017); Environmental Protection Agency, Co. Wexford, Ireland
- EPA, (2015). Draft *EPA Advice Notes for Preparation of Environmental Impact Statements*; Environmental Protection Agency, Co. Wexford, Ireland.
- NRA, (2009). *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*; June 2009. National Roads Authority, Dublin.
- AWN (April 2016) Due Diligence report for the site entitled '*Environmental due diligence, Dublin 17".*' Prepared for Clifton Scannell Emerson Associates (CSEA).
- AWN (June 2014) DIIO Independent Closure Audit.
- Environmental Impact Statement for 'Proposed Data Centre – DUB64' on lands at Clonshaugh Business & Technology Park, Belcamp, Dublin 15. Prepared for Clifton Scannell Emerson Associates, January 2017.
- Environmental Impact Assessment Report for 'Proposed Data Centres – DUB74 & DUB84' on lands at Clonshaugh Business & Technology Park, Belcamp, Dublin 15. Prepared for Clifton Scannell Emerson Associates, May 2018.

APPENDIX 5.1

CRITERIA FOR RATING SITE ATTRIBUTES – ESTIMATION OF IMPORTANCE OF HYDROLOGY ATTRIBUTES

NATIONAL ROADS AUTHORITY (NRA, 2009)

Table 1 Criteria for rating Site Attributes - Estimation of Importance of Hydrology Attributes (NRA)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

APPENDIX 5.2

FLOOD RISK ASSESSMENT

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FLOOD RISK ASSESSMENT FOR PROPOSED UNDERGROUND DOUBLE CIRCUIT 110 KILOVOLT (KV) TRANSMISSION CABLE INSTALLATION

Technical Report Prepared For

ADSIL

Technical Report Prepared By

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CD/18/10053WR01

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Signature		
Name	Colm Driver	Teri Hayes
Title	Environmental Consultant	Director
Date	29 May 2018	29 May 2018

EXECUTIVE SUMMARY

AWN Consulting Ltd. (AWN) has been appointed to undertake a Flood Risk Assessment (FRA) to support a planning application which will comprise the laying of an underground double circuit 110 kilovolt (kV) transmission cable installation between the two no. substation. They are the permitted Darndale substation and Belcamp substation. The two no. substations are located c. 2.1 km apart, and are separated by industrial buildings, greenfield lands, parklands and roadways located north of the Clonshaugh Business and Technology Park in Dublin 17.

This assessment is undertaken in accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government, *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (2009), hereafter referred to as the FRM Guidelines.

As outlined in the FRM Guidelines, a FRA aims to quantify the risk posed to the development and to the surrounding environment by this development.

No historic flooding events of the site has been identified from the OPW flood maps or local planning applications. Soil cover mapping was researched and indicated that the site was not underlain by alluvium soils but mainly glacial clay till. Alluvium soils, which could be indicative of flooding, were not identified. Pluvial flood maps produced as part of the OPW PFRA flood maps indicate that the site is not at risk from pluvial flooding. No pluvial flood zones are identified at the site; however, areas of localised pluvial flooding have been identified in the surrounding area. Though due to existing drainage infrastructure in place, it is not anticipated that pluvial flooding would have a significant impact on the site. The proposed development is not affected by groundwater flooding.

However, there the ***FINAL*** OPW FRA maps which indicate that the site is located within Flood Zone B, as the proposed development is affected by the 1 in 1000-year flood event. The development is considered as a 'Less Vulnerable Development', due to the nature of the development. Therefore, the development is an *'appropriate'* development for these types of flood zone.

In keeping with the Stage 1 assessment procedure, the review of available information has identified no flood hazards for the proposed development, therefore in accordance with FRM Guidelines, there is no requirement to proceed to a Stage 2 or 3 assessment.

CONTENTS

1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has been appointed to undertake a Flood Risk Assessment (FRA) to support a planning application which will comprise the laying of an underground double circuit 110 kilovolt (kV) transmission cable installation between the two no. substations. They are the permitted Darndale substation and Belcamp substation. The two no. substations are located c. 2.1 km apart, and are separated by industrial buildings, greenfield lands, parklands and roadways located north of the Clonshaugh Business and Technology Park in Dublin 17.

The site is relatively flat in terms of topography with an elevation to ordinance datum (AOD Malin) ranging between 52.7m AOD – 39.3m AOD west to east.

1.1 Scope

This assessment is undertaken in accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government (DoEHLG) - The Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009), hereafter referred to as the FRM Guidelines.

As per the FRM Guidelines a tiered approach has been taken. This usually begins with a Stage 1 Assessment which aims to quantify the risk posed to the development and to the surrounding environment by this development. The main aim of this FRA is to determine the effect any land filling will have on the floodplain, upstream and downstream levels and any mitigation measures necessary.

This hierarchy of assessment ensures that flood risk is taken into account at all levels of the planning system but also that the right level of detail is considered, avoiding the need for detailed and costly assessments prior to making strategic decisions.

In terms of the FRA and Management Study the scope of works incorporates three stages:

- ***Stage 1: Flood Risk Identification -*** to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

- ***Stage 2: Initial Flood Risk Assessment -*** to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. The extent of the risk of flooding should be assessed which may involve preparing indicative flood zone maps. Where existing river or coastal models exist, these should be used broadly to assess the extent of the risk of flooding and potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures; and

- ***Stage 3: Detailed Flood Risk Assessment -*** to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model of the river or coastal cell across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

As described in the FRM Guidelines, flood risk is a combination of the likelihood of flooding and the potential consequences arising, and is normally expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

Likelihood of flooding is normally expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in 100 years, i.e. it has a 1% chance of occurring in any one year. Therefore:

- 10 year flood = 10% Annual Exceedance Probability (AEP);
- 100 year flood = 1% AEP; and,
- 1000 year flood = 0.1% AEP.

In the FRM Guidelines, the likelihood of a flood occurring is established through the identification of Flood Zones which indicate a high, moderate or low risk of flooding from fluvial or tidal sources, as defined as follows:

- *Flood Zone A* - Where the probability of flooding is highest (greater than 1% AEP or 1 in 100 for river flooding and 0.5% AEP or 1 in 200 for coastal flooding) and where a wide range of receptors would be vulnerable;

- *Flood Zone B* - Where the probability of flooding is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 for coastal flooding); and

- *Flood Zone C* - Where the probability of flooding is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

1.2 Methodology

This assessment follows the FRM Guidelines; the methodology involves researching the following data sources:

- Base maps – Ordnance Survey of Ireland
- Flood Hazard Maps and flooding information for Ireland, www.floodmaps.ie Office of Public Works (OPW)
- Geological Survey of Ireland (GSI) maps on superficial deposits
- EPA hydrology maps
- Eastern (Catchment Flood Risk Assessment & Management Study)
- The National Development Plan 2007 – 2013

2.0 EXISTING HYDROLOGICAL ENVIRONMENT

2.1 Site Location

The site is located in lands directly north of the Clonshaugh Business and Technology Park in Dublin 17. Figure 2.1 below illustrates the site location. The area consists mostly of unused greenfield areas, roadways and, industrial and commercial premises.

The proposed cable installation route is bound by scrubland and the M50 and M1, and enters the permitted Darndale 110kV Substation located at the northern section of the former Diamond Innovations Site. The surrounding area is predominantly commercial/industrial with some undeveloped land (unused greenfield areas), see *Figure 2.1*, below. There are no areas of environmental sensitivity within 1km of the site.

There is one (1) water course traversing the proposed transmission cable installation route. The Turnapin Great (Mayne River) river lies approx. 300 metres south of the Belcamp Substation. The proposed transmission cable installation route intersects this river at the entrance of the Belcamp substation from the N32 Carriageway. Refer to Figure 2.1, below.

Figure 2.1 Site Location and Context

2.2 Hydrology

The site is relatively flat in terms of topography with an elevation to ordinance datum (AOD Malin) ranging between 52.7m AOD – 39.3m AOD west to east. The riverbed level of the Santry River to the south of the site ranges between 41.5mAOD (near

M1) and 37.6mAOD (further east passing the entrance to Clonshaugh Business & Technology Park). There is no riverbed data on the Mayne River. However, it is believe that the Mayne River is not hydraulically connected to the bedrock due to the depth of the bedrock in the surrounding area, i.e. >20 metres overburden present.

In accordance with the WFD, each river catchment within the ERBD was assessed and a water management plan detailing the programme of measures was put in place for each.

Currently, the EPA classifies the WFD Ecological Status for both the Mayne and Santry waterbodies as having 'Poor Status', with a WFD River Waterbody risk score (period for WFD Status 2010-2015) of 1a, *'At risk of not achieving good status'.* Figure 7.3 presents the drainage for the area. The Mayne river is within RWB Code: IE_EA_09MO30500, River Basin Code:166.

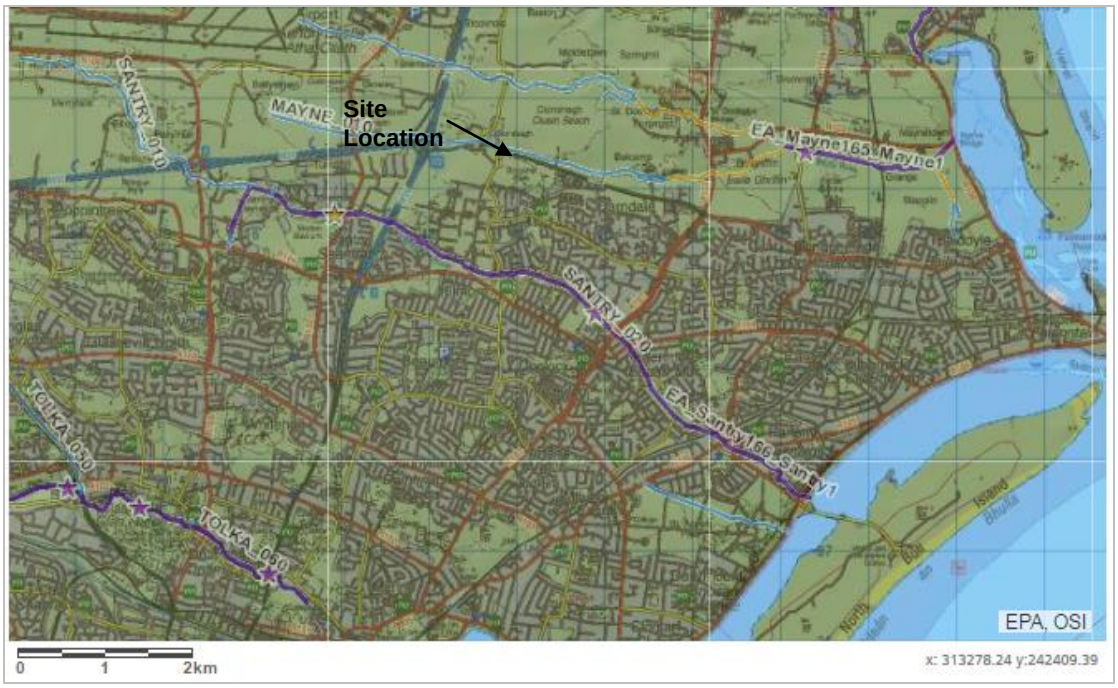

Figure 2.2 Local Surface Water Bodies

2.3 Existing Flood Records

The potential risk of flooding on the site was assessed. This included a review of the Office of Public Works (OPW) Catchment Flood Risk Assessment and Management Study Preliminary Flood Risk Assessment (CFRAM PFRA) Maps.

The OPW on-line database floodmaps.ie was reviewed regarding incidences of historical regional and local flooding relevant to the area. While there are flood events recorded in the regional area there is no apparent historical risk of flooding in the immediate vicinity of the site. The nearest flood point recorded is approximately 3km to the north of the site at Stockhole Lane. This road was recorded by Fingal County Council as prone to flooding in 2005. The OPW flood map for this area is included as Figure 2.3.

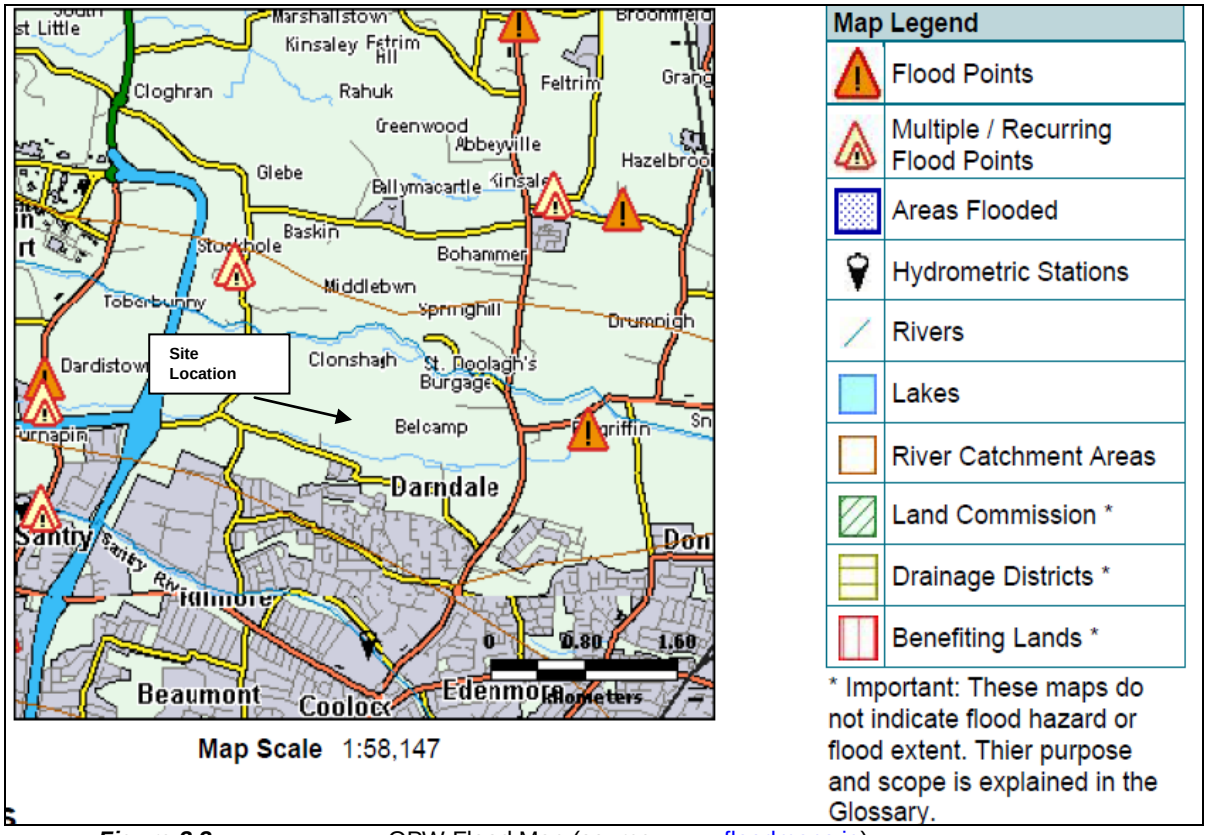

Figure 2.3 OPW Flood Map (source: www.floodmaps.ie)

Based on review of floodmaps.ie and discussions with land owners there was no evidence of flooding at the site location or in proximity to the site which would indicate a risk of flooding to the site and neighbouring properties.

CFRAM Preliminary Flood Risk Assessment (PFRA)

The EU Floods Directive (2007/60/EC) required Member States to undertake a national preliminary flood risk assessment by 2011 to identify areas where significant flood risk exists or might be considered likely to occur. Members States were also required to prepare catchment-based Flood Risk Management Plans by 2015 that would set out flood risk management objectives, actions and measures. The OPW, in co-operation with various Local Authorities have produced a large number of CFRAMs. These CFRAMs aim to map out current and possible future flood risk areas and develop risk assessment plans. They will also identify possible structural and non-structural measures to improve the flood risk of the area. As part of the CFRAM programme provisional flood risk assessment maps (PFRA) were produced by the OPW with cooperation with the local authorities.

The PFRA flood maps do indicate flooding along the M50/M1 interchange, N32 Carriage way and directly east of the Belcamp substation. Flooding occurs where the Mayne River is culverted at post M50/M1 interchange and prior to N32 Carriageway. These areas are ***not*** affected by the 1 in 10-year and 1 in 100-year flood events, but are affected by the 1 in 1000-year flood event. The CFRAM PFRA flood maps for the site and surrounding area is provided in Figures 2.4 and 2.5 below. Therefore, the proposed development is within **Flood Zone B**. The development is considered as a 'Less Vulnerable Development', due to the nature of the development. Therefore, the proposed development is **'appropriate'** for this flood zonation.

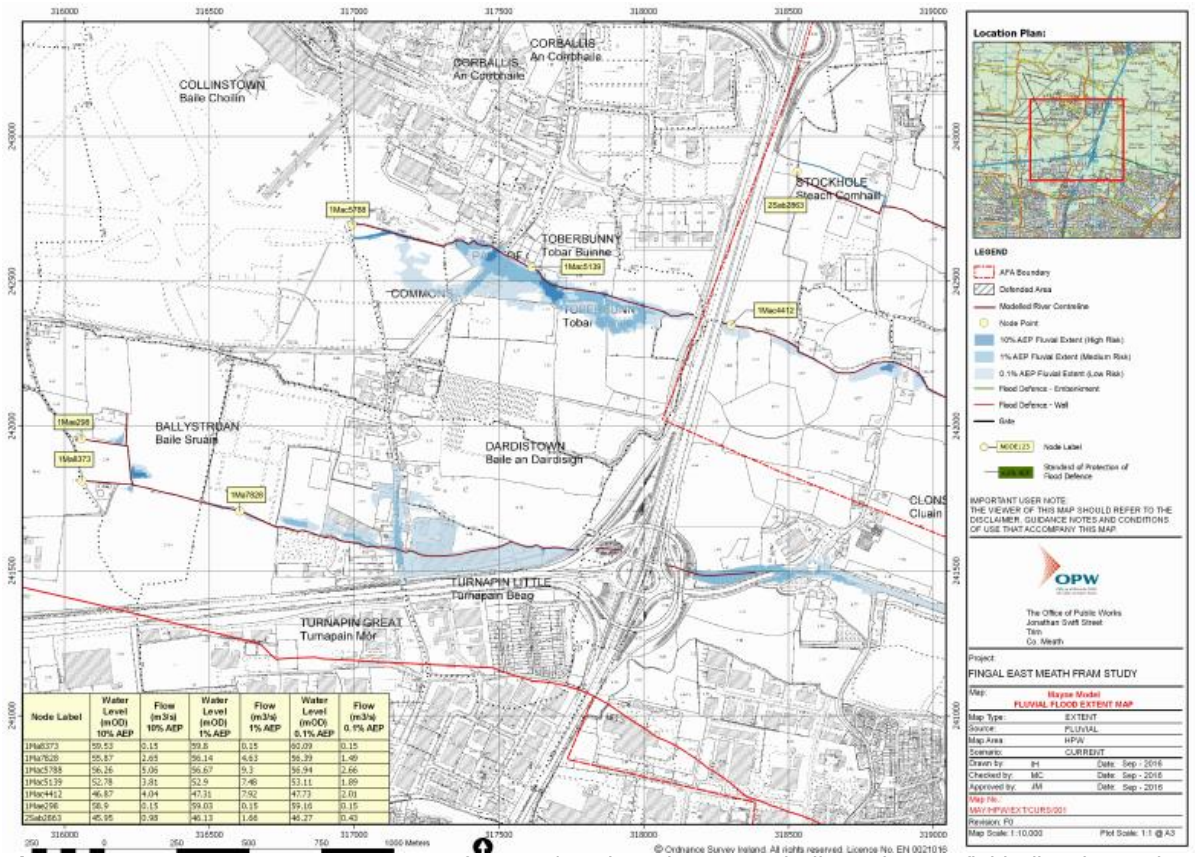

Figure 2.4 CFRAM PFRA extract for M50/M1 interchange and disused greenfield directly north of Clonshaugh Industrial and Technology Park.

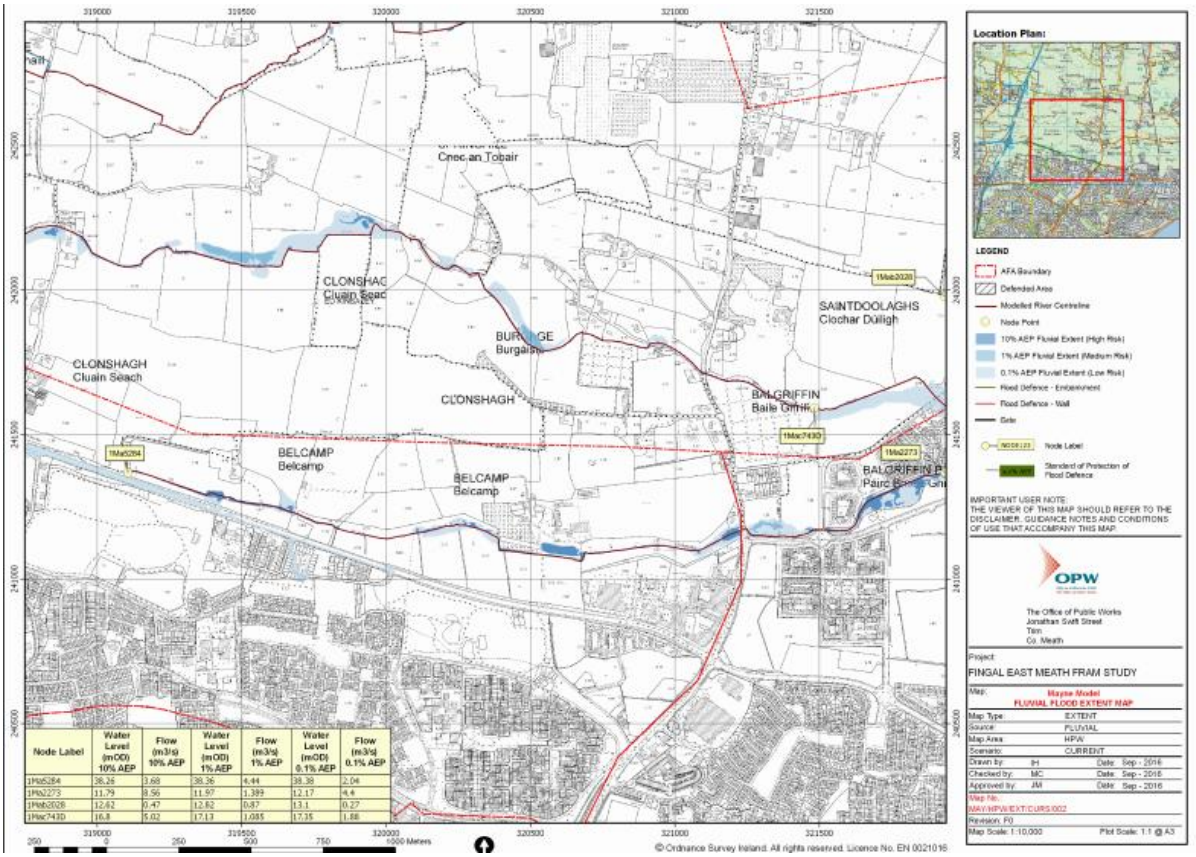

Figure 2.5 CFRAM PFRA for the Belcamp Substation and surrounding areas.

2.4 Existing Drainage

The proposed works are situated along the N32 Carriageway and disused greenfield lands north of the Clonshaugh Industrial and Technology Park.

The N32 Carriageway is serviced by surface water drainage system put in place by the local County Council.

Drainage along the disused greenfield areas are serviced by natural drainage ditches and agricultural land drains.

2.5 Existing Site Geology and Hydrogeology

The bedrock of the greater Dublin region consists of Dinantian Upper Impure Limestone which is part of the Lucan Formation. The limestone is colloquially known as Calp and is estimated to be up to 800m thick. The Belcamp substation and a small percentage of the transmission cable installation route is underlain by Tober Colleen Formation. This formation is made up of calcareous shale, limestone conglomerate.

The bedrock aquifer, according to the GSI: (www.gsi.ie/mapping) National Draft Bedrock Aquifer Map, is classified as a Locally Important Aquifer (Ll) i.e. *Bedrock which is Moderately Productive only in Local Zones.* According to the GSI, the aquifer is not considered to have any primary porosity and flow will be primarily fracture controlled. The bedrock aquifer underlying the Belcamp Substation and a small section of the proposed transmission cable installation route is classed as a Poor Aquifer (Pu) which is described as *Bedrock which is Generally Unproductive expect for Local Zones.*

The site is underlain by the IE-Eastern Dublin Urban Groundwater Body (EU code: IE_EA_G_005). This groundwater body (GWB) has been investigated by the GSI and is described as having a groundwater flow regime of PP i.e. poorly productive bedrock aquifer. The vulnerability status of this GWB, as with subsoil thickness, is highly variable at all scales according to the GSI. Presently, the GSI classifies the groundwater vulnerability at the site as Low which is consistent with the local geology and nearby site assessments, e.g. based on the local site geology and clay subsoil thicknesses observed (> 20 metres Clay).

3.0 DEVELOPMENT CHARACTERISTICS

The proposed development will comprise the laying of an underground double circuit 110 kilovolt (kV) transmission cable installation between the two no. substations. They are the permitted Darndale substation and Belcamp substation.The two no. substations are located c. 2.1 kilometres apart, and are separated by industrial buildings, greenfield lands, parklands and roadways.

The proposed development will not be required to adhere to the Local Authority requirements as well as the requirements of the GDSGS and the SuDS Technical Guidance document due to the nature of the development.

Cut and fill will be required to facilitate construction, installation of the transmission cable from the Darndale substation (located on the former Diamond Site) to the Belcamp substation, and ancillary works. Topsoil/subsoil stripping and localised stockpiling of soil will be required for short periods of time during construction. The maximum excavation depth for the installation of the transmission cable will be 2m bgl. The maximum width of the excavations will be 3m. Once the ducting and

transmission cable is installed, the excavations will be infilled with 'clean' engineering fill material.

4.0 FLOOD RISK IDENTIFICATION

4.1 Fluvial Flooding

A thorough review of historical records such as the OPW Flood maps and the GSI Subsoil maps was undertaken as part of this FRA process. The nearest potential source of fluvial flooding is the Mayne River. However, the OPW flood maps do not indicate any historic flooding at the site or immediate vicinity of site that would indicate it is at risk of flooding.

The GSI Subsoil maps do not indicate the presence of alluvium near the site. Alluvium could be indicative of historic flooding. The primary subsoil within the site is identified as glacial clays.

OPW CFRAM PFRA maps confirm there is indication of potential fluvial flooding along the proposed transmission cable installation route or in immediate area which would pose a flood risk to the site. However, the development is in Flood Zone B as the route is affected by the 1 in 1000-year modelled flood event. The development is considered as a 'Less Vulnerable Development', due to the nature of the development. Therefore, the development is an *'appropriate'* development for these types of flood zone.

4.2 Pluvial Flooding

Pluvial flooding is usually caused by intense rainfall that may only last a few hours. The resulting water follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low lying areas. Any areas at risk from fluvial flooding will almost certainly be at risk from pluvial flooding.

The OPW PFRA maps do not indicate pluvial flooding at or near the site. Localised events are highlighted in the surrounding areas. The proposed development is located at an existing developed industrial area with suitable drainage infrastructure and therefore in the event of pluvial flooding in this area, it would not have any significant adverse impact on the site.

4.3 Groundwater Flooding

Groundwater flooding can be due to high water tables and increased recharge following extended periods of wet weather. Groundwater flooding typically occurs in areas underlain by limestone and where underlying geology is highly permeable with high capacity to receive and store rainfall.

CFRAM PFRA maps do not indicate the occurrence of groundwater flooding at or near the site. Furthermore, a review of the GSI Groundwater Vulnerability maps show that the thickness of overburden at the site ranges from 10-20m, therefore indicating that the site is at low risk from groundwater flooding.

4.4 Overview of Flood Risk Identification

Historic flood maps do not indicate a history of flooding of the site from the Mayne River along the proposed development. However, there the ***FINAL*** OPW FRA maps

which indicate that the site is located within Flood Zone B, as the proposed development is affected by the 1 in 1000-year flood event. The development is considered as a 'Less Vulnerable Development', due to the nature of the development. Therefore, the development is an *'appropriate'* development for these types of flood zone.

Pluvial flood maps produced as part of the OPW PFRA flood maps indicate that the site is not at risk from pluvial flooding. No pluvial flood zones are identified at the site; however, areas of localised pluvial flooding have been identified in the surrounding area. Though due to existing drainage infrastructure in place, it is not anticipated that pluvial flooding would have a significant impact on the site.

The proposed development is not affected by groundwater flooding.

The bedrock aquifer, according to the GSI: (www.gsi.ie/mapping) National Draft Bedrock Aquifer Map, is classified as a Locally Important Aquifer (Ll) i.e. *Bedrock which is Moderately Productive only in Local Zones.* According to the GSI, the aquifer is not considered to have any primary porosity and flow will be primarily fracture controlled. The bedrock aquifer underlying the Belcamp Substation and a small section of the proposed transmission cable installation route is classed as a Poor Aquifer (Pu) which is described as *Bedrock which is Generally Unproductive expect for Local Zones.*Based on a review of available records there is no evidence of groundwater flooding at or near the site.

5.0 CONCLUSIONS

This report sets out the Flood Risk Assessment Stage 1 desk top assessment of the application site, in accordance with the FRM Guidelines. The assessment is based on the best data available in the public domain at the time of writing.

The sequential approach, as outlined in the FRM Guidelines, was followed. As the proposed development is located in an area with no flood hazard thereby avoiding flood risk and adhering to the first stage of the sequential approach, a Stage 1 assessment was undertaken with no requirement for a justification test.

Pluvial flood maps produced as part of the OPW PFRA flood maps indicate that the site is not at risk from pluvial flooding. No pluvial flood zones are identified at the site; however, areas of localised pluvial flooding have been identified in the surrounding area. Though due to existing drainage infrastructure in place, it is not anticipated that pluvial flooding would have a significant impact on the site. The proposed development is not affected by groundwater flooding.

However, there the ***FINAL*** OPW FRA maps which indicate that the site is located within Flood Zone B, as the proposed development is affected by the 1 in 1000-year flood event. The development is considered as a 'Less Vulnerable Development', due to the nature of the development. Therefore, the development is an *'appropriate'* development for these types of flood zone.

REFERENCES

- Base maps – Ordnance Survey of Ireland
- Department of the Environment & Local Government, The National Development Plan 2007-2013, 2007
- EPA, Hydrology Data, www.epa.ie
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- GSI, Online mapping, www.gsi.ie
- The Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009