

Appendix A4.2 Engineering Specialist Report for Crossings

JACOBS®



Greater Dublin Drainage

Irish Water

Engineering Specialist Report

for Crossings

Irish Water

December 2017

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List of Acronyms

ABP	An Bord Pleanála
AGI	Above Ground Installation
ASA	Alternative Sites Assessment
GNI	Gas Networks Ireland
DBO	Design Build Operate
EIS	Environmental Impact Statement
ESB	Electricity Supply Board
FCC	Fingal County Council
GDA	Greater Dublin Area
GDD	Greater Dublin Drainage
GDSDS	Greater Dublin Strategic Drainage Study
IFI	Inland Fisheries Ireland
NDDS	North Dublin Drainage Scheme
NFS	North Fringe Sewer
NRA	National Roads Authority
PE	Population Equivalent
RPA	Railway Procurement Agency
SBR	Sequencing Batch Reactor
SEA	Strategic Environmental Assessment
SHC	Sludge Hub Centre
TSS	Total Suspended Solids
WwTP	Wastewater Treatment Plant

1. Introduction

1.1 Introduction

The official name of the project is **Greater Dublin Drainage Project**

1.2 Objective of Overall Scheme

The core requirement of the GDD project is to safely deliver through the entire planning process a:

- *Regional Waste Water Treatment Plant (WwTP) and associated outfall pipeline located at a site, to be selected as part of this process, in the northern part of the Greater Dublin Area (GDA), and*
- *An Orbital Sewer linking the proposed WwTP to the existing regional sewer network and to provide for future connections for identified developing areas within the catchment.*

1.3 Client

This report was initially prepared and reviewed over the period between November 2012 and November 2013. At this time Fingal County Council were the Contracting Authority for the project on behalf of Meath, Kildare, Dun Laoghaire Rathdown and South Dublin County Councils and Dublin City Council.

Therefore this report was drafted on the basis that Fingal County Council, as the Local Authority, would be responsible for progressing the project through the entire procurement process and through to construction.

However, as of 01 January 2014, the project is officially transferred into the ownership of Irish Water following the formation of this utility in 2013.

1.4 Project Engineering Consultant

Following a competitive tender process Jacobs Engineering Ireland Ltd. in association with TOBIN Consulting Engineers was appointed to act as Project Engineering Consultant on this project with formal signing of Contract on the 14th March 2011.

1.5 Project Communications Consultant

Following a competitive tender process RPS Project Communications was appointed by FCC to act as Project Communications Consultant on this project.

1.6 Previous Reference Studies

- Greater Dublin Strategic Drainage Study (GDSDS) completed in April 2005, and
- Strategic Environmental Assessment of the Greater Dublin Strategic Drainage Study (SEA of GDSDS).

1.7 Project Stages

The Project is divided into a number of stages as follows:

- Sub-stage (a): Project Inception
- Sub-stage (b): Alternative WwTP Site Assessment (ASA) / Pipeline and Marine Outfall Route Selection Report
- Sub-stage (c): Concept Design Report (CDR)
- Sub-stage (d): Environmental Impact Statement (EIS)
- Sub-stage (e): Wayleave / Land Acquisition
- Sub-stage (f): Additional Reports
- Sub-stage (g): Planning Process
- Sub-stage (h): Any Other Work

1.8 Commencement Date

The official commencement date of the project is set as the 14th March 2011.

1.9 Scope of Engineering Specialist Report for Crossings

This Draft Engineering Specialist Report for Crossings has been prepared in order to:

- identify locations where the orbital sewers and outfall pipeline associated with the final preferred site option at Clonshagh will cross strategic infrastructure such as rail lines, motor-ways, gas pipe lines (transmission) and significant power transmission lines as well as natural features such as significant rivers;
- consider the physical constraints these crossings will have on the routing of the orbital sewers and the outfall pipelines; and
- develop measures to address these constraints.

Information from this report will be included, and where relevant further developed, in the Concept Design Report for the project.

2. Scheme Overview

Table 2-1: - Summary of Infrastructure for Transfer of Flows

2.1 Introduction

A comprehensive Alternative Sites Assessment (ASA) and Route Selection study, which was a key recommendation of the Strategic Environmental Assessment (SEA) of the Greater Dublin Strategic Drainage Study (GDSDS), was undertaken for the Greater Dublin Drainage (GDD) project with an overall objective of identifying a preferred site for the proposed WwTP, a preferred location for its associated outfall pipeline and preferred routes for the orbital sewers and outfall pipeline.

The selection of the optimum location for the proposed WwTP, orbital sewer and outfall pipeline has entailed an assessment of the means to minimise potential adverse environmental impacts and to optimise environmental benefits. The full ASA process is described in full in Volume A of the Concept Design Report.

On completion of the ASA and Route Selection study a final preferred site option has been selected, which includes for:

- A site for the proposed WwTP located in the townland of Clonshagh in North County Dublin;
- An outfall location for the discharge of treated wastewater from the WwTP located approximately 1km north-east of Ireland's Eye;
- Pipeline corridor for the Orbital Sewer serving the existing drainage networks of the 9C (Blanchardstown) sewer catchment and the North Fringe Sewer (NFS) Phase 1 Diversion to the proposed WwTP, including any necessary pumping stations;
- A pipeline corridor for the outfall pipeline from the proposed WwTP to the coastline north of Baldoyle and on to the marine outfall location north-east of Ireland's Eye.

2.2 Definition of Study Area

The study area has been determined with reference to the key recommendations of the GDSDS as amended by its SEA.

These recommendations informed the initial selection of the study area, which included North County Dublin, the foul drainage catchments of Blanchardstown, the north city area (Finglas to Howth), the Lucan/Clondalkin foul drainage catchment in South County Dublin, the drainage catchment of Leixlip WwTP, and the County Meath towns of Ashbourne, Ratoath, Kilbride, Dunboyne, and Clonee.

The Study Area was then refined to omit the area north of Balbriggan following consideration of the topography in this area of north County Dublin, the location and extent of the Balbriggan/Skerries Shellfish Waters and the constraints imposed by locating a new marine outfall within these designated waters.

The study area is shown in **Drawing No. 1** included in Appendix 1.

2.3 Strategy for Load Transfer

The proposed strategy for load transfer from the identified load centres to a new WwTP in North Dublin via an Orbital Sewer recommends:

- The interception and diversion of the 9C Sewer to the Orbital Sewer immediately north west of the M50/N3 Interchange at the BRDS pump station located at the Tolka Valley
- Flow transfer from the Lower Liffey Valley Catchment to occur at Leixlip WwTP with a pumped system delivering to the duplicated 9C Sewer in Blanchardstown. Irish Water advise that works to transfer the excess flow and load from Leixlip WwTP are currently at planning stage
- Flow Transfer from the North Fringe Sewer Phase 1 Catchment - flows to the west of the proposed WwTP at Clonshagh, north and south of the M50 to be intercepted and diverted to the proposed WwTP.

The proposed 500,000 PE treatment capacity at the Regional WwTP will provide the projected treatment capacity requirements out to 2050 (the design year horizon for the GDD project).

The recommended load transfer catchments are identified in Table 2.1.

Table 2.1 Development of Required Treatment Capacity at Proposed Regional WwTP

Catchment	Design Year			
	2025	2031	2040	2050
9C Sewer, incl load transferred from Leixlip WwTP	363,385	376,151	392,697	411,939
NFS sub-catchments west of proposed Regional WwTP	75,036	79,089	84,703	89,973
Total Treatment Capacity Required	438,421	455,240	477,400	501,912

2.3.1.1 Infrastructure for Transfer of Flows to the Emerging Preferred WwTP Sites

The following is a summary of the pipeline infrastructure requirements for the proposed scheme.

Table 2.2 Development of Required Treatment Capacity at Proposed Regional WwTP

Summary of the Pipeline Requirements	
Blanchardstown 9C Sewer/ NFS Phase 1 North	Infrastructure Requirements
Combined Pumping and Gravity Tunnel Sewer from Blanchardstown to proposed WwTP at Clonshagh	1,400mm Ø Rising Main and 1,800mm Ø Gravity Sewer
NFS Phase 1 South	Infrastructure Requirements
Combined Gravity sewer and Pumped rising main from the NFS to	1,500mm Ø Gravity Sewer

proposed WwTP at Clonshagh	800mm Ø Rising Main
Outfall Pipeline	Infrastructure Requirements
Pressurised Gravity Sewer, Gravity Tunnel Sewer and Subsea Pipeline from the proposed WwTP at Clonshagh to the Outfall Location	<p>1,800mm Ø Land Based Pressurised Gravity Sewer</p> <p>2000mm Ø Marine Based Pressurised Gravity Tunnel/ Subsea (dredged) Pipeline</p>

3. Identification of Engineering Constraints

3.1 Introduction

This section of the report considers the physical and technical constraints related to any above ground, natural and manmade features, and below ground services, which are located within the study area and which have potential to impact on the final site option.

3.2 Methodology for the Identification of Potential Crossings

In order to identify the physical constraints for the orbital sewer, WwTP site and outfall pipeline, it was necessary to identify potential crossings. The methodology applied was to collect all potential data, review this data and visit the sites, where possible, to verify the data. The methodology used is described in further detail, hereunder.

3.2.1 Data Collection

In order to identify above ground natural and manmade features within the study area information including mapping, aerial photography and LIDAR surveys was obtained from Ordnance Survey of Ireland.

Information on underground services was obtained from data provided by the various utility companies.

Information on future planned infrastructure was also collected from the various utility companies.

3.2.2 Desk top studies

A desk top review of the data collected (including aerial photography, Ordnance Survey mapping, information provided by utility providers) identified a large number of above ground features and underground services within the study area, however this report concentrates on critical features and infrastructure which will have to be crossed by the orbital sewers and outfall pipeline and where there is potential for significant disruption to the public, significant cost implications and significant environmental and health and safety impacts.

The following natural features, manmade features, infrastructure and utilities have been considered as part of this report:

- Gas Networks Ireland infrastructure
- Power transmission infrastructure (ESB/Eirgrid)
- Rail infrastructure (Iarnrod Eireann and TII)
- Motorways and National Primary Roads (TII)
- Water Supply Infrastructure (trunk mains)
- Wastewater infrastructure (large diameter pipelines)

- Aviation Infrastructure
- Significant watercourses
- Communications infrastructure
- Proposed and future infrastructure

It is noted that there are other features and infrastructure, such as local roads, water supply distribution network, wastewater infrastructure (small diameter pipelines), gas and electrical distribution infrastructure which will also potentially be impacted by the development of the final preferred site option. While there are potential impacts associated with these features it is considered that the consequences are of a lower risk and that it is more appropriate to deal with these issues at the detailed design stage of the project.

3.2.3 Site Visits

Site visits were undertaken on the orbital sewer and outfall pipeline corridors, to verify the features and infrastructure identified during the desk top studies and to determine the presence of any unknown infrastructure which might impact on the routing and preliminary design of the various pipelines.

3.3 Identification of Required Crossings

The physical constraints identified within the study area with potential to impact on the routing of the orbital sewers, WwTP site and outfall pipelines are discussed in the following sections.

3.3.1 Gas Transmission Infrastructure

The high pressure gas transmission pipelines identified within the study area include:

- a North-South transmission pipeline running from Blanchardstown to an Above Ground Installation (AGI) west of Lusk, with spurs serving the Airport and city centre;
- an East-West transmission pipeline routed from the landing point of the subsea interconnector, North of Rush, to the AGI west of Lusk and on westward.
- the subsea section of the East-West gas interconnector crosses the northern outfall study area.

Gas Networks Ireland (GNI) have a wayleave around their gas transmission pipelines, which extends 7m either side of the pipeline.

The orbital sewers and/or outfall pipeline associated with the final preferred site option will cross the gas transmission infrastructure. The identified crossing/interaction points are shown on Drawing No. 6 and detailed on Drawing No. 7.

A total of 3 No. crossings of the gas transmission network are required.

3.3.2 Power Transmission Infrastructure

The existing power infrastructure identified within the study area consists of;

- Low Voltage and Medium Voltage Network (10kV– 20kV);
- High voltage network (38kV, 110kV, 220kV and 400kV);
- East-West Interconnector land section; and
- East-West Interconnector subsea section.

The identified power infrastructure consists of a mix of overhead and underground lines. The high voltage network and the East-West Interconnector together with the orbital sewer and outfall pipeline corridors are shown on Drawing No. 8.

The orbital sewer and outfall pipeline associated with the final preferred site option will have to cross under/over the 38kV, 110kV and 220kV infrastructure, however this would be considered to be normal infrastructure which would be encountered in any civil engineering works in an urban environment. Given the preliminary design of the orbital sewer and outfall pipeline, they will be at a deeper level and will pass beneath the electricity infrastructure.

Following the identification of Clonshagh as the final preferred site option, as detailed in the *Alternative Sites Assessment and Route Selection Report (Phase 4): Final Preferred Site and Routes; June 2013*, no crossing of the East-West Interconnector is required.

3.3.3 Rail Infrastructure

The rail infrastructure identified within the study area includes:

- the existing Dublin to Belfast Railway; and
- the proposed Metro North and Metro West lines.

The Railway Procurement Agency (RPA) have advised that

- Metro North has a Railway Order in place and has also been tendered. The project future, however, is unclear at this moment.
- Metro West has no Railway Order in place; however it has been progressed to a stage that a Railway Order could be applied for within a short timeframe.

Transport Infrastructure Ireland (TII) in conjunction with National Transport Authority (NTA) now has responsibility for the Metro projects. The route of this existing and proposed rail infrastructure (available at time of reporting) together with the orbital sewer and outfall pipeline corridors is shown on Drawing No. 9.

The existing Dublin to Belfast railway line runs North-South through the study area and will be impacted upon, by the outfall pipeline land based.

For the Clonshagh site option, 1 No. crossings of the Dublin to Belfast Railway, 2 No. crossings of the proposed Metro West line and 1 No. crossing of the Metro North line are required.

The identified crossing/interaction points are shown on Drawing No. 9 and detailed on Drawings No. 10 and 11.

3.3.4 Motorways and National Primary Roads

Motorways and National Primary Roads identified within the study area which will be impacted by the crossing of the pipeline corridor include the following:

- Motorways
 - M1 and M2
- National Primary Roads
 - N2
- Regional Roads
 - R135, R122, R108, R132 (Swords Road), R107 (Malahide Road), R124, R106 (Coast Road)
- Other roads as outlined in Table 3.1.

The Old Swords Road (R132) has further been identified as a critical road crossing due to its proximity to the Airport and presence of services.

Following discussions with TII an application has been progressed under Section 53 of the Roads Act 1993 for the crossing of the N2 national road and for the M1 motorway. The M50 and the road network with the above motorways and National Primary Roads highlighted, is shown on Drawing No. 12 together with the orbital sewer and outfall pipeline corridors.

The identified crossing/interaction points are shown on Drawing No. 12 and detailed on Drawings No. 13 to 15.

3.3.5 Water Supply Infrastructure

An overview of the strategic trunk water supply mains within the study area is provided in Drawing No. 16.

The orbital sewer and outfall pipeline corridors associated with the Clonshagh site option would require crossings of the following strategic trunk water supply mains:

- 24", 450mm and 800mm North Fringe trunk main from Ballycoolen to Cappagh, Dublin City (3 nr)
- 400mm supply to Dublin Airport along the R132 Old Swords Road (3nr)

- 24" trunk main between Swords and Clonshagh, Dublin City (1nr)
- 450 and 560mm trunk main between Swords and Donaghmede, Dublin City (2nr)

The identified crossing/interaction points are shown on Drawing No. 16 and detailed on Drawing No. 17.

3.3.6 Wastewater Collection Infrastructure

The large diameter wastewater pipelines identified within the study area include:

- Route 9C sewer
- Off take from the North Fringe Sewer
- Rising Main from Sutton PS

These wastewater networks and the orbital sewer and outfall pipeline corridors are shown on Drawing No. 18.

It is intended to intercept and divert the Route 9C sewer to the proposed WwTP site. In addition the orbital sewer and outfall pipeline will cross a number of branches of large diameter sewers. These crossings are identified on Drawing No. 18 and detailed on Drawing No. 19.

3.3.7 Significant Watercourses

A large number of rivers and streams cross the study area generally flowing from west to east. The route of the significant watercourses is shown on Drawing No. 20 and crossings are detailed in Drawing No. 21.

The routing of the orbital sewer and outfall pipeline corridor associated with the Clonshagh site option does not entail the crossing of any significant watercourses but will require crossing a number of smaller watercourses as shown on Drawings Nos. 20 and 21.

There are no canals or other significant manmade watercourses within the study area.

3.3.8 Communications Infrastructure

There is a large amount of communications and telecoms infrastructure within the study area, and this would be considered to be normal infrastructure which would be encountered in any civil engineering works in an urban environment. However during the course of the project a subsea communications cable, which connects Ireland to the UK, was identified within the study area. The outfall pipeline associated with the Clonshagh site option would necessitate crossing this subsea cable.

3.3.9 Aviation Transmission Infrastructure

A proposed aviation fuel pipeline from Dublin Airport to Dublin Port crosses the proposed orbital sewer route approximately 200m west of the WwTP compound. Planning permission was granted in April 2016.

3.4 Summary of Identified Crossings

Table 3.1 provides a summary of the number of crossings of natural features and manmade infrastructure by the orbital sewer and outfall pipeline corridors associated with the final preferred site option.

Table 3-1 – Summary of Number of Crossings

	Pipeline Corridor	Approx.Chainage	Description
Aviation transmission infrastructure	Orbital Sewer (Blanchardstown – Clonshagh)	13,370m	Aviation fuel pipeline
Gas Transmission Infrastructure	Orbital Sewer (Blanchardstown – Clonshagh)	2,160m	900mm dia. Gas main
	Orbital Sewer (Blanchardstown – Clonshagh)	2,600m	900mm dia. Gas main
	Orbital Sewer (Blanchardstown – Clonshagh)	11,700m	450mm dia Gas main
Electrical Power Transmission Infrastructure	Orbital Sewer (Blanchardstown – Clonshagh)	1980m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	2,300m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	3,400m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,550m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,820m	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,840m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,870m	220kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,890m	220kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	4,900m	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,070	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,110m	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,110m	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,150m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,150m	110kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,180m	220kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	5,370m	110kV U/G Cable
	Orbital Sewer (Blanchardstown – Clonshagh)	11,680m	38kV O/H Power Line
	Orbital Sewer (Blanchardstown – Clonshagh)	12,410m	38kV O/H Power Line
	North Fringe Sewer Diversion	0,485m	38kV O/H Power Line
	Outfall Pipeline (Land Based Section)	2,300m	38kV O/H Power Line
	Outfall Pipeline (Land Based Section)	3,150m	38kV O/H Power Line
	Outfall Pipeline (Land Based Section)	3,530m	38kV O/H Power Line
	Outfall Pipeline	3,660m	38kV O/H Power Line

	Pipeline Corridor	Approx.Chainage	Description
	(Land Based Section)		
Strategic Trunk Sewer Pipelines	Orbital Sewer (Blanchardstown – Clonshagh)	11,700m	900mm trunk sewer
	Orbital Sewer (Blanchardstown – Clonshagh)	13,380m	300mm sewer (TBC)
	Outfall Pipeline (Marine Based Section)	0,100m	300mm rising main (TBC)
Strategic Trunk Water Supply Pipelines	Orbital Sewer (Blanchardstown – Clonshagh)	3,550m	24", 450mm and 800mm North Fringe trunk main from Ballycoolen to Cappagh, Dublin City (2No)
	Orbital Sewer (Blanchardstown – Clonshagh)	10,650m	400mm supply to Dublin Airport along the R132 Old Swords Road (3No)
	Orbital Sewer (Blanchardstown – Clonshagh)	13,380m	24" trunk main between Swords and Clonshaugh, Dublin City (1No)
	Outfall Pipeline (Land Based Section)	4,800m	450 and 560mm trunk main between Swords and Donaghmede, Dublin City (2No)
Existing Rail Infrastructure	Outfall Pipeline (Land Based Section)	4,570m	Dublin – Belfast Rail line
Planned Rail Infrastructure	Orbital Sewer (Blanchardstown – Clonshagh)	3,650m	Metro West Line
	Orbital Sewer (Blanchardstown – Clonshagh)	7,520m	Metro West Line
	Orbital Sewer (Blanchardstown – Clonshagh)	9,370m	Metro North Line
Submarine Fibre Optic Cable	Outfall Pipeline (Marine Section)	4,500m	Submarine Fibre Optic Cable
National Primary Roads & Motorways	Orbital Sewer (Blanchardstown – Clonshagh)	5,500m	N2
	Orbital Sewer (Blanchardstown – Clonshagh)	12,650m	M1
Regional & Other Roads	Orbital Sewer (Blanchardstown – Clonshagh)	3,440m	Cappagh Road
	Orbital Sewer (Blanchardstown – Clonshagh)	5,350m	R135
	Orbital Sewer (Blanchardstown – Clonshagh)	6,250m	R122
	Orbital Sewer (Blanchardstown – Clonshagh)	9,100m	R108
	Orbital Sewer (Blanchardstown – Clonshagh)	11,650m	R132 (Swords Road)
	Orbital Sewer (Blanchardstown – Clonshagh)	13,380m	Clonshaugh Road
	Outfall Pipeline (Land Based Section)	1,860m	R107 (Malahide Road)
	Outfall Pipeline (Land Based Section)	3,890m	R124
	Outfall Pipeline (Marine Section)	0090m	R106 (Coast Road)
	Outfall Pipeline (Marine Section)	0850m	Golf Links Road
Local Roads	Orbital Sewer (Blanchardstown – Clonshagh)	2,620m	Local Road West of Premier Business Park
	Orbital Sewer (Blanchardstown – Clonshagh)	2,860m	Premier Business Park
	Orbital Sewer (Blanchardstown – Clonshagh)	6,780m	Dubber Cottages
	Orbital Sewer (Blanchardstown – Clonshagh)	7,990m	Silloogue Green
Watercourses	Orbital Sewer (Blanchardstown – Clonshagh)	0,680m	Tributary of Tolka River
	Orbital Sewer (Blanchardstown – Clonshagh)	8,310m	Santry River
	Orbital Sewer (Blanchardstown – Clonshagh)	10,560m	Mayne River

	Pipeline Corridor	Approx.Chainage	Description
	Outfall Pipeline (Land Based Section)	0050m	Cuckoo Stream
	NFS Sewer Diversion	0025m	Mayne River

4. Consultations with Stakeholders

In the preparation of this report consultations were held with the relevant stakeholders to appraise them of the project, confirm presence of their infrastructure, discuss options for the orbital sewer and outfall pipeline to cross their particular infrastructure and to determine if there are any issues which could severely impact on the construction of the orbital sewers and outfall pipelines.

The schedule of consultations held is provided in Table 4.1

Table 4.1: Schedule of Consultations

Stakeholder	Meeting Date	Additional Consultation
Bord Gais Networks (now Gas Networks Ireland)	19 th November 2012	In addition to the meeting there was additional correspondence by phone and email
EirGrid	23 rd November 2012	
Iarnrod Eireann	14 th December 2012 14 th March 2014	In addition to the meeting there was additional correspondence by phone and email
Rail Procurement Agency (Currently TII)	12 th April 2013, 27 th June 2017	In addition to the meeting there was additional correspondence by phone and email
National Roads Authority (Currently TII)	11 th February 2013, 27 th June 2017	In addition to the meeting there was additional correspondence by phone and email
Inland Fisheries Ireland	5 th November 2012	
Fingal Co. Co. Water Operations	11 th February 2014	
Fingal Co. Co. Wastewater Operations	27 th February 2014	
Dublin City Council Water Operations	20 th March 2014	
Hibernia Atlantic	10 th April 2014	In addition to the meeting there was additional correspondence by phone and email.

4.1.1 Gas Networks Ireland

A meeting was held between the project team and a representative of Gas Networks Ireland (GNI) to discuss the project and potential crossings of the gas transmission infrastructure. The timing of this meeting was such that there were three site options and associated orbital sewers and outfall pipelines under consideration.

It was noted by BGN that all works would have to comply with the BGN documents “Code of Practice for Working in the Vicinity of the Transmission Network” and “Safety Advice for Working in the Vicinity of Natural Gas Pipes”.

It was also confirmed that a crossing agreement between the Project Owner (now Irish Water previously Fingal County Council) and BGN detailing the technical requirements for each crossing would need to be in place prior to works commencing on site, however this was not needed at this stage in the process.

BGN confirmed that in principle they do not see a major difficulty in the orbital sewers and/or outfall pipelines crossing the gas transmission network, however they would have a preference for crossing by means of trenchless methods.

Subsequent to the meeting BGN provided digital as built drawings in order that the designers of the orbital sewer could consider the actual location of the gas transmission network and avoid the network and associated wayleaves where possible.

When the preferred site option was identified and the wayleaves for the orbital sewer developed contact was again made with BGN in order to discuss the crossings. It was confirmed that another meeting was not required, however if outline technical proposals were submitted, outline approval could be provided by BGN in order to support the planning application.

4.1.2 EirGrid

A meeting was held between the project team and representative of EirGrid to discuss the project and potential crossings of the power transmission infrastructure. The timing of this meeting was such that there were three site options and associated orbital sewers and marine outfalls under consideration.

EirGrid confirmed that their main concern with crossings of their East-West Interconnector was the potential for damage to the concreted surrounded grouted ducting, in which the interconnector is laid, from vibration caused by the construction of the GDD pipelines. Any crossing design would have to account for vibration mitigation measures.

A crossing agreement between IW and EirGrid detailing the technical requirements for each crossing would have to be in place prior to works commencing on site.

When the preferred site option was identified and the wayleaves for the orbital sewer developed, it was deemed not relevant to contact EirGrid to discuss the project in any further detail, as the preferred site option does not impact on the East-West Interconnector.

4.1.3 Iarnrod Eireann

A meeting was held between the project team and representatives of Iarnrod Eireann to discuss the project and potential crossings of the rail infrastructure. The timing of this meeting was such that there were three site options and associated orbital sewers and outfall pipelines under consideration.

Iarnrod Eireann confirmed the following requirements with respect to any crossing of the Dublin-Belfast rail line:

- Crossings should be a minimum of 4.7m from the crown of the pipe to the track bed level;
- Crossings should be perpendicular where possible;
- If two (or more) crossings are required they should be in a single conduit or there should be a separation between them (of the order of 5m);
- Crossings should not be at track joint positions;
- Crossings should take account of stanchion locations for overhead power lines associated with DART trains running on this line; and
- A survey of track position and level will be required.

Iarnrod Eireann confirmed that a crossing agreement, between IW and Iarnrod Eireann, detailing the technical requirements for each crossing would have to be in place prior to works commencing on site, however this agreement is not required at this stage of the project.

When the preferred site option was identified and the wayleaves for the orbital sewer developed contact was again made with Iarnrod Eireann in order to discuss the crossing of the Dublin Belfast railway.

A meeting was held on site to review the crossing proposal and Iarnrod Eireann confirmed that subject to their normal restrictions, they had no objections to the crossing proposal. It was confirmed that Iarnrod Eireann would provide a letter of support for the project on submission of a proposal.

The project team has had discussions with Iarnrod Eireann who have indicated that the proposed crossing point and details are acceptable in principle. A formal wayleave agreement will be required in advance of construction

4.1.4 Railway Procurement Agency

A meeting was held between the project team and representatives of the Railway Procurement Agency (RPA) to discuss the project and potential crossings of planned rail infrastructure. The timing of this meeting was such that there were three site options and associated orbital sewers and outfall pipelines under consideration.

The RPA advised that they have no difficulty with the GDD pipelines crossing under the Metro North or Metro West Lines and confirmed that a depth in the region of 3m below the track would be sufficient to mitigate potential impact.

Subsequent to the meeting the RPA provided detailed information outlining their proposals for the Metro North and West, where the GDD orbital sewer is intended to cross these lines. This information has been considered in the preliminary design of the orbital sewer. At present the

construction timeline for the Metro North is 2021. The programme regarding Metro West is uncertain at present and it is not clear if this metro line will be constructed prior to commencement of the GDD.

Transport Infrastructure Ireland (TII) indicated in a recent meeting that the National Transport Authority (NTA) shall be leading the Metro projects. Further correspondence will be undertaken with the NTA to determine if a route has been finalised.

4.1.5 Transport Infrastructure Ireland (formerly NRA)

A meeting was first held between the project team and representatives of the National Roads Authority (NRA) to discuss the project and potential crossings of the national road infrastructure. The timing of this meeting was such that there were three site options and associated orbital sewer and outfall pipeline under consideration.

The NRA advised that a formal application to the NRA for permission to construct the orbital sewers and outfall pipelines beneath the national roads or motorways, in accordance with Section 53 of the Roads Act, 1993, will be required prior to submitting the GDD to An Bord Pleanála for planning permission. Exact detail of each crossing would not be required at this time however prior to going to construction it will be necessary to submit individual designs for each crossing to the NRA for agreement.

The NRA advised that all crossings should be achieved by trenchless techniques such as tunnelling or directional drilling. Designs for crossings would have to take account of the road drainage and fibre optic infrastructure, and mitigate any potential impact on this existing infrastructure.

A meeting was held in June 2017 with TII at which TII advised that a letter of support would be provided but that these documents would not be signed/sealed until planning permission has been granted. Formal applications to TII have been made for the crossings of the N2 and M1 as requested and in accordance with Section 53 of the Roads Act, 1993.

4.1.6 Inland Fisheries Ireland

A meeting was held between the project team and representatives of Inland Fisheries Ireland (IFI) to discuss the project and potential crossings of natural water features. The timing of this meeting was such that there were three site options and associated orbital sewers and marine outfalls under consideration.

Inland Fisheries Ireland (IFI) advised that they would prefer that all crossings of watercourses be undertaken using trenchless techniques such as tunnelling or directional drilling. However, should this not prove to be possible then each crossing would have to be agreed with the IFI and should be designed and planned to take place during a time that will minimise impact on the aquatic environment and fish populations.

4.1.7 Fingal Co. Co. Water Operations

A meeting was held between the project team and representatives of Fingal Co. Co. water operations section to discuss the project and potential crossings of the water transmission infrastructure. The timing of this meeting was such that the preferred site options and associated orbital sewers and marine outfalls, had been identified.

At this meeting the water operations section confirmed that the data collection had identified the significant water mains, but also identified that some water mains are operated by Dublin City Council and we would have to make contact with them also. A meeting was held with Dublin City Council on this matter as outlined in Section 4.1.9.

The water operations section did not have any objections to the proposals in principle and advised they would have no issue with the orbital sewer and/or outfall pipeline passing beneath their infrastructure.

4.1.8 Fingal Co. Co. Wastewater Operations

A meeting was held between the project team and representatives of Fingal Co. Co. wastewater operations section to discuss the project and potential crossings of the wastewater collection infrastructure. The timing of this meeting was such that the preferred site options and associated orbital sewers and marine outfalls, had been identified.

At this meeting the wastewater operations section confirmed that the data collection had identified the significant sewers.

The wastewater operations section did not have any objections to the proposals in principle and advised they would have no issue with the orbital sewer and/or outfall pipeline passing beneath their infrastructure.

4.1.9 Dublin City Council Water operations

A meeting was held between the project team and representatives of Dublin City Council (DCC) water operations section to discuss the project and potential crossings of the water transmission infrastructure that is located in Fingal but is operated by DCC. The timing of this meeting was such that the preferred site options and associated orbital sewers and marine outfalls, had been identified.

It was confirmed that the major water assets had been identified and that there were no objections to the crossings of the assets, subject to normal good practice being followed. Particular requirements which were identified were;

- Proposed orbital sewer should go beneath water mains
- Vertical separation to be a minimum of 500mm
- Horizontal separation to be 6m
- At crossings there should be no joints over joints.

4.1.10 Hibernia Atlantic Ltd.

Following email and telephone communication with Hibernia Atlantic Ltd. where it was initially indicated that the route of the marine outfall did not cross the Hibernia Atlantic Ltd. subsea cable it was subsequently confirmed that the route for the marine outfall did cross the subsea cable.

A meeting was held between the project team and a representative of Hibernia Atlantic Ltd. to discuss the project and potential crossings of the submarine fibre optic infrastructure owned by Hibernia Atlantic Ltd.

Hibernia Atlantic Ltd. advised that the cable is a 38mm shielded fibre optic cable that is typically ploughed to a depth of 1m below the sea bed. At this meeting it was confirmed that only the dredged option would have any potential impact on the subsea cable. A number of options for the crossing were discussed at high level including diversion of the subsea cable, a temporary break in the cable to allow the marine outfall to be constructed and engineering measures to protect the subsea cable during the construction of the marine outfall.

Hibernia Atlantic Ltd. advised that there is no requirement for planned maintenance to this cable and the only maintenance carried out is reactive in case of damage to the cable. It was advised that there are significant cost implications if the cable is out of service as the company have to lease capacity from other providers to provide a service to their customers.

Given the costs and risks involved Hibernia Atlantic Ltd. are of the opinion that the risks could be mitigated by providing an engineering solution to protect the subsea cable during the construction of the marine outfall.

The project team has made contact with Hibernia Atlantic Ltd. and are awaiting a meeting to discuss the project, potential crossings and possible mitigation measures and construction methodologies.

5. Technical Proposals for Constraints Crossings

Following the identification of the required crossings and subsequent discussions with the relevant stakeholders with respect to their technical requirements for crossings, technical proposals for crossing the constraints have been developed and included in the preliminary design of the orbital sewers and marine outfall.

It is noted that the technical proposals are preliminary at this stage of the design process and have been developed prior to any detailed information being available with respect to ground conditions.

The technical proposals as well as any other requirements identified by the stake holders are included in the following sections.

5.1 Gas Transmission Infrastructure

Gas Networks Ireland (GNI) confirmed that in principle they do not see a major difficulty in the orbital sewers and/or outfall pipelines crossing the gas transmission network.

The BGN Code of Practice for Working in the Vicinity of the Transmission Network states that where a service is to cross under transmission pipelines it shall have a minimum clearance of 0.6m, and additionally, that no new service shall be laid parallel to the transmission pipeline within a wayleave. It has been confirmed by BGN that the wayleave for the transmission pipeline is 7m either side of the gas main.

BGN indicated at a meeting with the project team that they would prefer that all crossings be constructed using trenchless techniques such as tunnelling and a separation of 2-3m from the crown of the tunnel to the underside of the gas transmission pipeline would be preferable.

The preliminary design of the orbital sewer has taken into account the requirements of BGN and it is proposed to carry out the crossings by means of trenchless techniques. The first two crossings of the gas transmission network are at chainages Ch 2+160 and Ch 2+600 approximately, where the orbital sewer has been designed as a 1400mm diameter rising main. The actual methodology for undertaking the crossing will be determined at detailed design stage following receipt of detailed site investigation information, however, at this diameter and distance it is considered possible to thrust bore or directionally drill the crossings depending on the ground conditions.

The third crossing is at chainage Sec-1 Ch 11+700 approximately, where the orbital sewer is designed as a 1800mm diameter gravity sewer. This crossing is located at Collinstown Cross, which poses a number of technical constraints on the design and construction options for the orbital sewer due to the amount of services in this road and the requirement to avoid major traffic disruption at this location.

Due to these constraints the crossing at Collinstown Cross has been designed as a trenchless crossing and it is anticipated this will be a tunnelled crossing carried out using a tunnel boring machine, subject to detailed ground investigation. In order to avoid the services in the area, the orbital sewer is designed as 5.8m below ground level to top of crown, so this will also provide adequate separation for the gas transmission main crossing.

5.2 Power Transmission Infrastructure

It is noted that the orbital sewer and outfall pipeline corridors for the preferred site option at Clonshagh do not require any crossing of the East-West Interconnector.

The orbital sewer and outfall pipeline associated with the final preferred site option will have to cross under/over the 38kV, 110kV and 220kV infrastructure, however this would be considered to be normal infrastructure which would be encountered in any civil engineering works in an urban environment.

The preliminary design of the orbital sewer and outfall pipeline has been such as to avoid overhead lines and their support structures, where possible, and the preliminary design is such that the orbital sewer and marine outfall will be at a deeper level to underground electricity cables and will pass beneath this electricity infrastructure. It is considered appropriate that the crossings of the power infrastructure are considered in more detail at the detail design stage.

5.3 Rail Infrastructure

Dublin-Belfast Railway

Iarnrod Eireann (IE) confirmed that subject to their requirements being satisfied, that they will not have any objections to the construction of the orbital sewer and marine outfall crossing the Dublin-Belfast rail line. The main IE requirements are:

- Crossings should be a minimum of 4.7m from the crown of the pipe to the track bed level;
- Crossings should be perpendicular where possible;
- If two (or more) crossings are required they should be in a single conduit or there should be a separation between them (of the order of 5m);
- Crossings should not be at track joint positions;
- Crossings should take account of stanchion locations for overhead power lines associated with DART trains running on this line.

The land based marine outfall is an 1800mm diameter gravity pipeline and this crosses the Dublin-Belfast rail line at chainage Ch 4570 approximately. At this location the cover to the outfall pipeline land based is approximately 5m which meets the minimum requirement for cover to the crossing. It is envisaged that this crossing would be carried out by trenchless techniques such as thrust boring or tunnelling by means of a tunnel boring machine.

It is envisaged that a separate trenchless crossing would be carried out adjacent to the marine outfall crossing, by similar methods to the marine outfall crossing. This second crossing would act as a conduit for provision of future infrastructure.

It is noted that a crossing agreement between FCC and Iarnrod Eireann detailing the technical requirements for each crossing will have to be in place prior to works commencing on site.

5.4 Railway Procurement Agency

The RPA advised that they have no difficulty with the GDD pipelines crossing under the Metro North or Metro West Lines. A depth of 3m below the track would be sufficient to mitigate potential impact.

The preliminary design of the orbital sewer has used a depth to crown in the region of 3m at the potential crossing points for the Metro infrastructure. The actual construction methodology for this crossing will be dependent on the actual construction timeframes for both projects, however the preliminary design of the orbital sewer is such that it is envisaged a trenchless method for crossing would be suitable, should the Metro infrastructure be in place prior to the orbital sewer construction.

5.5 Motorways and National Primary Roads

The NRA confirmed that a formal application to the NRA for permission to construct the orbital sewers and outfall pipelines beneath the national roads or motorways, in accordance with Section 53 of the Roads Act, 1993, will be required prior to submitting the GDD to An Bord Pleanála for planning permission. The NRA also confirmed that all crossings should be achieved by trenchless techniques such as tunnelling or directional drilling. Designs for crossings would have to take account of the road drainage and fibre optic infrastructure, and mitigate any potential impact on this existing infrastructure. Exact detail of each crossing would not be required at this time however prior to going to construction it will be necessary to submit individual designs for each crossing to the NRA for agreement.

The crossing of all road infrastructure is outlined in Table 3.1.

The preliminary design of the orbital sewer has accommodated the requirements of the NRA by using the criteria of 3m cover to the crown of the orbital sewer at the crossing points with the motorways and a requirement for the crossings to be carried out by trenchless methods.

Given the cover requirements and the diameter and distance of the crossings, subject to detail site investigation and design, it is envisaged that the crossings will be constructed using micro-tunnelling techniques or a similar trenchless technology.

5.5.1 Water Supply Infrastructure

Following discussion with, Fingal Co. Co. and DCC, water operations departments, it was confirmed that the major water assets had been identified and that there were no objections to the crossings of the assets, subject to normal good practice being followed. Particular requirements which were identified were;

- The orbital sewer or marine outfall should go beneath water supply infrastructure
- Vertical separation to be a minimum of 500mm
- Horizontal separation to be 6m
- At crossings there should be no joints over joints.

The crossing of all water supply infrastructure is outlined in Table 3.1.

The particular requirements have been included in the preliminary design of the orbital sewer and the marine outfall at the locations where there are crossings of critical water supply infrastructure.

5.6 Wastewater Network Infrastructure

Following discussions with Fingal Co. Co. wastewater operations department, it was confirmed that the routing of the orbital sewer and outfall pipeline corridors will entail crossings of branches of large diameter wastewater pipelines, and that there were no objections to the crossings of the assets, subject to normal good practice being followed.

The crossing of all wastewater infrastructure is outlined in Table 3.1.

5.7 Significant Watercourses

Inland Fisheries Ireland (IFI) indicated at a meeting that they would prefer that all crossings of watercourses be undertaken using trenchless techniques such as tunnelling or directional drilling. However, should this not prove to be possible then each crossing would have to be agreed with the IFI and should be designed and planned to take place during a time that will minimise impact on the aquatic environment and fish populations.

The crossing of all watercourses is outlined in Table 3.1.

The preliminary design of the orbital sewer and outfall pipeline took into account the preference of the IFI and it is envisaged that crossings of significant watercourses will be by trenchless methods, such as directional drilling, micro-tunnelling or thrust boring, depending on the detailed site investigation results. The crossings of watercourses have been designed to allow a separation of 3m to the orbital sewer crown.

It is noted that other drainage ditches and similar have also been identified and the methodology to cross these should be considered in consultation with landowners and the local authority.

5.8 Communications Infrastructure

A required crossing of the marine outfall with the Hibernia Atlantic Ltd. Dublin to Southend submarine cable has been identified at approximately chainage Sec-3 Ch 4+500 on the marine outfall, in the eventuality that the outfall is constructed by a tunnel and dredge methodology.

Discussions with Hibernia Atlantic Ltd. revealed that there is no requirement for planned maintenance to this cable, and that work would only be required in the case of damage having been caused to the cable. It was advised that there are significant cost implications if the cable is out of service as the company have to lease capacity from other providers to provide a service to their customers.

Given the costs and risks involved Hibernia Atlantic Ltd. are of the opinion that the risks could be mitigated by providing an engineering solution to protect the subsea cable during the construction of the marine outfall.

The exact nature of the crossing would be subject to detailed design and approval by Hibernia Atlantic Ltd. however the outline technical proposal for the crossing is detailed hereunder.

Initially is important to identify the cable with assistance from the asset owner by means of inducing a detectable frequency and experienced divers using a probe. Once located the cable shall be uncovered and visibly marked to minimise risk of accidental damage. In order to construct the section of marine outfall that will have to cross the subsea cable, it is envisaged that the subsea cable would be protected by means of a cable protection system, at which point it may be supported to allow the excavation beneath the cable and installation of the outfall beneath the cable.

The exact details of this technical proposal are subject to site investigation, detailed design and agreement with the asset owner. It is also likely that Hibernia Atlantic Ltd. would have some supervisory presence during the works adjacent to the subsea cable.

6. Summary and Recommendations

This Engineering Specialist Report for Crossings has been prepared in order to:

- identify locations where the orbital sewer and outfall pipeline associated with the final preferred site option at Clonshagh will cross strategic infrastructure such as rail lines, motorways, gas pipe lines (transmission), water and wastewater infrastructure, significant power transmission lines as well as natural features such as significant rivers;
- consider, in consultation with the relevant stakeholders, the physical constraints these crossings will have on the routing of the orbital sewers and the outfall pipelines; and
- develop technical proposals to address these constraints and include these proposals in the preliminary design of the orbital sewer and marine outfall.

Significant manmade infrastructure and natural features identified that may be impacted by the routing of the orbital sewers and outfall pipelines associated with the final preferred site option include:

- Gas transmission infrastructure;
- Electrical Power transmission infrastructure;
- Existing Rail Infrastructure;
- Proposed Rail Infrastructure;
- National Primary Routes and Motorways;
- Water Supply trunk mains;
- Wastewater Collection Infrastructure;
- Watercourses;
- Aviation Infrastructure.

Discussions with the relevant stakeholders have been positive and on the basis of these discussions technical proposals have been developed for the crossings, which have been incorporated into the preliminary design of the orbital sewer and marine outfall.

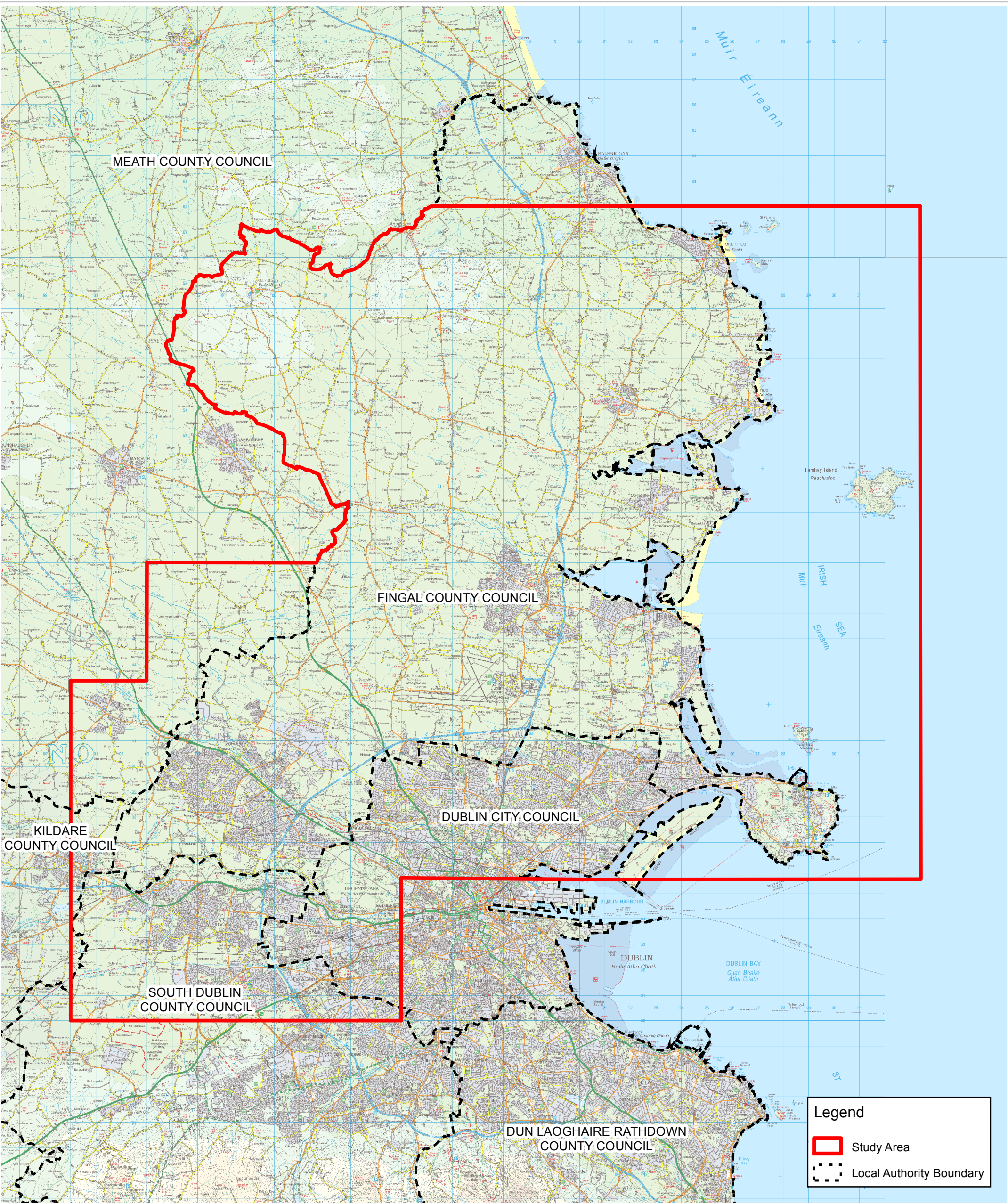
The technical proposals mitigate the potential impacts arising from the construction of the proposed pipeline crossings by:


- Provision of appropriate separation distance, as discussed above, between the pipe and the existing or proposed constraint (infrastructure and river or stream); and
- Consideration of trenchless construction methodologies in the preliminary design. The confirmation of the particular methodology shall be confirmed at detailed design stage and

must be appropriate to the particular situation, taking into account considerations such as ground conditions, orbital sewer/marine outfall diameter and depth.

Appendix 1 - Drawings

Drawing No. 1	Study Area
Drawing No. 2	Ringsend Catchment Area
Drawing No. 3	Critical Catchments
Drawing No. 4	Secondary Catchments
Drawing No. 5	Final Site – Preferred Option
Drawing No. 6	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Gas Infrastructure (Sheet 1 of 2)
Drawing No. 7	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Gas Infrastructure (Sheet 2 of 2)
Drawing No. 8	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Powerlines
Drawing No. 9	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Railway (Sheet 1 of 2)
Drawing No. 10	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Railway (Sheet 2 of 2)
Drawing No. 11	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Railway Dublin Belfast Railway
Drawing No. 12	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Major Roads (Sheet 1 of 2)
Drawing No. 13	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Motorways N2
Drawing No. 14	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Roads Old Airport Road
Drawing No. 15	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Motorways M1 Motorway
Drawing No. 16	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Watermains (Sheet 1 of 2)
Drawing No. 17	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Watermains (Sheet 2 of 2)
Drawing No. 18	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Wastewater (Sheet 1 of 2)
Drawing No. 19	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Wastewater (Sheet 2 of 2)
Drawing No. 20	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Watercourses (Sheet 1 of 2)
Drawing No. 21	Location of Crossing Points Orbital Sewer/Outfall Pipeline & Watercourses (Sheet 2 of 2)

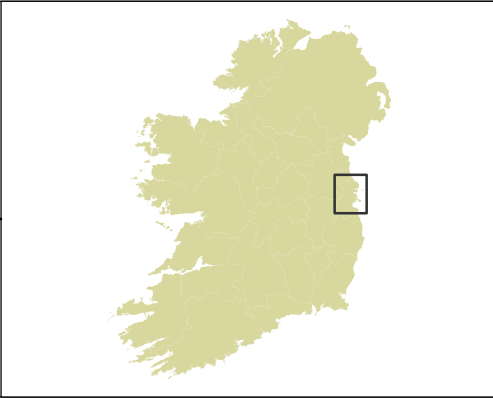




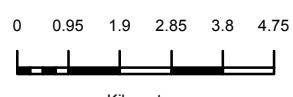

Drawing Title

ENGINEERING SPECIALIST REPORT
FOR CROSSINGS



STUDY AREA



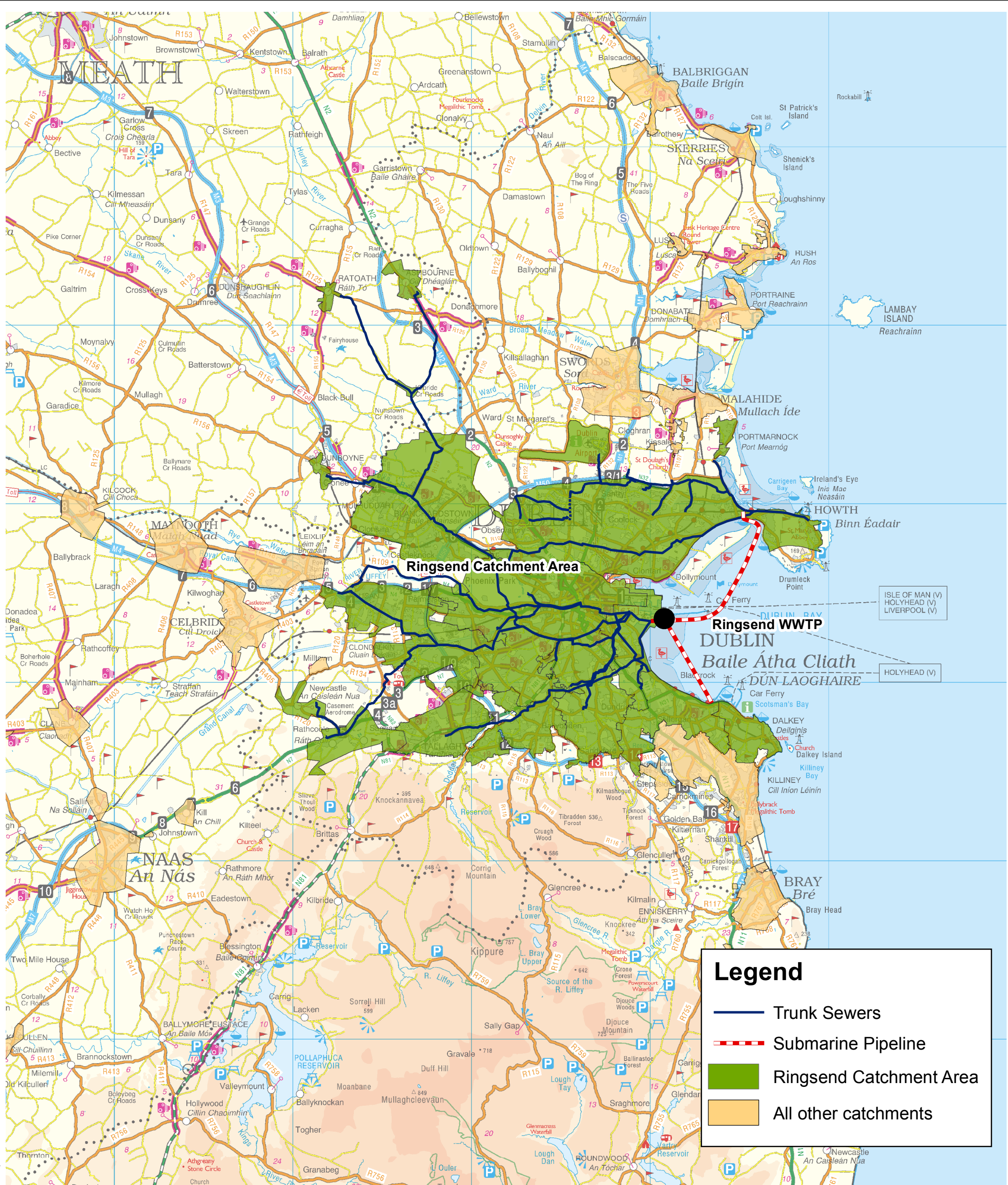
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A	10.12.13	ISSUED	MN	AWD	DC	COK			
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd			
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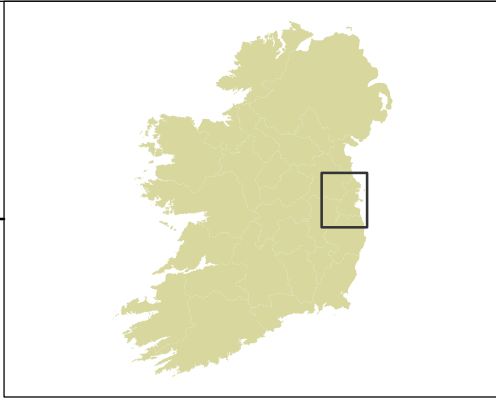
Legend

- Trunk Sewers
- Submarine Pipeline
- Ringsend Catchment Area
- All other catchments

Drawing Title

ENGINEERING SPECIALIST REPORT
FOR CROSSINGS

RINGSEND CATCHMENT AREA



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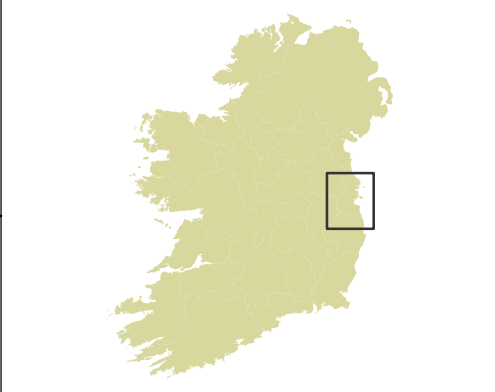
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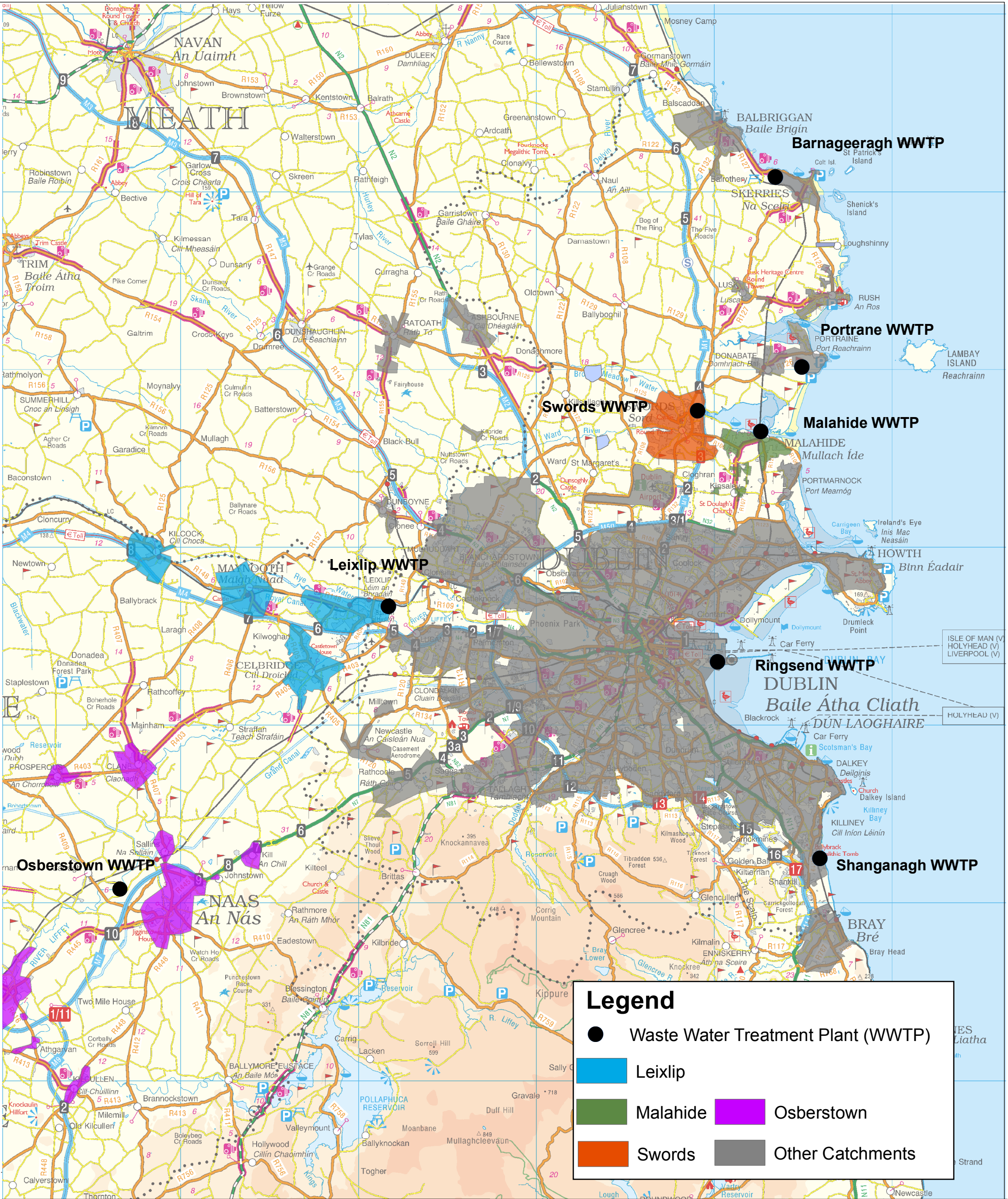
ENGINEERING SPECIALIST REPORT
FOR CROSSINGS

CRITICAL CATCHMENTS



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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	App'd			
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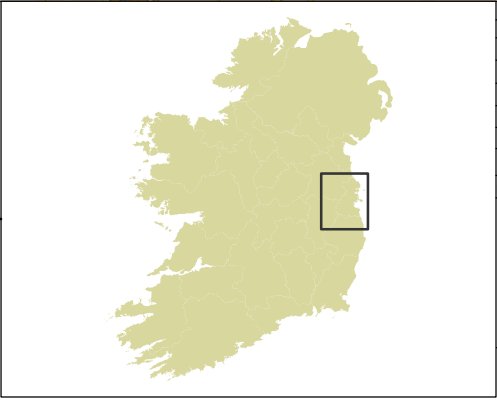
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Drawing Title

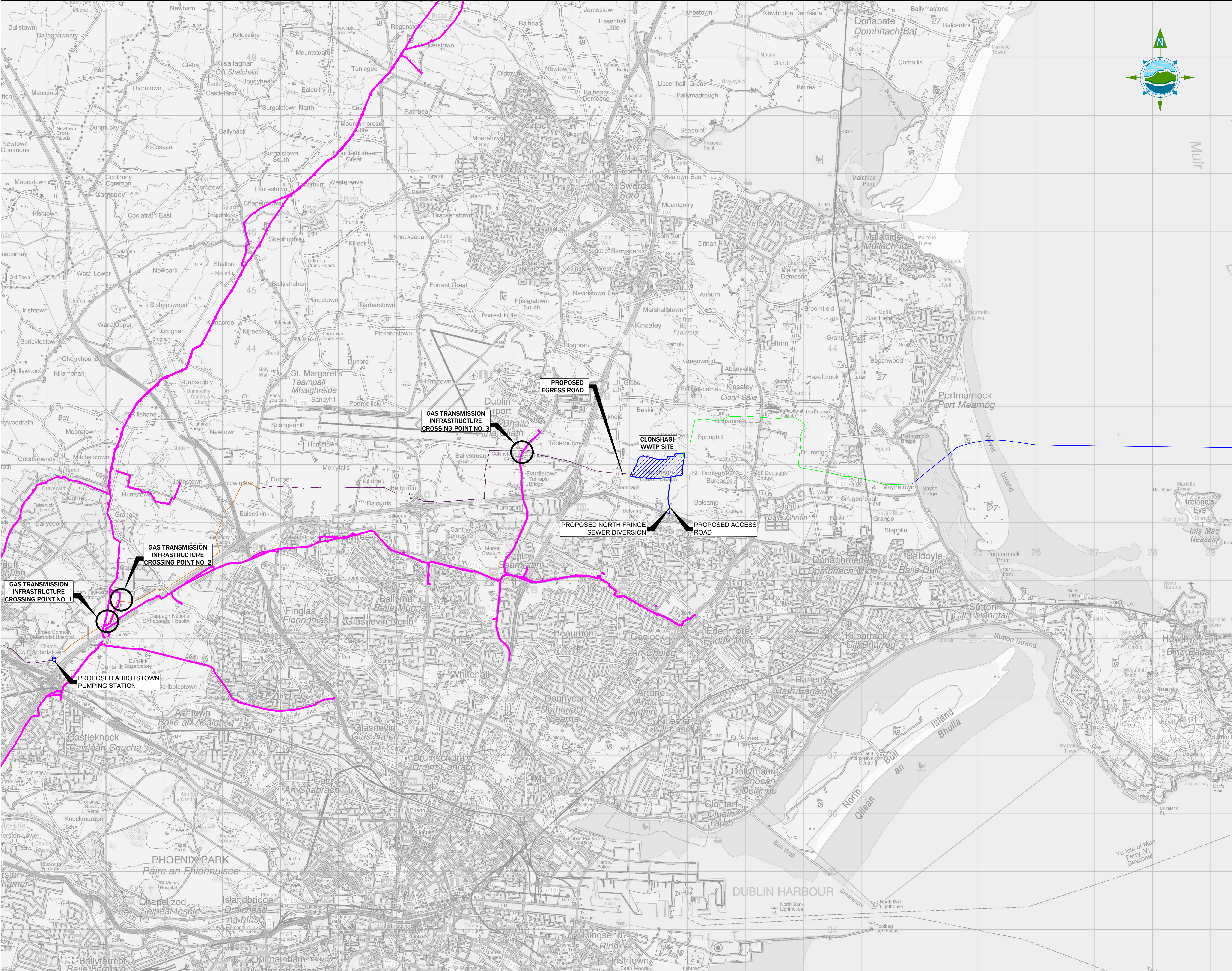
ENGINEERING SPECIALIST REPORT
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SECONDARY CATCHMENTS



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Drawing No.	Drawing No. 4	



LEGEND:

PROPOSED WWT/PPS

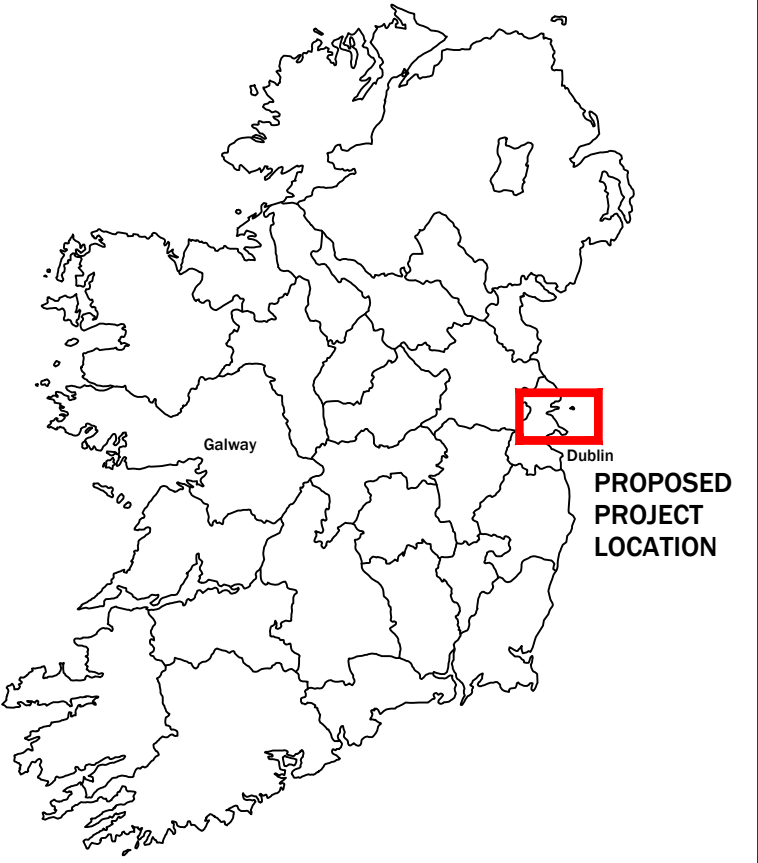
PROPOSED ORBITAL SEWER ROUTE (GRAVITY)

PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)

PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)

PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)

GAS TRANSMISSION INFRASTRUCTURE



- NOTES:**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
 - ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE.
 - ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES.
 - THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION, DIAMETER AND INVERT LEVEL OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
 - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	11.12.17	DRAFT ISSUE FOR REVIEW	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title:

LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINE & GAS INFRASTRUCTURE
- Sheet 1 of 2 -

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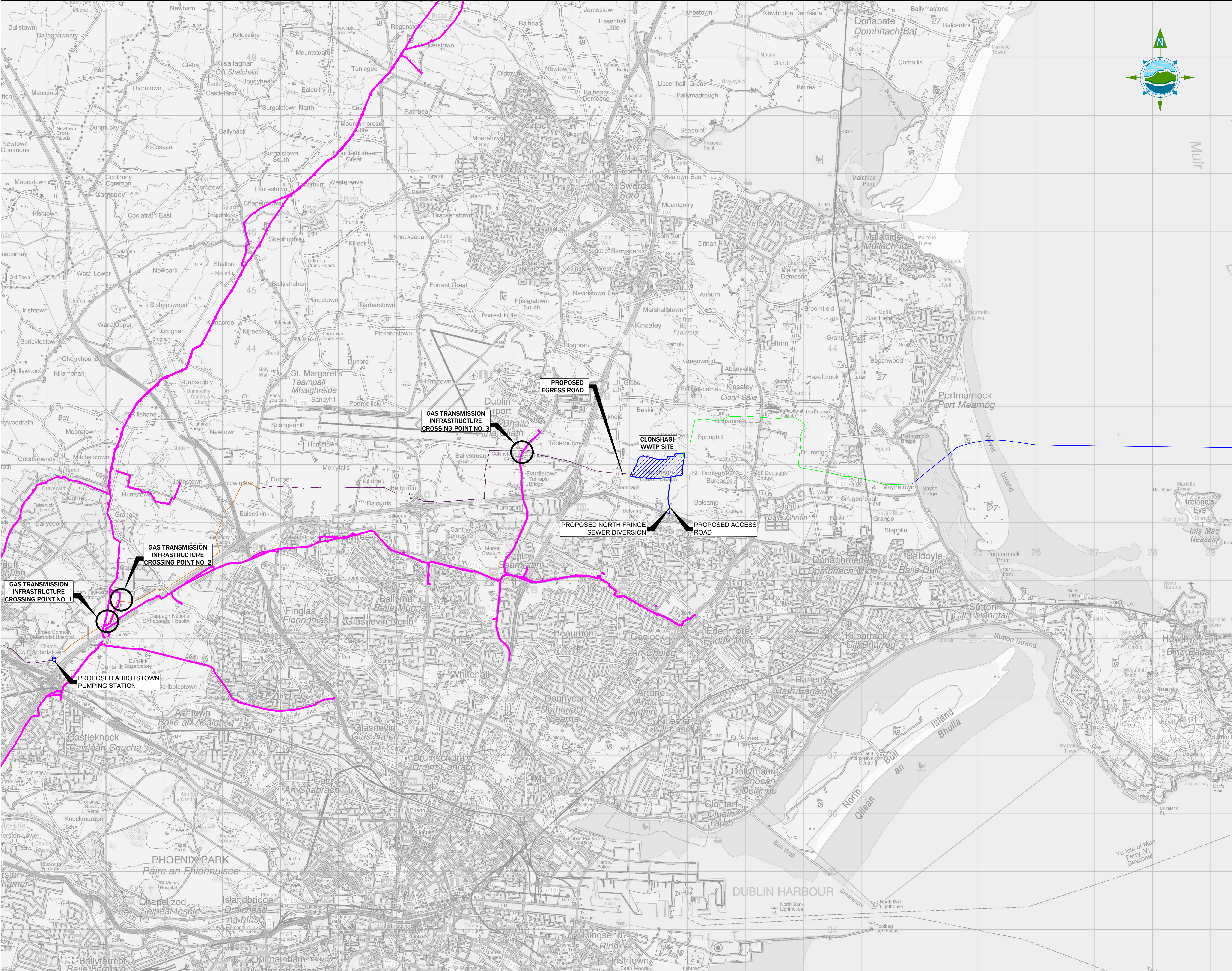
Prepared by:	Checked:	Date:
A. O'Callaghan	D. Conneran	May 2016

Project Director:	C. O'Keefe
Drawing Status:	REPORT

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Drawing No: **Drawing No. 6**

Revision: **D**



LEGEND:

PROPOSED WWT/PPS

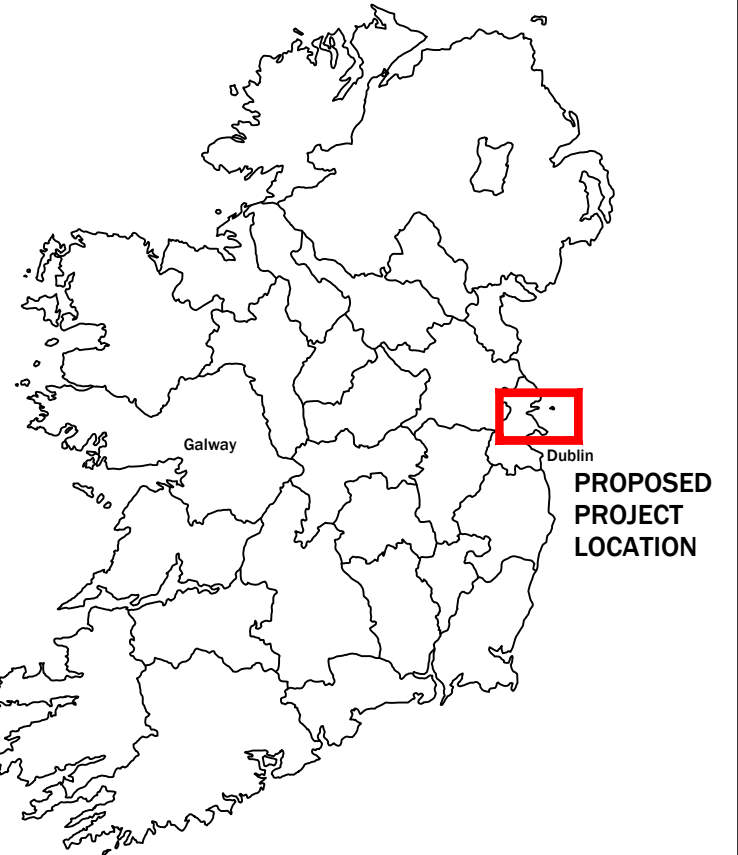
PROPOSED ORBITAL SEWER ROUTE (GRAVITY)

PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)

PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)

PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)

GAS TRANSMISSION INFRASTRUCTURE



- NOTES:**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
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 - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	11.12.17	DRAFT ISSUE FOR REVIEW	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title:

LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINE & GAS INFRASTRUCTURE
- Sheet 1 of 2 -

Scale @ A1: 1:30,000

Prepared by: A. O'Callaghan Checked: D. Conneran Date: May 2016

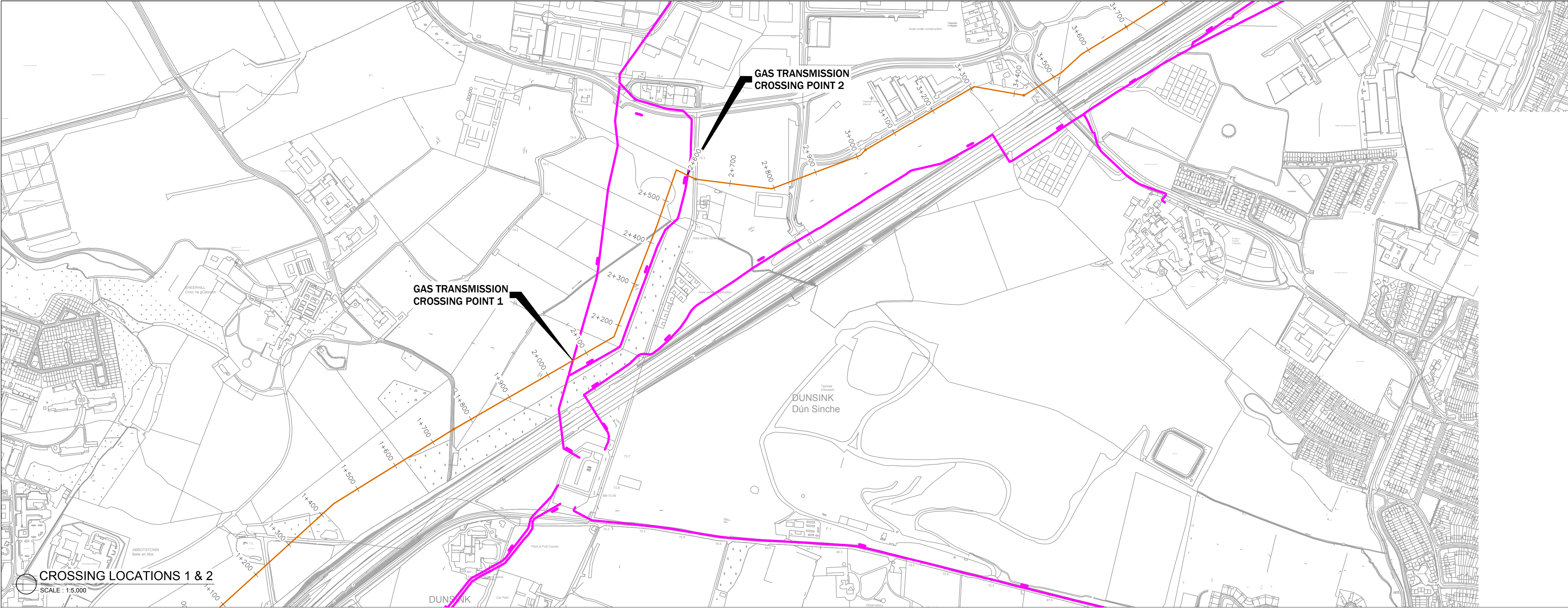
Project Director: C. O'Keefe

Drawing Status: REPORT

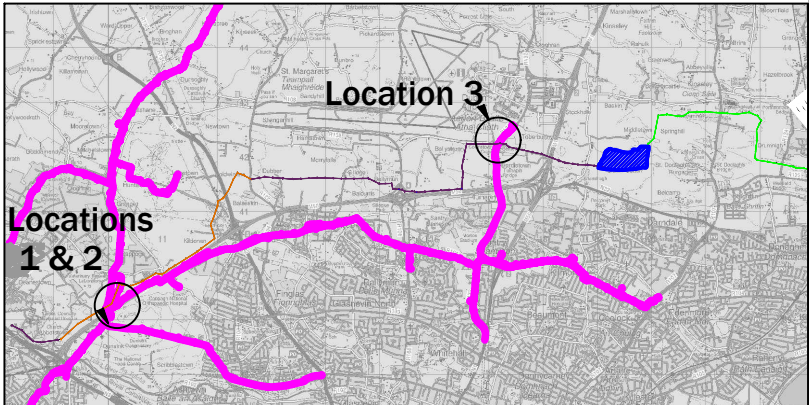
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Drawing No: **Drawing No. 6**

Revision: **D**



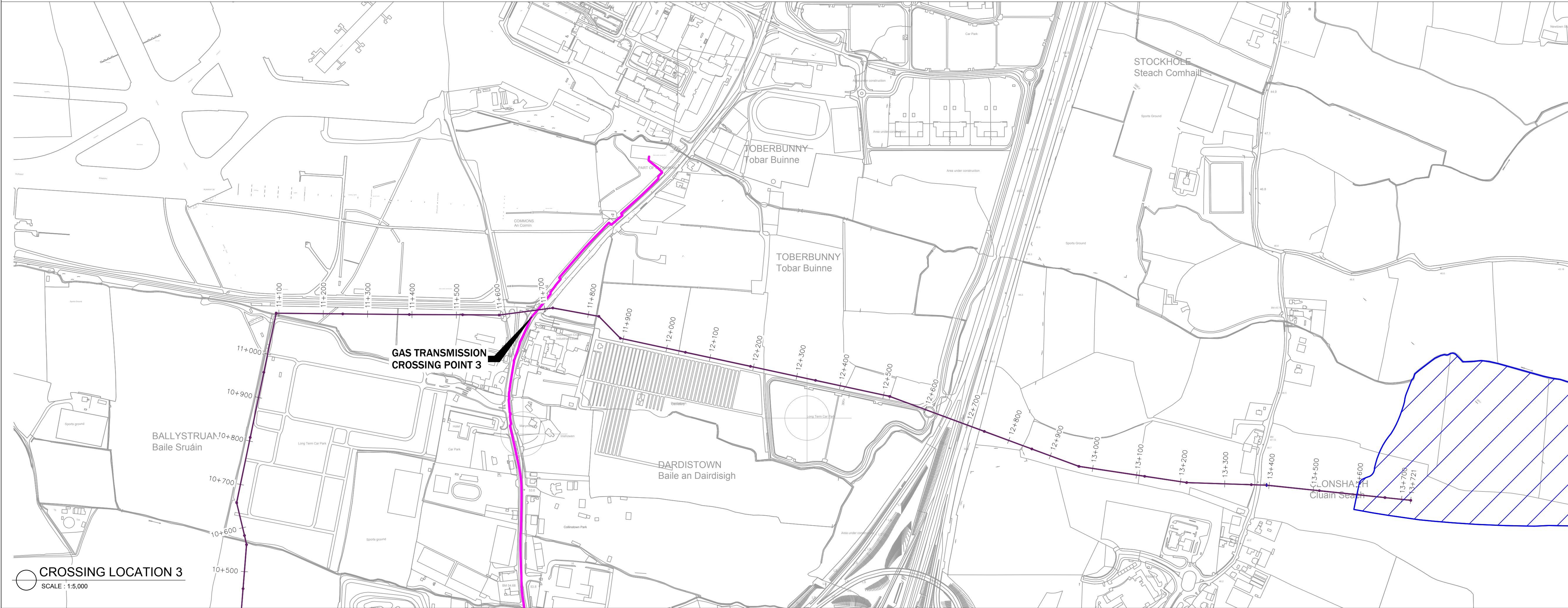
- LEGEND:**
- PROPOSED WWTP/PS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - GAS TRANSMISSION INFRASTRUCTURE



KEYPLAN

- NOTES:**
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D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	11.12.17	DRAFT ISSUE FOR REVIEW	AOC	JF
B	28.08.17	REISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.



Client: **UISCE**
SIRIANN - IRISH WATER

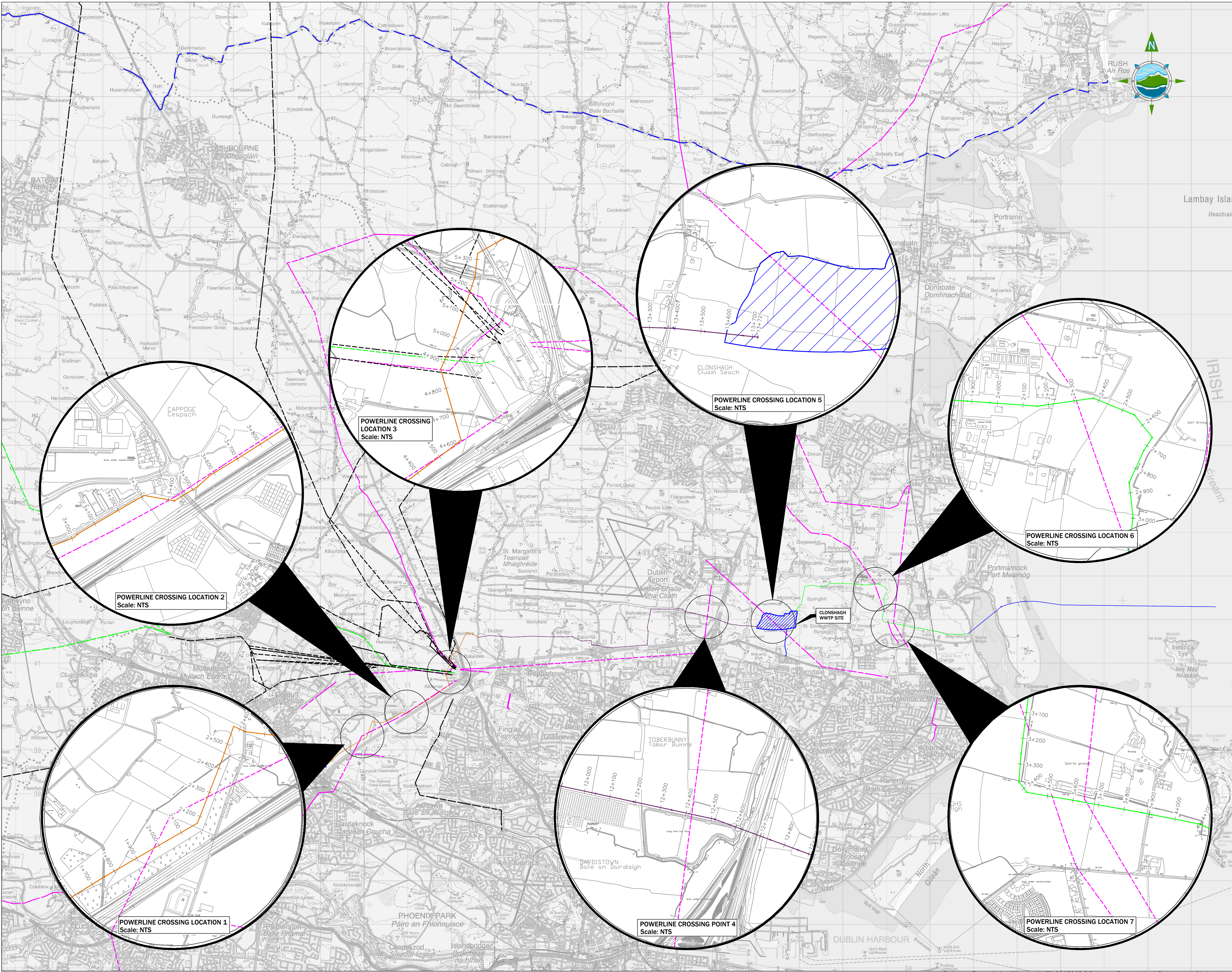
Project: **Greater Dublin Drainage**

Title: **LOCATION OF CROSSING POINTS, ORBITAL SEWERS/OUTFALL PIPELINE & GAS INFRASTRUCTURE - Sheet 2 of 2 -**

Scale @ A1: **AS SHOWN**
Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **May 2016**
Project Director: **C. O'Keefe**
Drawing Status: **REPORT**

JACOBS **TOBIN**
Partners, Joint Venture & Co. Ltd.

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Drawing No.: **Drawing No. 7** Revision: **D**



LEGEND:

PROPOSED WWTP/IPS

PROPOSED ORBITAL SEWER ROUTE (GRAVITY)

PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)

PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)

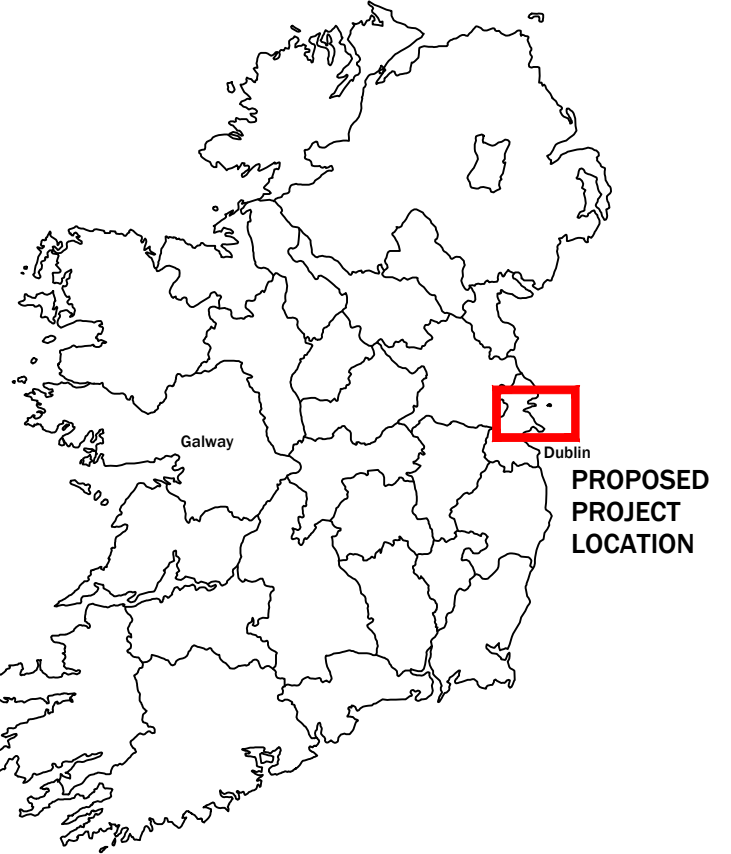
PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)

38KV POWERLINE

220KV POWERLINE

110KV POWERLINE

EAST WEST INTERCONNECTOR



- NOTES:**
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D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	25.05.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title: **LOCATION OF CROSSING POINTS ORBITAL SEWER/OUTFALL PIPELINE & POWERLINES**

Scale @ A1: **AS SHOWN**

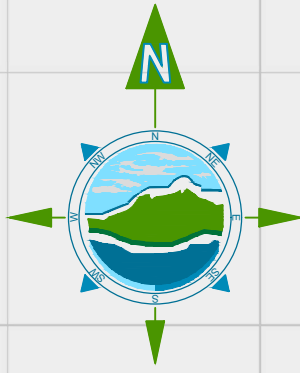
Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **May 2016**

Project Director: **C. O'Keefe**

Drawing Status: **REPORT**

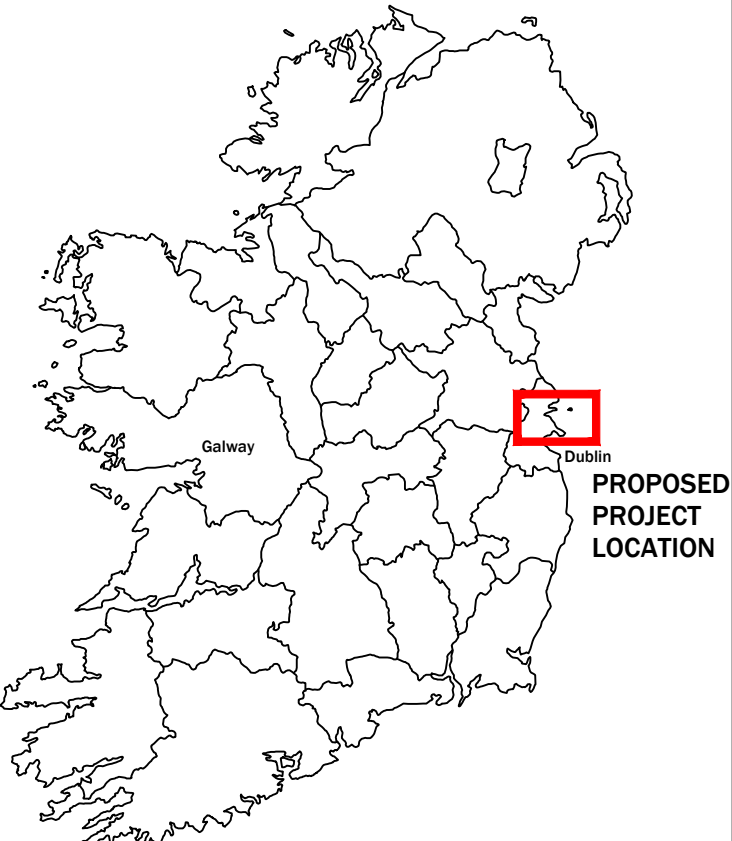
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Drawing No: **Drawing No. 8** Revision: **D**



LEGEND:

- PLANNING BOUNDARY
- PROPOSED WWTP/PS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- PROPOSED METRO WEST/NORTH LINES
- DUBLIN - BELFAST RAIL LINE



NOTES:

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A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title:

LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINE & RAILWAY
- Sheet 1 of 2 -

Scale @ A1: 1:25,000

Prepared by: A. O'Callaghan Checked: D. Conneran Date: May 2016

Project Director: C. O'Keefe

Drawing Status: REPORT

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Drawing No: **Drawing No. 9**

Revision:

D



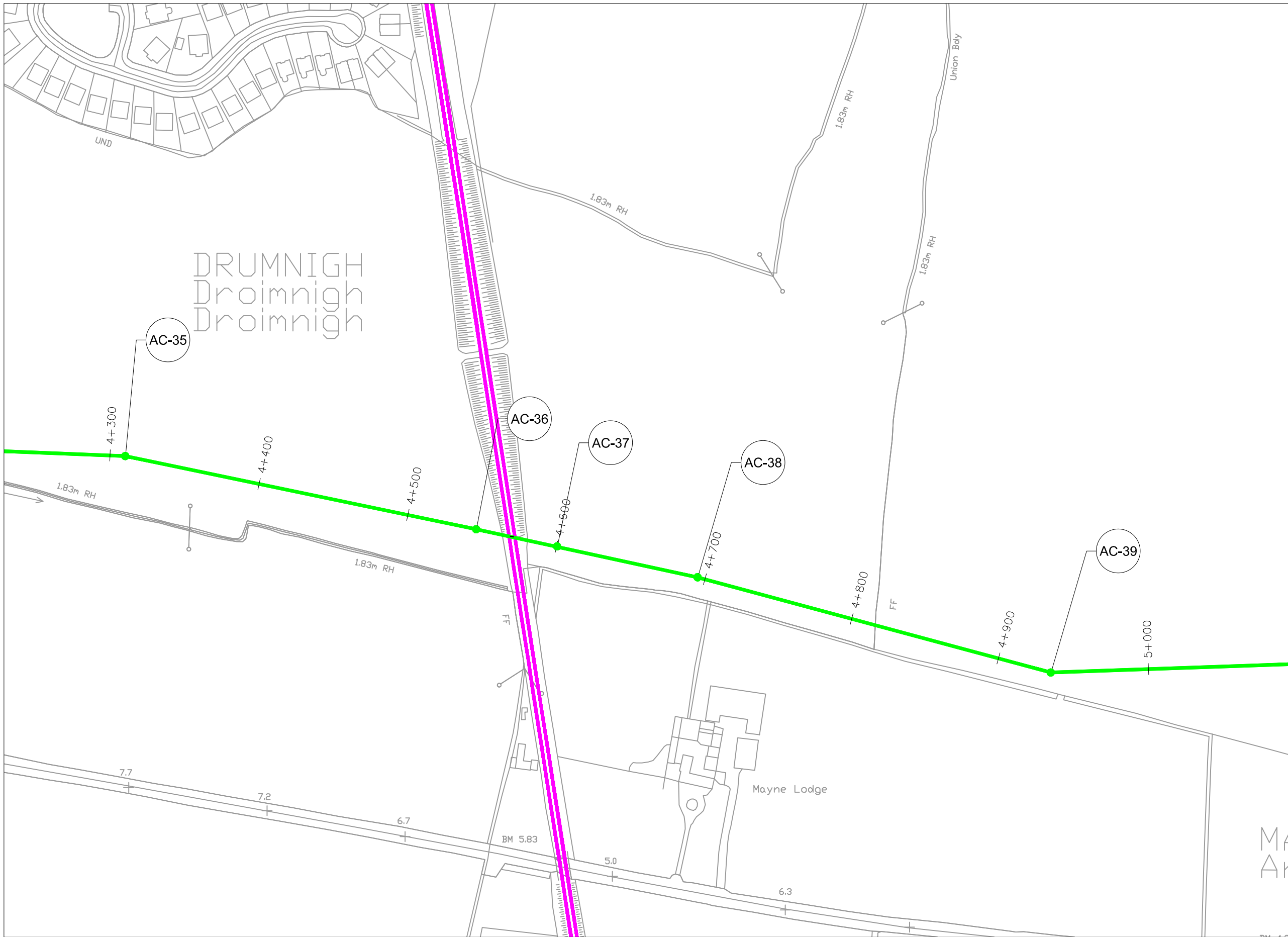
CROSSING POINT 1 (METRO WEST)
SCALE : 1:2,500



CROSSING POINT 2 (METRO WEST)
SCALE : 1:2,500



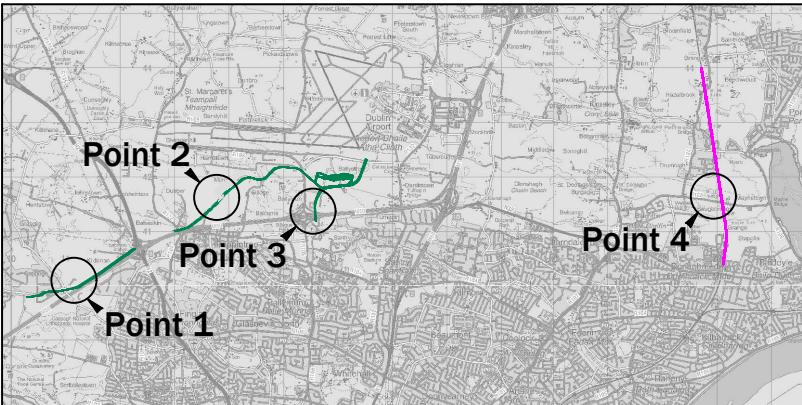
CROSSING POINT 3 (METRO NORTH)
SCALE : 1:2,500



CROSSING POINT 4 (DUBLIN - BELFAST RAILWAY)
SCALE : 1:2,500

LEGEND:

- PROPOSED WWTP/PS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- PROPOSED METRO WEST/NORTH LINES
- DUBLIN - BELFAST RAIL LINE



KEYPLAN

NOTES:

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B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:



Project:



Title:
LOCATION OF CROSSING POINTS,
ORBITAL SEWER/OUTFALL
PIPELINE & RAILWAY
- Sheet 2 of 2 -

Scale @ A1: AS SHOWN
Prepared by: A. O'Callaghan
Checked: D. Conneran
Date: May 2016
Project Director: C. O'Keefe
Drawing Status: REPORT



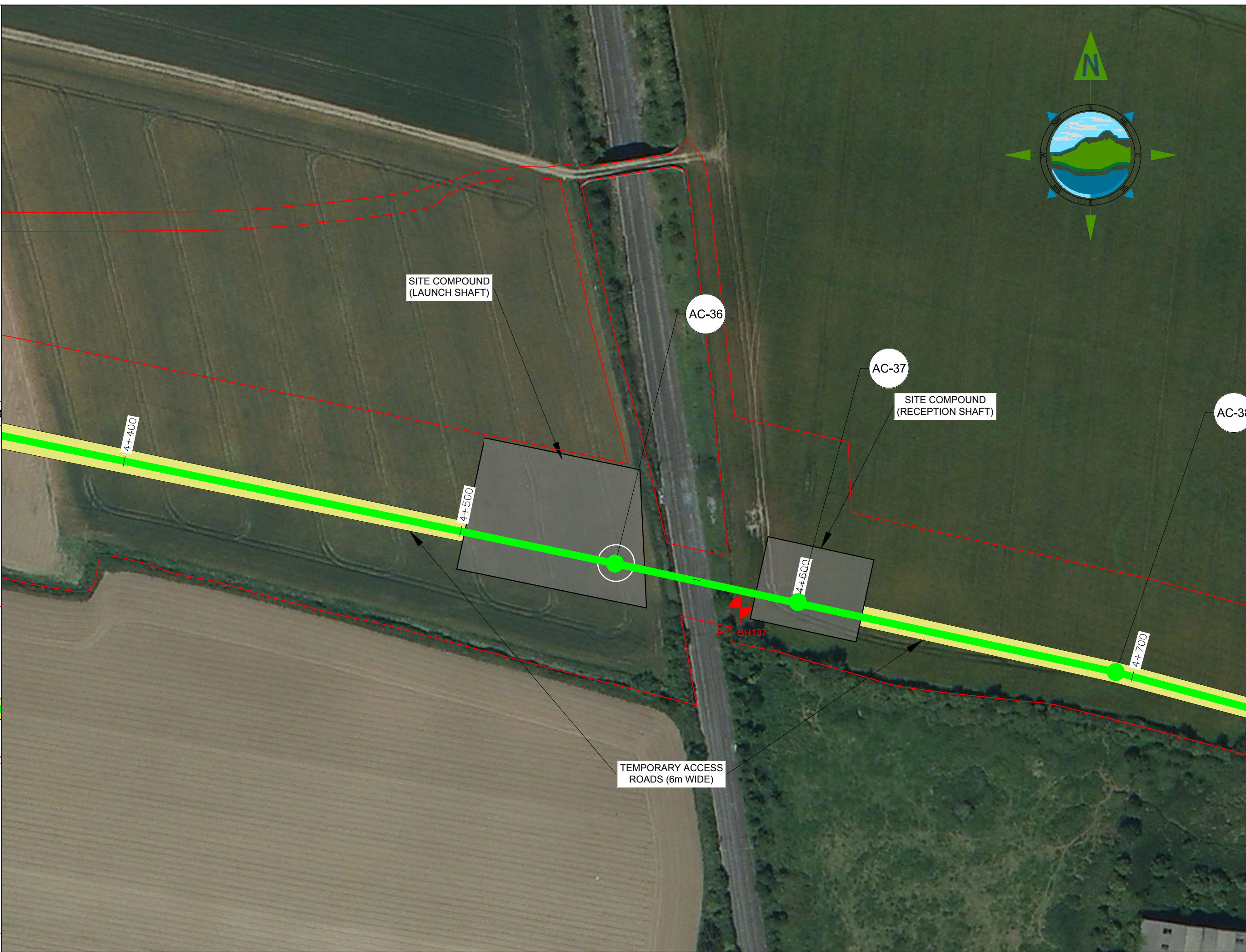
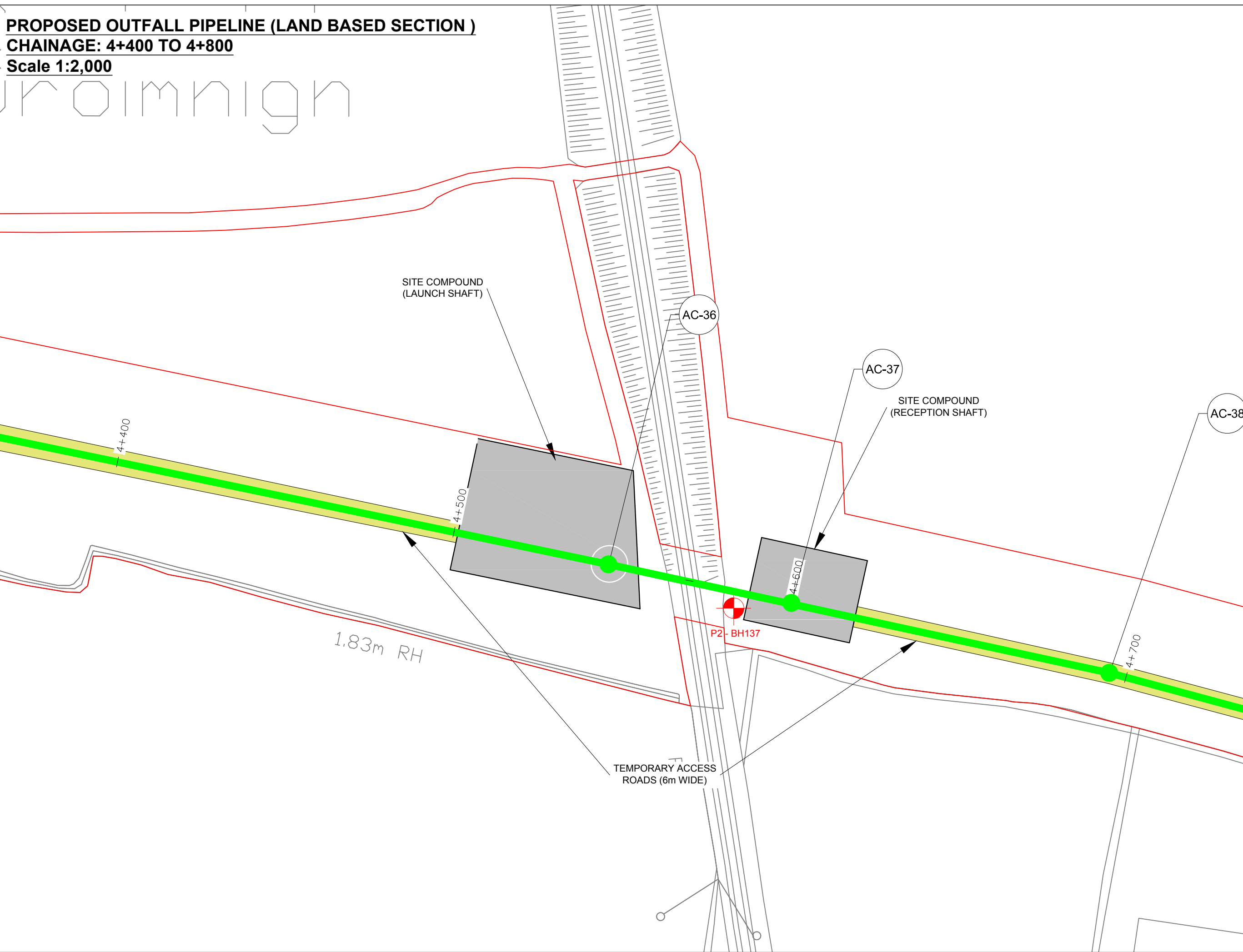
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Drawing No.: Drawing No. 10

Revision:
D

PROPOSED OUTFALL PIPELINE (LAND BASED SECTION)
CHAINAGE: 4+400 TO 4+800
Scale 1:2,000

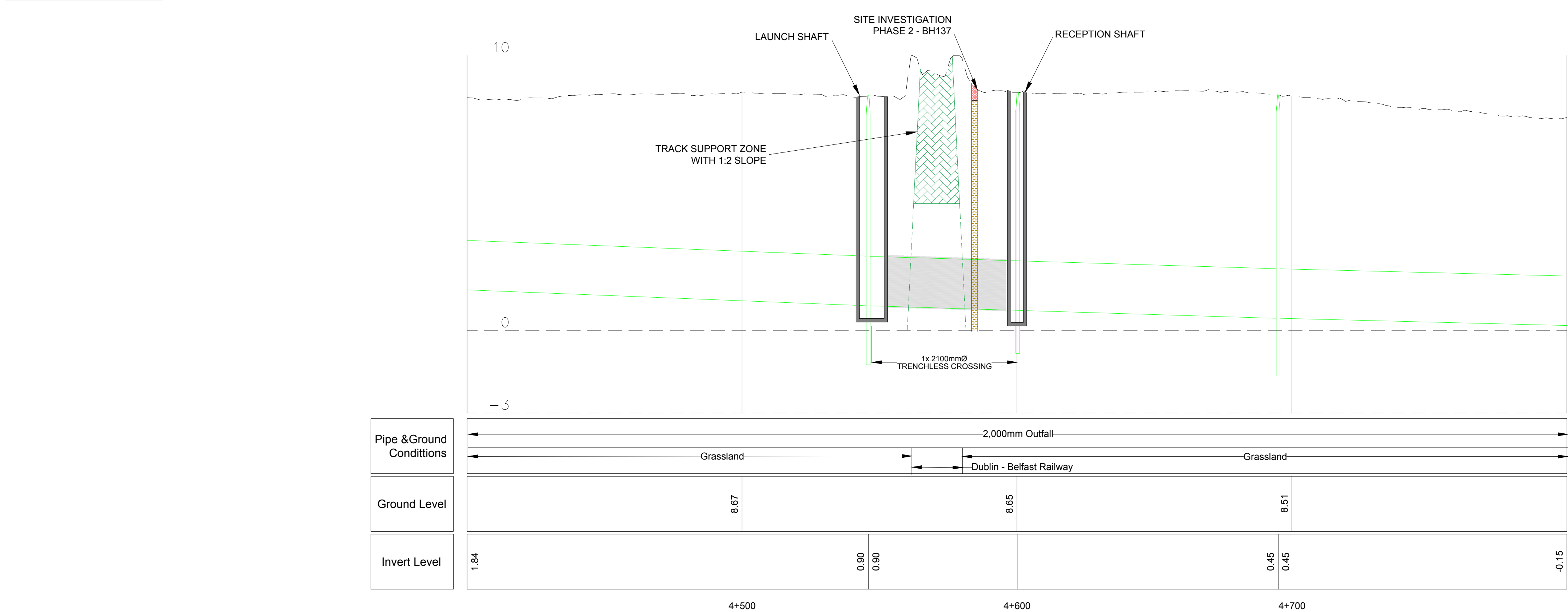
irish water



LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- PROPOSED ACCESS ROAD
- SANDY GRAVELLY CLAY
- BEDROCK
- SILT
- TOPSOIL
- BOREHOLE LOCATIONS

PROPOSED OUTFALL PIPELINE (LAND BASED SECTION)
CHAINAGE: 4+400 TO 4+800
Scale H-1:1,000 / V-1:100



NOTES:

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C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client: **UISCE EIREANN - IRISH WATER**

Project: **Greater Dublin Drainage**

Title: **LOCATION OF CROSSING POINTS, ORBITAL SEWER/OUTFALL PIPELINE & RAILWAY - DUBLIN BELFAST RAILWAY**

Scale @ A3: **As Shown**

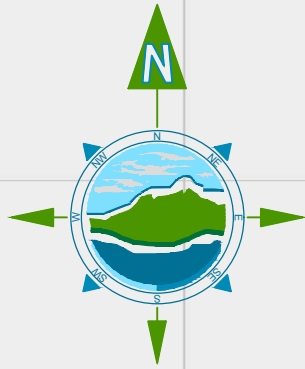
Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **January 2016**

Project Director: **C. O'Keefe**

Drawing Status: **Draft**

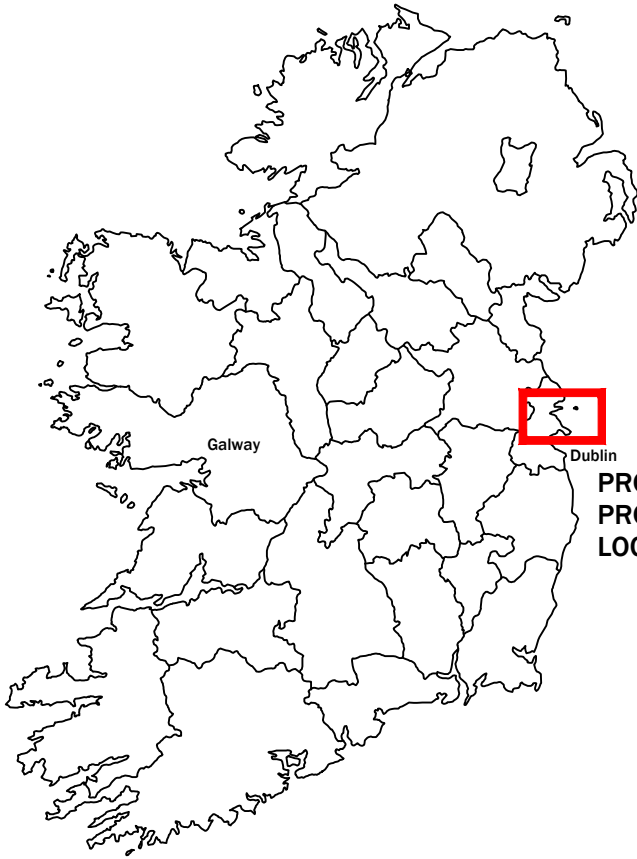
JACOBS **TOBIN**

Drawing No.: **Drawing No. 11** Revision: **D**



LEGEND:

- PROPOSED WWT/PS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)



PROPOSED PROJECT LOCATION

NOTES:

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C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:



Project:



Title:
LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINES & MAJOR ROADS

Scale @ A1: 1:25,000

Prepared by: A. O'Callaghan

Checked: D. Conneran

Date: May 2016

Project Director: C. O'Keefe

Drawing Status: REPORT

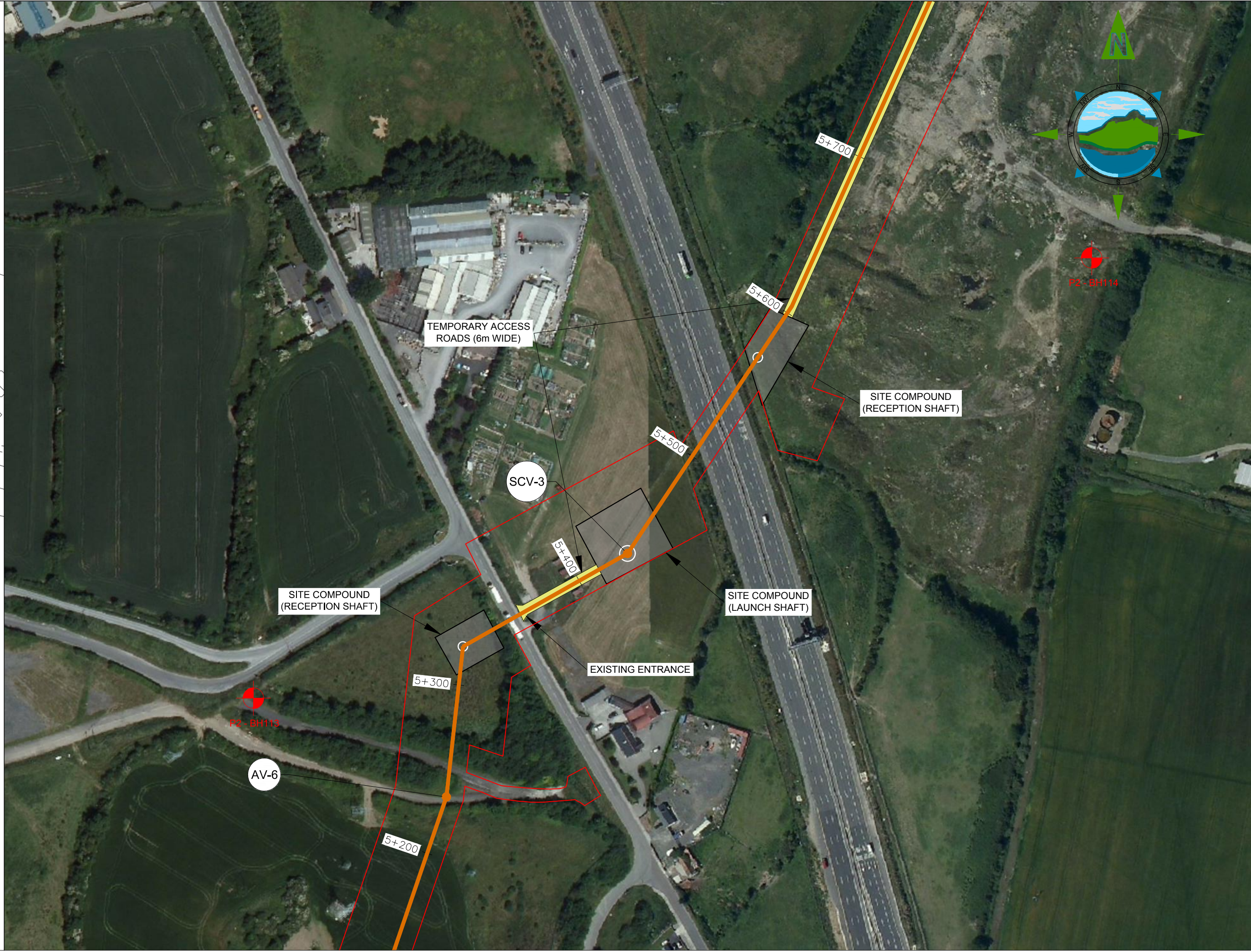
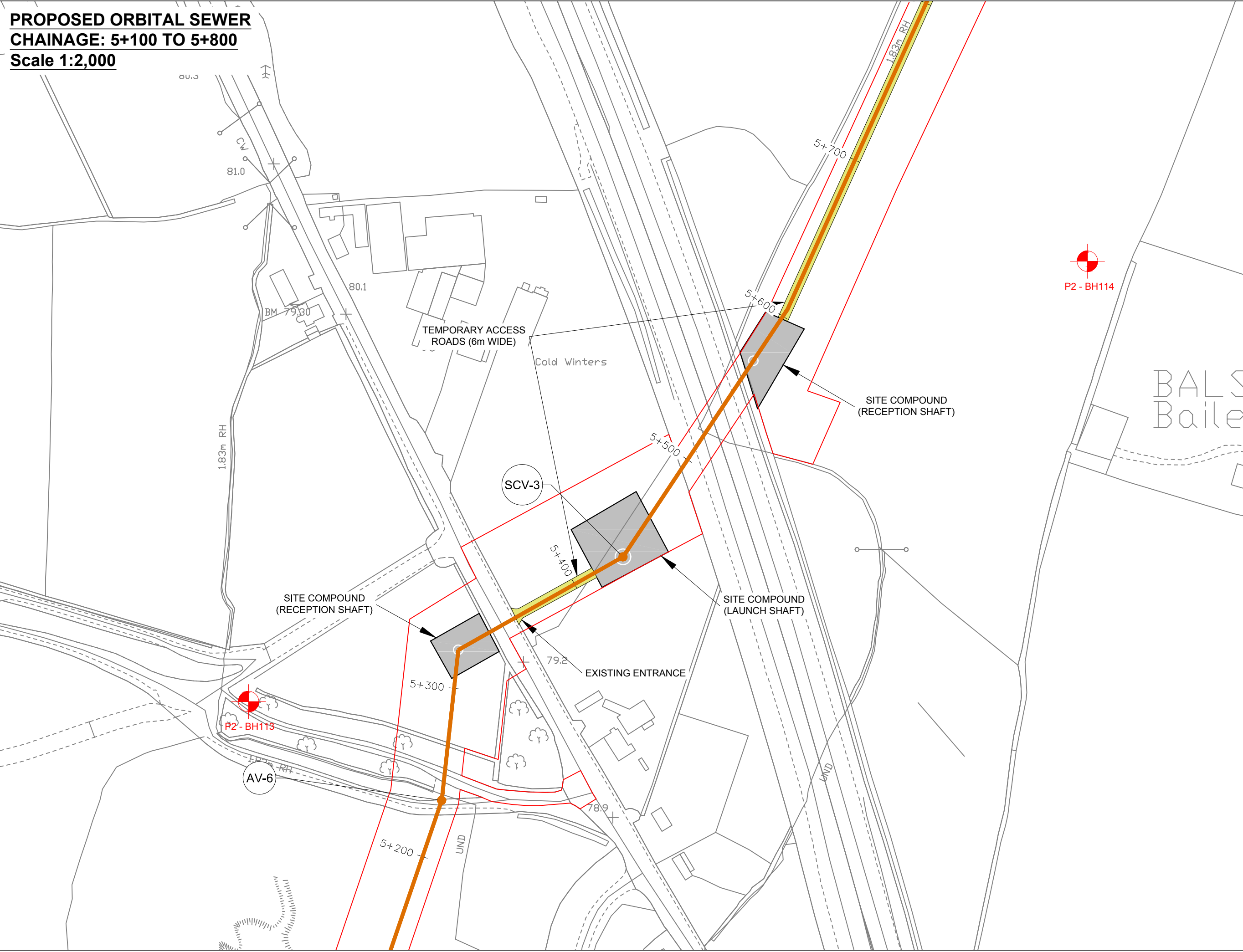


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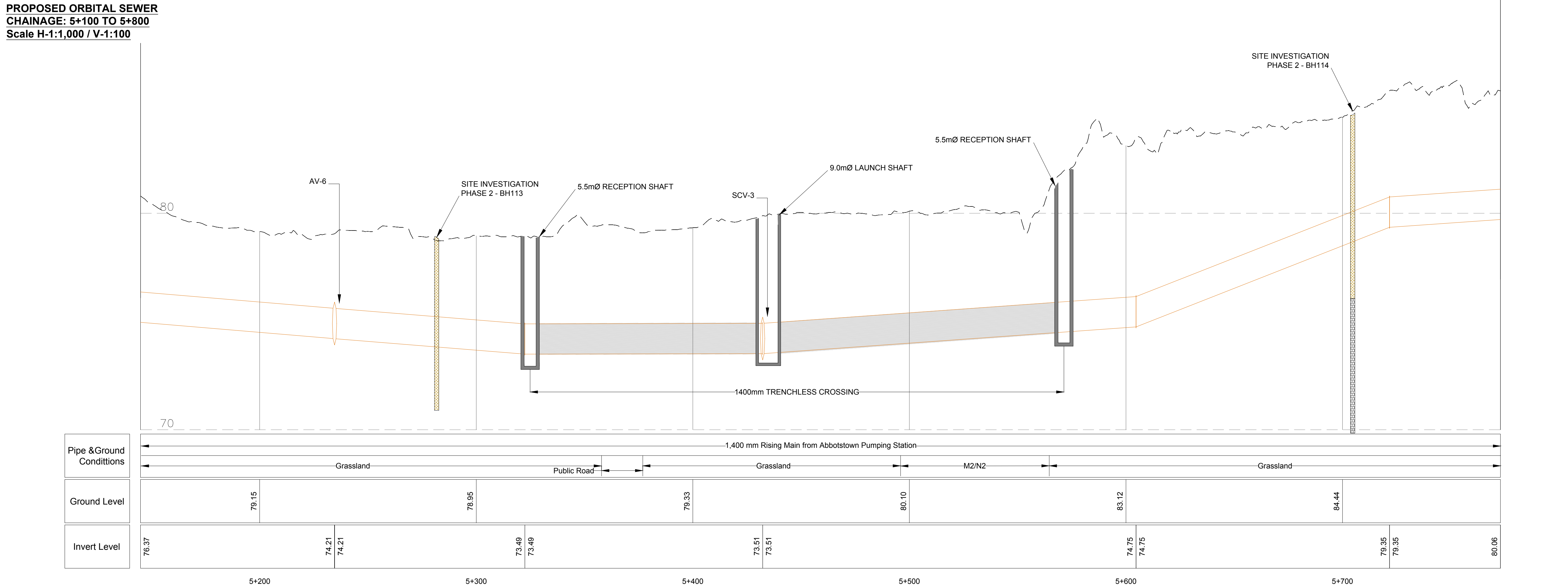
Drawing No: Drawing No. 12

Revision:

D



- LEGEND:**
- PLANNING BOUNDARY
 - CONSTRUCTION COMPOUNDS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - PROPOSED ACCESS ROAD
 - SANDY GRAVELLY CLAY
 - BEDROCK
 - SILT
 - TOPSOIL
 - BOREHOLE LOCATIONS



- NOTES:**
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C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client: **UISCE EIREANN - IRISH WATER**

Project: **Greater Dublin Drainage**

Title: **LOCATION OF CROSSING POINTS, ORBITAL SEWERS/OUTFALL PIPELINE & MOTORWAYS - N2**

Scale @ A3: **As Shown**

Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **January 2016**

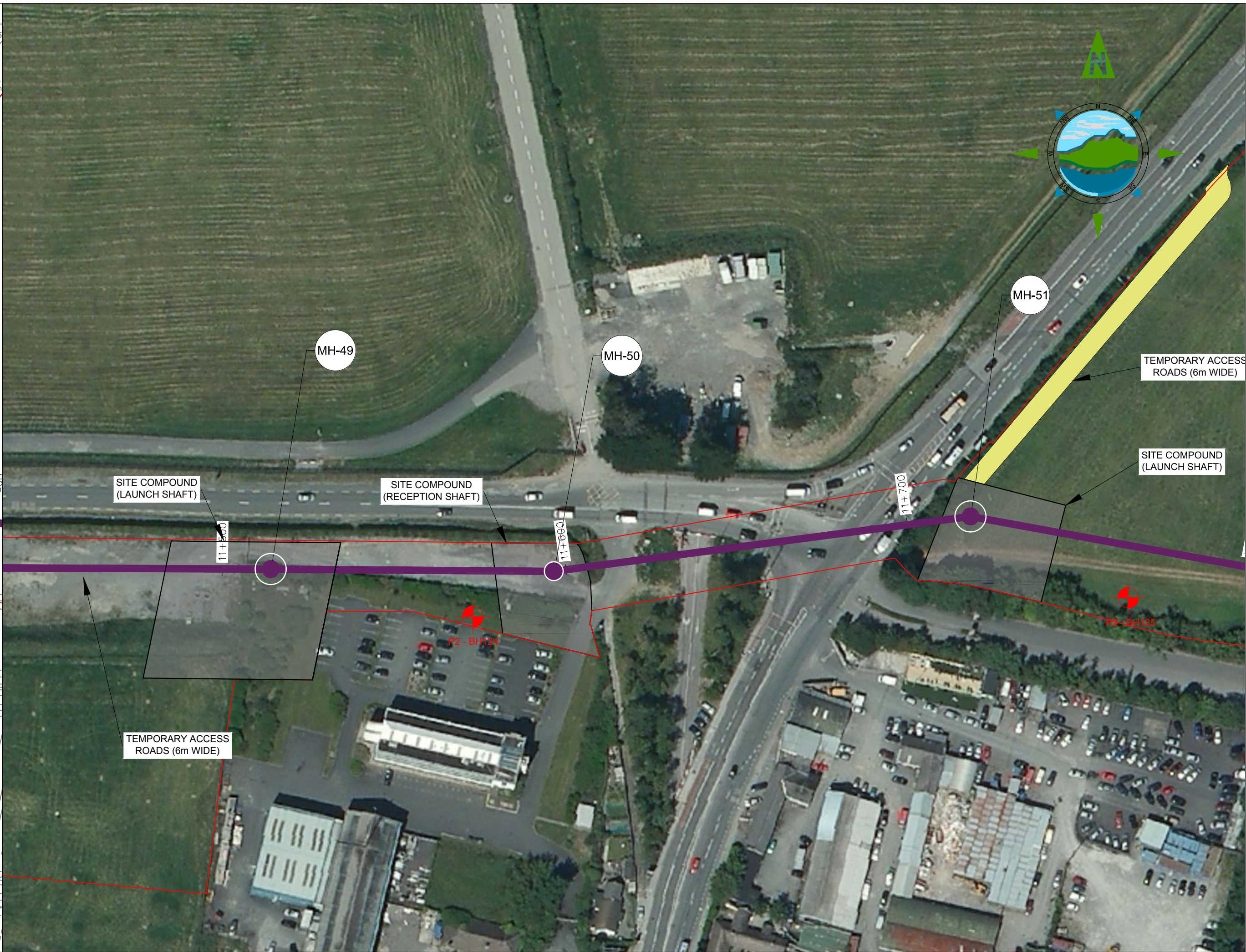
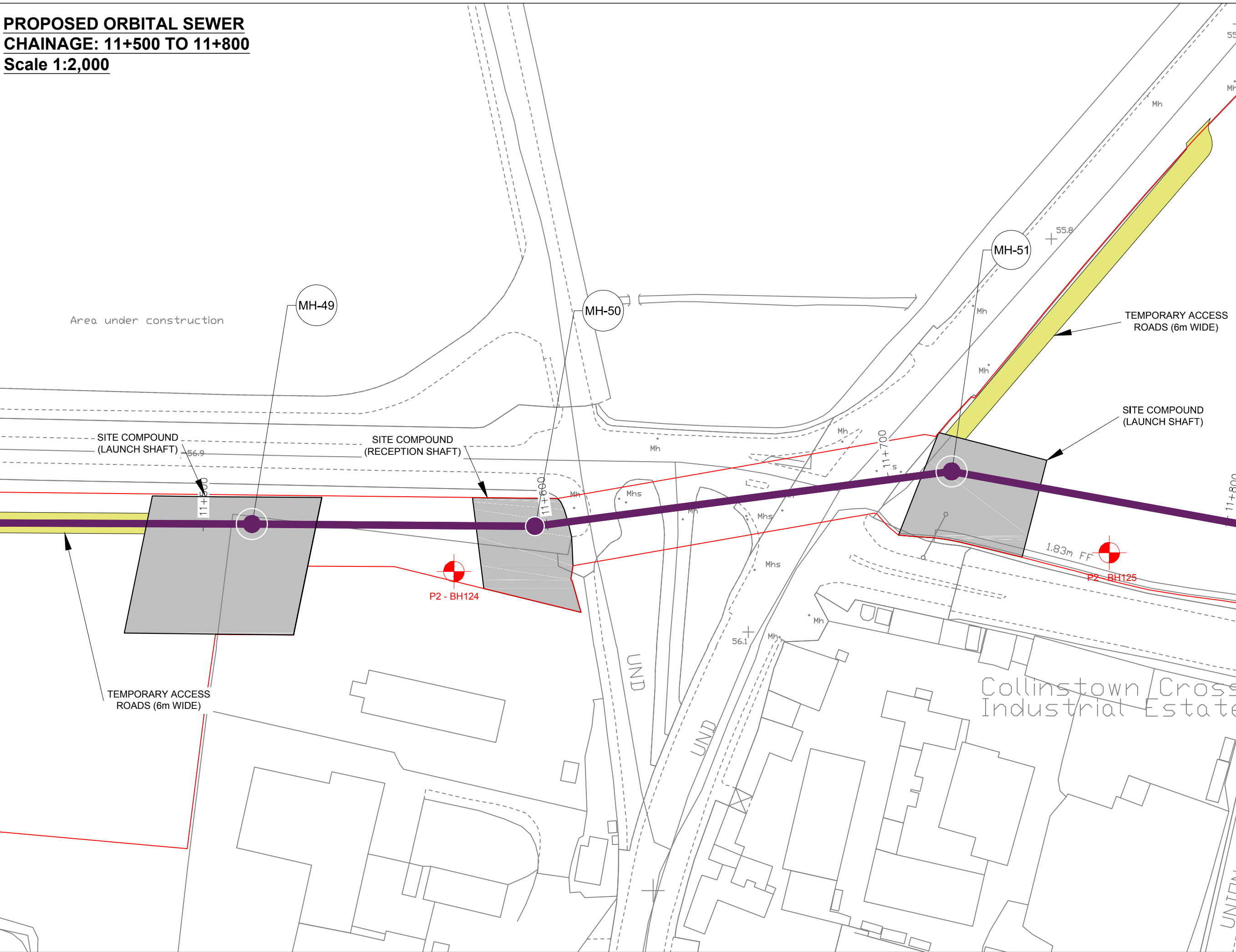
Project Director: **C. O'Keeffe**

Drawing Status: **Draft**

JACOBS **TOBIN**

Drawing No.: **Drawing No. 13** Revision: **D**

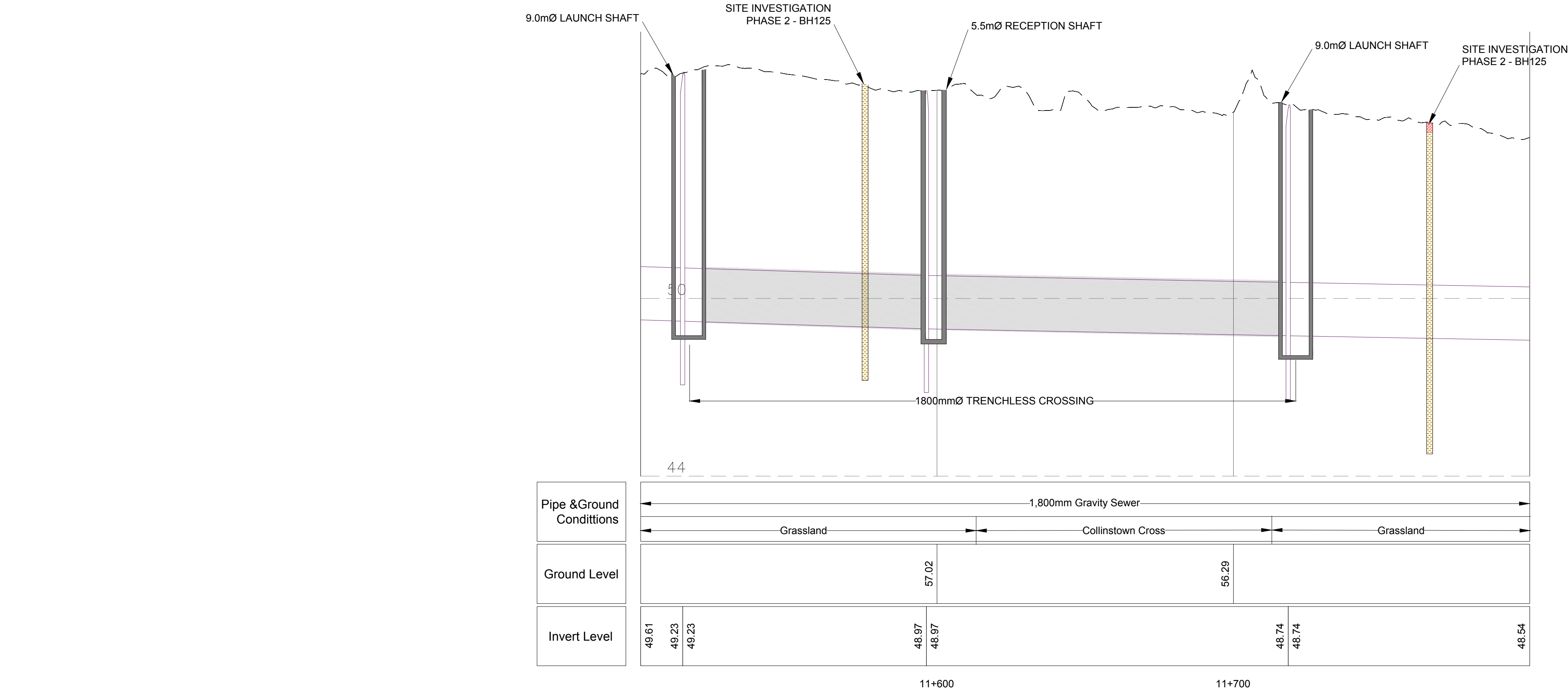
PROPOSED ORBITAL SEWER
CHAINAGE: 11+500 TO 11+800
Scale 1:2,000



LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- PROPOSED ACCESS ROAD
- SANDY GRAVELLY CLAY
- BEDROCK
- SILT
- TOPSOIL
- BOREHOLE LOCATIONS

PROPOSED ORBITAL SEWER
CHAINAGE: 11+500 TO 11+800
Scale H-1:1,000 / V-1:100



NOTES:

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B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title:

Scale @ A3:

Prepared by:

Project Director:

Drawing Status:

Uisce Éireann - Irish Water

Greater Dublin Drainage

LOCATION OF CROSSING POINTS, ORBITAL SEWER/OUTFALL PIPELINE & ROADS - OLD AIRPORT ROAD

As Shown

A. O'Callaghan D. Conneran January 2016

C. O'Keefe

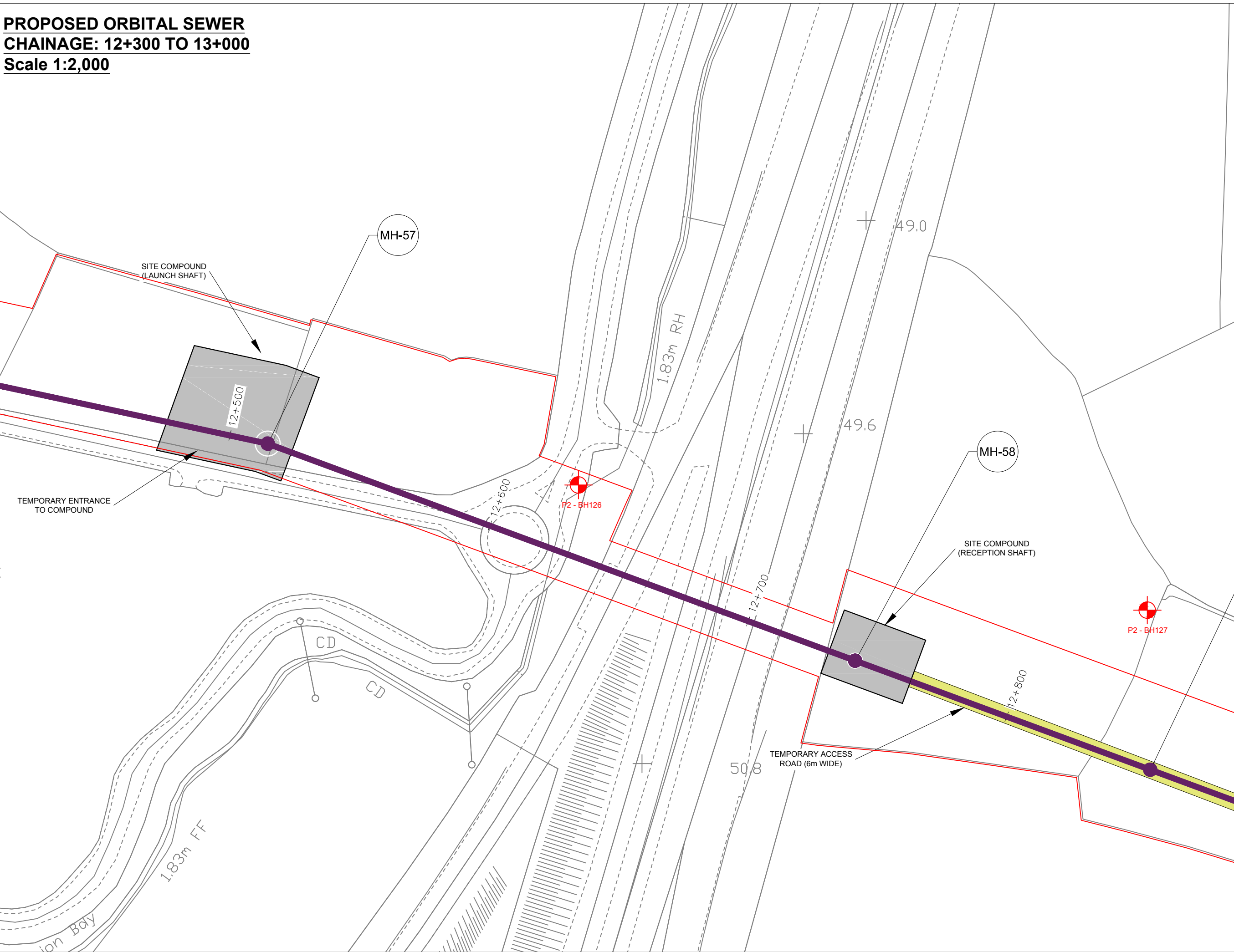
Draft

JACOBS TOBIN

Drawing No.: 14

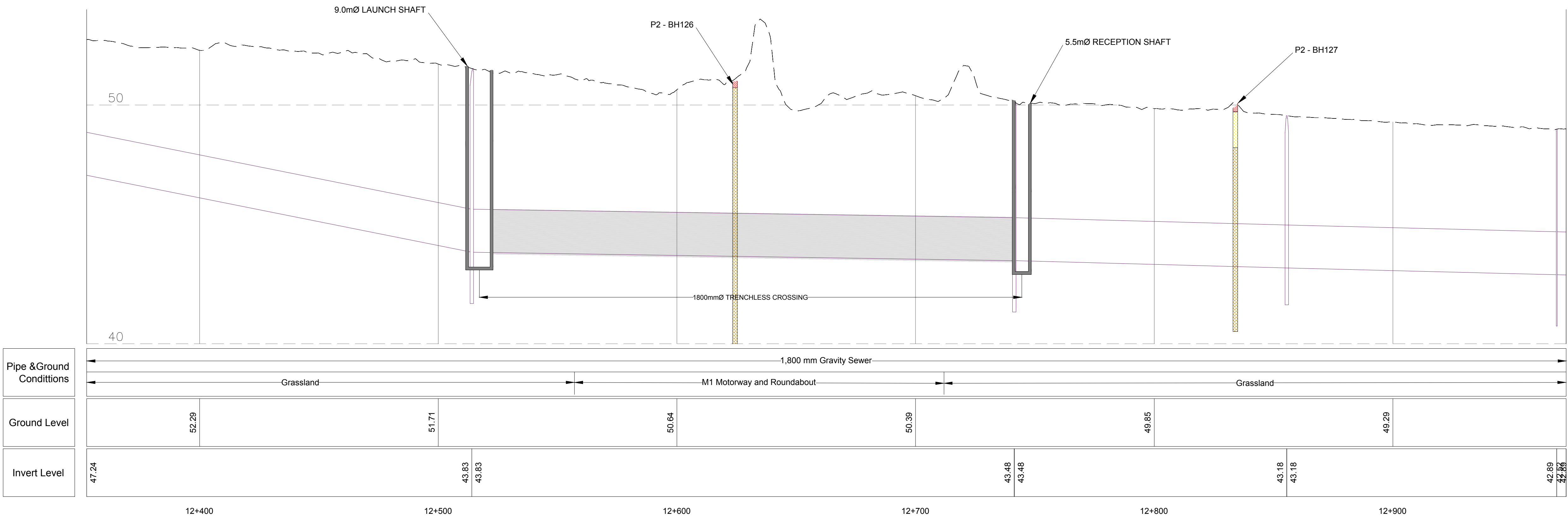
Revision: D

PROPOSED ORBITAL SEWER
CHAINAGE: 12+300 TO 13+000
Scale 1:2,000



- LEGEND:**
- PLANNING BOUNDARY
 - CONSTRUCTION COMPOUNDS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - PROPOSED ACCESS ROAD
 - SANDY GRAVELLY CLAY
 - BEDROCK
 - SILT
 - TOPSOIL
 - BOREHOLE LOCATIONS

PROPOSED ORBITAL SEWER
CHAINAGE: 12+300 TO 13+000
Scale H-1:1,000 / V-1:100



- NOTES:**
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A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client: **UISCE EIREANN - IRISH WATER**

Project: **Greater Dublin Drainage**

Title: **LOCATION OF CROSSING POINTS, ORBITAL SEWER/OUTFALL PIPELINE & MOTORWAYS - M1 MOTORWAY**

Scale @ A3: **As Shown**

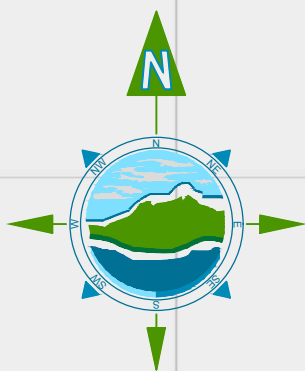
Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **January 2016**

Project Director: **C. O'Keeffe**

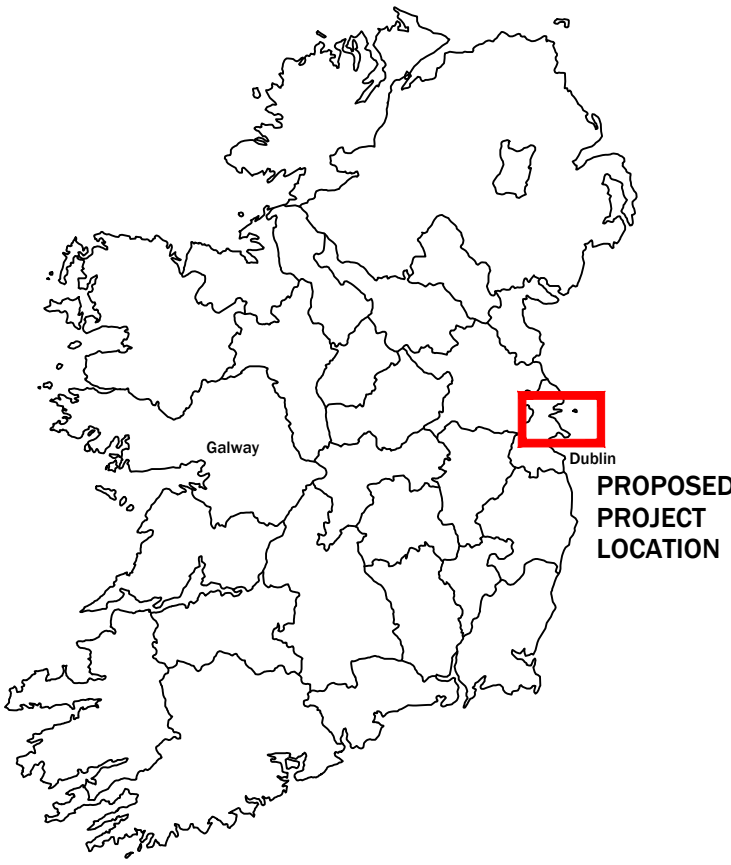
Drawing Status: **Draft**

JACOBS **TOBIN**

Drawing No.: **Drawing No. 15** Revision: **D**



- LEGEND:**
- PROPOSED WWTP/PS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - TRUNKMAIN (WATERMAIN ≥ 400mm)



- NOTES:**
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 - ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES.
 - THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION, DIAMETER AND INVERT LEVEL OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.
 -

D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.



Title:
**LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINES & WATERMAINS
- Sheet 1 of 2 -**

Scale @ A1: **1:25,000**

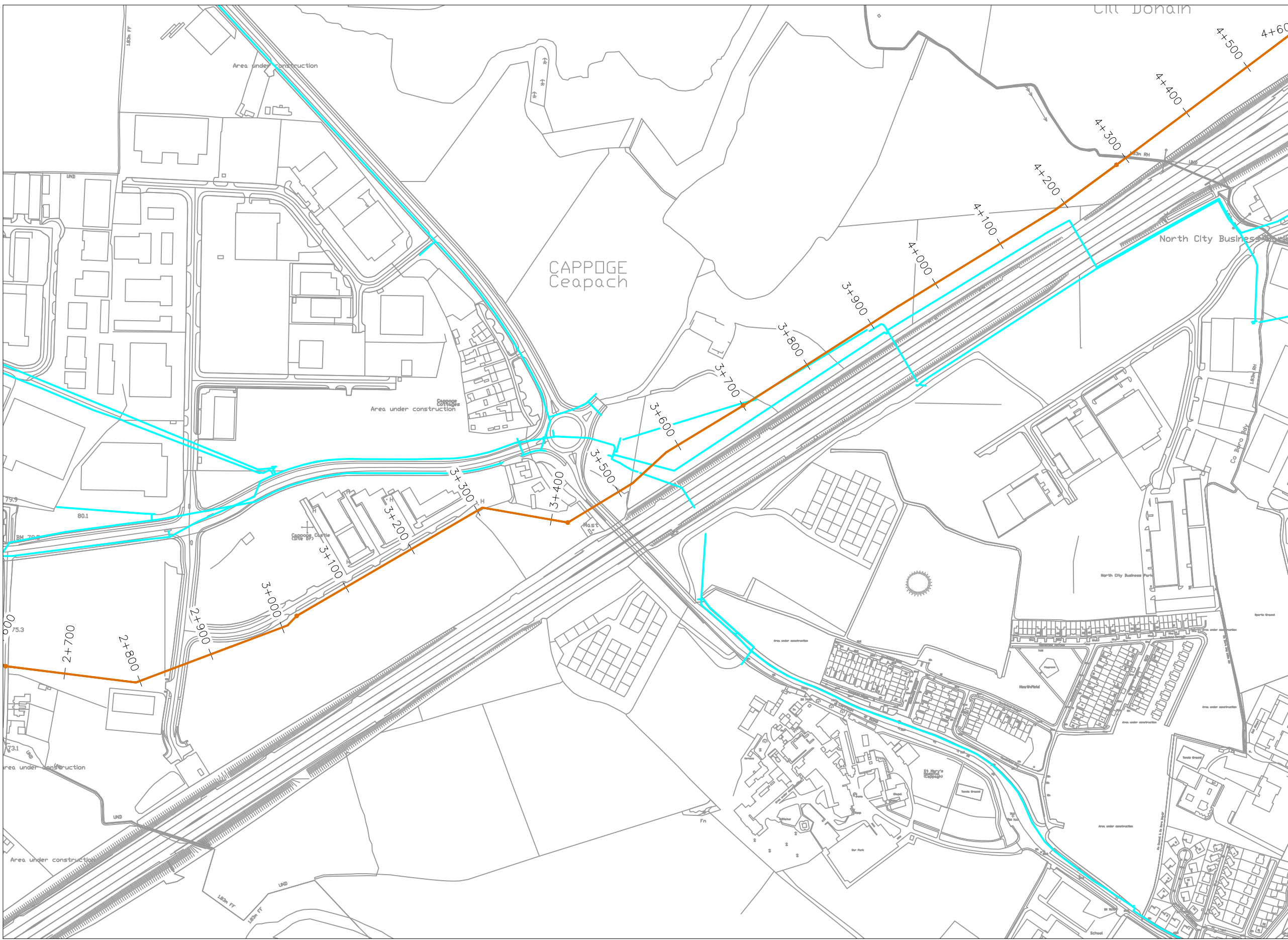
Prepared by: **A. O'Callaghan** Checked: **D. Conneran** Date: **May 2016**

Project Director: **C. O'Keefe**

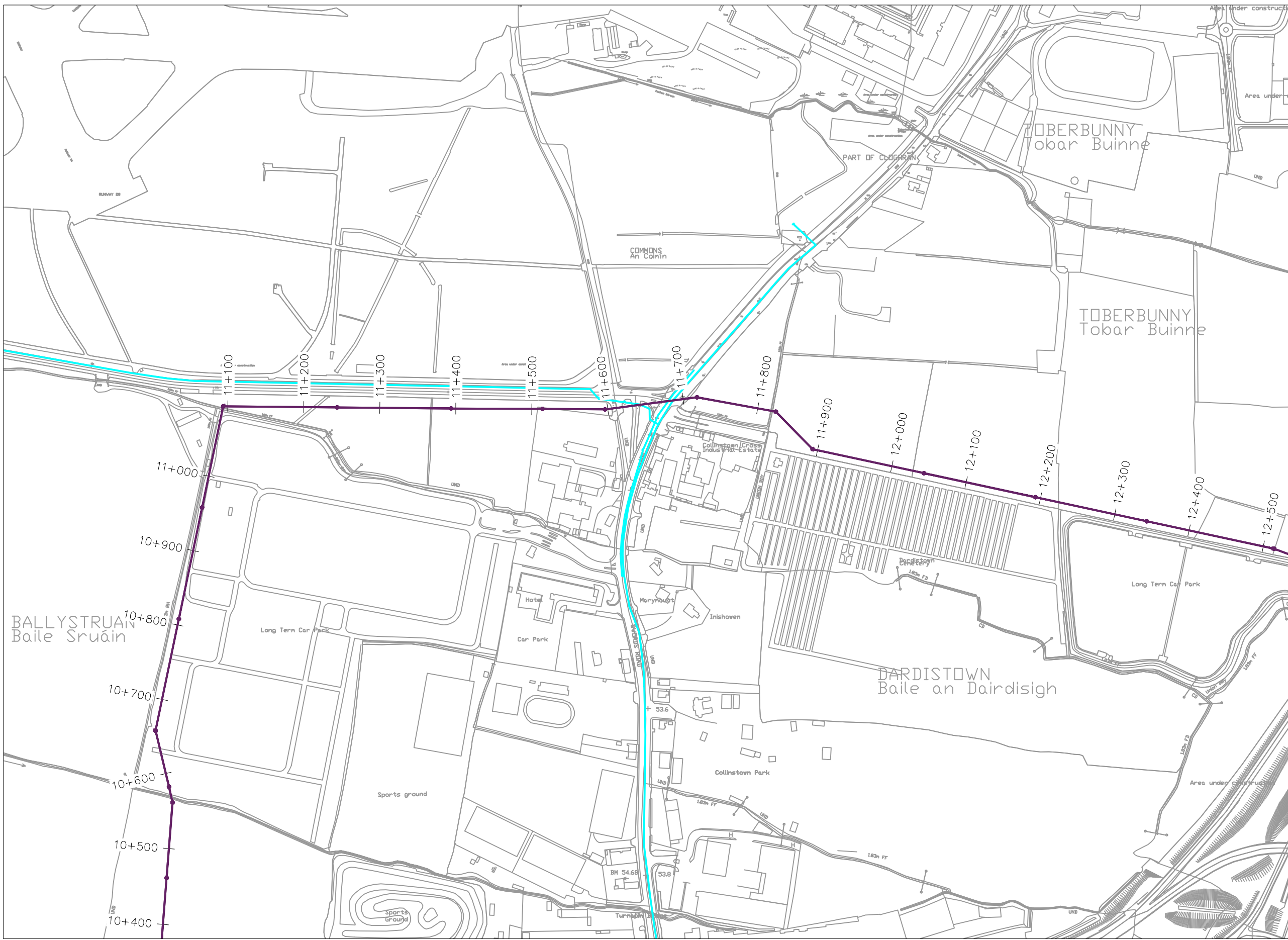
Drawing Status: **REPORT**



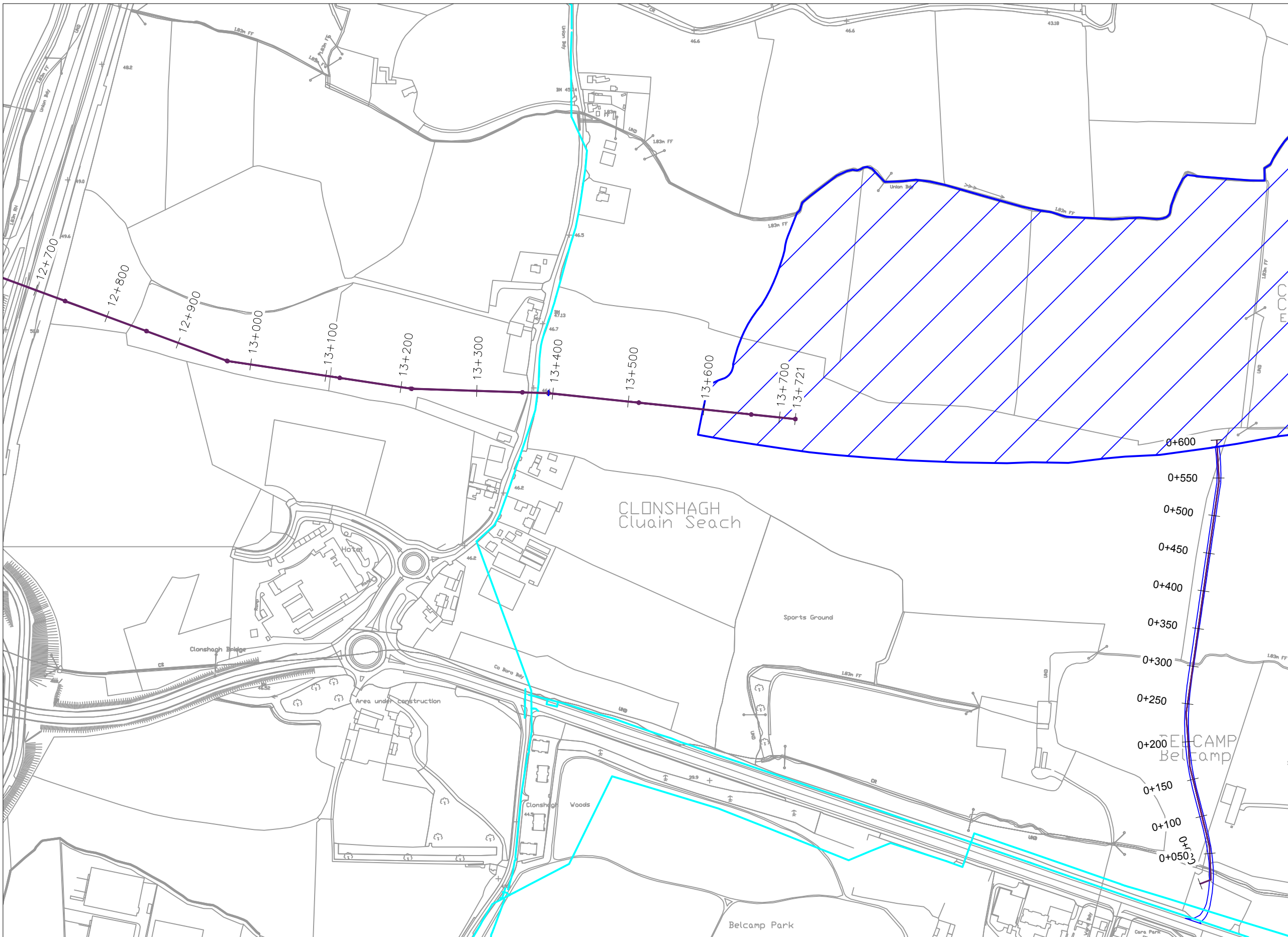
Drawing No.: **Drawing No. 16** Revision: **D**



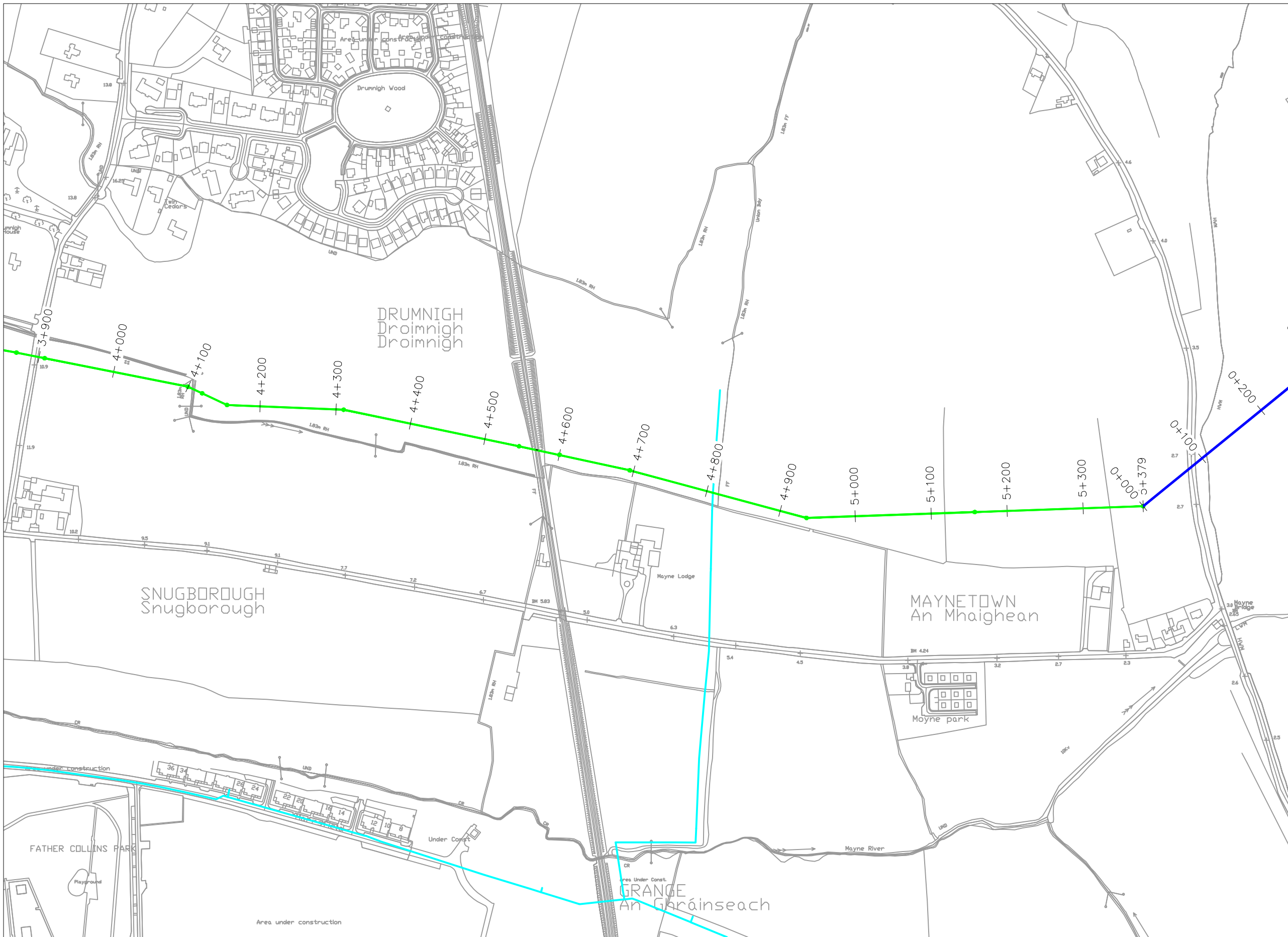
CROSSING LOCATION 1
SCALE : 1:5,000



CROSSING LOCATION 2
SCALE : 1:5,000



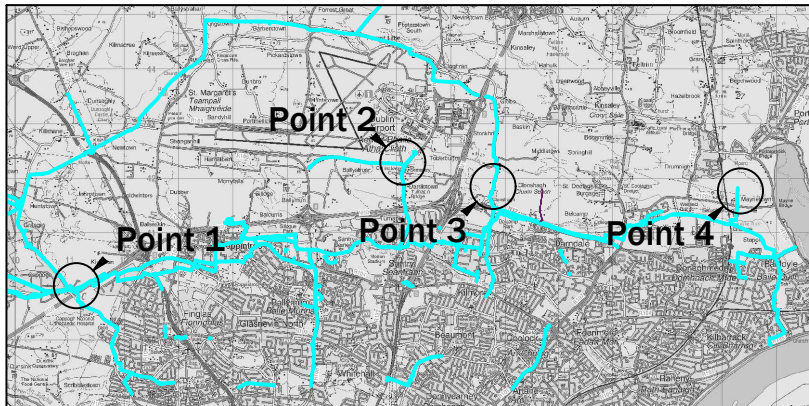
CROSSING LOCATION 3
SCALE : 1:5,000



CROSSING LOCATION 4
SCALE : 1:5,000

LEGEND:

- PROPOSED WWTP/PS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- TRUNKMAIN (WATERMAIN ≥ 400mm)



KEYPLAN

NOTES:

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- ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:



Project:



Title:

LOCATION OF CROSSING POINTS
ORBITAL SEWERS/OUTFALL
PIPELINE & WATERMAINS
- Sheet 2 of 2 -

Scale @ A1: AS SHOWN

Prepared by: A. O'Callaghan
Checked: D. Conneran
Date: May 2016

Project Director: C. O'Keefe

Drawing Status: REPORT



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Drawing No.: Drawing No. 17

Revision:

D



LEGEND:

PROPOSED WWTP/PS

PROPOSED ORBITAL SEWER ROUTE (GRAVITY)

PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)

PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)

PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)

9B SEWER

9C TRUNK SEWER

NORTH DUBLIN TRUNK SEWERS

SUBMARINE PIPELINE

RINGSEND WWTP

- NOTES:**
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 - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title: LOCATION OF CROSSING POINTS ORBITAL SEWERS/OUTFALL PIPELINE & WASTEWATER - Sheet 1 of 2 -

Scale @ A1: 1:40,000

Prepared by: A. O'Callaghan Checked: D. Conneran Date: May 2016

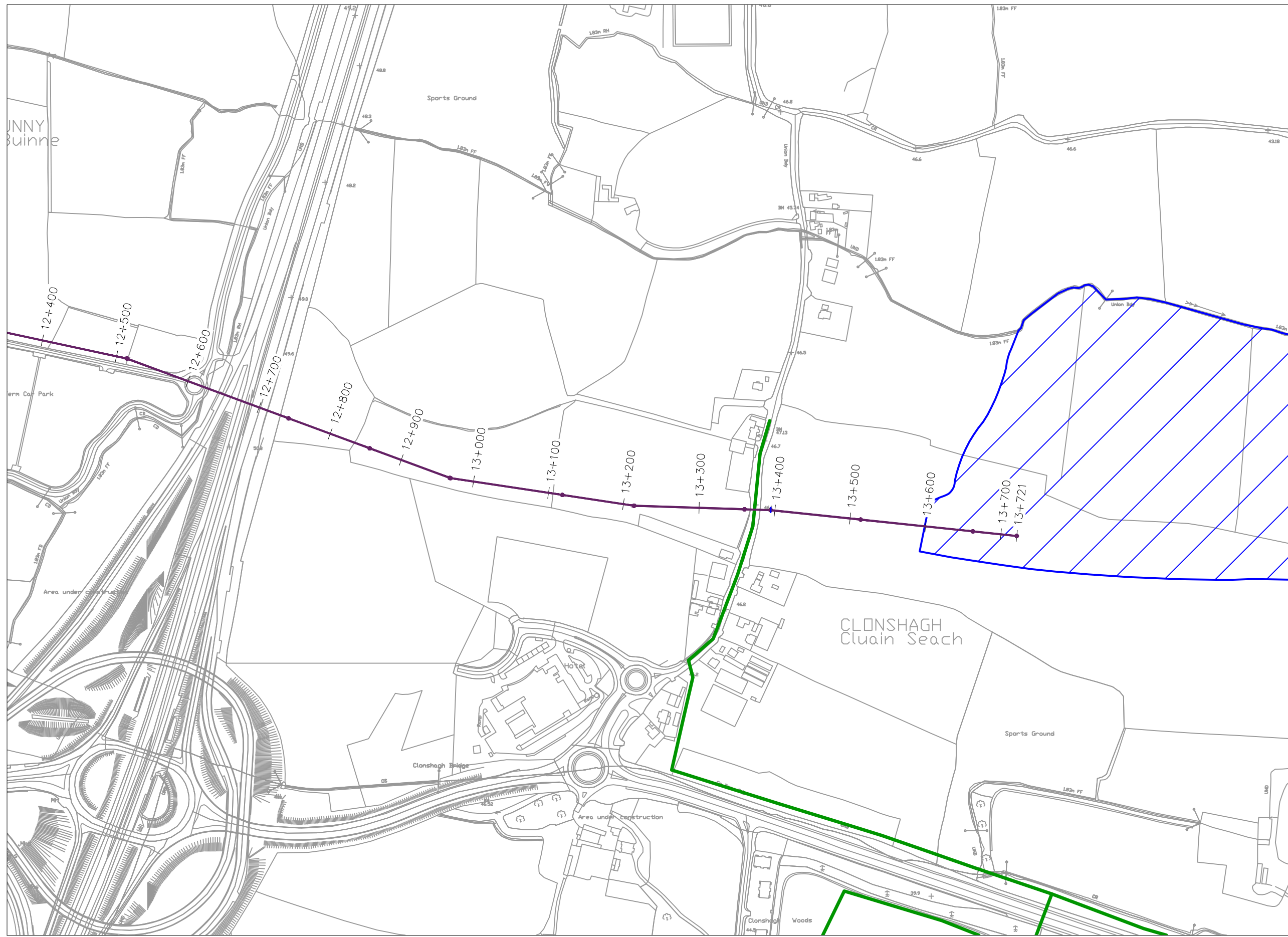
Project Director: C. O'Keefe

Drawing Status: REPORT

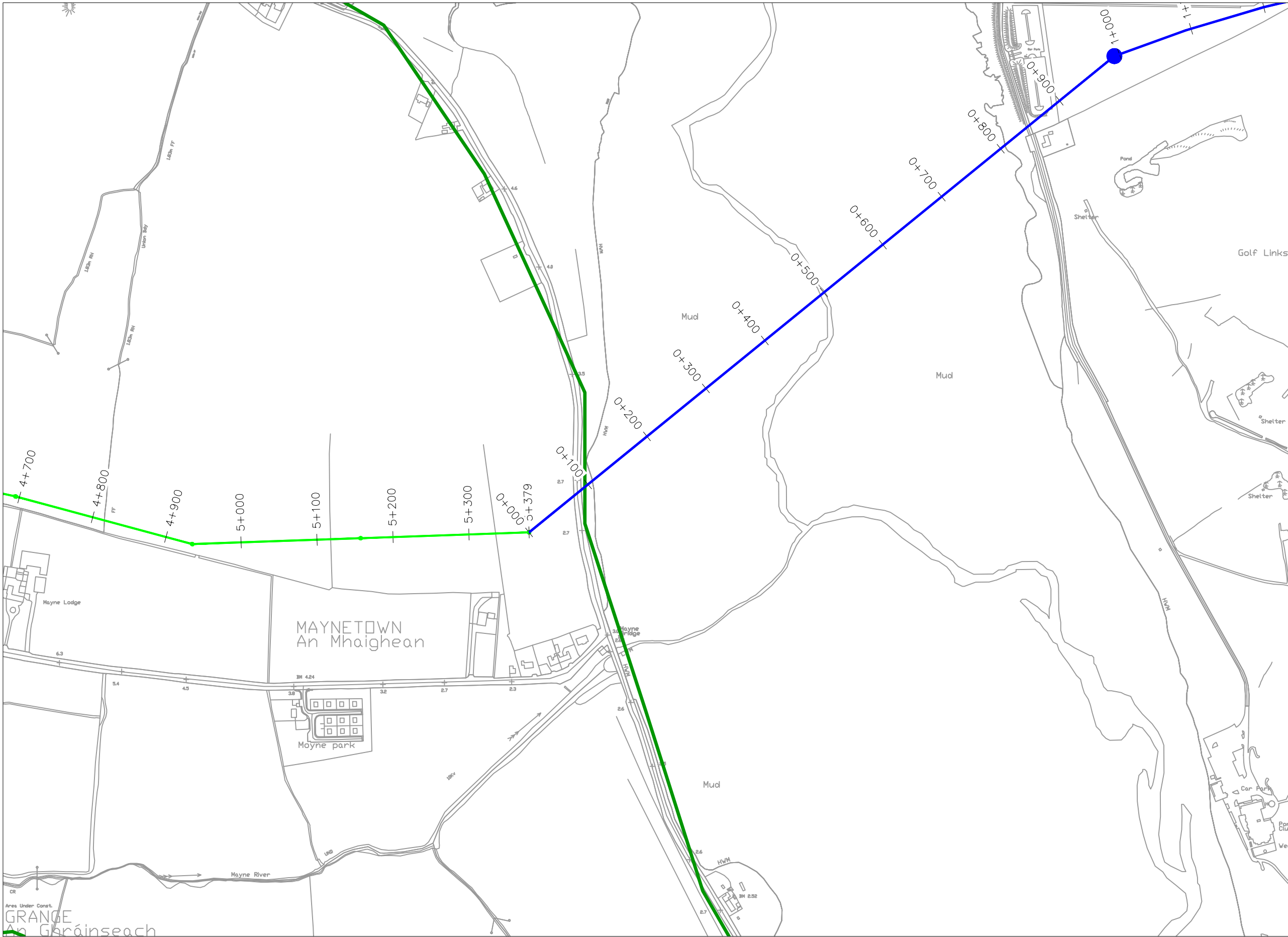
Drawing No.: Drawing No. 18 D



CROSSING LOCATION 1
SCALE : 1:5,000

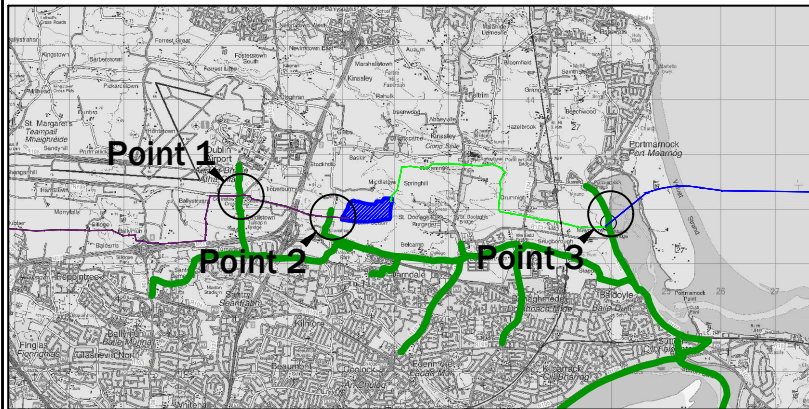


CROSSING LOCATION 2
SCALE : 1:5,000



CROSSING LOCATION 3
SCALE : 1:5,000

- LEGEND:**
- PROPOSED WWTP/PS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - WASTEWATER COLLECTION NETWORK



- NOTES:**
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D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

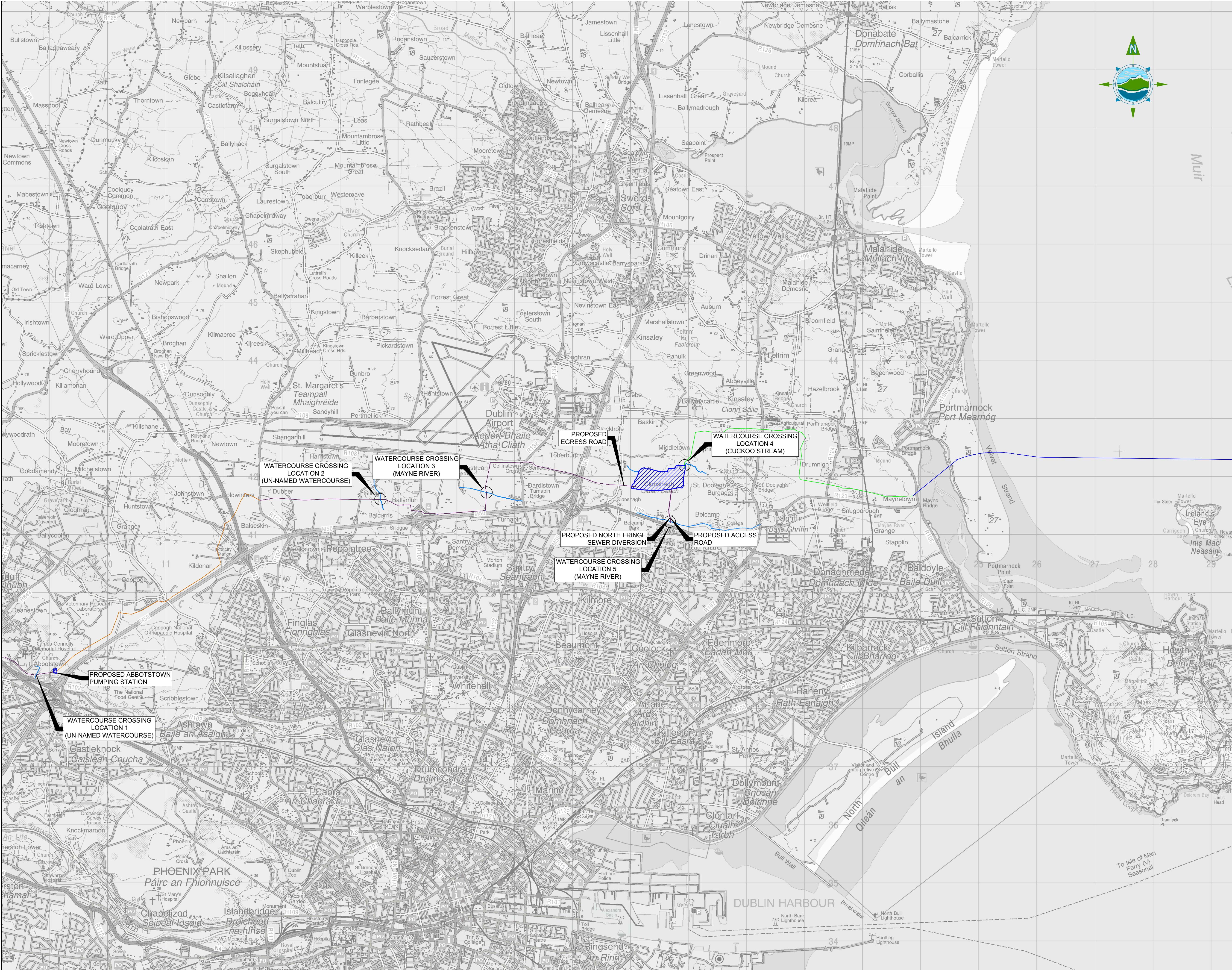
Client:

Project:

Title:
LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINE & WASTEWATER
- Sheet 2 of 2 -

Scale @ A1: AS SHOWN
Prepared by: A. O'Callaghan
Checked: D. Conneran
Date: May 2016
Project Director: C. O'Keefe
Drawing Status: REPORT

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Drawing No.: **Drawing No. 19**
Revision: **D**



LEGEND:

PROPOSED WWTP/PS

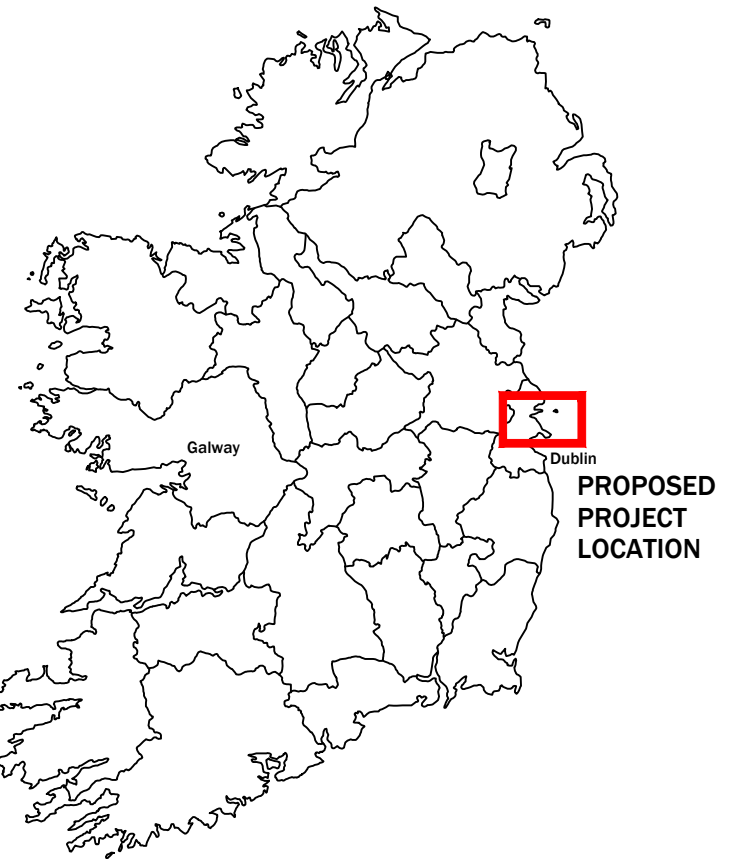
PROPOSED ORBITAL SEWER ROUTE (GRAVITY)

PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)

PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)

PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)

WATERCOURSE



- NOTES:**
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E	07.06.18	ISSUED FOR REVIEW	AOC	BD
D	04.05.18	ISSUED FOR REVIEW	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.06.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.

Client:

Project:

Title: LOCATION OF CROSSING POINTS ORBITAL SEWER/OUTFALL PIPELINE & WATERCOURSES - Sheet 1 of 2 -

Scale @ A1: 1:25,000

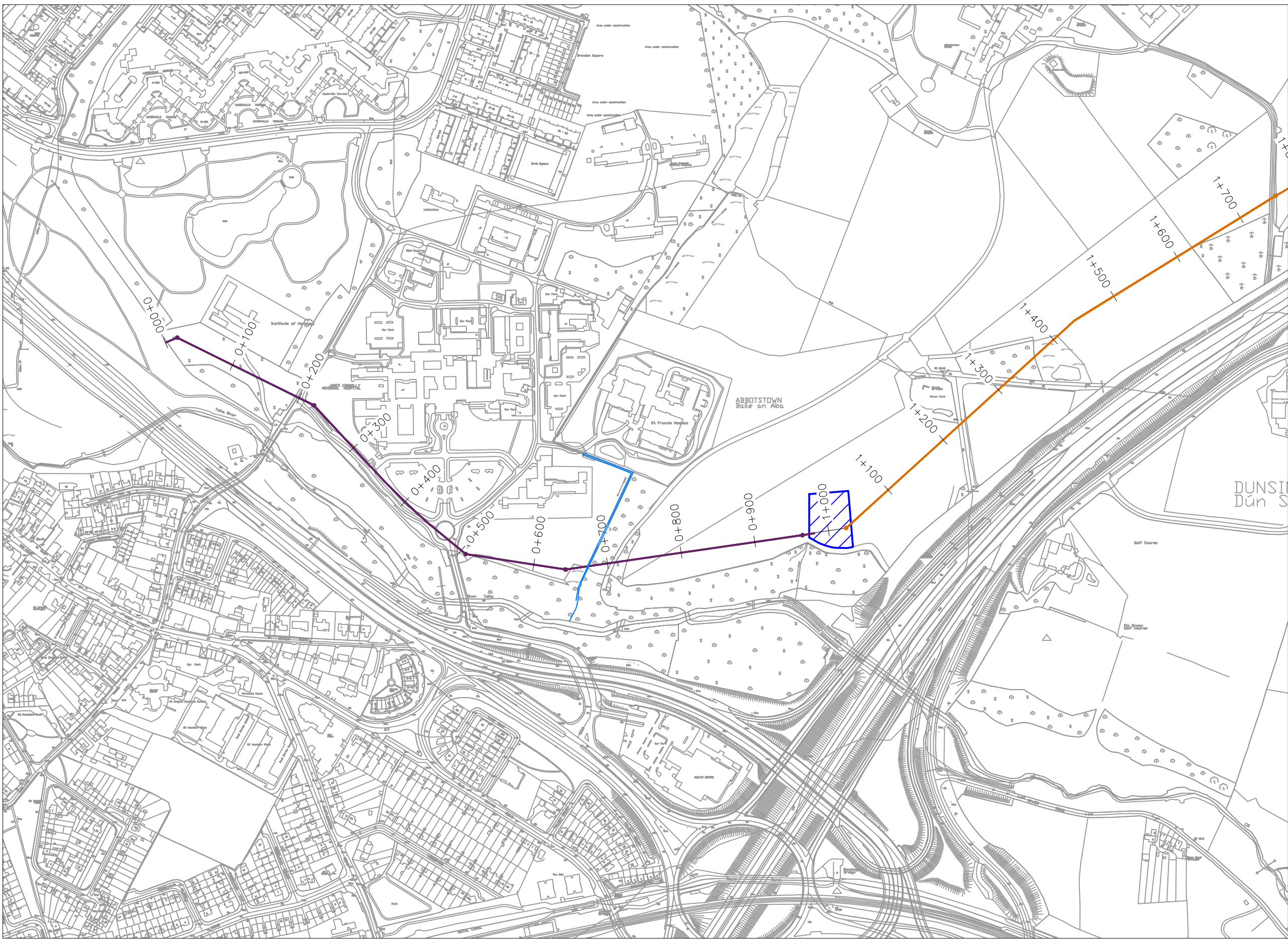
Prepared by: A. O'Callaghan Checked: D. Conneran Date: May 2016

Project Director: C. O'Keefe

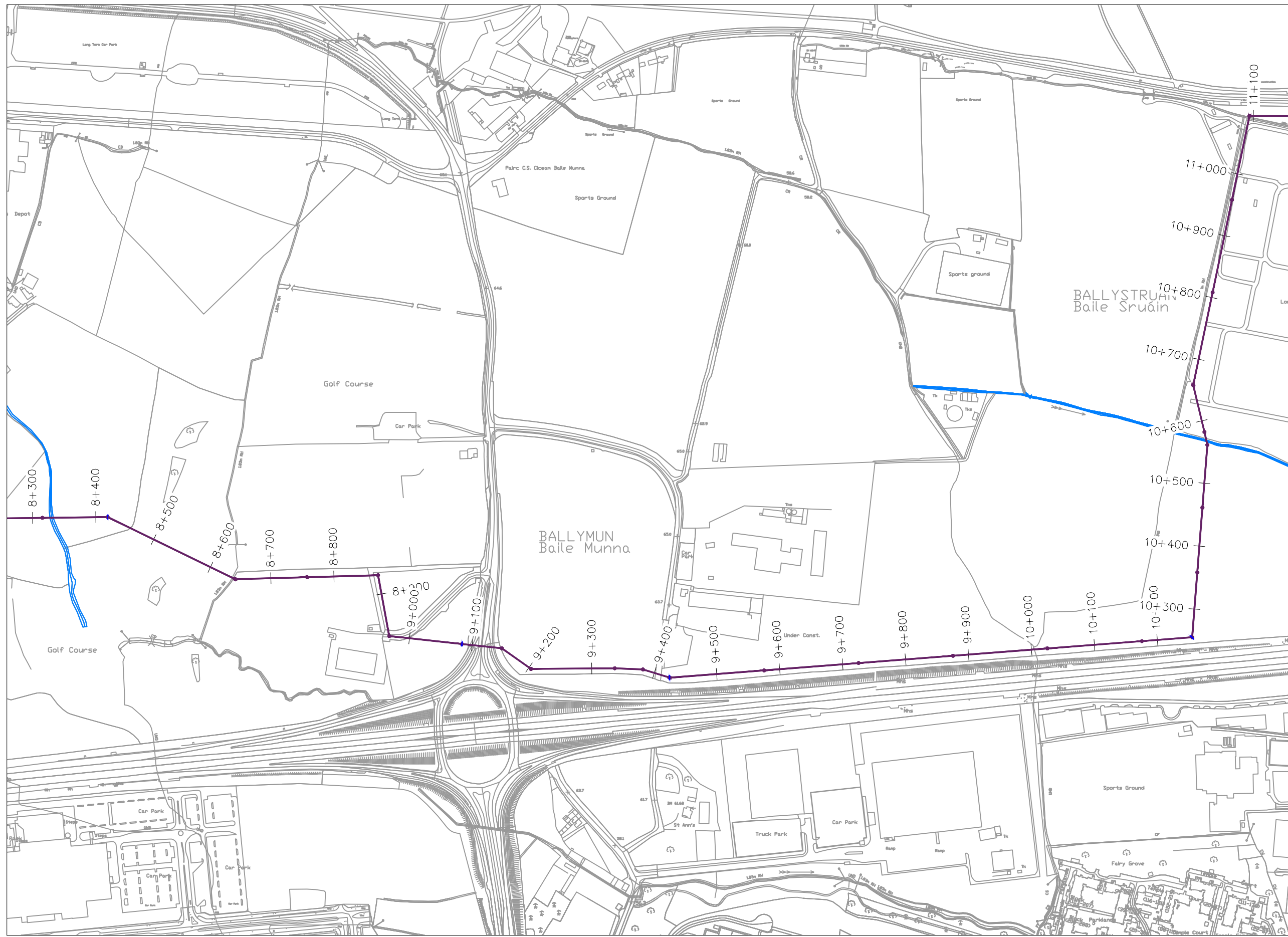
Drawing Status: REPORT

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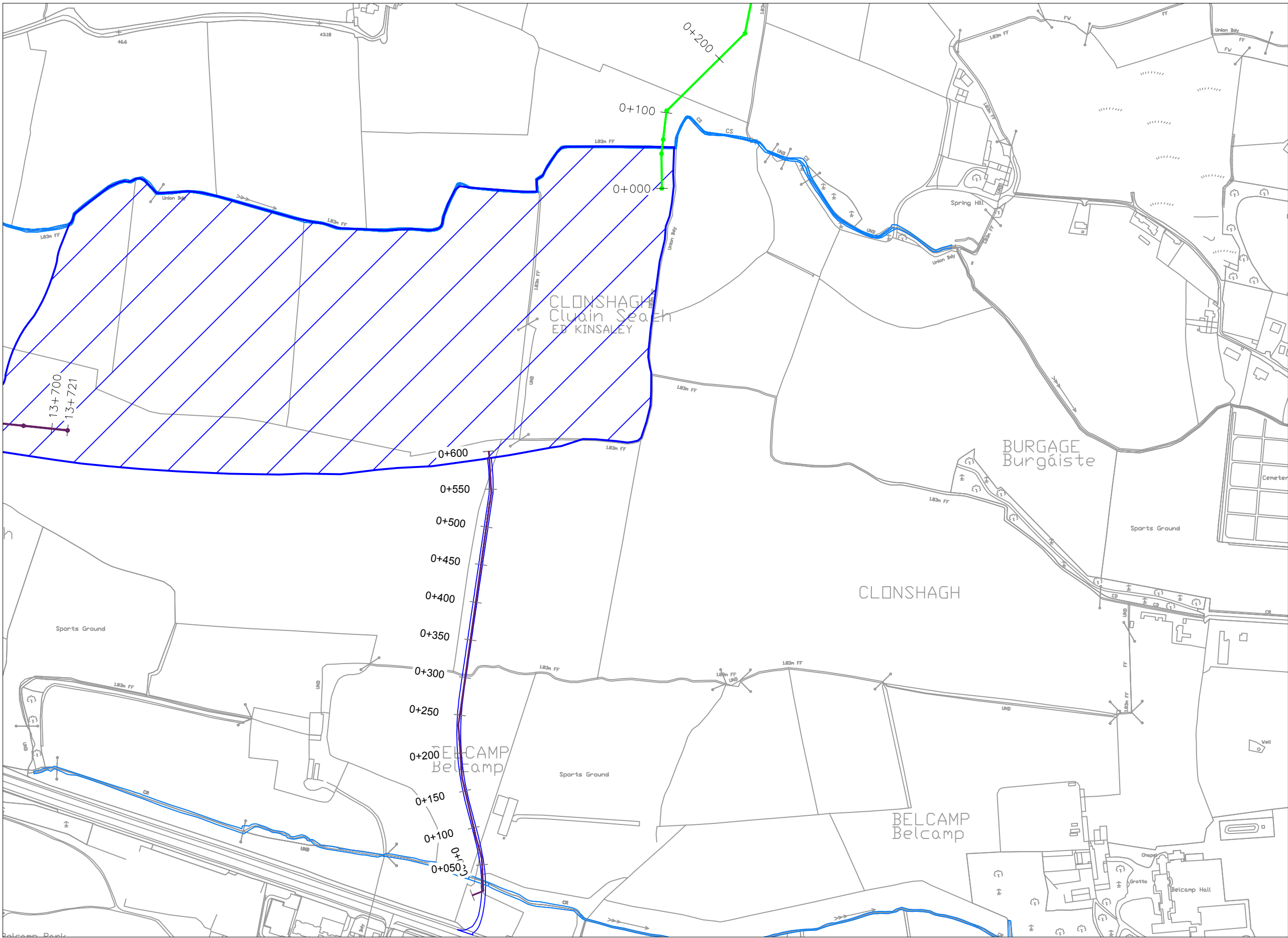
Drawing No.: **Drawing No. 20** Revision: **E**



CROSSING LOCATION 1
SCALE : 1:5,000

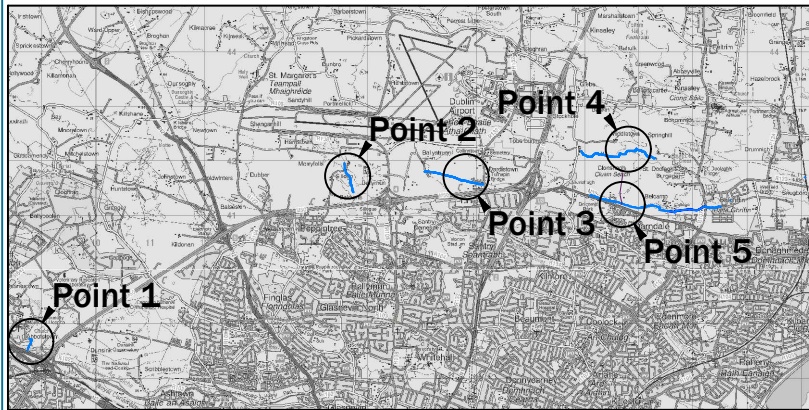


CROSSING LOCATIONS 2 & 3
SCALE : 1:5,000



CROSSING LOCATION 4 & 5
SCALE : 1:5,000

- LEGEND:**
- PROPOSED WWTP/PS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
 - WATERCOURSE



KEYPLAN

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E	07.06.18	ISSUED FOR REVIEW	AOC	BD
D	04.05.18	ISSUED FOR REPORT	AOC	BD
C	18.12.17	ISSUED FOR REPORT	AOC	JF
B	28.08.17	ISSUED FOR REPORT	AOC	DC
A	23.05.16	ISSUED FOR REPORT	AOC	DC
Rev	Date	Description	By	Chkd.



Title:
LOCATION OF CROSSING POINTS
ORBITAL SEWER/OUTFALL
PIPELINE & WATERCOURSES
- Sheet 2 of 2 -

Scale @ A1: AS SHOWN
Prepared by: A. O'Callaghan
Checked: D. Conneran
Date: May 2016
Project Director: C. O'Keefe
Drawing Status: REPORT



Drawing No.: Drawing No. 21
Revision: E