

Appendix 3: Surface Water Management Plan

JACOBS[®]



Greater Dublin Drainage Project

Irish Water

Outline Surface Water Management Plan

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List of Acronyms

AEP	Annual Exceedance Probability
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
COSHH	Control of Substances Hazardous to Health
DBO	Design Build Operate
ECoW	Ecological Clerk of Works
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FRA	Flood Risk Assessment
FEM-FRAMS	Fingal East Meath Flood Risk Assessment and Management Study
GDD	Greater Dublin Drainage
IFI	Inland Fisheries Ireland
IMO	International Marine Organisation
NFS	North Fringe Sewer
NRA	National Roads Authority
OPW	Office of Public Works
PE	Population Equivalent
PFRA	Preliminary Flood Risk Assessment
pNHA	Proposed Natural Heritage Area
SAC	Special Area of Conservation
SCP	Sediment Control Plan
SDS	Safety Data Sheet
SNR	Statutory Nature Reserve
SPA	Special Protection Area
SuDS	Sustainable Drainage System
SWMP	Surface Water Management Plan
TII	Transport Infrastructure Ireland
TSS	Total Suspended Solids
WFD	Water Framework Directive
WwTP	Wastewater Treatment Plant

1. Introduction

1.1 Introduction

This Outline Surface Water Management Plan (hereafter referred to as the Outline SWMP) has been prepared to identify and outline specific mitigation measures that shall be implemented to minimise impact of the proposed Project to surface water quality, as well as surface water flora and fauna. This document provides an outline surface water management methodology for each of the Proposed Project elements and should be read in conjunction with the Outline Construction Environmental Management Plan (hereafter referred to as the Outline CEMP) and the Environmental Impact Assessment Report (EIAR) for the Greater Dublin Drainage (GDD) project.

This Outline SWMP will be a key part in ensuring that all mitigation measures, which are considered necessary to protect the surface water environment, prior to construction, during construction and/or during operation of the Proposed Project are fulfilled. Irish Water shall be responsible for ensuring that the appointed contractor(s) manages the construction activities in accordance with the Outline SWMP. The appointed contractor(s) will prepare a final SWMP which is in accordance with the Outline SWMP to ensure that construction delivers the mitigation measures set out within the EIAR. The final SWMP will include all mitigation measures included in the EIAR as well as any conditions of planning which are made in addition to the measures in the EIAR.

1.2 Legislation and Guidance

The key legislation with respect to surface water management is as follows:

- Water Framework Directive (WFD) 2000/60/EC;
- European Communities (Water Policy) Regulations 2003-2005 (S.I. 722 of 2003);
- EC Environmental Objectives (Surface Waters) Regulations (S.I. 272 of 2009);
- Local Government (Water Pollution) Acts 1977 – 1990;
- Groundwater Directive (2006/118/EC);
- EC Environmental Objectives (Groundwater) Regulations 2009 (S.I. 9 of 2010 and SI 366 2016);
- Urban Waste Water Treatment (UWWT) Regulations (S.I. 254 of 2001) as amended;
- European Communities (Quality of Shellfish Waters) Regulations 2009 (S.I. 272 of 2009);
- Bathing Water Quality Regulations 2008 (S.I. 79 of 2008);
- European Communities (Marine Strategy Framework) Regulations 2011 (S.I. 249 of 2011); and
- European Communities (Quality of Salmonid Waters) Regulations 1998 (S.I. 293 of 1998).

The mitigation measures in this plan are based on guidance which includes:

- The Planning System and FRM Guidelines (OPW, 2009);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (CIRIA Technical guidance C532, 2001);
- Control of water pollution from linear construction projects: Technical Guide (CIRIA C648, 2006);
- Control of water pollution from linear construction projects: Site Guide (CIRIA C649, 2006);
- Erosion and Sediment Control Handbook (Goldman *et al*, 1986);
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (TII (formerly NRA), 2005); and

- Guidelines on the management of noxious weeds and non-native invasive plant species on national roads (TII (formerly NRA), 2008).

1.3 Description of Proposed Project

The Proposed Project will form a significant component of a wider strategy to meet future wastewater treatment requirements within the Greater Dublin Area (GDA) as identified in a number of national, regional and local planning policy documents. The plant, equipment, buildings and systems associated with the Proposed Project will be designed, equipped, operated and maintained in such a manner to ensure a high level of energy performance and energy efficiency.

The table below includes a summary of the Proposed Project elements. A full description of the Proposed Project is detailed within Volume 2 Part A, Chapter 4 Description of the Proposed Project, of this Environmental Impact Assessment Report (EIAR).

Proposed Project Element	Outline Description of Proposed Project Element
Proposed Wastewater Treatment Plant (WwTP)	<ul style="list-style-type: none"> WwTP to be located on a 29.8 hectare (ha) site in the townland of Clonshagh (Clonshaugh) in Fingal. 500,000 population equivalent wastewater treatment capacity. Maximum building height of 18m. Sludge Hub Centre (SHC) to be co-located on the same site as the WwTP with a sludge handling and treatment capacity of 18,500 tonnes of dry solids per annum. SHC will provide sustainable treatment of municipal wastewater sludge and domestic septic tank sludges generated in Fingal to produce a biosolid end-product. Biogas produced during the sludge treatment process will be utilised as an energy source. Access road from the R139 Road, approximately 400m to the southern boundary of the site. Egress road, approximately 230m from the western boundary of the site, to Clonshaugh Road. A proposed temporary construction compound to be located within the site boundary.
Proposed Abbotstown pumping station	<ul style="list-style-type: none"> Abbotstown pumping station to be located on a 0.4ha site in the grounds of the National Sports Campus at Abbotstown. Abbotstown pumping station will consist of a single 2-storey building with a ground level floor area of 305m² and maximum height of 10m and a below ground basement 17m in depth with floor area of 524m² incorporating the wet/dry wells. The plan area of the above ground structure will be 305m² and this will have a maximum height of 10m. A proposed temporary construction compound to be located adjacent to the Abbotstown pumping station site.
Proposed orbital sewer route	<ul style="list-style-type: none"> The orbital sewer route will intercept an existing sewer at Blanchardstown and will divert it from this point to the WwTP at Clonshagh. Constructed within the boundary of a temporary construction corridor. 13.7km in length; 5.2km of a 1.4m diameter rising main and 8.5km of a 1.8m diameter gravity sewer. Manholes/service shafts/vents along the route. Odour Control Unit at the rising main/gravity sewer interface. Proposed temporary construction compounds at Abbotstown, Cappoge, east of Silloge, Dardistown and west of Collinstown Cross to be located within the proposed construction corridor.
Proposed North Fringe Sewer (NFS) diversion sewer	<ul style="list-style-type: none"> The NFS will be intercepted in the vicinity of the junction of the access road to the WwTP with the R139 Road in lands within the administrative area of Dublin City Council. NFS diversion sewer will divert flows in the NFS upstream of the point of interception to the WwTP. 600m in length and 1.5m in diameter. Operate as a gravity sewer between the point of interception and the WwTP site.
Proposed outfall pipeline route (land based section)	<ul style="list-style-type: none"> Outfall pipeline route (land based section) will commence from the northern boundary of the WwTP and will run to the R106 Coast Road. 5.4km in length and 1.8m in diameter. Pressurised gravity sewer. Manholes/service shafts/vents along the route. Proposed temporary construction compounds (east of R107 Malahide Road and east of Saintdoolaghs) located within the proposed construction corridor.
Proposed outfall pipeline route (marine section)	<ul style="list-style-type: none"> Outfall pipeline route (marine section) will commence at the R106 Coast Road and will terminate at a discharge location approximately 1km north-east of Ireland's Eye. 5.9km in length and 2m in diameter. Pressurised gravity tunnel/subsea (dredged) pipeline. Multiport marine diffuser to be located on the final section. Proposed temporary construction compounds (west and east of Baldoyle Bay) to be located within the proposed construction corridor.

Proposed Project Element	Outline Description of Proposed Project Element
Proposed Regional Biosolids Storage Facility	<ul style="list-style-type: none"> • Located on an 11ha site at Newtown, Dublin 11. • Maximum building height of 15m. • Further details and full impact assessment are provided in Volume 4 Part A of this EIAR.

The Construction Phase will last approximately 48 months in total, including a 12-month commissioning period to the final Operational Phase. The Proposed Project will serve the projected wastewater treatment requirements of existing and future drainage catchments in the north and north-west of the Dublin agglomeration, up to the Proposed Project’s 2050 design horizon.

1.4 Existing Surface Water Environment

There are four main rivers that are adjacent to the Proposed Project. These are the Tolka River, Santry River, Mayne River (and its tributary the Cuckoo Stream), and the Sluice River. The Tolka River and Santry River discharge to Dublin Bay, whilst the Mayne River and Sluice River discharge to Baldoyle Estuary which then discharges to the Irish Sea.

1.4.1 Waterbodies

Figure 1 shows all known waterbodies and proposed waterbody crossings in the vicinity of the Proposed Project.

Tolka River

The Tolka River rises near Culmullin Crossroads and with a network of small tributaries flows through Batterstown, Black Bull, Dunboyne, Clonee, Mulhuddart, Abbotstown, Finglas Bridge, Glasnevin, Druncondra, North Strand and East Wall to enter Dublin Bay at Fairview Park. The proposed Abbotstown pumping station site is located approximately 100m north of the Tolka River just before the Tolka River flows under the M50 Motorway.

The overall WFD status of the Tolka_040 River Water Body is “Poor” and “at risk” of not achieving “Good” status.

Santry River

The Santry River has its origins at Harristown and Dubber South of St. Margaret’s. It flows to the west of Dublin Airport and parallel to the main runway. From there it flows through Sillogue, under the M50 Motorway at Ballymun, through Santry Demesne. It then passes under the M1/M50 Motorway at Santry, through Kilmore, Edenmore, Raheny and under the Dublin/Belfast railway line before discharging to Dublin Bay at North Bull Island. The proposed orbital sewer route from the proposed Abbotstown pumping station to the proposed WwTP will intercept the Santry River at Sillogue (just outside the M50 Motorway).

The WFD Status for the Santry_010 River Water Body is “Poor” and “at risk” of not achieving “Good” status.

Mayne River

The Mayne River commences at Dardistown (west of the M50/M1 Motorway interchange). It flows under this interchange, along the R139 Road (through Belcamp, Balgriffin, Snugborough, and under the Dublin/Belfast railway line), and discharges to the Baldoyle Estuary. The Cuckoo Stream, which is a tributary of the Mayne River, commences at Dublin Airport, flows under the M1 Motorway at Toberbunny and joins the Mayne River just upstream of Wellfield Bridge. There is a significant floodplain for the Mayne River just downstream of the railway line which provides essential storage of the Mayne River during high tides. The proposed WwTP is adjacent to the Cuckoo Stream and approx. 400m north of the Mayne River. Finally, the route of the proposed outfall pipeline route (land based section) will be located to the north of the Mayne River floodplain.

The WFD Status for the Mayne_010 River Water Body is “Poor” and “at risk” of not achieving “Good” status.

Sluice River

The Sluice River rises in Kinsealy and flows in an easterly direction passing under the railway line before discharging to the Baldoyle Estuary at Portmarnock Bridge. The proposed outfall pipeline route (land based section) is approx. 300m south of the Sluice River.

There is no WFD status for the Sluice River.

Coastal and Estuary Areas

Baldoyle Estuary is tidal and is sheltered by an extensive sand dune system. The Estuary has large areas of intertidal sands and some muds. Eel grass beds are present in the bay. The Estuary supports internationally important populations of Brent Geese and nationally important populations of a further seven waterfowl species. Baldoyle Estuary is a SAC, SPA, pNHA, and Ramsar site. It is also a Statutory Nature Reserve (SNR). It should be noted that the water quality of the Estuary is classified (by the EPA) as Eutrophic. Its status and risk under the WFD is presently under review. The Mayne River and Sluice River both discharge to the Estuary. While the Estuary is considered to have extremely high ecological importance, it should be noted that the surface water pathway to the Estuary from the elements of the Proposed Project is via a water course whose quality is poor status.

The proposed outfall pipeline route (marine section), which crosses Baldoyle Estuary, is located in the coastal area adjacent to Portmarnock Strand. There is no WFD Status assigned for this location, however, the coastal waters to the north have “Good” quality status and Dublin Bay, located to the south, is also classified as ‘Good’. One recreational bathing site, namely Velvet Strand - Portmarnock Beach, is a Blue Flag beach.

The Tolka River discharges to Dublin Bay at Fairview. This part of Dublin Bay is part of the South Dublin Bay and Tolka Valley Estuary SPA. The Tolka Estuary WFD quality status is “moderate”. The Santry River discharges near to North Bull Island SPA. North and South Dublin Bay are both classified as SACs and pNHAs. According to the Eastern River Basin District (ERBD) (2009-2015), Dublin Bay is achieving “Good” status.

1.4.2 Flood Risk

A Flood Risk Assessment (FRA) has been prepared for the Proposed Project in accordance with ‘*The Planning System and FRM Guidelines* (OPW 2009). This report is summarised below.

The FRM Guidelines define three Flood Zones (refer to Diagram 1.1), namely:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year for river flooding or 0.5% AEP or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

It is important to note that Flood Zone C covers all areas which are not in Flood Zones A and B.

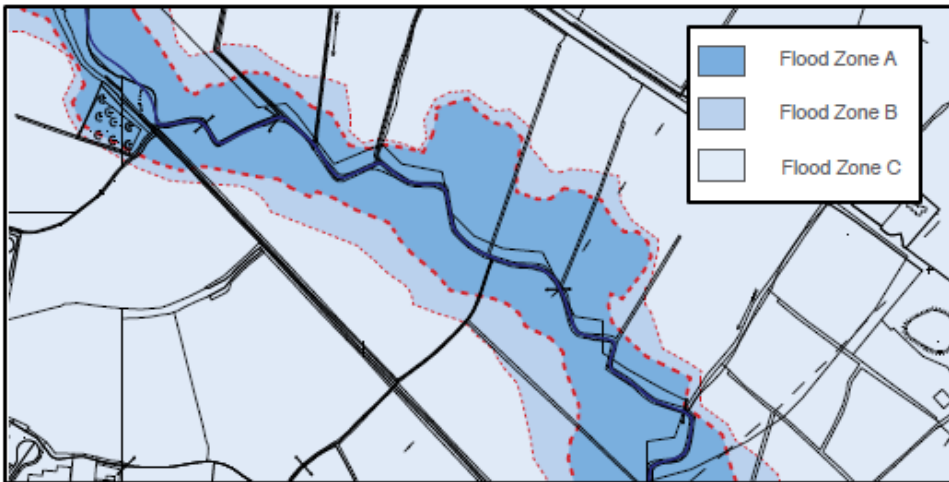


Diagram 1.1: Indicative Flood Zone Map Extract from the FRM Guidelines

The proposed WwTP site is bounded by the Cuckoo Stream to the north and the Mayne River to the south. The nearest recurring historic flooding location is approximately 1.1km to the north-west of the proposed WwTP site, at Stockhole Lane (near Dublin Airport). Fluvial modelling results from the FEM-FRAMS Project indicate that the area immediately beside the Cuckoo Stream is at flood risk. No disturbance or infilling will take place in Flood Zone A or Flood Zone B areas. The proposed WwTP site is in Flood Zone C – low risk (See Figure 3.6 of the FRA Report, Appendix A17.1 of the EIAR).

The proposed Abbotstown pumping station is located to the north of the Tolka River and is situated approximately 6m above river bank level. The National Flood Hazard Mapping website (www.floodmaps.ie) shows no records of historic flooding at the proposed Abbotstown pumping station. The closest historic flood event occurred on the M50 Motorway at the N3 National Road interchange in November 2002. Whilst detailed flood risk mapping is not available for this area, the PFRA maps and the topography indicates that this site is in Flood Zone C - low risk.

In accordance with the FRM guidelines, the proposed WwTP and proposed Abbotstown pumping station sites are considered to be 'highly vulnerable development (including essential infrastructure)' and these types of developments are considered to be 'appropriate' for Flood Zone C – low risk.

The proposed orbital sewer route and outfall pipeline route pipework, by its nature, will pass through a variety of flood zone areas. However, pipelines are not considered to be vulnerable to flooding and it is not inappropriate to locate pipelines in flood risk areas, under rivers, through floodplains etc. subject to appropriate design modifications to cater for construction and long-term durability issues. The fluvial and tidal flood risk maps which are appended to the FRA Report outlines the route of the proposed orbital sewer route and highlights the areas where the pipeline enters flood risk areas. The only areas where the proposed orbital sewer enters flood risk areas is at watercourse crossing locations. Trenchless construction techniques employed at watercourse crossings will ensure that the flood risk will not be considered significant. To further reduce the flood risk at these locations the construction sites/ launch pits will be located beyond the floodplain of the summer peak flood of 1:20 return period.

2. Surface Water Management Measures

2.1 Embedded Mitigation

Note that the design of various project components has considered the potential impacts and mitigation has been embedded in the design.

2.1.1 Surface Water Drainage

Objective SW04 of the Fingal Development Plan 2017-2023 requires:

“the use of sustainable drainage systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks”.

The drainage systems will be designed in accordance with the report entitled ‘The Planning System and FRM Guidelines for Planning Authorities (OPW 2009). Surface drainage from the proposed WwTP and the proposed Abbotstown pumping station will be attenuated to greenfield runoff rates and will make allowance for climate change.

As a result of the Site Selection Process, the proposed WwTP and proposed Abbotstown pumping station sites have been selected in Flood Zone C -Low risk.

2.1.2 Prevention of Pollution

All pipelines, tanks, storage containers, and pump sumps will be designed to be watertight. The pipeline will be designed and constructed to minimise the possibility of any leaks. Reinforced concrete structures will be designed to be water retaining and the use of bunds around any chemicals and oil storage areas will reduce the risk of any leaks or accidental spillages.

2.1.3 Culverting

Mitigation has been embedded in the choice of method for the culverting and crossing of rivers and streams. The main watercourse crossings will be completed using trenchless techniques. Details of the crossings are listed in Table 2.1. and presented on Figure 1. The use of trenchless technology for water crossings will ensure that the proposed orbital sewer route shall be constructed below the river, stream or ditch bed levels. The appointed contractor(s) will locate construction compounds and launch pits in Flood Zone C – low risk areas for both the proposed orbital sewer route and the proposed outfall pipeline route.

Table 2.1: River and Stream Crossings

Crossing No.	Description	Pipeline Route	Proposed Methodology/ Machinery
Watercourse Crossing 1	Tributary of Tolka River	Orbital Sewer Route (Blanchardstown – Clonshagh)	Trenchless/ Tunnel
Watercourse Crossing 2	Santry River	Orbital Sewer Route (Blanchardstown – Clonshagh)	Trenchless/ Tunnel
Watercourse Crossing 3	Mayne River	Orbital Sewer Route (Blanchardstown – Clonshagh)	Trenchless/ Tunnel
Watercourse Crossing 4	Cuckoo Stream	Outfall Pipeline Route (Land Based Section)	Trenchless/ Tunnel
Watercourse Crossing 5	Mayne River	NFS Diversion Sewer	Trenchless/ Tunnel
Watercourse Crossing 6	Tributary of Mayne River	Outfall Pipeline (Land Based Section)	Trenchless/ Tunnel

2.1.4 Proposed Outfall Pipeline Route (Marine Section) – Microtunnelling

Microtunnelling techniques will be used for the proposed outfall pipeline route (marine section) from the open fields immediately west of the R106 Coast Road to approximately 750m offshore terminating below the low tide level. The microtunnel section is envisaged as 2.0m internal diameter, constructed at depths ranging between 15m and 20m below ground level using a microtunnelling machine, with pipe sections installed as the tunnelling machine progresses.

An embedded mitigation by avoidance approach has been adopted in the tunnel design and route to eliminate any potential impacts on the Baldoyle Estuary SAC and the Golf Club irrigation wells on the Portmarnock Peninsula. The proposed outfall pipeline route (marine section) will be constructed in a manner that will remove the pathway between the hazard and the receptor. The sewer will be tunnelled in bedrock beneath Baldoyle Estuary and Portmarnock Peninsula and will emerge below the low tide level on the eastern side of the peninsula. The stiff boulder clay in the overburden will act as a barrier between the groundwater in the rock and in the shallow groundwater in the dune sands from which the irrigation wells abstract.

This methodology will ensure that the tunnelled section of the proposed outfall pipeline route will have no hydraulic connection with the groundwater from the irrigation wells abstract.

The tunnel section will require drive/receptor shafts onshore, in the open field immediately west of the R106 Coast Road and in the open space adjacent to the public car park off the Golf Links Road, immediately north of Portmarnock Golf Club. The microtunnelling compound area will be approximately 200m x 100m in size. At the compounds the launch / reception shafts will be constructed, tunnelling equipment located and tunnel materials will be stored temporarily.

The tunnelled pipeline will be grouted to eliminate the possibility of a preferential flow path in the annulus outside the pipe.

It is possible that the microtunnelling machine will be recovered via a 10m cofferdam structure. The cofferdam will be constructed from a jack up platform, using an interlocking sheet pile methodology. The interlocking sheet piles will be driven from the jack up platform to create the cofferdam structure using vibratory hammers, impact hammers or using a hydraulic method of installation. All access will be from the seaward side. Alternatively, the microtunnelling machine will be recovered via a pre-excavated trench filled with granular material (excavated from elsewhere along the pipeline trench) without the necessity to construct a cofferdam.

2.2 Construction Phase Measures

2.2.1 General Measures

A number of measures will be implemented in order to manage surface water in and around construction works and prevent impact to surface waters as a result of construction activity. The appointed contractor(s) will be required to develop a Surface Water Management Plan, which will form part of the overall Construction Environmental Management Plan. The measures outlined below will be included at a minimum in the Surface Water Management Plan.

An Ecological Clerk of Works (ECoW) will be appointed by Irish Water or its agents to monitor and regularly inspect the implementation of all ecological mitigation contained in the EIAR, associated NIS and the Outline CEMP, and to act as a liaison between Irish Water and ABP in the discharge of planning conditions relating to biodiversity.

The key risks to surface water associated with the Proposed Project are:

- Impacts associated with increases in suspended solids being released into waterbodies;
- Impacts associated with pollution of waterbodies by other substances;
- Spreading of invasive species; and

- Increases in flooding.

The following measures are required in order to limit / prevent those listed impacts.

Control of Suspended Solids

The reduction and prevention of suspended solid pollution will be required during all elements of the Project works including:

- During site preparation and clearance works (cut / fill operations);
- Where trenchless operations are undertaken;
- Where the culvert system is constructed along with the new access road to the new WwTP;
- Where site access roads are constructed;
- Where new WwTP and Abbotstown Pumping Station construction works are undertaken;
- Where works are undertaken in marine areas; and
- Where satellite construction compounds are temporarily installed.

The appointed contractor(s) will develop a Sediment Control Plan (SCP), which will form part of the CEMP (the principles of which are detailed in this document and the Outline CEMP included in the EIAR), in advance of any construction activities commencing for the Proposed Project;

The appointed contractor(s) will inspect and monitor the water quality of surface waters in the vicinity of any works, paying particular attention to suspended solids and turbidity levels. This monitoring will form part of the CEMP for the works.

All discharges to surface waters will be suitably treated prior to discharge. There will be no direct discharge of surface water from any element of the works without proper attenuation and treatment. The level of suspended solids in any discharges to fisheries waters i.e. the Tolka River (or waters with fisheries potential i.e. the Santry, Mayne and Cuckoo stream) as a consequence of construction works shall not exceed 25 mg/l¹ nor result in the deposition of silts or any element of aquatic flora and fauna (as per IFI (2016) Guidelines). If baseline suspended solid levels in pre-construction monitoring show that these rivers exceed this threshold, the baseline suspended solid levels will not exceed baseline levels during the construction phase of the Proposed Project;

Pathways of preferential flow will be identified within the works area and the appropriate mitigation measures will be undertaken by the appointed contractor(s) to ensure contaminated water from the sites is treated before being discharged to the watercourse. Pathways of preferential flow on a small scale are determined by the topography of the site and are subject to change as works are undertaken, and therefore will need to be determined on site by the appointed contractor(s), and agreed with the ECoW. All vulnerable infrastructure i.e. the WwTP and Abbotstown Pumping Station are to be located in Flood Zone C i.e. low risk. Similarly, all construction site compounds, storage areas and launch pits (for trenchless technologies) will be located, where possible, within Flood Zone C – low risk. The following best practice guidelines for erosion and sediment control will be adhered to during the Construction Phase, and form appropriate mitigation:

- Works within and adjacent to watercourses will only be conducted during forecast low flow periods;
- The design of the outfalls and settlement ponds and the construction method statements for their installation shall be agreed with IFI prior to construction;
- A sediment mat / silt trap or similar will be located immediately downstream of the works within and adjacent to the minor watercourses. These should be inspected daily, maintained and cleaned regularly during the

¹ The standard is expressed as an average concentration over a period of 12 months and does not apply to suspended solids with harmful chemical properties. <http://www.irishstatutebook.ie/eli/1988/si/293/made/en/print>

course of site works. Diversion of water to and from temporary diversion channels should only take place during the period of March to September or as agreed with the IFI;

- Topsoil stripping in proximity to any watercourses will be undertaken in dry weather conditions and all stockpiles will be located greater than 100m from a watercourse or removed off site. Stockpiles within 200m of a watercourse will be covered;
- Stripped areas will be revegetated, particularly cut and fill slopes and disturbed slopes as soon as possible, e.g. by use of hydroseeding (larger areas), replacement of turves (smaller areas) etc. Mulches or other organic stabilisers will be used to minimise erosion until vegetation is established on sensitive soils. Hydroseeding shall not be carried out in close proximity to water and these areas will be seeded by hand or placement turves used;
- Run-off velocities and erosive energy will be minimised by maximising the lengths of flow paths for precipitation run-off, constructing interceptor ditches and transport, and lining unavoidably steep interceptors or conveyance channels with low gradients to minimise secondary erosion, and ditches with filter fabric, rock or polyethylene lining to prevent channel erosion;
- The crossing of watercourses at natural fords will not be permitted due to the uncontrolled sedimentation that can be generated;
- The creation of fords on streams and rivers through the introduction of stone shall be prohibited;
- There will be designation of appropriate locations set back from watercourses and methods for stockpiling soil, aggregates, chemicals, etc.;
- Heavy vehicular movements will be restricted adjacent to watercourse and tidal areas in order to avoid inputs;
- Run-off from stockpiles will be collected via a shallow toe drain which will discharge to a settlement pond. Settlement ponds will be designed and sized to adequately attenuate suspended solid run-off from stockpile areas. Sediment build-up will be removed at regular intervals by manual means only and will be treated at an appropriately authorised waste management facility;
- Existing and proposed surface water drainage and discharge points shall be mapped on a site plan including the location of existing and proposed measures such as monitoring points, sediment traps, settlement lagoons and hydrocarbon separators;
- Site access roads shall be constructed of a non-friable clean well graded material typically of NRA Clause 804 to ensure the material does not breakdown under loading;
- No water that has gathered on-site from any source (groundwater, surface water or precipitation) will be pumped directly to the surface water drainage network. All water intercepted on-site must be attenuated in sediment control structures for sufficient time to ensure that sediment concentrations are appropriate before discharge;
- Where works are to be carried out such as the crossing of drainage ditches, the works area shall be isolated from surface water using a sufficiently large flume or other suitable containment methods. Water within the contained area contaminated with suspended solids or other potential pollutants shall not be released directly to the drainage ditch. It shall be pumped to a suitable sediment control structure (e.g. sediment control pond) to allow sediment removal before it re-enters the drainage ditch;
- Small check dams will be constructed in the cut-off watercourse to trap any sediment, and a sediment trap will be provided immediately downstream of the diversion to the existing watercourse.
- No in-stream structures, strictly no temporary stream crossings or temporary culverting shall take place without the prior agreement of IFI; and
- Excavations for foundations will be carried out so as to minimise sediment run off.

Stockpiling

The following measures will be put in place by the appointed contractor(s) with regard to stockpiling of material:

- Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10m of a non-sensitive watercourse or within 50m of a sensitive watercourse;
- Management of stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be required with the final measures to be determined by the appointed contractor(s), including the following:

- Allowing the establishment of vegetation on the exposed soil;
- Providing silt fences or straw barriers at the toe of the stockpile to mitigate runoff during rain events;
- Surrounding stockpiles with cut-off ditches to contain runoff;
- Directing any rainwater runoff to the site drainage system and to the settlement pond (or other) treatment systems;
- Providing bunds or another form of diversion to keep runoff from entering the stockpile area.

Pollution with Other Substances

Where the construction works are close to a watercourse, and at all watercourse crossings, the following best practice guidelines shall be followed:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site should be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to current best practice (Enterprise Ireland BPGCS005);
- Fuelling and lubrication of equipment shall not be carried out on-site within 20m of any watercourse or drainage ditch;
- Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained and a pollution control kit used. The contaminated soil shall be removed from the site and properly disposed of;
- In the event of any spillage of fuels, lubricants or hydraulic oils, the ECoW will be notified immediately;
- Oil booms and oil soakage pads shall be kept on-site to deal with any accidental spillage, and replenished immediately once used;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or re-cycling;
- All pumps using fuel or containing oil shall be locally and securely bunded and shall not be located within 20m of a watercourse or drainage ditch; and
- Prior to any instream works, the appointed contractor(s) will ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.

A detailed CEMP will be established prior to construction. This will follow best practice for the storage, handling and disposal of hazardous/non hazardous materials to prevent chemical pollution. All fuels or chemicals kept on the construction site will be stored in protected containers and all refuelling and maintenance will be carried out in bunded containment areas. Refuelling and maintenance in areas draining directly to water habitats will be avoided where possible. Oil interceptors will also be installed in appropriate locations. Equipment will be regularly maintained and leaks repaired immediately. Accidental spillages will be contained and cleaned up immediately. Remediation measures will be carried out in the unlikely event of pollution of the marine environment.

Use of Concrete

Concrete will be required as part of works undertaken to construct the new WwTP at Clonshagh, to construct the proposed Abbotstown pumping station and at manholes (at bends, changes in gradient and at specific locations along the proposed pipeline routes) and chambers. Mitigation in the form of avoidance of the use of concrete has been built into the design of the Project for the culvert and bridge structures discussed above, with a precast box culvert utilised. It is possible that the chosen pipe material may be concrete, however the suitability of the particular materials will be considered further at the detailed design state. Therefore, mitigation proposed here, includes for the scenario in which the pipe material is concrete.

The use and management of concrete, which has a deleterious effect on water chemistry and aquatic habitats and species, in or close to watercourses shall be carefully controlled to avoid spillage. Where the use of concrete near water cannot be avoided, the following control measures will be employed:

- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration of the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters;
- Placing of concrete in or near watercourses will be carried out only under the supervision of the ECoW;
- There will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately and runoff prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses;
- On-site concrete batching and mixing activities will not be allowed and will be specifically prohibited in the contract documents;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The concrete plant and all delivery drivers will be informed of their location with the order information and on arrival on site;
- Chute washout locations will be provided with appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks, and
- The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste to a licensed facility

Invasive Species

No invasive species were found during freshwater surveys within the route corridor, however invasive species records are known from the wider catchments of the Tolka and Santry. There may be a risk associated with the spread of, or introduction of invasive species via soil or other materials which will be imported to the site during construction work, or via machinery or equipment, the following mitigation shall be adhered to:

- All plant and equipment employed on the proposed construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned using a power washer unit prior to arrival on-site, and prior to leaving site, to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed in accordance with the Office of Public Works (OPW) Environmental Standard Operating Procedures (2011) and IFI Biosecurity Protocols (IFI, 2010). A sign off sheet must be maintained to confirm cleaning;
- Staff involved in the works shall be informed as to the presence of invasive species in the area downstream along the Tolka and Santry Rivers. All staff working on the project shall be familiar with the sections within the document 'Guidelines on the Management of Noxious Weeds and Non-Native Plant Species on National Roads' (NRA, 2008) which detail the treatment necessary for each of the aforementioned species, together with the required reporting procedure if encountered, and, Information and Guidance Document on Japanese knotweed (Irish water 2012); and
- If invasive species are found within the works area during the course of construction works, a buffer zone will be marked around the invasive species, and plant and equipment that could transport the species within the site will be excluded. This will be reported to the ECoW, who will develop a plan of action in association with the appointed contractor(s). The significance of the buffer will be explained to machinery operators.

Flood Prevention

The Proposed Project will be designed in accordance with the report entitled 'The Planning System and FRM Guidelines for Planning Authorities' (OPW 2009) and the Flood Risk Assessment carried out for the project.

All flood vulnerable infrastructure, i.e. the WwTP and Abbotstown Pumping Station, are located in Flood Zone C i.e. low risk. Similarly, all construction site compounds, storage areas and launch pits (for trenchless technologies) will be located, where possible, within Flood Zone C – low risk. The proposed landscaping berm to the north of the treatment plant will be confined to the area outside the Flood Zones A and B. The proposed access to the treatment plant will be constructed over the Mayne River. The existing culverting arrangements will be replaced ensuring the existing flooding regime will not be altered as a result.

In areas which are liable to flooding, the following measures are to be taken to reduce the potential impact of the works in the event of a flood:

- Immediate removal / disposal of surplus material off site;
- Provision of drainage within soil bunds to reduce the influence upon the surface runoff pathways of flood water;
- Avoidance of direct discharge of surface water from any temporary impervious area to the nearby watercourse without proper attenuation;
- Provision of temporary attenuation ponds if the stream to which surface water from the construction area is due to discharge to has limited capacity; and
- The Office of Public Works (OPW) will be contacted for all issues related to watercourse flooding.

Trenchless construction techniques will be used for the installation of the outfall pipeline under Baldoyle Estuary. The appointed contractor(s) will locate construction compounds and launch pits in Flood Zone C – low risk areas for both the orbital sewer and outfall pipeline. The appointed contractor(s) will ensure that construction compounds located within the allowable wayleave are not within Flood Zones A and B. The areas at risk are predominantly located at the significant watercourse crossings and these compounds are to be sited in Flood Zone C.

The shafts / construction fronts for any trenchless technologies will be located beyond the floodplain of the summer peak flood of an appropriate return period (1 in 20 years).

Environmental Incidents and Accidents

- An emergency-operating plan shall be established to deal with incidents or accidents during construction that may give rise to pollution within any watercourse. This shall include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (including oil booms, soakage pads, etc.);
- Throughout all stages of the construction phase of the Proposed Project the appointed contractor(s) shall ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types;
- All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the storage contents;
- Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase of the project as appropriate;
- Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project and an emergency response plan shall be in place, in case of accidental spillage;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of, and

- There shall be no discharge of un-attenuated water to the adjacent marine environment.

2.2.2 Construction Compounds and Main Sites

A number of proposed temporary construction compounds (including those at the proposed WwTP and Abbotstown pumping station sites) are proposed. Site compounds will be provided with SuDS storage and soak away systems designed to BRE Digest 365, for any storm water running directly off any impermeable areas of the compounds. Storage compounds will have stoned areas for the clean storage of materials. The following mitigation will apply together with suspended solids pollution measures outlined previously:

- Sites for storage areas, machinery depots, site offices, construction of temporary access roads or the disposal of spoil will be located at least 50m from any watercourse;
- All materials will be stored in compounds and shall be stored in a manner that is safe and in line with best industry practice. Fuels and chemicals will be stored in an appropriately bunded area/with double skinned tanks;
- Any watercourses that occur in areas of land that will be used for site compound / storage facilities will be fenced off at a minimum distance of 5m from the watercourse. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compounds does not discharge directly to the watercourse;
- The impermeable area within compounds will be minimised to limit surface water runoff;
- Each site compound will be provided with a variety of drainage containment systems to cater for containment of chemical spills, storm water runoff and foul flows from the site during construction;
- All surface water runoff will be intercepted and directed to treatment system for the removal of pollutants prior to discharge. Surface water and storm water will be put through a sedimentation tank, dewatering bags or similar silt retention process;
- Once structures have roofs and down pipes installed, storm water will be discharged into a SuDS based drainage system to prevent runoff and control discharge from the site;
- All aspects of the works will be watertight, which will include the pipelines, tanks, storage containers and pump sumps;
- Wheel washing facilities will be installed at the entrance to the WwTP site and other locations deemed appropriate,
- Invasive species biosecurity measures will be installed at the entrance to the WwTP site, the Abbotstown Pumping Station site and all satellite compounds. This will adhere to the IFI Biosecurity Protocol (2010); and
- Foul drainage from site offices and other construction facilities will be disposed of through the provision of a direct connection to a local sewer (WwTP) or be serviced by means of a waste water storage tank (other site compounds), which will be emptied by means of a suction tanker and the waste water shall be disposed of to a licensed facility.

The northern boundary of the proposed WwTP site is set back from the Cuckoo Stream. Earth mounds and planting will occur within 50m of the stream, however these works will not take place within 20m of the stream as stream riparian vegetation plays a crucial role in removing sediment in over land flows. Riparian vegetation is a vital component of a healthy stream ecosystem and will be preserved. The site will be stripped and earth mounds will be formed as work progresses along the site boundary. These mounds/ planting will provide a buffer to further protect the Cuckoo stream in conjunction with the maintained 20m riparian buffer. Earth mounds will be revegetated as soon as possible e.g. by use of hydroseeding (for larger areas). Broadleaves will be planted in this area adjacent to the Cuckoo stream to encourage a mixture of dapple and shade conditions benefitting instream flora and fauna.

WwTP and Abbotstown Pumping Station

The surface water drainage system of the WwTP and Abbotstown pumping station and access roads will be designed to incorporate SuDS principles, with attenuation systems in place to limit discharges from the site to the green field site flow rate.

The proposed WwTP is located in the Mayne River catchment. The land parcel is bounded by the Cuckoo Stream (a tributary of the Mayne River) immediately to the north. The Mayne River is located approximately 400m to the south of the land parcel. Access to the site is intended from the R139 Road on a left-turn only basis. This will involve crossing the Mayne River. The topography of the proposed WwTP site suggests that surface waters will generally flow towards the Cuckoo Stream.

The northern boundary of the proposed WwTP site is set back from the Cuckoo Stream. Earth mounds and planting will occur within 50m of the stream, however these works will not take place within 20m of the stream as stream riparian vegetation plays a crucial role in removing sediment in over land flows. Riparian vegetation is a vital component of a healthy stream ecosystem and will be preserved. The site will be stripped and earth mounds will be formed as work progresses along the site boundary. These mounds/ planting will provide a buffer to further protect the Cuckoo Stream in conjunction with the maintained 20m riparian buffer. Earth mounds will be revegetated as soon as possible e.g. by use of hydroseeding (for larger areas). Broadleaves will be planted in this area adjacent to the Cuckoo Stream to encourage a mixture of dapple and shade conditions benefitting instream flora and fauna.

Surface water from the WwTP will be discharged to the Cuckoo Stream after attenuation and treatment. Treatment will include interceptors and attenuation tanks before discharge to the Cuckoo Stream. Surface water from the WwTP roof will be collected in grey water tanks. It will then either be recycled on the site, or discharged into the surface water drainage downstream of the fuel interceptors.

The topography of the proposed Abbotstown pumping station site is such that surface waters will generally flow towards the Tolka River. Access to the site shall be through the grounds of the National Sports Campus (NSC) and Ballycoolin Road. Culverts or bridge crossings will not be required to facilitate either the construction of the pumping station or the access road. Surface water runoff will be attenuated on site at the Abbotstown pumping station through means of a filter drain system prior to discharge to the existing water courses to the south of the site.

Construction of Culvert System

Suspended solid pollution associated with culvert system installation will be avoided by use of a clear span structure if possible, or where a bottomless box culvert is installed, will follow IFI (2016) for works in or adjacent to watercourses. Mitigation will include protection of the riparian bank structure, minimisation of sedimentation to the watercourse by use of silt fencing, sand bags or other sediment reducing measures, and minimisation of instream activity.

There is one culvert system proposed as part of this Project. This culvert system will be located on the access road to the new WwTP at Clonshaugh, and will cross the Mayne river. The following mitigation is proposed and is in line with IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, in particular Section 6 – River and Stream Permanent Crossing Structures. During the construction phase the appointed contractor(s) shall ensure that:

- Instream works shall be undertaken during the period 1st July to 30th September as required by IFI Guidance (2016) to avoid accidental damage or siltation of spawning beds, and unless otherwise specified by IFI during consultations in advance of works. This shall include preparatory work in the vicinity of all watercourses and all river bank works;
- Where bank protection works may be required (i.e. upstream and downstream of new structures, to ensure no undercutting or destabilisation of either the structure or riparian bank areas occurs) large enough boulders shall be selected by the appointed contractor(s) and strategically positioned, to ensure they cannot be undercut;
- If rock armour is required, the height to which this is built shall take account of the riparian zone, and if relevant, where protection of bird species is required, and;
- Bridge and culvert design has avoided impacting on flow regimes and river bed profiles upstream and downstream of the structure and has allowed for unimpeded movement of fish by ensuring a minimum

depth of water within the structure. The appointed contractor(s) shall ensure that flow regime for this crossing, which has the potential to support salmonids in the future, shall allow for the unimpeded passage of fish upstream and downstream by having the invert buried 500m below bed level. The culvert will be bottomless and pre-cast. Bridge foundation will be designed and positioned at least 2.5m from the river bank so as not to impact riparian habitats. The use of these structures will maintain the natural stream channel characteristics and have the least impact on habitat.

2.2.3 Proposed Orbital Sewer and Outfall Pipeline (Land Based) Routes

For construction of any watercourse crossings, detailed Pollution Control Plans, Emergency Response Plans and Method Statements will be drafted in agreement with IFI and other relevant authorities, and having regard to relevant pollution prevention guidelines, in particular the IFI document 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' (IFI, 2016). All works in or adjacent to watercourses will comply with the EPA, IFI and OPW requirements.

Surface Water Management Along the Route

Surface water management measures will be installed along the pipeline route in order to manage run-off through the wayleave in which construction is occurring. There will be shallow toe-drains located along the edges of the wayleave in order to catch run-off from the stockpiles of top soils and subsoils resulting from the digging of the trenches for the pipeline. These toe-drains will drain into temporary settlement ponds which will be located along the pipeline route at regular intervals as required as construction progresses, and shall be sized based on calculations of hourly run-off volumes based on a 1 in 10 year rainfall event. These settlement ponds will collect surface waters flowing over the wayleave and in the toe-drains. The routes will be split into 19 separate sections for the purposes of surface water management. Table 2.2 provides detail of the volumes of attenuation to be provided at each section along the proposed route, as well as outfall information. Please refer to Figure 2 for proposed temporary outfall locations.

Table 2.2: Surface Water Attenuation Details for proposed orbital sewer and outfall pipeline (land based) routes

Section	Length (m)	Area (m ²)	Post-Attenuation Outfall To	Volume of Temporary Storage Required m ³ [1 in 10 year (1 hour)]
Proposed Orbital Sewer				
1	300	12,000	Ditch	135
2	425	17,000	Internal Road	192
3	425	17,000	Road	192
N/A	850	N/A	Pipe in roadway in Premier Business Park	N/A
4	850	34,000	Ditch	384
5	800	32,000	Ditch	361
6	550	22,000	Road R122	248
7	2,100	84,000	Santry River	948
8	450	18,000	Santry River	203
9	1,475	59,000	Mayne River	666
10	925	37,000	Mayne River	417
11	650	26,000	Ditch Before M1	293
12	625	25,000	Clonshaugh Road	282
Proposed Outfall Pipeline (Land Based)				
13	1,850	74,000	Malahide Road	835
14	1,500	60,000	Watercourse – tributary of Mayne River	677
15	550	22,000	Road R124	248
16	200	8,000	Ditch	90
17	450	18,000	Watercourse – tributary of Mayne River	203
18	550	22,000	Ditch	248
19	300	12,000	Ditch	135

Sediment will be removed from the surface water prior to discharge through measures as per the guidance on control of water pollution from construction projects (for example silt screens or hay bales). The treated surface water will be discharged to local watercourses, ditches or road drainage as deemed suitable at locations along the pipeline route. There will be no direct discharge of surface waters from the site without prior attenuation and treatment.

During pipeline construction, trenches shall not be left open overnight or for extended periods of time. Trenches shall only be dug to lengths which can be constructed each day. All trenches will be backfilled once the section of pipe is installed. This will prevent pooling of surface waters within open trenches.

Trenchless Crossing of Watercourses

Proposed trenchless crossings of watercourses are shown in Table 2.1 and on Figure 1. Where trenchless crossing works take place i.e. within 200m of the Tolka River, and crossing under the Santry River, Mayne River and Cuckoo stream, a riparian buffer strip at least 20m in width (from the edge of the watercourse on either bank) shall be clearly marked and maintained, to protect the watercourse from any potential impact. Reception and launch pits from trenchless operations will not be located within this 20m buffer. Silt fencing will be installed along the 20m buffer line to isolate the works area from the relevant watercourses. A detailed Pollution Control Plan, Emergency Response Plan and Method Statements will be drafted in agreement with IFI and other relevant authorities.

The primary mitigation measure for the protection of the freshwater environment during the construction phase of the Proposed Project is the use of trenchless techniques to cross the watercourses. This approach will protect the streams and downstream marine protected areas from the significant impacts of traditional trench based methods. Nevertheless, there are some risks associated with the various trenchless methods, and mitigation for these are outlined below.

- Reception and launch pits for the directional drilling process shall not be located within 20m of any watercourse;
- Direct disposal of arisings from excavations and tunnelling, and from groundwater dewatering activities to the nearby watercourses will not be allowed. Any discharge of such water, after proper treating / de-silting will be discussed and agreed with the landowner and, if necessary, discharge consent will be acquired from the concerned authority (EPA, IFI) prior to the commencement of work;
- If drilling fluids are being returned for cleaning and reuse or recirculation through a temporary fluid return line, pneumatic leak testing shall be carried out to confirm the integrity of the return line;
- Spent drilling fluids including separated drill materials shall be contained in secure bunded areas within selected satellite construction compounds for off-site disposal at a licensed disposal facility;
- To avoid reception and launch pits being open for longer than is necessary, all ducting required shall be available on-site prior to commencement of pit excavation;
- Marker posts will be placed at each side of the streams/rivers identifying the location of the crossing;
- Stream crossing works, including preparatory works, shall be carried out under the supervision of a suitably qualified ECoW;
- Refuelling of plant and vehicles shall be done on impermeable and bunded areas, and away from any watercourses;
- Upon completion of works at each stream crossing the site shall be cleaned and any waste disposed of to a suitably licenced facility;
- Pipes once in place will be hydrostatic / water tested to design capacity to validate pipe integrity, and
- The appointed contractor(s) will inspect and monitor the water quality of surface waters in the vicinity of trenchless works, paying particular attention to signs of blowout and silt plumes. In the event of a bentonite break-out, then the site will be monitored for chemical and macro-invertebrates to ensure no residual impacts following clean-up operations. This monitoring will form part of the CEMP for the works.

2.2.4 Proposed Outfall Pipeline (Marine Based)

Please refer to Section 2.1.4 for a discussion on microtunnelling as embedded mitigation for this section of the Proposed Project.

Disturbance of intertidal and subtidal habitats will be minimised so as to reduce the creation of suspended solids within the marine and estuarine habitats. The tunnelling compound spanning either side of the Baldoyle Estuary will be subject to surface water management as part of the CEMP to prevent all runoff into the water courses and the estuary.

The potential for an accidental release of bentonite will be minimised by closely monitoring its use during all works. All bentonite usage will be monitored through materials balance calculations, pressure monitoring in the lines and above ground visual assessment of the works to ensure that should a breakout occur, the volume is minimised. In the event of a bentonite breakout, the site will be monitored for chemical and macroinvertebrate communities to ensure no residual impacts. This may include both benthic and water quality measurements.

In order to prevent impacts arising from increased suspended sediments in the Rockabill to Dalkey SAC the turbidity will be monitored using a buoy mounted turbidity meter telemetered back to the dredger to monitor potential impacts from dredging activity. As the reef is only prone to sedimentation during slack water periods, a slightly elevated level of total suspended solids (TSS) up to 40mg/l (the natural standard deviation for the year) above a daily background will be permitted off Ireland's Eye northern coastline. If this level increases above this threshold as a result of dredging activity, then the discharge of material will be temporarily halted to allow the resulting plume to disperse. This is particularly important 30 minutes before and after slack water where increased suspended sediments can settle within the SAC.

A vessel management plan will be put in place to ensure that the Ireland's Eye SPA boundary is not unnecessarily approached or crossed by construction vessels working on the marine diffuser or subsea pipeline.

All on board waste discharge, from dredgers, pipeline survey vessels, maintenance vessels and marine rigs, will follow the guidelines from Annex V of the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL) for domestic waste discharges to the environment. Solid and Chemical Waste will be treated onboard and recycling will take place wherever practicable. No waste is to be disposed of at sea. Bilge water will be treated in accordance with MARPOL standards. All waste discharge will be monitored & recorded as per vessel procedures.

Any hazardous wastes will be in sealed in labelled drums and stored in lockable chemical cabinets. A record will be kept on the type and quantities of waste arising on each vessel.

Ballast tanks will be separated from any hydrocarbon storage areas on board the vessels and no potentially contaminated drain systems will be routed to the ballast tanks. De-ballasting shall be undertaken offshore in accordance with International Marine Organisation (IMO) Guidelines and away from sensitive environmental areas to prevent introducing marine organisms from outside the Proposed Project location.

Project vessels and rigs will be equipped with oil-water separation systems in accordance with MARPOL requirements.

Any spills on deck will be contained and controlled using absorbing materials. This will be collected in dedicated drums to avoid contamination of deck runoff water. Vessels or rigs without a sewage treatment system will have a suitable holding tank, wastewater will then be brought back to shore for treatment by a licensed contractor.

All chemicals used onboard the Proposed Project vessels or rigs will be handled in compliance with the relevant Safety Instructions, including Control of Substances Hazardous to Health (COSHH) Handling of Hazardous Materials

For each chemical, a Safety Data Sheet (SDS) will be available, as well as an assessment of the hazards associated with the chemical (to personnel, for storage, for emergency response). These will be available at the various places where the chemical is used, and centralised with the Safety Officer on board.

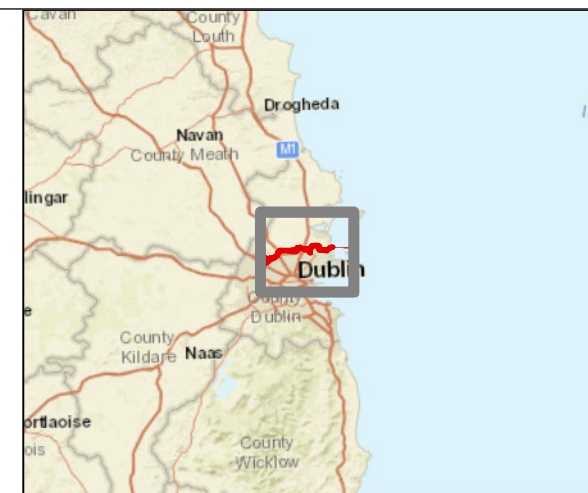
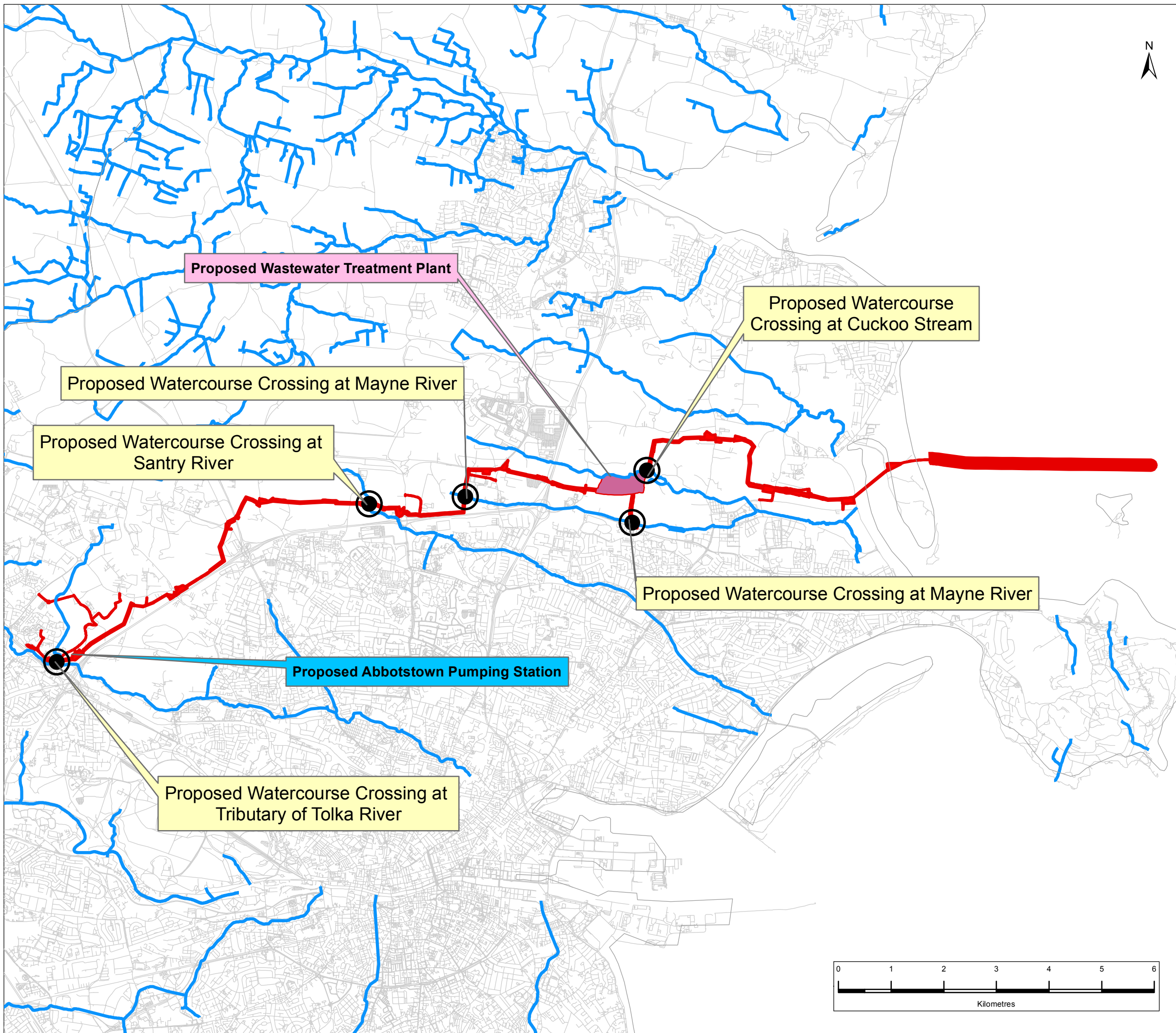
Chemicals will be stored in compliance with the handling instruction, including separation of incompatible chemicals, provision of adequate firefighting, spill containment and other safety facilities. The only bulk storage on board vessels will be the fuel; all other chemicals will be stored in drums or smaller containers and will be suitably banded to contain any leaks or spills.

The Outline CEMP for the Proposed Project will take account of the recommendations of this document to minimise as far as possible the risk of soil, groundwater and surface water contamination.

3. References

- CIRIA (2001). Control of Water Pollution from Construction Sites. CIRIA Technical guidance C532
- CIRIA (2006). Control of Water Pollution from Linear Construction Projects. CIRIA Technical guidance C648
- Fingal County Council (2017). Fingal Development Plan 2017-2023
- Goldman, S. J., Jackson, K., and Bursztynsky, T. A. (1986). Erosion and Sediment Control Handbook
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- Office of Public Works (2009). The Planning System and FRM Guidelines for Planning Authorities
- Transport Infrastructure Ireland (TII, formerly NRA) (2005). Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes
- Transport Infrastructure Ireland (TII, formerly NRA) (2008). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads
- Transport Infrastructure Ireland (TII, formerly NRA) (2013). Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures

Figure 1 –Proposed Watercourse Crossings



- Key**
- Proposed Project Boundary
 - Proposed Watercourse Crossing
 - River

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Rev.	Date	Purpose of revision	RG	SmG	SK	CoK
0	08/06/2018	FINAL				



Client: UISCE
 URBAN WATER

Project: Greater Dublin Drainage Project

Drawing Title: Figure 1 - Proposed Watercourse Crossings

Drawing Status: FINAL

Scale @A3	1:70,000
Jacobs No.	32102902
Filepath	\\002\shared\GIS\Report\11_01_Rain_Drainage.mxd
Drawing No.	32102902-SWMP-1

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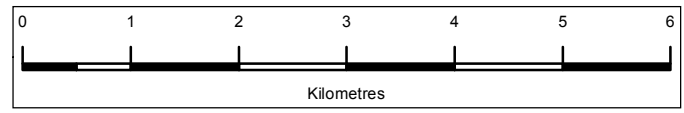
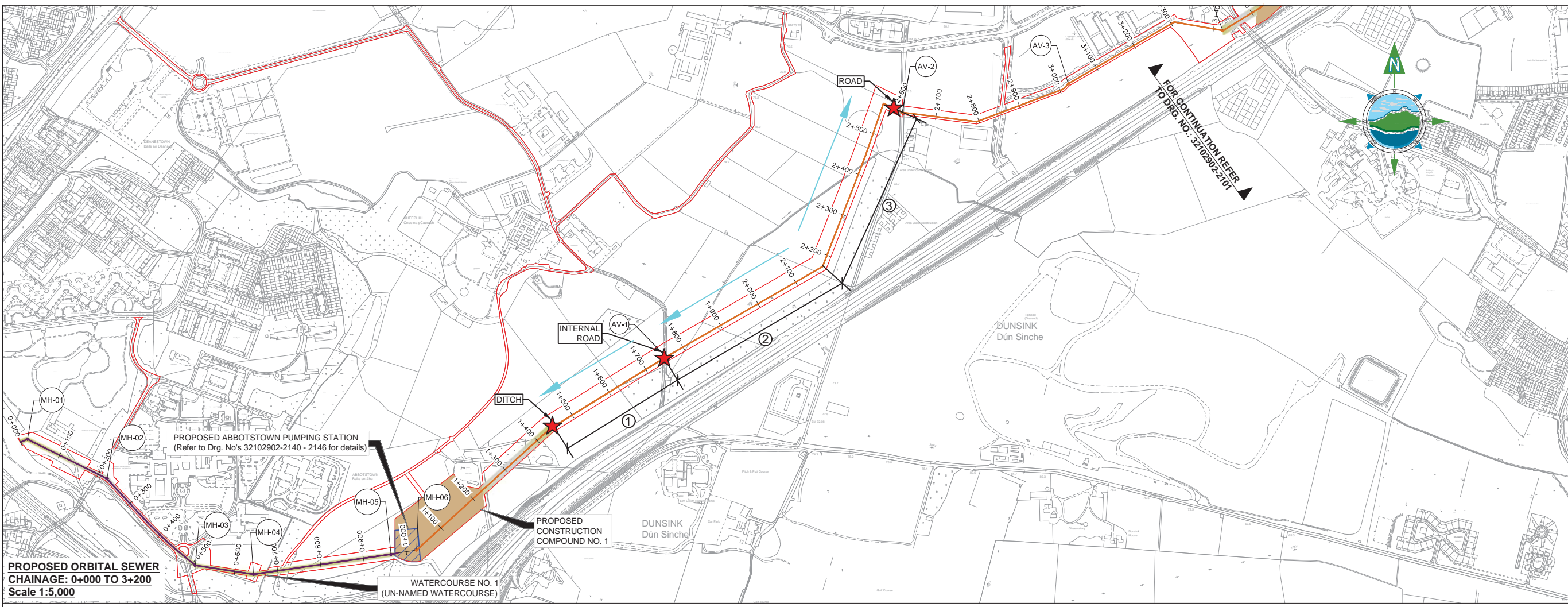


Figure 2 – Pipeline Construction Surface Water Management – Proposed Orbital Sewer and Outfall Pipeline (Land Based) Route



LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- 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 TRENCHLESS SECTION
- MANHOLE
- ACCESS CHAMBER
- AIR VALVE
- SCOUR VALVE
- SURFACE WATER FLOW DIRECTION
- INDICATIVE OUTFALL LOCATION

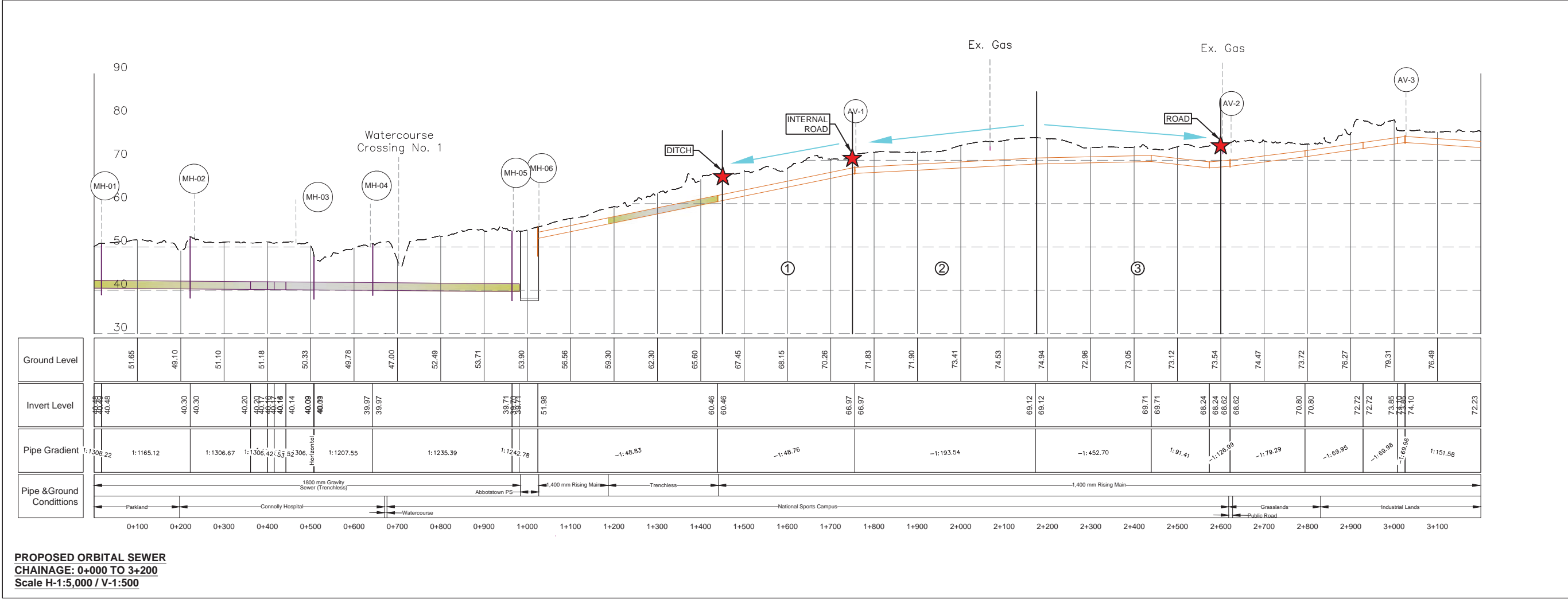
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3062-D, 3063-C, 3063-D, 3064-C, 3064-D, 3130-A, 3130-B, 3130-C, 3130-D, 3131-A.

OSI 1:1,000 Sheet No's:
3063-12, 3063-13, 3063-14, 3063-15, 3064-11, 3064-12, 3129-15, 3129-20, 3129-25, 3130-06, 3130-07, 3130-11, 3130-12, 3130-15, 3130-16, 3130-17, 3130-21, 3130-22, 3131-01, 3131-06, 3131-07.

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 OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
- ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

Rev	Date	Description	By	Chkd.
B	11.06.18	ISSUED FOR REPORT	AOC	BD
A	10.05.18	ISSUED FOR REPORT	AOC	BD



Client:

Project:

Title: FIGURE 2 - OUTLINE SURFACE WATER MANAGEMENT PLAN - PROPOSED ORBITAL SEWER ROUTE (SHEET 1 OF 4)

Scale @ A1: As Shown

Prepared by: A. O'Callaghan B. Downes **Date:** May 2018

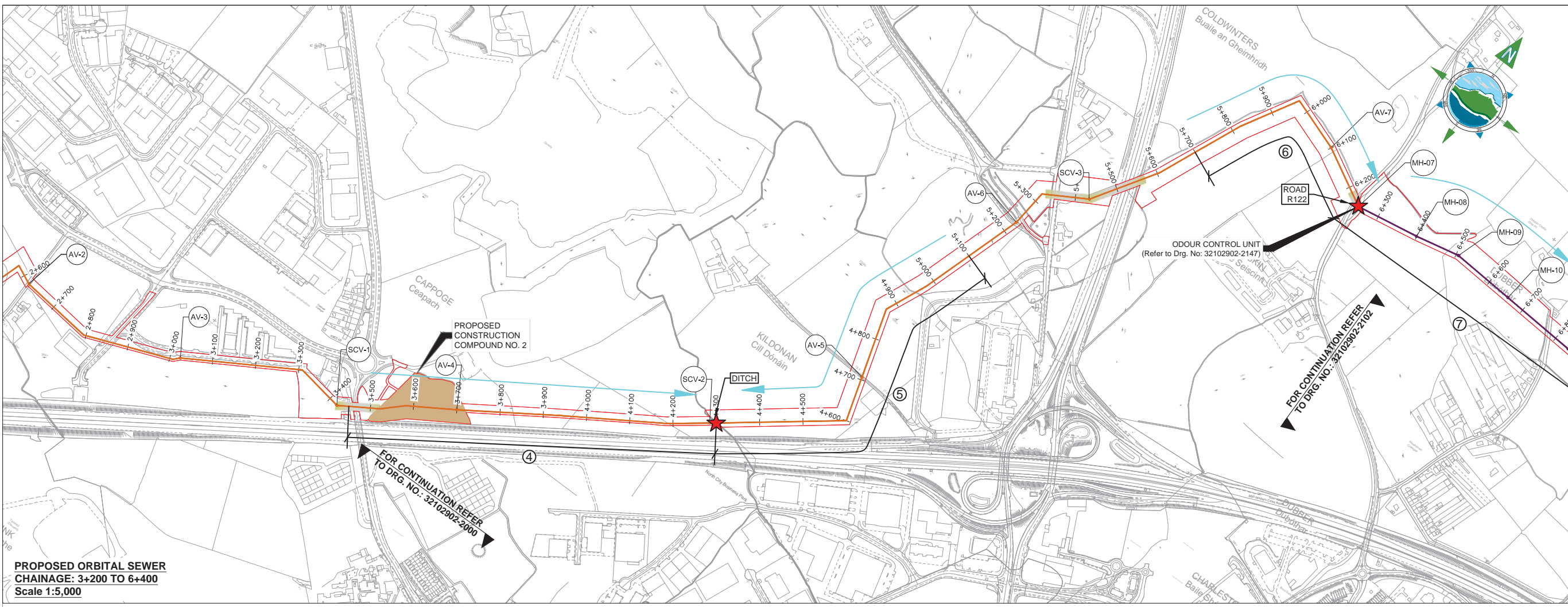
Project Director: C. O'Keefe

Drawing Status: Report

JACOBS TOBIN

Revision: B

Drawing No.: 32102902-SWMP-2(1/6)



- LEGEND:**
- PLANNING BOUNDARY —
 - CONSTRUCTION COMPOUNDS
 - 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 TRENCHLESS SECTION
 - MANHOLE MH-1
 - ACCESS CHAMBER AC-1
 - AIR VALVE AV-1
 - SCOUR VALVE SCV-1
 - SURFACE WATER FLOW DIRECTION →
 - INDICATIVE OUTFALL LOCATION ★

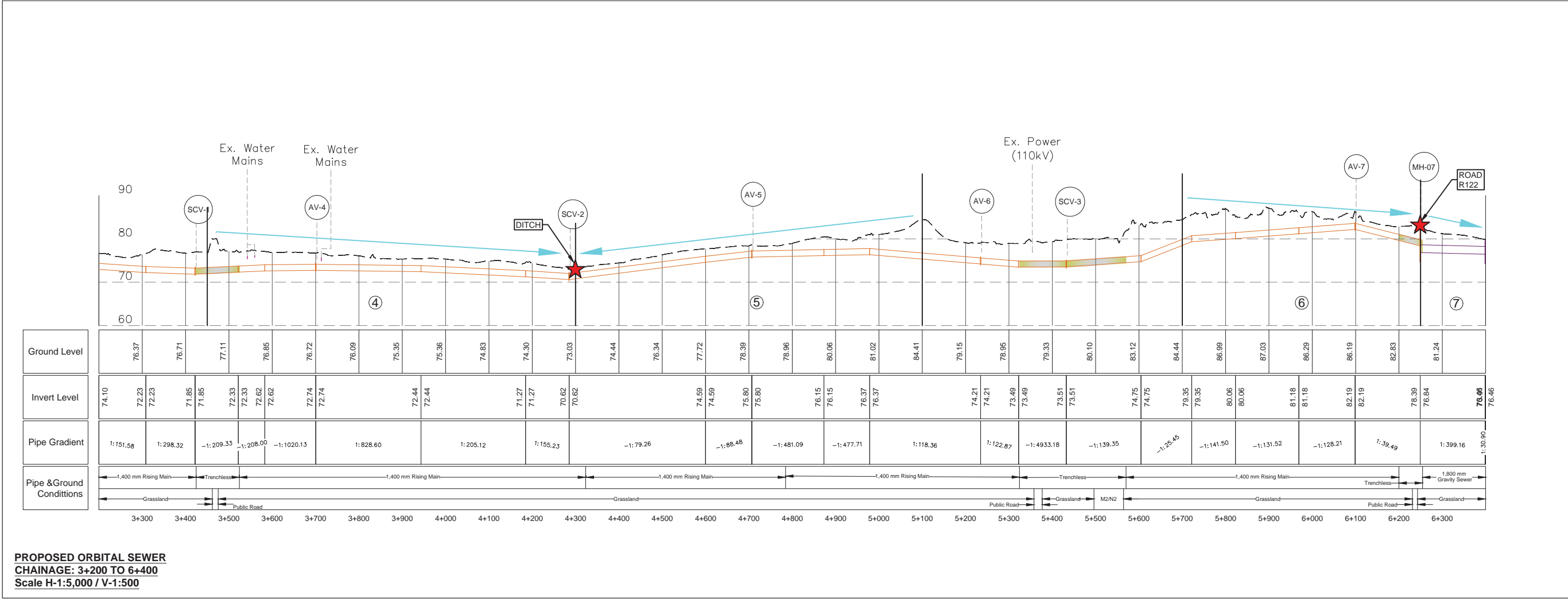
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OSI 1:1,000 Sheet No's:
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PROPOSED ORBITAL SEWER CHAINAGE: 3+200 TO 6+400
Scale 1:5,000

- 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 OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
 - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

Rev	Date	Description	By	Chkd.
B	11.06.18	ISSUED FOR REPORT	AOC	BD
A	10.05.18	ISSUED FOR REPORT	AOC	BD



PROPOSED ORBITAL SEWER CHAINAGE: 3+200 TO 6+400
Scale H-1:5,000 / V-1:500

Client: **UISCE**
 Project: **Greater Dublin Drainage**

Title: **FIGURE 2 - OUTLINE SURFACE WATER MANAGEMENT PLAN - PROPOSED ORBITAL SEWER ROUTE (SHEET 2 OF 4)**

Scale @ A1: **As Shown**

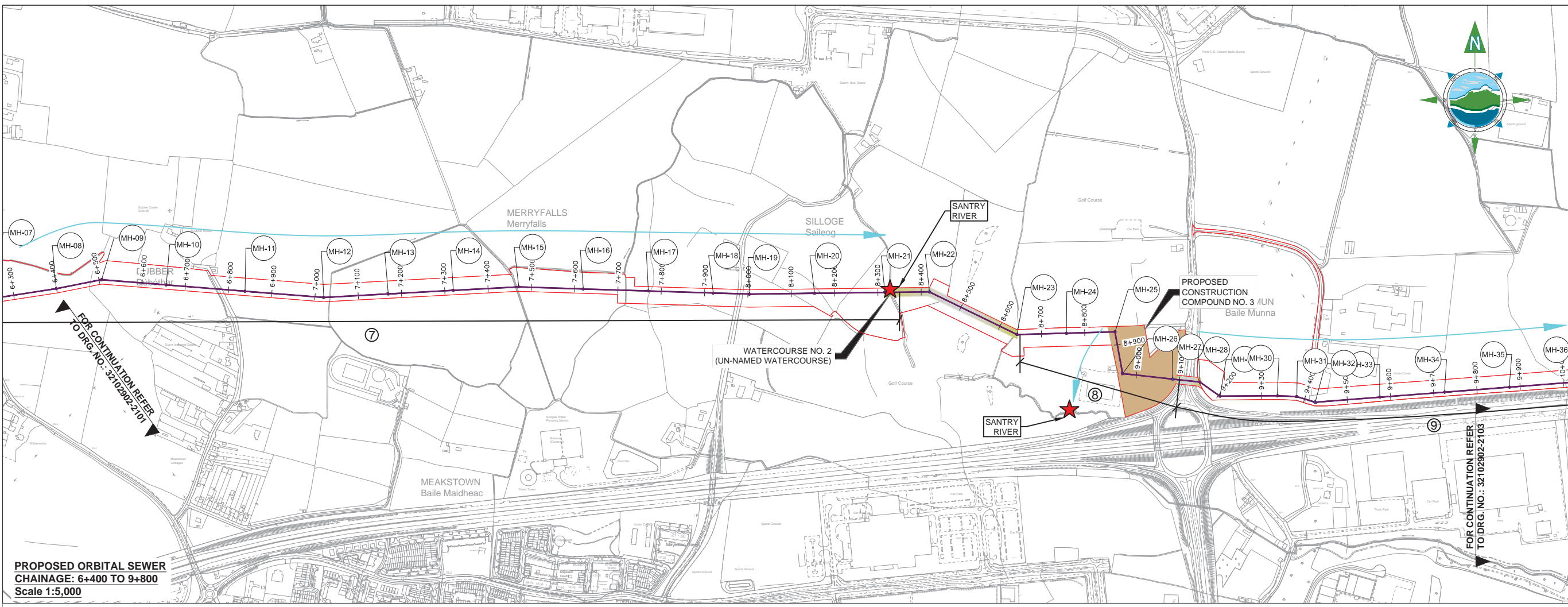
Prepared by: **A. O'Callaghan** Checked by: **B. Downes** Date: **May 2018**

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

Drawing Status: **Report**

JACOBS **TOBIN**

Revision: **B**



LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- 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 TRENCHLESS SECTION
- MANHOLE
- ACCESS CHAMBER
- AIR VALVE
- SCOUR VALVE
- SURFACE WATER FLOW DIRECTION
- INDICATIVE OUTFALL LOCATION

OSI 1:2,500 Sheet No's:
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OSI 1:1,000 Sheet No's:
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NOTES:

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Rev	Date	Description	By	Chkd.
B	11.06.18	ISSUED FOR REPORT	ADC	BD
A	10.05.18	ISSUED FOR REPORT	ADC	BD

Client: **UISCE**
Greater Dublin Drainage

Title: **FIGURE 2 - OUTLINE SURFACE WATER MANAGEMENT PLAN - PROPOSED ORBITAL SEWER ROUTE (SHEET 3 OF 4)**

Scale @ A1: **As Shown**

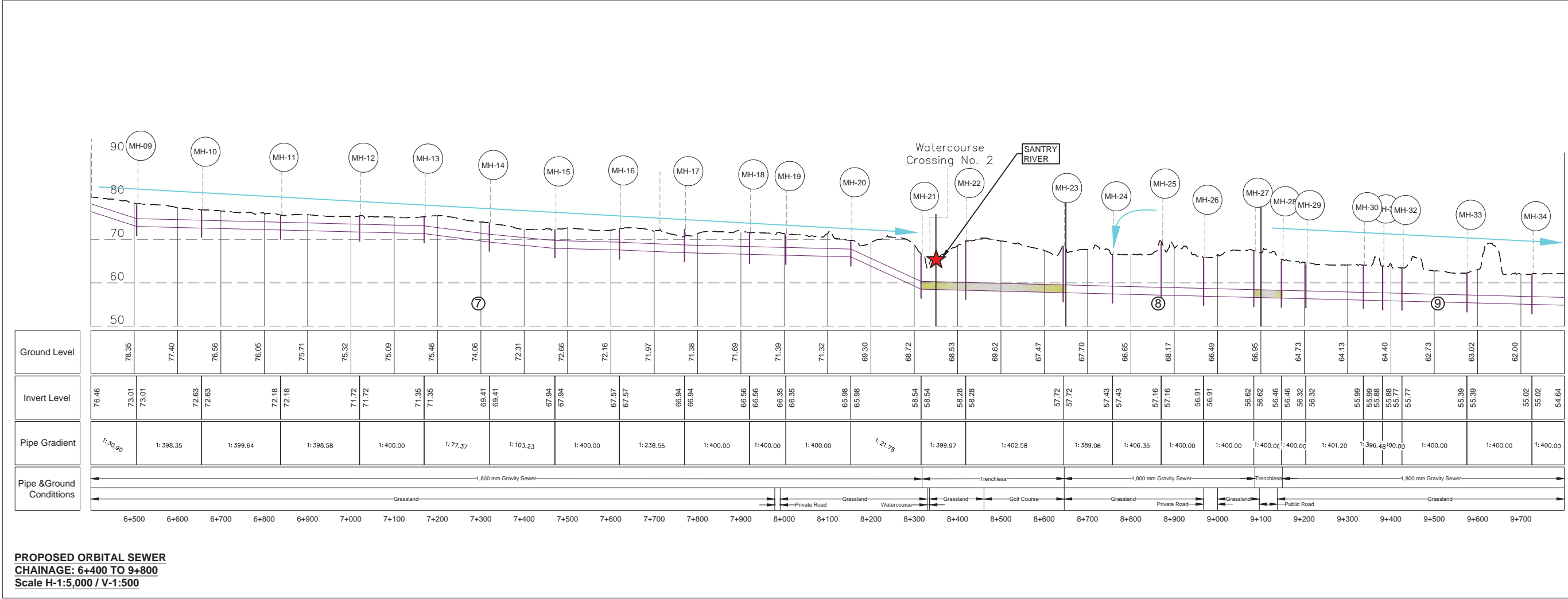
Prepared by: A. O'Callaghan
Checked by: B. Downes
Date: May 2018

Project Director: C. O'Keefe

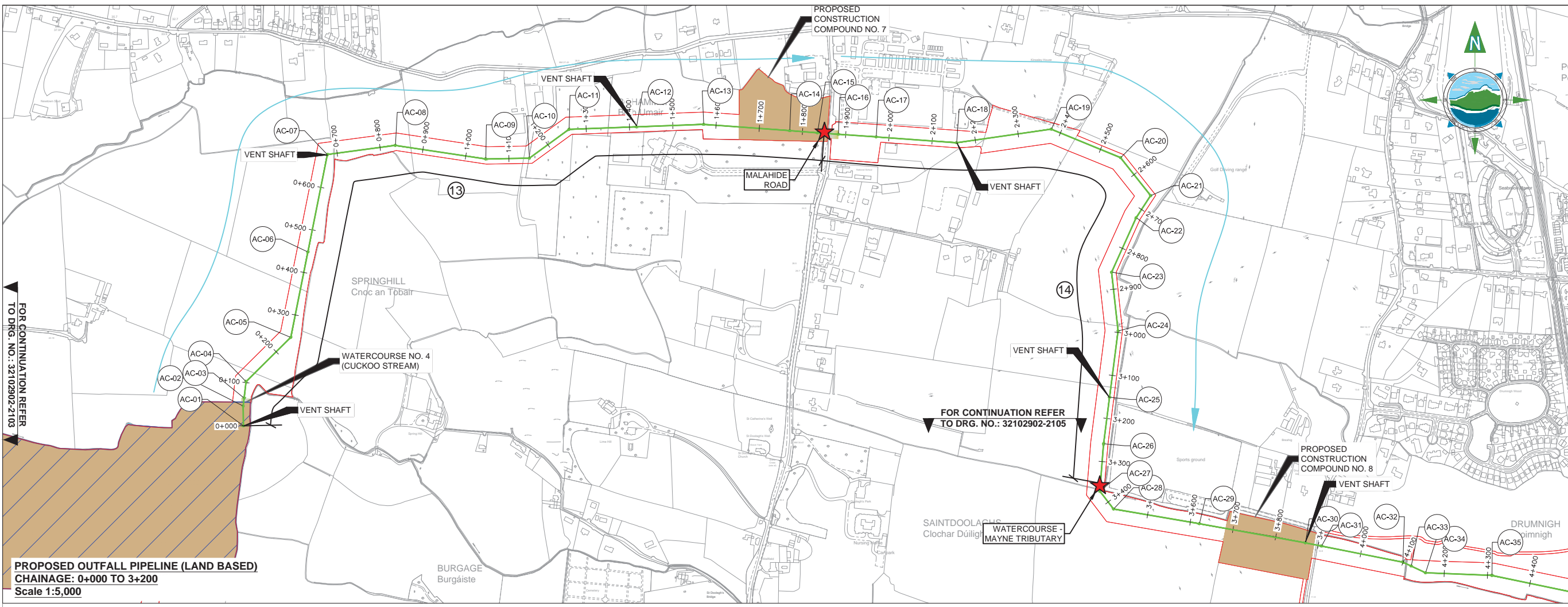
Drawing Status: Report

JACOBS TOBIN

Revision: **B**



PROPOSED ORBITAL SEWER
CHAINAGE: 6+400 TO 9+800
Scale H-1:5,000 / V-1:500

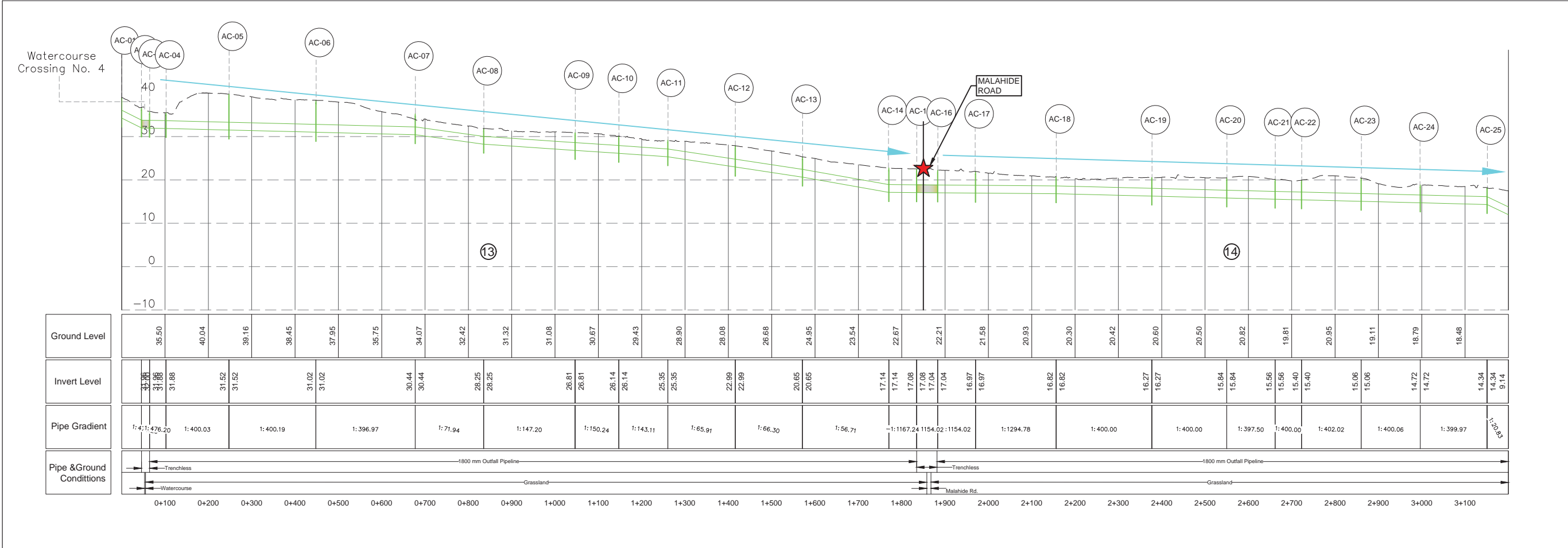


- LEGEND:**
- PLANNING BOUNDARY —
 - CONSTRUCTION COMPOUNDS
 - PROPOSED WWTP/PS
 - PROPOSED ORBITAL SEWER ROUTE (GRAVITY) —
 - PROPOSED ORBITAL SEWER ROUTE (RISING MAIN) —
 - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION) —
 - PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION) —
 - PROPOSED TRENCHLESS SECTION
 - MANHOLE (MH-1)
 - ACCESS CHAMBER (AC-1)
 - AIR VALVE (AV-1)
 - SCOUR VALVE (SCV-1)
 - SURFACE WATER FLOW DIRECTION →
 - INDICATIVE OUTFALL LOCATION ★

OSI 1:2,500 Sheet No's:
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PROPOSED OUTFALL PIPELINE (LAND BASED)
CHAINAGE: 0+000 TO 3+200
Scale 1:5,000



PROPOSED OUTFALL PIPELINE (LAND BASED)
CHAINAGE: 0+000 TO 3+200
Scale H-1:5,000 / V-1:500

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Rev	Date	Description	By	Chkd.
B	11.06.18	ISSUED FOR REPORT	AOC	BD
A	10.05.18	ISSUED FOR REPORT	AOC	BD

Client: **UISCE**
 URBAN WATER

Project: **Greater Dublin Drainage**

Title: **FIGURE 2 - OUTLINE SURFACE WATER MANAGEMENT PLAN - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION) (SHEET 1 OF 2)**

Scale @ A1: **As Shown**

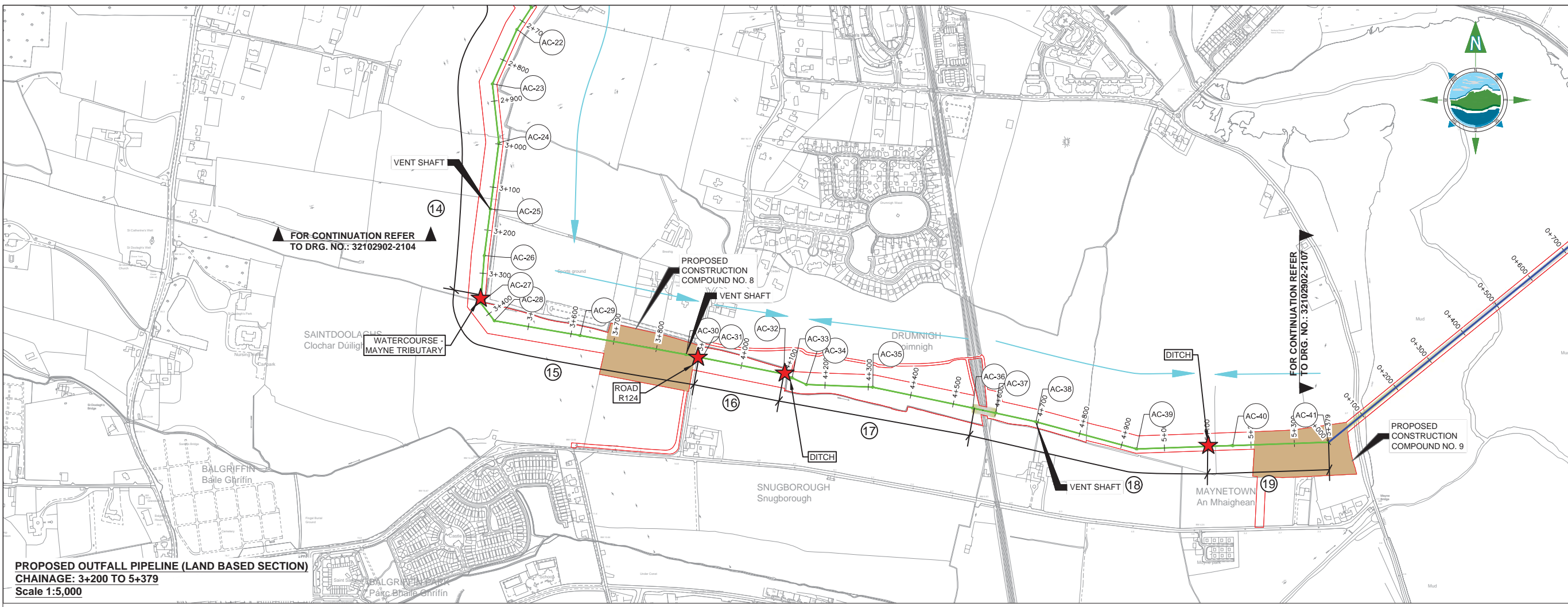
Prepared by: **A. O'Callaghan** Checked: **B. Downes** Date: **May 2018**

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

Drawing Status: **Report**

JACOBS **TOBIN**

Revision: **B**



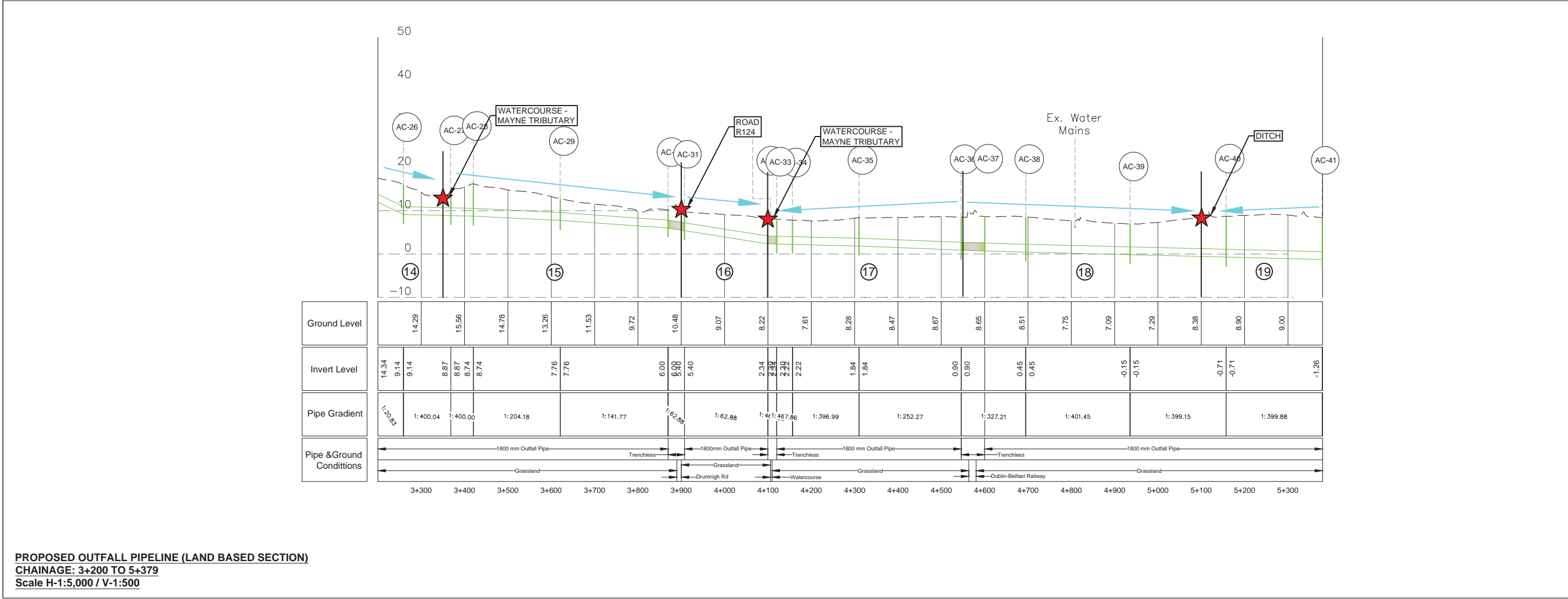
LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- 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 TRENCHLESS SECTION
- MANHOLE
- ACCESS CHAMBER
- AIR VALVE
- SCOUR VALVE
- SURFACE WATER FLOW DIRECTION
- INDICATIVE OUTFALL LOCATION

OSI 1:2,500 Sheet No's:
3062-D, 3063-C, 3063-D, 3064-C, 3064-D, 3130-A, 3130-B, 3130-C, 3130-D, 3131-A

OSI 1:1,000 Sheet No's:
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PROPOSED OUTFALL PIPELINE (LAND BASED SECTION)
CHAINAGE: 3+200 TO 5+379
Scale 1:5,000



PROPOSED OUTFALL PIPELINE (LAND BASED SECTION)
CHAINAGE: 3+200 TO 5+379
Scale H-1:5,000 / V-1:500

NOTES:

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Rev	Date	Description	By	Chkd.
B	11.06.18	ISSUED FOR REPORT	AOC	BD
A	10.05.18	ISSUED FOR REPORT	AOC	BD

Client: **UISCE**
DUBLIN IRISH WATER

Project: **Greater Dublin Drainage**

Title: **FIGURE 2 - OUTLINE SURFACE WATER MANAGEMENT PLAN - PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION) (SHEET 2 OF 2)**

Scale @ A1: **As Shown**

Prepared by: **A. O'Callaghan** Checked: **B. Downes** Date: **May 2018**

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

Drawing Status: **Report**

JACOBS **TOBIN**

Drawing No.: **32102902-SWMP-2(6/6)** Revision: **B**