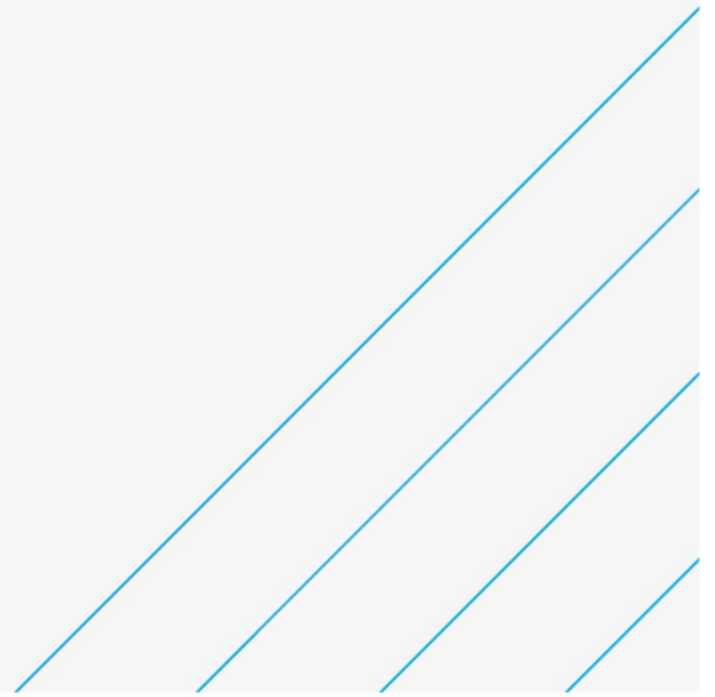


Carrigtwohill URDF Initiative

Appropriate Assessment Screening Report

Cork County Council

May 2023



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1. Introduction

1.1. Background

WS Atkins Ireland Ltd (“Atkins”) was appointed by Cork County Council to prepare, on its behalf, an Appropriate Assessment Screening Report in respect of the proposed Carrigtwohill Urban Regeneration and Development Fund (URDF) – Urban Expansion Area (UEA) Infrastructure Project (“the proposed development”). The proposed development comprises of infrastructure which will facilitate and accelerate future housing delivery in the Carrigtwohill UEA and to support regeneration, compact growth, and sustainable development in Carrigtwohill. The proposed development is not directly connected with or necessary to the management of any designated site for nature conservation.

This report comprises the Appropriate Assessment Screening Report in respect of the proposed development and is intended to assist Cork County Council, in its capacity as the competent authority in this case, by providing it with sufficient evidence to make a properly informed determination as to whether or not Appropriate Assessment under Article 6(3) of the Habitats Directive (92/43/EEC) is required in this case.

1.2. Legislative Context

1.2.1. Natura 2000

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (“the Habitats Directive”) is a legislative instrument of the European Union (EU) which provides legal protection for habitats and species of Community interest. Article 2 of the Directive requires the maintenance or restoration of such habitats and species at a favourable conservation status, while Articles 3 to 9, inclusive, provide for the establishment and conservation of an EU-wide network of special areas of conservation (SACs), known as Natura 2000, which also includes special protection areas (SPAs) designated under Article 4 of Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (“the Birds Directive”). Both SACs and SPAs are commonly referred to as “European sites” or “Natura 2000 sites”.

SACs are selected for natural habitat types listed on Annex I to the Habitats Directive and the habitats of species listed on Annex II to the Habitats Directive. SPAs are selected for species listed on Annex I to the Birds Directive, other regularly occurring migratory species and other species of special conservation interest. The habitats and species for which a Natura 2000 site is selected are referred to as the “qualifying interests” of that site and each is assigned a “conservation objective” aimed at maintaining or restoring its “favourable conservation condition” at the site, which contributes to the maintenance or restoration of its “favourable conservation status” at national and European levels.

1.2.2. Appropriate Assessment

Article 6 of the Habitats Directive deals with the management and protection of Natura 2000 sites. Articles 6(3) and (4) set out the decision-making process, known as “Appropriate Assessment” (AA), for plans or projects in relation to Natura 2000 sites. Article 6(3) states: -

“Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.”

The first sentence of Article 6(3) provides a basis for determining which plans and projects require AA, i.e., those “not directly connected with or necessary to the management of [one or more Natura 2000 sites] but likely to have a significant effect thereon, either individually or in combination with other plans or projects”. In *Waddenzee* (C-127/02), the Court of Justice of the European Union (CJEU) ruled that significant effects must be considered “likely” if “it cannot be excluded, on the basis of objective information”, that they would occur. This clearly sets a

low threshold, such that AA is required wherever there is a reasonable possibility of significant effects on a Natura 2000 site. In the same judgment, the CJEU established that the test of significance relates specifically to the conservation objectives of the site concerned, i.e., “significant effects” are those which, “*in the light, inter alia, of the characteristics and specific environmental conditions of the site*”, could undermine the site’s conservation objectives. In addition to the effects of the plan or project on its own, the combined effects arising from the plan or project under consideration and other plans and projects must also be assessed (see Section 7.1 for more details).

The last part of the first sentence of Article 6(3) defines AA as an assessment of the “*implications [of the plan or project] for the site in view of the site’s conservation objectives*”. In the second sentence, Article 6(3) requires that, prior to agreeing to a plan or project, the competent authority must “ascertain” that “*it will not adversely affect the integrity of the site concerned*”. In *Sweetman v. An Bord Pleanála* (C-258/11), the CJEU ruled that a plan or project “*will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of sites*”. On that basis, EC (2018) described the “integrity of the site” as “*the coherent sum of the site’s ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated*”. As such, the “integrity” of a specific site is defined by its conservation objectives and is “adversely affected” when those objectives are undermined. In *Waddenzee*, the CJEU ruled that the absence of adverse effects can only be ascertained “*where no reasonable scientific doubt remains*”.

The “precautionary principle” applies to all of the legal tests in AA, i.e., in the absence of objective information to demonstrate otherwise, the worst-case scenario is assumed. Where the tests established by Article 6(3) cannot be satisfied, Article 6(4) applies (see explanation in Section 1.3 below).

1.2.3. Competent authority

The requirements of Articles 6(3) and (4) are transposed into Irish law by, inter alia, Part 5 of the European Communities (Birds and Natura Habitats) Regulations, 2011 (as amended) (“the Habitats Regulations”) and Part XAB of the Planning and Development Act, 2000 (as amended) (“the Planning and Development Acts”). As per the second sentence of Article 6(3), it is the “competent national authorities” who are responsible for carrying out AA and, by extension, for determining which plans and projects require AA. The competent authority in each case is the authority responsible for consenting to or licensing a plan or project, e.g., local authorities, An Bord Pleanála, the Environmental Protection Agency (EPA) or a Government Minister. In all cases, it is the competent authority who is ultimately responsible for determining whether or not a plan or project requires AA and for carrying out the AA, where required.

1.3. Appropriate Assessment Process

The AA process can be described as being made up of three distinct stages, as described below, the need to progress to each stage being determined by the outcome of the preceding stage.

Stage 1: Screening – This stage involves a determination by the competent authority as to whether or not a given plan or project required AA. As explained in Section 1.2 above, AA is required in respect of any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but for which the possibility of likely significant effects on one or more Natura 2000 sites cannot be excluded. In *People Over Wind* (C-323/17), the CJEU ruled that measures intended to avoid or minimise harmful effects on a Natura 2000 site cannot be considered in making this determination. Consideration of the potential for in-combination effects is also required at this stage.

Stage 2: Appropriate Assessment – This stage involves a detailed assessment of the implications of the plan or project, individually and in combination with other plans and projects, for the integrity of the Natura 2000 site(s) concerned. This stage also involves the development of appropriate mitigation to address any adverse effects and an assessment of the significance of any residual impacts following the inclusion of mitigation. In *Kelly v. An Bord Pleanála* (IEHC 400), the High Court ruled that a lawful AA must contain complete, precise and definitive findings based on examination and analysis, and conclusions and a final determination based on an evaluation of the findings. In the same judgment, the High Court stressed that, in order for the findings to be complete, precise and definitive, the AA must be carried out in light of best scientific knowledge in the field and cannot have gaps or lacunae. In *Holohan v. An Bord Pleanála* (C-461/17), the CJEU clarified that AA must “*catalogue the entirety of habitat types and species for which a site is protected*” (i.e. the qualifying interests of the site) and

assess the implications of the plan or project for the qualifying interests, both within and outside the site boundaries, and other, non-qualifying interest habitats and species, whether inside or outside the site boundaries, “provided that those implications are liable to affect the conservation objectives of the site”. The proposer of a plan or project requiring AA is furnishes the competent authority with the scientific evidence upon which to base its AA by way of a Natura Impact Statement (NIS) or Natura Impact Report (NIR). If it is not possible to ascertain that the plan or project will not adversely affect one or more Natura 2000 sites, authorisation can only be granted subject to Article 6(4).

Stage 3: Article 6(4) – If a plan or project does not pass the legal test at Stage 2, alternative solutions to achieve its aims must be considered and themselves subject to Article 6(3). If no feasible alternatives exist, authorisation can only be granted where it can be demonstrated that there are imperative reasons of overriding public interest (IROPI) justifying its implementation. Where this is the case, all compensatory measures must be taken to protect the overall coherence of Natura 2000.

The three stages described above are illustrated in Figure 1.1 below.

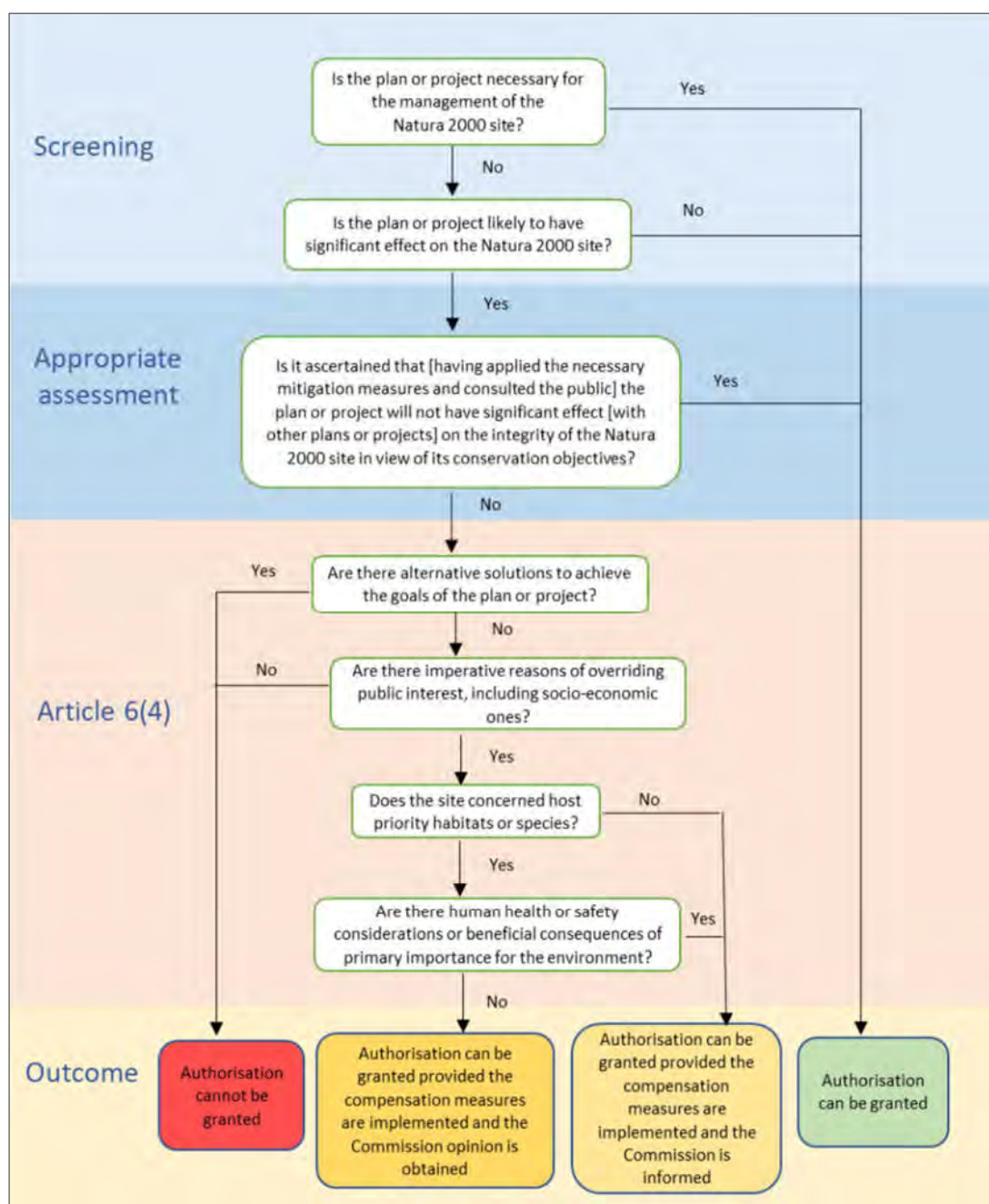


Figure 1.1 Stages of the Appropriate Assessment process (EC, 2021).

2. Methodology

2.1. Sources of Guidance

This report was prepared with due regard to the relevant European and Irish legislation, case law and guidance, including but not limited to: -

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna. *Official Journal of the European Communities* L 206/7-50.
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. *Official Journal of the European Union* L 20/7-25.
- European Communities (Birds and Natural Habitats) Regulations, 2011. *S.I. No. 77/2011* (as amended) (“the Habitats Regulations”).
- Planning and Development Act, 2000. *No. 30 of 2000* (as amended) (“the Planning and Development Acts”).
- National Parks & Wildlife Service: *Development Consultations* webpage (NPWS, 2022b)
- EC (2018) *Managing Natura 2000 sites: The provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC*. European Commission, Brussels.
- EC (2021) *Assessment of plans and projects in relation to Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission, Brussels.
- DEHLG (2010a) *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Revised 11/02/2010*. Department of the Environment, Heritage and Local Government, Dublin.
- DEHLG (2010b) *Circular NPW 1/10 & PSSP 2/10. Dated 11/03/2010*. Department of the Environment, Heritage and Local Government, Dublin.
- NPWS (2012) *Marine Natura Impact Statements in Irish Special Areas of Conservation. A Working Document. April 2012*. National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- OPR (2021) *Appropriate Assessment Screening for Development Management. OPR Practice Note PN01*. Office of the Planning Regulator, Dublin.
- Case law, including *Waddenzee* (C-127/02), *Sweetman v. An Bord Pleanála* (C-258/11), *Kelly v. An Bord Pleanála* (IEHC 400), *Commission v. Germany* (C-142/16), *People Over Wind* (C-323/17), *Holohan v. An Bord Pleanála* (C-461/17), *Eoin Kelly v. An Bord Pleanála* (IEHC 84) and *Heather Hill* (IEHC 450).
- Opinion of Advocate General Kokott on *Eco Advocacy CLG* [2023] CJEU C-721/21.

2.2. Desk Study

Baseline data regarding the receiving environment, including Natura 2000 sites, was gathered through a thorough desk study. The locations and boundaries of Natura 2000 sites in relation to the proposed development were reviewed on the National Parks & Wildlife Service (NPWS) *Designations Viewer* (NPWS, 2022b). Information on the qualifying interests and the structures and functions of the relevant Natura 2000 sites was found in the Site Synopsis, Natura 2000 Standard Data Form, Conservation Objectives and supporting documents for each site. Reporting under Article 17 of the Habitats Directive (NPWS, 2019a-c; ETC/DB, 2022a) and Article 12 of the Birds

Directive (NPWS, 2022c; ETC/BD, 2022b) provided further information on the habitats and species concerned at the national level.

Spatial and other data regarding rivers and other waterbodies were obtained from the Environmental Protection Agency (EPA) using its online facility *EPA Maps: Water* (EPA, 2022). Spatial data for other features of the natural environment were viewed on the *ESM Webtool*. Information relating to recent and historical records of species was obtained from the National Biodiversity Data Centre (NBDC) *Biodiversity Maps* (NBDC, 2022) and via a data request to the NPWS. Irish Wetland Bird Survey (I-WeBS) data for Cork Harbour (0L403) and the Glounthane Estuary/Slatty Water (0L489) subsite were also received for the seasons 2011/12 to 2020/21, inclusive.

2.3. Site Visits

Habitat surveys of the full Carrigtwohill UEA site were carried out by Lesley Lewis of Limosa Environmental in December 2014 and January 2015. These surveys were part of a Preliminary Ecological Appraisal (PEA) of the site to inform the masterplan and identify the need for further specialist surveys for future planning applications. Full details of the methods and results are available in: -

- Limosa (2015) *Preliminary Ecological Appraisal for the Carrigtwohill North Masterplan Site. RP15-GW102-02*. Report by Limosa Environmental.

The main surveys of the UEA were undertaken by Karen Banks of Greenleaf Ecology from 30th June to 3rd July 2020. These surveys included flora and habitat survey and mapping, invasive alien species survey, targeted survey for protected mammals, and breeding bird survey, as well as noting habitat for other mammals, reptiles, amphibians, and invertebrates. These surveys provided the basis for the evaluation of receptors carried out by Greenleaf Ecology. Full details of the methods and results are available in: -

- Greenleaf Ecology (2020a) *Ecological Walkover Survey, Carrigtwohill URDF Initiative, Carrigtwohill, Co. Cork*. Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.

Bat activity transects were undertaken by Karen Banks of Greenleaf Ecology on 21st July and 5th August 2020 and dusk emergence surveys (for bats) were undertaken at structures on 16th, 25th and 27th July 2020 and at trees in the grounds of the Parochial House on 5th August 2020. Full details of the methods and results are available in: -

- Greenleaf Ecology (2020b) *Bat Survey, Carrigtwohill URDF Initiative, Carrigtwohill, Co. Cork*. Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.

Wintering bird surveys covering the proposed development site were undertaken by Tom Gittings during the winter 2022/23 season. Full details of the methods and results are available in: -

- Gittings, T. (2023) *Carrigtwohill Waterbird Survey, November 2022 - February 2023. Report No. 2227-F1, Revision 1, dated 20/03/2023*. Tom Gittings PhD MCIEEM for WS Atkins Ireland Ltd on behalf of Cork County Council.

These reports are included in full in Appendix B-E, respectively.

Additional walkover surveys were carried out by Atkins ecologists Niamh Sweeney in February 2020 Emma Nickelsen in June 2021, and Owen O'Keefe and Caroline Downey on 28th February 2023. The purpose of the first was to identify the need for specialist surveys described above and the purpose of the second and third were to identify any significant changes since the main surveys were undertaken.

The above site visits were conducted following the most appropriate and most recent guidelines available at the time of survey and reporting, including: -

- IEEM (2012) *Guidelines for Preliminary Ecological Appraisal (1st edition)*. Institute of Ecology and Environmental Management.
- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition)*. Bat Conservation Trust, London.

- NRA (2009b) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. National Roads Authority, Dublin.
- Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011) *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.

2.4. Impact Assessment

The assessment detailed in this report was undertaken in the following steps, following the best practice guidance highlighted in Section 2.1 above: -

1. Description of the proposed development, including its location and extent, nature, scale, duration, and potential impacts on the natural environment.
2. Description of baseline conditions in the receiving environment, focussing on habitats, species, ecological corridors, and any known threats, pressures and activities.
3. Establishment of a Zone of Influence, and identification and description of Natura 2000 sites therein.
4. Identification of source-pathway-receptor chains between the proposed development and the qualifying interests of Natura 2000 sites, and evaluation of effects in view of the relevant conservation objectives.
5. Consideration of the potential for significant effects in combination with other plans and projects.
6. Conclusion and recommendation.

Further details of the methodology and the rationale behind it are provided in the relevant sections.

2.5. Statement of Authority

This report has been prepared by Caroline Downey and Owen O'Keefe, and peer-reviewed by Paul O'Donoghue.

Caroline Downey is a Graduate Environmental Consultant holding a BSc (Hons) in Ecology and Environmental Biology from University College Cork. Caroline has worked in ecological consultancy since 2023. The focus of Caroline's work to date has been assisting with the preparation of Ecological Impact Assessments, AA Screening Reports and NIS, as well as assisting with site visits. Caroline collated the information from the previous surveys and reporting and assisted with the 2023 site walkover.

Owen O'Keefe is a Senior Ecologist at Atkins. Owen holds a BSc (Hons) in Ecology from University College Cork (2015) and is a Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). He has 7 years' professional experience in ecological consultancy, specialising river ecosystems and Appropriate Assessment. Owen undertook the 2023 walkover and prepared this report.

Paul O'Donoghue is an Associate Director (Ecology) at Atkins. Paul holds a BSc (Zoology), MSc (Behavioural Ecology) and a PhD in avian ecology and genetics. Paul is a Chartered member of the Society for the Environment (CEnv) and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Paul has over 18 years' experience in ecology; including extensive experience in the preparation of Habitat Directive Assessments/Natura Impact Statements (i.e., Appropriate Assessment under the Habitats Directive). Paul carried out the technical review of this report.

3. Proposed Development

3.1. Overview

With reference to Figure 3.1 below, the infrastructure which makes up the proposed development comprises: -

- A. Western (A1) and Eastern (A2) Services Corridor Link Roads connecting Wise's Road (L3616-0) on the western side of the UEA with Carrigane Road (L3617-25) on the eastern side of the UEA. The roads will also provide connectivity to Station Road (L3603-0), Leamlara Road (L3607-37) and the Ballyadam Road (L7640-0) and includes the realignment of the Carrigane Road near Ballyadam Bridge.
- B. Northern Services Corridor Link Road connecting the Western Services Corridor Link Road with the new Northern Schools Link Road via an existing vehicular underpass below the Cork to Midleton railway line.
- C. Upgrade/ re-alignment of Wises Road (C1) from north of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge (C2) across the railway line providing connectivity to Wises Road south of the railway.
- D. Upgrade/ re-alignment of Station Road (D1) from south of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge (D2) across the railway line providing connectivity to Station Road south of the railway line.
- E. Upgrade/ re-alignment of Leamlara Road from its junction with Station Road to its new western junction with the Eastern Services Corridor Link Road and from north of the UEA to its new eastern junction with the Eastern Services Corridor Link Road.
- F. Upgrade/ re-alignment of Ballyadam Road from its new junction with the Eastern Services Corridor Link Road to the L7639-0 north of the UEA including the permanent closure of the existing Ballyadam Road between the Eastern Services Corridor Link Road and Carrigane Road to vehicular traffic including the junction of the existing Ballyadam Road and Carrigane Road.

The infrastructure will also include shared cycling/pedestrian paths connecting the new road network with the planned Carrigtwohill to Midleton Inter-urban Cycle Route, areas of green open space, underground services including surface water drainage networks including detention ponds and attenuation, foul water networks, electrical and fibre-optic/telecoms ducting and water and gas supply. Services will be connected to existing services/infrastructure in Carrigtwohill as required.

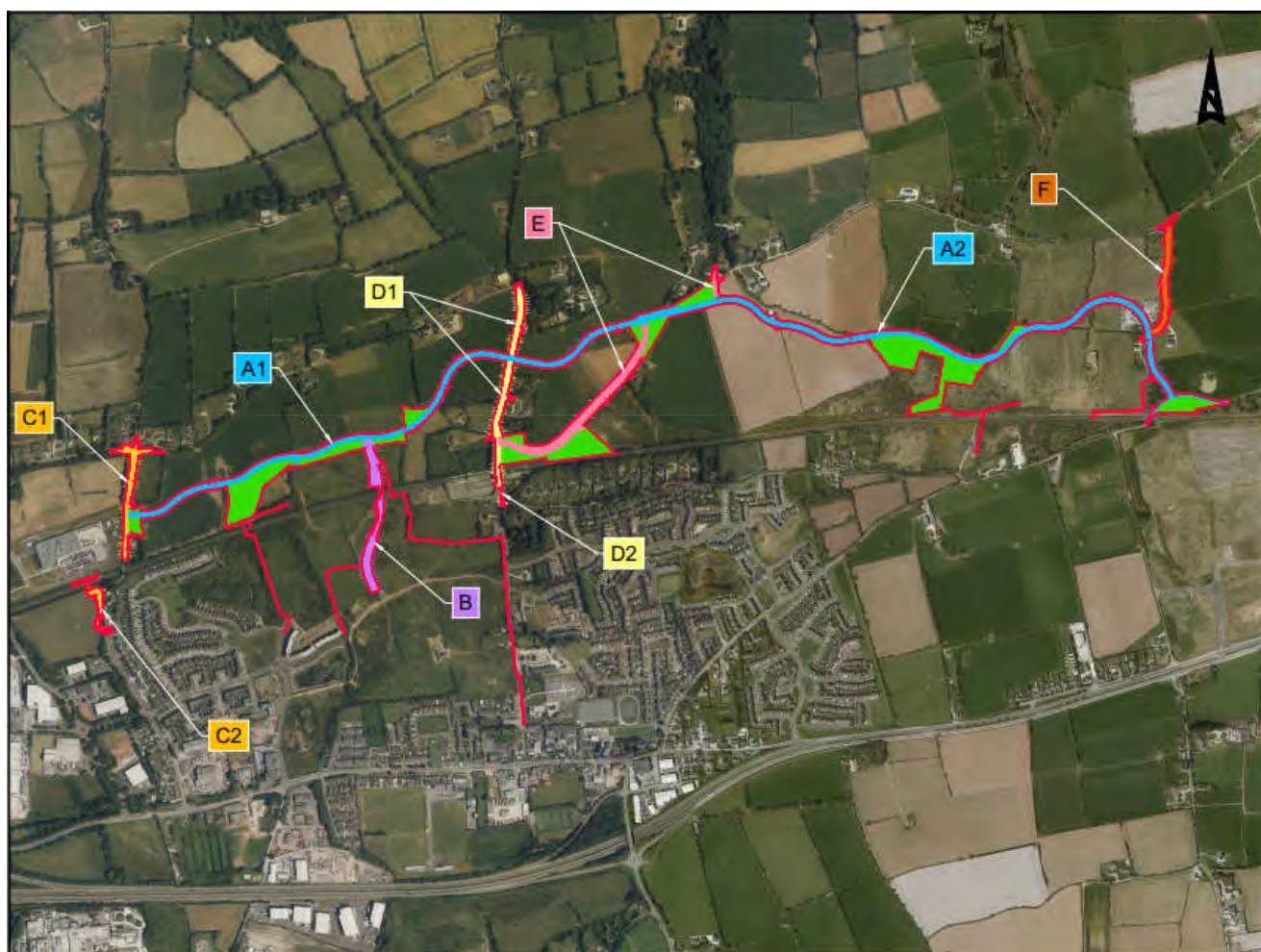


Figure 3.1 Overall layout of the Carrigtwohill URDF Initiative Infrastructure.

3.2. Location and Context

The proposed development is located to the north of the town of Carrigtwohill, Co. Cork. The new Western and Eastern Services Corridor Link Roads connect the existing Wise's Road in the west to the Ballyadam Road in the east, and run to the north of the Cork to Midleton railway line. The new Northern Services Corridor Link Road, upgrades of existing roads and new cycling/pedestrian paths include some sections to the south of the railway line. The location of the proposed development in the context on Carrigtwohill is illustrated in Figure 3-2 below.

The main land use in the vicinity of the proposed development is agriculture (a mixture of arable and pasture). The proposed development does not cross any rivers or streams large enough to be mapped by the EPA, but it does cross a number of drainage ditches and small streams which drain either to the Tibbotstown or Anngrove streams or to karst systems and ultimately to Cork Harbour. The inner parts of Cork Harbour to the north of Great Island are designated as part of the Great Island Channel SAC (site code: 001058) and the Cork Harbour SPA (site code: 004030). These Natura 2000 sites are designated for their intertidal mudflats, saltmarshes, waterbirds, and wetlands.



Figure 3.2 Location of the proposed Carrigtwohill URDF Infrastructure Project.

3.3. Detailed Description

The following detailed description of the proposed development is taken from Section 4 of the *Part 8 Planning Application Report* (Atkins Doc. Ref. 5194601DG0195).

3.3.1. Eastern and Western Services Corridor Link Roads

Overview

The proposed Western and Eastern Services Corridor Link Roads will connect the existing Wisnes Road (L3161-0) on the western side of Carrigtwohill UEA to the existing Carrigane Road (L3617-25) on the eastern side of the UEA. These roads will also have connectivity to Station Road (L3603-0) and Leamlara Road (L3607-37) within the UEA. The aim of these roads is to provide pedestrian, cyclist, and vehicular access to development lands in the Carrigtwohill UEA to facilitate the commencement of development within the UEA. The roads will include all ducts and services to facilitate the future development of housing and associated public infrastructure in the UEA. Water supply and wastewater pipework will also be included within the roads. A segregated cycle track and footpath and bus stops will be provided along both sides of the road. Provision has also been made along the services corridor link roads for from the adjacent lands in the UEA.

Description

Cross-Section

The proposed cross-section of the Services Corridor Link Roads is described in Table 3.1 and a typical section is shown in Figure 3.3.

Table 3.1 Proposed Eastern and Western Services Corridor Link Road cross-section parameters.

Element	Width	Description
Carriageway	6.5m	This is based on a preferred lane width of 3.25 metres as per DMURS guidance.
Verge	2 x 2m	A verge is to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2.0m	Off-road cycle tracks are proposed on both sides of the road behind the verges. This will provide easy access to the cycle track from future residential developments on both sides of the Western / Eastern Link Road without excessive crossing of the road for cyclists.
Footpaths	2 x 2m	Footpaths are proposed outside each of the cycle tracks on both sides of the road. A 1 m wide verge is proposed outside each footpath and stock proof boundary fencing or other required boundary treatment.
Services	-	Below ground services are proposed outside of the carriageway, where possible, for health and safety and ease of maintenance reasons. Any future maintenance should not require lane closures or restrictions due to excavation of the carriageway. Maintenance workers will be able to undertake works on the services away from traffic.

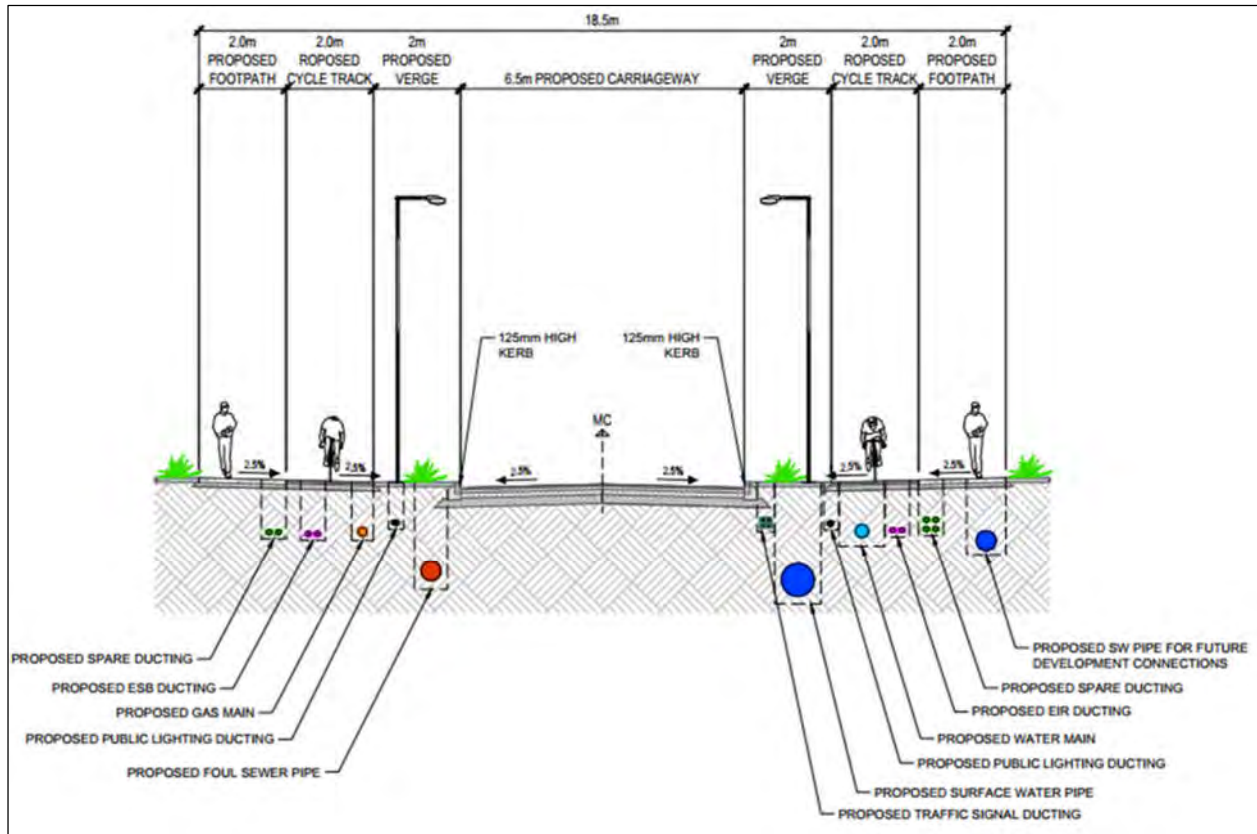


Figure 3.3 Typical Cross-Section of Eastern and Western Services Corridor Link Roads.

Junctions

New main road junctions are proposed along the Western and Eastern Services Corridor Link Road . These are at the roads’ junctions with Wisés Road, the Northern Services Corridor Link Road, Station Road, Leamlara Road (upgraded and existing) and Carrigane Road. These junctions are proposed to be raised tables with traffic signals including crossing facilities for pedestrians and cyclists to prioritise safe pedestrian and cyclist movements over vehicular traffic.

It is proposed that the junctions of minor roads with the Services Corridor Link Road will be priority junctions. Traffic travelling east to west along the Services Corridor Link Road will have priority. Raised table crossing facilities for pedestrians and cyclists will be provided at all minor junctions.

The locations of signalised and priority junctions are shown in drawings 5194601-HTR-UEA-DR-0010 to 0038.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage and Services

Refer to Section 3.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the Services Corridor Link Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths and public spaces. The lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

3.3.2. Northern Services Corridor Link Road

Overview

The Northern Services Corridor Link Road is a proposed road connecting the connecting the Western Services Corridor Link Road with the new Northern Schools Link Road via an existing vehicular underpass below the Cork to Midleton railway line.

The aim of the road is to provide pedestrian, cyclist, and vehicular access to development lands in the Carrigtwohill UEA to facilitate the commencement of development within the UEA. The road will include ducts, services pipework, and the provision of surface water drainage, drinking water pipework and wastewater services pipework.

A segregated pedestrian/cycle track will be provided at the existing underpass. Generally segregated footpaths and cycle tracks will be provided along both sides of the road. At the underpass the footpath and cycle track will join the route of the planned Carrigtwohill to Midleton Inter-urban Cycle Route which is being developed as part of a separate project.

Description

Cross-Section

The proposed cross-section of the Northern Services Corridor Link Road is described in Table 3.2 and a typical section is shown in Figure 3.4.

Table 3.2 Proposed Northern Services Corridor Link Road cross-section parameters.

Element	Width	Description
Carriageway	6.5m generally except at the existing underpass where road width reduces to 5m	This is based on a preferred lane width of 3.25 metres as per DMURS guidance. The road cross-section will reduce to 5 metres at the existing underpass to allow the road to pass through the 6 metre wide clearance of the existing underpass structure.
Verge	2 x 2m minimum	A verge is to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2.0m generally except at the underpass	Off-road cycle tracks are proposed on both sides of the road behind the verges generally except where the road crosses below the railway line.

Element	Width	Description
Footpaths	2 x 2.0m generally except at the underpass	Footpaths are proposed on both sides of the road behind the verges generally except where the road crosses below the railway line. A 1 m wide verge is proposed outside each footpath and stock proof boundary fencing or other required boundary treatment.
Services	-	Below ground services are proposed outside of the carriageway, where possible, for health and safety and ease of maintenance reasons. Any future maintenance should not require lane closures or restrictions due to excavation of the carriageway. Maintenance workers will be able to undertake works on the services away from traffic.

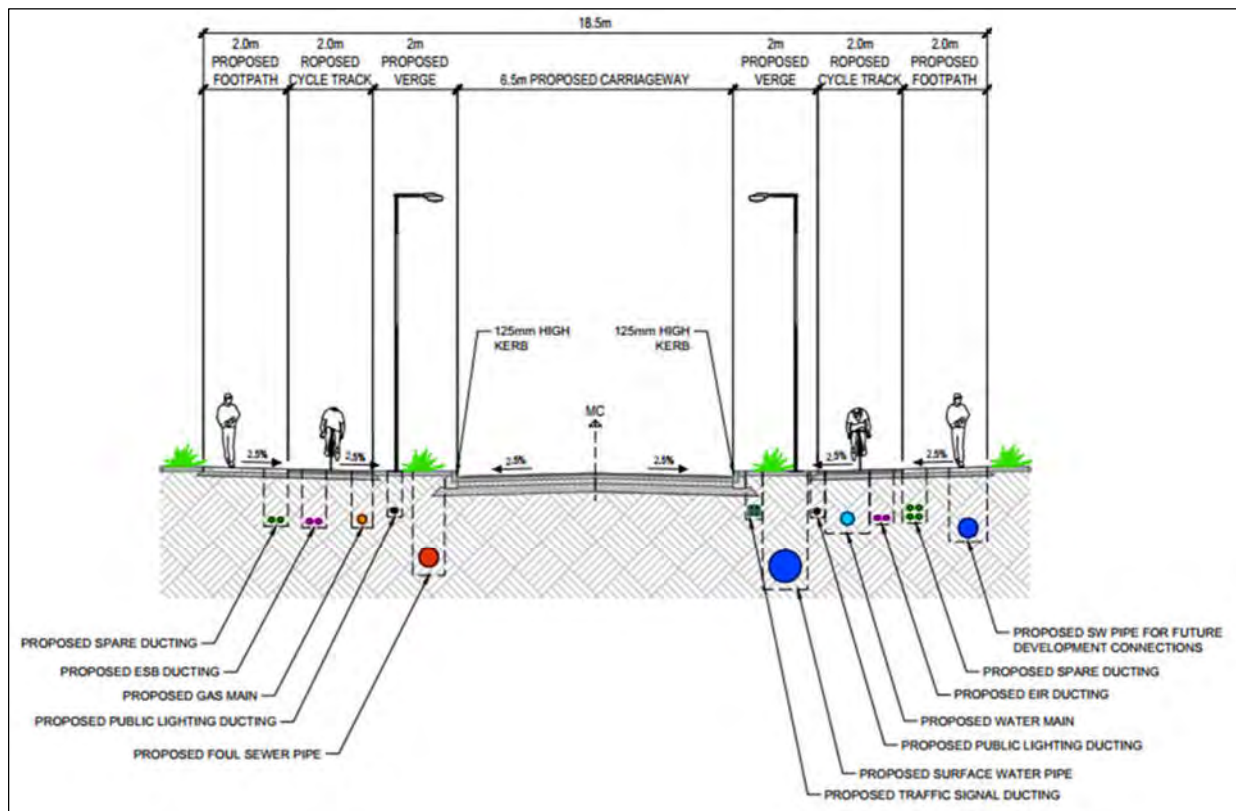


Figure 3.4 Typical Cross-Section of Northern Services Corridor Link Road.

Junctions

Two major junctions along the Northern Services Corridor Link Road junctions are proposed. These are at the roads' northern junction with the Western Services Corridor Link Road and at its southern junction with the new Northern Schools Link Road. The northern junction is proposed to be a raised tables with traffic signals including crossing facilities for pedestrians and cyclists. The southern junction will tie into the existing signalised T-junction which also includes crossing facilities for pedestrians and cyclists.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage and Services

Refer to Section 3.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the proposed upgrade of Main Street and Station Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths, and public spaces. The lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

3.3.3. Upgrade/Re-alignment of Wises Road, Station Road, Leamlara Road and Ballyadam Road

Overview

The upgrade of the above roads is proposed as follows:

- Wises Road from north of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge across the railway line providing connectivity to Wises Road south of the railway line.
- Station Road from south of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge across the railway line providing connectivity to Station Road south of the railway line;.
- Leamlara Road from from its junction with Station Road to its new western junction with the Eastern Services Corridor Link Road and from north of the UEA to its new eastern junction with the Eastern Services Corridor Link Road. It is noted that no works are proposed to the south of the existing Leamlara Road boundary, i.e., the Woodstock Stream side of the road. No works on the south side of this road will extend into the roadside verge, treeline or hedgerow and the existing buffer between the road and the stream will be maintained.
- Ballyadam Road from its new junction with the Eastern Services Corridor Link Road to the L7639-0 north of the UEA including the permanent closure of the existing Ballyadam Road between the Eastern Services Corridor Link Road and Carrigane Road to vehicular traffic including the junction of the existing Ballyadam Road and Carrigane Road.

Description

Cross-Section

The proposed cross-sections for the road upgrades Wises Road, Station Road, Leamlara Road and Ballyadam Road is described in Table 3.3 and a typical section along Wises Road is shown in Figure 3.5.

Table 3.3 Proposed Services Corridor Link Road cross-section parameters.

Element	Width	Description
Carriageway	6m	A 6-metre carriageway is proposed generally. This is within the range noted in DMURS for 'Arterial and Link streets' with low to moderate design speeds.
Verge and Planting	2 x 1m minimum except at pinch points	A verge is generally to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2m generally except for Wises Road	Segregated off-road cycle tracks will be provided on both sides of the upgraded roads generally. On Wises Road there is an existing 3 metre wide shared cycle/ pedestrian path on the western side of the road. This will be retained as part of the proposals with a 2m wide segregated cycle track to be provided on the eastern side of the road from its junction with the Inter-urban cycle route northwards.
Footpath	2 x 2m minimum	Footpaths will be provided on both sides of the upgraded roads generally. As above on Wises Road the 3 metre wide shared cycle/ pedestrian path on the western side of the road will retained as part of the proposals with a 2m wide footpath be provided on the eastern side of the road from its junction with the Inter-urban cycle route northwards. A 0.5m to 1 m wide verge is proposed outside footpaths and stock proof boundary fencing or other required boundary treatment.

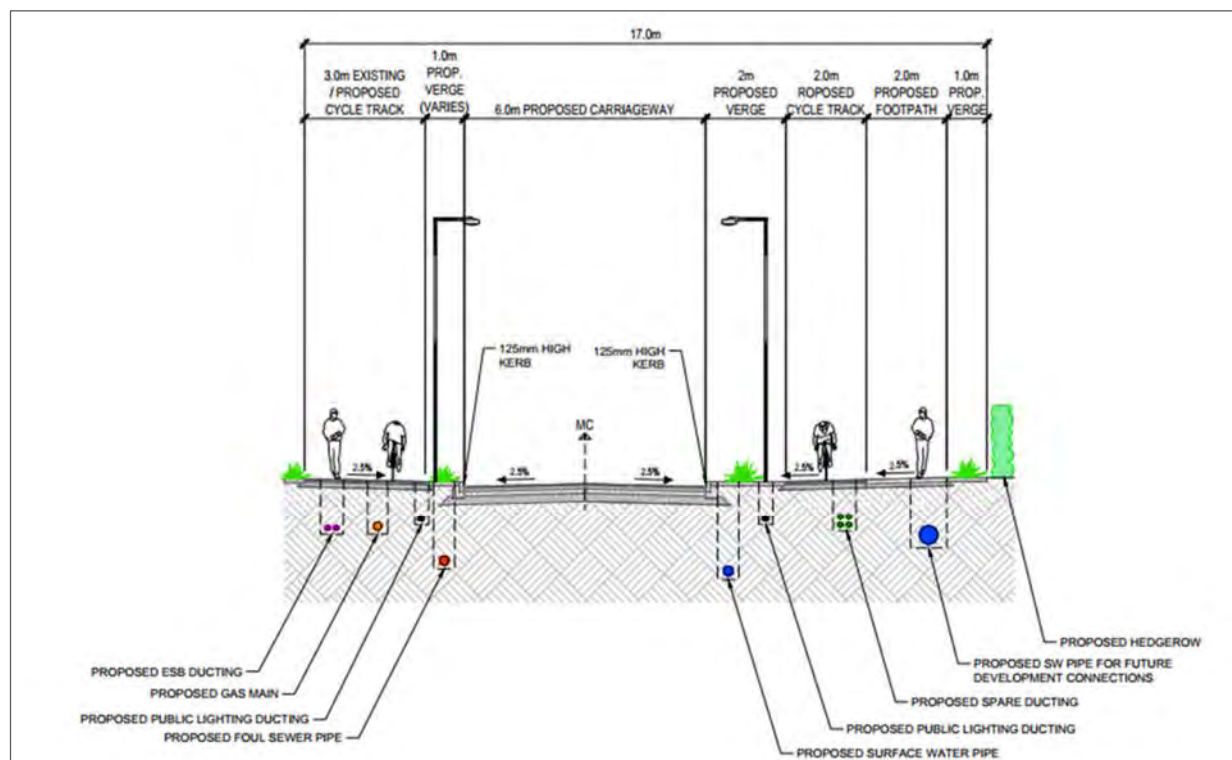


Figure 3.5 Typical Cross-Section of Wises Road upgrade.

Junctions

The following junction are proposed to be signalised junctions with raised tables and crossing facilities for pedestrians and cyclists:

- Wises Road/ L3615-0
- Wises Road/ Western Services Corridor Link Road
- Station Road/ Western Services Corridor Link Road
- Station Road/ Leamlara Road
- Leamlara Road/ Western Services Corridor Link Road
- Leamlara Road/ Eastern Services Corridor Link Road
- Ballyadam Road/ Carrigane Road

It is proposed that the junctions of the above roads with minor roads will be priority junctions with traffic on the minor roads giving way. Raised table crossing facilities for pedestrians and cyclists shall be provided at all minor junctions.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage

Refer to Section 3.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the proposed upgrade of Main Street and Station Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths, and public spaces. The lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

Wises Road Pedestrian/ Cycle Bridge

The proposed additional pedestrian/cycle bridge immediately west of Wises Road Bridge over the railway line will facilitate the connection of the UEA, Wises Road and the existing shared cycle/ pedestrian path in IDA lands across the railway line with the existing pedestrian/ cycling facilities on Wises Road south of the railway line.

The bridge will provide a vertical clearance of 5.3m to the existing track. The maximum horizontal span of the bridge will be 28m. The bridge will be a reinforced concrete structure built on concrete columns. The bridge will be 4m in width between bridge parapets and will run on the western side of the existing bridge. The bridge abutments will be outside the Irish Rail corridor including lands required for proposed dual

tracking of the railway line. The bridge parapets will match the parapets of the existing bridge in terms of height.

Station Road Pedestrian/ Cycle Bridge

The proposed additional pedestrian/cycle bridge immediately east of Barry's Bridge will facilitate the connection of the junction of Station Road/ Leamlara Road (north of the railway line) across the railway with Station Road (south of the railway line). This will provide pedestrian/ cycling connectivity along Station Road between the UEA and the existing settlement located to the south of the railway line.

The bridge will provide a vertical clearance of 5.3m to the existing track. The maximum horizontal span of the bridge will be 25m. The bridge will be a reinforced concrete structure built on concrete columns. The bridge will be 4m in width between bridge parapets and will run on the eastern side of the existing Barry's Bridge. The bridge abutments will be outside the Irish Rail corridor including lands required for proposed dual tracking of the railway line. The bridge parapets will match the parapets of the existing bridge in terms of height and materials.

3.3.4. UEA Community and Open Space Development and Green Infrastructure

Community and Open Space will be provided in the western and eastern UEA comprising of shared cycling/pedestrian paths connecting the new roads, footpaths and cycle tracks with the planned Inter-urban Cycle Route. The Community and Open Space will largely be Passive Open Space.

There is a total of approximately 5.5 hectares of passive green space, located in different areas of the UEA, included in the proposals. This space has been designated as passive to enhance local biodiversity value as appropriate for each area. This will be done through the retention and integration of existing trees and hedgerows, landscaping through the planting of native trees and other suitable plant species and the planting of pollinator friendly species. Planting in each area will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist so that it is most appropriate for the characteristics of that area and to retain connectivity to the wider green infrastructure network.

Surface water detention ponds, stream overflow channels and low lying areas will encourage biodiversity through the creation of new aquatic and wetland habitats. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas. Planting in these areas will also be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas.

Any development on adjacent lands in the future will need to recognise the importance of green infrastructure and particularly the ecological corridor along the road and connectivity to the wider green infrastructure network. Through the planning process and development management adjacent developments will be required by the Local Authority to contribute to this on their lands to be permitted to develop and connect to the road.

3.3.5. Drainage and Services

Surface Water Drainage

A surface water drainage system is proposed to accommodate surface water run-off from the Services Corridor Link Roads and the proposed road upgrades. The proposed system is also designed to accommodate attenuated surface water design flows that would be generated by future UEA development.

The UEA is located within a "Karst" area and the proposed system has been designed to manage the associated risk but also having regard to the potential for nature-based solutions and the objectives within the County Development Plan 2022. While systems of gullies/pipes are proposed in the road pavement for the management of the "Karst" risk, road verges will be used for retention/treatment of surface water run-

off upstream and the attenuation/treatment of the flows downstream is being proposed and managed in open ponds/basins situated within open space area/network.

The overall flow attenuation design approach is based on limiting surface water discharge to greenfield run-off rates, based on QBAR (or mean annual peak flow) from existing permeable areas where this does not require significant diversion of watercourses/removal of hedgerows. The current run-off rates from existing impermeable road areas will also be reduced post-construction. This will result in a reduction in the total discharge rates, and associated impacts, following the construction of the proposed infrastructure to the Woodstock and Poulaniska Streams respectively.

There will be several surface water networks serving infrastructure in the western and eastern UEA as summarised below.

1. In the western UEA the main surface water network will comprise of road gullies, pipes, and manholes within the road corridors of Wises Road, the western Services Corridor Link Road, and the most northern part of Station Road. The run-off will pass through the network into a large detention pond which will remove pollutants and which will provide attenuation. Attenuated flows from the pond will discharge to the existing drainage ditch running along the northern boundary of the Cork to Midleton railway line. The drainage ditch connects to the Woodstock Stream at a location south of the railway line.
2. A drainage network is required for the northern part of the Northern Services Corridor Link Road north of it's crossing of the railway line. This will consist of gullies, pipes, and manholes. The surface water will pass through a by-pass separator and on to an attenuation tank. It will discharge to a new piped crossing of the railway line before discharging to a 600mm diameter sewer which will be extended from an existing 1050mm surface water sewer at the southern end of Station Road to the railway crossing. Discharge will again be limited to greenfield run-off rates (QBAR).
3. A drainage network is required for the lowest part of the Northern Services Corridor Link Road including the northern approach to the underpass below the Cork to Midleton railway line. This will consist of pipes, gullies, channel drains and manholes. The drainage route will run below the route of the Inter-urban Cycle Route as it passes below the Cork to Midleton railway line and below the Northern Services Corridor Link Road south of the railway line. It will then connect to an existing surface water drainage network in Castlflake.
4. A separate drainage network will be provided for the southern part of Station Road, Leamlara Road and the Western Services Corridor Link Road between Station Road and Leamlara Road. This will consist of gullies, pipes, and manholes. The run-off will pass through the network into a detention pond south of Leamlara Road which will remove pollutants and which will provide attenuation. Discharge from the attenuation/ treatment pond will be to Woodstock Stream north of the Cork to Midleton railway line.
5. In the eastern UEA the main surface water network will comprise of road gullies, pipes, and manholes within the corridors of Leamlara Road and the eastern Services Corridor Link Road. The run-off will pass through surface water networks into detention/ treatment ponds which will remove pollutants and which will provide attenuation. Discharge from the ponds will be to the Poulaniska Stream north of the railway line.
6. A separate drainage network will be provided in the eastern UEA for the upgrade of the Ballyadam Road and the Ballyadam Road/ Carrigane Road junction. This network will comprise of road gullies, pipes, and manholes within the road corridors. This network will discharge to an attenuation tank via a by-pass separator which will be used to remove hydrocarbons. Discharge from the tank will be to an existing drainage ditch to the west of Ballyadam Road. This drainage ditch discharges to the Poulaniska Stream north of the railway line.

Nature-based drainage solutions as per '*Nature-based solutions to the Management of Rainwater and Surface Water Runoff – Water Sensitive Urban Design – Best Practice Interim Guidance Document*' will be implemented upstream of the main drainage network during the detailed design. There are generous

verges proposed along the new roads as well as pockets of green open space. They will be used where possible for the planting of trees and low growing planted area which will retain and treat surface water run-off from adjacent hard standing areas before discharge to the downstream drainage network.

Foul Drainage

Two separate foul gravity sewer pipe networks are proposed to facilitate future development in the Carrigtwohill UEA. It is noted that no wastewater flows will be generated as part of the infrastructure development described in this document.

In the western part of the UEA a foul sewer pipeline, comprising of manholes and pipes, will be laid within the upgraded Wises Road and the Western Services Corridor Link Road. The sewer pipeline will connect to an existing sewer pipe crossing of the railway line in the western part of the UEA which was laid during the re-construction of the Midleton to Glounthaune railway line (in 2009) to allow for wastewater connectivity from the UEA to the existing sewer network south of the railway line. South of the railway line crossing the sewer will connect to the existing Irish Water foul sewer. A response to a pre-connection enquiry to Irish Water states that this connection is feasible subject to identified upgrades being implemented.

In the eastern part of the UEA a foul sewer pipeline will be laid within the Eastern Services Corridor Link Road. The sewer pipeline will connect to an existing sewer pipe crossing of the railway line which was laid to allow for wastewater connectivity from the UEA to the existing Irish Water wastewater pumping station (which is located south of the railway line). A response to a pre-connection enquiry to Irish Water states that this connection is feasible subject to identified upgrades being implemented.

Stub pipework will be provided from the proposed foul sewer network along the Services Corridor Link Road and Wises Road to allow for future connections to accommodate development in the UEA. While sufficient flow capacity will be provided in the pipework, any connections will be subject to Irish Water approval.

Other Services

All new roads and road upgrades will also include ducting and services that would be normally required for the commencement of development within the Urban Expansion Area. This will include but not be limited to ESB ducting, Eir ducting, gas mains, water mains, public lighting ducting and Cork County Council spare ducting. All services and ducts will be provided within the new/ upgraded road corridors.

3.3.6. Project Delivery

Project Phasing

The Cork County Development Plan (2022) notes that infrastructure, necessary for housing development to commence within the UEA, will be delivered in two phased bundles namely 'Bundle A' and 'Bundle B' (subject to funding).

Bundle A, construction of which would be estimated to take 18 months, includes: -

- Western Services Corridor Link Road (from Wises Road to Leamlara Road)
- Northern Services Corridor Link Road
- Upgrade of Station Road
- Upgrade of Leamlara Road
- Small Park in western UEA (Community and Open Space development)

- Surface water management and other services e.g., water supply, wastewater etc. for western UEA

The County Development Plan also notes that the early phases of development are also likely to require the modification of Barry's Bridge (Station Road) to provide for cyclists and pedestrians.

The upgrade of Wises Road is included in special development objective CT-U-04 and linked to development in western UEA. The provision of segregated pedestrian/cycle link across the railway at Wises Road is included in Phase 2 of the "Core Off-Site Infrastructure".

Bundle B infrastructure, construction of which is likely to take 12 months, includes: -

- Eastern Services Corridor Link Road
- Small Park in eastern UEA (Community and Open Space development)
- Surface water management and other services e.g., water supply, wastewater etc. for eastern UEA

The upgrade of Ballyadam Road is included in special development objective CT-U-20 and is linked to development in the eastern UEA.

The County Development plan proposes to deliver Bundle A first. It also however notes that the phasing arrangements are flexible and in the event that it proves possible to commence development on the eastern part of the UEA, then Infrastructure Bundle 'B' (together with the measures proposed for Station Road Bridge and Leamlara Road Upgrade) will be required at the outset.

Works Methods

For each phase of infrastructure development, the works will commence with site clearance/ accommodation works. Temporary traffic management including measures for pedestrians and cyclists will be put in place. Pre-construction demolition surveys of buildings/ boundary walls necessary for the construction of the works will be undertaken followed by the demolition of these structures. Trees/vegetation to be retained will be marked/ protected. Natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during the construction of the proposed infrastructure. The site will be cleared of redundant fencing and road signage, street lighting to be replaced and existing vegetation to be removed. Vegetation clearance will be done in the appropriate season, i.e., outside the bird nesting season (1st March to 31st August, inclusive).

Underground utilities which conflict with the main works will be uncovered using mechanical excavators and hand digging. A utility survey, including slit trenches for verification, will be carried out during the detailed design stage to determine the location of services to the most accurate extent possible. Any service diversions or protection works that are required will be commenced at this stage. This will include the diversion of all overhead lines to underground ducts and chambers on Wises Road, Station Road, Leamlara Road and Ballyadam Road as necessary for that phase of development.

The routes of new roads to be constructed (Western/ Eastern and Northern Services Corridor Link Roads) and roads to be upgraded (Wises Road, Station Road, Leamlara Road, Ballyadam Road) will be excavated to formation/ sub-formation level. It is anticipated that generally the maximum excavation depth for the road build up will be 1 metre. Excavations will be undertaken by mechanical means with any spoil arisings to be removed off site or reused locally where testing confirms its suitability. The new roads, cycle tracks and footpaths will then be constructed.

Generally, the roads will have asphalt surfacing with road widths varying by location as outlined earlier in this report. Sub-base and base layers will be compacted stone materials and asphalt layers respectively. Footpaths will be a mixture of concrete and natural stone finishes. The roads and cycle tracks will have asphalt surfacing.

Drainage works will run in tandem with earthworks and road construction. There is a north to south fall across the site and interceptor filter drains will be installed on the northside of the road prior to the earthworks commencing to prevent overland flows from impacting upon the earthworks. These drains will drain to ground directly or to existing drainage ditches/ streams via the detention ponds which are to be excavated as part of the surface water drainage network. Gullies will be connected to a new surface water drainage sewer, consisting of pipes and manholes, to be installed below the new alignment. The maximum anticipated trench excavation depths for the surface water network is 4m. The detention ponds will be an anticipated maximum depth of 2m.

The foul drainage, consisting of a network of manholes and pipes, will be installed at the same time as the surface water drainage network. The drainage will connect to existing foul sewers south of the railway line. Maximum trench excavation depths for the foul water network will be 4 metres. Other services i.e., gas mains, ESB ducting, Eir ducting etc. will also be installed at the same time.

Road crossings of existing field drains and streams will also run in tandem with earthworks. Smaller culverts of field drains will be pipe culverts up to a diameter of 900mm. Culverts of field drains larger than this will be box culverts with the maximum width to be 1500mm. Crossings of the Woodstock Stream will be small bridge crossings with abutments constructed outside of the stream embankments. All culverts, headwalls and bridge beams/ decks will be pre-cast concrete. The bed level of the culverts will meet the requirements of '*Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*'. Where proposed drains cross below watercourses / ditches the methods used to install them will allow for maintaining existing buffer areas where possible.

New road signs, road markings, public lighting columns, traffic signals and bollards will be installed and commissioned where required. Areas of soft landscaping (verges, open space areas) will be top-soiled, seeded and planted following specification by a Landscape Architect working with a suitably qualified and experienced ecologist. Permanent accommodation works will be completed, including the erection of permanent fencing and boundary walls and other required boundary treatments. Temporary traffic management measures will be removed when appropriate.

The new cycle/pedestrian bridges at the existing Barry's and Wise's Bridges will be constructed on piled foundations and will span across the railway. Necessary clearances, protection, and monitoring measures, as required by Irish Rail, will be put in place for the construction of the bridges.

4. Receiving Natural Environment

4.1. Habitats

The dominant Fossitt (2000) habitats within the proposed development boundary and its immediate vicinity are 'Arable crops' (BC1) and 'Improved agricultural grassland' (GA1). A mosaic of 'Dry meadows and grassy verges' (GS2) with 'Wet grassland' (GS4) also occurs frequently. Other grassland habitats such as 'Dry calcareous and neutral grassland' (GS1) and 'Dry meadows and grassy verges' (GS2) also occur. Field and other boundaries comprise 'Hedgerows' (WL1) and 'Treelines' (WL2), 'Earth banks' (BL2) and 'Stone walls and other stonework' (BL1), 'Drainage ditches' (FW4), often co-occurring.

Closer to the urban areas of Carrigtwohill, i.e., south of the proposed Western and Eastern Services Corridor Link Road, habitats such as 'Recolonising bare ground' (ED3) and 'Amenity grassland (improved)' (GA2) are more common. Houses and other buildings with their gardens and landscaped areas are classed as a mosaic of 'Buildings and artificial surfaces' (BL3) with 'Amenity grassland (improved)' (GA2).

Other habitats occurring in the immediate vicinity of the proposed development, albeit in small quantities, include 'Scrub' (WS1) and 'Wet grassland' (GS4).

Natural habitat types listed on Annex I to the Habitats Directive ("Annex I habitats")¹ which may occur within or near the proposed development boundary include 'Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation' (3260), which is likely present in small streams and also larger channels further downstream, and 'Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites)' (6210), which may occur in some of the grasslands, particularly the 'Dry calcareous and neutral grassland' (GS1).

Downstream of the proposed development, additional habitats present in Cork Harbour include a range of coastal habitats, such as upper and lower saltmarshes (including Annex I 'Atlantic salt meadows (*Glaucopuccinellietalia maritimae*)' (1330)), hard- and soft-substrate intertidal habitats (e.g., sheltered rocky shores and mudflats, including Annex I 'Mudflats and sandflats not covered by seawater at low tide' (1140)), aquatic habitats of varying salinities.

4.2. Threatened and Protected Species

4.2.1. Flora

There are no species protected under the Flora (Protection) Order, 2022 recorded within or immediately adjacent to the boundary of the proposed project. Round-leaved Crane's-bill (*Geranium rotundifolium*) has been recorded as recently as 2020 within a grassy verge in the IDA Business Park, south of the roundabout. This plant is listed as 'Least Concern' in *Ireland Red List No. 10: Vascular Plants* (Wyse Jackson *et al.*, 2016). Bee orchid (*Ophrys apifera*), also listed as 'Least Concern' in Wyse Jackson *et al.* (2016), has been recorded south of Carrigtwohill's main street in the vicinity of the GAA pitches.

4.2.2. Fauna

Bats

All microbats (Microchiroptera) are listed on Annex IV to the Habitats Directive. All of the bat species recorded in Ireland (including 9 No. resident species and 2 No. vagrants) belong to this group. As such, they are all afforded strict protection under Article 12 of the Directive, as transposed by Section 51 of the Habitats Regulations. In addition, all resident bat species are protected under the Wildlife Act, 1976 (as

¹ Annex I habitat types marked with an asterisk (*) are "priority habitat types", i.e., natural habitat types in danger of disappearing and for the conservation of which the EU has a particular responsibility given the proportion of their natural ranges falling within the European territory of Member States.

amended) and listed as Least Ireland Red List No. 12: Terrestrial Mammals (Marnell *et al.*, 2019).² There are no European sites designated for bats in the vicinity of the proposed development.³

A number of bat species have been recorded within the vicinity of the proposed development, including Leisler's Bat (*Nyctalus leisleri*), Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Brown Long-eared Bat (*Plecotus auritus*) and Daubenton's Bat (*Myotis daubentonii*). Bats are likely to use the landscape within and near the proposed development for commuting and foraging. Mature trees with cracks and crevices, and old or derelict buildings, may provide roost features.

Otter

Otter (*Lutra lutra*) is listed as Least Concern in Marnell *et al.* (2019), but is protected under the Wildlife Act, 1976 (as amended) and is also listed on Annex IV to the Habitats Directive. As such, it is afforded strict protection under Article 12 of the Directive, as transposed into Irish law by Section 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) ("the Habitats Regulations"). There are no European sites designated for Otter in the vicinity of the proposed development.⁴

Numerous broadscale records (10km grid square) for Otter exist in the vicinity of the proposed development on NBDC (2022). The nearest precise records for Otter are from the Tibbotstown Reservoir, the Slatty Bridge, and the River Owenacurra. Given the size of the watercourses in the vicinity of the proposed development and their distance from larger streams and rivers, they are considered unlikely to support otters.

Badger and Other Mammals

Badger (*Meles meles*) is protected under the Wildlife Act, 1976 (as amended) and listed as Least Concern in Marnell *et al.* (2019). This species been recorded at multiple locations along the N25, between Carrigtwohill and Midleton, and the proposed development site and surrounding landscape provides suitable habitat for foraging and, to a lesser extent, badger setts. Therefore, there is potential for Badger to occur within the proposed development boundary.

Other mammals potentially present within or in close proximity to the development boundary include Irish Hare (*Lepus timidus hibernicus*), Red Fox (*Vulpes vulpes*), Hedgehog (*Erinaceus europaeus*), Irish Stoat (*Mustela erminea hibernica*) and Rabbit (*Oryctolagus cuniculus*). Deer species are also likely to occur.

Birds

Waterbirds are discussed under Section 4.6, below. Other species of concern in relation to road projects in rural areas include Barn Owl (*Tyto alba*). There is one record of a single roosting Barn Owl approximately 1km north of the proposed development from summer 2021 (Anon, *pers. comm.*). There is potential for Barn Owl to roost and forage within the proposed development boundary. After a period of decline Barn Owl numbers are showing sign of recovery, linked in part to the presence of the invasive small mammal, Greater white-toothed shrew (*Crocidura russula*).

Amphibians and Reptiles

There are records for Common Frog (*Rana temporaria*) along a road between the N25 and Carrigane Road, east of the proposed development, and along Station Road. Drainage ditches, wet grasslands/freshwater marshes and standing water within and in close proximity to the proposed development have the potential to support Common Frog and Smooth Newt (*Lissotriton vulgaris*).

² The two vagrant species, namely Greater Horseshoe Bat (*Rhinolophus ferrumequinum*) and Brandt's Bat (*Myotis brandtii*), are both listed as 'Not Assessed' (NA) in Marnell *et al.* (2019).

³ One Irish bat species, namely Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is listed on Annex II to the Habitats Directive, requiring the designation of Special Areas of Conservation for this species.

⁴ Otter is listed on Annex II to the Habitats Directive, requiring the designation of Special Areas of Conservation for this species.

Agricultural field boundaries with stone walls also have the potential to provide hibernacula for frogs, newts, and Viviparous Lizard (*Zootoca vivipara*).

4.2.3. Fisheries

The watercourses within the Tibbotstown sub-catchment have not been evaluated for water quality. Thus, their potential to support a diverse aquatic community is unknown. However, this may be limited by the scale of these streams within the catchment. There are no records for European Eel (*Anguilla anguilla*), River/Brook (*Lampetra* sp.) or salmonids in any of the streams which intersect the study area.

The Slatty Water has an ecological fish status of Moderate, with records of fish including Cod (*Gadus morhua*), European Eel, European Seabass (*Dicentrarchus labrax*), Five-bearded Rockling (*Ciliata mustela*), Flounder (*Platichthys flesus*), Greater Pipefish (*Syngnathus acus*), Sand Goby (*Pomatoschistus minutus*), Sand Smelt (*Atherina presbyter*), Sprat (*Sprattus sprattus*) and Two-spot Goby (*Gobiusculus flavescens*) recorded by IFI in 2010 (Kelly *et al.*, 2010).

4.3. Invasive Alien Species

Invasive alien plant species (IAPS) recorded during the surveys for the Carrigtwohill to Midleton Inter-urban Cycleway Phase 1 (Atkins, 2021b) were Himalayan Balsam (*Impatiens glandulifera*), Japanese Knotweed (*Fallopia japonica*), Cherry Laurel (*Prunus laurocerasus*), Butterfly Bush (*Buddleja davidii*), Himalayan Honeysuckle (*Leycesteria formosa*) and Winter Heliotrope (*Petasites fragrans*). Himalayan Balsam, Japanese Knotweed and Cherry Laurel are all 'High-impact' species (O'Flynn *et al.*, 2014), while Butterfly Bush and Himalayan Honeysuckle are 'Medium-impact'.

4.4. Ecological Corridors

Ecological corridors provide links between areas of higher biodiversity value in the wider landscape. These often comprise linear landscape features/semi-natural habitats. In the vicinity of the proposed development, ecological corridors include both aquatic features, e.g., small streams and drainage ditches, and terrestrial features, e.g., hedgerows, treelines and linear woodlands. These features provide connectivity from the proposed development site to areas such as Cork Harbour and nearby rivers and woodlands.

4.5. Threats, Pressures and Activities

The main threats, pressures and activities which impact negatively on the receiving natural environment in the vicinity of the proposed development include those related to continued urban expansion and population growth in Carrigtwohill, Midleton and other settlements in the vicinity of Cork Harbour. These include habitat loss and fragmentation, noise and visual disturbance, pollution from construction, water quality impacts from increased effluent discharge, and the introduction and spread of invasive alien species (both terrestrial and aquatic).

4.6. Waterbirds Survey Results (2022-2023)

4.6.1. Background

Dr. Tom Gittings (TG) was commissioned to undertake a waterbird survey of the Carrigtwohill Urban Regeneration and Development Fund (URDF) Initiative lands between November 2022 and March 2023. The survey was commissioned by Atkins on behalf of Cork County Council. The objective of the survey was to assess the usage of the Carrigtwohill URDF Initiative lands by field-feeding waterbirds. The following information is extracted from his report, which is also included in full in Appendix E to this Report.

The survey included three components: -

- Surveys of the Carrigtwohill URDF Initiative lands.
- Surveys of known areas for field-feeding waterbirds around the Glounthaune Estuary / Slatty Water.
- Surveys of the Brown Island North Curlew nocturnal roost, which is used by field-feeding Curlews.

The survey areas are shown in Figure 4-1. The Carrigtwohill URDF Initiative survey area comprised the mapped extent of the Carrigtwohill URDF Initiative lands. The area was not divided into sectors; instead, birds were simply recorded at the exact locations of any waterbird observations. The Glounthaune Estuary / Slatty Water survey area comprised areas containing field habitats that Dr. Gittings also counts as part of the I-WeBS counts of the Glounthaune Estuary / Slatty Water subsite (on behalf of BirdWatch Ireland). It also included an area of fields around Barryscourt Castle that are not included in the Glounthaune Estuary / Slatty Water subsite, but where he has previously observed large flocks of field-feeding waders. This survey area was divided into sectors corresponding to those used for other counts of the Glounthaune Estuary / Slatty Water undertaken by Dr. Gittings.

The Brown Island North survey area comprised the saltmarsh island to the east of Harper's Island and to the north of the N25 that regularly holds a nocturnal Curlew roost. The vantage point that I used for this survey area also covered Harper's Island Wetlands, which can hold part, or all, of the Curlew roost on evening high tides. Any roosting Curlew counted in Harper's Island Wetlands during the roost counts are included in the totals for the Brown Island North roost. On some dates I also checked the upper section of Slatty Water and the southern side of Harper's Island, which can also hold the Curlew roost on evening low tides.

Survey dates are presented in full in Table 2.1, Appendix D. The high tide, low tide and sunset times on each survey date are shown in Table 2.2. Appendix E.

The survey dates were chosen so that the surveys of the Carrigtwohill URDF Initiative lands represented a range of tidal conditions, in case the incidence of field-feeding was influenced by the tide. The counts of the Brown Island North roost were carried out around sunset, with the final counts around 10-30 minutes after sunset, depending on the visibility.

4.6.2. Survey Methods

TG carried out the survey from suitable vantage points on the public roads around the survey area. On all but the first survey, TG also took the train between Midleton and Glounthaune before, or after, the survey, which provided views of some fields in the Carrigtwohill URDF Initiative lands next to the railway that had limited visibility from the roads. On each survey, TG recorded all observations of waterbirds and raptors in field habitats in the Carrigtwohill URDF Initiative and Glounthaune Estuary / Slatty Water survey areas. The Glounthaune Estuary / Slatty Water survey area included some sectors with mixture of field and wetland habitat (HIW, LIEF and SP); in these sectors, TG only counted waterbirds in the field sections.

During the Brown Island North roost counts, TG carried out repeat counts of the roosting Curlew at 10-15 minute intervals.

The time of each observation was recorded and the behaviour of the birds was classified using the categories in Table 4.1 (copy of Table 2.3, Appendix E). The the locations of all the flocks of field-feeding waterbirds that were recorded were also mapped.

Table 4.1 Behavioural categories used for waterbird survey.

Category	Behaviour
F	Feeding
R	Non-feeding behaviour, excluding Y1, Y2 and H categories
Y1	Flying bird that is using the sector: e.g., a bird that was present in the site, but flew off before its behaviour could be categorised
Y2	Flying bird that is not using the sector: e.g., a bird commuting across the sector
H	Bird flushed by the observer before its behaviour was categorised

4.6.3. Results

Habitats

The main field-feeding waterbird species likely to occur in this area favour large open fields of improved grassland. This habitat occurred in the central-eastern section of the Carrigtwohill URDF Initiative lands (Map 3.1). At the eastern end of this section there were some smaller fields of improved grassland enclosed by tall hedges / treelines. The easternmost and most of the western sections of the UEA lands were occupied by arable land. In the eastern section, rough grassland occurred along the railway line. In the western section there was a field with pools of flood water next to the railway line, and another field of Juncus-dominated wet grassland next to it.

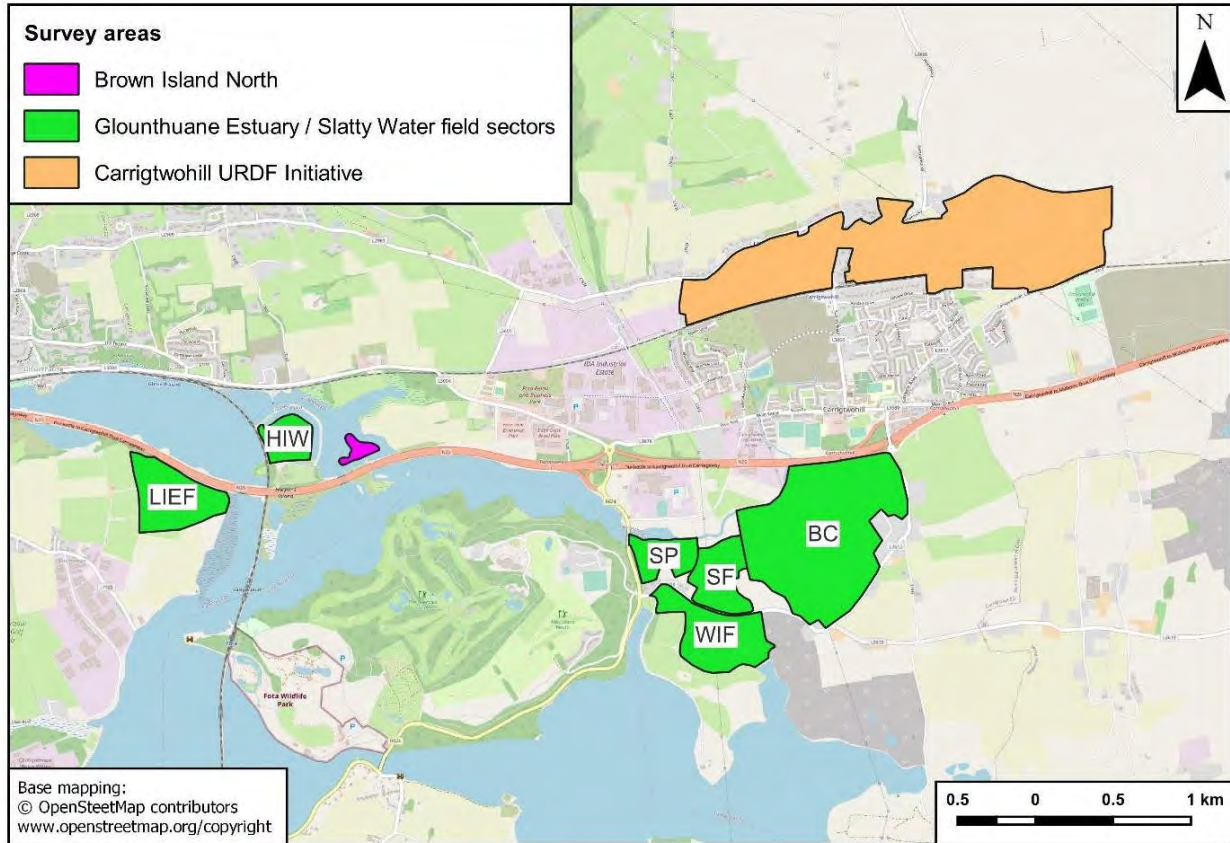


Figure 4.1 Waterbird Survey Areas.

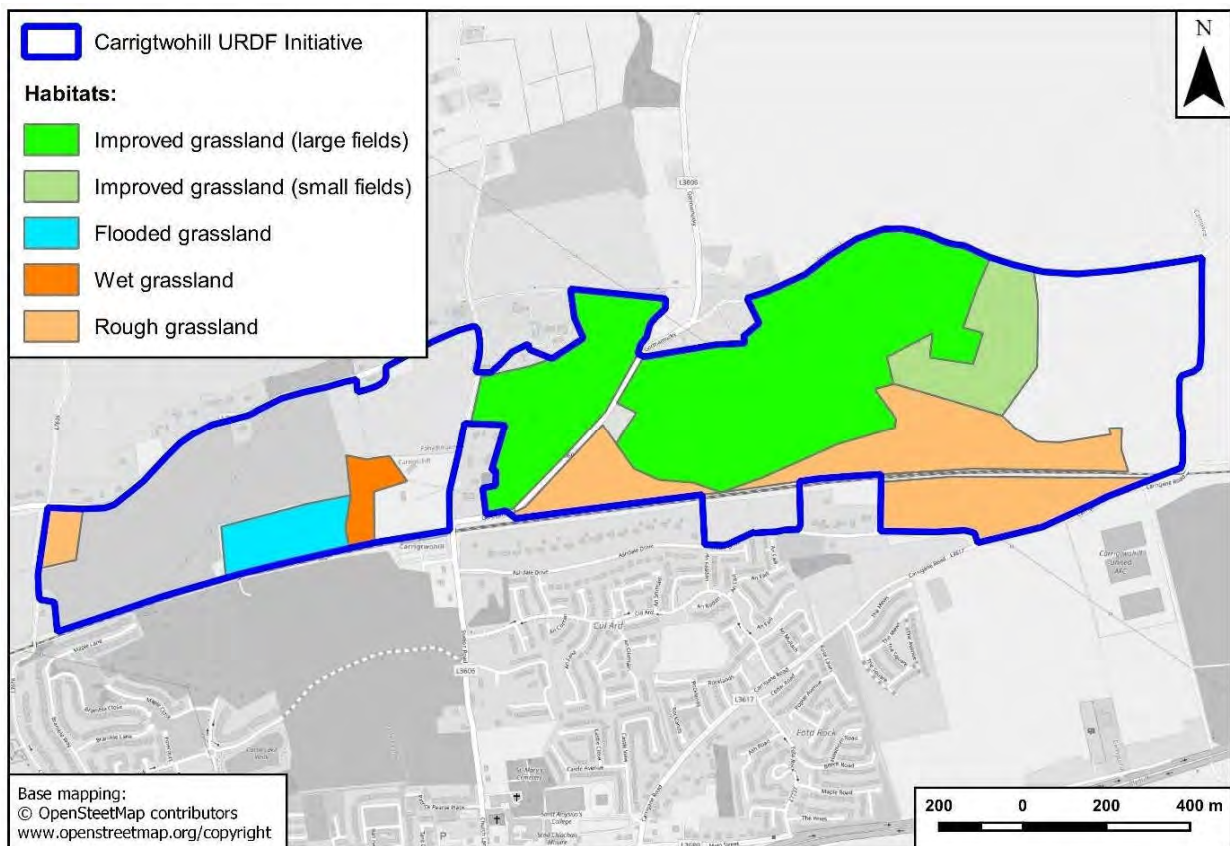


Figure 4.2 Grassland habitats in the Carrigtwohill URDF Initiative lands.

Curlew

Curlews were recorded field feeding in the Carrigtwohill URDF Initiative lands on the first four surveys, but not on any of the subsequent surveys (Table 4-2). The numbers peaked at 86 on 7th December 2022. Most of the records came from one area in the central part of the Carrigtwohill URDF Initiative lands, in a triangular group of fields enclosed by the two roads that fork from the Station Road after it crosses Barry's Bridge (Figure 4-3). On 11th December 2022, TG also recorded the same flock in the large field across the road to the east (Figure 4-3). On 29th December 2022, TG only recorded a single Curlew in the Carrigtwohill URDF Initiative lands and this bird was in the smaller field of rough grassland just to the east of Barry's Bridge (Figure 4-3).

This appears to the same area where Limosa (2015) recorded 45 Curlew feeding during a site visit.

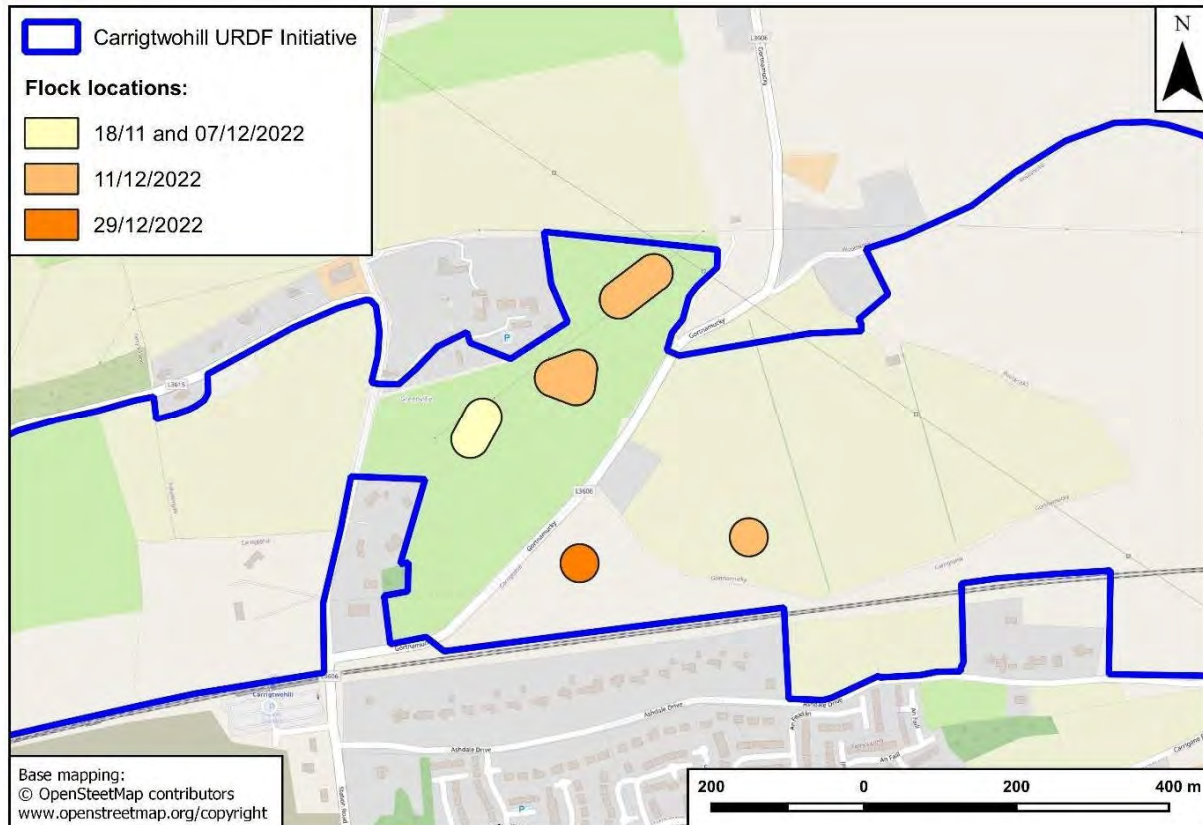


Figure 4.3 Locations of field-feeding waterbird flocks recorded in the Carrigtwohill URDF Initiative lands.

Table 4.2 Summary of Curlew counts in the three survey areas.

Date	UEA	GSW	BN
18/11/2022	16	9	115
07/12/2022	22	42	172
11/12/2022	86	7	174
29/12/2022	1	101	105
16/01/2023	0	66	96
24/01/2023	0	58	245
15/02/2023	0	58	9
26/02/2023	0	28	55

Legend:

UEA Carrigtwohill Lands
GSW Glounthaune / Slatty Water
BN Brown Island North

Curlews were recorded field-feeding in the Glounthaune Estuary / Slatty Water survey area on all the survey dates (Table 4-2); i.e., outside the Carrigtwohill lands. The numbers peaked at 101 on 29th December 2022. The highest counts and most frequent records came from the LIEF and WIF sectors, while there were no records from the HIW or SF sectors (see Figure 4-1).

The Brown Island North roost counts peaked at 245 Curlews on 24th January 2023 (again outside the Carrigtwohill lands), while only 9 Curlew were recorded on the roost count on 15th February 2023. On the latter date, TG checked the alternative roost sites in the upper part of Slatty Water and at Harper's Island South, but these were also unoccupied.

On 11th December 2022, when the peak Curlew count occurred in the Carrigtwohill URDF Initiative lands, that count represented just under half of the Brown Island North roost count.

The Brown Island North roost counts on 7th and 29th December 2022 coincided with evening high tides, which might be expected to result in higher counts due to the presence of non-field-feeding birds. However, the roost counts were not particularly high on either date. On 7th December 2022, around two-thirds of the roosting Curlew were in Harper's Island Wetlands.

The breakdown of numbers as distributed within the neighbouring Glounthaune Estuary / Slatty Water survey area is shown in Table 4.3 (see Figure 4.1 for locations).

Table 4.3 Summary of Curlew counts in the Glounthaune Estuary / Slatty Water survey area.

Date	BC	WIF	SP	LIEF
18/11/2022	0	9	0	0
07/12/2022	0	42	0	0
11/12/2022	0	0	7	0
29/12/2022	0	23	40	38
16/01/2023	0	51	0	15
24/01/2023	18	0	0	40
15/02/2023	0	3	0	55
26/02/2023	22	1	0	5

Note: There were no records from the HIW or SF sectors.

Black-tailed Godwit

Black-tailed Godwits were recorded in the Carrigtwohill URDF Initiative lands on two dates: 38 on 11th December 2022 and 1 on 29th December 2022. On both occasions, the Black-tailed Godwits occurred with the Curlews (see above).

Field-feeding Black-tailed Godwits were recorded in the Glounthaune Estuary / Slatty Water field sectors on six dates. The peak numbers occurred on 18th November 2022, when there were 610 Black-tailed Godwits in the WIF sector (see Figure 4.1). The overall pattern of usage was variable, with no one sector being regularly used. However, no field-feeding Black-tailed Godwit were recorded in the SF sector.

Table 4.4 Summary of Black-tailed Godwit counts in the Glounthaune Estuary / Slatty Water survey area.

Date	BC	WIF	SP	HIW	LIEF	Totals
18/11/2022	0	610	0	0	0	610
07/12/2022	400	0	12	0	0	412
11/12/2022	0	0	0	0	0	0
29/12/2022	0	7	40	0	58	105
16/01/2023	0	0	0	0	0	0
24/01/2023	0	0	0	32	0	32
15/02/2023	0	0	0	0	148	148
26/02/2023	0	0	0	0	4	4

Note: There were no records from the SF sector.

Oystercatcher

No field-feeding Oystercatchers were recorded in the Carrigtwohill URDF Initiative lands. Small numbers of field-feeding Oystercatchers occurred in the Glounthaune Estuary / Slatty Water field sectors on three dates with a peak count of 18 in the SP sector on 19th December 2022. There were Oystercatcher roosting flocks at Brown Island North on 11th December 2022 and 24th January 2023, although these may not have involved field-feeding birds.

Other Waterbirds

Records of single Black-headed Gulls on two dates were the only records of other waterbird species in the Carrigtwohill URDF Initiative lands.

Four other waterbird species were recorded in the Glounthaune Estuary / Slatty Water field sectors: namely, Mute Swan, Little Egret, Lapwing and Black-headed Gull. For full details refer to Table 3.4, Appendix E.

4.6.4. Conclusions

General

The Carrigtwohill URDF Initiative lands are over 1km from the nearest estuarine area (the upper end of Slatty Water). The wader populations in Cork Harbour that make significant use of non-adjacent agricultural land are Oystercatcher, Golden Plover, Lapwing, Curlew and Black-tailed Godwit. In addition, the heron (Little Egret and Grey Heron) and the gull populations of Cork Harbour make significant use of non-adjacent agricultural land.

The Cork Harbour Oystercatcher, Curlew and Black-tailed Godwit populations favour intensively managed grasslands, although Curlew may occur in rougher grasslands than the other two species. For all three species, grasslands probably support significant proportions of the Cork Harbour populations.

The large fields of improved grassland in the central-eastern section of the Carrigtwohill URDF Initiative lands provide the best potential habitat for field-feeding waders. The arable fields may be used by gulls at times (e.g., when recently ploughed), and also provide potential habitat for Golden Plover and Lapwing. I did not record any waterbirds in the flooded field next to the railway line in the western section. However, it may support small numbers of cryptic species such as Snipe.

The usage of the fields in the Carrigtwohill URDF Initiative lands by field-feeding waterbirds is likely to vary from year-to-year, with changes in agricultural land use and the effects of weather on food resources and feeding conditions.

Curlew

The field-feeding Curlew in Cork Harbour feed on fields during the day and roost in estuarine areas at night. There are at least seven regularly used Curlew nocturnal roosts around the harbour. Based on roost counts, compared to IWeBS counts, TG previously estimated that around half of the Cork Harbour Curlew population use grassland habitats in mid-winter. However, field-feeding is a strategy that estuarine waders generally exploit when the estuarine food resources are depleted below a certain level. Given the long-term reduction in Curlew populations in Cork Harbour, the importance of field-feeding for the Curlew population may be decreasing.

TG has previously observed Curlew flocks commuting across the Elm Tree skew bridge to/from the Brown Island North roost, indicating the potential for field-feeding Curlew to use fields within the Carrigtwohill URDF Initiative lands. In the present survey, field-feeding Curlew used one area of fields within the middle of the Carrigtwohill URDF Initiative lands in November and December 2022, but there were no records in January and February 2023. This pattern of occurrence is probably quite typical for Curlew, and other field-feeding waders. Presumably the birds were exploiting a concentration of food resources in one area and abandoned the area when these resources had been depleted.

The peak count of 86 Curlew on 11th December 2022 probably represented around half of the local field-feeding population, as indicated by the Brown Island North roost count. However, the Brown Island North roost counts were quite variable. This variability did not appear to be due to increased number of non-field-feeding Curlew on days with evening high tides. It is possible that field-feeding Curlew may move between roosts depending on the locations of the fields that they are exploiting. In particular, there are alternative nocturnal Curlew roosts at Belvelly (adjacent to the WIF sector) and at Dunkettle.⁵

Oystercatcher & Black-tailed Godwit

Oystercatcher and Black-tailed Godwit are the other two wader species with significant field-feeding populations in the Glounthaune Estuary / Slatty Water area. In particular, flocks of hundreds of Black-tailed Godwit often feed on the field adjacent to Slatty Pool (the SP sector). However, Oystercatcher was not

⁵ As well as in the *Spartina* on the southern side of Weir Island, where there is a large Curlew high tide roost. Birds have also been seen flying into this area around dusk (PO'D, *pers obs*).

recorded in the Carrigtwohill URDF Initiative lands, and only recorded small numbers of Black-tailed Godwit on two dates. I did record large flocks of Black-tailed Godwit on two dates in the Glounthaune Estuary / Slatty Water field sectors. However, the incidence of Black-tailed Godwit field-feeding in this area appeared to be relatively low this winter with no records of large flocks from the SP sector during this survey, or on IWeBS and other counts.

Other Species

Golden Plover and Lapwing wintering populations are largely dependent on agricultural habitats and mainly visit estuarine habitats to roost. However, while large flocks of Golden Plover and Lapwing are fairly regular in the Glounthaune Estuary / Slatty Water, they are rarely (Lapwing) or never (Golden Plover) seen feeding on fields in the immediate hinterland of the estuary. Therefore, it was not surprising that there were no records of these species from the Carrigtwohill URDF Initiative lands. TG did record Lapwing from the Glounthaune Estuary / Slatty Water HIW and LIEF sectors. The field sections of the HIW sector were extensively flooded when these records occurred, while the Lapwing flock recorded from the LIEF sector was roosting (these are outside the Carrigtwohill lands).

The gull populations in Cork Harbour show complex patterns of field-feeding behaviour. During the day, gulls often move between feeding areas in fields and estuarine areas where they roost and bathe. At night, the gull numbers in the harbour may increase by an order of magnitude, with gulls commuting over a wide area to roost in the harbour. Field-feeding gulls often exploit ephemeral conditions, such as recently ploughed fields. During the present survey, the only gull records were of single Black-headed Gulls on two occasions in the Carrigtwohill URDF Initiative lands, but large numbers of gulls may occur in these lands when suitable conditions arise.

Grey Heron and Little Egret also regularly occur in fields and other non-estuarine habitats around Cork Harbour. However, neither species was recorded either species in the Carrigtwohill URDF Initiative lands.

Several other waterbird species can exploit agricultural habitats in the Cork Harbour area. However, these species generally only use habitats that are immediately adjacent to the estuaries (e.g., Wigeon) or permanently or temporarily flooded habitats (e.g., Teal and Redshank). The Carrigtwohill URDF Initiative lands are over 1km from the nearest estuarine area (the upper end of Slatty Water), and comprise largely well-drained and sloping ground, which limits the potential usage of the area by these waterbird species. However, there was one field that held pools of flood water (Figure 4.3), although waterbirds were not recorded in this field.

5. Natura 2000 Sites

5.1. Zone of Influence

The “Zone of Influence” of a plan or project is the area which may experience ecological effects as a result of its implementation, including any ancillary activities. The various impacts of a plan or project will each have their own characteristics, e.g., nature, extent, magnitude, duration etc. Accordingly, the area subject to each impact (“zone of impact”) will vary depending on characteristics of the impact and the presence of pathways for its propagation. Ecological features within or connected to one or more zones of impact could, depending on their sensitivities, be affected by the plan or project under consideration. The area containing such features may be regarded as the Zone of Influence. As such, in establishing the Zone of Influence for a plan or project, regard must be had to the characteristics of its potential impacts, potential pathways for impacts and the sensitivities of ecological features in the receiving environment.

In its guidance on selecting which Natura 2000 sites to include in the AA Screening, *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities* (DEHLG, 2010a) recommends inclusion of sites in the following three categories: -

- Any Natura 2000 sites within or adjacent to the plan or project area,
- Any Natura 2000 sites within the Zone of Influence of the plan or project (generally within 15km for plans, to be established on a case-by-case basis for projects, having regard to the nature, scale and location of the project, the sensitivities of the ecological receptors and the potential for in-combination effects), and
- Following the precautionary principle, any other Natura 2000 sites for which the possibility of significant effects cannot be excluded, e.g., for a project with hydrological impacts, it may be necessary to check the full extent of the catchment for Natura 2000 sites with water-dependent qualifying interests.

In addition, *Assessment of plans and projects in relation to Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC, 2021) recommends consideration of Natura 2000 sites hosting fauna which could move to the plan or project area or its zone(s) of impact, and the potential for the plan or project to sever ecological connectivity within or between Natura 2000 sites. *Appropriate Assessment Screening for Development Management* (OPR, 2021) emphasises the importance of employing the source-pathway-receptor model (rather than arbitrary distances such as 15km) when selecting Natura 2000 sites for inclusion in the AA Screening.

Based on the descriptions of the proposed development (Section 3) and the receiving natural environment (Section 4), the zones of impact of the proposed development were defined as: -

- For habitat loss and fragmentation, all areas within the proposed development boundary, including any areas temporarily required during construction,
- For disturbance to birds and other fauna, all areas within a precautionary buffer of 500m from the proposed development,
- For water quality impacts, all surface waters which intersect the proposed development or are located within 100m thereof, including upstream and downstream stretches, and the full extent of transitional waters within the Great Island Channel SAC, and
- For the introduction or spread of invasive alien species, the proposed development site and adjoining areas, as well as likely haul routes to/from the construction site.

The Zone of Influence was defined as the above zones of impact as well as other areas with potential ecological connectivity to them, i.e., woodlands and other semi-natural habitats connected to the proposed development by proximity or linear landscape features such as hedgerows or treelines, and the remainder of Cork Harbour and connected wetlands and waterbodies.

Publicly available spatial data for river, transitional and coastal waterbodies (EPA, 2022) were used in conjunction with aerial imagery to identify pathways and zones of impact for disturbance and water quality impacts from the proposed development. These were then mapped in relation to Natura 2000 sites (see Figure below). In addition, the Zone of Influence was examined to identify any other Natura 2000 sites with potential ecological connections to these zones of impact.

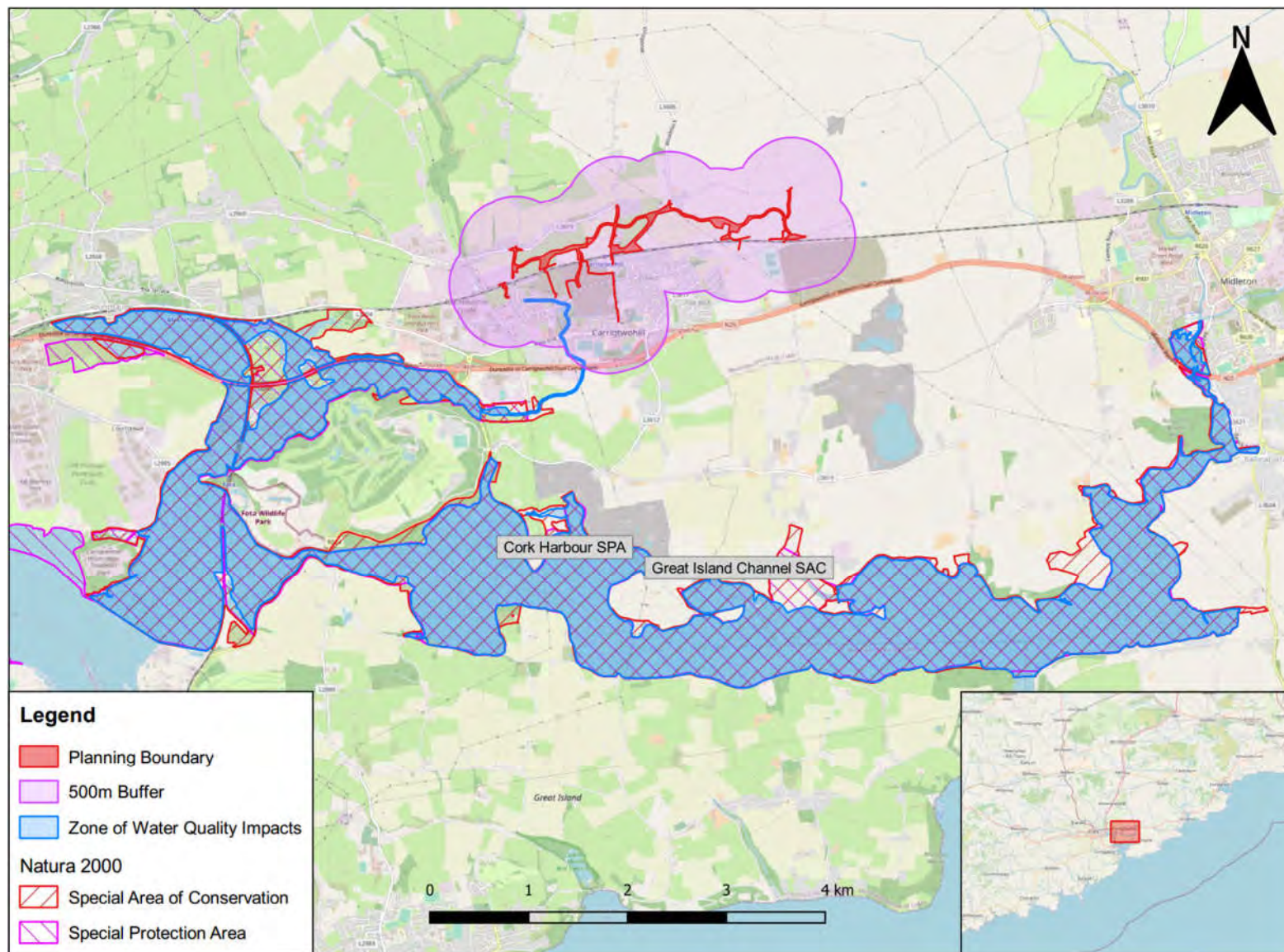


Figure 5.1 Zones of impact from the proposed development in relation to the boundaries of Natura 2000 sites.

5.2. Identification of Sites

Habitat loss and fragmentation

There are no Natura 2000 sites within, intersecting or adjoining the proposed development boundary. Therefore, there will be no direct effects on any such sites arising from habitat loss or fragmentation associated with the proposed development.

The nearest sites are the Great Island Channel SAC (site code: 002170) and the Cork Harbour SPA (site code: 004030), which are located c. 950m south-west of the proposed development at their closest point. The Great Island Channel SAC is selected for 2 No. habitat types and no species. As such, there are no species of interest in this SAC which depend on habitats closer to the proposed development. However, the Cork Harbour SPA is selected for 23 No. waterbirds, some of which are known to utilise habitat within or adjoining the proposed development. Therefore, there is potential for ex-situ habitat loss or fragmentation for these species as a result of the proposed development.

Disturbance to birds and other fauna

There are no Natura 2000 sites within 500m of the proposed development. As noted above, the Great Island Channel SAC and Cork Harbour SPA are located c. 950m from the proposed development at their closest point and, while the SAC is not selected for any species, the SPA is selected for a number of bird species which are either known to or could potentially utilise habitats within or in close proximity to the proposed development. As such, there is potential for ex-situ disturbance of these species from the proposed development.

Water quality impacts

The zone of impact for water quality impacts from the proposed development includes most of the Great Island Channel SAC and a large portion of the Cork Harbour SPA. As these sites are selected for habitats and species which are directly or indirectly dependent on water quality within this zone of impact, there is considered to be connectivity for likely significant effects on both of these sites.

Invasive alien species

As the locations and extents of invasive alien species within the proposed development site and the proposed haul routes are not yet known, it is not currently possible to quantify the risk of the spread of invasive alien species to Natura 2000 sites as a result of the proposed development.

Indirect effects

The only additional areas of the Natura 2000 network present within the wider Zone of Influence are further portions of the Cork Harbour SPA, i.e., there are no additional Natura 2000 sites. Given the lack of ecological connectivity between the zones of impact of the proposed development and Natura 2000 sites other than the Great Island Channel SAC and Cork Harbour SPA, the possibility of likely significant effects on other such sites can be ruled out at this stage.

5.3. Special Areas of Conservation

The descriptions of Natura 2000 sites presented in this section are based on the Site Synopsis, Conservation Objectives and Natura 2000 Standard Data Form documents for the sites concerned, augmented by information from the supporting documents available on the site-specific pages of the NPWS website.

The estuary to the south of Carrigtwohill is located within the Great Island Channel SAC. Surface and ground waters from within the Carrigtwohill lands discharge to this area. While there is no direct overlap, the Great Island Channel SAC is within the zone of influence of the proposed project and is discussed in greater detail below. Table 5.1 below details qualifying interests of Great Island Channel SAC.

The only other Special Areas of Conservation in the wider landscape are as follows. The River Blackwater (Cork/Waterford) SAC (002170) is located just over 13.5km from the lands at Carrigtwohill. The proposed lands are not, however, within the catchment of the River Blackwater.

To the west the Gearagh SAC (000108) is located upstream of Cork City on the River Lee to the southwest of Macroom (>43km from the site). The proposed lands at Carrigtwohill is downstream of this site and will not affect the Gearagh SAC (ca. 40km straight line distance).

Along the coast Ballymacoda (Clonpriest and Pillmore) SAC (000077) is located at the mouth of the Womanagh River approximately 25km to the east of lands at Carrigtwohill. Like the Blackwater River, the estuary at Ballymacoda is not within the same catchment as the proposed lands at Carrigtwohill. In a similar way Courtmacsherry Estuary SAC (001230) is located just over 35km to the southwest, again outside the catchment within which the lands at Carrigtwohill are located.

These SACs are not deemed to be within the zone of influence of the lands at Carrigtwohill and are not discussed further (see Table 5.1 for qualifying interests of these sites).

Table 5.1 SACs within 15km of the proposed project.

Site Name	Approximate distance	Features of Interest	Within Zol
Great Island Chanel SAC (001058)	>1km	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] 	Yes
River Blackwater (Cork/Waterford) SAC (002170)	>13.5km	<ul style="list-style-type: none"> Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] <i>Salicornia</i> and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] 	No

Site Name	Approximate distance	Features of Interest	Within Zol
		<ul style="list-style-type: none"> • <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] • <i>Petromyzon marinus</i> (Sea Lamprey) [1095] • <i>Lampetra planeri</i> (Brook Lamprey) [1096] • <i>Lampetra fluviatilis</i> (River Lamprey) [1099] • <i>Alosa fallax fallax</i> (Twaite Shad) [1103] • <i>Salmo salar</i> (Salmon) [1106] • <i>Lutra lutra</i> (Otter) [1355] • <i>Trichomanes speciosum</i> (Killarney Fern) [1421] 	
Ballymacoda (Clonpriest and Pillmore) SAC (000077)	>25km	<ul style="list-style-type: none"> • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • <i>Salicornia</i> and other annuals colonising mud and sand [1310] • Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330] • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] 	No
Courtmacsherry Estuary SAC (001230)	>35km	<ul style="list-style-type: none"> • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Annual vegetation of drift lines [1210] • Perennial vegetation of stony banks [1220] • <i>Salicornia</i> and other annuals colonising mud and sand [1310] • Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330] • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] • Embryonic shifting dunes [2110] • Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] • Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] 	No
The Gearagh SAC	>43km	<ul style="list-style-type: none"> • Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] • Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p. vegetation [3270] • Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] • Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] • <i>Lutra lutra</i> (Otter) [1355] 	

5.3.1. Great Island Channel SAC

Overview

The following description is taken from the Site Synopsis (NPWS, 2013) and Conservation Objectives Supporting Document (NPWS, 2014b) for Great Island Channel SAC. The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the Great Island Channel.

Great Island Channel SAC is of ecological importance for its examples of intertidal mud and sand flats and Atlantic salt meadows of the estuarine type. Both habitats are fairly extensive in area and of moderate to good quality. The site has high ornithological importance, regularly supporting c. 50% of the wintering waterfowl of Cork Harbour (NPWS, 2013; 2014b). Significant proportions of the internationally important populations of Black-tailed Godwit and Redshank, which winter in Cork Harbour, utilise the site and it supports nationally important populations of a further 12 species, including Golden Plover and Bar-tailed Godwit, both listed on Annex I to the Birds Directive.

Qualifying Interests and Conservation Objectives

The Great Island Channel SAC was selected for the following qualifying interests: -

- Mudflats and sandflats not covered by seawater at low tide (1140)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)

The Annex I habitat 'Estuaries' (1130) is also present within the site (NPWS, 2019d) but is not listed as a qualifying interest. NPWS (2014b) states that the swards of *Spartina* sp. within the site are not considered to qualify as the Annex I habitat '*Spartina* swards (*Spartinion maritimae*)' (1320).

The conservation objectives of the Great Island Channel SAC are as follows:

- *To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Great Island Channel SAC*
- *To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in Great Island Channel SAC*

The Conservation Objectives document for the site (NPWS, 2014a) also states the following: "*Please note that this SAC overlaps with Cork Harbour SPA (004030). [...] The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.*"

Threats, Pressures and Activities

While the main land use within the Great Island Channel SAC is aquaculture (specifically, oyster farming), the greatest threats to its conservation significance come from road works, infilling, sewage outflows and possible marina developments.

Table 5.2 below lists the threats, pressures, and activities with negative impacts on the site, as per its Natura 2000 Standard Data Form NPWS, 2019d).

Table 5.2 Threats, pressures, and activities with negative impacts on the Great Island Channel SAC.

Rank	Threat, pressure or activity (code)	Threat, pressure or activity (description)	Inside, outside or both
High	F01	Marine and Freshwater Aquaculture	inside
High	D01.02	roads, motorways	inside
Medium	I01	invasive non-native species	inside
Medium	A04	grazing	inside
High	J02.01.02	reclamation of land from sea, estuary or marsh	inside
Medium	A08	Fertilisation	outside
High	E01	Urbanised areas, human habitation	outside
Medium	K02.03	eutrophication (natural)	inside

NPWS (2019d) and Eionet (2022).

5.4. Special Protection Areas for birds

The estuary to the south of the lands at Carrigtwohill is part of Cork Harbour SPA (004030). The site is designated for waterbirds that are dependent on the wetlands within the harbour for feeding and roosting. As the proposed site hydrologically connected to the SPA, Cork Harbour SPA is within the zone of influence of the proposed works. Consideration is also given to the potential for ex-situ impacts, in the form of disturbance to or displacement of field feeding birds.

The details of the SPA, including qualifying interests, are detailed in Table 5.3, while Figure 5.1 displays the distribution of Cork Harbour SPA in relation to the proposed lands at Carrigtwohill.

Other SPAs in the wider environment include: -

- The Gearagh SPA (004109) – >46km to the west.
- Blackwater Callows SPA (004094) – >26km to the northeast.
- Ballycotton Bay SPA (004022) – ca. 18km to the east.
- Ballymacoda Bay SPA (004023) – >23km to the east.
- Blackwater Estuary SPA (004028) - >28km to the east.
- Sovereign Islands SPA (004124) – >27km to the southwest.

In summary, these SPAs are between 18km and over 46km from the lands at Carrigtwohill and are designated for a range of wetland birds. These SPAs are not deemed to be within the zone of influence of the lands at Carrigtwohill and are not discussed further. Qualifying interests for all sites are set out in Table 5.3.

Table 5.3 SPAs within 15km of the proposed project.

Site Name	Approximate distance	Features of Interest	Within Zol
Cork Harbour SPA (004030)	>1km	<ul style="list-style-type: none"> • Little Grebe (<i>Tachybaptus ruficollis</i>) [A004] • Great Crested Grebe (<i>Podiceps cristatus</i>) [A005] • Cormorant (<i>Phalacrocorax carbo</i>) [A017] • Grey Heron (<i>Ardea cinerea</i>) [A028] • Shelduck (<i>Tadorna tadorna</i>) [A048] • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Pintail (<i>Anas acuta</i>) [A054] • Shoveler (<i>Anas clypeata</i>) [A056] • Red-breasted Merganser (<i>Mergus serrator</i>) [A069] • Oystercatcher (<i>Haematopus ostralegus</i>) [A130] • Golden Plover (<i>Pluvialis apricaria</i>) [A140] • Grey Plover (<i>Pluvialis squatarola</i>) [A141] • Lapwing (<i>Vanellus vanellus</i>) [A142] • Dunlin (<i>Calidris alpina</i>) [A149] • Black-tailed Godwit (<i>Limosa limosa</i>) [A156] 	Yes

Site Name	Approximate distance	Features of Interest	Within ZoI
		<ul style="list-style-type: none"> • Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] • Curlew (<i>Numenius arquata</i>) [A160] • Redshank (<i>Tringa totanus</i>) [A162] • Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] • Common Gull (<i>Larus canus</i>) [A182] • Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183] • Common Tern (<i>Sterna hirundo</i>) [A193] • Wetland and Waterbirds [A999] 	
The Gearagh SPA (004109)	>46km to west	<ul style="list-style-type: none"> • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Mallard (<i>Anas platyrhynchos</i>) [A053] • Coot (<i>Fulica atra</i>) [A125] • Wetland and Waterbirds [A999] 	No
Blackwater Callows SPA (004094)	>26km to northeast	<ul style="list-style-type: none"> • Whooper Swan (<i>Cygnus cygnus</i>) [A038] • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Black-tailed Godwit (<i>Limosa limosa</i>) [A156] • Wetland and Waterbirds [A999] 	No
Ballycotton Bay SPA (004022)	ca. 18km to the east	<ul style="list-style-type: none"> • Teal (<i>Anas crecca</i>) [A052] • Ringed Plover (<i>Charadrius hiaticula</i>) [A137] • Golden Plover (<i>Pluvialis apricaria</i>) [A140] • Grey Plover (<i>Pluvialis squatarola</i>) [A141] • Lapwing (<i>Vanellus vanellus</i>) [A142] • Black-tailed Godwit (<i>Limosa limosa</i>) [A156] • Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] • Curlew (<i>Numenius arquata</i>) [A160] • Turnstone (<i>Arenaria interpres</i>) [A169] • Common Gull (<i>Larus canus</i>) [A182] • Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183] • Wetland and Waterbirds [A999] 	No
Ballymacoda Bay SPA (004023)	>23km to the east	<ul style="list-style-type: none"> • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Ringed Plover (<i>Charadrius hiaticula</i>) [A137] • Golden Plover (<i>Pluvialis apricaria</i>) [A140] • Grey Plover (<i>Pluvialis squatarola</i>) [A141] • Lapwing (<i>Vanellus vanellus</i>) [A142] • Sanderling (<i>Calidris alba</i>) [A144] • Dunlin (<i>Calidris alpina</i>) [A149] 	No

Site Name	Approximate distance	Features of Interest	Within ZoI
		<ul style="list-style-type: none"> Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Turnstone (<i>Arenaria interpres</i>) [A169] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Common Gull (<i>Larus canus</i>) [A182] Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183] Wetland and Waterbirds [A999] 	
Blackwater Estuary SPA (004028)	>28km to east	<ul style="list-style-type: none"> Wigeon (<i>Anas penelope</i>) [A050] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Lapwing (<i>Vanellus vanellus</i>) [A142] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Wetland and Waterbirds [A999] 	No
Sovereign Islands SPA (004124)	>27km to southwest	<ul style="list-style-type: none"> Cormorant (<i>Phalacrocorax carbo</i>) [A017] 	No

5.4.1. Cork Harbour SPA

Overview

The following description is taken from the Site Synopsis (NPWS, 2015) and Conservation Objectives Supporting Document (NPWS, 2014c) for Cork Harbour SPA. Cork Harbour is a large, sheltered bay system, with several river estuaries, principally those of the Rivers Lee, Douglas, Owenboy and Owenacurra. The site comprises most of the main intertidal areas of Cork Harbour, including all of the Great Island Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay, Ringabella Creek and the Rostellan and Poul nabibe inlets. Owing to the sheltered conditions, the intertidal flats are often muddy in character. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Otherwise, birds roost on stony shorelines and in some areas fields adjacent to the shore. Some shallow bay water is included in the site. Cork Harbour is adjacent to a major urban centre and a major industrial centre.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country. It supports an internationally important population of Redshank (*Tringa totanus*). A further 15 species have populations of national importance, with particularly notable numbers of Shelduck (*Tadorna tadorna*) (9.6% of national total), Shoveler (*Anas clypeata*) (4.5% of total), Pintail (*Anas acuta*) (4.2% of total) and Cormorant (*Phalacrocorax carbo*) (4.1% of total) occurring. It has regionally important populations of Golden Plover (*Pluvialis apricaria*) and Bar-tailed Godwit (*Limosa lapponica*). Passage waders are regular, including Ruff (*Philomachus pugnax*) and Spotted Redshank (*Tringa erythropus*). It is an important site for gulls in winter and autumn, especially Common Gull (*Larus canus*) and Lesser Black-backed Gull (*L. fuscus*). The SPA provides both feeding and roosting areas for the waterfowl species. The quality of most of the estuarine habitats is good. The wintering birds have been well-monitored since the 1970s. The site has a breeding colony of Common Tern (*Sterna hirundo*) which is of national importance.

Qualifying Interests and Conservation Objectives

The Cork Harbour SPA was selected for the following qualifying interests: -

- Little Grebe (*Tachybaptus ruficollis*) (A004)
- Great Crested Grebe (*Podiceps cristatus*) (A005)
- Cormorant (*Phalacrocorax carbo*) (A017)
- Grey Heron (*Ardea cinerea*) (A028)
- Shelduck (*Tadorna tadorna*) (A048)
- Wigeon (*Anas penelope*) (A050)
- Teal (*Anas crecca*) (A052)
- Pintail (*Anas acuta*) (A054)
- Shoveler (*Anas clypeata*) (A056)
- Red-breasted Merganser (*Mergus serrator*) (A069)
- Oystercatcher (*Haematopus ostralegus*) (A130)
- Golden Plover (*Pluvialis apricaria*) (A140)
- Grey Plover (*Pluvialis squatarola*) (A141)
- Lapwing (*Vanellus vanellus*) (A142)
- Dunlin (*Calidris alpina alpina*) (A149)
- Black-tailed Godwit (*Limosa limosa*) (A156)
- Bar-tailed Godwit (*Limosa lapponica*) (A157)
- Curlew (*Numenius arquata*) (A160)
- Redshank (*Tringa totanus*) (A162)
- Black-headed Gull (*Chroicocephalus ridibundus*) (A179)
- Common Gull (*Larus canus*) (A182)
- Lesser Black-backed Gull (*Larus fuscus*) (A183)
- Common Tern (*Sterna hirundo*) (A193)
- Wetlands (A999)

All of the qualifying interests listed above are assigned a conservation objective to “maintain” their favourable conservation status in the Cork Harbour SPA.

The Conservation Objectives document for the site (NPWS, 2014d) also states the following: “Please note that this SPA overlaps with Great Island Channel SAC (001058). [...] The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.”

Threats, Pressures and Activities

Table 5.4 below lists the threats, pressures, and activities with negative impacts on the Cork Harbour SPA, as per its Natura 2000 Standard Data Form (NPWS, 2021).

Table 5.4 Threats, pressures, and activities with negative impacts on the Cork Harbour SPA.

Rank	Threat, pressure or activity (code)	Threat, pressure or activity (description)	Inside, outside or both
High	D03.01	port areas	outside
High	E02	Industrial or commercial areas	outside
Low	E01.03	dispersed habitation	outside
Medium	G01.02	walking, horse riding and non-motorised vehicles	inside
High	E01	Urbanised areas, human habitation	outside
Medium	F02.03	Leisure fishing	inside
High	D01.02	roads, motorways	outside
High	F01	Marine and Freshwater Aquaculture	inside
Medium	G01.01	nautical sports	inside
Medium	D03.02	Shipping lanes	inside
Medium	A08	Fertilisation	outside

NPWS (2021) and Eionet (2022).

Of particular note in this instance are the categories Urbanised areas, human habitation and roads, motorways.

5.4.2. Birds – Carrigtwohill lands

Cork Harbour is routinely counted as part of BirdWatch Ireland’s Irish Wetland Bird Survey (IWeBS). Wintering waders and wildfowl are counted by a team of volunteer counters as close to high tide as is practical during the winter months, ideally from September to March. The most recent published summary of the site can be downloaded from the BirdWatch Ireland IWeBS webpage⁶. These present counts for all of Cork Harbour from 2010/2011 to 2020/2021. The areas counted can also be viewed on BirdWatch Ireland IWeBS webpage⁷.

The harbour has also been counted as part of the National Parks and Wildlife Services series of Low Tide Counts in 2010 (Cummins and Crowe, 2011), which were undertaken following the methodology set out in Lewis and Tierney (2014). These illustrate the spatial distribution of birds during low tide when they may be foraging, rather than at high tide roosts as generally recorded by IWeBS. Both these sources of data were extensively used in the *Cork Harbour SPA. Conservation Objective Supporting Document* (NPWS, 2014b) to summarise the numbers and trends of wintering birds for which Cork Harbour SPA has been designated.

A number of birds for which Cork Harbour has been designated are known to feed in fields outside the SPA. These include Oystercatcher, Curlew, Black-tailed Godwit, Golden Plover, and Lapwing. The above surveys do not however specifically target field feeding birds. While IWeBS counters do routinely record birds using fields immediately adjoining the estuary, fields which are more distant (i.e., not visible) are not generally counted. It is for this reason that a targeted survey of the Carrigtwohill lands was commissioned (see Section 4.6; and Appendix E).

Of these species Golden Plover and Lapwing were not recorded feeding within the lands at Carrigtwohill. Oystercatcher was not recorded in the Carrigtwohill URDF Initiative lands, and only small numbers of Black-tailed Godwit were recorded on two dates. Compared to observations outlined in Section 4.6 (see also Appendix E), the Carrigtwohill lands do not support important numbers of Black-tailed Godwit.

Curlew was the only species recorded feeding within the Carrigtwohill lands in notable numbers. Curlew is discussed further below.

In addition to wintering birds, Cork Harbour SPA is also designated for its breeding population of Common Tern (*Sterna hirundo*). Historically Common Tern nested primarily on old barges anchored near Marino Point (Wilson *et al.*, 2000); following their deterioration terns nested at a number of locations in Cork Harbour, such as the Deep Water Berth, Ringaskiddy; on the roof of the Martello Tower adjoining the Cork to Cobh railway line (south of Fota Island) and on a small island in the lagoon at Pfizer’s Golf Course, Shanbally (on the southern shore of Raffeek Creek). In recent years a nesting platform / raft has been anchored on the eastern side of Little Island, close to the eastern side of Lough Mahon. There is no habitat within the lands at Carrigtwohill suitable for use by Common Tern.

Cork Harbour SPA is also designated for Wetland and Waterbirds [A999]. There is no spatial overlap between the SPA and the lands at Carrigtwohill.

Curlew

As can be seen in Table 5.5 the number of Curlew wintering in Cork Harbour has been in long term decline. The baseline count for Cork Harbour for the 5-year period 1995/96 – 1999/00 was 2,237 birds; while this had dropped to 1,252 by 2008/09 – 2012/13 5-year period (NPWS, 2014b).

At the time of writing in 2014, the *Cork Harbour SPA. Conservation Objective Supporting Document* (NPWS, 2014b) described the trend for Curlew as follows: “...the long-term trend for decline is consistent with the national trend where numbers have declined throughout I-WeBS by an average c.3% per year. The all-Ireland trend is also for decline. In Britain, numbers of Curlew increased from the 1970’s until the start of the 2000’s but have steadily declined since then”. Many Curlew wintering in Ireland would be from the British breeding population as well as from further afield.

⁶ <https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/>

⁷ <https://bwi.maps.arcgis.com/apps/View/index.html?appid=1043ba01fcb74c78bc75e306eda48d3a>

NPWS published an updated review on waterbird trends in 2019 (Lewis et al., 2019). The % population trend is -2.4% (5 year); -21.1% (12 year); -41% (22 year) and -64.2% (historical⁸) demonstrating a long term decline in wintering Curlew in Ireland. This is mirrored by an even larger decline in breeding Curlew number in Ireland (O'Donoghue et al., 2019).

The numbers presented in Table 5.5 include annual peak counts for Cork Harbour and for the Glounthaune Estuary / Slatty Water IWeBS subsite (0L489), which incorporates the estuary to the south of Carrigtwohill (running east from Little Island, through Glounthaune Estuary, north of Fota and including Slatty Pool).

Glounthaune Estuary / Slatty Water has supported between 19.23% and 34.79% of Curlew counted within Cork Harbour as part of IWeBS during the period 2011/12 to 2020/21. However, counts must be interpreted with caution due to Curlew's tendency to field feed in which case Curlew may be missed during the high-tide IWeBS counts. It should also be noted that a relatively large proportion of the national population of Curlew in Ireland occur along non estuarine coasts (Lewis et al., 2017). In the context of Cork Harbour, however, this is only likely to account for a small number of additional birds in areas outside the core IWeBS coverage within the Harbour / SPA. Table 5.6 shows the monthly trends in Curlew numbers. As noted no Curlew were noted field feeding on the Carrigtwohill lands in the January or February 2023 counts. Birds were instead recorded in November and December when numbers in the harbour as shown in Table 5.6 are often lower.

Table 5.5 Curlew numbers in Cork Harbour SPA and Glounthaune Estuary / Slatty Water subsite (2011/12 to 2020/21) (Source: IWeBS, BirdWatch Ireland).

Species	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Cork Harbour	1662	1266	1163	1987	1524	1082	983	1172	1153	650
0L489	457	369	312	371	370	307	342	354	280	125
%	27.50%	29.15%	26.83%	18.67%	24.28%	28.37%	34.79%	30.20%	24.28%	19.23%

Table 5.6 Pattern of monthly counts for Curlew in Cork Harbour SPA (Source: IWeBS, BirdWatch Ireland).

Year	All-Ireland threshold	Peak	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2011/12	350	1662	1662	976	887	566	1107	1244	324
2012/13	350	1266	1234	1139	506	89	628	1266	27
2013/14	350	1163	1163	69	747	831	883	855	521
2014/15	350	1987	1987	1307	0	662	799	851	37
2015/16	350	1524	1044	988	471	1134	703	1524	253
2016/17	350	1082	845	908	1082	782	535	816	374
2017/18	350	983	849	399	809	627	661	983	422
2018/19	350	1172	1172	850	930	630	980	748	232
2019/20	350	1153	816	1153	1146	416	668	828	207
2020/21	350	650	650	465	0	569	32	0	0

As noted. Curlews were recorded field feeding in the Carrigtwohill URDF Initiative lands on the first four surveys, but not on any of the subsequent surveys (Table 4.2). The numbers peaked at 86 on 7th December 2022. Most of the records came from one area in the central part of the Carrigtwohill URDF Initiative lands, in a triangular group of fields enclosed by the two roads that fork from the Station Road after it crosses Barry's Bridge (Figure

⁸ Sheppard, 1993; Crowe, 2005.

4-3). On 11th December 2022, TG also recorded the same flock in the large field across the road to the east (see Figure 4.3). On 29th December 2022, TG only recorded a single Curlew in the Carrigtwohill URDF Initiative lands and this bird was in the smaller field of rough grassland just to the east of Barry's Bridge (see Figure 4-3).

The favoured area is located close to and along the main alignment; between Station Road and Leamlara Road (i.e., Link E - upgrade / re-alignment of the Leamlara Road). Displacement of birds feeding in this area is therefore probable during construction and may also occur during operation; this would be influenced by final levels and screening of the favoured fields as Curlew seem to be favouring more open and larger fields. In time the opening up of lands through construction of the link roads would result in development of these areas which could in turn result in full displacement of field feeding birds from this area.

Unfortunately, IWeBS count data is not as yet available for 2022/23 in order to allow a direct comparison with the numbers observed within the Carrigtwohill lands during the targeted survey work. However, taking a precautionary approach and using the most recent year available (in which the total counted was low – 650 birds, with 125 birds in 0L489); the peak count of 86 birds represents just under 70% of Curlew noted on 0L489 Glounthaune Estuary / Slatty Water; and 13.2% of Curlew within Cork Harbour SPA as a whole.

However, the total count in the previous year (2019/20) was substantially higher at 1,153 birds (of which 280 were in 0L489); this results in the peak count of 86 birds representing 7.45% of numbers in Cork Harbour (30.7% of birds in Glounthaune Estuary / Slatty Water, 0L489).

Using the most recent 5-year mean, 1008 Curlew in Cork Harbour and 281.6 birds in Glounthaune Estuary / Slatty Water this results in percentages of 8.53% and 30.5%, respectively.

As noted, Limosa (2015) recorded 45 field feeding Curlew. The counts for Curlew in 2014/15 were 1987 birds in Cork Harbour and 371 in *Glounthaune Estuary / Slatty Water*. The count of 45 birds represented 2.26% of the Cork Harbour population: 12.1% of the birds in the Glounthaune Estuary / Slatty Water (i.e. locally).

Summary

In summary, the data suggests that the fields within the Carrigtwohill lands where Curlew were recorded can support up to ca. 7.45% - 13.2% of Curlew in Cork Harbour (using counts from Table 5.5). However, this high percentage only occurred on a single count of 86 birds in December 2022. The other counts were only of 1, 16 and 22 birds, respectively, representing a significantly lower proportion of birds within the SPA (i.e., 0.15%; 2.46% and 3.38%, respectively based on the low count of 650 birds in 2020/21). The percentage using the most recent 5 year mean (1008 Curlew) would be 0.1%, 1.59% and 2.18% of Cork Harbour SPA numbers, respectively. At less than 5% of the Cork Harbour numbers, these are not significant.

As noted above, the pattern of occurrence (present in Nov/Dec; absent in Jan/Feb) is probably quite typical for Curlew, and other field-feeding waders. Field-feeding is a strategy that estuarine waders generally exploit when the estuarine food resources are depleted below a certain level; thus, the use of fields will be influenced by the size of the estuarine resource in any given year together with the speed with which this is depleted. The latter will be influenced by overall bird numbers as well as factors such as weather (e.g., in poor weather the energetic requirements of waterbirds will increase). Furthermore, the value of a field may also be influenced by management practices, crop type / crop changes, moisture (level of rainfall affecting soil moisture) etc. Therefore, patterns of use will vary significantly from year to year, with birds using other sites as these become suitable in any given year (time of year). As noted, the long-term reduction in Curlew populations in Cork Harbour, the importance of field-feeding for the Curlew population may also be decreasing.

Thus, in summary the fields within the Carrigtwohill lands can on occasion support notable numbers of Curlew, however, most counts did not support significant numbers or recorded no observations of Curlew.

Furthermore, as can be seen from Section 4.62 and Figure 4.1 alternate fields are available for use by Curlew in the immediate environs of the Brown Island roost.

6. Screening Assessment

The identification of likely effects in this section follows the “source-pathway-receptor” model. According to this model, for an effect to exist, all three of the following criteria must be met: -

- Some aspect of the plan or project must act as a source of an impact,
- There must be a pathway capable of conveying the impact to a receptor, and
- The receptor must be sensitive to the impact.

The following subsections detail the specific effects on each receptor and evaluate their significance in view of the relevant conservation objectives.

6.1. Identification of potential impacts on the Great Island Channel SAC

6.1.1. Potential Direct Impacts

The proposed development does not occur within or directly adjacent to the Great Island Channel SAC and there will be no direct impacts, such as habitat loss or habitat modification, as a result of the proposed development at the Carrigtwohill lands.

6.1.2. Potential Indirect Impacts

Indirect impacts via surface water run-off during construction and operational phase

As outlined above surface waters from the Carrigtwohill lands will discharge to Slatty Water adjoining the site. There is, accordingly, a hydrological link between the development site and European sites in Cork Harbour.

When considering the potential for impacts on annexed habitats consideration was given to each of the Attributes for Habitat 1140 (Table 6.1) and 1330 (Table 6.2) as set out in the Conservation Objective Supporting documentation (NPWS, 2014a).

Table 6.1 Attributes of 1140 Mudflats and sandflats not covered by seawater at low tide (from NPWS, 2014a).

1140	Mudflats and sandflats not covered by seawater at low tide		
To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Great Island Channel SAC, which is defined by the following list of attributes and targets:			
Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See Map 3 of NPWS, 2014a.	Habitat area was estimated using as 723ha using OSi data
Community distribution	Hectares	Conserve the following community type in a natural condition: Mixed sediment to sandy mud with polychaetes and oligochaetes community complex. See Map 4 of NPWS, 2014a.	Based on intertidal and subtidal surveys undertaken in 2006 (Aquafact, 2007) and 2011 (EcoServe, 2012; MERC, 2012). See marine supporting document for further information.

Table 6.2 Attributes of 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (from NPWS, 2014a).

1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)		
To restore the favourable conservation condition of Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) in Great Island Channel SAC, which is defined by the following list of attributes and targets:			
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bawnard - 0.29ha; Carrigatohil - 1.01ha. See Map 5 of NPWS, 2014a.	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Two sub-sites that supported Atlantic salt meadow were mapped (1.30ha) and additional areas of potential saltmarsh (17.60ha) were identified from an examination of aerial photographs, giving a total estimated area of 18.90ha. Saltmarsh habitat has also been recorded at two other sub-sites within the SAC (Curtis and Sheehy Skeffington, 1998). NB further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details.
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See Map 5 of NPWS, 2014a.	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and ASM is the dominant saltmarsh habitat. NB further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details.
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). At Bawnard there is a seawall that was constructed in the 18th-19th centuries. At Carrigatohil the northern and eastern shorelines have been significantly modified by road construction. Part of the saltmarsh has also been infilled. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). The ASM at Carrigatohil is poorly developed, though some of the larger sections contain salt pans. The smaller sections, however, tend to be quite uniform in topography. The saltmarsh topography at Bawnard is poorly developed with few typical saltmarsh features. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Based on data from McCorry and Ryle (2009). At Bawnard, the entire bay empties at low tide to expose soft intertidal mudflats. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to <i>Salicornia</i> flats and intertidal mudflats occurs at Carrigatohil. At Bawnard, there is succession from saltmarsh to brackish saltmarsh and wet grassland as well as zonation to intertidal mudflats at the lower saltmarsh boundary. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). At Carrigatohil, the sward height is quite tall due to lack of grazing. At Bawnard only part of the site is grazed. See coastal habitats supporting document for further details

Continued.

1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)		
To restore the favourable conservation condition of Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) in Great Island Channel SAC, which is defined by the following list of attributes and targets:			
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted in places at Bawnard. See coastal habitats supporting document for further details
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain range of subcommunities with typical species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - <i>Spartina anglica</i>	Hectares	No significant expansion of common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1% where it is known to occur	Based on data from McCorry and Ryle (2009). <i>Spartina</i> occurs at both sub-sites in this SAC. See coastal habitats supporting document for further details

Construction Phase

Potential water quality impacts arising from construction activities (including site preparation) include pollution of surface waters and groundwater by sediment, cementitious materials (e.g. concrete), hydrocarbons (e.g. diesel, hydraulic oils and lubricating oils) and other deleterious matter. In the case of the proposed development, these include fine sediment from excavations and earthworks, fuels and other hydrocarbons from vehicles, plant and machinery, concrete and other construction materials, and waste from on-site welfare facilities.

As noted in Section 3.3, interceptor drains will be installed prior to the earthworks commencing in order to prevent overland flows interacting with earthworks. These will drain either directly to ground or to existing ditches/streams via the new detention ponds. A construction compound(s) will also be established within the red line boundary and will not be located in close proximity to any drains or surface water features through which sediment or pollutants such as hydrocarbons could be discharged to Cork Harbour. The development lands and construction activities will be managed following routine practices and procedures for the control of pollution from construction sites, including the relevant, well-established guidelines from CIRIA and TII, as listed in the outline Construction Environmental Management Plan (oCEMP) included with the application. These include controls on the phasing of works, waste management, location of site compounds, and surface water management.

Given the works sequence and methodology, the probability of any significant pollution event occurring is minimal and the magnitude of any negative water quality impacts, were they to occur, would be low and their duration brief or temporary. Given the low probability and significance of any water quality impacts within the construction site, any impacts on ‘Mudflats and sandflats not covered by seawater at low tide’ (1140) or ‘Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)’ (1330) in the Great Island Channel SAC (>1km further downstream) would be imperceptible. As such, the possibility of significant effects on these qualifying interests from construction-phase water quality impacts can be excluded at this stage.

Operational Phase

Potential water quality impacts from the operation of the proposed development relate to run-off from the new and upgraded roads, footpaths and cycleways. The impermeability of these surfaces can result in increased run-off rates. Run-off from roads can be contaminated by hydrocarbons such as fuels, oils, greases, coolants and anti-freeze from vehicles and micro-plastics such as tyre dust, as well as general litter and fine sediments. Increased run-off rates and contaminants from roads (as well as footpaths and cycleways) can negatively impact on water quality and hydrological regime in receiving waterbodies.

As described in more detail in Section 3.3, the road drainage system for the proposed development comprises a six separate networks of gullies, pipes and manholes which will collect surface water run-off from the roads and convey it to attenuation and treatment systems. For most networks, attenuation of flows is provided by detention ponds, which also provide settlement and treatment to remove contaminants prior to discharge to existing drainage ditches/streams or existing surface water sewers. These ponds have been designed following a Nature-based Solutions (NbS) approach, consistent with the Sustainable Drainage Systems (SuDS) principles which guided the overall design of the proposed development. Due to spatial and other constraints, two of the drainage networks have attenuation tanks with hydrocarbon interceptors in place of detention ponds. Attenuation and treatment of run-off from the footpaths and cycleways will be provided by SuDS/NbS features in the verges.

Based on the design of the proposed drainage systems, there will be no negative impact on surface waters due to the quantity or quality of run-off from the new roads, footpaths or cycleways. With regard to existing roads and other artificial surfaces to be upgraded as part of the proposed development, the design of the proposed drainage systems will result in an improvement in the quantity and quality of run-off from these areas, as there is currently no attenuation or treatment of same.

While a foul sewer network forms part of the design, no wastewater flows will be generated from the proposed development itself. Therefore, there will be no impact from wastewater. The potential for in-combination effects from wastewater is assessed in Section 7.

Thus, given the proposed design, the possibility of any negative effects on 'Mudflats and sandflats not covered by seawater at low tide' (1140) or 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' (1330) in the Great Island Channel SAC from the operation of the proposed development can be excluded at this stage.

Potential Indirect Impacts during construction and operational phase via groundwater (hydrogeological pathway)

Excavation works on site can interact with groundwater and has the potential to expose groundwater to contamination by concrete, hydrocarbons and other chemicals used in construction. The proposed development is primarily underlain by till derived from Devonian Sandstones, with very minor portions of Gravels derived from Devonian sandstones underlying the western portion of the development (GSI, 2023).

According to the Geological Survey of Ireland GSI (2023), there are 3 no. geological formations underlying the study area; Ballysteen Formation (dark muddy limestone, shale) is the predominant formation, the Waulsortian Limestone (massive, unbedded limestone) lies under the southern portion of the proposed development and the northern portion is underlain by the Cuskinny Member (Kinsale Formation) (flaser-bedded sandstone and mudstone). There are no karst features reported within the immediate vicinity of the proposed development (GSI, 2023). The closest karst feature is a cave ca.60m north of Main Street.

Site excavation is anticipated to be no more than 4m in depth. Any localised / temporary alteration of ground water levels on-site is therefore expected to be minor and will not have a significant impact on the Slatty Water or more widely Cork Harbour. In landscaped areas of the site surface water will naturally infiltrate to soils and ultimately groundwater; all other waters will be intercepted by the surface water management system as discussed above.

It is therefore considered that the proposed development will not negatively impact on water quality within Great Island Channel SAC; nor will it impact, directly or indirectly, any of the habitats or species listed as features of interest for Great Island Channel SAC. However, as is good practice, a series of environmental protection measures are proposed during both construction and operation, which are detailed in full design of the drainage network (see Section 3.3.5) as well as in the accompanying oCEMP.

Potential Indirect impact / damage through discharge of treated foul effluent.

Two separate foul gravity sewer pipe networks are proposed to facilitate future development in the Carrigtwohill UEA. It is noted that no wastewater flows will be generated as part of the infrastructure development described in this document.

Therefore, it is not anticipated that there will be an operational discharge of foul to the existing network arising from the works proposed as part of this scheme.

Proposed Indirect habitat/species loss/damage via spread of invasive species (if present at the study site).

The introduction and spread of invasive species can also result in negative impacts within a designated site. As noted, no species listed on the 3rd Schedule of the EC (Bird and Natural Habitats) Regulations, 2011 (S.I. 477/2011), have been recorded on site. No 3rd Schedule species were recorded within the site boundaries as illustrated on Figure 1.1.

No invasive species have been recorded on proposed Carrigtwohill lands. Due care will however also be taken to prevent the introduction of any invasive species to the site. As a result, no adverse effects shall occur on the Great Island Channel SAC as a result of the potential spread of invasive species.

Summary

The likelihood of significant effects on the Great Island Channel SAC were discounted.

6.2. Identification of potential impacts on the Cork Harbour SPA

6.2.1. Potential Impacts

The proposed development does not occur within Cork Harbour SPA and as such there will be no direct impact such as habitat loss or habitat modification as a result of the proposed development at the Carrigtwohill lands.

The site is screened by existing residential development, landscaping the N25 road corridor etc. from the estuary. There will be no direct impact to wetland habitats (Wetland and Waterbirds [A999]) for which the SPA has been designated.

Consideration of potential surface or ground water impacts are as discussed above for Great Island Channel SAC.

Field feeding birds are discussed in Section 4.6 and Section 5.4.2. A number of birds for which Cork Harbour has been designated are known to feed in fields outside the SPA. These include Oystercatcher, Curlew, Black-tailed Godwit, Golden Plover, and Lapwing. Of these species Golden Plover and Lapwing were not recorded feeding within the lands at Carrigtwohill. Oystercatcher was not recorded in the Carrigtwohill URDF Initiative lands, and only small numbers of Black-tailed Godwit were recorded on two dates. Compared to observations outlined in Section 4.6 (see also Appendix E), the Carrigtwohill lands do not support important numbers of Black-tailed Godwit.

Curlew was the only species recorded feeding within the Carrigtwohill lands in notable numbers. Curlew is discussed further below. In summary, the data suggests that the fields within the Carrigtwohill lands where Curlew were recorded can support up to ca. 7.45% - 13.2% of Curlew in Cork Harbour (using counts from Table 5.5). However, this high percentage only occurred on a single count of 86 birds in December 2022. The other counts were only of 1, 16 and 22 birds, respectively, representing a significantly lower proportion of birds within the SPA (i.e., 0.15%; 2.46% and 3.38%, respectively based on the low count of 650 birds in 2020/21). The percentage using the most recent 5 year mean (1008 Curlew) would be 0.1%, 1.59% and 2.18% of Cork Harbour SPA numbers, respectively. At less than 5% of the Cork Harbour numbers, these are not significant.

As noted above, the pattern of occurrence (present in Nov/Dec; absent in Jan/Feb) is probably quite typical for Curlew, and other field-feeding waders. Field-feeding is a strategy that estuarine waders generally exploit when the estuarine food resources are depleted below a certain level; thus, the use of fields will be influenced by the size of the estuarine resource in any given year together with the speed with which this is depleted. The latter will be influenced by overall bird numbers as well as factors such as weather (e.g., in poor weather the energetic requirements of waterbirds will increase). Furthermore, the value of a field may also be influenced by management practices, crop type / crop changes, moisture (level of rainfall affecting soil moisture) etc. Therefore, patterns of use will vary significantly from year to year, with birds using other sites as these become suitable in any given year (time of year). As noted, the long-term reduction in Curlew populations in Cork Harbour, the importance of field-feeding for the Curlew population may also be decreasing.

Thus, in summary the fields within the Carrigtwohill lands can on occasion support notable numbers of Curlew, however, most counts did not support significant numbers or recorded no observations of Curlew.

Furthermore, as can be seen from Section 4.62 and Figure 4.1 alternate fields are available for use by Curlew in the immediate environs of the Brown Island roost.

Thus, ex-situ impacts on field feeding birds which are qualifying interests of the adjoining Cork Harbour SPA are not anticipated.

6.3. Summary

On the basis of objective information presented in Sections 3, 4 and 5, the evaluation in Section 6.1 and 6.2 has found that the proposed development, is not likely to result in significant effects on the qualifying interests of the Great Island Channel SAC and Cork Harbour SPA, or indeed other Natura 2000 sites. The potential for such effects to occur in combination with other plans and projects is considered in Section 7.

7. Potential In-combination Effects

7.1. Requirement for Assessment

The requirement for AA arising out of Article 6(3) of the Habitats Directive covers plans and projects that, “*either individually or in combination with other plans or projects*”, are likely to have a significant effect on one or more Natura 2000 sites. This means that AA is required for any plan or project that, in combination with other plans or projects, would have a significant effect on one or more Natura 2000 sites, irrespective of the presence or absence of such effects from that plan or project on its own. Therefore, regardless of the significance of the effects of the plan or project individually, the potential for significant effects in combination with other plans and projects must be considered in all cases.

7.2. Approach and Methodology

The objective of this requirement is to capture significant effects potentially arising from the cumulation or other interaction of non-significant effects from multiple plans and projects. Consequently, the assessment of potential in-combination effects is not a pair-wise assessment, rather, it considers the totality of the effects arising from all plans and projects affecting the Natura 2000 site(s) in question. In identifying the plans and projects to be included in this assessment, it is important to define an appropriate geographical scope and timescale over which potential in-combination effects are to be considered and the sources of information to be consulted, as described below. It is also important to consider the nature of the interactions between effects, which may be additive, antagonistic, synergistic or complex.

7.2.1. Geographical Scope

In defining the geographical scope for identifying potential in-combination effects, it is important to remember that effects are evaluated in view of the conservation objectives of the Natura 2000 site(s) concerned. As such, two or more effects relating to the same conservation objective for a given Natura 2000 site would combine even if their geographical extents did not overlap. For example, the loss of a small area of an Annex I habitat type listed as a qualifying interest of a Natura 2000 site would combine with the loss of an entirely unconnected area of the same habitat type from a remote part of the same site to produce an in-combination effect, the significance of which would need to be evaluated in view of the relevant conservation objective. On that basis, the scope of the assessment of in-combination effects extends to all plans and projects affecting the same conservation objectives as the plan or project under consideration, irrespective of whether those effects are significant or not.

It was established in Section 5 of this report that the proposed development has connectivity to 2 No. Natura 2000 sites, namely the Great Island Channel SAC and Cork Harbour SPA. Thus, the geographical scope of the in-combination assessment covered all areas which influence the conservation condition of the qualifying interests of the Great Island Channel SAC and Cork Harbour SPA, which was taken to be the ZOI of the proposed development itself, plus transitional and coastal waterbodies of Cork Harbour and the adjoining lands (including lands adjoining the River Lee in Cork City and the River Owenacurra in Midleton).

7.2.2. Timescale

Given the nature and scale of the proposed development, as well as its integration with other future developments as part of the Carrigtwohill UEA and the development of the wider Carrigtwohill/South-East Cork area, it was considered appropriate to include all existing plans, projects and ongoing activities, projects under construction, approved or awaiting planning decisions, activities awaiting licensing, and any additional future plans or projects for which there is sufficient information available at this stage to allow for meaningful consideration of the potential in-combination effects. This includes particularly other projects relating to the Carrigtwohill UEA.

7.2.3. Sources of Information

The following sources of information were consulted to gather information on other plans and projects: -

- Cork County Development Plan, 2022-2028.

- Cork City Development Plan, 2022-2028.
- Cork County Council Planning Viewer <<https://corkcoco.maps.arcgis.com/apps/webappviewer/index.html?id=03a3b83db76c46fd9b66178f8d407e0d>> [accessed 09/03/2023].
- Cork City Council Planning Viewer <<https://corkcity.maps.arcgis.com/apps/webappviewer/index.html?id=e4af482c8da547de9f1689eba346a1ed>> [accessed 09/03/2023].
- EIA Portal <<https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1>> [accessed 09/03/2023].
- EPA Maps <<https://gis.epa.ie/EPAMaps>> [accessed 09/03/2023].
- Ireland's Marine Atlas <<https://atlas.marine.ie/>> [accessed 09/03/2023].

Plans and projects in the following categories were considered to be particularly relevant to this assessment: -

- Plans and projects contributing to the known threats, pressures and activities with negative effects on the Great Island Channel SAC and Cork Harbour SPA, as described in the Site Synopses (NPWS, 2013, 2015) and catalogued in the Natura 2000 Standard Data Forms (NPWS, 2019d, 2021),
- Other plans and projects whose construction or operation negatively affect water quality in Cork Harbour, particularly the Great Island Channel and the Slatty Water,
- Other plans and projects causing habitat loss/fragmentation (including outside the Cork Harbour SPA) for waterbirds, particularly in Carrigtwohill and the surrounding agricultural areas, and
- Carrigtwohill UEA projects and other projects connecting to the wastewater infrastructure which forms part of the proposed development.

7.3. Assessment

Plans

The current Cork City Development Plan and Cork County Development Plan set out the policies and objectives of Cork City Council and Cork County Council, respectively, with regard to the proper planning and sustainable development within their respective functional areas. Both plans cover the period from 2022 to 2028.

Both the Cork City Development Plan and the Cork County Development Plan were subject to AA, including the preparation of Natura Impacts Reports (NIRs). These NIRs assessed at a strategic level, the implications of the plans for Natura 2000 sites, including the Great Island Channel SAC and the Cork Harbour SPA. Where potential adverse effects were identified, the plans were amended to mitigate those effects. Following these amendments, the adopted plans now contain specific text in relation to the protection of these and other Natura 2000 sites. This includes restrictions on development within the vicinity of these sites, requirement for assessment under Article 6 of the Habitats Directive for development likely to have a significant effect on these sites, use of sustainable urban drainage systems (SUDS), and commitments to develop green infrastructure to support Natura 2000 sites and biodiversity generally, in line with Article 10 of the Habitats Directive and Article 3 of the Birds Directive.

The policies and objectives in these local authority development plans contribute to mitigating the negative effects of development on the Great Island Channel SAC, Cork Harbour SPA and other Natura 2000 sites and provide for the enhanced resilience of these sites through the development of green infrastructure/ecological networks. Therefore, there will be no adverse effects from the proposed works in combination with these development plans and these plans will also mitigate any in-combination effects arising from other projects.

Projects

A number of key infrastructure projects are currently being implemented in Carrigtwohill as follows: -

Carrigwohill URDF Initiative – Public Realm Infrastructure Bundle

Cork County Council approved Part 8 planning for the Carrigwohill URDF Initiative – Public Realm Infrastructure Bundle in 2022. This project includes a wide range of public realm enhancement measures and junction upgrades in Carrigwohill along Station Road, Main Street and at N25 Junction 3 (Cobh Cross). The works include: -

- Main Street and Station Road Public Realm Works (Figure 7.1) including footpath widening, provision of off-road cycling facilities, road re-alignment, resurfacing, signalisation, traffic calming measures, street lighting, demolition of buildings at the junction of Main Street and Station Road along with other small-scale demolition works and provision of new public spaces.
- Upgrade of Wises Road junction.
- Additional capacity measures at N25 Junction 3 (Cobh Cross) including widening and realignment of approach roads to the roundabout.

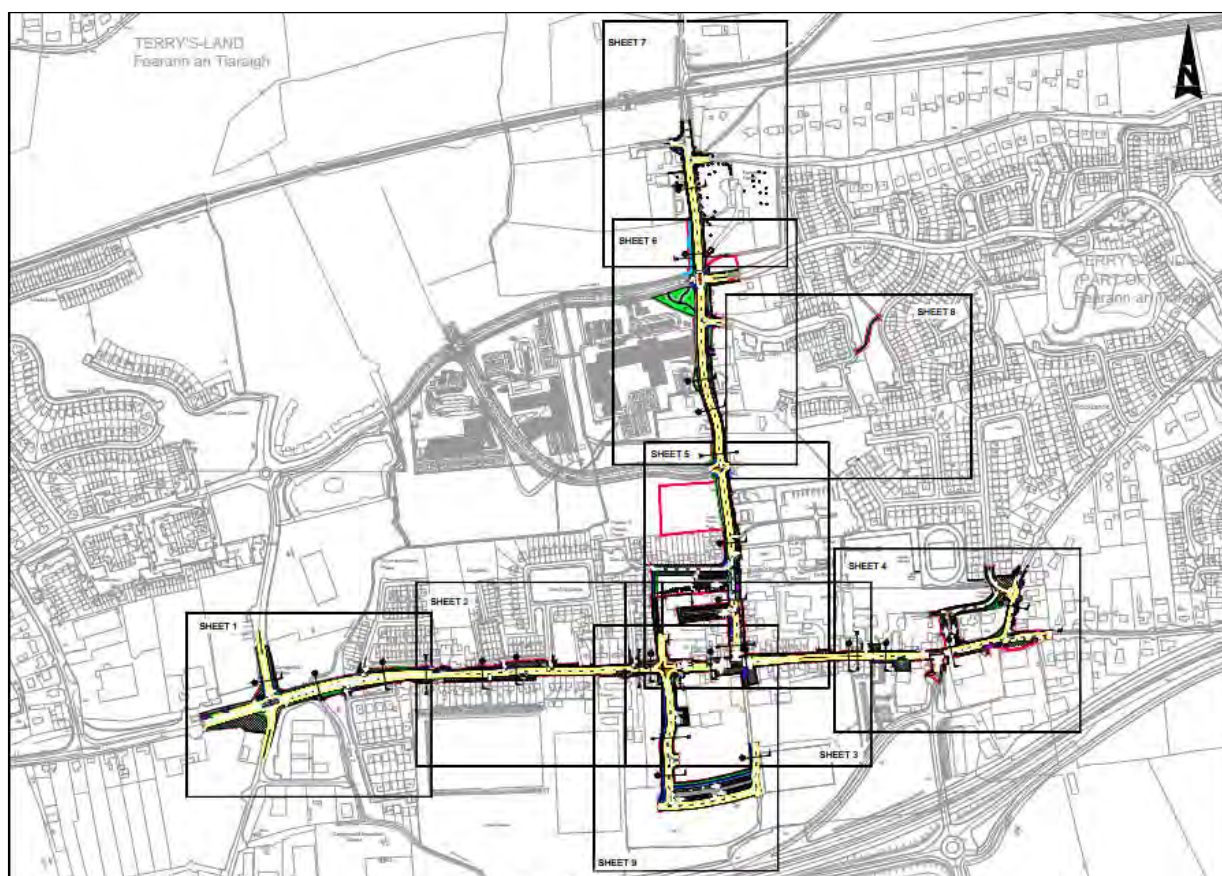


Figure 7.1 Main Street and Station Road Public Realm Works.

These proposed works are complimentary to the proposed Carrigwohill UEA Infrastructure. Together both projects will: -

- Support regeneration, compact growth, and sustainable development in Carrigwohill.
- Provide better quality streetscapes and public spaces to unlock the potential of Carrigwohill Town.
- Improve connectivity between Carrigwohill Town Centre and residential developments (existing and future), Carrigwohill train station, schools, business parks, commercial premises etc.
- Encourage sustainable modes of transport by reducing car dominance and providing safe pedestrian and cyclist facilities.

Station Road Schools Campus

Cork County Council granted planning permission (Planning reference: 19/5707) for a new school's campus on Station Road. This campus, which is currently under construction, comprises of two primary schools and one post-primary school. It also includes two new link roads connecting Station Road and Castlake. These link roads include segregated cycling facilities on both sides. An extract of the site layout plan from the planning application is shown in Figure 7.2 below.



Figure 7.2 Proposed Schools Campus Layout Plan (Planning Reference: 19/5707).

Midleton to Dunkettle Inter-urban Cycle Route

The Midleton to Dunkettle Inter-urban Cycle Route (IU-1) is proposed in the Cork Metropolitan Area Transport Strategy 2040. This cycle route will connect major employment centres such as Little Island (10,000+ employees) and Carrigtwohill IDA Business Park (3,800 employees) with existing and proposed residential areas including in Carrigtwohill, Midleton, Glanmire and Glounthaune. The Midleton to Dunkettle route will form part of the Cork to Waterford Inter-urban Demonstrator which is included in the Department of Transport Pathfinder Programme.

Sections of this route will provide connectivity to the Carrigtwohill UEA as described below.

Bury's Bridge Cycleway

Cork County Council granted Part 8 planning permission for a strategic cycleway scheme connecting Bury's Bridge at Dunkettle outside Cork City with Carrigtwohill. This scheme, part of which has now been constructed, provides approximately 7.7 kilometres of pedestrian and cycle path segregated from vehicular traffic. The indicative route of the cycleway, as extracted from the Preliminary Design Report included with the planning submission, is shown in Figure 7.3 below. The cycleway enters the east side of Carrigtwohill to the north of Cobh Cross (N25 Junction 3). It runs parallel to Carrigtwohill Main Street before turning north and running along the Castlake Access Road. It then joins the link roads associated with the new schools' campus as described above.



Figure 7.3 Bury's Bridge Cycleway (Extract from Preliminary Design Report by Aecom 2020).

Carrigwohill to Midleton Inter-urban Cycle Route Phase 1

The Carrigwohill to Midleton Inter-urban Cycle Route received Part 8 Planning Approval from Cork County Council in 2022. This section of IU-1 (Figure 7.4) runs to the north of Carrigwohill, primarily through the Carrigwohill UEA, connecting the IDA Business Park in the west with lands zoned for Industry to the south of Carrigane Road in the east. It will provide a sustainable transport link to the Carrigwohill UEA lands. It will also provide a link to existing and future employment centres in Carrigwohill, Carrigwohill Train Station, the planned Carrigwohill school's campus on Station Road which has obtained planning permission and existing and planned residential developments along Wise's Road, Station Road and Leamlara Road in Carrigwohill. As a section of IU-1 it will also provide sustainable transport connectivity from Carrigwohill to the major employment centre in Little Island.

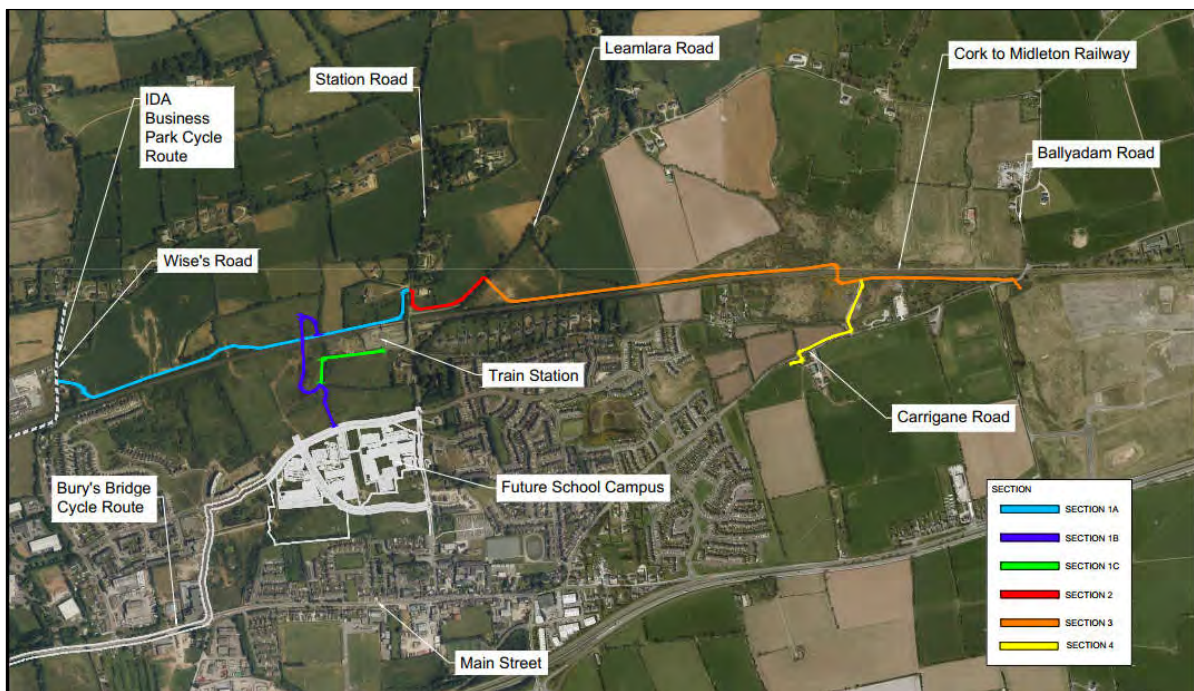


Figure 7.4 Carrigwohill to Midleton Inter-urban Cycle Route Phase 1.

Other Large-scale Projects

A search of the *EIA Portal*, focussing on areas within c. 1km of the Great Island Channel SAC and Cork Harbour SPA and connected waterbodies, identified 33 No. projects which required Environmental Impact Assessment (EIA). These included applications relating to quarries, new large-scale residential and mixed-use developments, railway improvement, electricity transmission, chemical and pharmaceutical industry, wastewater infrastructure, bridges and educational facilities. These projects are summarised in Table 7.1 below.

Table 7.1 Projects identified through the EIA Portal.

Competent Authority	Application No.	Applicant Name	Location	Description
Cork County Council	17/5659	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, Co. Cork	An extension to the existing biomedicines manufacturing facility (proposed gross floor area c. 19,116m ²).
An Bord Pleanála	PL04.248154	GE Healthcare Life Sciences BioPark	Barnahely, Raheens East, Ringaskiddy, Co. Cork	BioPark and all ancillary site development works including landscaping.
Cork County Council	17/7428	John Garde	Courtstown Industrial Estate, Courtstown, Little Island, Co. Cork	Construct a building (6625m ²) containing a waste transfer and recycling facility. The proposed development also includes the construction of a separate two storey administration block (178m ²).
EPA	P0778-02	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, County Cork	5.16 The production of pharmaceutical products including intermediates.
Cork County Council	18/7200	Country Clean Recycling Unlimited Company	Courtstown Industrial Estate, Courtstown, Little Island, Co. Cork	Construct a building containing a waste transfer and recycling facility along with a separate Administration Block, ESB Sub-Station, weighbridges, underground tanks, service yard, new boundary treatments and all associated drainage and site works.
EPA	n/a	Indaver Ireland Limited	Ringaskiddy, County Cork (National Grid Ref. E179055, N064279)	Waste to Energy Facility (waste incinerator with energy recovery) for the treatment of residual household, commercial and industrial waste which includes up to 24,000 tonnes of suitable hazardous waste with an annual capacity of 240,000 tonnes per annum.
Cork City Council	n/a	Tower Development Properties Ltd	The Custom House site at North Custom House Quay and South Custom House Quay, Custom House Street, Cork City	Refurbishment of the existing buildings on site including the Custom House and Bonded Warehouses, construction of a 34-storey tower c. 140m over the Revenue Building, a distillery, remedial works to quay walls, and the provision of a new public realm.
An Bord Pleanála	n/a	Progressive Commercial Construction Ltd	Site of Carey Tool Hire and the former Sextant bar, Albert Quay, Cork City	A Strategic Housing Development of 201no. Build To Rent apartments in a building that ranges in height from 8 to 11 to 24 storeys over ground floor, ancillary resident & communal facilities; cafe; private rented office; public bar/restaurant; basement.
Cork County Council	19/6783	Belvelly Marino Development Company DAC	Belvelly Port Facility, Marino Point, townlands of Marino, Belvelly and Oldcourt, Cobh, Co. Cork	Demolition, site infrastructure improvements, and utility upgrade works to stabilise the existing site and to provide capacity for future industrial development proposals.
Cork County Council	19/6964	Architectural and Metal Systems Limited	Wallingstown, Little Island, Co. Cork, T45 VP40	Construction of a new single-storey extension for the surface treatment (anodising) of aluminium sections, underground services and associated site works.
Minister for Public	DPE63-18-2018	Commissioners for Public Works	Blackpool, Cork	Flood Relief Scheme for Blackpool, Cork involving the construction of direct flood defences and conveyance improvement

Competent Authority	Application No.	Applicant Name	Location	Description
Expenditure and Reform				measures along a stretch of the River Bride and its tributaries in Blackpool, Cork.
Minister for Public Expenditure and Reform	DPE63-9-2018	Commissioners for Public Works	Glanmire/Sallybrook, Cork	Flood Relief Scheme for Glanmire/Sallybrook, Cork involving the construction of direct flood defences and conveyance improvement measures along the Glashaboy River and its tributaries.
Cork County Council	20/5627	Portfolio Concentrate Solutions UC ("PepsiCo Ireland")	Ballytrasna, Little Island, Co. Cork	Extension to the existing Production Building, expansion of the Site Utility Services and provision of a new Waste Water Treatment Plant.
An Bord Pleanála	n/a	Marina Quarter Limited	Former Ford Distribution Site, Centre Park Road, Cork	Permission for a Strategic Housing Development at the Former Ford Distribution Site, Centre Park Road, Cork, comprising demolition of existing structures and construction of a mixed-use development including apartments, commercial and community facilities.
Cork County Council	20/6955	Goulding Chemicals Limited and Belvelly Marino Development Company DAC	Belvelly Port Facility, in the townland of Marino, Marino Point, Cobh, Co. Cork	The construction of a new agricultural fertiliser facility for use by Goulding Chemicals Limited; and additional port operational use of the jetty to facilitate cargo vessels. An EIAR, and NIS will be submitted with the application.
Cork City Council	n/a	University College Cork & Tyndall National Institute	University College Cork, Distillery Fields, North Mall, Cork, T23 XA50	Construction of a new purpose-built research facility comprising of approximately 16,325m ² (GIA) rising from 4 storeys at the east to 7 storeys at the west accommodating mix of research laboratories, seminar rooms, offices, exhibition space and café.
Cork County Council	21/5132	Pfizer Ireland Pharmaceuticals	Townlands of Ballintaggart and Ballybricken, Ringaskiddy, County Cork, P43 X336	The construction of a new five-storey clinical manufacturing building, associated buildings, utilities, piperack, and associated site development works.
Cork City Council	n/a	Progressive Commercial Construction Ltd	Carey Tool Hire site, Albert Quay, Cork City, bounded by Albert Quay East to the north, Albert Street to the west, Albert Road to the south, and Navigation Square to the east	Office building 5-12-14-16 storeys over ground floor, external terraces at Levels 2, 6, 13, & 15; two levels of basement for parking; café/deli & restaurant with outdoor seating; refurbishment 2no. Protected Structures; Demolition of Carey Tool Hire.
An Bord Pleanála	ABP-310798-21	EirGrid plc	County Cork, between the existing Knockraha substation in the townland of Ballyanelagh in County Cork and Claycastle Beach in Youghal in the townland of Summerfield in Co. Cork	That portion of the Celtic Interconnector project to be constructed onshore in Ireland, to the Mean High Water Mark (HWM), including an electricity converter station in the townland of Ballyadam east of Carrigtwohill in County Cork.
Cork County Council	21/5965	Kilsaran Concrete Unlimited Company	Barryscourt and Rossmore townlands, Carrigtwohill, Co. Cork	The development will comprise continuance of use of the existing quarry development within an overall application area of c. 24.ha; extraction to the permitted level of 40m below

Competent Authority	Application No.	Applicant Name	Location	Description
				Ordnance Datum, within the area permitted under P. Ref. 03/4570.
Cork County Council	21/6983	Lagan Materials Ltd	Rossmore Townland, Carrigtwohill, Co. Cork	Permission sought for deepening the existing quarry from -20mOD to -50mOD within the existing permitted quarry footprint (P. Ref. S/02/5476; ABP Ref. PL04.203762; & ABP Ref. PL04.QD.0010) within an application area of 12ha.
Cork County Council	21/7265	Dawn Meats Ireland and EMR Projects Ltd	Lands at Water Rock, Middleton, Co. Cork	Two separate residential developments on adjoining sites at Water Rock, Middleton. EMR development will consist of 284no. residential units and associated buildings. Dawn Meats development will consist of 434no. residential units and associated buildings.
Cork City Council	n/a	Leeside Quays Limited	Kennedy Quay, Marina Walk, Victoria Road and Mill Road, South Docklands, Cork City	3.1426ha at Kennedy Quay & Marina Walk, South Docks, Cork City. Mixed Use: residential, office, entertainment, food & beverage, cinema, retail and public open space including Odlums Building (RPS ref. PS856) and rehabilitation hospital, all over double basement.
EPA	n/a	Irish Water	Cork Lower Harbour Ringaskiddy, Shanbally, Co. Cork	The provision of wastewater collection systems and treatment facilities in the Cork Lower Harbour area, with the wastewater treatment plant treating waste from Carrigaline, Crosshaven, Shanbally, Coolmore, Ringaskiddy, Passage West, Glenbrook, Monkstown & Cobh.
An Bord Pleanála	ABP-313216-22	Estuary View Enterprises 2020 Limited	Bessborough, Ballinure, Blackrock, Cork	Facilities, café, crèche, and all ancillary site development works.
An Bord Pleanála	ABP-313206-22	Estuary View Enterprises 2020 Limited	Bessborough, Ballinure, Blackrock, Cork	Demolition of 10no. existing agricultural buildings/sheds and log cabin residential structure and the construction of a residential development of 140no. apartment units, resident amenity facilities, crèche, and all ancillary site development works.
An Bord Pleanála	ABP-313277-22	Tiznow Property Company Limited (Comer Group Ireland)	Former Tedcastles Yard, Centre Park Road and the Marina, Cork	The demolition of existing structures and the construction of a strategic housing development of 823no. apartments in 6no. buildings ranging in height from part-1 to part-35no. storeys over lower ground floor level.
Cork County Council	n/a	Merck Millipore Ltd	Tullagreen, Carrigtwohill, Co. Cork, T45KD29	The demolition of an existing switch room and an existing drum store and the construction of a new 3-storey manufacturing building, a two storey Utilities Building, a single drum store, expansion to WWTP and Tank Farm with all associated site works.
An Bord Pleanála	ABP-313720-22	Reside Investments Limited	Kilmoney Road, Carrigaline, Co. Cork	Consists of Strategic Housing Development providing 224no. residential units, a creche/childcare facility and 3no. retail units and all associated works.
An Bord Pleanála	ABP-313919-22	Hibernia Star Limited	Jacobs Island, Ballinure, Mahon, Cork	The development will consist of the construction of 489no. apartments, creche and offices in 5 no. buildings ranging in height from part-1 to part-8 no. storeys over lower ground and semi-basement podium levels.
An Bord Pleanála	BP-315087-22	Córas Iompair Éireann (CIÉ)	Traverses through the townlands of Anngrove; Ballyadam, Middleton, Co. Cork.	Twin tracking of the existing single-track sections of railway between Glounthaune and Middleton, Co. Cork.

Competent Authority	Application No.	Applicant Name	Location	Description
			Ballyrichard More; Broomfield East; Broomfield West; Carrigane; Carrigtwohill; Harpers Island; Johnstown; Killacloyne; Killahora, Co. Cork	
Cork City Council	22/41675	University College Cork & Tyndall National Institute	Lee Maltings, Dyke Parade, Cork, T12 PX46 to North Mall, Cork, T23 XA50	Construction of a circa 65m long × 3.5-4.5m wide tri-span bridge on two structural piers connecting the existing Tyndall National Institute campus on the south to Tyndall National Institute's New Facility on the North (subject to OPW Section 50 approval).

Owing to their proximity to the proposed Carrigtwohill URDF Infrastructure Project and the Natura 2000 sites concerned, as well as their nature and scale, the following projects were deemed to be the most relevant in terms of the potential for negative effects in combination with the proposed development: -

- EirGrid Celtic Interconnector, including electricity converter station in Ballyadam, east of Carrigtwohill,
- Dawn Meats and EMR Projects residential developments at Water Rock, Midleton,
- Merck Millipore new buildings and expansion to WwTP in Tullagreen, Carrigtwohill, and
- CIÉ twin tracking of the existing single-track sections of railway between Glounthaune and Midleton.

In the context of the existing land use and habitats within the footprint of and adjoining these projects and the sensitivities of the Great Island Channel SAC and Cork Harbour SPA, and given the nature and scale of these projects, it is considered that they do not have any potential to give rise to adverse effects on any Natura 2000 sites in combination with the proposed development.

Furthermore, Uisce Éireann's planned upgrades to the wastewater networks and treatment plants discharging to Cork Harbour and connected waterbodies (as discussed in more detail below), ensure that adequate treatment is provided for wastewater from these and other projects before discharge to receiving waterbodies, thereby preventing negative effects on water quality in the Great Island Channel SAC and Cork Harbour SPA.

Small-scale Projects

Searches of the *Cork County Council Planning Viewer* and *Cork City Council Planning Viewer* found that, since 1st January 2017, there have been c. 10,000 No. planning applications to these two local authorities for projects within c. 1km of the Great Island Channel SAC and Cork Harbour SPA and connected waterbodies.

The nature and scale of these projects vary considerably, but they are generally of less concern in terms of their potential environmental effects than those identified through the *EIA Portal* (though there is some overlap). They include a large number of domestic projects such as retention of existing dwelling houses and associated structures, or modifications to same, or the construction of new domestic dwellings or extensions to dwellings, including new connections to the public wastewater network, or associated septic tanks or other on-site treatment.

Regarding potential impacts to water quality, such projects must comply with the EPA's *Code of Practice for Wastewater Treatment Systems for Single Houses* (EPA, 2009, 2018). Furthermore, Uisce Éireann's planned upgrades to the wastewater networks and treatment plants discharging to Cork Harbour and connected waterbodies (as discussed in more detail below), ensure that adequate treatment is provided for wastewater from such projects (where they are within urban wastewater agglomerations) prior to discharge to the receiving waterbodies, thereby preventing negative effects on water quality in the Great Island Channel SAC and Cork Harbour SPA. Therefore, such projects are not likely to have any significant effects in combination with the proposed Carrigtwohill URDF Infrastructure Project.

Licensed Activities

A review of licensed activities through *EPA Maps* found that there are 46 No. activities licences by the EPA in the vicinity of the Great Island Channel SAC and Cork Harbour SPA and connected waterbodies. These included the following: -

- 8 No. Integrated Pollution Control (IPC) licences for: -

Licence No.	Licensee	Location
P0028-01	Mr Brian Moran, Mr Tom Coughlan and Mr Hugh O'Regan	Marino Point, Cobh, Cork
P0218-01	Dulux Paints Ireland Ltd	Shandon Works, Commons Road, Cork
P0246-01	Georgia Holdings Ltd trading as Youghal Carpet Yarns	Killacloyne, Carrigtwohill, Cork
P0251-01	Rothbury Manufacturing Ltd	Sunbeam Industrial Park, Millfield, Blackpool, Cork
P0273-01	Cork Fabrication Services Ltd	Rushbrooke Commercial Park, Rushbrooke, Cork
P0343-01	Brooks Haughton Ltd	Pouladuff Industrial Estate, Togher, Cork
P0389-01	Goldenville Ltd	Wallingstown, Little Island, Cork
P0445-01	Heineken Ireland Ltd	Lady's Well Brewery, Cork

- 33 No. Industrial Emissions (IE) licences for: -

Licence No.	Licensee	Location
P0004-06	Thermo Fisher Scientific Cork Ltd	Currabinny, Carrigaline, Cork
P0006-04	Novartis Ringaskiddy Ltd	Ringaskiddy, Cork
P0010-05	Hovione Ltd	Loughbeg, Ringaskiddy, Cork
P0013-05	Pfizer Ireland Pharmaceuticals (Ringaskiddy)	PO Box 140, Ballintaggart, Ringaskiddy, Cork, P43 X336
P0016-02	Janssen Pharmaceutical Sciences UC	Wallingstown, Little Island, Cork
P0017-02	Cara Partners	Little Island Industrial Estate, Cork
P0034-03	Marinochem Ltd	Marino Point, Cobh, Cork
P0052-02	BASF Ireland Ltd	Inchera and Wallingstown, Little Island, Cork
P0091-03	Wexport Ltd	Wallingstown, Little Island, Cork, T45 RP82
P0136-04	Upjohn Manufacturing Ireland Unlimited Company	Wallingstown, Little Island, Cork, Cork
P0196-01	FLEXcon Company Incorporated	Carrigtwohill Industrial Estate, Tullagreen, Carrigtwohill, Cork
P0266-03	Irving Oil Whitegate Refinery Ltd	Whitegate, Midleton, Cork
P0316-01	Mr James O'Brien	Ballintubbrid East, Carrigtwohill, Cork
P0391-01	Galco (Cork) Ltd	Tramore Road, Cork
P0399-01	John A. Wood (Burnt Lime) Ltd	Carrigtwohill Quarry, Ballyvodock, Carrigtwohill, Cork
P0407-01	Irish Pioneer Works (Fabricators) Ltd	Kinsale Road, Cork, T12 K7XR
P0442-02	Irish Distillers Ltd	Midleton Distilleries, Midleton, Cork
P0476-02	Recordati Ireland Ltd	Raheens East, Ringaskiddy, Cork
P0561-05	Electricity Supply Board (Aghada)	Aghada Generating Station, Whitegate, Midleton, Cork
P0571-04	Merck Millipore Ltd	Tullagreen, Carrigtwohill, Cork, T45 KD29
P0578-03	Electricity Supply Board (Marina)	Marina Generating Station, Centre Park Road, Cork

Licence No.	Licensee	Location
P0778-02	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, Cork, P43 FA46
P0830-02	Bord Gais Energy Ltd	Whitegate Power Station, Whitegate (Corkbeg and Glanagow townlands), Cork
P0864-01	BioMarin International Ltd	Ballintaggart, Shanbally, Ringaskiddy, Cork
P0997-01	The Hammond Lane Metal Company Ltd	Ringaskiddy, Cork
P1018-01	Little Island BioEnergy Ltd	Inchera, Little Island, Cork
P1046-01	Fournier Laboratories Ireland Ltd trading as AbbVie	IDA Industrial Estate, Anngrove, Carrigtwohill, Cork
P1114-01	Indaver Ireland Ltd	Ringaskiddy Resource Recovery Centre, Ringaskiddy, Co. Cork
P1117-01	Architectural & Metal Systems Ltd	Wallingstown, Little Island, Cork, T45VP40
W0012-03	Kinsale Road Landfill	Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork
W0145-02	Enva Ireland Ltd (Cork)	Unit 9, Raffeen Industrial Estate, Raffeen, Monkstown, Cork
W0186-01	Indaver Ireland	Ringaskiddy, Cork
W0291-02	Forge Hill Recycling Unlimited Company	Forge Hill Waste Transfer Station, Forge Hill, Cork, T12 AK44

- 5 No. Waste licences for: -

Licence No.	Licensee	Location
W0022-01	East Cork Landfill Site	Rossmore, Carrigtwohill, Cork
W0023-01	Raffeen Landfill Site	Raffeen, Kerrycurrihy, Cork
W0132-01	Lotamore	Glanmire, Cork
W0171-01	Materials Recovery & Transfer Facility	Forge Hill, Kinsale Road, Ballycurreen, Cork
W0289-01	The East Tip	Haulbowline Island, Cork

Some of the above licences are currently pending approval, while others may no longer be in use. Based on the nature and scale of these activities, a risk of significant in-combination effects on Natura 2000 sites via water quality impacts must be considered. However, given the conditions attached to the IPC and IE licences and enforcement of the same by the EPA, and the very low risk of any significant water quality impacts in Cork Harbour from the proposed Carrigtwohill IRDF Infrastructure Project, there is not likely to be any significant effects in combination with from these activities the proposed development.

Wastewater Treatment Plants and Networks

Upper Cork Harbour

The proposed Carrigtwohill URDF Infrastructure Project includes new wastewater infrastructure to accommodate future development within the Carrigtwohill UEA. This new infrastructure will feed into the existing Carrigtwohill Wastewater Treatment Plant (WwTP), which discharges treated effluent to the Lough Mahon (Harper's Island) transitional waterbody, within the Great Island Channel SAC and a short distance upstream of the Cork Harbour SPA. The Carrigtwohill WwTP can provide tertiary treatment (including nitrogen and phosphorus removal) for a population equivalent (p.e.) of up to 30,000. The current load is 10,010 p.e. (as of 2021) and the WwTP passed its Water Framework Directive (WFD) compliance test in 2021. This leaves adequate capacity for future from the developments envisaged as part of the UEA. Furthermore, Uisce Éireann will progress any WwTP and network upgrades as required and in advance of treatment headroom being exhausted.

The Midleton WwTP can provide tertiary treatment (including nitrogen removal) for 15,000 p.e. but is currently overloaded, with an agglomeration p.e. of 16,376 (as of 2021). Nevertheless, it passed its WFD compliance test

in 2021. This plant discharges to the Owenacurra Estuary transitional waterbody, which is connected to the North Channel Great Island transitional waterbody. In addition, on 13th February 2023, Cork County Council granted planning permission for the Midleton North Wastewater Pumping Station and Network (Planning Ref. 22/05032), which will provide for the diversion of loads of c. 4,100 p.e. from the Midleton wastewater network to Carrigtwohill, which, as demonstrated above, currently has treatment headroom of almost 20,000 p.e. This will bring the effective loading to the Midleton WwTP within its design capacity without significantly reducing the capacity of the Carrigtwohill WwTP to accommodate expected loading from future UEA development.

The Cork City WwTP provides tertiary phosphorus removal for 231,000 p.e., the plant capacity is 413,200 p.e. and it passed its WFD compliance test in 2021. This WwTP is located at Carrigrenan, Little Island and discharges to the Lough Mahon transitional waterbody, which overlaps with the Great Island Channel SAC and Cork Harbour SPA, and is connected to the Glashaboy Estuary and Lee (Cork) Estuary Lower. There is no existing or proposed connection between the Carrigtwohill and Cork City wastewater networks.

The current WFD ecological status or potential and risk of not achieving WFD objectives by 2027 for each of the transitional waterbodies to which the three WwTPs concerned discharge are provided in Table 8-2 below. While these are identified as being at risk in many cases, Uisce Éireann’s planned upgrades to the wastewater networks and treatment plants discharging to Cork Harbour and connected waterbodies should significantly assist in the aim to achieve good water quality status in these waterbodies.

Table 7.2 WFD Status and Risk for transitional waterbodies covering the Great Island Channel SAC and inner sectors of the Cork Harbour SPA and to which the Carrigtwohill, Midleton and Cork City WwTPs are connected.

Transitional Waterbody	WFD Status 2016-2021	Risk (re 2027)
Slatty Bridge, Fota Island	Unassigned	Review
Lough Mahon (Harper’s Island)	Good	At risk
Lough Mahon	Moderate	At risk
Glashaboy Estuary	Bad	At risk
Lee (Cork) Estuary Lower	Moderate	At risk
Owenacurra Estuary	Moderate	At risk
North Channel Great Island	Moderate	At risk

Given the existing capacity at the Carrigtwohill WwTP and Uisce Éireann’s planned WwTP and network upgrades, the proposed new wastewater infrastructure will not facilitate future loading to the Carrigtwohill WwTP, i.e., from envisaged UEA developments, including in combination with future loads diverted from the Midleton network, which could lead to overloading of the WwTP and consequent negative impacts on water quality in the Great Island Channel SAC and Cork Harbour SPA. As such, significant effects on these sites in combination with future UEA development can be ruled out.

Lower Cork Harbour

Large WwTPs in discharging to the outer sectors of the Cork Harbour SPA and connected waterbodies include Ringaskiddy, Cobh North and Cloyne. The Ringaskiddy WwTP at Shanbally provides secondary treatment for 45,602 p.e. from Ringaskiddy Village, Ringaskiddy-Crosshaven-Carrigaline, Passage-Monkstown and Cobh Town, the plant capacity is 65,000 p.e. but it failed its WFD compliance test in 2021 due to discharges of industrial effluent downstream of the WwTP. The Cobh North provides secondary treatment for 1,135 p.e. and the plant capacity is 2,000 p.e. The Cloyne WwTP provides secondary treatment for 1,400 p.e., the plant capacity is 2,040 p.e. but it passed its WFD compliance test in 2021. There is no treatment provided for wastewater from Whitegate-Aghada (2,328 p.e.). As noted, the WFD status of transitional and coastal waterbodies to which these networks discharge and are connected are all ‘Moderate’ and ‘At risk’.

Overall, the discharge from these wastewater networks is not considered to be significantly affecting the Cork Harbour SPA and, given the absence of effects from the proposed development individually or in combination with the Carrigtwohill, Midleton and Cork City WwTPs (and future UEA development), it can be concluded that there will be no such effects in combination with these other wastewater networks.

Aquaculture

EPA Maps shows 4 No. areas designated under the Shellfish Waters Directive (2006/113/EC), as transposed into Irish law by European Communities (Quality of Shellfish Waters) Regulations, 2006 (as amended), in Cork Harbour. The largest of these is “Cork Great Island North Channel”, which occupies approximately the middle third of the Great Island Channel and so overlaps with both the Great Island Channel SAC and Cork Harbour SPA. In addition, the “Rostellan North”, “Rostellan South” and “Rostellan West” shellfish areas overlap the north-eastern sector the Cork Harbour SPA in the Lower Harbour. Under the Shellfish Waters Directive, the quality of these waters must be protected from pollution and meet specific targets for physical, chemical and microbiological parameters in order to support bivalve and gastropod molluscs.

A review of *Ireland’s Marine Atlas* found 3 No. licensed aquaculture sites in Cork Harbour. These include a small area to the west of Brick Island, where Fota Oyster Farm Ltd is licensed to produce Pacific Oyster and Brown Seaweeds, a larger area to the east of Brick Island, where Atlantic Shellfish Ltd is licensed to produce Pacific Oyster, and a large area covering the north-eastern part of the Lower Harbour, where Atlantic Shellfish Ltd is licensed to produce Blue Mussel. The two sites near Brick Island are both within the Great Island Channel SAC and Cork Harbour SPA, while the large Blue Mussel site overlaps the Cork Harbour SPA only.

In its AA of aquaculture activities in Cork Harbour (October 2022), the Department of Agriculture, Food and the Marine found that, given the types of aquaculture practised, as well as the scale and location of activities, such activities do not pose a threat to the Great Island Channel SAC or Cork Harbour SPA. On the basis of that assessment and given the nature, scale and location of the proposed Carrigtwohill URDF Infrastructure Project, no significant effects will arise from the proposed development in combination with aquaculture.

Other Activities

Farmers and landowners may also undertake general agricultural operations in areas adjacent to the proposed works and along watercourses, which could potentially give rise to impacts of a similar nature to those arising from the proposed development. This could potentially result in additional an increased risk to water quality. Many agricultural operations are periodic, not continuous in nature, and qualify as Activities Requiring Consent (ARCs) that require consultation with the NPWS in advance of the works, e.g., reclamation, infilling or land drainage within 30m of a river, removal of trees or any aquatic vegetation within 30m of a river, and harvesting or burning of reed or willow (NPWS, 2022a). Agricultural operations must also comply with the European Communities (Environmental Impact Assessment) (Agriculture) Regulations, 2011 (as amended) in relation to:

- Restructuring of rural land holdings,
- Commencing use of uncultivated land or semi-natural areas for intensive, and
- Land drainage works on lands used for agriculture.

Stage 2 AA is required under Regulation 9 if it is likely to have a significant effect on a Natura 2000 site. The drainage or reclamation of wetlands is controlled under the Planning and Development (Amendment) (No. 2) Regulations, 2011 and the European Communities (Amendment to Planning and Development) Regulations, 2011. Therefore, any in-combination effects from agricultural operations and the proposed works are not likely to be significant.

The harbour, as well as the catchments of watercourses which enter the harbour, are also subject to a diverse range of other impacts arising from forestry, sports and recreation, shipping, military uses etc.

7.4. Conclusion

As detailed in the preceding sections, it can be concluded that, based on the nature of the proposed development and its integration with other projects under the Carrigtwohill URDF Initiative, UEA Masterplan and Cork County Development Plan, it will not give rise to significant effects on any of the Natura 2000 sites within the Zone of Influence, in combination with other plans or projects.

8. Conclusion

This Appropriate Assessment Screening Report has examined the details of the proposed Carrigtwohill URDF Infrastructure Project and the Natura 2000 sites in their Zone of Influence. It has analysed the potential impacts of the proposed development on the receiving natural environment and evaluated their effects, both individually and in combination with other plans and projects, in view of the conservation objectives of the relevant Natura 2000 sites. This report has been prepared in line with the Habitats Directive, as transposed into Irish law by the Habitats Regulations, relevant case law and guidance from the European Commission, the Department of the Environment, Heritage and Local Government and the Office of the Planning Regulator, on the basis of objective information and adhering to the precautionary principle.

Following the assessment detailed in this report, it is concluded that the proposed development will not, either individually or in combination with other plans or projects, give rise to impacts which would constitute significant effects on the Great Island Channel SAC or Cork Harbour SPA, in view of its/their conservation objectives. Therefore, it is the recommendation of the authors of this report that Cork County Council, as the competent authority, may determine that Appropriate Assessment is not required in respect of the proposed Carrigtwohill URDF Infrastructure Project. Should any aspect of the design or construction methodology for the proposed development be materially changed, a new AA Screening Report would be required.

9. References

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Appendices

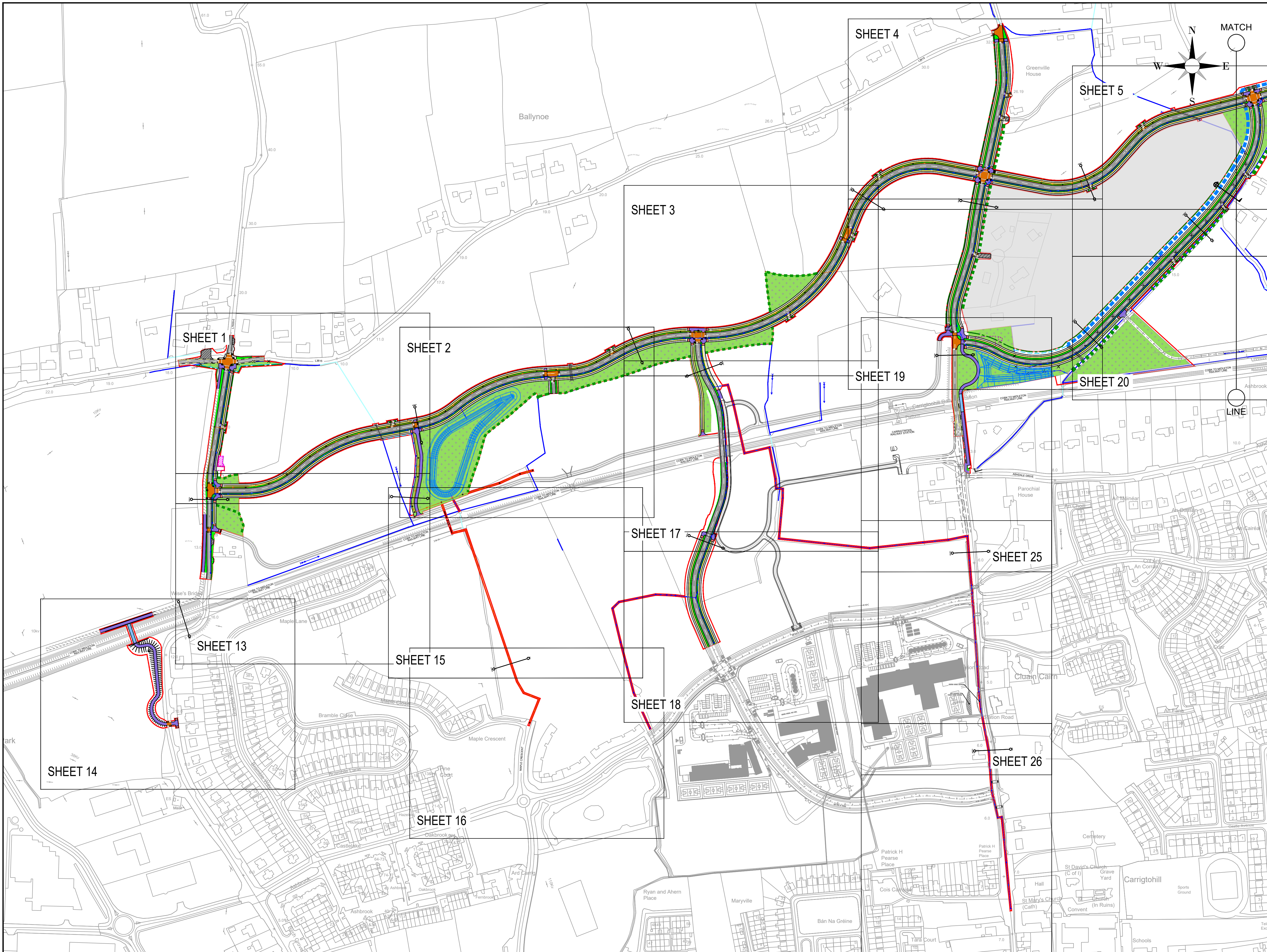


Appendix A. Design Drawings

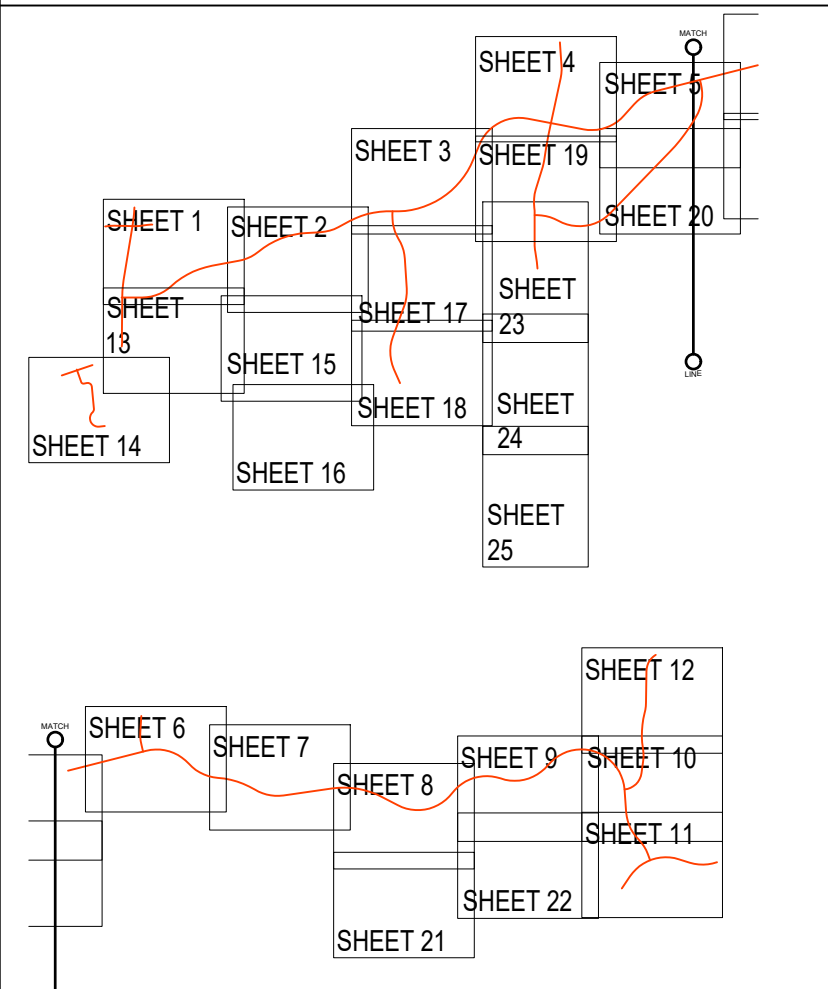
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- LEGEND:**
- PART 8 SITE BOUNDARY
 - PROPOSED CARRIAGEWAY
 - PROPOSED CYCLEWAY
 - PROPOSED FOOTPATH
 - PROPOSED SHARED USE PATH
 - PROPOSED BRIDGE DECK
 - PROPOSED TACTILE PAVING
 - PROPOSED RAISED TABLE/ CROSSING
 - PROPOSED VERGE/LANDSCAPING
 - PROPOSED PASSIVE GREEN SPACE
 - EXISTING SHARED USE PATH
 - EXISTING ENTRANCE TO BE MAINTAINED
 - EXISTING WALL
 - EXISTING CULVERT
 - EXISTING WATERCOURSE/ CHANNEL
 - EXISTING WATERCOURSE/ CHANNEL TO BE DIVERTED
 - PROPOSED DIVERTED WATERCOURSE/ CHANNEL
 - PROPOSED OVERLAND FLOW RELIEF CHANNEL
 - PROPOSED DITCH / WATERCOURSE CROSSING
 - PROPOSED OVERLAND FLOW RELIEF CULVERT
 - PLANNED INTERURBAN CYCLE ROUTE (IU-1) - TO BE DEVELOPED AS PART OF SEPARATE PROJECT
 - EXISTING HEDGE TO BE MAINTAINED
 - PROPOSED HEDGE
 - PROPOSED FOUL SEWER
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED DETENTION POND
 - PROPOSED ATTENUATION TANK

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Fax (+353) 091 779 830

Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

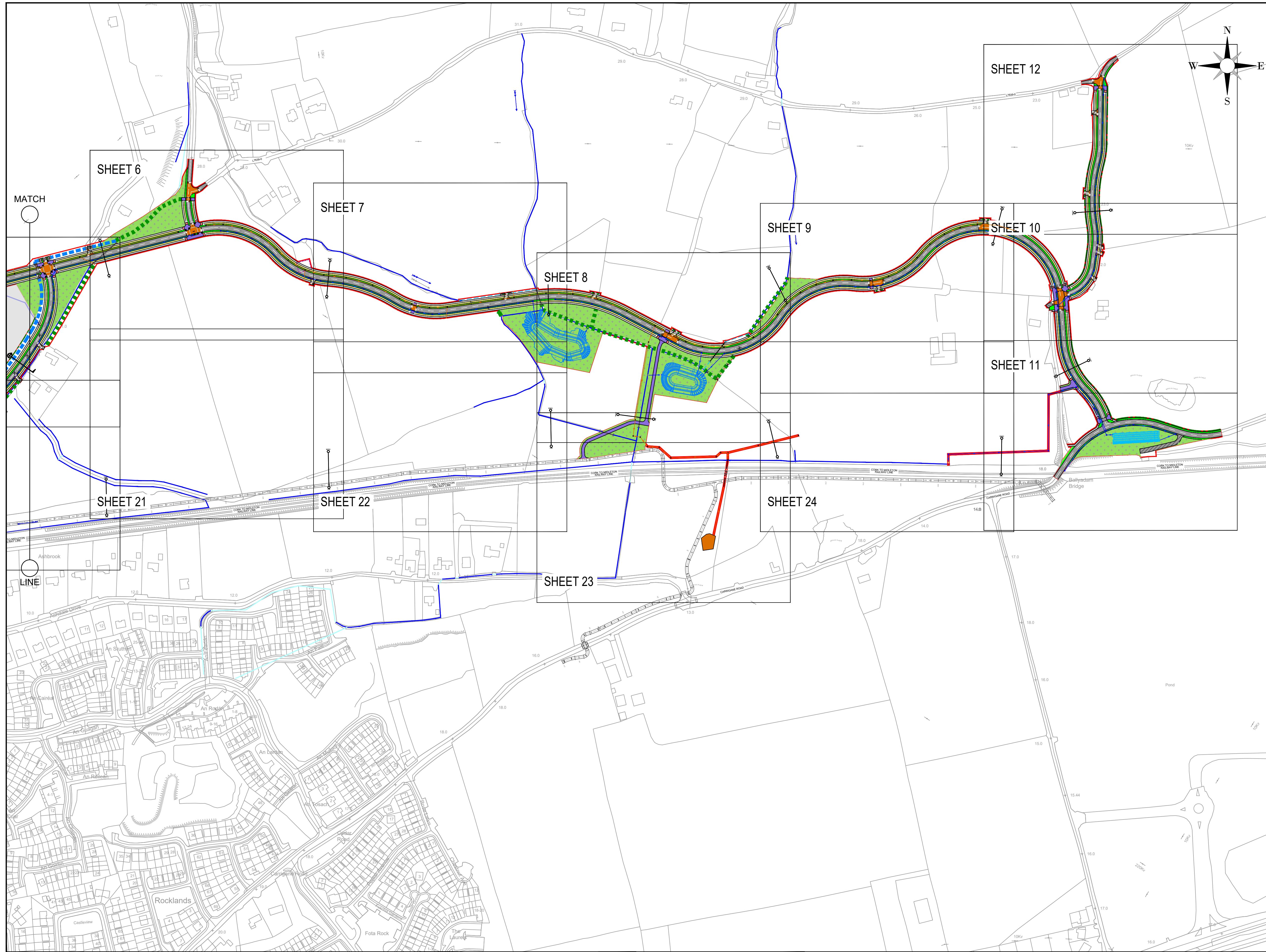
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Title
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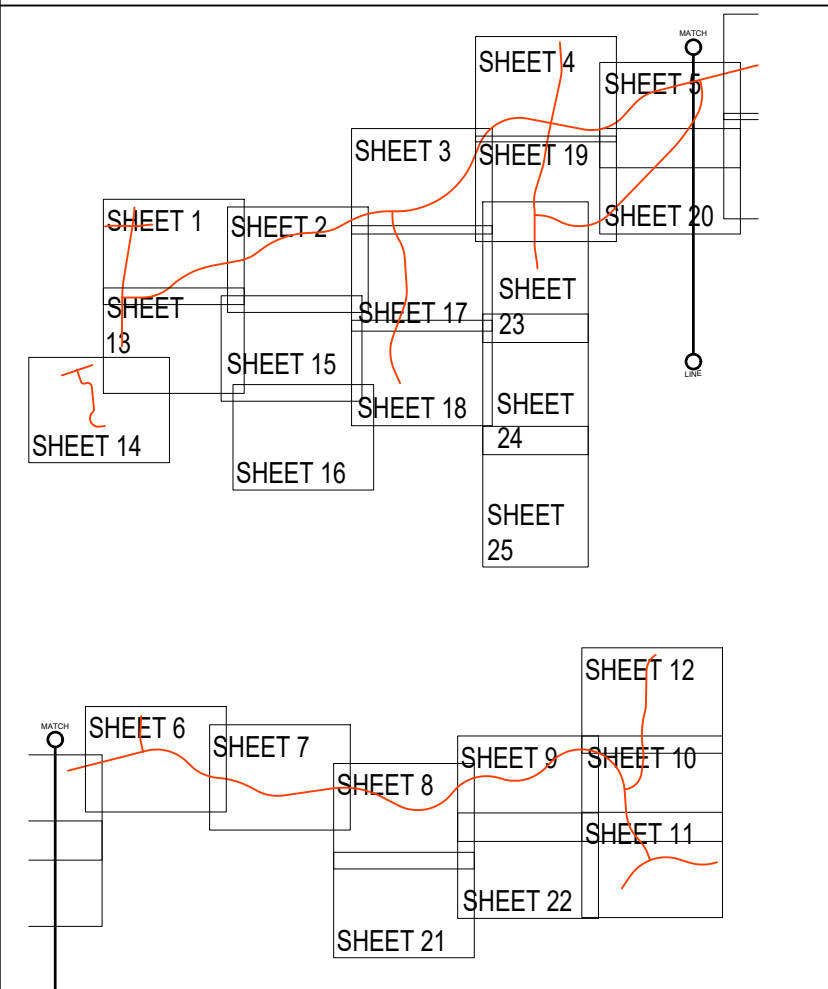
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KEY PLAN

- LEGEND:**
- PART 8 SITE BOUNDARY
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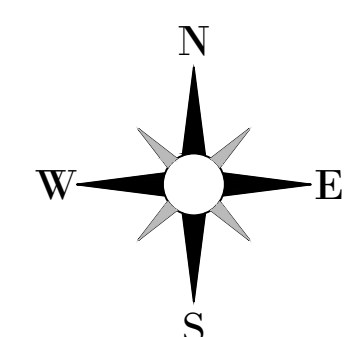
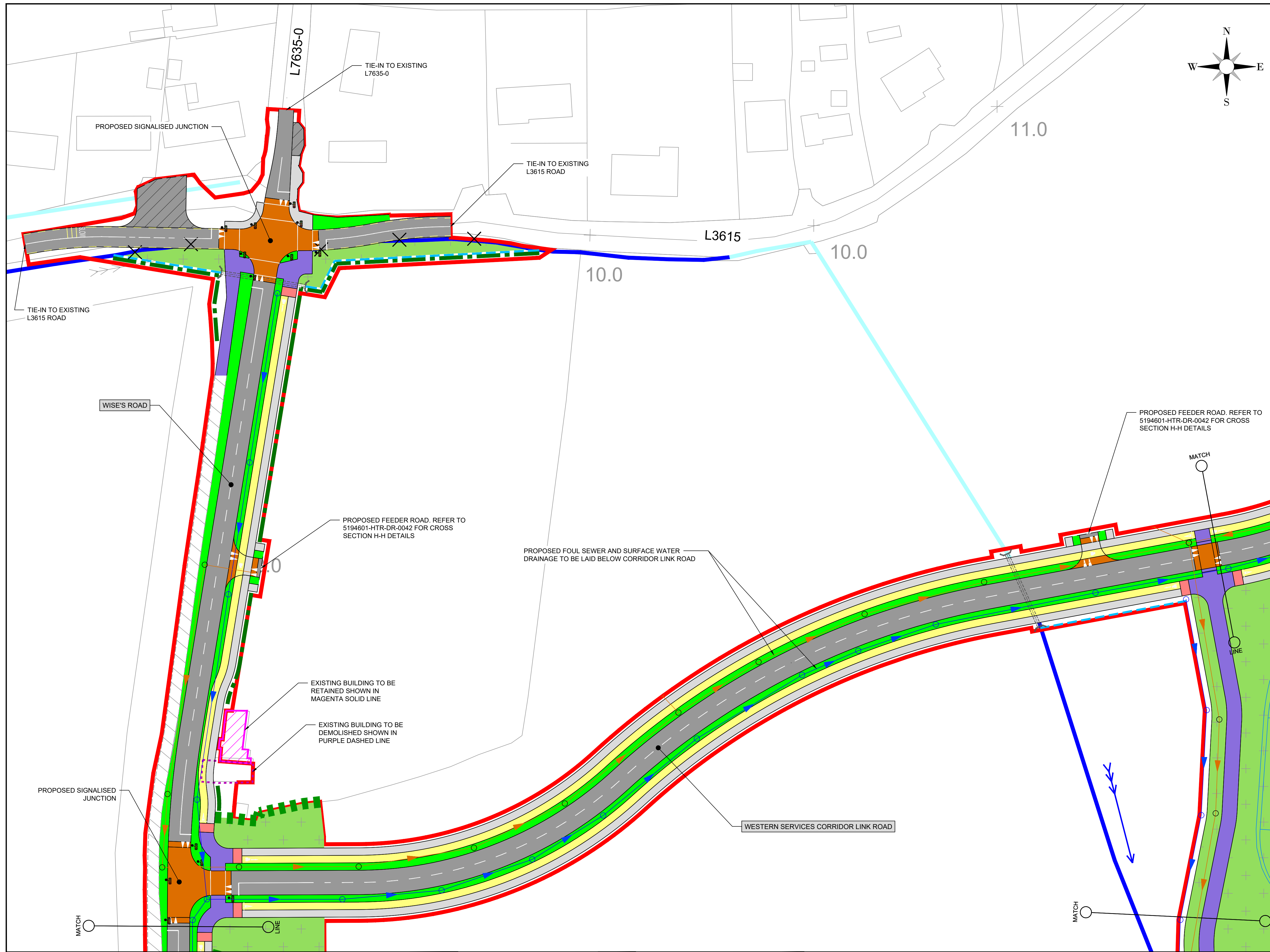
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Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE				

Purpose	ISSUED FOR PLANNING				
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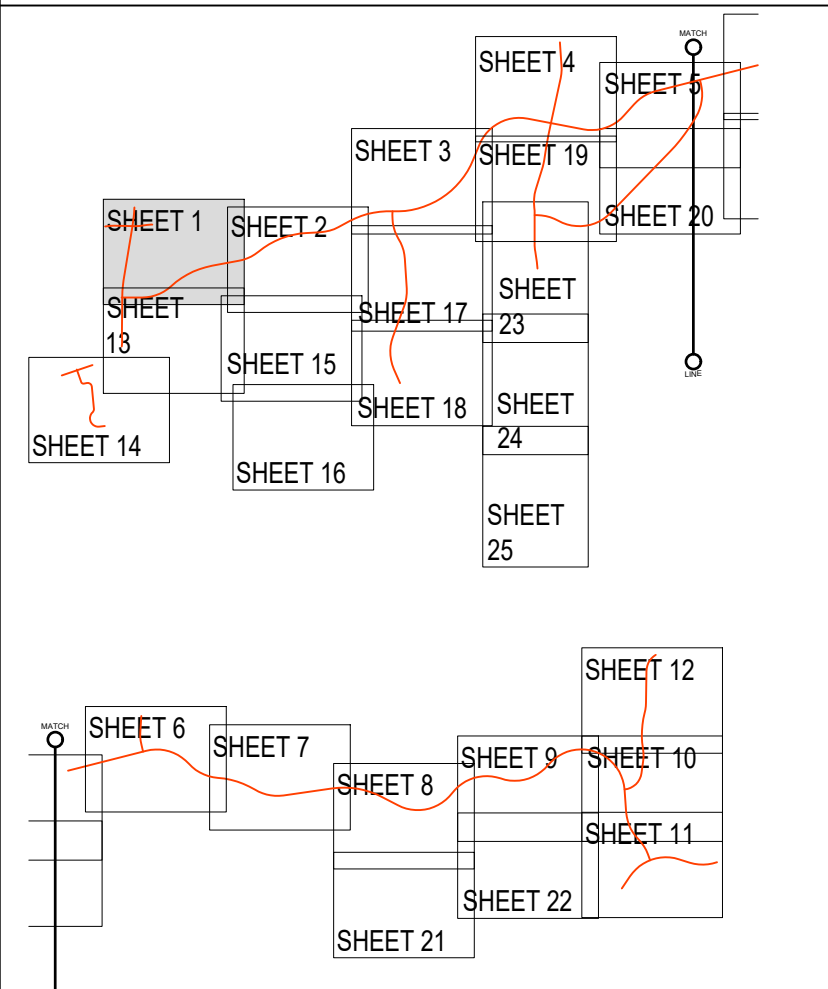
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Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

Purpose
ISSUED FOR PLANNING

Title
CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE

SHEET 1 OF 25

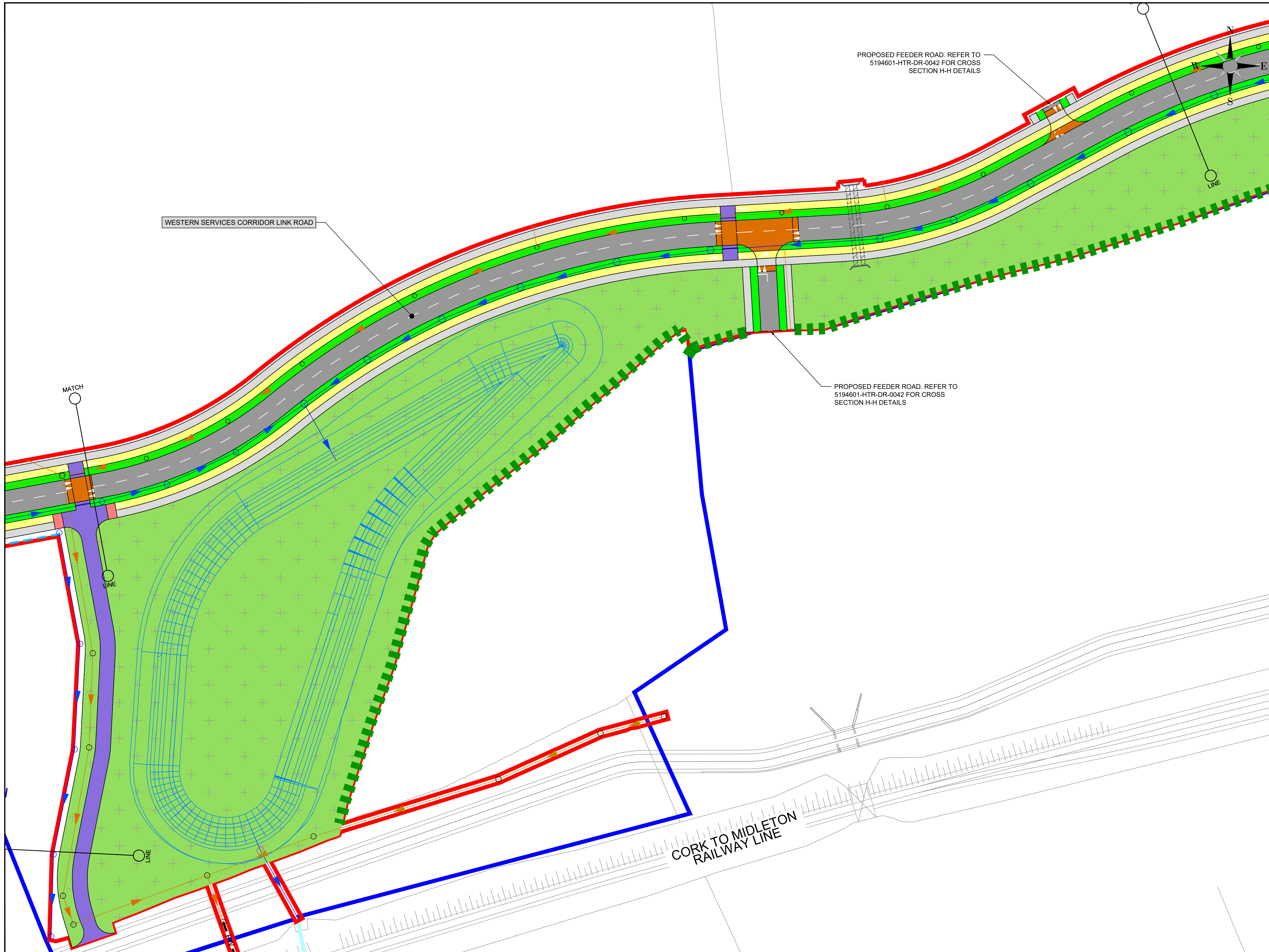
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Date	23/03/23	Date	23/03/23	Date	23/03/23

Status	Drawing Number	Rev
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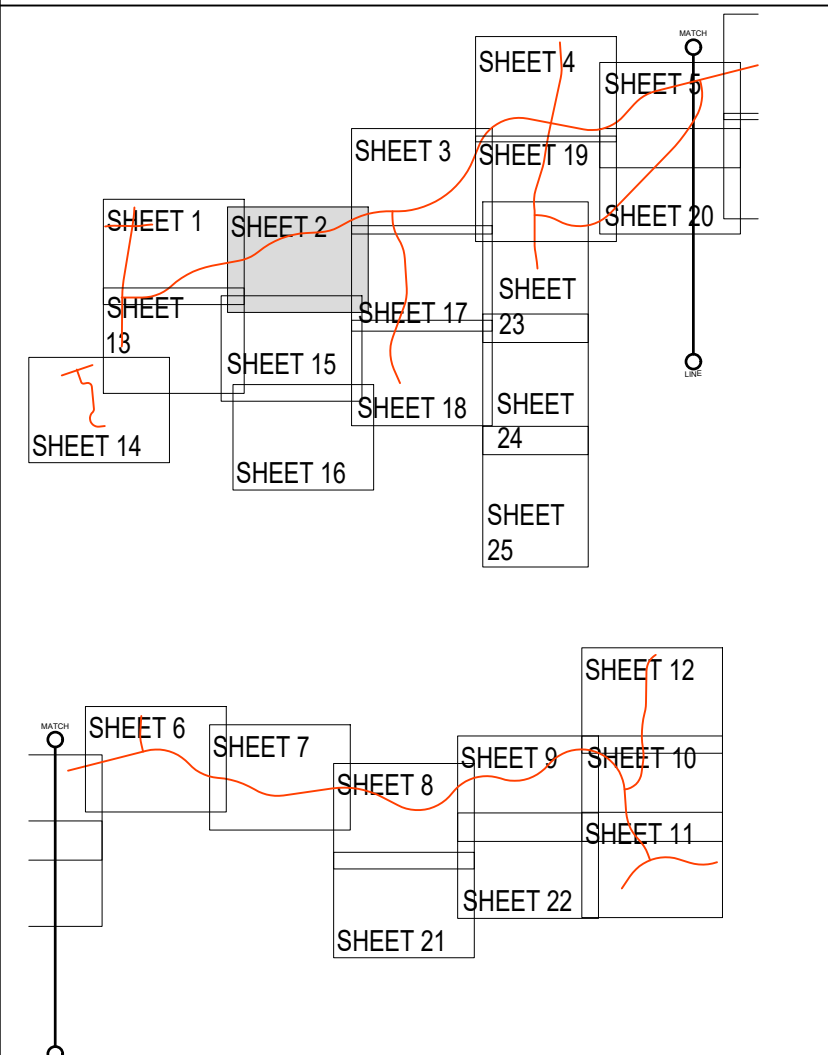
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Date: May 16, 2023 - 11:11am
Plotted by: F.MendozaDiaz



- GENERAL NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
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 4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
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- LEGEND:**
- PROPOSED PART 8 SITE BOUNDARY
 - PROPOSED CARRIAGEWAY
 - PROPOSED CYCLEWAY
 - PROPOSED FOOTPATH
 - PROPOSED SHARED USE PATH
 - PROPOSED BRIDGE DECK
 - PROPOSED TACTILE PAVING
 - PROPOSED RAISED TABLE/ CROSSING
 - PROPOSED VERGE/LANDSCAPING
 - PROPOSED PASSIVE GREEN SPACE
 - EXISTING SHARED USE PATH
 - EXISTING ENTRANCE TO BE MAINTAINED
 - EXISTING WALL
 - EXISTING CULVERT
 - EXISTING WATERCOURSE/ CHANNEL
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 - PROPOSED HEDGE
 - PROPOSED FOUL SEWER
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED DETENTION POND
 - PROPOSED ATTENUATION TANK

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Rev	Description	By	Date	Chk'd	Auth
D	ISSUED FOR PART 8 PLANNING	FMD	05/23	JOC	RAN
C	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
B	ISSUED FOR REVIEW	FMD	04/23	JOC	RAN
A	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
-	ISSUED FOR REVIEW	FMD	03/23	JOC	RAN

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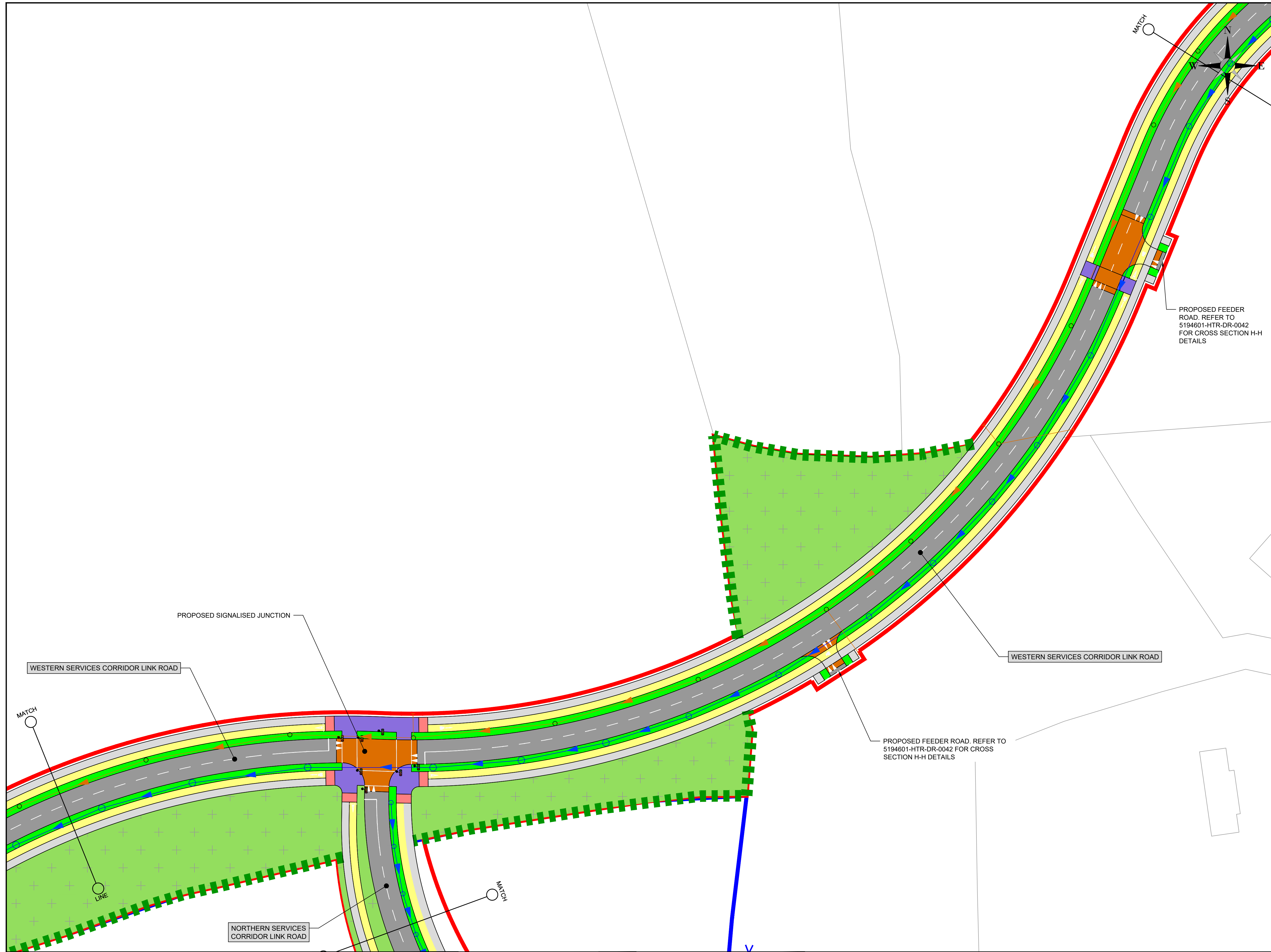
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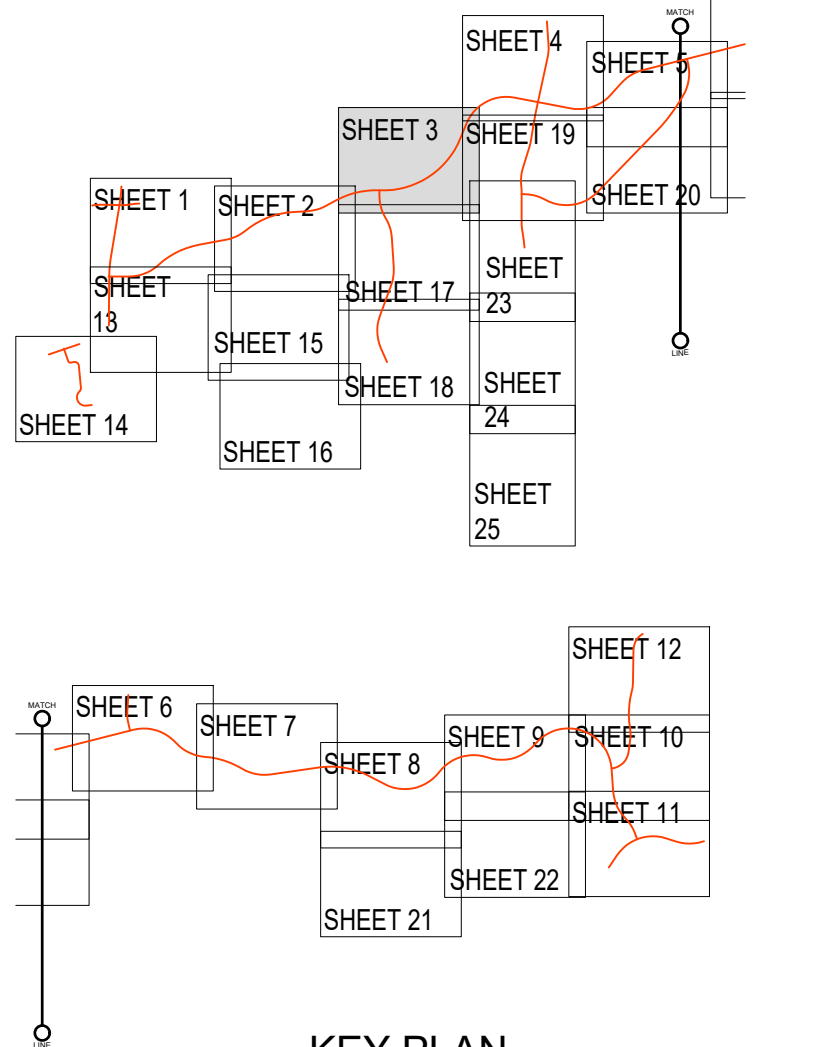
2nd Floor Technology House Parkmore Technology Park, Galway
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Clients	CORK COUNTY COUNCIL				
Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE				

Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 2 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JOC
Date	23/03/23	Date	23/03/23	Date	23/03/23
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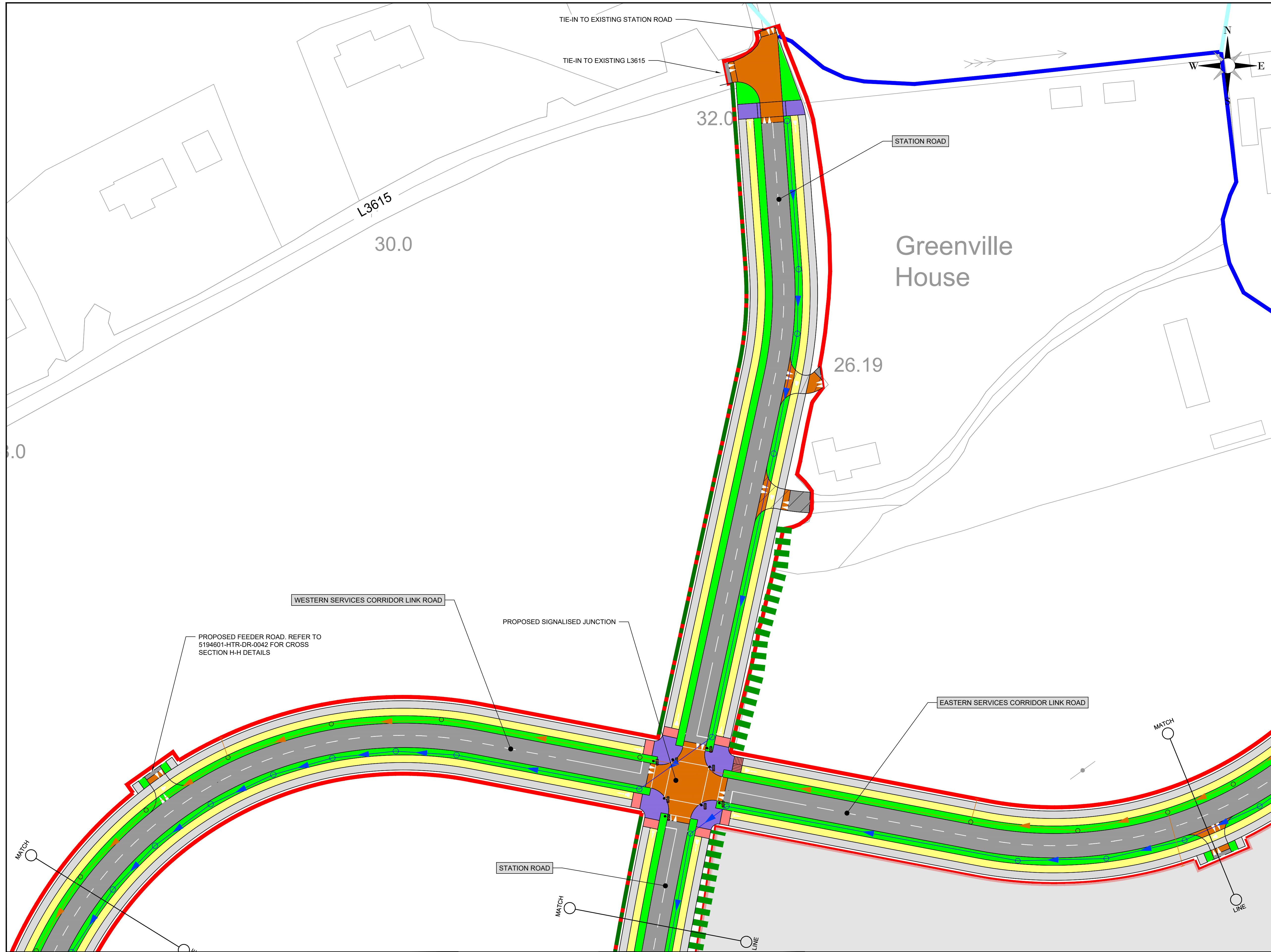
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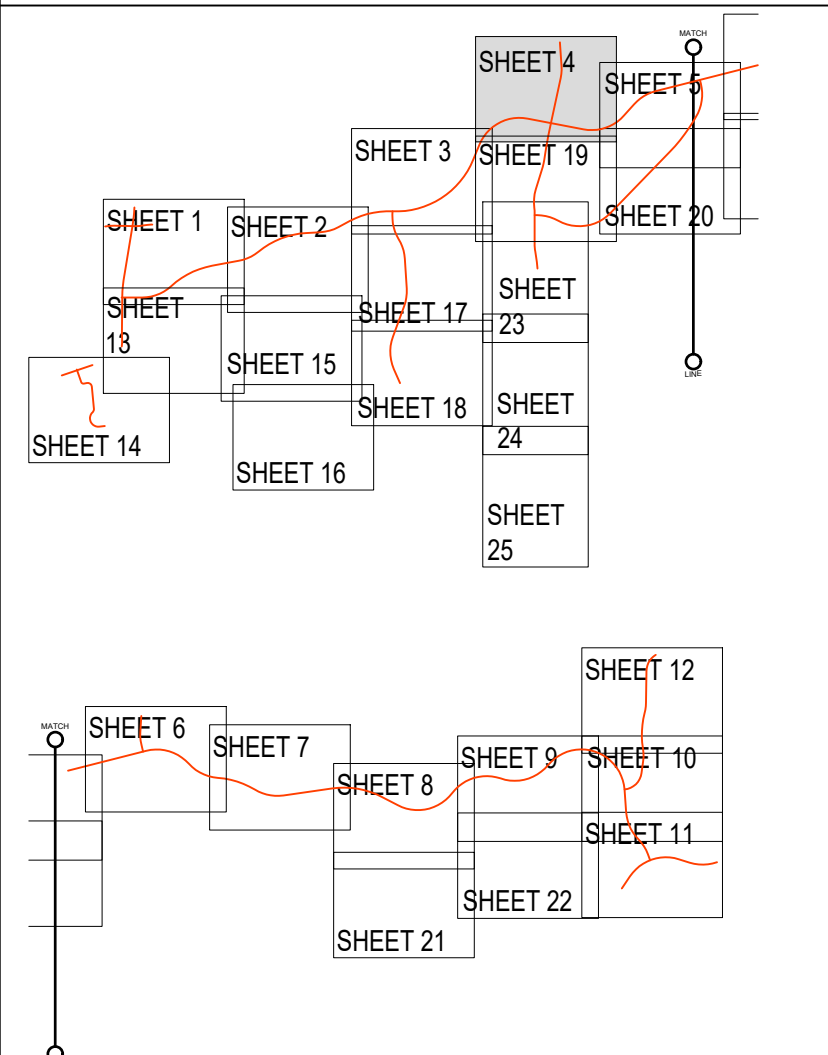
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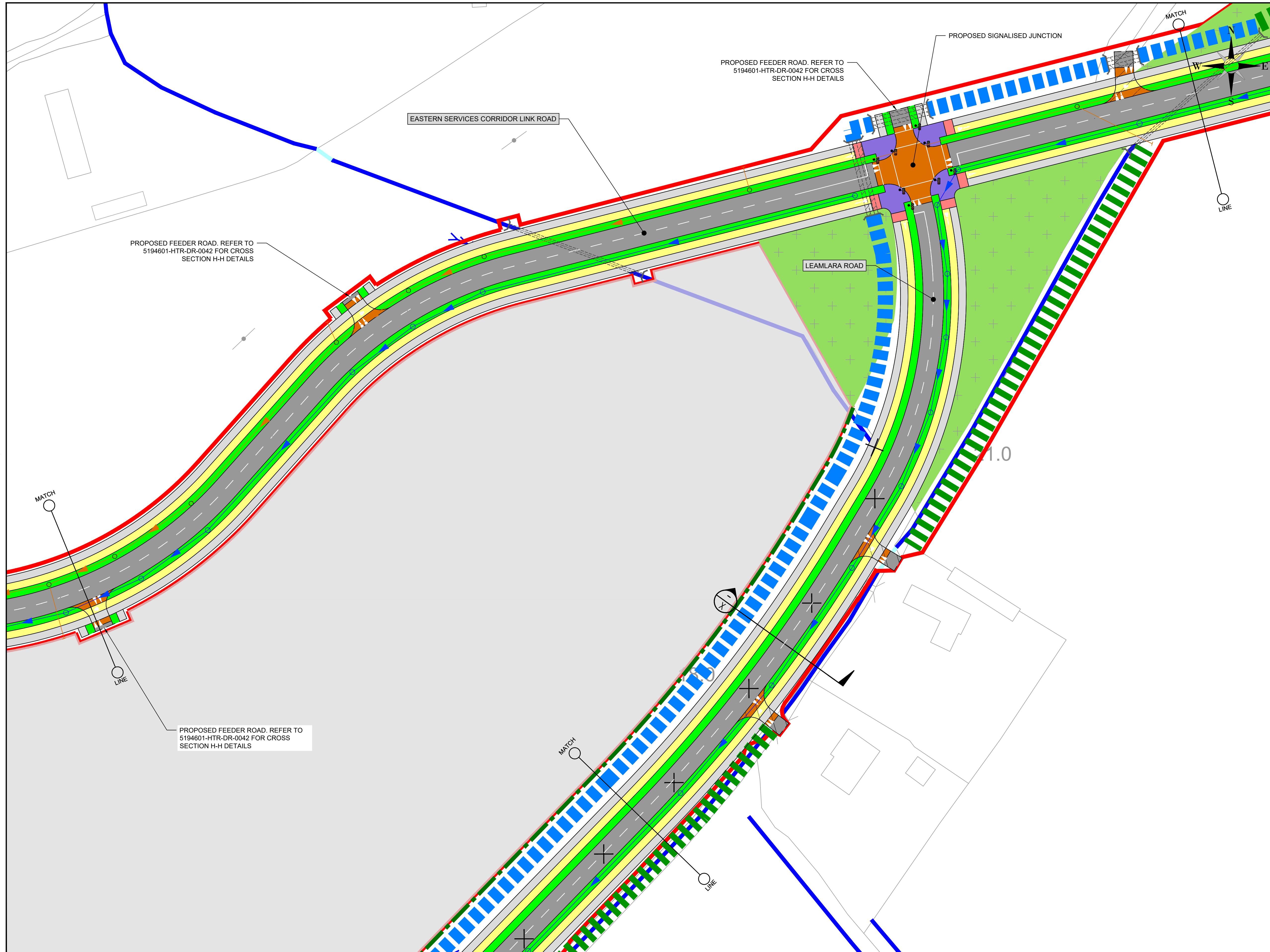
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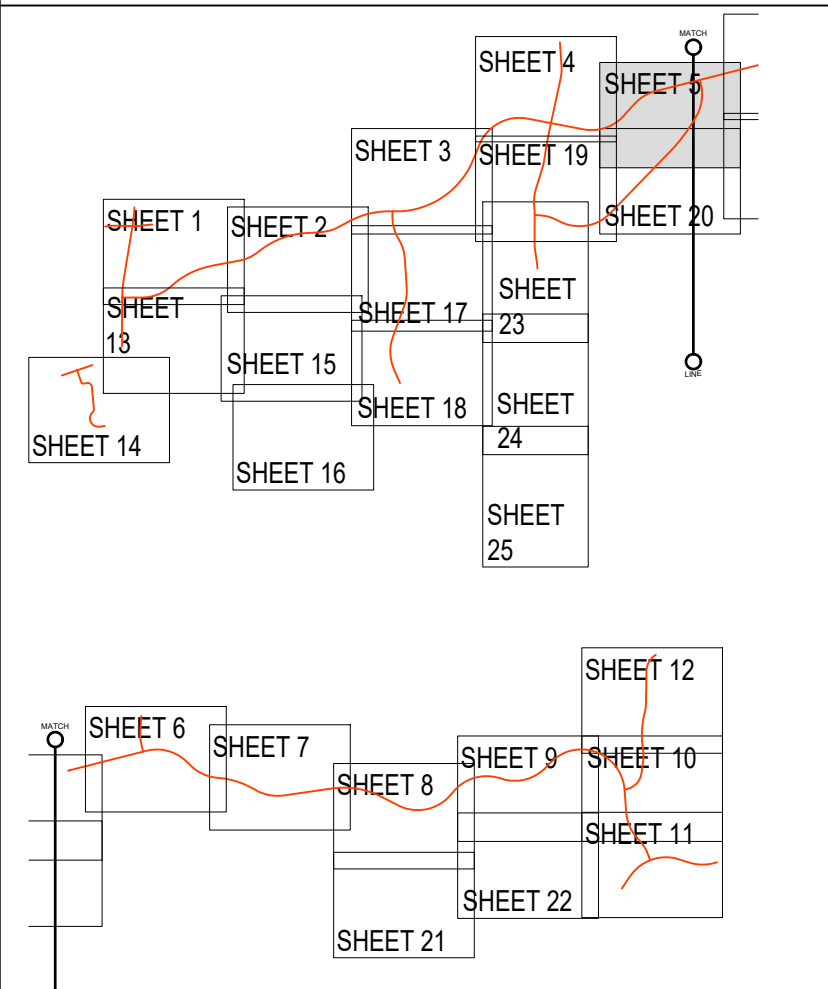
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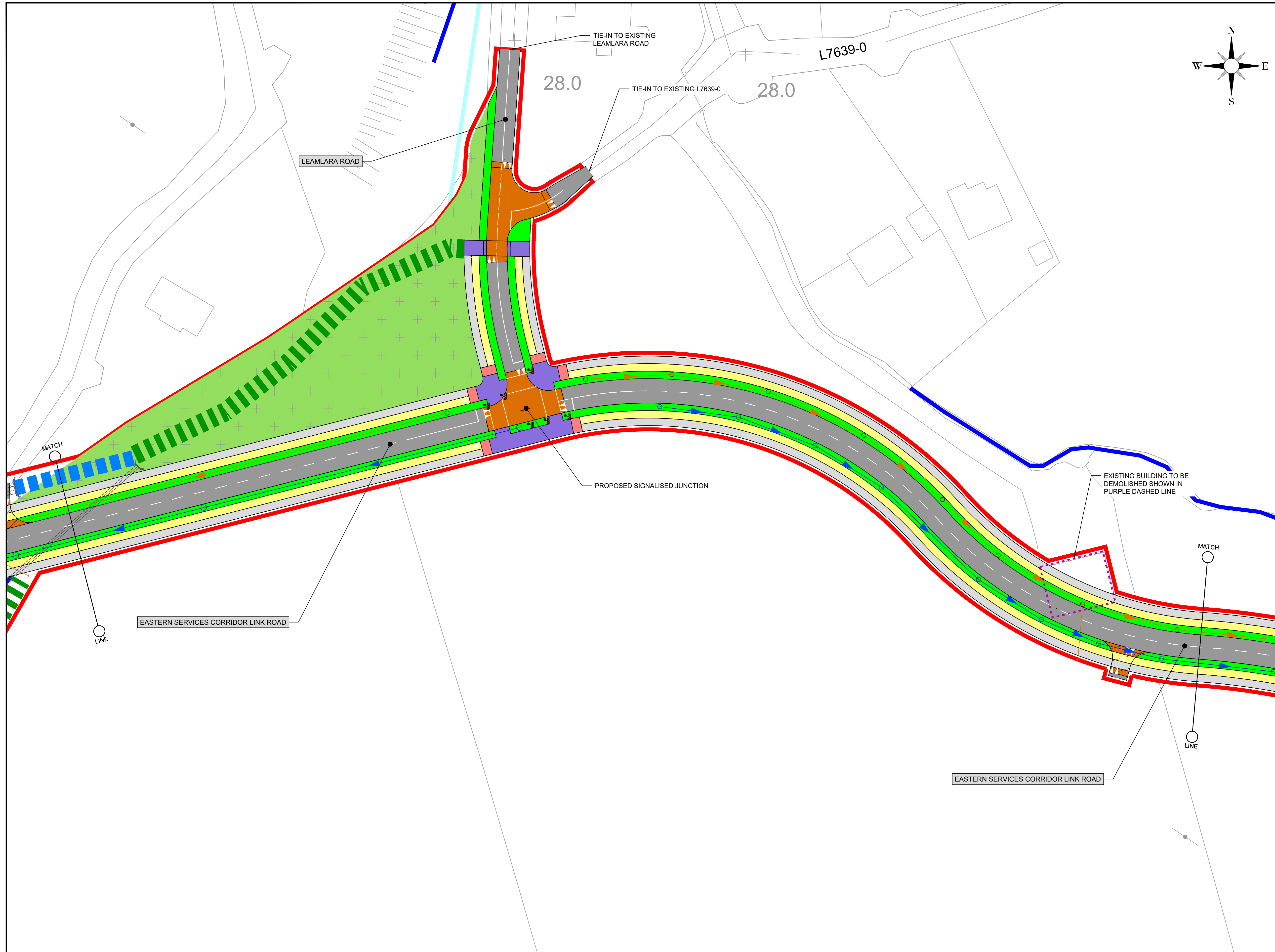
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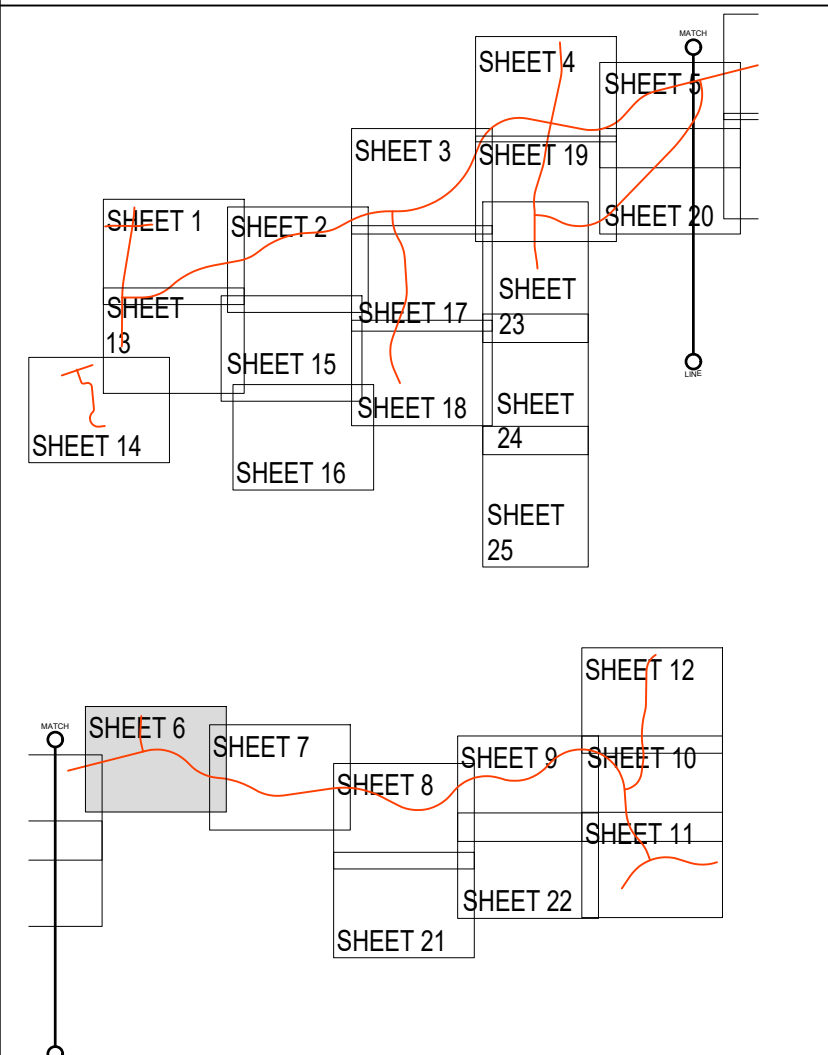
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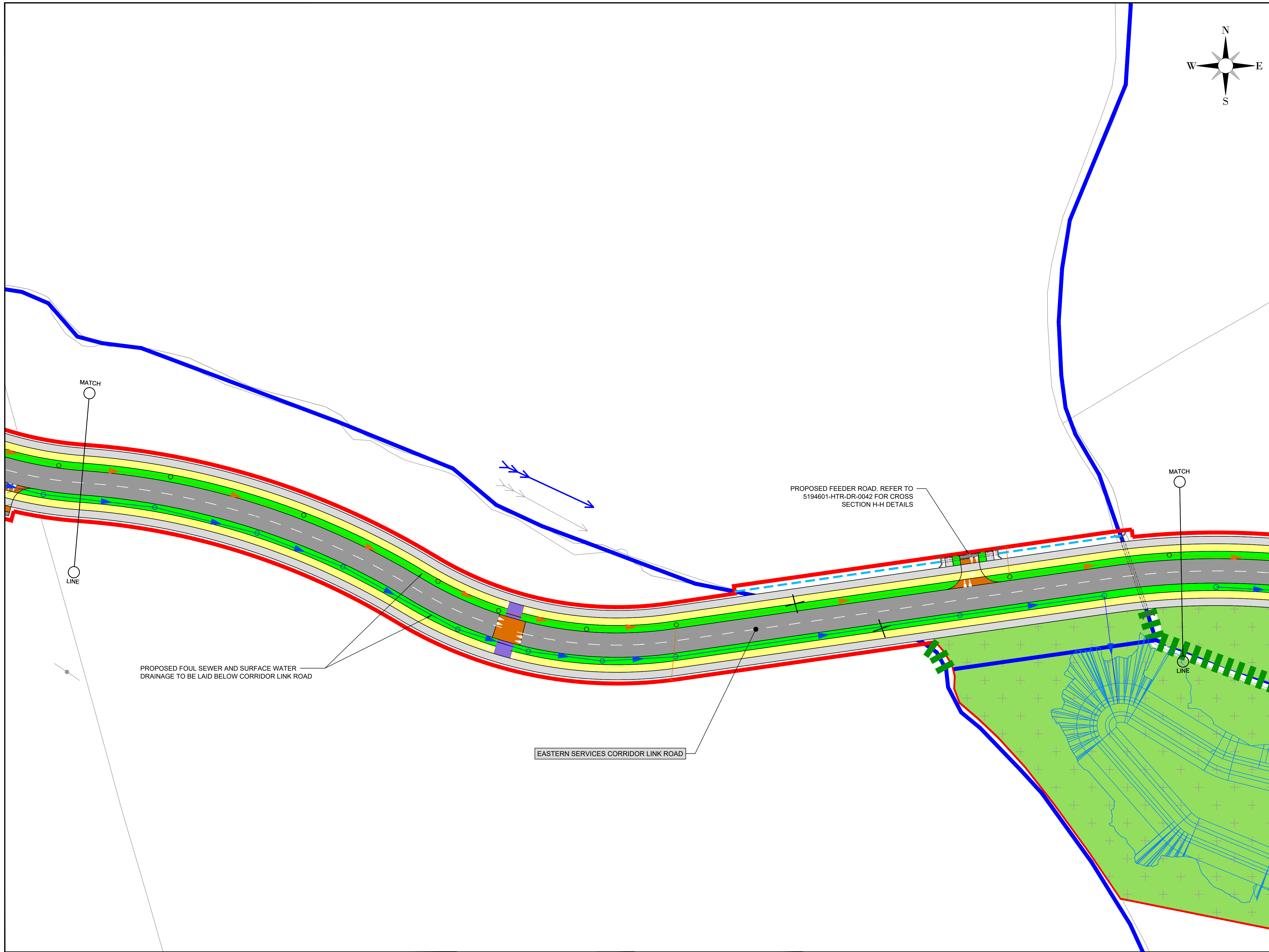
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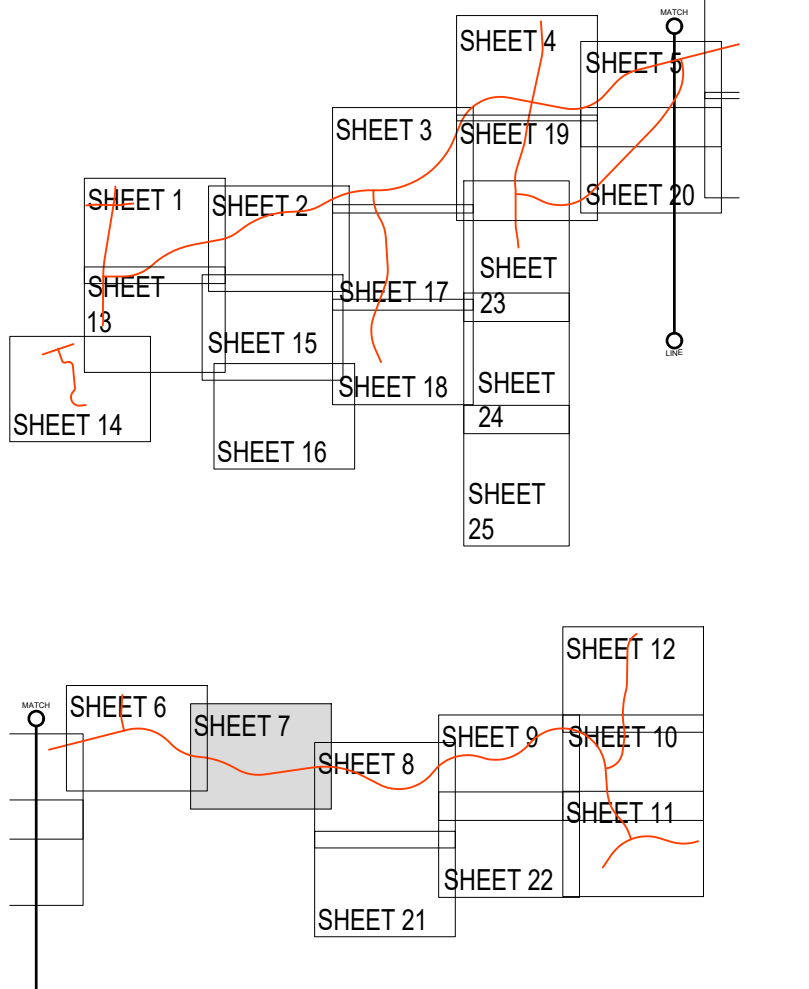
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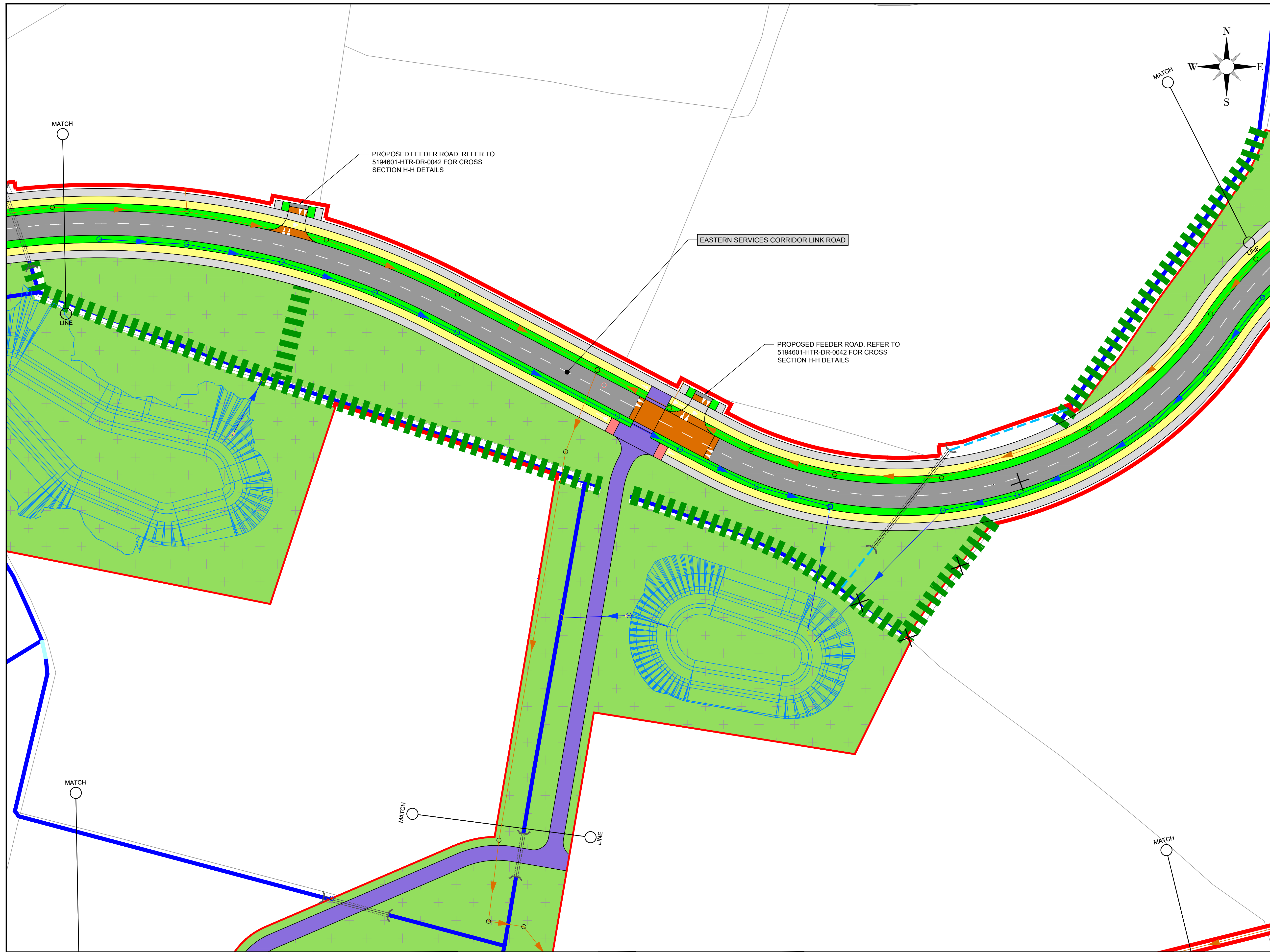
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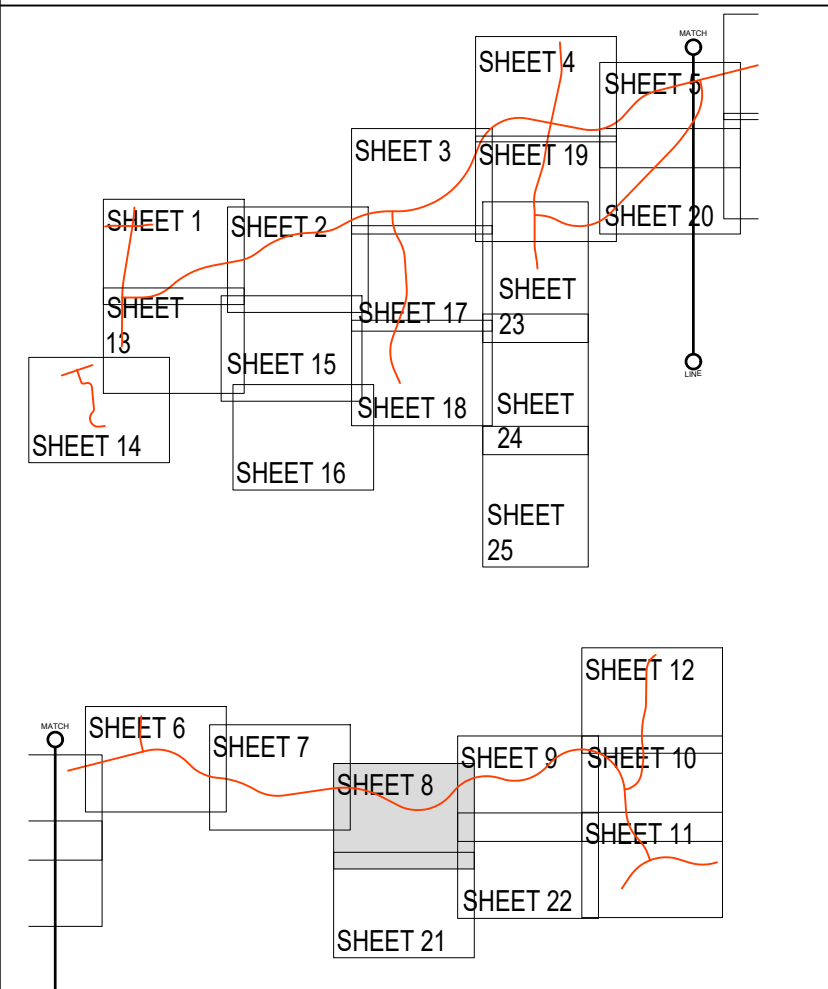
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 - EXISTING CULVERT
 - EXISTING WATERCOURSE/ CHANNEL
 - EXISTING WATERCOURSE/ CHANNEL TO BE DIVERTED
 - PROPOSED DIVERTED WATERCOURSE/ CHANNEL
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 - PROPOSED DETENTION POND
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Rev	Description	By	Date	Chk'd	Auth
D	ISSUED FOR PART 8 PLANNING	FMD	05/23	JOC	RAN
C	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
B	ISSUED FOR REVIEW	FMD	04/23	JOC	RAN
A	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
-	ISSUED FOR REVIEW	FMD	03/23	JO'	RAN

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Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

Purpose: ISSUED FOR PLANNING

Title: **CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE**
SHEET 8 OF 25

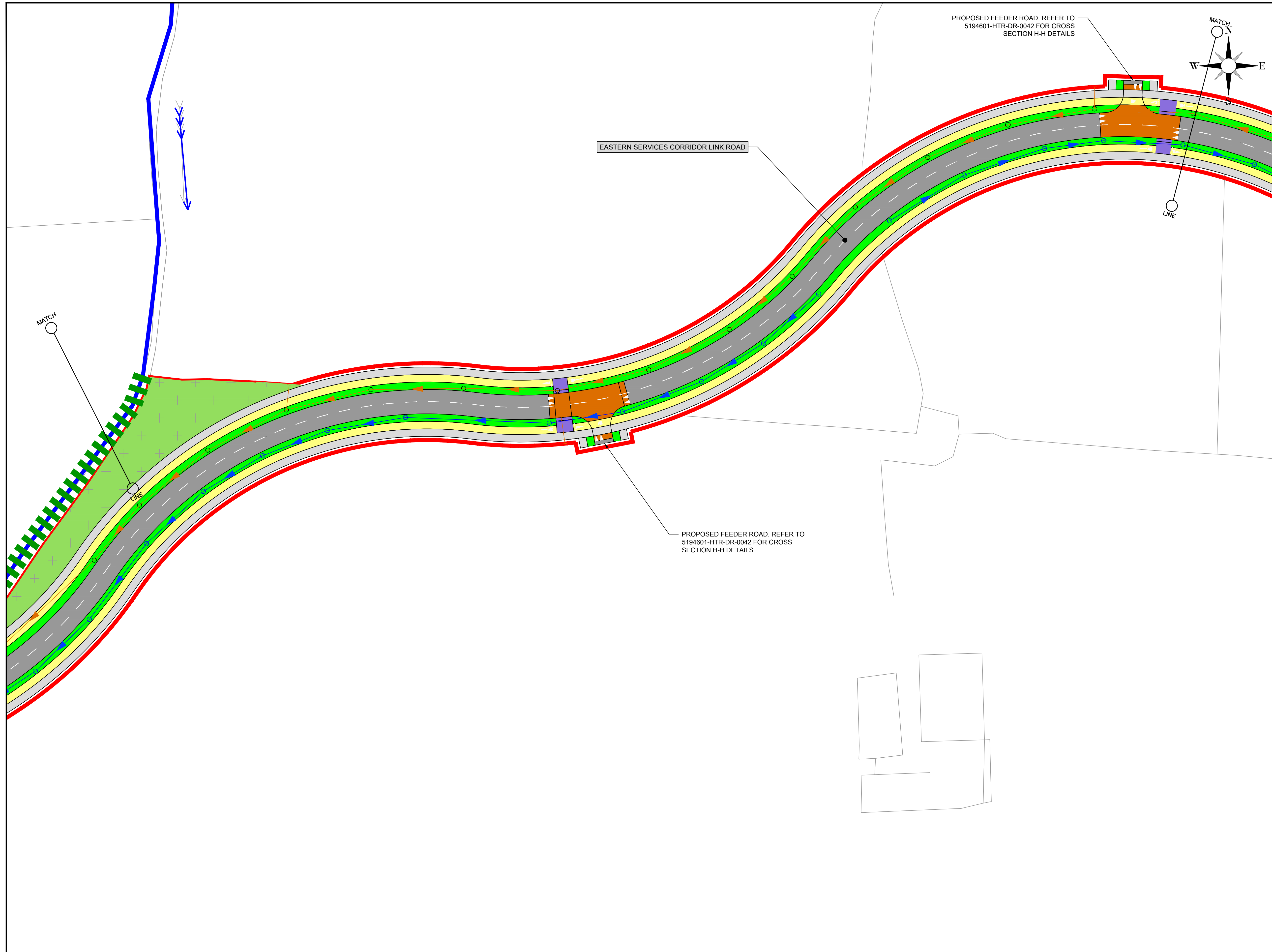
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Date	23/03/23	Date	23/03/23	Date	23/03/23

Status	Drawing Number	Rev
P	5194601-HTR-DR-0019	D

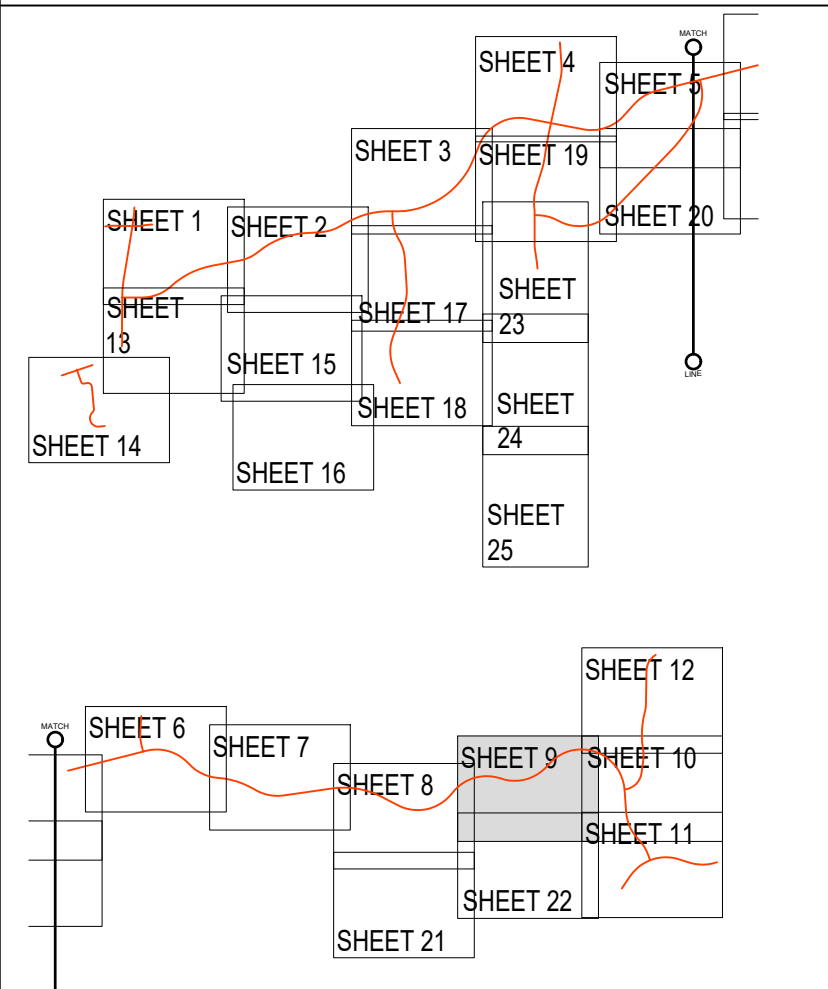
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File: 5194601-HTR_DR_0010 to 0036.dwg
Date: May 16, 2023 - 11:13am
Plotted by: FMendozaDiaz



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- LEGEND:**
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 - PROPOSED FOOTPATH
 - PROPOSED SHARED USE PATH
 - PROPOSED BRIDGE DECK
 - PROPOSED TACTILE PAVING
 - PROPOSED RAISED TABLE/ CROSSING
 - PROPOSED VERGE/LANDSCAPING
 - PROPOSED PASSIVE GREEN SPACE
 - EXISTING SHARED USE PATH
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Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE SHEET 9 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JO'C
Date	23/03/23	Date	23/03/23	Date	23/03/23
Status	P	Drawing Number	5194601-HTR-DR-0020	Rev	D

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-	ISSUED FOR REVIEW	FMD	03/23	JO'C	RAN

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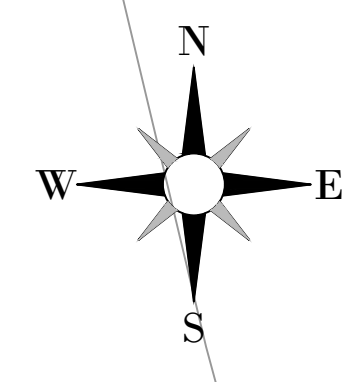
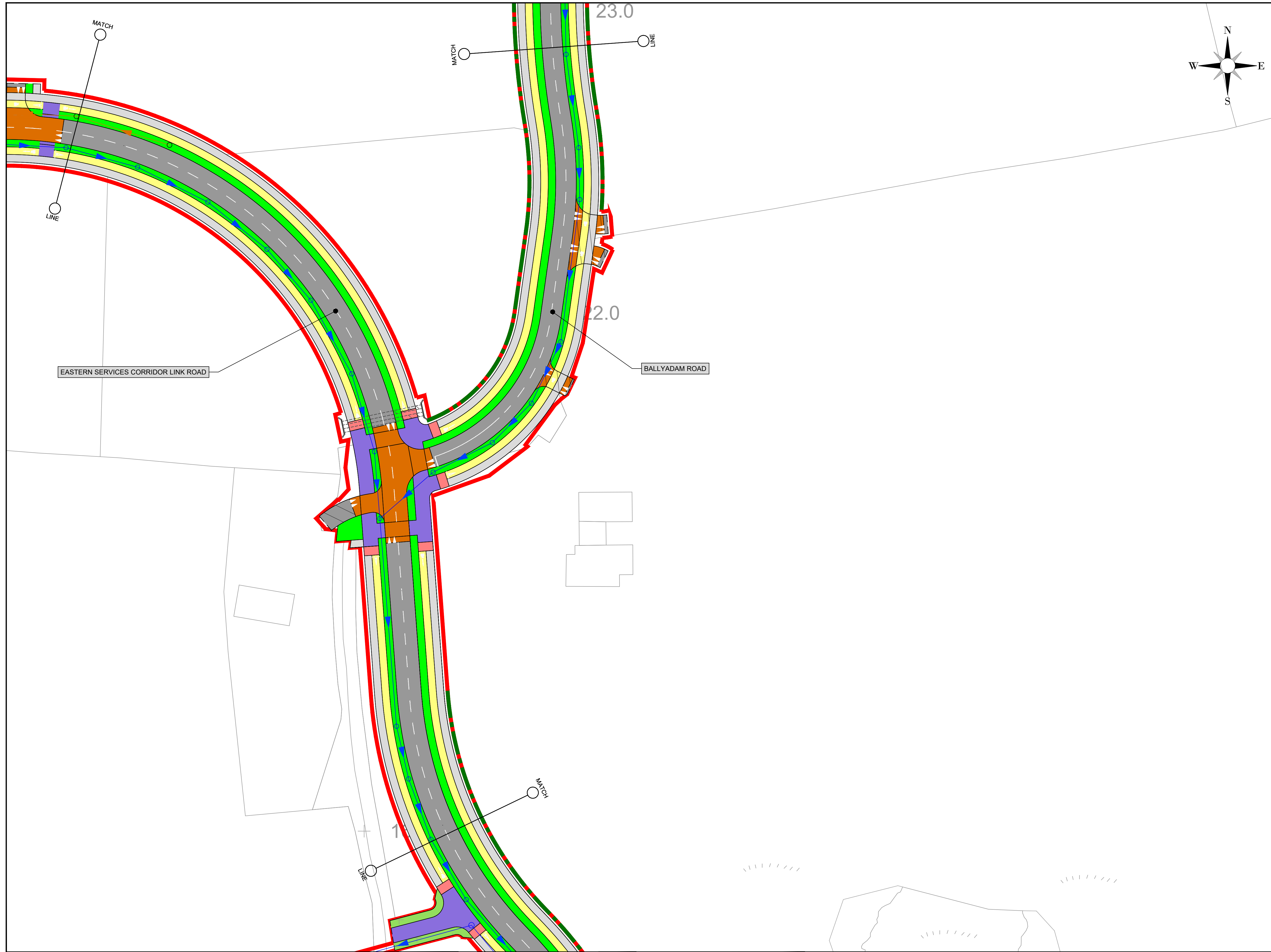
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Clients
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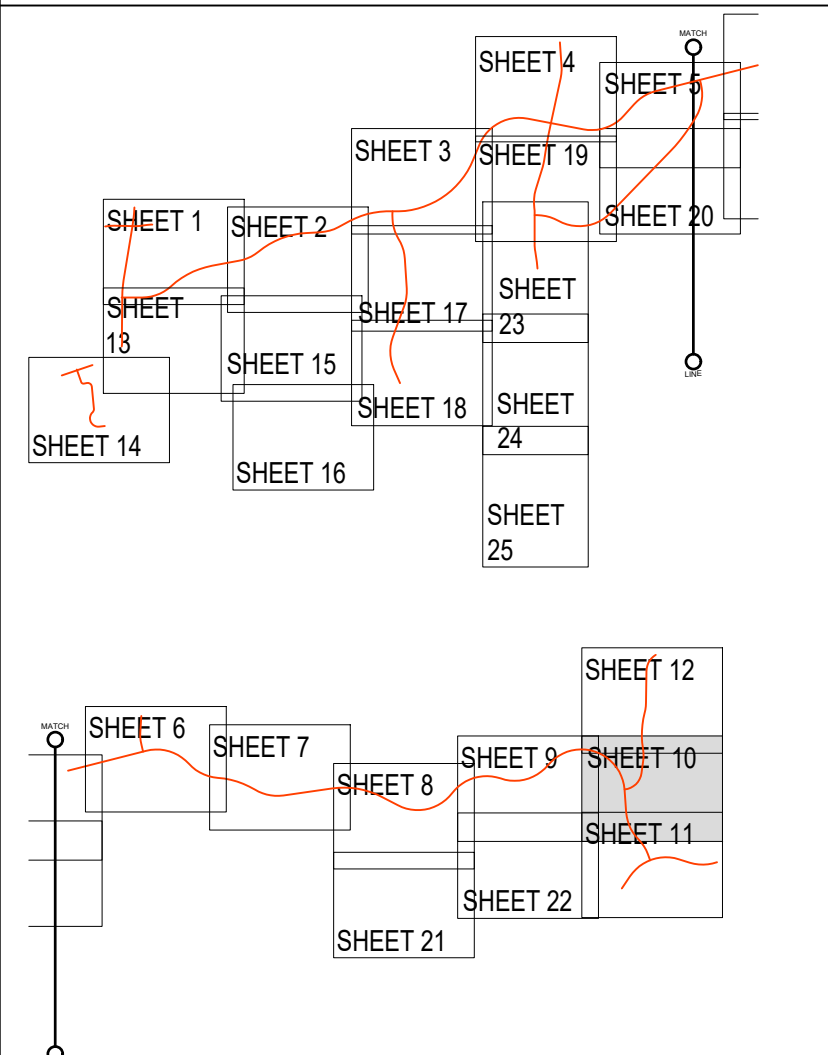
Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

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-	ISSUED FOR REVIEW	FMD	03/23	JOC	RAN

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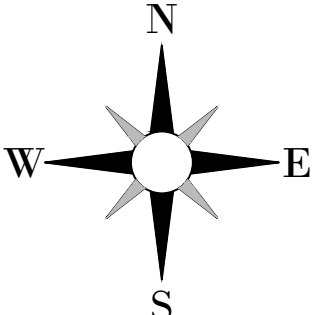
Clients	CORK COUNTY COUNCIL				
Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE				

Purpose	ISSUED FOR PLANNING						
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE						
	SHEET 10 OF 25						
Original Scale	1:500	Des/Drawn	FMD	Checked	JOC	Authorised	RAN
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Drawing Number	5194601-HTR-DR-0021			Rev	D		

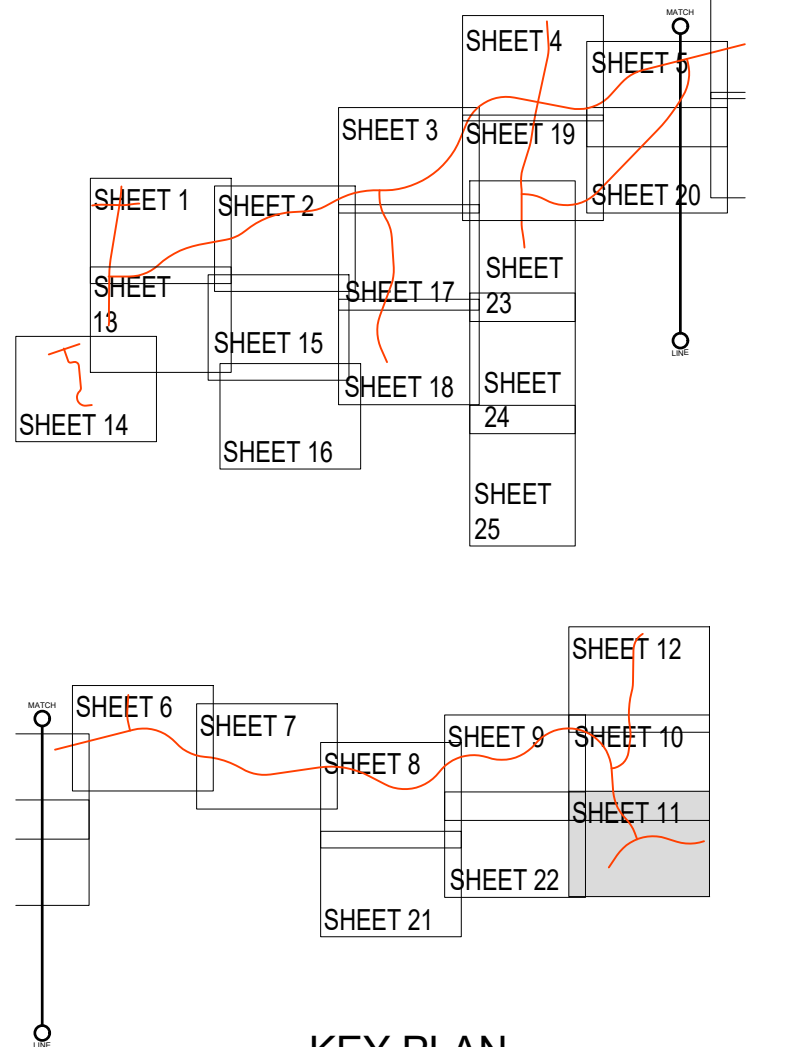
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Plotted by: F.MendozaDiaz



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Rev	Description	By	Date	Chk'd	Auth
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-	ISSUED FOR REVIEW	FMD	03/23	JOC	RAN

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Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

Purpose: ISSUED FOR PLANNING

Title: **CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE**
SHEET 11 OF 25

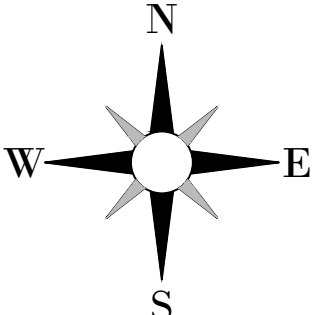
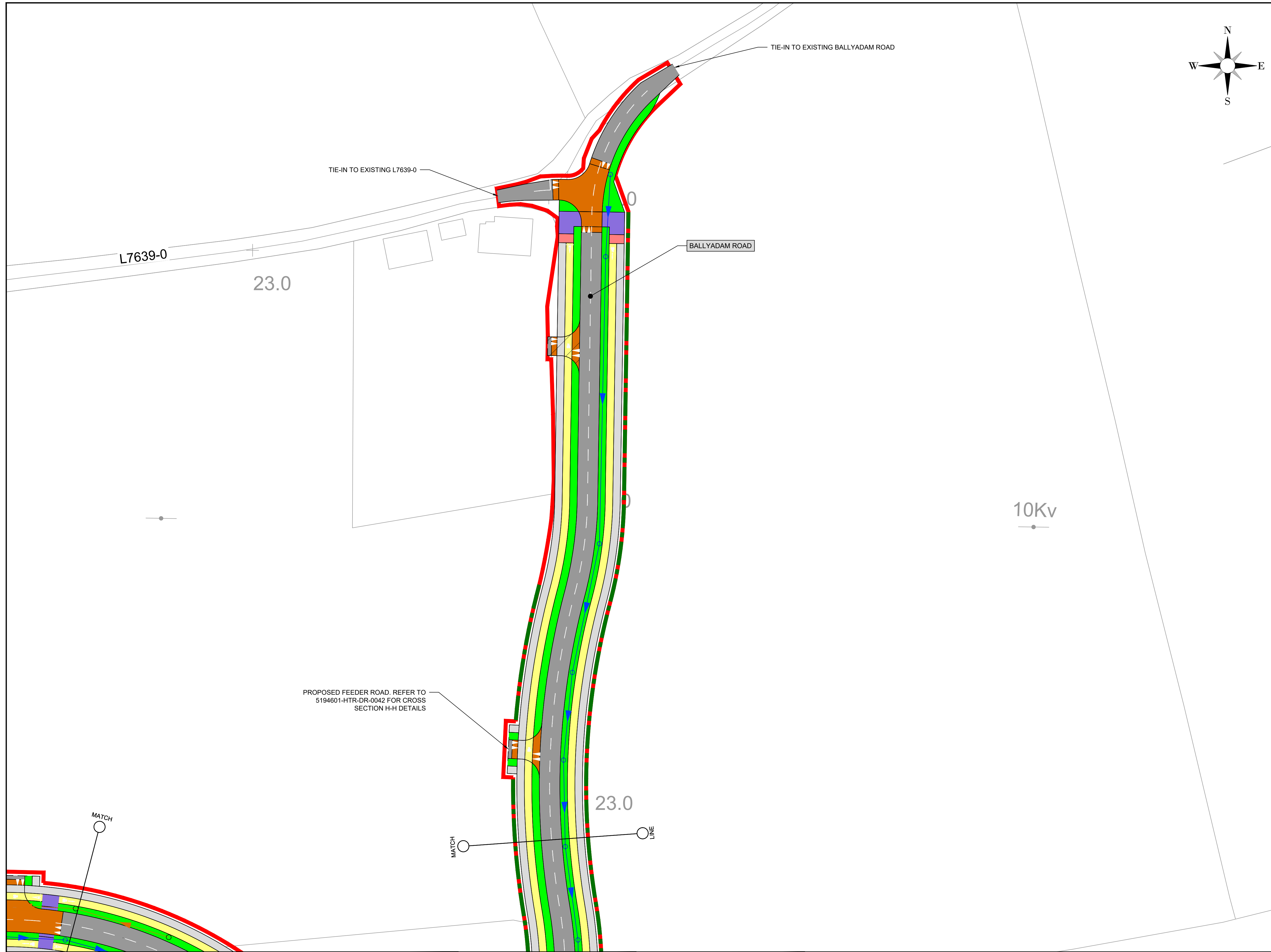
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Status	Drawing Number	Rev
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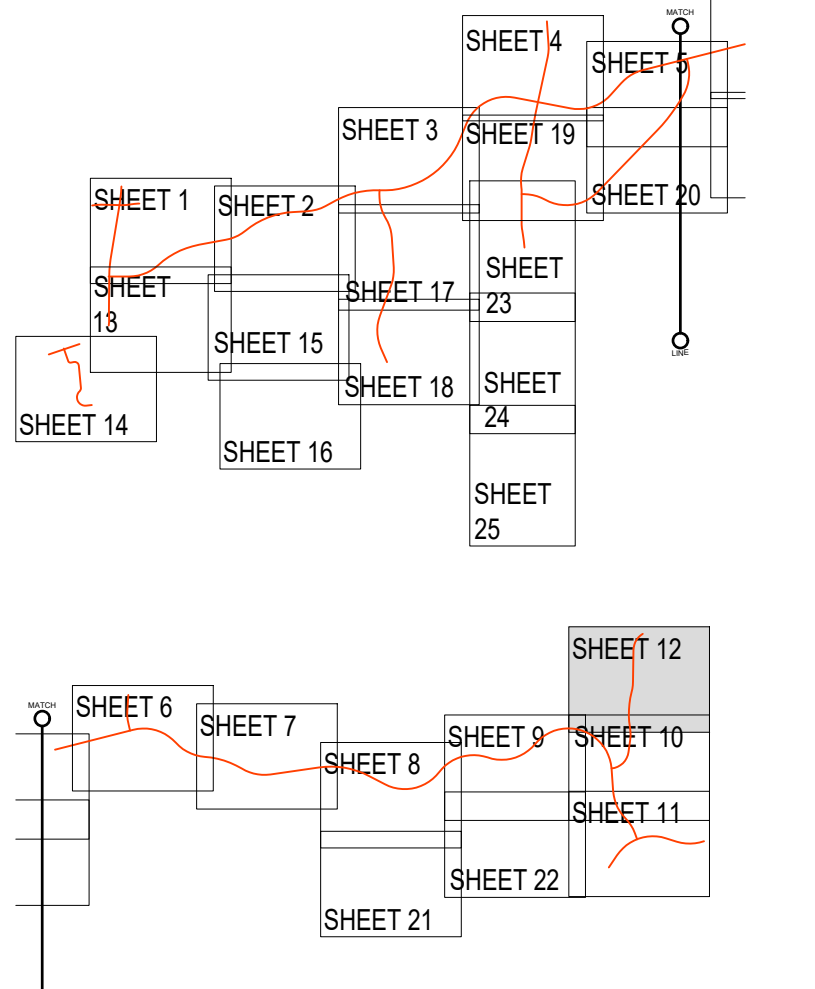
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Date: May 16, 2023 - 11:14am
Plotted by: F.MendozaDiaz



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KEY PLAN

- LEGEND:**
- PART 8 SITE BOUNDARY
 - PROPOSED CARRIAGEWAY
 - PROPOSED CYCLEWAY
 - PROPOSED FOOTPATH
 - PROPOSED SHARED USE PATH
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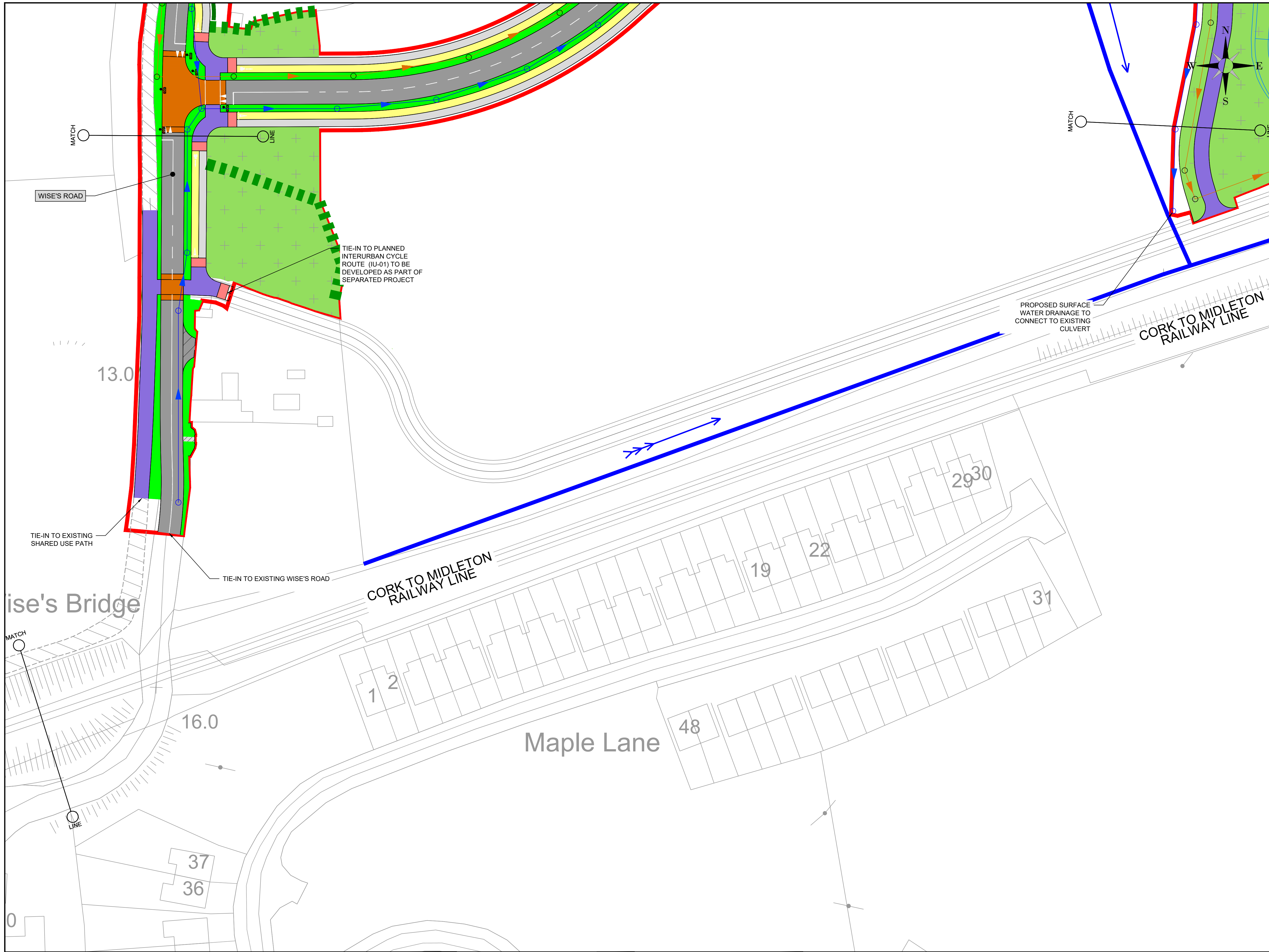
Clients	CORK COUNTY COUNCIL	
Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE	

Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 12 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JO'C
Date	23/03/23	Date	23/03/23	Date	23/03/23
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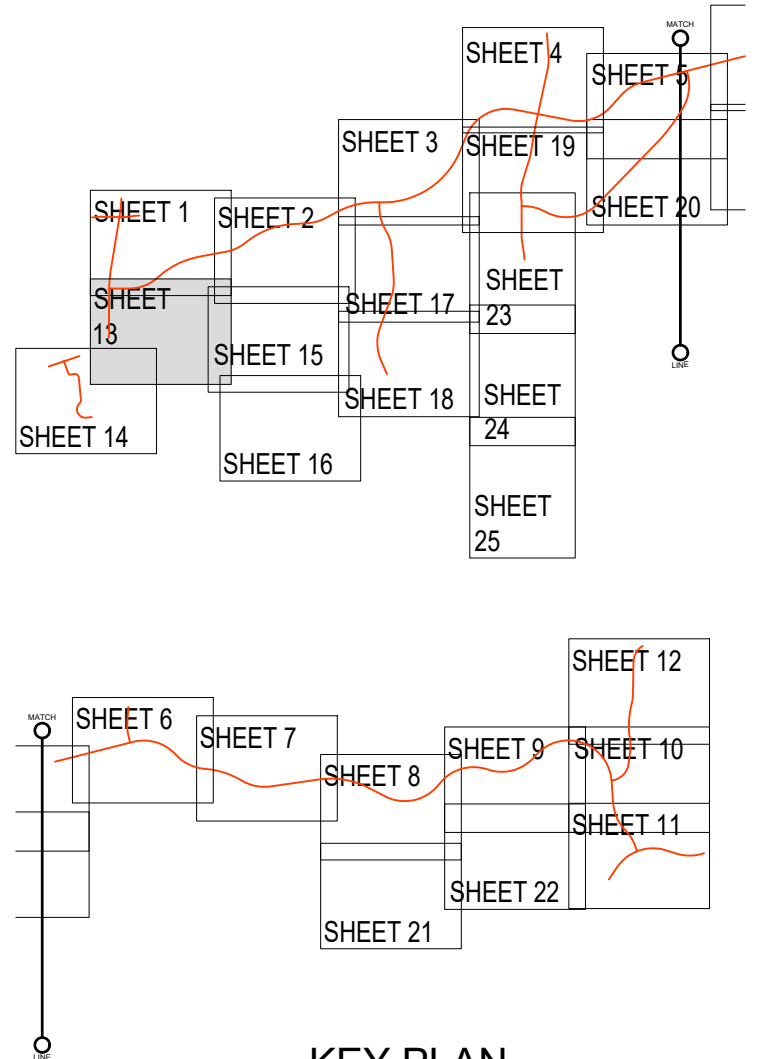
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Purpose
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Title
CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE

SHEET 13 OF 25

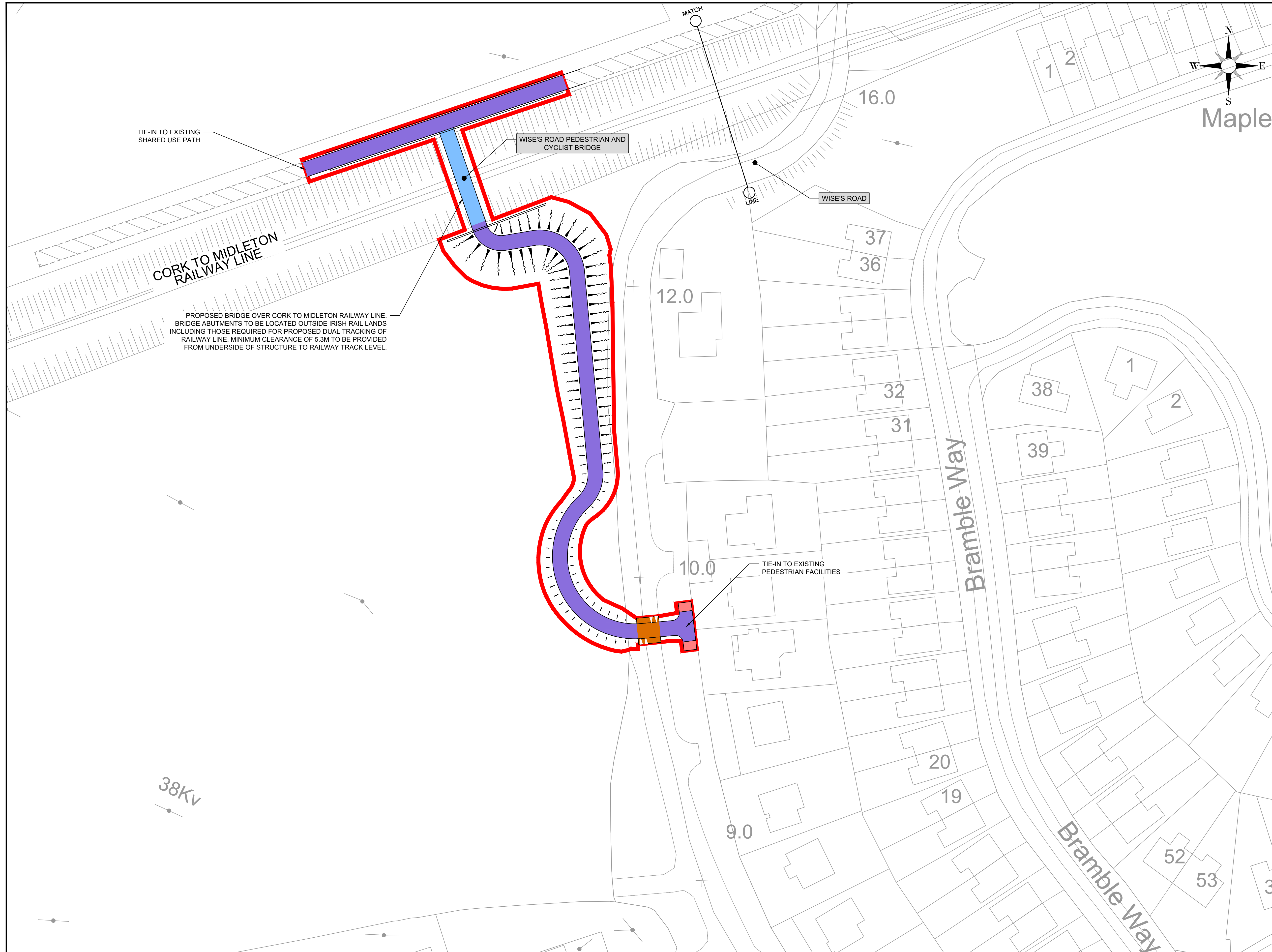
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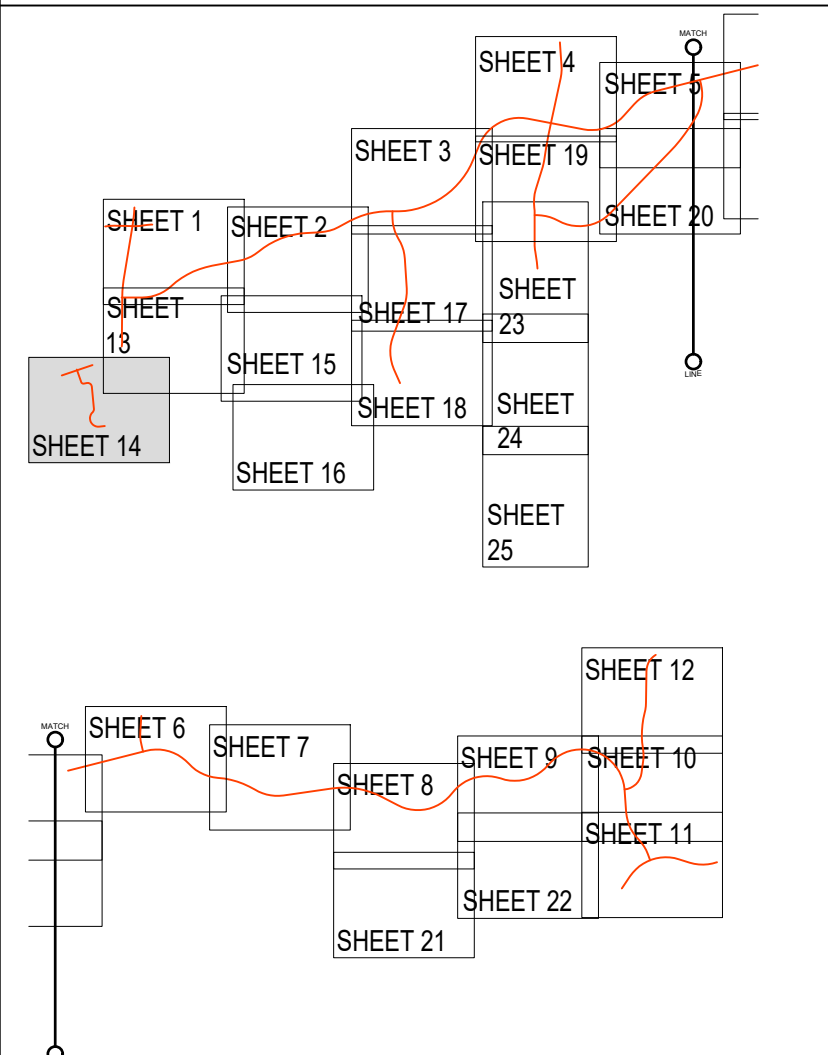
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Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

Purpose
ISSUED FOR PLANNING

Title
CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE

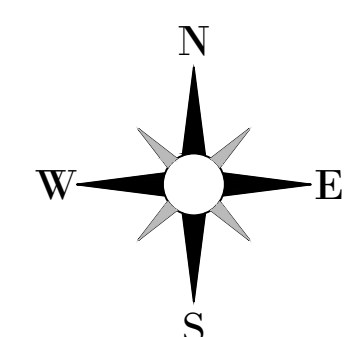
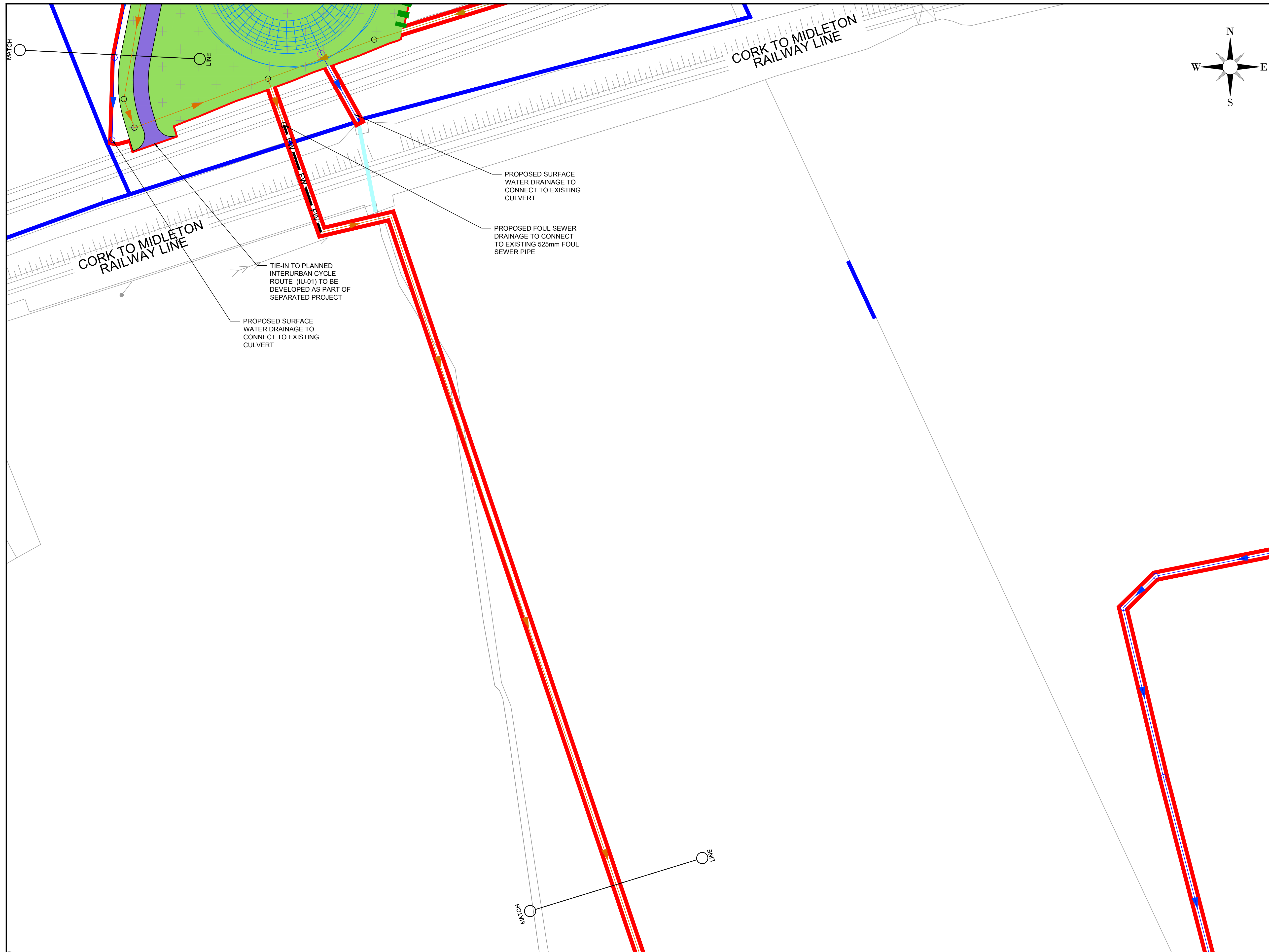
SHEET 14 OF 25

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Status	P	Drawing Number	5194601-HTR-DR-0025	Rev	D		

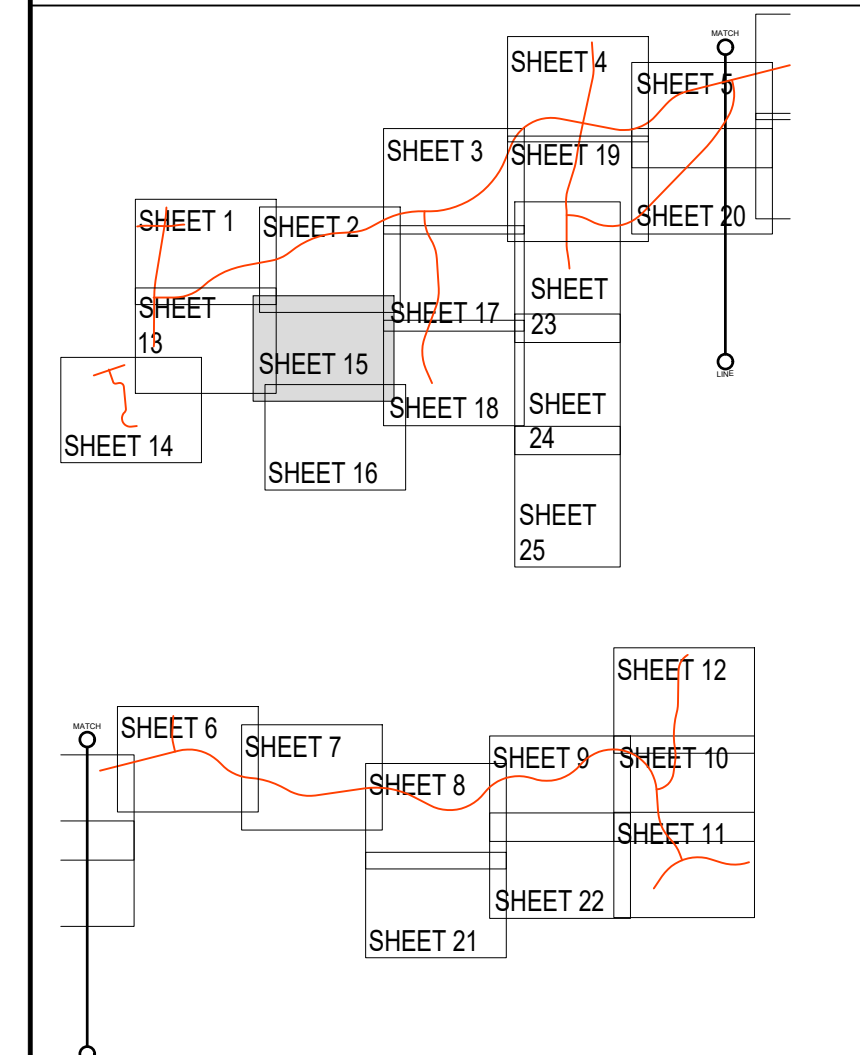
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Date: May 16, 2023 - 11:14am
Plotted by: FMendozaDiaz



- GENERAL NOTES**
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- LEGEND:**
- PROPOSED PART 8 SITE BOUNDARY
 - PROPOSED CARRIAGEWAY
 - PROPOSED CYCLEWAY
 - PROPOSED FOOTPATH
 - PROPOSED SHARED USE PATH
 - PROPOSED BRIDGE DECK
 - PROPOSED TACTILE PAVING
 - PROPOSED RAISED TABLE/ CROSSING
 - PROPOSED VERGE/LANDSCAPING
 - PROPOSED PASSIVE GREEN SPACE
 - EXISTING SHARED USE PATH
 - EXISTING ENTRANCE TO BE MAINTAINED
 - EXISTING WALL
 - EXISTING CULVERT
 - EXISTING WATERCOURSE/ CHANNEL
 - EXISTING WATERCOURSE/ CHANNEL TO BE DIVERTED
 - PROPOSED DIVERTED WATERCOURSE/ CHANNEL
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 - PROPOSED DETENTION POND
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Rev	Description	By	Date	Chk'd	Auth
D	ISSUED FOR PART 8 PLANNING	FMD	05/23	JOC	RAN
C	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
B	ISSUED FOR REVIEW	FMD	04/23	JOC	RAN
A	ISSUED FOR FINAL REVIEW	FMD	04/23	JOC	RAN
-	ISSUED FOR REVIEW	FMD	03/23	JOC	RAN

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Clients	CORK COUNTY COUNCIL				
Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE				

Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 15 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JOC
Date	23/03/23	Date	23/03/23	Date	23/03/23
Status	P	Drawing Number	5194601-HTR-DR-0026	Rev	D

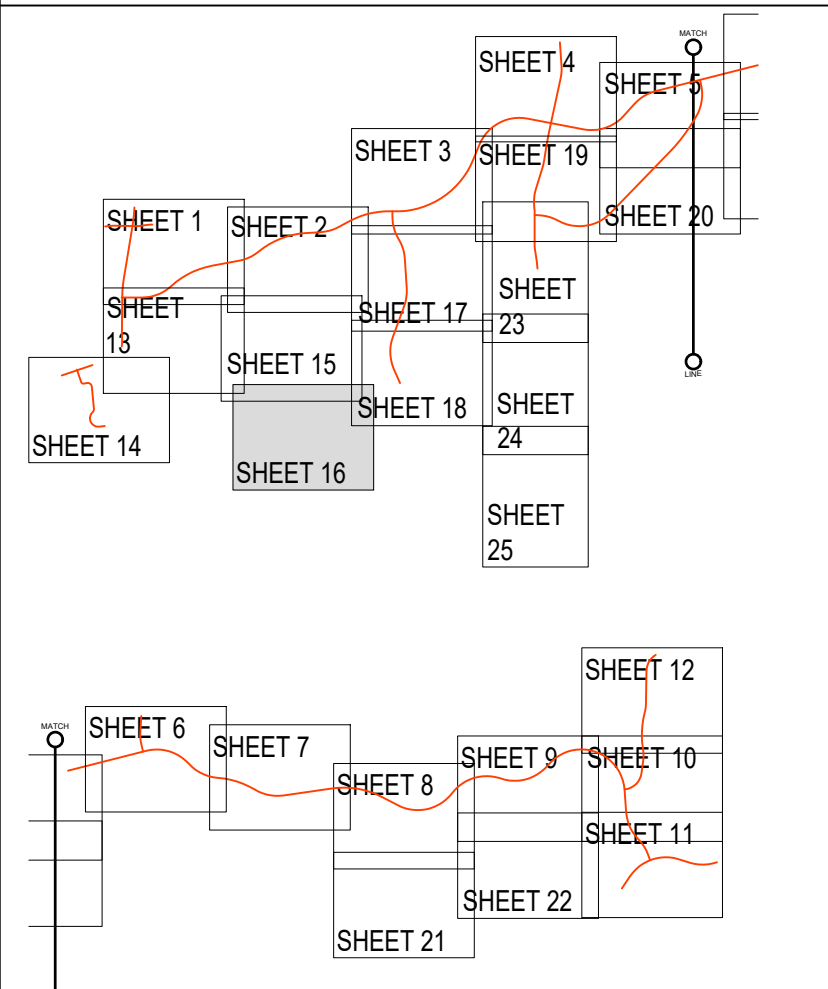
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Date: May 16, 2023 - 11:15am
Plotted by: F.MendozaDiaz



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Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 16 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JO'C
Date	23/03/23	Date	23/03/23	Date	23/03/23
Status	P	Drawing Number	5194601-HTR-DR-0027	Rev	D

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-	ISSUED FOR REVIEW	FMD	03/23	JO'C	RAN

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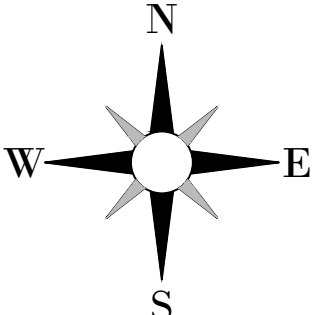
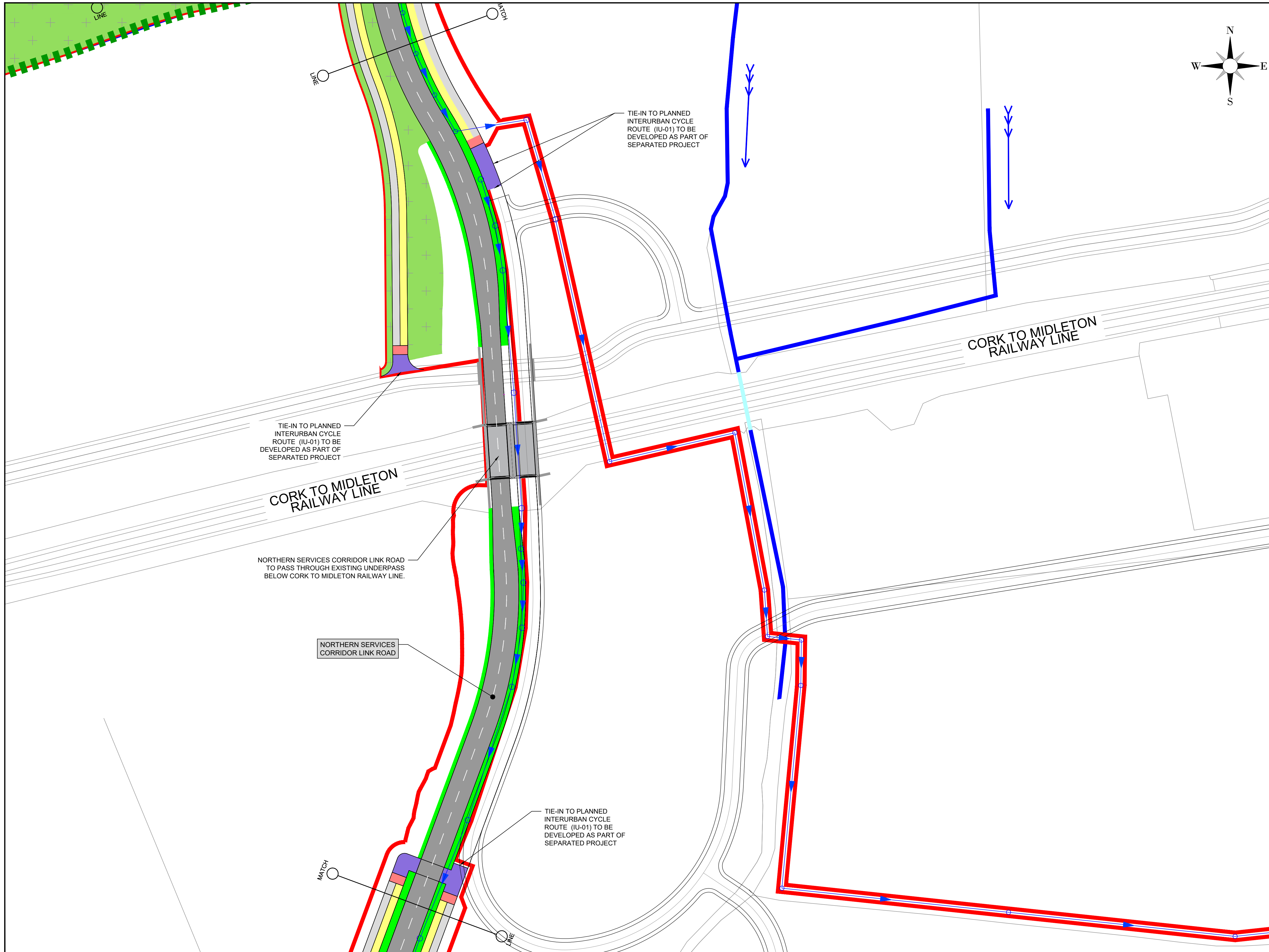
Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

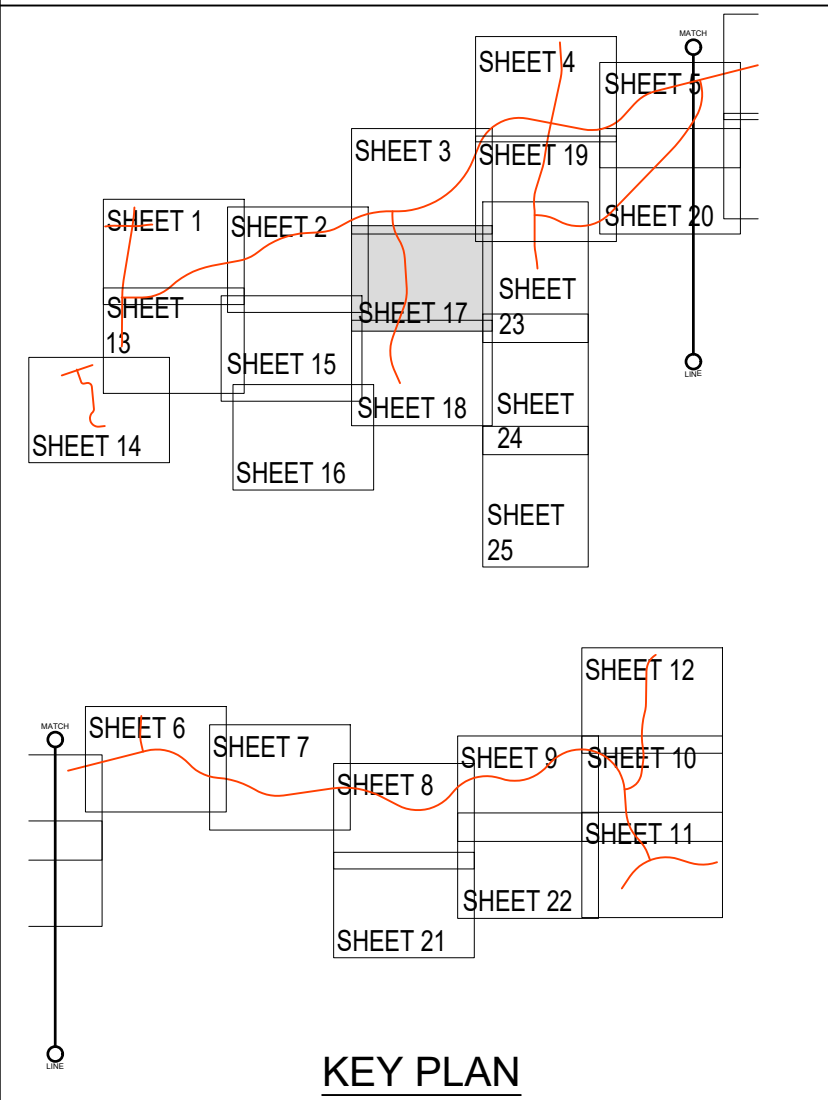
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Date: May 16, 2023 - 11:15am
Plotted by: F.MendozaDiaz



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Clients
CORK COUNTY COUNCIL

Project
CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE

Purpose: ISSUED FOR PLANNING

Title: **CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE**
SHEET 17 OF 25

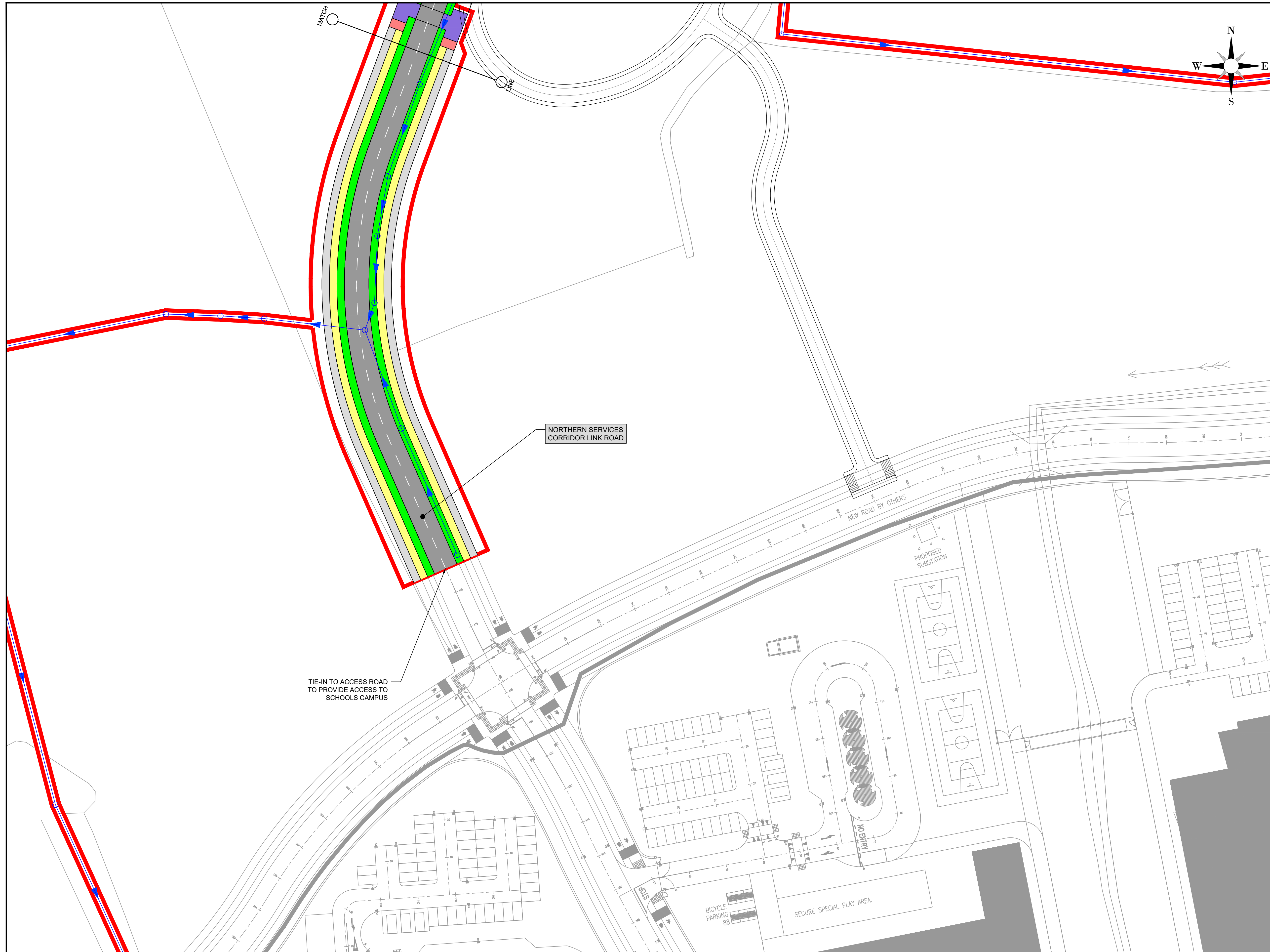
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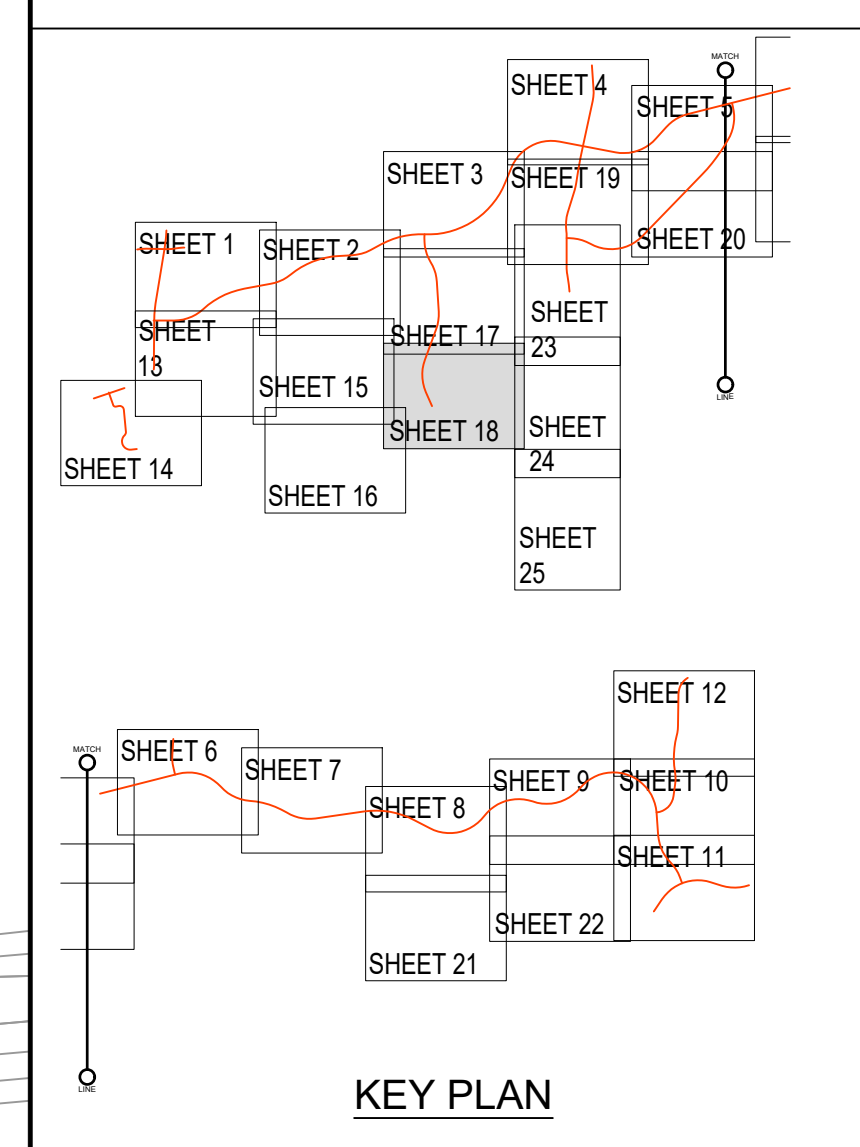
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Date: May 16, 2023 - 11:15am
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Clients
CORK COUNTY COUNCIL

Project
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Purpose
ISSUED FOR PLANNING

Title
CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE

SHEET 18 OF 25

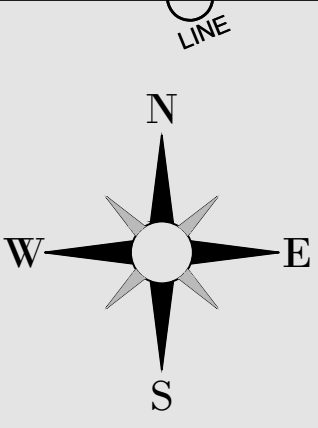
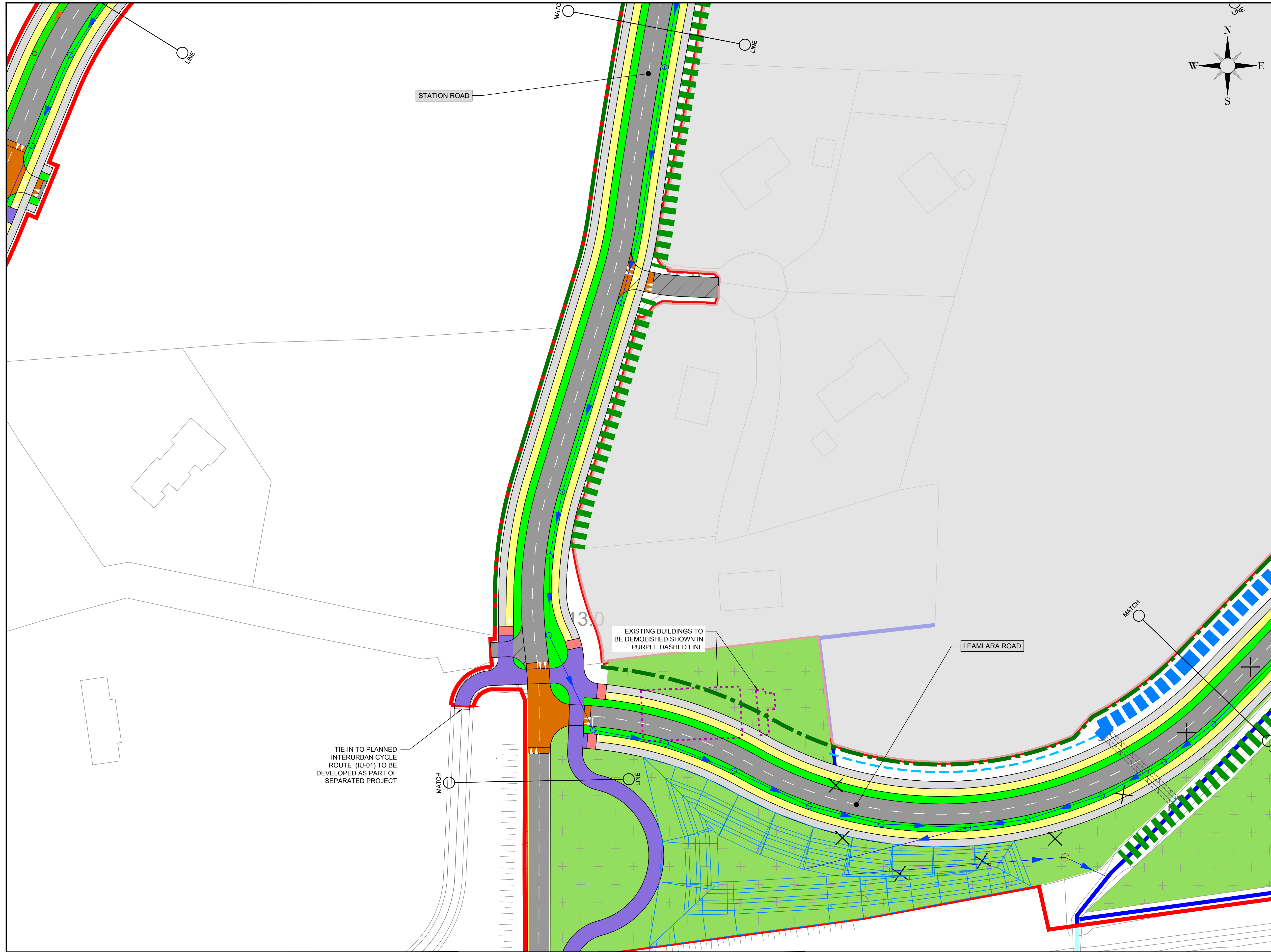
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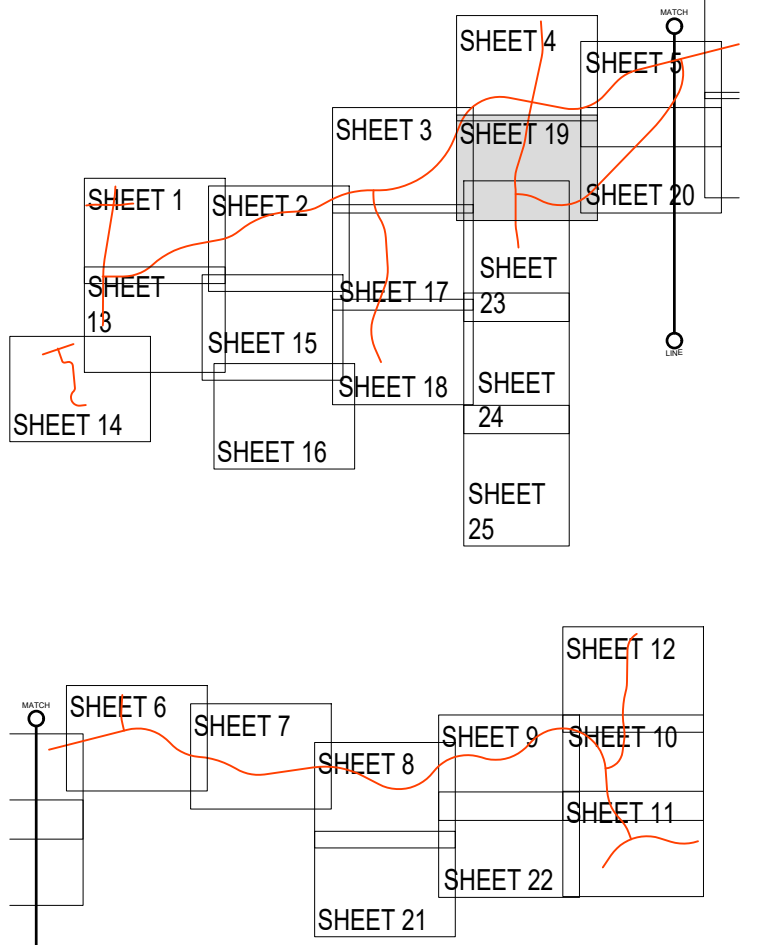
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KEY PLAN

LEGEND:

- PART 8 SITE BOUNDARY
- PROPOSED CARRIAGEWAY
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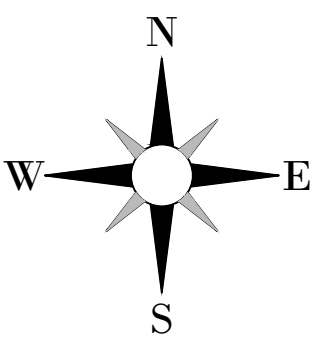
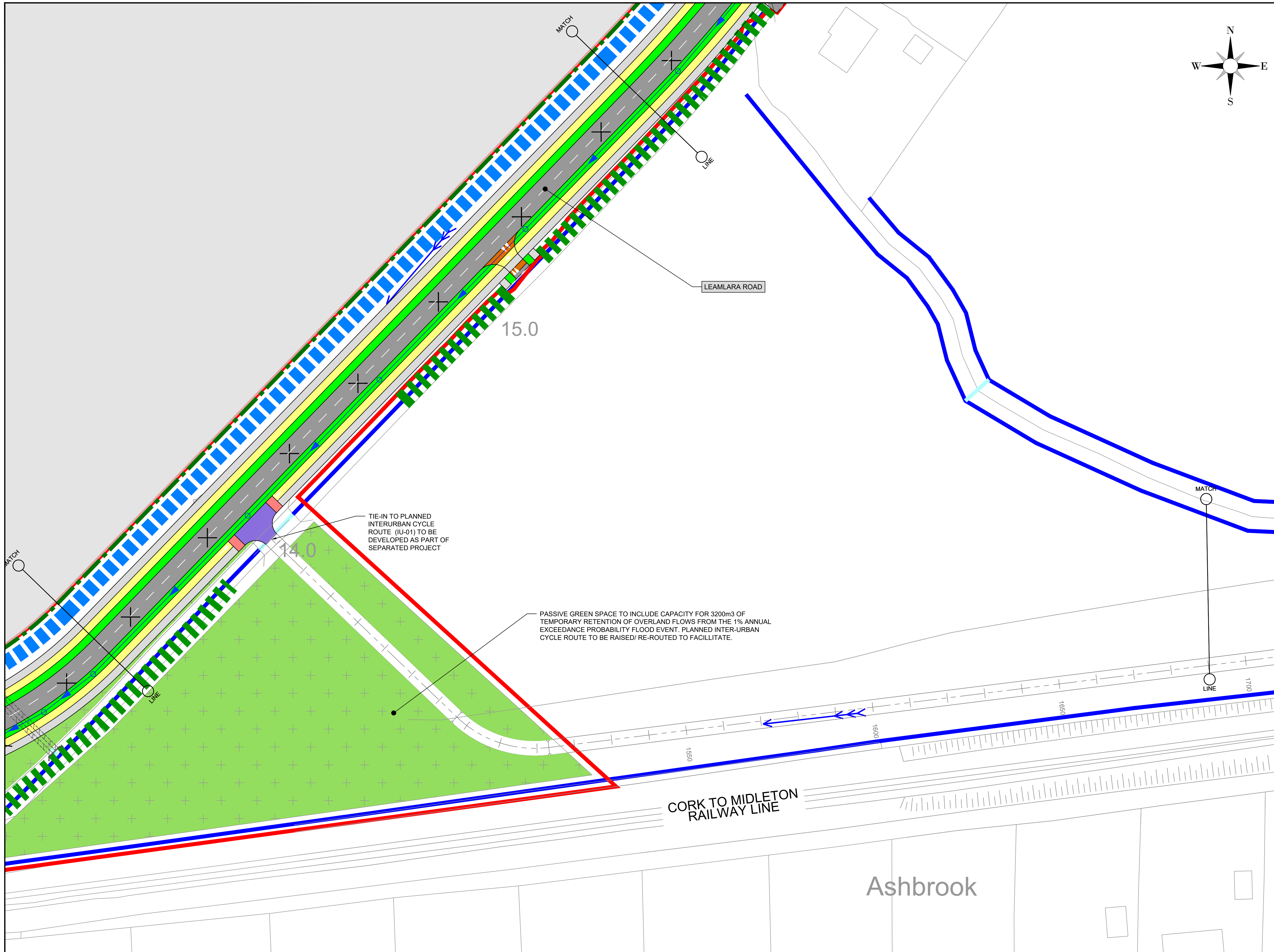
Clients	CORK COUNTY COUNCIL				
Project	CARRIGTWOHILL URDF INITIATIVE - URBAN EXPANSION AREA INFRASTRUCTURE				

Purpose	ISSUED FOR PLANNING				
Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 19 OF 25				
Original Scale	1:500	Des/Drawn	FMD	Checked	JOC
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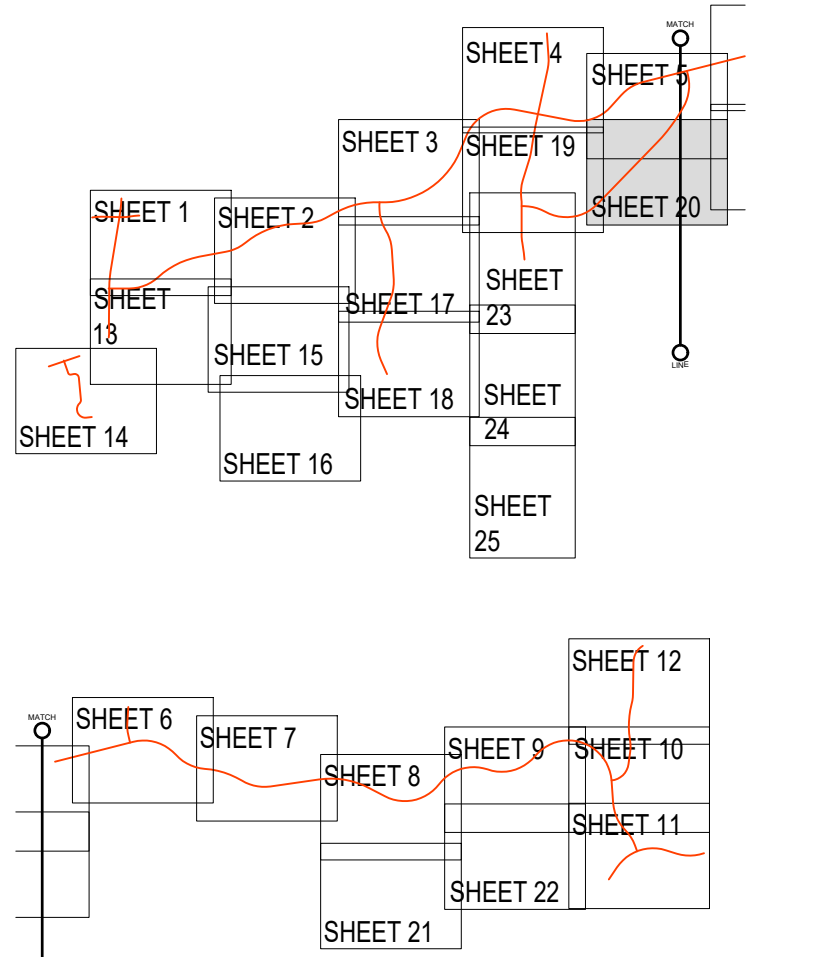
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Purpose ISSUED FOR PLANNING

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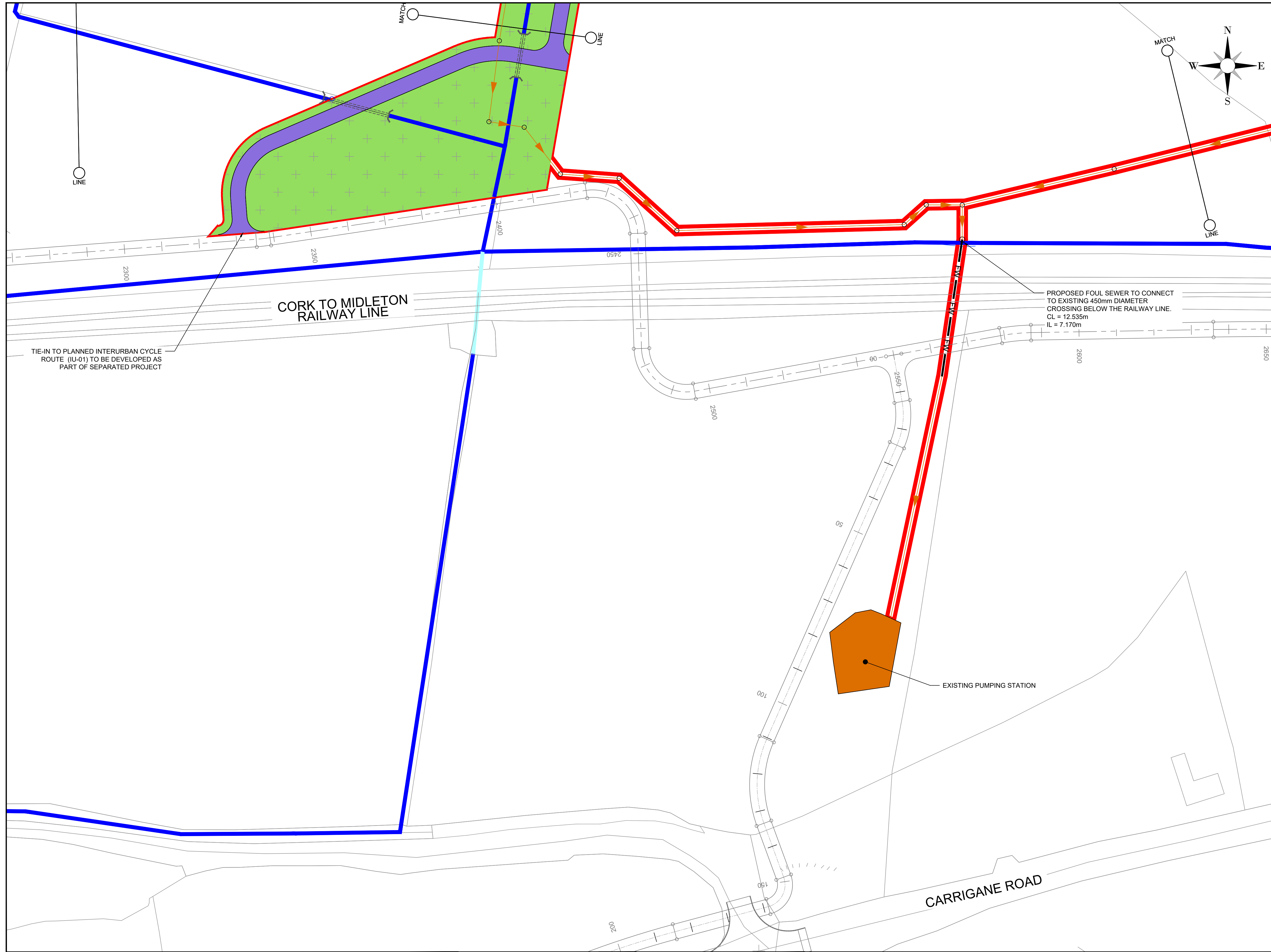
Clients	CORK COUNTY COUNCIL				
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Title	CARRIGTWOHILL URDF INITIATIVE UEA INFRASTRUCTURE				
	SHEET 20 OF 25				
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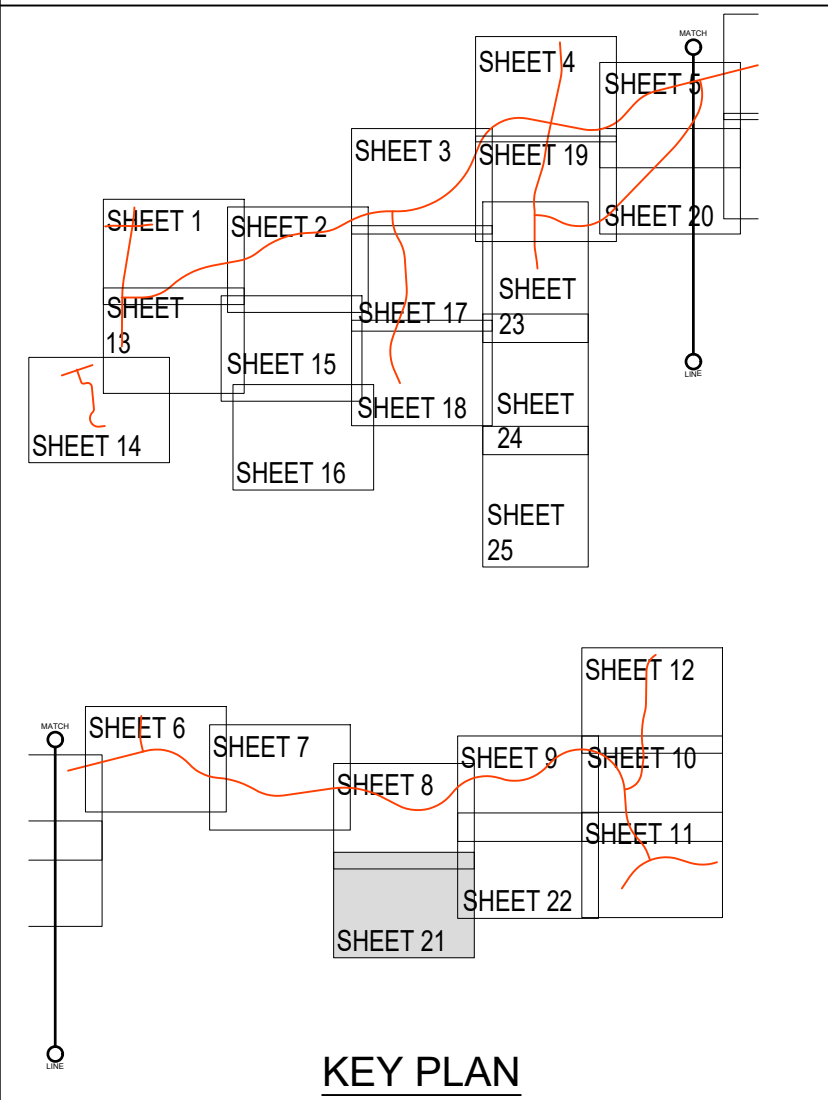
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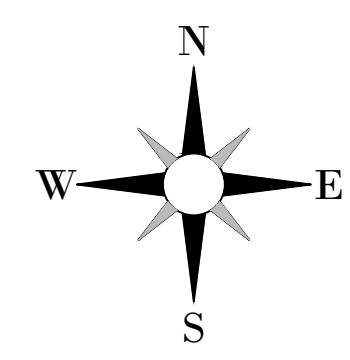
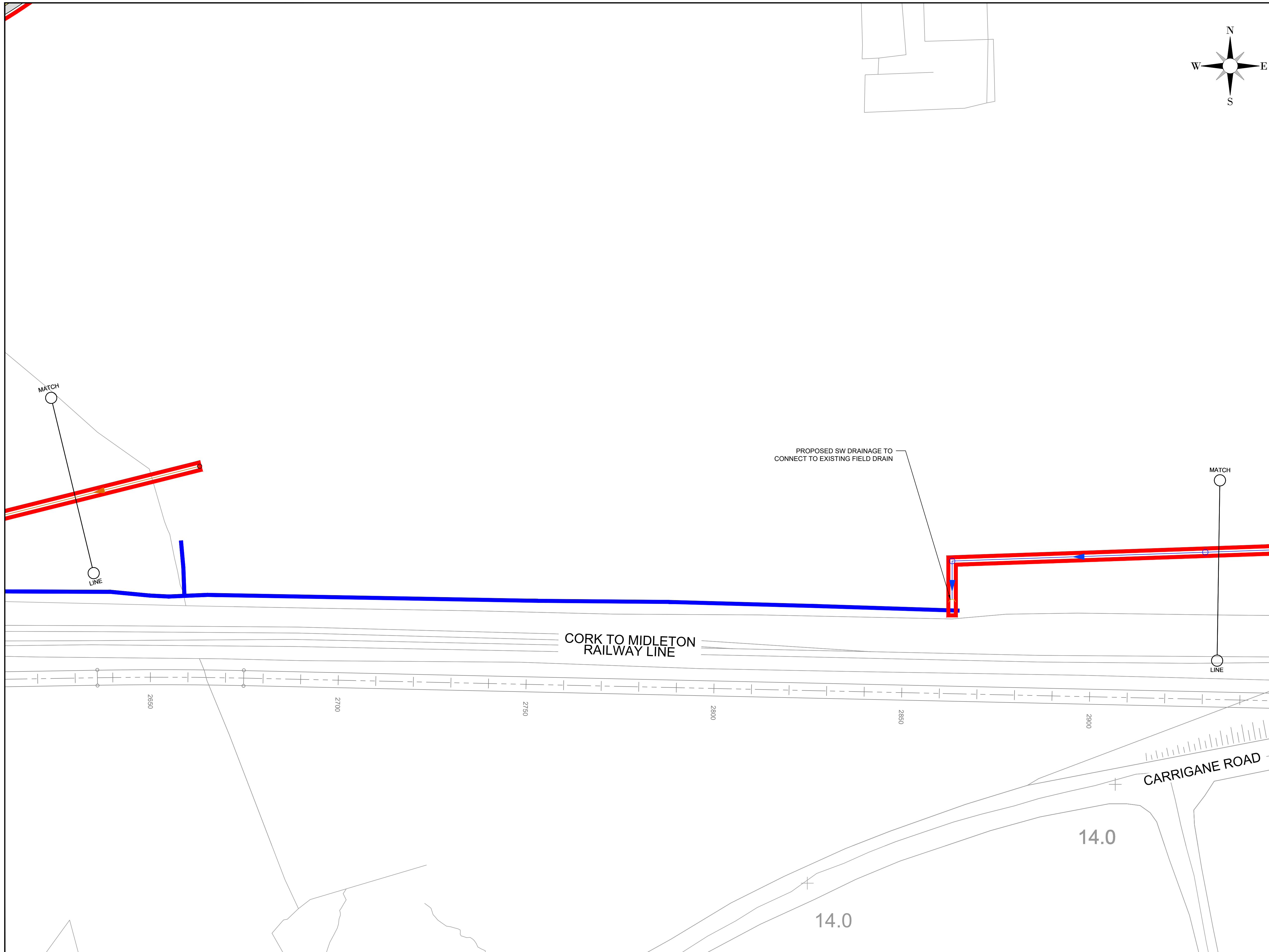
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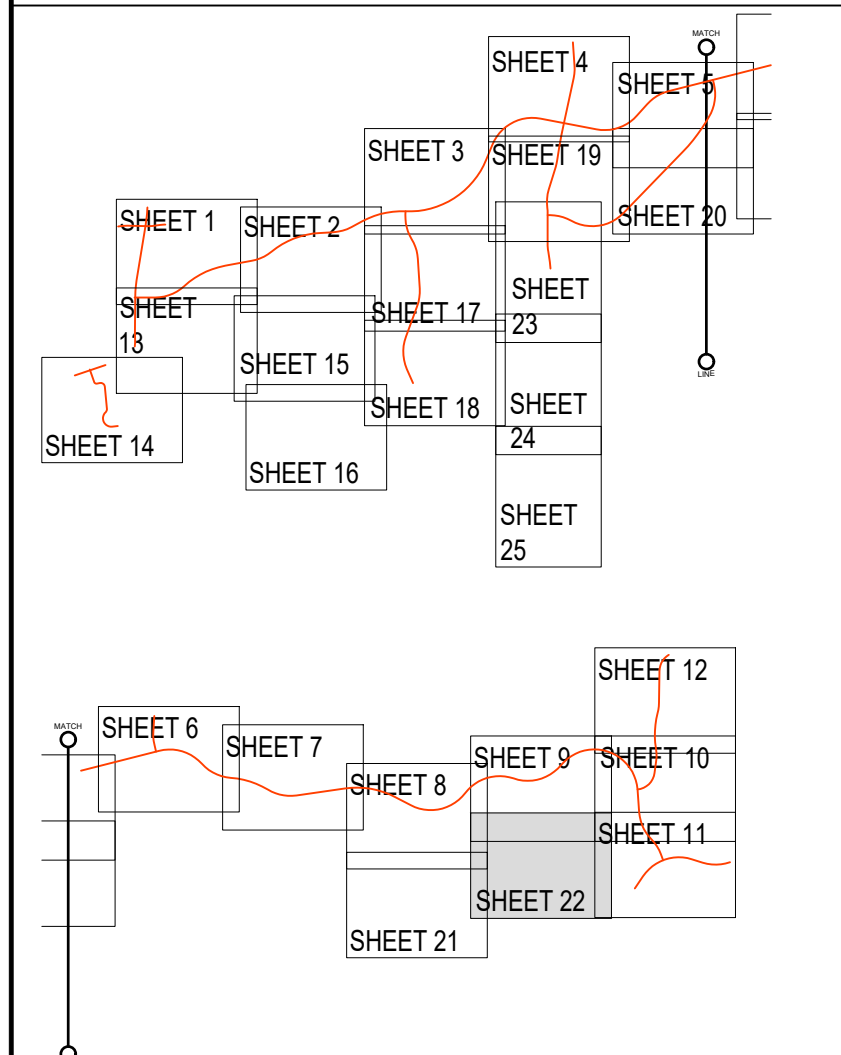
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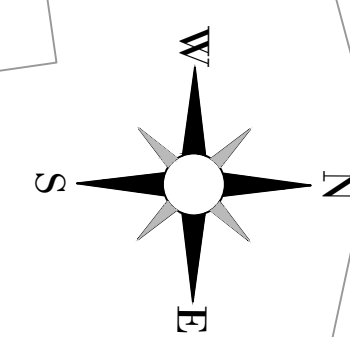
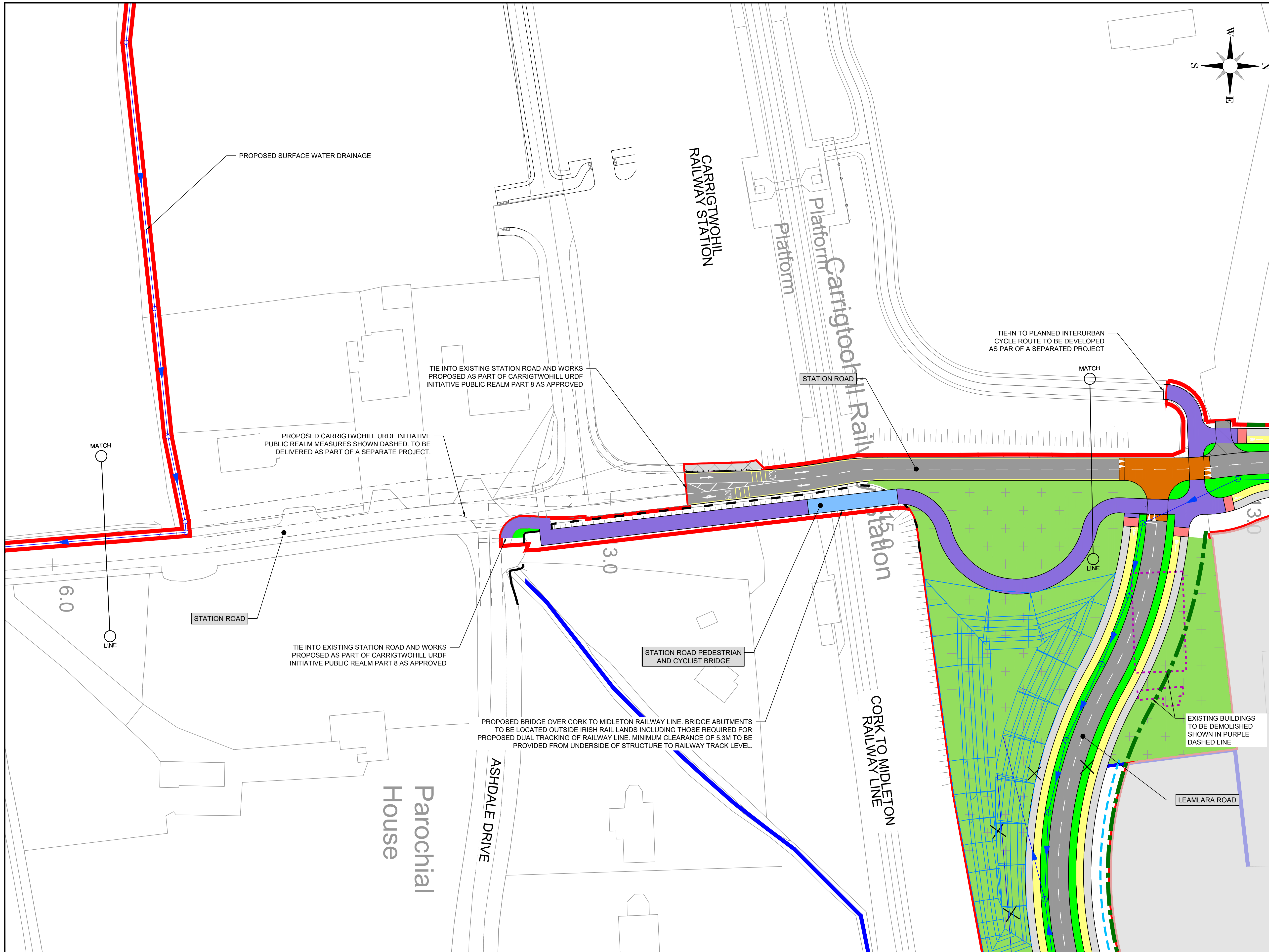
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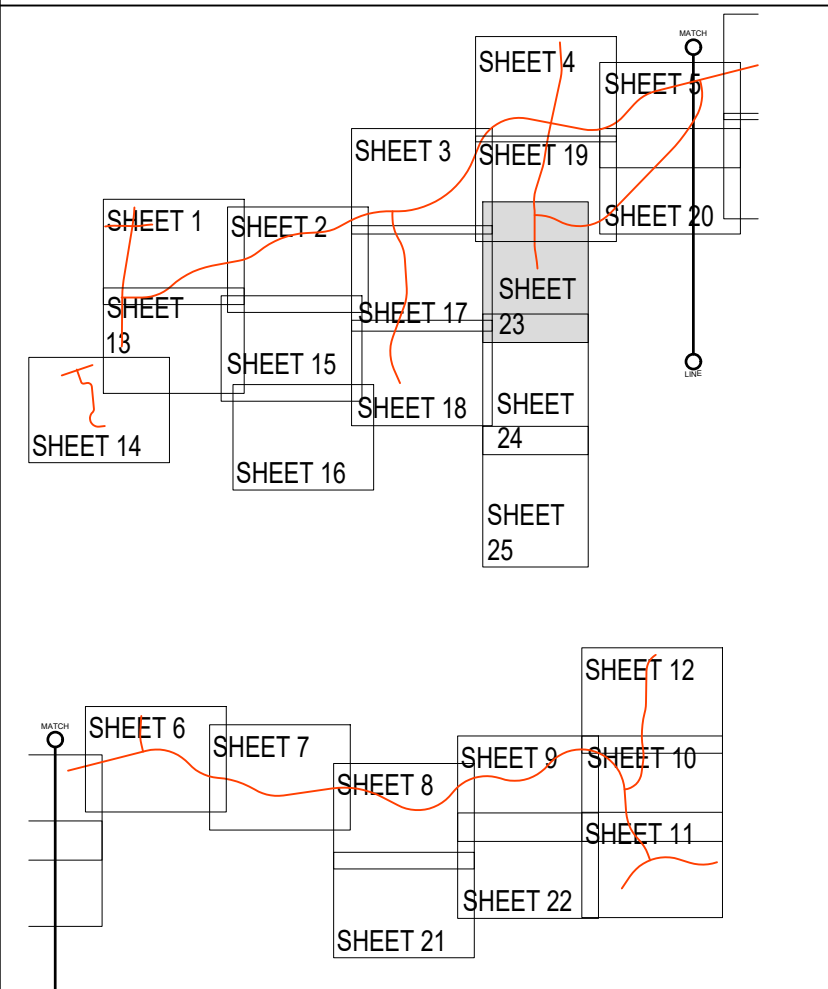
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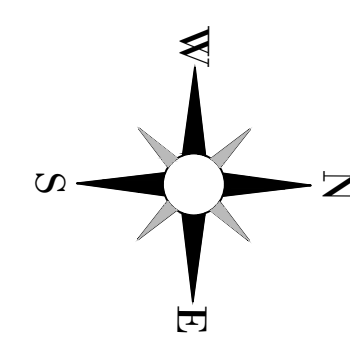
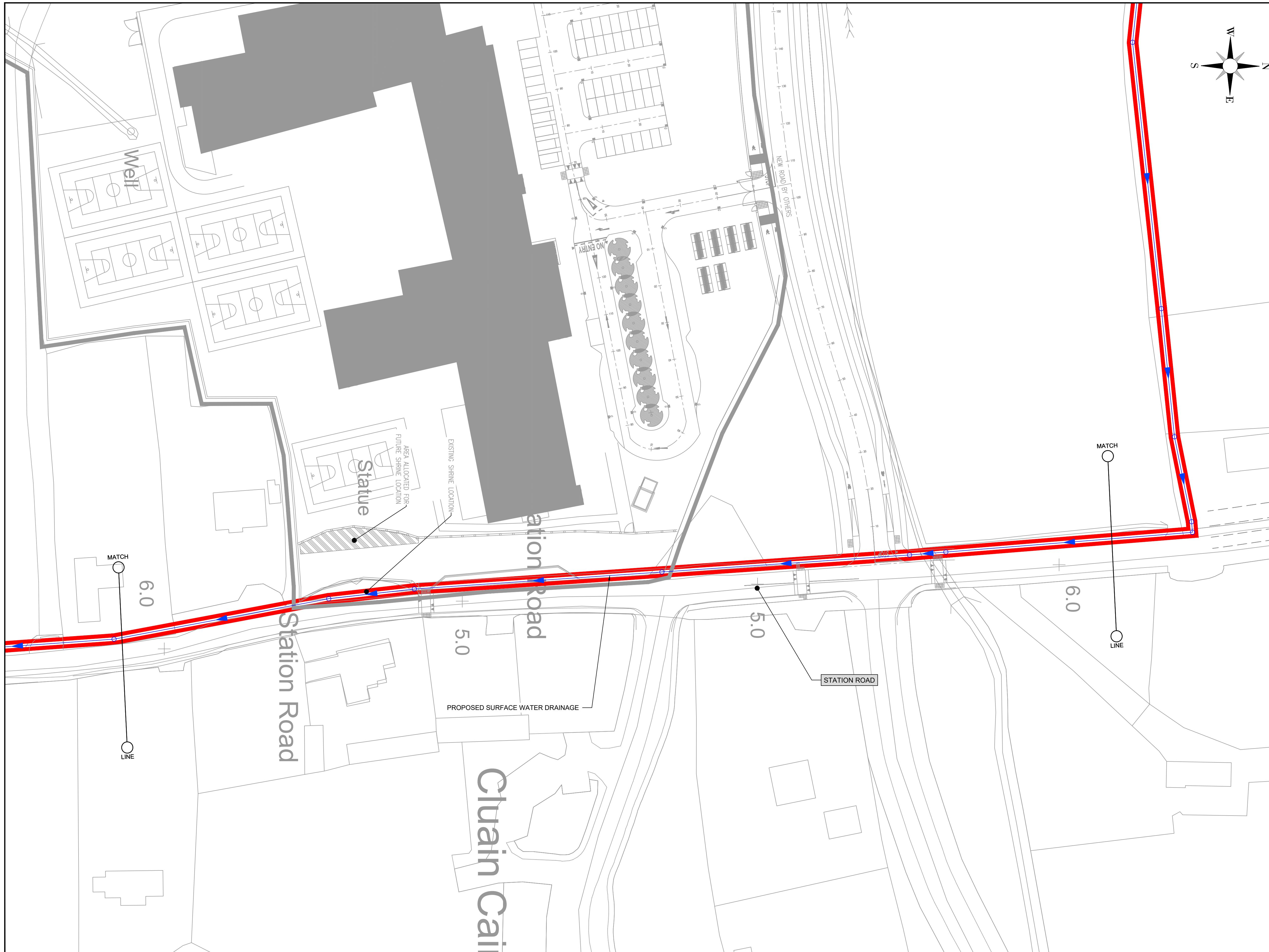
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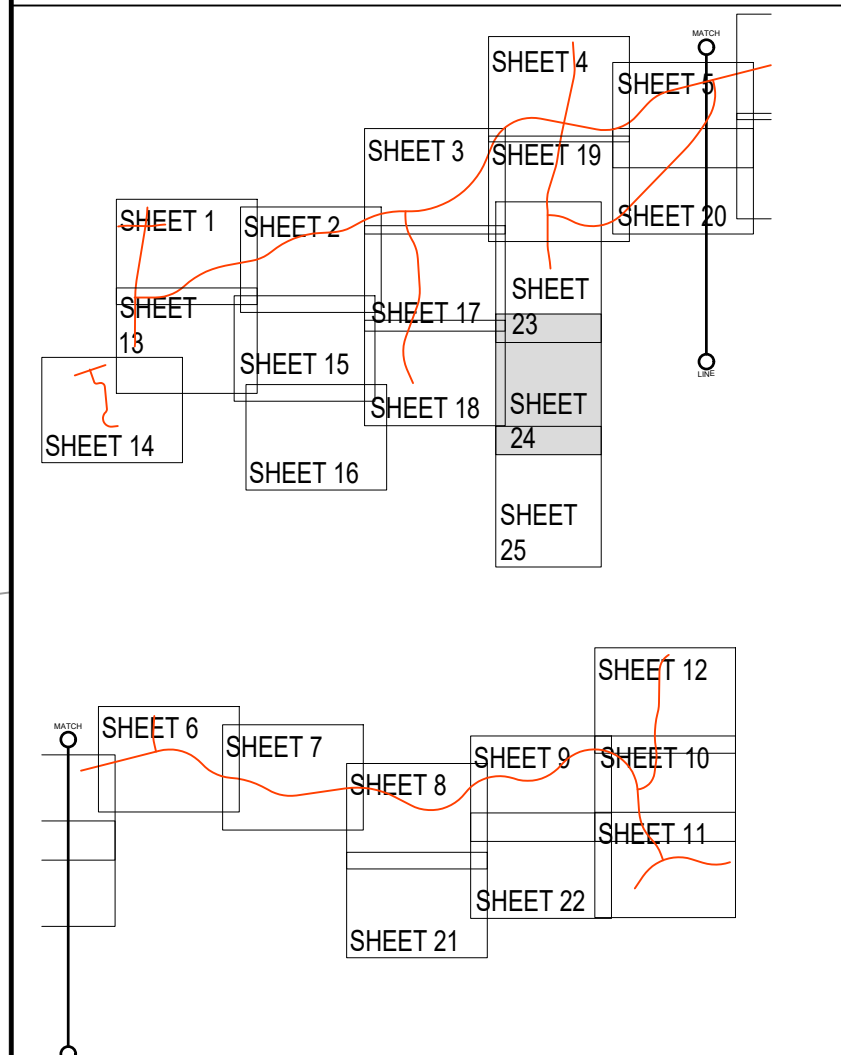
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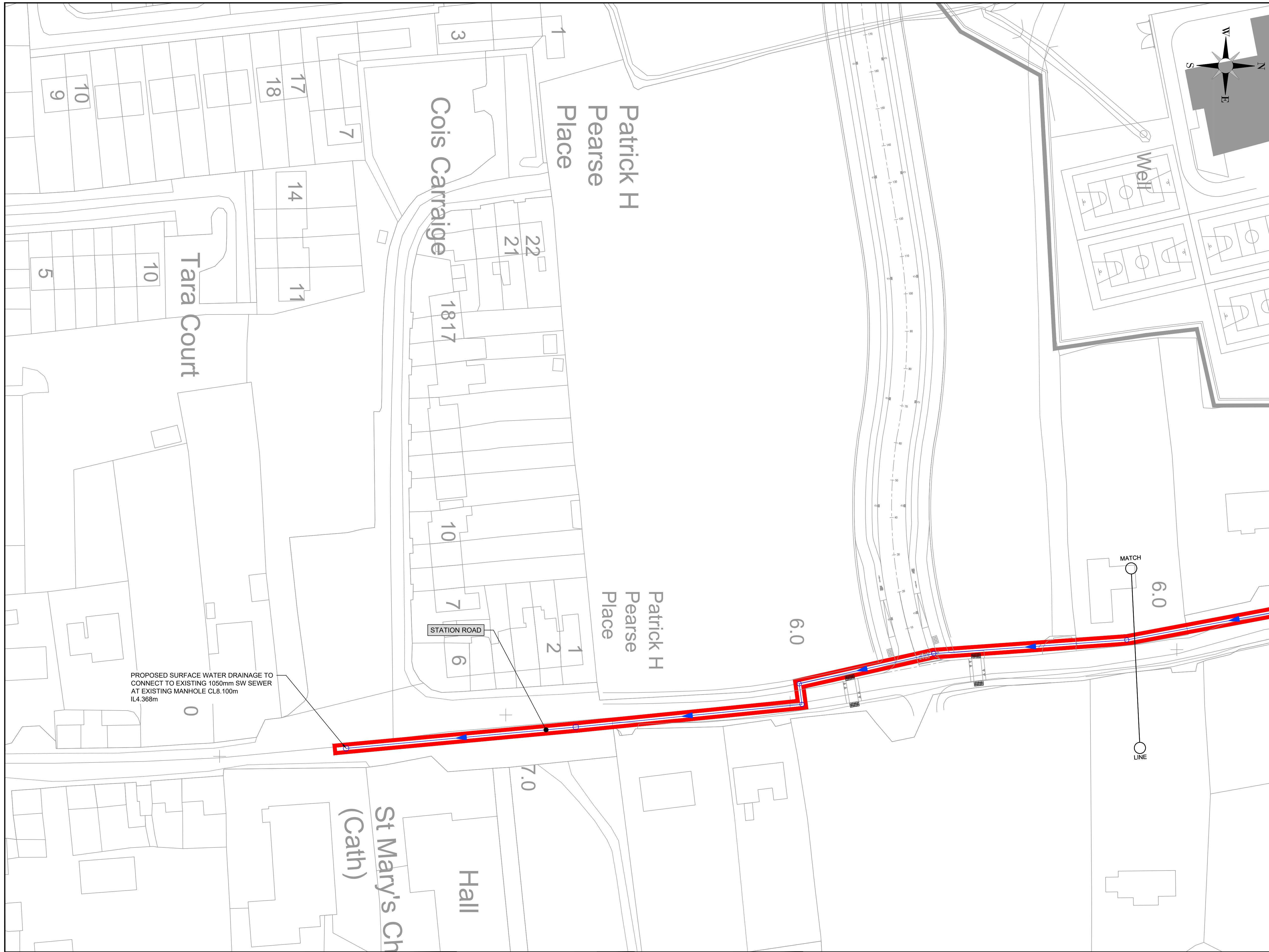
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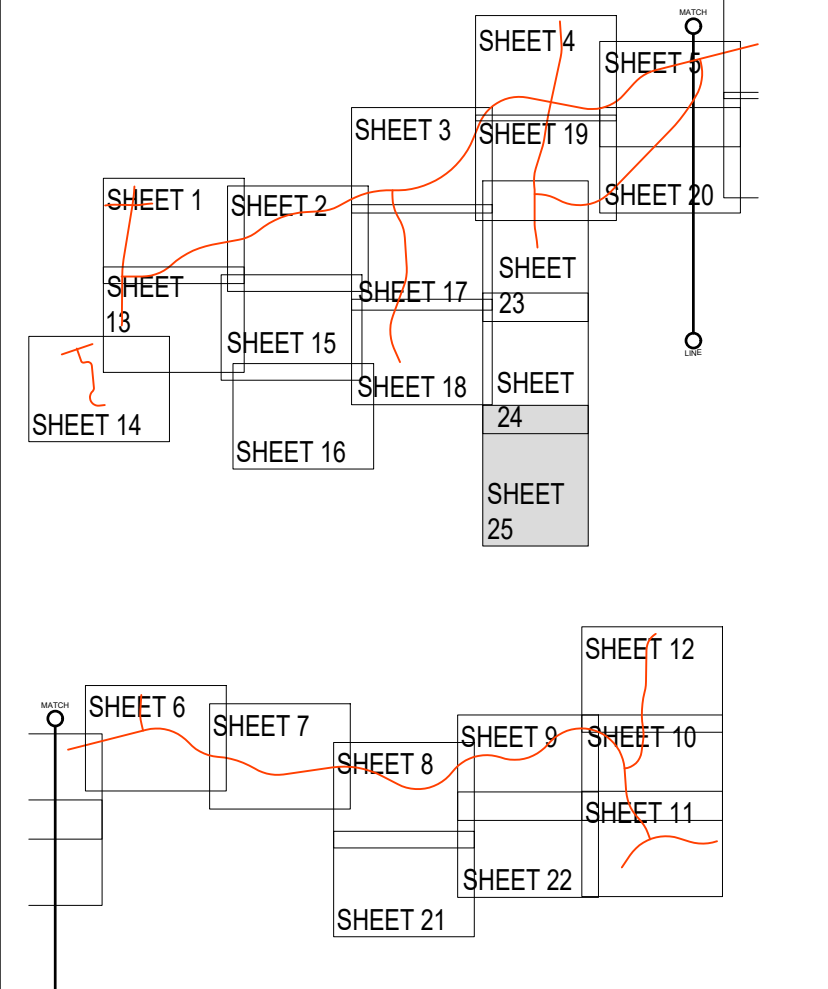
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PROPOSED SURFACE WATER DRAINAGE TO CONNECT TO EXISTING 1050mm SW SEWER AT EXISTING MANHOLE CL8.100m IL4.368m

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Appendix B. Ecology Walkover Report (Greenleaf Ecology)

Ecological Walkover Survey

Carrigtwohill URDF Initiative

Carrigtwohill

Co. Cork

Final Report, prepared for Atkins and Cork County Council

By Karen Banks MCIEEM

18th August, 2020



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1 Introduction

Greenleaf Ecology were commissioned by Atkins on behalf of Cork County Council to undertake ecological walkover surveys of the proposed infrastructure corridors and other proposed works areas within the Urban Expansion Area (UEA) at Carrigtwohill.

This report presents details of the survey methodology and the baseline survey results, including habitat mapping. The report also includes an evaluation of the ecological receptors identified within the survey area.

1.1 Statement of Competence

The surveys and reporting were undertaken by Karen Banks, MCIEEM. Karen is an ecologist with 14 years' experience in the field of ecological assessment. She holds a BSc in Environment and Development from Durham University, and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen specialises in terrestrial ecology field survey and is a skilled botanical surveyor and a licensed bat surveyor. In her career as an ecologist she has undertaken numerous Ecological Impact Assessments (EIA) including those for flood alleviation schemes, solar farms, wind farms and transport infrastructure. Clients include state and semi-state bodies (including EPA, Coillte, Irish Water and OPW), engineering companies and planning consultancies.

2 Methodology

2.1 Relevant Guidelines

This report has been prepared with regards to the following guidelines:

- CIEEM (2017) Guidelines for Ecological Report Writing;
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester;
- EPA (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency;
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill
- NRA (2009) Guidelines for the Assessment of Ecological Impacts of National Road Schemes Rev. 2. National Roads Authority; and
- NRA (2009) NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes). National Roads Authority.

2.2 Desk Study

The sources of material that were consulted as part of the desk study for the purposes of the ecological walkover are as follows:-

- Review of Ordnance Survey maps and ortho-photography;
- Environmental Protection Agency mapping (<http://gis.epa.ie/Envision>); and
- Lewis L., (2015) Preliminary Ecological Appraisal: Carrigtwohill North Masterplan Site, Carrigtwohill, Co. Cork. Limosa Environmental.

2.3 Field Survey

Walkover surveys of the study area¹ were carried out by ecologist Ms Karen Banks between 30th June 2020 and 3rd July 2020. Flora and habitats within the study area were surveyed using the methodology outlined in the guidance document *Best Practice Guidance for Habitat Survey and Mapping* (Smith *et al.*, 2011). The habitats found in the study area (shown on Figure 3-1 and Figure 3-2), were classified in accordance with the guidelines set out in 'A Guide to Habitats in Ireland' (Fossitt, 2000), which classifies habitats based on the vegetation present and management history. The classification is a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. The classification is hierarchical and operates at three levels, outlining the correlation between its habitat categories and the phytosociological units (plant communities) of botanical classifications. Dominant species, indicator species and/or species of conservation interest were recorded and species recorded were given both their Latin and common names, following the nomenclature as given in the 'New flora of the British Isles' (Stace, 2010). Habitat potentially linked to European Annex I habitats was assessed based on the *Interpretation Manual of EU Habitats* (European Commission, 2013) and *The Status of EU Protected Habitats and Species in Ireland* (NPWS, 2019).

A survey for invasive species was conducted during the habitat and botanical survey undertaken in June and July 2020. This survey included the identification and mapping of Invasive Alien Plant Species (IAPS). This survey was conducted in accordance with the NRA publication "Guidelines for the Management of Noxious Weeds and Non- Native Invasive Plant Species on National Roads".

The site walkovers conducted in June 2020 and July 2020 included an assessment of the presence, or likely presence, of protected species. The survey was conducted in accordance with the standard protected species survey guidelines contained in the National Roads Authority publication 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes' (2009). The surveys were conducted for areas of habitat that might support protected mammals in addition to recording any field signs, such as well-used pathways, droppings, places of shelter and features or areas likely to be of particular value as foraging resources. Any badger setts present were recorded during the site walkover, along with potential pine marten den sites. In addition, the suitability of the habitat for pygmy shrew, hedgehog, Irish stoat, pine marten, amphibians and invertebrates were recorded.

Targeted mammal surveys were undertaken as detailed in Sections 2.3.1 to 2.3.3 below.

2.3.1 Otter Survey

An otter survey of the streams within the study area were conducted in conjunction with the site walkover undertaken in June 2020 and July 2020. The survey was restricted to the length of the streams within the proposed study area.

The river banks and areas around bridges/culverts were searched for field signs including:

- Sleeping and resting places including holts, couches and natal dens;
- Breeding sites;
- Spraints;
- Pathways/ trails;
- Slides;
- Hairs;
- Footprints; and

¹ The study area is defined as the entire UEA area as identified in Appendix A of the request for tender.

- Food remains.

Natal dens tend to be well hidden and therefore can be hard to locate. Survey for natal dens was undertaken by searching for field signs including:

- Any heavily used path or paths from the water into dense cover or an enclosed structure;
- Bedding within the structure which may consist of grass, ferns or reeds (bedding may also be present in other types of resting places);
- A latrine containing a large number of spraints at the den or within 2m of it (however, it is important to note that there are often no droppings at a natal den as the female will excrete in the water to ensure that there are no signs of occupation near the natal den);
- A cub play area which may be a well-worn area around a tree or on a bank; and
- Different sized otter prints.

2.3.2 Badger Survey

A badger survey was conducted within the study area in conjunction with the site walkovers undertaken in June 2020 and July 2020. The badger survey was conducted in accordance with *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA, 2009).

Field signs of badger activity are characteristic and sometimes quite obvious and can include tufts of hair caught on barbed wire fences and scrub, conspicuous badger paths, footprints, small excavated pits or latrines in which droppings are deposited, scratch marks on trees, and snuffle holes, which are small scrapes where badgers have searched for insects and plant tubers (NRA, 2009).

Notes were made on signs of other mammals in order to deduce the likelihood of faint tracks and/or feeding signs belonging to badgers. The objectives of the badger survey were to:

- Confirm whether or not badger setts occur within the area surveyed.
- Confirm where possible the status of any setts identified in survey.
- Describe field signs of badger activity.

2.3.3 Bird Survey

A breeding bird survey of the study area was undertaken on 30th June 2020. The survey targeted suitable habitat areas as previously identified in the desktop study and review of the Preliminary Ecological Appraisal (Lewis, 2015). All species that were seen or heard were recorded. All bird locations, numbers and behaviour were recorded by annotating field maps and taking notes. Breeding evidence such as singing males, agitated behaviour, carrying food and recently fledged young was recorded. The breeding status of all species encountered during surveys were classified into four categories: Confirmed (Br), Probable (Pr), Possible (Po) and Nonbreeder (N), based on British Trust for Ornithology (BTO) categories of breeding evidence, as detailed in Table 2-1. The survey was conducted under dry, calm and light weather conditions.

The conservation status of bird species recorded was considered in respect of the following: Birds of Conservation Concern in Ireland (BoCCI) Red, Amber and Green lists (see Colhoun & Cummins, 2013); EU Birds Directive Annex I list.

Table 2-1: BTO categories of breeding bird evidence

Breeding status	Confirmed breeder (Br)	Probable breeder (Pr)	Possible breeder (Po)	Non-breeder (N)
Observed behaviours	Distraction display or injury feigning (DD)	Pair in suitable nesting habitat (P)	Observed in suitable nesting habitat (H)	Flying Over (F)
	Used nest or eggshells found from current season (UN)	Permanent Territory (T)	Singing Male (S)	Migrant (M)
	Recently fledged young or downy young (FL)	Courtship and Display (D)		Summering non-breeder (U)
	Adults entering or leaving nest site indicating occupied nest (ON)	Visiting probable nest site (N)		
	Adult carrying faecal sac or food for young (FF)	Agitated Behaviour (A)		
	Nest containing eggs (NE)	Brood patch of incubating bird (I)		
	Nest with young seen or heard (NY)	Nest Building or excavating nest hole (B)		

2.4 Survey Constraints

All surveys were undertaken within an appropriate survey period and in good weather conditions. Due to the project timeframes one targeted breeding bird survey was undertaken in locations targeted as suitable habitat on review of the results of the PEA, however, it was not possible to undertake breeding bird surveys at the start of the breeding season. It is recommended that further breeding bird surveys are undertaken to inform an ecological assessment in the event that detailed development plans for the study area are completed.

It was not possible to access one field to the west and two fields to the south-east of the study area. Habitat classification of these areas was made by aerial photography interpretation and viewing the areas with binoculars from public roads.

2.5 Ecological Evaluation

The valuation of ecological features is in accordance with the methodology detailed in National Roads Authority Guidelines (2009) (Table 2-2). To qualify as an ecological feature (referred to as key ecological receptors in the NRA Guidelines), features must be of local ecological importance (higher value) or higher as per the geographical frame of reference detailed in Table 2-2. Ecological features might also be important because they play a key functional role in the landscape as ‘stepping stones’ for migratory species to move during their annual migration cycle, as well as for species to move

between sites, to disperse populations to new locations, to forage, or move in response to climate change.²

Table 2-2: Geographical frame of reference for ecological evaluation

for Ecological Sites
<p>International Importance:</p> <ul style="list-style-type: none"> ▪ 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. ▪ Proposed Special Protection Area (pSPA). ▪ Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). ▪ Features essential to maintaining the coherence of the Natura 2000 Network. ▪ Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. ▪ Resident or regularly occurring populations (assessed to be important at the national level) of the following: <ul style="list-style-type: none"> ▪ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or ▪ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. ▪ Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). ▪ World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). ▪ Biosphere Reserve (UNESCO Man & the Biosphere Programme). ▪ Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). ▪ Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). ▪ Biogenetic Reserve under the Council of Europe. ▪ European Diploma Site under the Council of Europe. ▪ Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
<p>National Importance:</p> <ul style="list-style-type: none"> ▪ Site designated or proposed as a Natural Heritage Area (NHA). ▪ Statutory Nature Reserve. ▪ Refuge for Fauna and Flora protected under the Wildlife Acts. ▪ National Park. ▪ Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. ▪ Resident or regularly occurring populations (assessed to be important at the national level) of the following: <ul style="list-style-type: none"> ▪ Species protected under the Wildlife Acts; and/or ▪ Species listed on the relevant Red Data list. ▪ Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
<p>County Importance:</p> <ul style="list-style-type: none"> ▪ Area of Special Amenity. ▪ Area subject to a Tree Preservation Order. ▪ Area of High Amenity, or equivalent, designated under the County Development Plan. ▪ Resident or regularly occurring populations (assessed to be important at the County level) of the following: <ul style="list-style-type: none"> ▪ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ▪ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ▪ Species protected under the Wildlife Acts; and/or ▪ Species listed on the relevant Red Data list.

² Ref Article 10 of the Habitats Directive: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML>

<ul style="list-style-type: none">▪ Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.▪ County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared.▪ Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.▪ Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
<p>Local Importance (higher value):</p> <ul style="list-style-type: none">▪ Locally important populations of Priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan (BAP), if this has been prepared;▪ Resident or regularly occurring populations (assessed to be important at the Local level) of the following:<ul style="list-style-type: none">▪ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;▪ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;▪ Species protected under the Wildlife Acts; and/or▪ Species listed on the relevant Red Data list.▪ Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;▪ Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
<p>Local Importance (lower value):</p> <ul style="list-style-type: none">▪ Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;▪ Sites or features containing non-native species that are of some importance in maintaining habitat links.

3 Receiving Environment

3.1 Habitats

Improved Agricultural Grassland (GA1)

Improved agricultural grassland (Plate 3-1) is present across the Urban Expansion Area (UEA) in the townlands of Terry's-Land, Gortnamucky and Poulaniska. Species present within the sward are typical of improved grasslands, and include Perennial Rye-grass (*Lolium perenne*), Timothy (*Phleum pratense*) and Yorkshire-fog (*Holcus lanatus*), with herbs including Dandelion (*Taraxacum* agg.), White Clover (*Trifolium repens*), Red Clover (*Trifolium pratense*), Creeping Buttercup (*Ranunculus repens*) and Ribwort Plantain (*Plantago lanceolata*).

Plate 3-1: Improved agricultural grassland to the east of the UEA



Amenity Grassland (GA2)

Amenity grassland is present throughout the study area in domestic gardens.

Dry Calcareous and Neutral Grassland (GS1)

This habitat is represented by areas of less intensively grazed grassland present in the townlands of Terry's-Land, Carrigtohill and Ballyadam. Species in the sward include Yorkshire Fog, Sweet Vernal-grass (*Anthoxanthum odoratum*), Timothy, Creeping Bent (*Agrostis stolonifera*), Rough Meadow-grass (*Poa trivialis*), Glaucus Sedge (*Carex flacca*) and locally frequent Sharp-flowered Rush (*Juncus acutiflorus*) and Soft Rush (*Juncus effusus*) in wet depressions. Herbs present include Creeping Buttercup, Greater Bird's-foot-trefoil (*Lotus pedunculatus*), Curled Dock (*Rumex crispus*), Ragwort (*Senecio jacobea*), Common Mouse-ear (*Cerastium fontanum*) and White Clover; with locally frequent Common Knapweed (*Centaurea nigra*), Common Bird's-foot-trefoil (*Lotus corniculatus*) and Oxeye Daisy (*Leucanthemum vulgare*) (Plate 3-2).

Plate 3-2: Grazed neutral grassland in the townland of Carrigtwohill



Dry Meadows and Grassy Verges (GS2)

This habitat is present in the townlands of Terry's-Land and Carrigtwohill in fields that have not been improved in recent years and do not show any indication of recent grazing. These areas are of variable species richness and support grasses including False Oat-grass (*Arrhenatherum elatius*), Cock's-foot (*Dactylis glomerata*), Sweet Vernal-grass, Creeping Bent, Common Bent (*Agrostis capilaris*), Rough Meadow-grass and Yorkshire Fog, with locally frequent Soft Rush in wet depressions. Herbs present include Daisy (*Bellis perennis*), Yarrow (*Achillea millefolium*), Common Vetch (*Vicia sativa*), Meadow Vetchling (*Lathyrus pratensis*), Greater Bird's-foot-trefoil, Common Knapweed, Selfheal (*Prunella vulgaris*), Ribwort Plantain, Curled Dock and Greater Plantain (*Plantago major*).

Wild Carrot (*Daucus carota*), Common Centaury (*Centaureum erythraea*), Oxeye Daisy, White Campion (*Silene latifolia*) and Field Forget-me-not (*Myosotis arvensis*) occur locally in an area of recolonised ground located between a watercourse/ drainage ditch and the railway line at the north of Carrigtwohill townland (Plate 3-3).

Plate 3-3: Relatively species rich dry meadows and grassy verge habitat in the townland of Carrigtwohill



Wet Grassland (GS4)

Areas of wet grassland (Plate 3-4) occur in low lying areas of land in the field between a watercourse/ drainage ditch and the railway line at the north of Carrigtwohill townland. Species present include Hard Rush (*Juncus inflexus*), Fleabane (*Pulicaria dysenterica*), Field Horsetail (*Equisetum arvense*), Water Mint (*Mentha aquatica*) and Meadowsweet (*Filipendula ulmaria*).

Other areas of wet grassland are typically associated with abandoned grassland and damp field margins in the vicinity of the railway line, also in the townland of Carrigtwohill. These areas comprise Compact Rush, Hard Rush, Grey Sedge (*Carex divulsa*), Rough Meadow-grass, Creeping Bent, Yorkshire Fog, Field Horsetail, Nettle (*Urtica dioica*), Fleabane, Common Vetch, Meadow Vetchling, Greater Bird's-foot-trefoil and Creeping Cinquefoil (*Potentilla reptans*). Willow (*Salix cinerea*), Alder (*Alnus glutinosa*) Gorse (*Ulex europaeus*) and Bramble scrub is encroaching in some areas, particularly towards the east of the study area.

Plate 3-4: Wet grassland in the townland of Carrigtwohill



Scrub (WS1)

Small parcels of scrub predominantly comprising Willow and Gorse occur throughout the study area. One parcel of scrub located in the townland of Poulanska supports a more diverse range of scrub species, including Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Elder (*Sambucus nigra*), Willow and Bramble.

Mixed Broadleaved Woodland (WD1)

This habitat is present in areas of woodland planted around Cobh Cross junction (Plate 3-5), verges of junctions in Carrigtwohill townland and a strip of linear woodland to the west of the UEA. Species present include Sycamore (*Acer pseudoplatanus*), Oak (*Quercus* spp), Ash, Elm (*Ulmus glabra*), Cherry (*Prunus* spp), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*) and Bramble (*Rubus fruticosus* agg.).

Plate 3-5: Mixed broadleaved woodland at Cobh Cross Junction



Spoil and Bare Ground (ED2)

Areas under construction in Carrigtohill and an area recently surfaced in the townland of Killacloyne to the west of the study area.

Recolonising Bare Ground (ED3)

An area of cleared land in the townland of Killacloyne that is recolonising with species including Purple Ramping-fumitory (*Fumaria purpurea*), White Clover, Prickly Sow-thistle (*Sonchus asper*), Sun Spurge (*Euphorbia helioscopia*), Curled Dock, Poppy (*Papaver rhoeas*), Scentless Mayweed (*Tripleurospermum inodorum*), Scarlet Pimpernell (*Anagallis arvensis*), Fat-hen (*Chenopodium album*), Hogweed (*Heracleum sphondylium*) and Rosebay Willowherb (*Chamerion angustifolium*).

Arable Crops (BC1)

Fields of Arable crops (predominantly Barley) (Plate 3-6) are present across the UEA in the townlands of Terry's-Land, Fahydorgan, Ballyadam and Caarrigtohill. The field margins support Scentless Mayweed, Scarlet Pimpernell, Prickly Sow-thistle, Hogweed, Field Pansy (*Viola arvensis*), Ragwort, Rosebay Willowherb and Sun Spurge.

Plate 3-6: Field of arable crops to the east of the UEA



Buildings and Artificial Surfaces (BL3)

The study area is located in the immediate proximity of Carrigtohill, therefore built land is present in the form of features such as roads, domestic dwellings and businesses.

Drainage Ditches (FW4)

There are three main areas of drainage within the study area. In the west of the study area, water rises centrally within an arable field and then flows into a drainage pipe that discharges into a drainage ditch that runs parallel to the railway line.

Centrally, a watercourse (FW4) runs from the north of the study area adjacent to a local road, bounded by a treeline (Plate 3-7). The watercourse is extensively culverted under the railway line and Station Road, and discharges into a field to the west of Station Road.

The third watercourse is present to the east of the study area, where a drainage ditch runs adjacent to a field boundary to an area of wet grassland and scrub adjacent to the railway line.

Due to the highly modified nature of these watercourses, they most closely correspond with the Fossitt classification Drainage ditch (FW4).

Plate 3-7: Drainage ditch running alongside local road



Hedgerows (WL1) and Treelines (WL2)

The fields across the study area are bound by hedgerows and treelines comprising native species including Ash, Oak, Elm, Hawthorn and occasional Elder and Willow (Plate 3-8 and Plate 3-9).

Plate 3-8: Typical hedgerow with standard trees



Plate 3-9: Field with line of mature trees in the background



Stone Walls (BL1)

The westernmost local road crossing the study area is lined by mature Beech (*Fagus sylvatica*) and Oak trees and a stone wall.

Earth Banks (BL2)

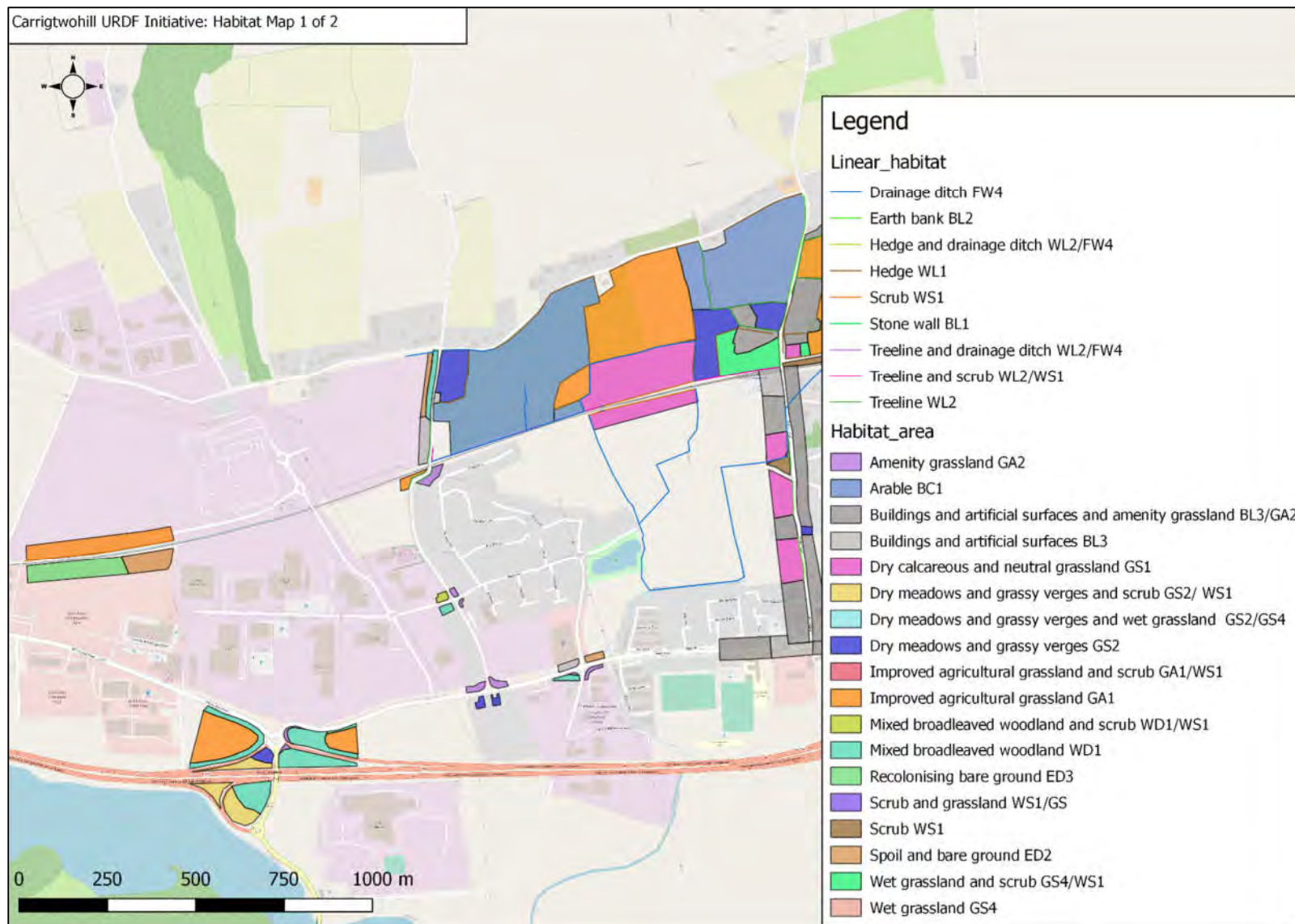
Field boundaries in the study area occasionally comprise earth banks vegetated by grass species, nettle and occasional bramble (Plate 3-10).

Plate 3-10: Earth bank located to the east of the UEA



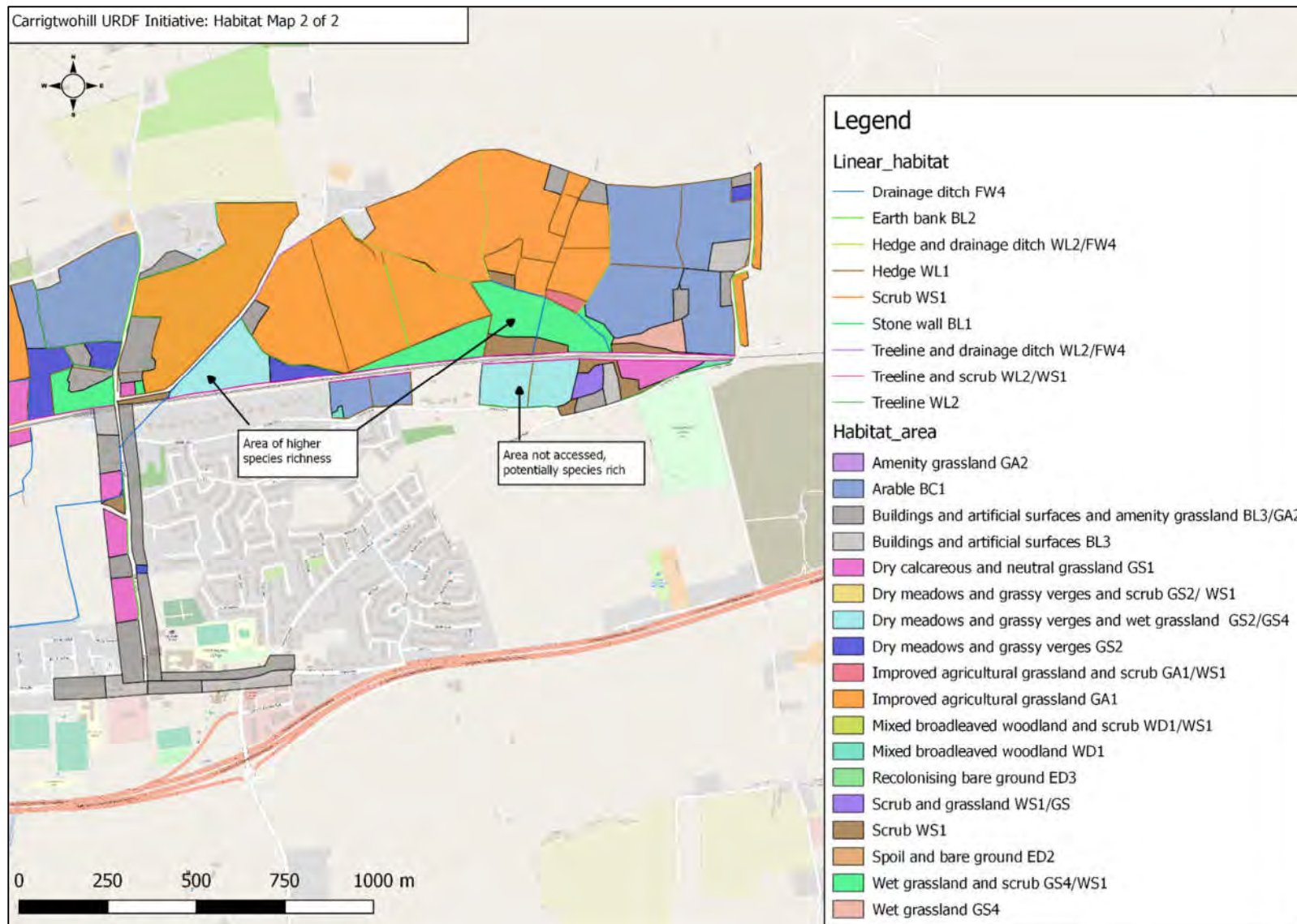
Habitats present in the study area and areas of higher species richness are illustrated in Figure 3-1 and Figure 3-2.

Figure 3-1: Carrigtwohill URDF Initiative, habitat map 1 of 2



Ecological Walkover Survey: Carrigtwohill URDF Initiative

Figure 3-2: Carrigtwohill URDF Initiative, habitat map 2 of 2



3.2 Species

3.2.1 Amphibians and Reptiles

No signs of newt or frog were observed within the study area during the course of the site walkover. There is potential habitat for amphibians in wet grassland and areas of standing water in wet depressions within fields and areas of standing/ very slow flowing water associated with drainage ditches across the study area.

No common lizard (*Zootoca vivipara*) were recorded during the course of the site surveys. There is potential for this species to utilise areas of woodland and grassland at field margins.

3.2.2 Mammals (excluding bats)

Otter

No evidence of otter was recorded within the study area during the course of the site walkovers. The watercourses present in the study area are small, highly modified and extensively culverted. As such, the study area provides limited foraging and commuting habitat for otter.

Badger

No badger setts or signs of badger activity were recorded within the study area. There is suitable habitat for badgers in the field boundaries and mammal tracks were occasionally recorded at field boundaries.

Other Species

No evidence of other protected species of mammal was recorded within the study area. As noted by Lewis (2015), the study area supports potential habitat for hedgehog, pygmy shrew, red squirrel, pine marten and deer.

3.2.3 Avifauna

A total of twenty two species of bird were recorded during the breeding bird survey within the study area (as listed in Table 3-1). In accordance with BTO categories (Table 2-1), one species was identified as 'confirmed breeding' within the study area, two species were identified as 'probably breeding', seventeen species were identified as 'possible breeders' and the remaining two species were identified as 'non-breeders'.

No Annex I or BoCCI (Colhoun, K. and Cummins, S. (2013)) Red listed birds were recorded within the study area during the course of surveys undertaken in 2020. Two BoCCI Amber listed bird species were recorded as possible breeders within the study area during the course of the breeding bird survey; Robin and House Sparrow were both recorded singing within the study area. No direct evidence was recorded that these species breed within the study area, however there is suitable nesting habitat within treelines, hedgerows and woodland. Swallows were observed nesting within a disused house located adjacent to a local road at the west of the UEA area and it is likely that this species breeds in agricultural barns throughout the study area.

The remaining nineteen bird species recorded during the breeding bird surveys are Green listed and comprise a range of relatively common species typically associated with the hedgerow, garden and agricultural habitats present within the study area.

Table 3-1: Breeding birds recorded within the study area, 2020

Species	Breeding Evidence ³	BoCCI Status	EU Birds Directive	Nest location within the study area
Blackbird (<i>Turdus merula</i>)	Probable (P)	Green		-
Blackcap (<i>Sylvia atricapilla</i>)	Possible (H)	Green		-
Blue Tit (<i>Parus caeruleus</i>)	Possible (H)	Green		-
Buzzard (<i>Buteo buteo</i>)	Non-breeding (F)	Green		-
Chaffinch (<i>Fringilla coelebs</i>)	Possible (H)	Green		-
Chiffchaff (<i>Phylloscopus collybita</i>)	Possible (S)	Green		
Collared Dove (<i>Streptopelia decaocto</i>)	Possible (H)	Green		-
Dunnock (<i>Prunella modularis</i>)	Possible (H)	Green		-
Garden Warbler (<i>Sylvia borin</i>)	Possible (H)	Green		-
Goldfinch (<i>Carduelis carduelis</i>)	Possible (H)	Green		-
Grey Heron (<i>Ardea cinerea</i>)	Non-breeding (F)	Green		-
Hooded Crow (<i>Corvus corone cornix</i>)	Possible (H)	Green		-
House Sparrow (<i>Passer domesticus</i>)	Possible (H)	Amber		-
Long-tailed Tit (<i>Aegithalos caudatus</i>)	Possible (H)	Green		-
Magpie (<i>Pica pica</i>)	Possible (H)	Green		-
Pheasant (<i>Phasianus colchicus</i>)	Possible (H)	Green		-
Robin (<i>Erithacus rubecula</i>)	Possible (H)	Amber		-
Rook (<i>Corvus frugilegus</i>)	Possible (H)	Green		-
Song Thrush (<i>Turdus philomelos</i>)	Possible (S)	Green		-
Swallow (<i>Hirundo rustica</i>)	Confirmed (ON)	Amber		Disused house adjacent to local road to the west of the UEA
Woodpigeon (<i>Columba palumbus</i>)	Possible (H)	Green		-
Wren (<i>Troglodytes troglodytes</i>)	Probable (A)	Green		-

³ Within the study area

3.2.4 Invasive Species

The following invasive species were recorded within the study area:

- Himalayan Balsam (*Impatiens glandulifera*);
- Japanese Knotweed (*Fallopia japonica*);
- Butterfly Bush (*Buddleja davidii*);
- Cherry Laurel (*Prunus laurocerasus*); and
- Himalayan Honeysuckle (*Leycesteria Formosa*).

Himalayan Balsam was recorded during the site walkover undertaken on 2nd and 3rd July 2020 to the north of an arable field and in the vicinity of a railway underpass, both of which are located in the townland of Terry's-Land. Himalayan Balsam is considered to be a High Impact⁴ invasive species and is included in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011).

Japanese Knotweed was recorded during the site walkover undertaken on 3rd July 2020 at the south-east of the UEA area, to the south of the railway line. The Japanese Knotweed was a well established stand located in the western corner of a field, with young growth encroaching into the field. Japanese Knotweed is considered to be a High Impact⁵ invasive species and is included in the Third Schedule.

Butterfly Bush is listed as being of 'Medium Impact' and is not listed in the Third Schedule. Four Butterfly Bush shrubs were recorded in the study area in the boundaries of domestic gardens.

Cherry Laurel is listed as being of 'High Impact' by Invasive Species Ireland, however it is not listed in the Third Schedule. Cherry Laurel plants were present within the tree lines in several locations within the study area.

Himalayan Honeysuckle was recorded in one location to the south of the UEA in the townland of Carrigtwohill. This plant is not listed in the European Communities (Birds and Natural Habitats) Regulations 2011 or identified in the NRA (now TII) Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads, but is identified by Biodiversity Ireland as a medium impact invasive species.

⁴ <http://invasivespeciesireland.com>

⁵ <http://invasivespeciesireland.com>

Ecological Walkover Survey: Carrigtwohill URDF Initiative

Figure 3-3: Carrigtwohill URDF Initiative, invasive plant species map



3.2.4.1 Invertebrates

The following species of invertebrate were recorded during the site walkover: meadow brown (*Maniola jurtina*), peacock (*Aglais io*), red admiral (*Vanessa atalanta*) and ringlet (*Aphantopus hyperantus*) butterfly. These species are all common and widespread in Ireland.

3.3 Ecological Evaluation

Table 3-2 summarises all identified ecological features. Ecological features are valued as being of local ecological importance (higher value) or above as per the criteria set out in Table 3-2.

Table 3-2: Ecological features within the study area

Habitat/ Species	Ecological Value ⁶	Ecological Feature
Improved agricultural grassland (GA1)	Local Importance (Lower Value). The agricultural fields within the study area are of low botanical importance but do provide some limited habitat for fauna and avifauna.	No
Amenity grassland (GA2)	Local Importance (Lower Value). Amenity grassland is intensively managed and is of low botanical importance.	No
Dry calcareous and neutral grassland (GS1)	Local Importance (Lower Value). The areas of this habitat within the study area were relatively species poor but do provide some limited habitat for fauna and avifauna. Dry calcareous and neutral grassland, as recorded in the study area, does not correspond to Annex I habitat.	No
Dry meadows and grassy verges (GS2)	Local Importance (Lower Value). Species poor variants of this habitat were present in a number of fields within the study area. Local Importance (Higher Value). A field at the centre of the UEA, located between the railway line and a local road supported relatively species rich areas of this habitat in association with wet grassland in low lying areas. These areas are of higher botanical diversity and also provide suitable habitat for fauna, avifauna and invertebrates. Dry meadows and grassy verges, as recorded in the study area, do not correspond to Annex I habitat.	No Yes
Wet grassland (GS4)	Local Importance (Lower Value). A species poor variant of this habitat was present to the south of an arable field to the east of the UEA. Local Importance (Higher Value). A field at the centre of the UEA, located between the railway line and a local road supported relatively species rich areas of wet grassland in association with areas of dry grassland. An area towards the east of the UEA also supported relatively species rich wet grassland and scrub. These areas are of higher botanical diversity and also provide suitable habitat for fauna, avifauna and invertebrates. Wet grassland, as recorded in the study area, does not correspond to Annex I habitat.	No Yes
Scrub (WS1)	Local Importance (Lower Value). The scrub within the study area is predominantly comprised of Willow and	No

⁶ In accordance with NRA (2009) Guidelines for the Assessment of Ecological Impacts of National Road Schemes Rev. 2. National Roads Authority

Ecological Walkover Survey: Carrigtwohill URDF Initiative

	Gorse and is not of high botanical value. This habitat provides potential habitat for avifauna and mammals.	
Mixed broadleaved woodland (WD1)	Local Importance (Higher Value). These areas of woodland are relatively dense and undisturbed and as such provide potential habitat for mammals and avifauna within the study area.	Yes
Spoil and bare ground (ED2)	Negligible. This habitat is subject to disturbance and is not of conservation interest.	No
Recolonising bare ground (ED3)	This habitat is of local importance (lower value). Areas of bare ground in the study area are re-vegetating with a range of species that are of limited botanical interest .	No
Arable crops (BC1)	Local Importance (Lower Value). The arable fields within the study area are of low botanical importance; however this habitat does provide a foraging area for some species of avifauna.	No
Buildings and artificial surfaces (BL3)	The buildings and artificial surfaces in the study area are of negligible ecological value.	No
Drainage ditch (FW4)	Local Importance (Higher Value). While the watercourses within the study area are highly modified to run alongside local roads and field boundaries, they provide connectivity in the landscape and provide foraging and commuting habitat for bats and other species of fauna.	Yes
Hedgerows and treelines (WL1 and WL2)	Local Importance (Higher Value). This habitat provides connectivity in the landscape and potential foraging and shelter for avifauna and commuting and foraging areas for bats.	Yes
Stone wall (BL1)	Local Importance (Lower Value).	No
Earth bank (BL2)	Local Importance (Lower Value). The earth banks were of low botanical value.	No
Amphibians & Reptiles	Local Importance (Higher Value). No evidence of amphibians and reptiles was recorded within the study area. However there is suitable breeding habitat for amphibians in wet, low lying areas of fields and in very slow flowing areas of drainage. There is suitable habitat for reptiles in field margins and areas of woodland.	Yes
Otter	No evidence of otter was recorded within the study area and the drainage ditches present are unlikely to provide significant foraging opportunities for this species.	No
Badger	Local Importance (Higher Value). No evidence of badger was recorded within the study area, however there is suitable habitat for this species within field boundaries and woodland parcels.	Yes
Other mammals	There is potential for other mammals, including pygmy shrew, hedgehog, red squirrel and pine marten to be present in the study area, however no evidence of these species was recorded during the site surveys.	No
Avifauna	Avifauna as they occur within the study area are considered to be of Local Importance (Higher Value).	Yes
Invertebrates	A range of common and widespread species of butterfly were recorded within the study area.	No

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Appendix C. Bat Report (Greenleaf Ecology)

Bat Survey

Carrigtwohill URDF Initiative

Carrigtwohill

Co. Cork

Final Report, prepared for Atkins and Cork County Council

By Karen Banks MCIEEM

18th August, 2020



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1 Introduction

Greenleaf Ecology were commissioned by Atkins on behalf of Cork County Council to undertake bat surveys of the proposed infrastructure corridors and other proposed works areas within the Urban Expansion Area (UEA) at Carrigtwohill.

This report presents details of the survey methodology, the baseline desktop study and survey results. The report also includes an evaluation of the bat fauna identified within the survey area.

1.1 Statement of Competence

The surveys were undertaken by Karen Banks, MCIEEM assisted by Mr Cathal MacPartholan.

Karen is an ecologist with 14 years' experience in the field of ecological assessment. She holds a BSc in Environment and Development from Durham University, and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen is an experienced and skilled bat surveyor, first gaining a scientific licence to disturb bats from Natural England, UK in 2008. Karen is trained in bat handling and capture methods and currently holds a bat disturbance licence granted by the NPWS. Karen has undertaken bat survey and assessment for numerous projects, including bridge repair and replacement works, domestic dwelling repair and demolition works, wind farm developments and large-scale infrastructure projects such as flood relief schemes, road developments and pipeline schemes. Karen has also represented Cork County Council as an expert witness for bats at an Oral Hearing.

1.2 Legislative Context

All Irish bats are protected under the Wildlife Act (Revised). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats, and requires that appropriate monitoring of populations be undertaken. Across Europe they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

All bats are listed in Annex IV of the EU Habitats Directive (92/43/EC) and the Lesser Horseshoe bat is further listed under Annex II of the same Directive.

Local Planning Authorities are required to give consideration to nature conservation interests under the guidance of the SEA Directive 2001/42/EC. This Directive states that the protected status afforded to bats means that planning authorities must consider their presence in order to reduce the impact of developments through mitigation measures.

Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "Guidance on

Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

1.3 Objectives

The objectives of the bat survey were to:

- Establish the location of any potential or actual bat roosts;
- Establish the value of the study area to bats for foraging and commuting; and
- Evaluate the survey results in a geographical context.

2 Methodology

2.1 Desk Study

A pre-survey data search was conducted in order to collate existing information from the study area¹ on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Collation of known bat records from within a 4km radius of the study area from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie);
- Review of Ordnance Survey mapping and aerial photography of the proposed study area and its environs;
- Records of designated sites where bats form part or all of the reason for designation within a 15km radius of the study area (<https://www.npws.ie/protected-sites>);
- Collation of lesser horseshoe bat records from the National Parks and Wildlife Service lesser horseshoe bat database (<https://www.npws.ie>); and
- Review of bat survey data from Ecological Impact Assessments from proposed and permitted developments within the study area.

2.2 Field Survey

This bat survey was cognisant of the following guidelines:-

- Bat Conservation Ireland, (2010). Guidance notes for Planners, Engineers, Architects, and Developers;
- Collins, J. (ed.) (2016). Bat Surveys for Professional ecologists: Good Practice Guidelines (3rd ed.). The Bat Conservation Trust, London; and
- Kelleher, C. & Marnell, F. (2006). Bat Mitigation Guidelines for Ireland.

2.2.1 Bat Roost Survey

2.2.1.1 Preliminary Ecological Appraisal

Walkover surveys of areas identified as potential roosting habitats during the desk top study were undertaken in June and July 2020. Roosting habitat was assessed using the criteria outlined in Table 2-1².

Table 2-1: Criteria for Assessing the Potential Suitability of the Proposed Development Site for Bats

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.

¹ The study area is defined as the entire UEA area as identified in Appendix A of the request for tender.

² Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London

Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

2.2.1.2 Bat Roost Inspection Survey

Trees

A detailed inspection of the exterior of trees was undertaken to look for features that bats could use for roosting (Potential Roost Features, or PRFs) from ground level. The aim of the survey was to determine the actual or potential presence of bats and the need for further survey.

A detailed inspection of each potential tree roost within the study area was undertaken. The inspection was carried out in daylight hours from ground level, and information was compiled on the tree, PRFs and evidence of bats. All trees surveyed were numbered and marked on a map and a description of each PRF observed was recorded. PRFs that may be used by bats include:

- Rot holes;
- Hazard beams;
- Other horizontal or vertical cracks or splits (e.g. frost cracks) in stems or branches;
- Lifting bark;
- Knotholes arising from naturally shed branches or branches previously pruned back to the branch collar;
- Man-made holes (e.g. flush cuts) or cavities created by branches tearing out from parent stems;
- Cankers in which cavities have developed;
- Other hollows or cavities;
- Double leaders forming compression forks with included bark and potential cavities;
- Gaps between overlapping stems or branches;
- Partially detached ivy with stem diameters in excess of 50mm; and
- Bat or bird boxes.

Signs of a bat roost (excluding the actual presence of bats), include:

- Bat droppings in, around or below a PRF;
- Odour emanating from a PRF;
- Audible squeaking at dusk or in warm weather; and
- Staining below the PRF.

It should be noted that bats or bat droppings are the only conclusive evidence of a roost and many roosts have no external signs. Therefore, this survey and evaluation was relatively basic as only those PRFs at ground level could be inspected closely to ascertain their true potential to support roosting bats. Trees were categorised according to the highest suitability PRF present.

Structures

Derelict/ disused buildings and bridges within the proposed study area were subject to a visual inspection for evidence of, and potential for, bats. The exterior of the structures was visually assessed for potential bat access points and evidence of bat activity using binoculars, a high powered torch and an endoscope (Explorer Premium 8803 with 9mm camera). Features such as crevices and small gaps in the building structure, such as between the brick or stone work, beneath roofing material, at eaves and around window frames which had potential as bat access points into the buildings were inspected. Evidence that these features/ access points were actively being used by bats includes staining within the gaps, urine staining and bat droppings. Indicators that potential access points are not actively used by bats include general detritus and cobwebs within the access point. A note of potential features used by bats was made where present.

Where possible, internal inspections of these buildings was undertaken. Internal inspections involved looking for features that may be suitable for roosting bats, such as joints and crevices in wood, holes or crevices between stonework in the walls and searching for bat droppings, urine stains and feeding signs on the floor.

2.2.1.3 Emergence Roost Survey

Dusk surveys of structures identified as being of moderate or high potential for bats during the roost inspection surveys were undertaken in July and August 2020. The purpose of the surveys was to watch and listen for bats exiting from bat roosts to determine the presence or absence of bats at the time of survey. The dusk emergence surveys commenced approximately 15 minutes before sunset and ended approximately 90 minutes after sunset. The surveys were undertaken in suitable weather conditions (avoiding periods of very heavy rain, strong winds (> Beaufort Force 5), mists and dusk temperatures below (10°C)).

An Anabat Walkabout detector was utilised for the survey, which records bat echolocation calls directly on to an internal SD memory card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. Data were then downloaded and all recordings were analysed using the Anabat Insight spectrogram sound analysis software Version 1.9.2.

2.2.1.4 Bat Activity Survey

Bat activity surveys were conducted across the study area using an Anabat Walkabout detector. Dusk activity surveys (from sunset, for a minimum of 120 minutes) were conducted. These surveys enable a determination of the approximate numbers and species of bats present within the site, areas used for foraging and commuting routes to and from roosts. The approximate flying height and direction taken by bats were estimated and detailed where possible.

Assessment of bat activity was undertaken in July and August 2020. A total of 2 dusk activity surveys were completed, and were undertaken on 21st July and 5th August 2020. Both surveys were conducted in good weather conditions (avoiding periods of very heavy rain, strong winds (> Beaufort Force 5), mists and dusk temperatures below (10°C).

In order to supplement the information gathered from the manual activity surveys, a Passive Monitoring System of bat detection was also deployed for this survey scheme (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for later analysis). This results in a far greater sampling effort over a shorter period of time. Passive monitoring was completed in July 2020 using the Anabat Express and Anabat Swift bat monitors. Bats are identified by their ultrasonic calls. The passive detectors record bat ultrasonic calls on a continuous basis and store the information onto an internal SD card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded.

One Anabat Express monitor and two Anabat Swift monitors were deployed for the survey and were positioned in eight different locations (illustrated in Figure 2-1). The monitors were positioned in hedgerows and treelines that will be severed by, or are proximal to, proposed infrastructure corridors. The detectors were set to record from approximately 30 minutes before sunset until sunrise and recorded for 3 nights at each location. Data were then downloaded and bat echolocation calls were later analysed by the Anabat Insight software analysis programme version 1.9.2. Each time-stamped file was analysed and the species of bat recorded was noted as a bat pass.

2.3 Survey Limitations

The bat surveys were undertaken in July 2020. As such, the survey results provide a representation of bat activity within the study area the summer season and do not provide information on bat activity during the spring and autumn months.

Brown long-eared bats can be difficult to detect as they echolocate at a low-amplitude and foraging bats often make no sound.

The survey design aimed to increase the likelihood of recording this species by the employment of full spectrum monitoring and the positioning of passive monitors at commuting routes, natural corridors through vegetation and highly suitable brown long-eared bat habitats (such as woodland and scrub edge). The use of passive monitors also enabled survey data to be gathered from parts of the study area that could not be accessed in the hours of darkness due to the presence of livestock.

Bat Survey: Carrigtwohill URDF Initiative

Figure 2-1: Carrigtwohill URDF: location of passive monitors, July 2020



3 Results

3.1 Existing Bat Data

The review of existing records of bat species in the study area and its environs indicates that seven of the ten known Irish species of bat have been recorded within a 4km radius of the study area. These bats include pipistrelle species (*Pipistrellus pipistrellus sensu lato*) and soprano pipistrelle (*P. pygmaeus*), Leisler's bat (*Nyctalus leisleri*), brown long-eared bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), Natterer's bat (*M. nattereri*) and whiskered bat (*M. mystacinus*) as shown in Table 3-1 below. One species has been recorded roosting in the study area and its environs, namely whiskered bat, which was last recorded roosting in a building located c.3.8km to the north-east of the study area in 2008.

Table 3-1: NBDC and NPWS bat records from within a 4km radius of the study area

Common Name	Scientific Name	Present	Known Roost	Date of Last Record
Pipistrelle sp.	<i>Pipistrellus pipistrellus sensu lato</i>	√		22/05/2010
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	√		22/05/2010
Leisler's Bat	<i>Nyctalus leisleri</i>	√		22/05/2010
Brown Long-eared Bat	<i>Plecotus auritus</i>	√		22/05/2010
Daubenton's Bat	<i>Myotis daubentonii</i>	√		27/08/2011
Natterer's Bat	<i>Myotis nattereri</i>	√		26/06/2006
Whiskered Bat	<i>Myotis mystacinus</i>	√	√	22/05/2010

The bat landscape association model (Lundy *et al*, 2011) suggests that the proposed site is part of a landscape that is of moderate to high suitability for bats including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle, brown long-eared, Leisler's, Daubenton's, natterer's and whiskered bat. The proposed site and its environs are of low suitability for Nathusius' pipistrelle and is outside of the distribution range for lesser horseshoe bat (*Rhinolophus hipposideros*) (Roche *et al*, 2014).

Bat activity surveys undertaken for the proposed Petrol Filling Station (Planning Ref: 1706934), located to the south-east of Cobh Cross junction recorded four species of bat, namely common pipistrelle, soprano pipistrelle, Leisler's, and *Myotis* species of bat (unidentifiable to species level). No bat roosts were recorded in the study area for this development³.

Bat activity surveys undertaken in 2015 for the proposed Stryker New Manufacturing Facility (Planning Ref: 155210), located adjacent to the western boundary of the UEA area recorded three species of bat: common pipistrelle, soprano pipistrelle and Leisler's bat⁴.

3.1.1 Designated Sites

There are no European sites located within a 15km radius of the study area which include bats as a Qualifying Interest (QI). There is one nationally designated site located within a 15km radius of the site designated for bats, namely Ballynaclashy House, North of Midleton pNHA (000099), which was designated due to the presence of a nursery colony of whiskered bat in Ballynaclashy House and is located c.5km north-east of the proposed site.

³ Banks K (2017) Bat and Bird Survey: Proposed Petrol Filling Station, Tullagreen, Carrigtwohill, Co. Cork. Greenleaf Ecology.

⁴ PM Group (2015) Environmental Report New Manufacturing Facility.

3.2 Bat Roost Survey

3.2.1 Preliminary Ecological Appraisal

Review of previous ecology surveys undertaken in the study area and recent aerial photography indicates that the proposed site predominantly comprises agricultural fields (improved agricultural grassland (Fossitt code GA1) and arable crops (BC1)) bound by hedgerows (WL1) and treelines (WL2). Smaller areas of wet grassland have also been recorded adjacent to the railway line. Three main areas of field drainage (FW4) occur within the study area. There is also a railway line running east to west across the study area, which is predominantly lined by scrub (WS1).

The site supports connectivity to the wider landscape via the scrub located along the railway line and hedgerows/ treelines with associated drainage ditches present at the site. In accordance with the criteria outlined in Table 2-1, the commuting and foraging habitats over the site are of moderate suitability for bats.

A summary of foraging and roosting habitats for Irish bats is included in **Appendix A**.

3.2.2 Bat Roost Inspection Survey

3.2.2.1 Trees

No trees within the study area were confirmed as roost sites. A total of nine trees within the study area were categorised as being of moderate suitability for roosting bats (as defined in Table 2-1) as they contained one or more potential roost features, but none were obviously suitable for use by larger numbers of bats on a regular basis. A further two trees were categorised as being of low suitability for roosting bats. The location of the trees with low to moderate suitability for roosting bats is illustrated in Figure 3-1 and detailed in Table 3-2.

Table 3-2: Carrigtwohill URDF- potential tree roosts

PTR Number	Tree Species	BCT Suitability Category	PRFs
1	Ash	Low	Knot hole and limb rot
2	Ash	Moderate	Dead tree, not accessible for close inspection but likely potential
3	Ash	Low	Lifting and fissured bark
4	Beech	Moderate	Knot hole
5	Sycamore	Moderate	Knot holes
6	Oak	Moderate	Knot hole and lifting bark
7	Oak	Moderate	Knot hole
8	Beech	Moderate	Knot holes
9	Copper Beech	Moderate	Large knot hole
10	Copper Beech	Moderate	Large knot hole
11	Beech	Moderate	Knot hole

3.2.2.2 Structures

Five disused/ derelict structures were identified within the proposed study area during the preliminary ecological appraisal. The suitability of these structures to provide roosting habitat for bats is described in the following section. The location of the structures described below is illustrated in Figure 3-1.

Structure 1

Structure no. 1 comprises a disused house (Plate 3-1) located in the townland of Terry's-Land to the west of the UEA area, adjacent to a local road. The building is a two-storey cottage with a slate tile roof. The cottage has potential access points for bats via roof tiles and broken soffits. The glass in the back door is also missing. Potential roosting features include the soffits and, potentially, the internal roof space (the building was not accessible for internal inspection). This structure is located adjacent to suitable foraging and commuting habitat (hedgerows and treelines) and appears to provide appropriate conditions for roosts of high conservation value and, as such, is considered to be of high suitability as a roosting habitat. No evidence of bats was recorded during the course of the external inspection of the building.

Plate 3-1: Disused house to the west of the UEA area



Structure 2

Structure no. 2 is a disused house located directly adjacent to Structure 1. The building is a single-storey building with a corrugated roof. There is potential access for bats via missing windows and gaps under the roofing. Internally, the building comprises one open space: there are no separate rooms and no roof space. Potential roosting features for bats are limited to gaps between roof joists. This structure is located adjacent to suitable foraging and commuting habitat (hedgerows and treelines) but does not support features that would provide appropriate conditions for roosts of high conservation value and, as such, is considered to be of moderate suitability as a roosting habitat. No evidence of bats was recorded during the course of the external or internal inspection of the building.

Plate 3-2: Disused stone building to the west of the UEA area



Structure 3

Structure no. 3 is a disused commercial building located in the middle of the UEA area in Carrigtwohill. The structure is a single-storey building constructed of block with cement render and a corrugated roof. Potential access points for bats are via broken fascia boards. This structure is located adjacent to suitable foraging and commuting habitat (hedgerows and treelines) but does not appear to support features that would provide appropriate conditions for roosts of high conservation value and, as such, is considered to be of moderate suitability as a roosting habitat. No evidence of bats was recorded during the course of the external inspection. The building was not accessible for internal inspection.

Plate 3-3: Disused commercial building within the UEA area



Structure 4

This structure is a single storey disused cottage with rendered stone walls and a slate tile roof. There are potential access points for bats via roof tiles, broken soffits and gaps around window boards. Potential roosting features include the soffits and, potentially, the internal roof space (the building was not accessible for internal inspection). This structure is located adjacent Cork Road in Carrigtwohill, which is a busy road lit by street lights. The structure does have some connectivity to the wider landscape via hedgerows to the south. The building does not appear to provide appropriate conditions for roosts of high conservation value and, as such, is considered to be of moderate suitability as a roosting habitat. No evidence of bats was recorded during the course of the external inspection of the building.

Plate 3-4: Disused house located adjacent to Cork Road



Structure 5

This structure is a single storey disused cottage with rendered stone walls and a slate tile roof and a small outbuilding to the south with a corrugated roof. There are potential access points for bats via roof tiles, broken soffits and edges of window boards. Potential roosting features include the soffits and, potentially, the internal roof space (the building was not accessible for internal inspection). This structure is located adjacent Cork Road in Carrigtohill, which is a busy road lit by street lights. The structure does have some connectivity to the wider landscape via hedgerows to the south. The building does not appear to provide appropriate conditions for roosts of high conservation value and, as such, is considered to be of moderate suitability as a roosting habitat. No evidence of bats was recorded during the course of the external inspection of the building.

Plate 3-5: Disused house located adjacent to the bus stop at Cork Road



Structure 6

A railway underpass is located to the south of the UEA in the townland of Terry's-Land. This structure is constructed of concrete and is entirely smooth with no features of potential use by bats.

Plate 3-6: Railway underpass in Terry's-Land



Railway bridges within the study area were not accessible for close inspection.

Structure 7

A very low lying culvert running under railway line (Plate 3-7). Negligible potential for bats.

Plate 3-7: Low Lying culvert under railway line



Structure 8

Low lying concrete culvert running under entrances to houses (Plate 3-8). Negligible potential for bats.

Plate 3-8: Concrete culvert under entrance to domestic property



The location of the structures described above is illustrated in Figure 3-1.

Bat Survey: Carrigtwohill URDF Initiative

Figure 3-1: Carrigtwohill URDF: potential/ actual bat roosts recorded in trees and structures



3.2.3 Emergence Roost Survey

An emergence roost survey was undertaken for structures identified as supporting moderate to high roosting potential in the bat roost inspection surveys.

Structure 1

An emergence roost survey of Structure 1 was undertaken on 25th July 2020. No bats were recorded emerging from this structure. The location of Structure 1 is illustrated in Figure 3-1.

Structure 2

An emergence roost survey of Structure 2 (Figure 3-1) was undertaken on 25th July 2020. No bats were recorded emerging from Structure 2.

Structure 3

An emergence roost survey of Structure 3 (Figure 3-1) was undertaken on 16th July 2020. No bats were recorded emerging from Structure 3.

Structure 4

An emergence roost survey of Structure 4 (Figure 3-1) was undertaken on 27th July 2020. No bats were recorded emerging from Structure 4.

Structure 5

An emergence roost survey of Structure 5 (Figure 3-1) was undertaken on 27th July 2020. No bats were recorded emerging from Structure 5.

Structure 9: Parochial House

Parochial House was not included in the bat roost inspection surveys (**Section 3.2.2.2**) as this building is unlikely to be subject to works as part of the project. An emergence survey of mature trees in the grounds of Parochial House was undertaken on 5th August 2020. No bats were recorded emerging from the trees, however, a small number of soprano pipistrelle were observed emerging from the roof of Parochial House. As the target of the survey was the mature trees adjacent to Station Road, an exact count of bats emerging from the building was not obtained.

3.3 Activity Survey

The bat activity transects undertaken on 21st July 2020 and 5th August 2020 recorded three species of bat within the study area: soprano pipistrelle, common pipistrelle and Leisler's bat. Soprano pipistrelle was the most frequently recorded species, followed by Leisler's bat, then common pipistrelle. All three species of bat were recorded foraging and commuting along hedgerows and treelines across the study area. A map of calls recorded is illustrated in Figure 3-2.

The calls recorded during the activity transect survey are summarised in Table 3-3 and Figure 3-2 illustrates the location of calls recorded.

Table 3-3: Carrigtwohill URDF- summary table of calls recorded during the activity transects in 2020

Date	Common Pipistrelle	Soprano Pipistrelle	Leisler's bat
21/07/2020	29	36	49
05/08/2020	23	74	22
Total	52	110	71

Passive Monitors 1-4, which were all located in the western half of the UEA (see Figure 2-1), recorded common pipistrelle, soprano pipistrelle and Leisler's bat. A notably high proportion (93%) of the calls recorded on PM1, to the west of the UEA area were of common pipistrelle, which were recorded from 13 minutes after sunset, indicating the likely presence of a roost nearby.

Passive Monitor 5, located next a watercourse/drainage ditch and the railway line in the centre of the UEA area recorded a higher diversity of bat species, including whiskered/Brandt's, Daubenton's and *Myotis* species (unidentified to species level) in addition to common pipistrelle, soprano pipistrelle and Leisler's bat. *Myotis* species were also recorded on Passive Monitor numbers 6, 7 and 8. Brown long-eared bat was recorded on one occasion on Passive Monitor 7, towards the east of the study area. A number of 50 kHz pipistrelle calls were recorded on Passive Monitor 7 and Passive Monitor 8 and a small number of calls did not register with sufficient quality to enable identification.

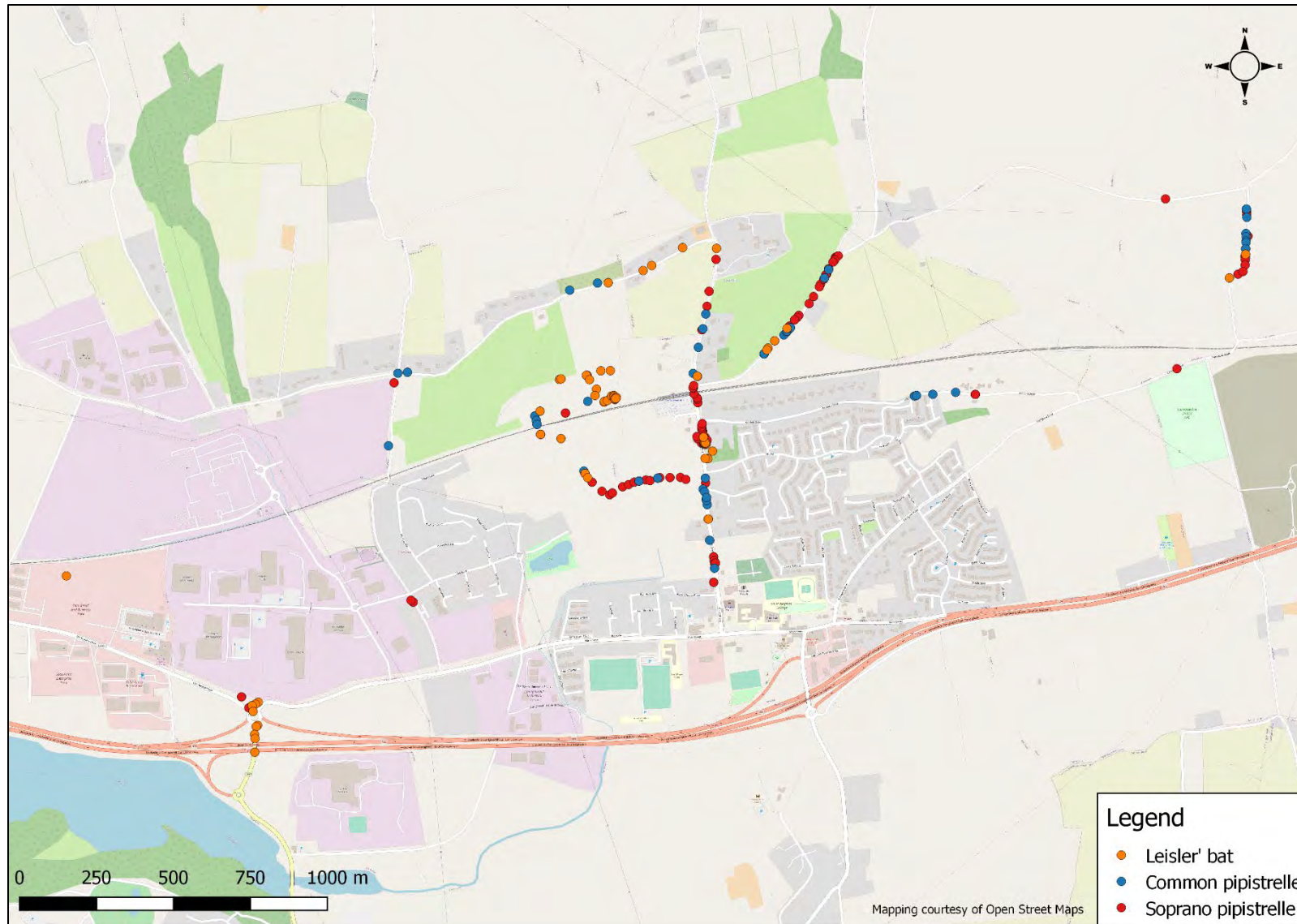
The calls recorded on the passive monitors are summarised in Table 3-4. The location of the passive monitors is illustrated in Figure 2-1.

Table 3-4: Carrigtwohill URDF- summary table of bat passes recorded on the passive monitors in July 2020

Species	PM1	PM2	PM3	PM4	PM5	PM6	PM7	PM8
Common Pipistrelle	808 (93%)	288 (39%)	451 (58%)	162 (29%)	150 (16%)	63 (24%)	547 (43%)	89 (42%)
Soprano Pipistrelle	6 (1%)	301 (40%)	238 (31%)	236 (43%)	651 (71%)	162 (63%)	310 (25%)	32 (15%)
Pipistrelle species	0	0	0	0	0	0	208 (16%)	4 (2%)
Leisler's	53 (6%)	156 (21%)	90 (12%)	153 (28%)	86 (9%)	28 (11%)	174 (14%)	80 (38%)
Myotis Species	0	0	0	0	25 (3%)	5 (2%)	2 (0%)	1 (0%)
Whiskered/Brandt's	0	0	0	0	2 (0%)	0	0	0
Daubenton's	0	0	0	0	2 (0%)	0	0	0
Brown Long-eared	0	0	0	0	0	0	1 (0%)	0
No ID	0	0	0	0	5 (1%)	0	19 (2%)	4 (2%)
Total	867 (100%)	745 (100%)	779 (100%)	551 (100%)	921 (100%)	258 (100%)	1261 (100%)	210 (100%)

Bat Survey: Carrigtwohill URDF Initiative

Figure 3-2: Carrigtwohill URDF- location of bat calls recorded during activity transect, July and August 2020



4 Evaluation of Survey Results

A review of existing bat records from within a 4km radius of the study area indicates that seven of the ten known Irish bat species had been observed. These include pipistrelle species, soprano pipistrelle, Leisler’s, brown long-eared, Daubenton’s, Natterer’s and whiskered bat. Of these species, whiskered bat has been recorded roosting within 4km of the study area.

Features in the study area of potential use by foraging and commuting bats include linear features such as scrub, hedgerows and treelines and associated watercourses/drainage ditches, which provide connectivity between the study area and other foraging areas in the wider landscape. Overall the study area and its environs is considered to be of moderate to high suitability for bats due to the presence of a confirmed bat roost, relatively good quality habitat for bats and moderate connectivity to other suitable habitats in the wider landscape.

Results from bat surveys undertaken in July and August 2020 indicate that there is a minor soprano pipistrelle roost in Parochial House, Station Road. In accordance with *Bat Mitigation Guidelines for Ireland*, this roost is considered to be of low conservation significance. No bat roosts were recorded in mature trees and structures within the study area that were identified during the preliminary roost surveys as supporting potential roosting features.

Results from the bat activity and passive monitoring surveys indicate that at least six species of bat, namely soprano pipistrelle, common pipistrelle, Leisler’s bat, whiskered/Brandt’s, Daubenton’s, *Myotis* species and brown long-eared bat commute to the study area to forage. A higher diversity of bat species was recorded to the east of the study area, which supports semi-natural habitats including wet grassland, scrub and mature treelines.

In relation to the foraging and commuting bat species recorded at the site, the bat populations are considered to be of Local Interest (Higher Value) (in accordance with NRA, 2009).

The status of Irish bat species (Marnell *et al.*, 2019) is summarised in Table 4-1. The bat species recorded at the site are all of Least Concern.

The conservation status of all the bats recorded at the site is Favourable (NPWS, 2019).

Table 4-1: Status of Irish Bat Fauna (Marnell *et al.*, 2019)

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species			
Daubenton’s bat (<i>Myotis daubentonii</i>)	Least Concern	Least Concern	Least Concern
Whiskered bat (<i>Myotis mystacinus</i>)	Least Concern	Least Concern	Least Concern
Natterer’s bat (<i>Myotis nattereri</i>)	Least Concern	Least Concern	Least Concern
Leisler’s bat (<i>Nyctalus leisleri</i>)	Least Concern	Least Concern	Least Concern
Nathusius’ pipistrelle (<i>Pipistrellus nathusii</i>)	Least Concern	Least Concern	Least Concern
Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	Least Concern	Least Concern	Least Concern
Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	Least Concern	Least Concern	Least Concern
Brown long-eared bat (<i>Plecotus auritus</i>)	Least Concern	Least Concern	Least Concern

Bat Survey: Carrigtwohill URDF Initiative

Lesser horseshoe bat (<i>Rhinolophus hipposideros</i>)	Least Concern	Near threatened	Least Concern
Possible Vagrants			
Brandt's bat (<i>Myotis brandtii</i>)	Not Assessed	Least Concern	Least Concern
Greater horseshoe bat (<i>Rhinolophus ferrumequinum</i>)	Not Assessed	Near threatened	Least Concern

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Appendix A: Description of Irish Bat Species

Ireland has ten known bat species from two distinct families. Each is briefly described below. For a more comprehensive overview see Roche *et al* (2014). The conservation status of each species is derived from NPWS (2019).

Vespertilionidae:

Common pipistrelle (*Pipistrellus pipistrellus*)

This species was only recently separated from its sibling, the soprano or brown pipistrelle *P. pygmaeus*, which is detailed below (Barratt et al, 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland. The conservation status of this species is Favourable.

Soprano pipistrelle (*Pipistrellus pygmaeus*)

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle on detector. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1,500 animals in mid-summer. The conservation status of this species is Favourable.

Nathusius' pipistrelle (*Pipistrellus nathusii*)

Nathusius' pipistrelle is a recent addition to the Irish fauna and has mainly been recorded from the north-east of the island in Counties Antrim and Down (Richardson, 2000) and also in Fermanagh, Longford and Cavan. It has also been recorded in Counties Cork and Kerry (Kelleher, 2005). However, the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. The conservation status of this species is Favourable.

Leisler's bat (*Nyctalus leisleri*)

This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. The conservation status of this species is Favourable.

Brown long-eared bat (*Plecotus auritus*)

This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversized ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked. It prefers to roost in old buildings. The conservation status of this species is Favourable.

Natterer's bat (*Myotis nattereri*)

This species has a slow to medium flight, usually over trees but sometimes over water. It usually follows hedges and treelines to its feeding sites, consuming flies, moths, caddis-flies and spiders. Known roosts are usually in old stone buildings but they have been found in trees and bat boxes. The Natterer's bat is one of our least studied species and further work is required to establish its status in Ireland. The conservation status of this species is Favourable.

Daubenton's bat (*Myotis daubentonii*)

This bat species prefers feeding close to the surface of smooth water, either over rivers, canals, ponds, lakes or reservoirs but it can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddy flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees. The conservation status of this species is Favourable.

Whiskered bat (*Myotis mystacinus*)

This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The conservation status of this species is Favourable.

Brandt's bat (*Myotis brandtii*)

According to NPWS (2013), whiskered and Brandt's bats are cryptic species and can only be told apart using DNA techniques. Brandt's bat has been confirmed only once from Ireland; a single specimen found in 2003 in Wicklow (Mullen, 2006). Following this discovery, an intensive re-survey, involving DNA testing, was undertaken of all known whiskered bat roosts in Ireland, by the Centre for Irish Bat Research. Woodland mist-netting was also conducted for the species. Despite the extensive survey-work, no further Brandt's bats were identified. The most recent Red Data List for Irish Mammals (Marnell *et al.* 2009) lists Brandt's bat as data deficient. There is no evidence of any roosts for this species in the country and at present the single record for the species is considered an anomaly. Boston *et al.* (2010) concluded that "M. brandtii cannot currently be considered a resident species. This species is now considered a vagrant to the country and consequently, a detailed assessment has not been carried out.

Rhinolophidae:

Lesser horseshoe bat (*Rhinolophus hipposideros*)

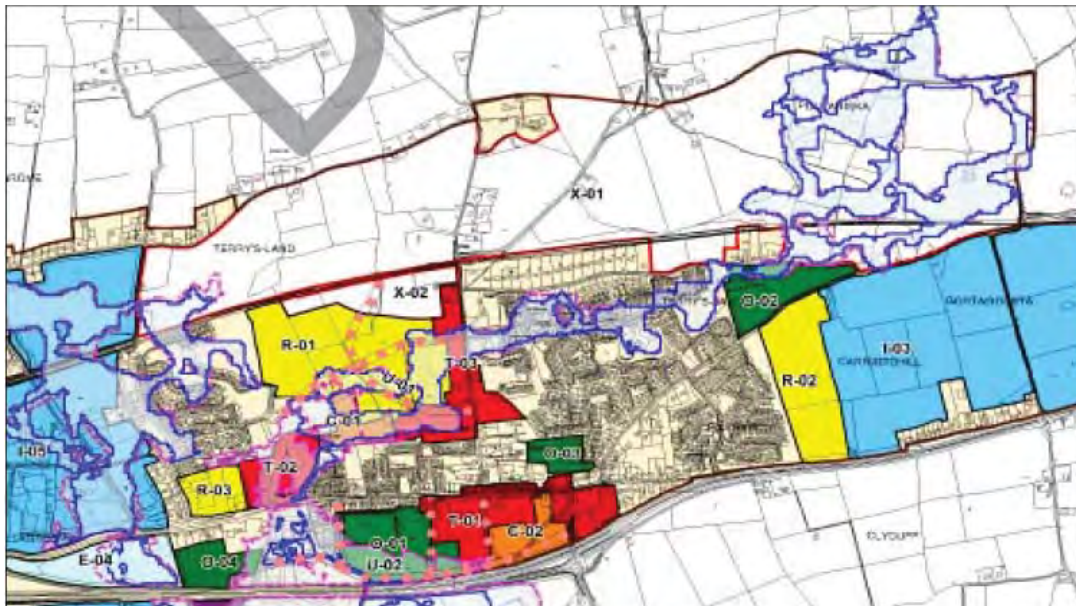
This species is the only representative of the Rhinolophidae or horseshoe bat family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. It often carries its prey to a perch to consume, leaving the remains beneath as an indication of its presence. The echolocation call of this species is of constant frequency and, on a heterodyne bat detector, sounds like a melodious warble. The species is confined to six counties along the Atlantic seaboard: Mayo, Galway, Clare, Limerick, Kerry and Cork. The current Irish national population is estimated at 12,500 animals. This species is listed on Annex II of the EC Habitats Directive and 41 Special Areas of Conservation have been designated in Ireland for its protection. Where it occurs, it is often found roosting within farm buildings. The conservation status of this species is Inadequate.

Appendix D. Ecology Report, 2015 (Limosa)




**LIMOSA ENVIRONMENTAL
ECOLOGICAL AND ENVIRONMENTAL CONSULTANCY**

Preliminary Ecological Appraisal



**Re: Carrigtwohill North Masterplan Site
Carrigtwohill, Co Cork**

January 2015

Report Reference:	RP15-GW102-02-Carrigtwohill North
Draft:	Final Report
Prepared By:	L. J. Lewis
Checked By:	L. J. Lewis
Date:	16 th January 2015
Sign-Off Date:	29 th January 2015
Signature:	

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1.0 INTRODUCTION

1.1 General Introduction

Cork County Council is in the process of preparing Framework Masterplan Studies in relation to three sites: (1) Water-Rock in Midleton; (2) Carrigtwohill North in Carrigtwohill; and (3) Shannonpark in Carrigaline. The purpose of the Framework Master Plans is to promote the expansion of the residential areas of existing towns in order for an additional 6,000 housing units and ancillary facilities (education and amenity) to be constructed.

Limosa Environmental was commissioned to prepare Preliminary Ecological Appraisal Reports for the three Masterplan Sites. The purpose of the appraisals is to assess the baseline ecological conditions for each site, to identify the key ecological resources to be retained, and where necessary identify the scope of further ecological surveys.

This report pertains to the Carrigtwohill North Masterplan site.

1.2 Background to Preliminary Ecological Appraisal

The purpose of a *Preliminary Ecological Appraisal* is to gather baseline data for a site through desk-top studies and walkover surveys. The identification of notable (e.g. rare/protected) species and habitats, and the evaluation of ecological features on sites, enables the identification of potential impacts of a proposed development on the site and the potential constraints to the proposed changes/developments, so these appraisals are often used as an important early stage in a development process.

The term *Preliminary Ecological Appraisal* is often referred to as Baseline ecological surveys, Constraints Survey, Ecological Site Assessment, Scoping Survey, Ecological Site Walkover Survey and others, and as they all may differ in minor aspects, clarity and standardisation in objectives and methodology was introduced in 2012 with the publication of CIEEM 'Guidelines for Preliminary Ecological Appraisal' (IEEM, 2012).

1.3 Background to the Masterplan sites

The location of the Carrigtwohill North Masterplan site is described as follows (after Cork County Council, 2014):

Carrigtwohill is located along the N25 Cork – Waterford route and is designated as a Metropolitan Town within the County Metropolitan Strategic Planning Area. A primary aim for Carrigtwohill, as set out in the draft County Development Plan 2013 and building on the success of the re-opening of the rail line, is to facilitate its growth as an integrated employment centre while maintaining its attractive setting within the Metropolitan Cork Green Belt. The framework Masterplan area (approx 128ha) is located to the north of the reopened Cork–Midleton Railway line and

Carrigtwohill Town Centre. To the south of the railway line, a major residential development is in the process of being completed. Part of the site in the extreme west and east is prone to flood risk. Approximately 2500 housing units, schools and amenity areas are proposed to be located on this land.

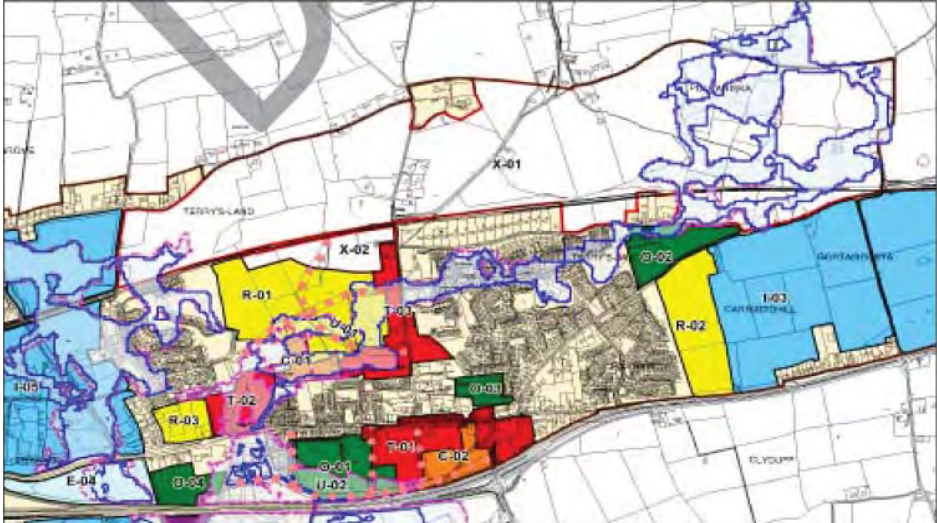


Figure 1. Proposed Future Residential Expansion Area in Carrigtwohill

2.0 METHODOLOGY FOR PRELIMINARY ECOLOGICAL APPRAISAL

Following the CIEEM 'Guidelines for Preliminary Ecological Appraisal' (IEEM, 2012), the following methodology was completed for each Masterplan site:

- **Desk-top study**

The aim of the desk-top study was to gather available ecological data relevant to each site and its surrounding area. Sources of information included the following:

- online data held by the National Parks and Wildlife Service (NPWS) (www.npws.ie);
- information on water quality from the Environmental Protection Agency (www.epa.ie);
- South Western River Basin District Draft River Basin Management Plan (www.wfdireland.ie);
- Cork County Biodiversity Action Plan (Cork County Council, 2009)
- County Cork Development Plan (Cork County Council, 2013a);
- National Biodiversity Data Centre (www.nbdc.ie);
- Online data held by the Botanical Society of Britain and Ireland (BSBI).

- **Identification of sites designated for nature conservation and legislative constraints**

Designated sites for nature conservation that occur in a 5km radius around the proposed development site were identified.

- **Habitat survey**

Site visits were carried out in December 2014 and January 2015. Habitat survey and mapping were carried out according to the Irish Habitat Classification as described within the Heritage Council's '*A Guide to Habitats within Ireland*' (Fossitt, 2000).

- **Habitat assessment and ecological evaluation**

As habitat surveys carried out in winter are constrained by the survey timing, the assessment used information collected through the desk-top study to identify and present a list of rare/protected plant species that *have the potential to occur* within the study area.

Habitats present on site were assigned a preliminary ecological value. Methodology and the criteria used for ecological evaluation are provided in Appendix 1.

- **Species assessment (flora and fauna)**

This assessment provides details in relation to notable or protected species that *have the potential* to be present within the survey area, using information collected through the desk-top study. In most cases, data collected are related to the 10-km square within which the Masterplan site is located.

With regard to flora, a list of plant species was generated for the 10-km square containing the Masterplan site from the UK National Biodiversity Network (NBN) gateway, which is a user-friendly way of producing lists of plant species collected by the Botanical Society of Britain and Ireland. The list produced included flowering plants, ferns, mosses and liverworts. The plant species list was then compared

against species listed in either the Red Data Book (Curtis & McGough, 1988) or on the Flora (Protection) Order, 1999 (SI 94/1999).

With regard to mammals, data and maps/maps were accessed from the National Biodiversity Data Centre (NBDC). For bats, GIS layers presented are a result of research conducted by Lundy et al. (2011) examining the relative importance of landscape and bat habitat associations across Ireland, with the geographical areas that are suitable for bats being identified, together with the 'core favourable areas' and 'roosting habitats' identified for most species.

- **Identification of impacts**

Following IEEM (2012), the assessment includes the preliminary identification of those ecological features and in particular, sensitive ecological features, that may be subject to impacts (adverse or positive) as a result of the proposed Masterplan development. Ecological impact assessment methodology is provided in Appendix 1.

- **Recommendations for further surveys, mitigation and possible ecological enhancements**

Mitigation measures and recommendations are given that aim to avoid or mitigate for potentially adverse impacts.

Where necessary further ecological survey are recommended, for example, for sensitive habitats/habitats having the potential to support sensitive floral/faunal species.

Potential ecological enhancements are recommended where possible e.g. to provide a net biodiversity gain in accordance with local Government policies. These are only indicative at the preliminary ecological appraisal stage as they may be reliant on more detailed assessment (IEEM, 2012).

- **Report layout**

The layout of the document follows the following general template:

- Identification of sites designated for nature conservation within 5km of the Masterplan site;
- Identification of legislative constraints;
- Baseline ecology and habitat mapping of Masterplan sites; including description of study area and likely zone of influence, ecological evaluation; and identification of survey limitations and constraints;
- Identification of protected, rare or ecologically sensitive habitats;
- Identification of protected, rare or ecologically sensitive species of flora and fauna;
- Identification of invasive plant or animal species;
- Potential impacts of the proposed Masterplan framework;
- Identification of potential mitigation measures; requirements for further survey and assessment; potential ecological enhancement measures.

Where mentioned habitat classification follows '*A Guide to Habitats within Ireland*' (Fossitt, 2000) and species Latin names are given at first mention in the text.

3.0 IDENTIFICATION OF DESIGNATED SITES FOR NATURE CONSERVATION

Designated sites within a 5 km radius of the Carrigtwohill North Masterplan site are:

- Great Island Channel Special Area of Conservation (SAC Site Code 1058) – situated c.1.3 km south of the Masterplan site (refer to Appendix 2).
- Cork Harbour SPA (Site Code 4030) – situated c.1.3 km south of the Masterplan site (refer to Appendix 2).
- Great Island Channel proposed Natural Heritage Area (pNHA Site Code 1058) – situated c.1.3 km south of the Masterplan site.
- Leamlara Wood proposed Natural Heritage Area (pNHA Site Code 1064) – situated c.3km to the north of the Masterplan site.
- Ballynaclashy House proposed Natural Heritage Area (pNHA Site Code 099) – situated c.3 km to the north-east of the Masterplan site.

Figure 2. Special Protection Areas within a 5 km radius of the Carrigtwohill North Masterplan site

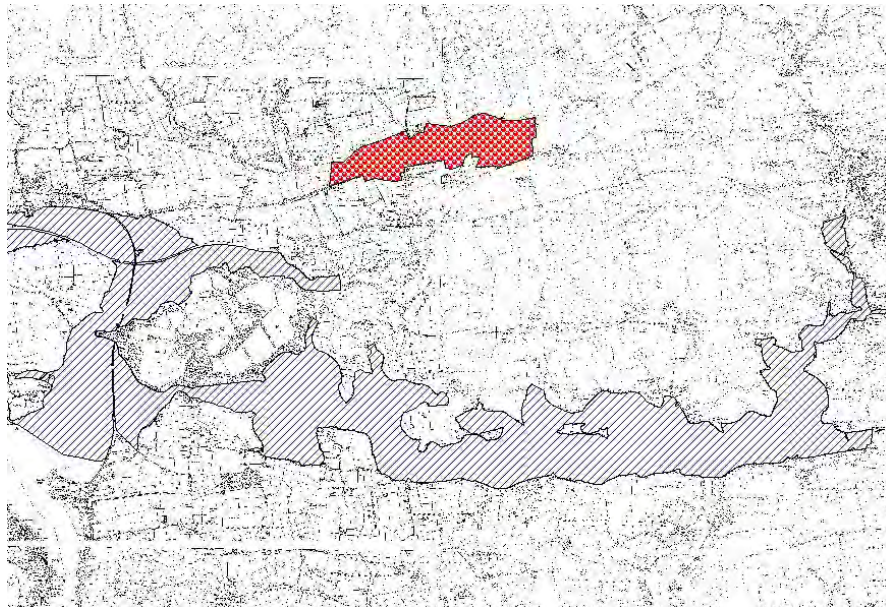


Figure 3. Special Areas of Conservation within a 5 km radius of the Carrigtwohill North Masterplan site

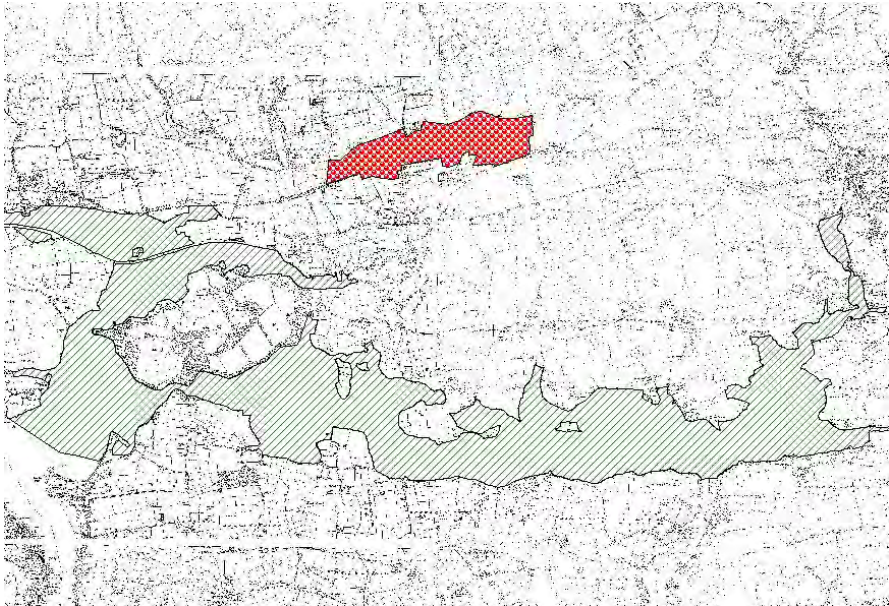
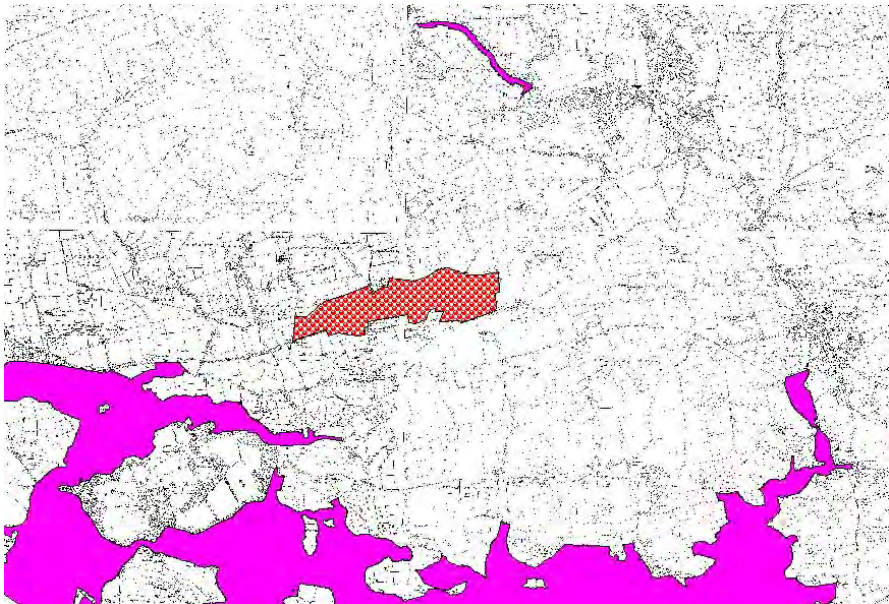


Figure 4. Proposed Natural Heritage Areas within a 5 km radius of the Carrigtwohill North Masterplan site



4.0 LEGISLATIVE CONSTRAINTS

4.1 Key European Legislation and Conventions

The key pieces of European environmental legislation are:

The EU Habitats Directive¹ (92/43/EEC) - requires member states to designate areas of European importance for certain habitats, plants and animals other than birds. These areas are known as Special Areas of Conservation (SACs).

The EU Birds Directive² – this is the EU's oldest piece of nature legislation and one of the most important. Relating only to birds and their habitats, it required that Ireland designate any site that met the required ecological criteria, as Special Protection Areas (SPAs); which established a network of protected sites for birds across Ireland and across Europe.

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites and are part of a network of sites of 'community importance' for biodiversity across the EU called the '**Natura 2000**' network.

Convention on Biological Diversity - Ireland is one of 193 countries who are parties to the Convention on Biological Diversity (CBD) along with the other EU Member States and the EU itself. In 2002, the Parties committed themselves to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national levels as a contribution to poverty alleviation and to the benefit of all life on Earth. In 2006 the European Commission set out a target of halting biodiversity loss by 2010; a target that has not been reached (DoAHG, 2011).

The Convention of Wetlands of International Importance (Ramsar Convention, 1971) - requires members to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories.

The **EU Environmental Impact Assessment (EIA) Directive** (85/337/EEC as amended by 97/11/EC), and **Strategic Environmental Assessment (SEA) Directive** (Directive 2001/42/EC) all require the consideration of potential development impacts on biodiversity. There needs to be improved coherence at national level between various plans and programmes affecting biodiversity and it must be ensured that decision making at regional and local levels is consistent with high level commitments for biodiversity (DoAHG, 2011).

¹ Council Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna, as amended by Council Directive 97/62/EC. The Directive was first transposed into Irish law by the European Communities (Natural Habitats) Regulations, SI 94/1997 (as amended SI 378/2005) and more recently revised and consolidated into the European communities (Birds and Natural Habitats) Regulations S. I. No 477 of 2011).

² Directive 2009/147/EC (Birds Directive) on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended).

The **Environmental Liability Directive** has been substantially transposed into Irish law through the **Environmental Liability Regulations** (SI 547 of 2008). The principal aims of the Directive are to prevent and remedy damage to waters and lands or damage to natural habitats and protected areas. It reinforces the “polluter pays principle” making any operator, as defined in the Regulations, that causes environmental damage, legally and financially liable for the damage caused and subsequent remediation through the liability regimes.

4.2 Natura 2000 sites and Appropriate Assessment

The obligation to undertake Appropriate Assessment is derived from Articles 6 (3) and (4) of European Union (EU) Council Directive 92/43/EEC (Habitats Directive) and transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations S.I. No 477 of 2011.

As signatories to the aforementioned Directive, Ireland like other EU member states must take appropriate steps to ‘*avoid the deterioration of natural habitats and the habitats of species*’ (Article 6-2). In addition, where plans or projects are proposed within, or have the potential to affect Natura 2000 sites, member states must ensure that these plans or projects are subject to Appropriate Assessment (AA), a process that considers the possible implications of any plan or project on the Natura 2000 site network before a decision is made to allow a plan or project to proceed (DoEHLG, 2009).

4.3 National Legislation

Planning and Development (Amendment) Act, 2010 - the requirements of the Habitats and Birds Directives have been incorporated into planning law via this act.

The Wildlife (Amendment) Act 2000 – is Ireland’s primary national legislation for the protection of wildlife. It covers a broad range of issues, from the designation of nature reserves, the protection of species, regulation of hunting and controls in wildlife trading. Section 40 of the Wildlife Act 1976 as amended by Section 46 of the Wildlife Amendment Act 2000 restricts the cutting, burning, or destruction of hedges during nesting and breeding season between the 1st March and the 31st August, in order to protect nesting birds except for certain exemptions.

Flora (Protection) Order 1999 - it is an offence to cut, pick, uproot or take the flowers of any species protected by a Flora Protection Order. The 1999 Flora Protection Order lists 68 vascular plant species which are protected by along with mosses, liverworts and lichens.

Irish Red Data Book- is a list of plant and animal species that are considered rare, threatened or internationally important. The species are categorised as critically endangered, endangered, vulnerable and near threatened. The lists of these species can be obtained from National Parks and Wildlife Services (NPWS).

Tree Preservation Orders and Tree Felling licences - These are the two main measures for the protection of trees in Ireland.

4.4 Legislation concerning water quality and protection

The principal legislation governing water quality in Ireland is the **European Communities (Water Policy) Regulations 2003** (S.I. 722 of 2003) and **EC Water Policy Regulations (Amendment) (SI No. 413 of 2005)** which transposed the **Water Framework Directive 2000/60/EC** (WFD) into Irish law. The WFD covers rivers, lakes, groundwater and transitional (estuarine) and coastal waters and its objectives are to prevent further deterioration of the status of all bodies of surface water, and to protect, enhance and restore all bodies of surface water to good status by 2015.

As part of the implementation of the WFD, Ireland was subdivided into eight River Basin Districts (RBD's). The majority of Cork County is located within the South West River Basin District (SWRBD).

The **European Communities Environmental Objectives (Surface Waters) Regulations 2009** (S.I. No. 272 of 2009) regulations came into effect in July 2009 and give effect to the measures needed to achieve the environmental objectives established for bodies of surface water by the WFD including:

- The establishment of legally binding quality objectives for all surface waters and environmental quality standards for pollutants;
- The examination and review of existing discharge authorisations by Public Authorities to ensure that the emission limits laid down support compliance with water quality objectives/standards;
- The classification of surface water bodies by the EPA;
- The establishment of inventories of priority substances by the EPA, and;
- The drawing up of pollution reduction plans to reduce pollution by priority substances and to cease and/or phase out discharges, emissions or losses of priority hazardous substances.

The treatment of wastewater is governed by the **Urban Waste Water Treatment Directive (91/271/EEC)** (amended by Directive 98/15/EEC) transposed into Irish law by the **Urban Waste Water Treatment Regulations 2001** (S.I. No. 254 of 2001). The Directive aims to protect the environment from adverse effects of wastewater discharges by ensuring that wastewater is appropriately treated before it is discharged to the receiving environment. The Directive sets minimum standards and deadlines for the provision of sewerage systems, and treatment of sewage according to the population served by sewage treatment works, and the sensitivity of receiving waters to their discharges.

4.5 County Cork Biodiversity Plan

Contains six overriding objectives:

- To review biodiversity information for County Cork and to prioritise habitats and species for conservation action;
- To collect data and use it to inform conservation action and decision making;
- To incorporate positive action for biodiversity into local authority actions and policy;

- To promote best practice in biodiversity management and protection;
- To facilitate the dissemination of biodiversity information;
- To raise awareness of County Cork's biodiversity and encourage people to become involved in its conservation.

5.0 BASELINE ECOLOGY OF MASTERPLAN SITES

5.1 Introduction and location of Carrigtwohill North

Carrigtwohill North Masterplan site (approx 128ha) is located to the north of the Cork – Midleton Railway line and Carrigtwohill Town Centre (Grid Ref W82459, 74090). To the south of the railway line, a major residential development is in the process of being completed. Part of the site in the extreme west and east is prone to flood risk. Approximately 2500 housing units, schools and amenity areas are proposed to be located on this land.

Figure 5. Carrigtwohill North Masterplan site and surrounding landscape © Bing Maps.



5.2 Study area

Habitat mapping and assessment was undertaken within the Masterplan site boundary (Figure 6); with the majority of lands observed/walked over during the site visit. The wider landscape was observed through the use of aerial photographs (OS, Bing Maps, maps.biodiversityireland.ie) to assess the site in the context of its surroundings and to assess habitat connectivity with the Masterplan site.



Figure 6. Carrigtwohill North Masterplan site boundary © Bing Maps.

5.3 Limitations and constraints to the study

The January site walk-over survey and habitat assessment was necessarily constrained by the time of year; habitat surveys being optimally timed during the flowering season months May – July.

5.4 Habitats within the Masterplan boundary

A summary of the habitats found on site is given below and a habitat map is given in Figure 7. Target notes from the site walk-over survey are given in Appendix 3.

The Masterplan site is comprised largely of agricultural habitats dominated by **improved agricultural grassland (GA1)** and **Arable crops (BC1)** (Figure 7). In the east of the site, agricultural fields are mapped as grassland (GA) and these fields, originating from improved agricultural grassland, are currently unmanaged, rank and full of 'weeds'. Grassland fields at Gortnamucky (centrally within the site) were observed to support foraging Curlew (*Numenius arquata*) (flock size *c.*45 birds).

Several areas of **buildings and artificial surfaces (BL3)** occur across the site and relate to private dwellings and farms. Each of these areas has associated

gardens/grounds and several have areas of trees that are too small to be mapped; presumably all of these habitats will be retained in any future development proposals.

Three areas of watercourses were identified (**streams and ditches FW2/FW4**).

In the west of the site, water rises centrally within a grassland field and then flows into a drainage pipe that discharges into a stream/wet ditch that runs parallel to the railway line. At the time of survey the water created a ponded effect in the field, but this may be due to heavy rainfall in recent days.



Centrally within the site a **stream (FW2)** runs from the north to run adjacent to the local road, bounded by a treeline. This stream gives rise to a section of wet ground to the south, currently unmanaged grassland and **wet grassland (GS4)** adjacent to the railway line. Currently grazed by horses, this unmanaged and rank grassland habitat also supports Gorse (*Ulex europaeus*), and scattered Willow (*Salix spp.*) and Oak (*Quercus spp.*) trees. The land is wetter in its eastern section where waterlogged areas occur and Soft Rush (*Juncus effusus*) often dominates.

The third watercourse is in the east of the site where a **stream (FW2)** runs from the north to run adjacent to a field boundary before creating a wetland area to the south, adjacent to the railway line. This wetland, mapped as **wet grassland (GS4)** and **Willow Scrub (WS1)**, becomes progressively wetter and waterlogged further south and contains abundant rushes (*Juncus spp.*) and Bulrush (*Typha latifolia*). Willow and Gorse scrub dominates as the habitat bordering the railway line, although this gives way to a treeline in the west.



Agricultural fields are bounded largely by **Treelines (WL2)**. In the west of the site (Terrysland), typical treelines comprised species such as Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Willow (*Salix* spp.) with Hawthorn (*Crataegus monogyna*) and occasional Elder (*Sambucus nigra*). Oak trees are also common.

Typical treeline at Terrysland



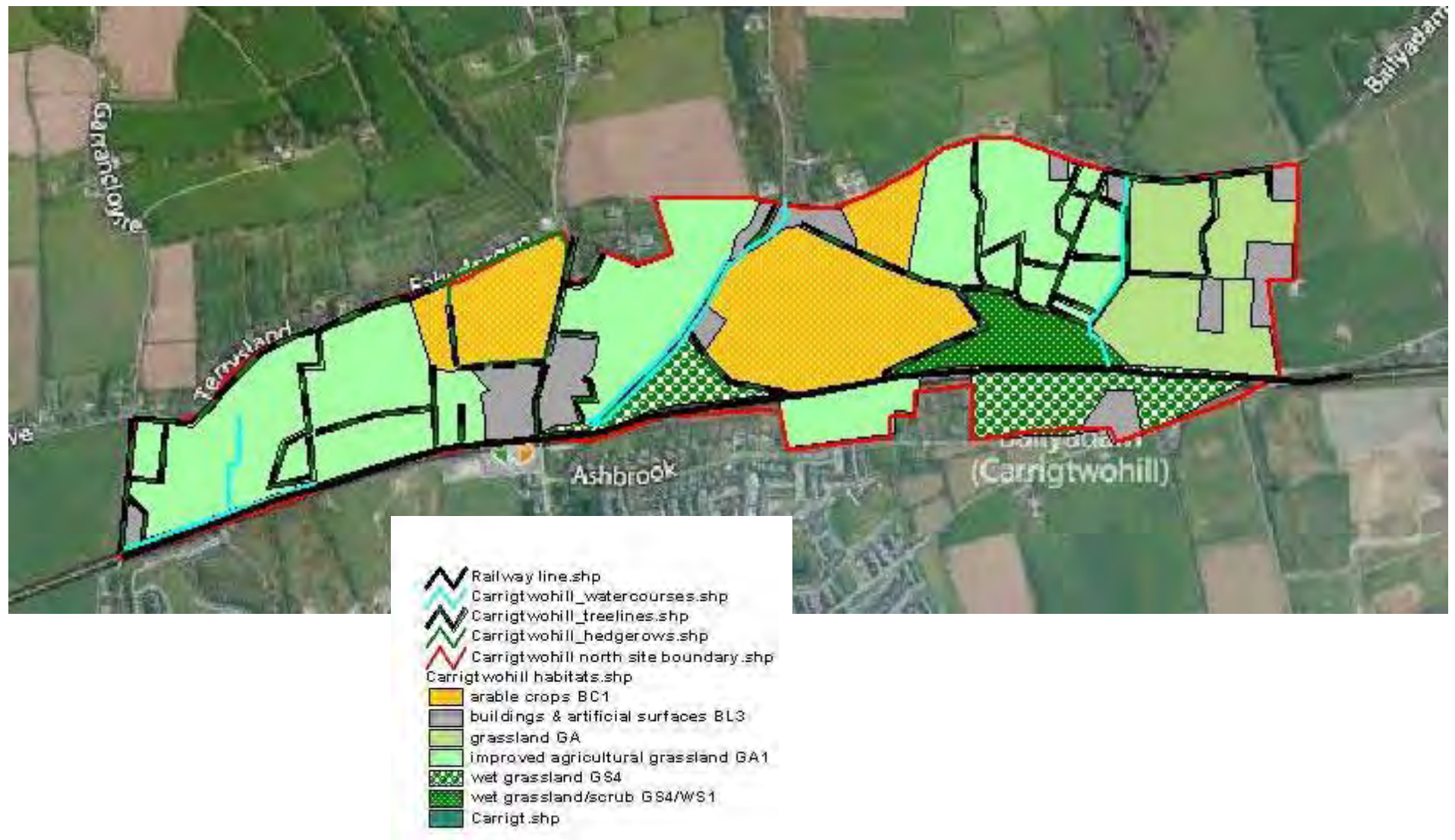
Two local roads cross the site, and the westernmost of these is lined by a mature treeline comprising Beech (*Fagus sylvatica*) and Oak in association with a **stone wall (BL1)**.



The second road, that runs in a north-eastern direction and is bordered by a stream, has an adjacent treeline comprising Beech, Alder (*Alnus glutinosa*), Hawthorn, Oak and Sycamore.

Hedgerows occur to a lesser extent in this site and are largely Hawthorn in nature.

Figure 7. Habitat Map.



5.4 Potential for rare or protected species within the study area

Tables 1 and 2 provide details of the potential for rare or protected plant or animal (mammal, amphibian, reptile) species to occur within the Carrigtwohill North Masterplan study site. For methods as to how these lists were generated and assessed, please refer to Section 2.

Table 1. Rare/Protected plant species recorded in 10-km square W87 and potential for presence within the Carrigtwohill North Masterplan site.

Species	Red Data Book*	Flora Protection Order, 1999	Potential presence within study area (after NBDC maps/O'Mahony, 2009)
Round-leaved Crane's-bill (<i>Geranium rotundifolium</i>)	√		Unlikely, characteristic of rocky limestone outcrops and walls in cork City.
Weasel's-Snout (<i>Misopates orontium</i>)	√	√	Unlikely, no recent Cork records.
Wild Clary (<i>Salvia verbenaca</i>)	√		Unlikely, no recent Cork records.

* Curtis & McGough, 1988

Table 2. Rare/Protected mammal, amphibian and reptile species within Ireland and their potential for presence within the Carrigtwohill North Masterplan site.

(Ireland Red List criteria follow IUCN (2001): RE Regionally Extinct; CR Critically Endangered; EN Endangered; VU Vulnerable; NT Near threatened; lc least concern; dd data deficient; na not assessed)

Mammals	EU Habitats Directive	Wildlife Act, 2000	Red Data Species*	Potential presence within study area
Insectivora				
Hedgehog <i>Erinaceus europaeus</i>		√	lc	Likely; widespread species.
Pygmy shrew <i>Sorex minutus</i>		√	lc	Likely; widespread species.
Chiroptera		√	lc	
Common pipistrelle <i>Pipistrellus pipistrellus</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	IV	√	lc	No
Brown long-eared bat <i>Plecotus auritus</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Leisler's bat <i>Nyctalus leisleri</i>	IV	√	NT	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Lesser Horseshoe bat <i>Rhinolophus</i>	II & IV	√	lc	No

<i>hipposideros</i>				
Whiskered bat <i>Myotis mystacinus</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Natterer's bat <i>Myotis nattereri</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Daubenton's bat <i>Myotis daubentonii</i>	IV	√	lc	Habitat suitability is 'moderate' or above (based on habitat suitability index (Lundy et al. 2011))
Brandt's bat <i>Myotis brandtii</i>	IV	√	DD	No (data deficient)
Lagomorpha				
Irish Hare <i>Lepus timidus hibernicus</i>		√	lc	Potential; recorded within W87.
Rodentia				
Red Squirrel <i>Sciurus vulgaris</i>		√	NT	Potential; recorded within W87.
Carnivora				
Badger <i>Meles meles</i>		√	lc	Potential. Recorded in W87.
Pine Marten <i>Martes martes</i>	V	√	lc	Potential. Recorded in W87 and a record shown on NBDC maps for area within the Carrigtwohill North study area.
Irish Stoat <i>Mustela erminea hibernica</i>		√	lc	Potential; recorded within W87.
Otter <i>Lutra lutra</i>	II & IV	√	NT	Potential; recorded within W87.
Artiodactyla				
Red deer <i>Cervus elaphus</i>		√	lc	No, no records for W87.
Sika deer <i>Cervus nippon</i>		√	na	Potential; recorded within W87.
Fallow deer <i>Dama dama</i>		√	lc	Potential; recorded within W87.
Amphibians				
Smooth newt <i>Triturus vulgaris</i>		√	lc	Potential; recorded in W87.
Common Frog <i>Rana temporaria</i>	V	√	lc	Highly likely; in association with watercourses.
Natterjack Toad <i>Bufo calamita</i>	IV	√	EN	No
Reptiles				
Common lizard <i>Lacerta vivipara</i>		√	lc	Some potential

* Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3 – Terrestrial Mammals*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Table 3 lists rare and protected bird species that, after examination of data/records, are considered to have some potential to occur within the Carrigtwohill North Masterplan site.

Table 3. Rare/Protected bird species recorded in 10-km square W87 (after Bird Atlas 2007-2011) that have the potential to be present within the Carrigtwohill North Masterplan site.

Species (alphabetical order)	EU Bird's Directive	BoCCi Listed (Red or Amber Listed) (after Colhoun & Cummins, 2013)	Potential presence (Bird Atlas 2007 – 2011)
Barn Owl <i>Tyto alba</i>	√	Red	'Probable' breeding bird; and confirmed winter presence.
Barn Swallow <i>Hirundo rustica</i>		Amber	Confirmed breeding bird.
Black-tailed Godwit <i>Limosa limosa</i>		Amber	Occurs in estuarine habitats of Cork Harbour c.1.3km to the south. Will feed inland in grassland therefore some potential for foraging during winter months.
Common Gull <i>Larus canus</i>		Amber	Confirmed wintering bird.
Curlew <i>Numenius arquata</i>		Red	Occurs in estuarine habitats of Cork Harbour c.1.3km to the south. Will feed inland in grassland therefore some potential for foraging during winter months.
Goldcrest <i>Regulus regulus</i>		Amber	Confirmed breeding and wintering bird.
Golden Plover <i>Pluvialis apricaria</i>		Red	Occurs in estuarine habitats of Cork Harbour c.1.3km to the south. Will feed inland in grassland therefore some potential for foraging during winter months.
Grey Wagtail <i>Motacilla cinerea</i>		Red	Confirmed breeding and wintering bird.
Greenfinch <i>Carduelis chloris</i>		Amber	Confirmed breeding and wintering bird.
Herring Gull <i>Larus argentatus</i>		Red	Potential foraging during winter e.g. after ploughing of arable fields.
House Sparrow <i>Passer domesticus</i>		Amber	Confirmed breeding and wintering bird.
Kestrel <i>Falco tinnunculus</i>		Amber	Confirmed breeding and wintering bird.
Lapwing <i>Vanellus vanellus</i>		Red	Occurs in estuarine habitats of Cork Harbour c.1.3km to the south. Will feed inland in grassland therefore some potential for foraging during winter months.

Lesser Black-backed Gull <i>Larus fuscus</i>		Amber	Potential foraging during winter e.g. after ploughing of arable fields.
Linnet <i>carduelis cannabina</i>		Amber	Confirmed breeding and wintering bird.
Meadow Pipit <i>Anthus pratensis</i>		Red	Confirmed breeding and wintering bird.
Mistle Thrush <i>Turdus viscivorus</i>		Amber	Confirmed breeding and wintering bird.
Oystercatcher <i>Haematopus ostralegus</i>		Amber	Occurs in estuarine habitats of Cork Harbour c.1.3km to the south. Will feed inland in grassland therefore some potential for foraging during winter months.
Robin <i>Erithacus rubecula</i>		Amber	Confirmed breeding and wintering bird.
Sand Martin <i>Riparia riparia</i>		Amber	Confirmed breeding bird.
Skylark <i>Alauda arvensis</i>		Amber	Confirmed breeding and wintering bird.
Snipe <i>Gallinago gallinago</i>		Amber	'probable' breeding bird; present during winter; observed during site visit.
Sparrowhawk <i>Accipiter nisus</i>		Amber	Confirmed breeding and wintering bird.
Spotted Flycatcher <i>Muscicapa striata</i>		Amber	Confirmed breeding bird.
Starling <i>Sturnus vulgaris</i>		Amber	Confirmed breeding and wintering bird.
Stock Dove <i>Columba oenas</i>		Amber	Confirmed breeding and wintering bird.
Stonechat <i>Saxicola rubicola</i>		Amber	Confirmed breeding and wintering bird.
Swift <i>Apus apus</i>		Amber	Confirmed breeding bird.
Woodcock <i>Scolopax rusticola</i>		Red	Confirmed presence during winter.
Yellowhammer <i>Emberiza citrinella</i>		Red	Confirmed breeding and wintering bird.

5.5 Alien, invasive species within study area

Alien, invasive species³ were noted when they occurred within the study area.

The non-native climbing plant, Traveller's Joy (*Clematis vitalba*) was recorded growing in some areas over treeline/hedgerow vegetation. This species can form a monoculture and shade out native species. It is listed as an 'amber' species by Invasive Species Ireland; defined as a species that can, under the right ecological

³ Invasive species can be defined as 'species that have been introduced (deliberately or accidentally) by humans and have a negative impact on the economy, wildlife or habitats of Ireland and Northern Ireland. After habitat loss, invasive species are the second biggest threat to biodiversity worldwide, and the biggest threat on islands (Invasive species Ireland. com)

conditions, impact on native species or habitats causing significant decline or loss; or a species that could impact either/both Natura 2000 sites and the goals of the WFD.

The tree Sycamore (*Acer pseudoplatanus*) is also amber-listed as per the above criteria, but is generally thought of more favourably, and as a widespread and naturalised species.

The Mink (*Neovison vison*) is likely to occur within the site in association with watercourses. This species is listed as a 'high priority' alien, invasive.

5.6 Preliminary Ecological Evaluation of the Carrigwohill North Masterplan study area

The preliminary ecological value of habitats recorded in the study area was assigned following the rationale described in Appendix 1 and these values are shown in Table 4. The more noteworthy habitats are discussed further below.

Table 4. Ecological Evaluation

Habitat	Preliminary Ecological Value	Notes
Improved agricultural grassland (GA1)	Low local	Relatively low value for wildlife
Wet grassland (GS4)	Low local	Widespread habitat.
Wet grassland (GS4) / Willow Scrub (WS1)	Moderate – High local	*further survey and assessment is required to confidently assign value.
Arable crops (BC1)	Low local	Relatively low value for wildlife.
Streams/ditches (FW2/FW4)	Moderate local*	*further survey and assessment is required to confidently assign value.
Hedgerows (WL1)	Moderate local	
Treelines (WL2)	Moderate - High local	See further discussion below.
Buildings and artificial surfaces (BL3)	Low local	

Habitats of greater ecological sensitivity

Streams/ditches (FW2/FW4)

The presence of stream/ditches with a landscape contributes to the biodiversity of the area primarily because they support species or species assemblages that are not found in other habitat types. By their nature, streams also provide ecological connectivity. The mid and eastern watercourses in the site are bounded by treelines present on OS 6" maps, and are likely to play an important role as wildlife corridors. When streams are bounded by treelines, the aerial insect fauna associated with both the streams and treelines may add to the importance of these habitats as foraging corridors for bats (see further text on treelines below).

Wet Grassland (GS4) / Willow Scrub (WS1)

The wetland area in the south-east of the site lies adjacent (north) of the railway line (Figure 8). It is unmanaged and therefore provides a 'wilderness' area for wildlife, and together with mature treelines, streams, and unmanaged habitat to the east, these habitats are likely to be the most biodiversity-rich area within the Masterplan site.

During the January 2015 site-walkover survey, the area supported abundant Snipe (*Gallinago gallinago*), and there is a potential that these wading birds breed in this habitat. The dense scrub habitat may support breeding mammals; a rabbit warren was observed in the east and signs of Foxes were abundant. We cannot rule out the potential for a Badger sett in this area.

Figure 8. Wetland area (wet grassland/willow scrub) highlighted by red outline



Hedgerows and Treelines (WL1/WL2)

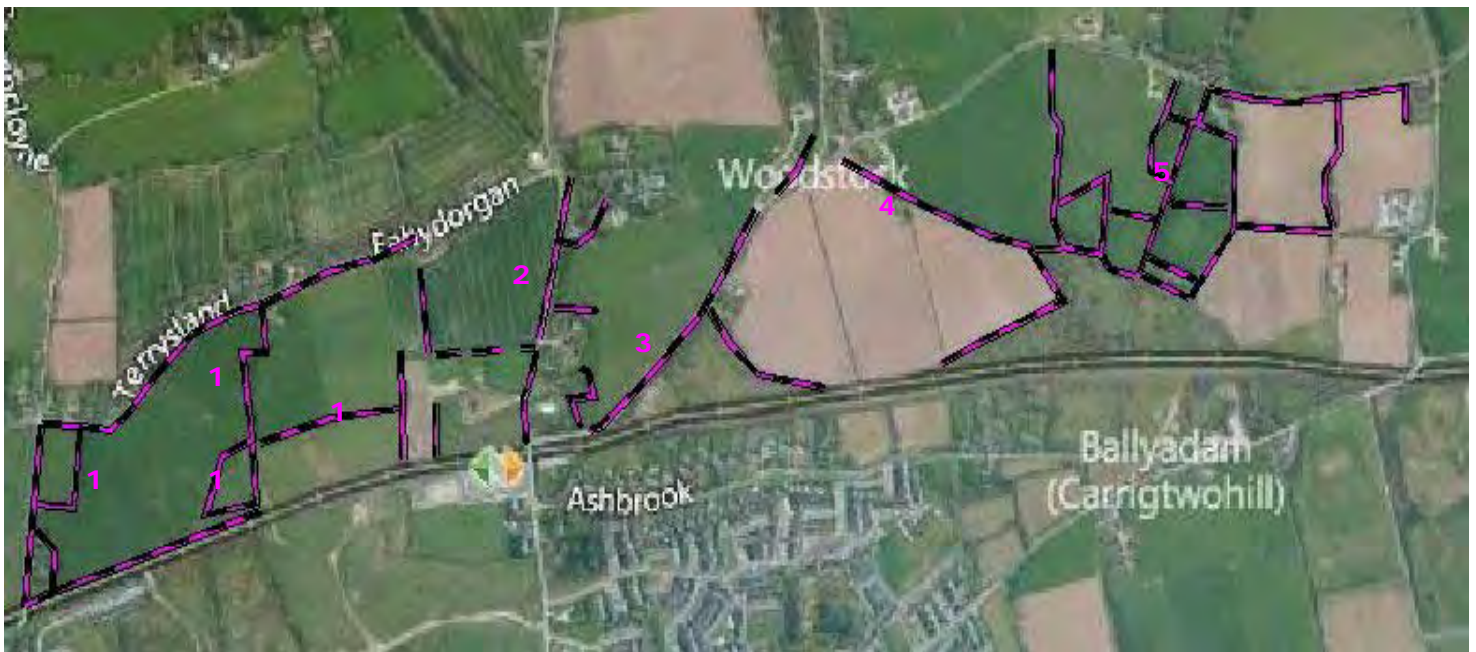
Hedgerows and treelines have higher intrinsic ecological value and contribute to the biodiversity of the site as well as having the potential to support a range of nesting, resting, breeding, foraging and commuting species. Treelines dominate as field boundaries within the Masterplan site, and whilst all have ecological value, five areas in particular are deemed to be of greater importance (refer to numbers on Figure 9): -

1. Treelines in Terrysland are the remainder of old field boundaries that are present on OS 6" maps. Comprising a range of species including Oak, these treelines are likely to be ecological corridors linking species distribution to habitats to the north.
2. Mature treeline comprising Beech and Oak that's runs along the local road. Townland boundary. There are adjacent small stands of woodland associated

with a private dwelling to the north (outside but adjacent to the Masterplan site boundary), and a private dwelling in the south. The woodland in the south (See Target Note 7 in Appendix 3), is all that remains of a former band of woodland habitat.

3. An old treeline, present on OS 6" maps and in particular, adjacent watercourse. Wooded habitats to the north (north of the Masterplan site). Likely historic ecological corridor.
4. An old treeline, present on OS 6" maps, townland boundary and in particular, a potential adjacent watercourse (watercourse shown on OS 6" maps, but not viewed in field). Wooded habitats to the north (north of the Masterplan site). Likely historic ecological corridor.
5. Many components of the original network of treelines in the west of the site have been removed. The landowner in area 5 has retained the original treelines and these comprise many mature species including Oak. Linked to a wetland area to the south, and unmanaged habitat to the east, these treelines and associated habitats are likely to be the most biodiversity-rich area within the Masterplan site.

Figure 9. Treelines of note



6.0 IMPACTS AND MITIGATION – PRELIMINARY CONSIDERATIONS & RECOMMENDED FURTHER STUDIES/ASSESSMENT

For the current Masterplan site, while the development will be contained within the site boundaries, there is ecological connectivity between the site and the surrounding environment via the watercourses and via certain key treelines both of which extend further into the surrounding landscape. Therefore, potential impacts can occur over a wider 'zone of influence'⁴ than simply at within-site level. These are discussed as necessary.

Impacts are considered only for those habitats valued at 'moderate local' value and above.

The space available for biodiversity, and its quality, is often diminished through urbanisation (European Commission, 2004). Therefore this preliminary assessment, while recognising the need for further studies and ecological impact assessment where required, proposes potential mitigation measures and recommendations that aim to identify practical ways to protect, enhance and create habitats within the proposed scheme, that maximises biodiversity within the site, and maximises the potential for connectivity and biodiversity gains across the wider landscape.

Potential impacts upon streams/ditches

The main threats to stream/ditch communities are fluctuations in water levels or permanent lowering of water levels; water pollution (runoff and other pollution, increase in suspended solids), the spread of invasive alien species; and inappropriate management. Inappropriate management of watercourses can take a number of forms such as the insufficient clearing of vegetation and silt from the channel, leading to shallowing and loss of open water through encroachment of vegetation, while insufficient management of bankside vegetation may allow tall herbaceous and woody vegetation to dominate and shade out aquatic vegetation. Conversely, the over-management of streams/ditches can cause a reduction in the quantity and quality of aquatic vegetation. Insufficient protection of watercourses during development/construction can lead to varying levels of water pollution, at worst case scenario level, completely obliterating the biodiversity value. Some or all of these potential impacts may be relevant in the Carrigtwohill North Masterplan project.

The Carrigtwohill North Concept Plan identifies 'open spaces/green corridors' that encompasses the main wetland habitats within the site. However, how these green spaces are retained/developed will determine how biodiversity is protected and maintained within the site.

⁴ Zone of influence can be defined as 'the ecological areas and features likely to be affected by the biophysical changes caused by the project, however remote from the route' (NRA, 2009); or 'the area/resources that may be affected by the biophysical changes caused by the proposed project (IEEM, 2006).

Recommendations for watercourses

- Watercourses should be maintained as close to their natural state as possible with minimal culverting. A mixture of open banks and over-hanging bankside vegetation is considered more natural (Brennan et al. 2010).
- Riparian vegetation is particularly important (both river and streams) and it provides several valuable functions such as providing habitat, trapping nutrients, and stabilising banks. While walk paths along watercourses may be highly desirable, adequate buffer zones should be provided to ensure riparian zones are not degraded and there is no bankside erosion. A corridor of semi-natural vegetation alongside a watercourse also provides a buffer against run-off from adjacent areas. Buffer zones should be designed following guidance given in the Shannon Regional Fisheries Board's '*Planning for watercourses in the urban environment*' (SHRFB, 2011). The recommended buffer zone width for larger river channels is 35m to 60m; while for smaller channels it is 20m or greater. The buffer zone is then subdivided into smaller zones (streamside, middle and outer) with the 'streamside zone' (<10m from the watercourse) having very restricted use and therefore forming a protective buffer.
- It is recommended that a freshwater aquatic survey be commissioned that will provide baseline data/information on water quality, aquatic vegetation, and provide a fisheries appraisal of watercourses on site. Such a survey, undertaken at a number of sampling sites along the watercourses should be achievable in a one-day survey period. The optimum time for such a survey is May – June when flowering structures are present. The baseline data should be used to re-assign ecological value to the watercourses within the site, undertake ecological impact assessment with regards the proposed housing development, and provide mitigation and specialist recommendations with regards future habitat management.
- Measures to avoid impacts upon water quality should be incorporated into the construction method statement. Construction/development works should proceed using standard best-practice guidelines for working near watercourses, such as:
 - Shannon Regional Fisheries Board - *Planning for watercourses in the urban environment* (SHRFB, 2011);
 - Construction Industry Research and Information Association CIRIA C648: Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006);
 - CIRIA C648: Control of water pollution from linear construction projects: Site guide (Murnane et al.2006);
 - CIRIA guidelines in relation to the management of ponding surface water and overland flows;

- DMRB HD33/06: Surface and sub-surface drainage systems for highways. Design Manual for Roads and Bridges. Volume 4: 2, (2006);
- NRA (2005) Guidelines for the crossing of watercourses during the construction of National Road Schemes;
- Inland Fisheries Ireland's best practice guidance;
- Eastern Regional Fishery Board Guidelines (Murphy, 2004).

Potential impacts upon wet grassland/wet scrub (wetland)

The wetland area in the south-east of the site lies adjacent (north) of the railway line, is unmanaged and currently provides a 'wilderness' area for wildlife, and together with mature treelines, streams, and unmanaged habitat to the east, these habitats are likely to be the most biodiversity-rich area within the Masterplan site. There is a potential that the habitats support breeding mammals, and the potential for a Badger sett cannot be discounted.

The Carrigtwohill North Concept Plan identifies the wetland area as a proposed 'open spaces/green corridor' therefore the habitats will not be impacted by direct habitat loss. However, habitat degradation is a threat, and how the green space is retained/developed is key; sensitive habitat management/enhancement will be required to preserve the current biodiversity value and allow the natural habitats to flourish within a predominantly residential area.

Recommendations for wet grassland/scrub

- Ideally a botanical survey should be undertaken to ascertain the floral diversity of the wetland area. Such a survey would need to be undertaken during the flowering period May – July. The survey results could then form the basis of re-assigning ecological value and recommending targeted mitigation for management and enhancement of this area for both people and wildlife.
- The wetland area will ideally be maintained as a habitat mosaic with open green space areas for human amenity merging into semi-natural habitats retained for wildlife. One recommendation would be to retain the wet willow scrub as it provides a buffer/barrier to the railway line.
- Connectivity to the wetland habitat mosaic should be retained through the retention of linking treelines, plus existing and enhanced buffer vegetation along the railway line. In this way the railway line will provide ecological connectivity to the wider landscape.

Potential impacts upon Treelines and Hedgerows

Potential impacts upon treelines and hedgerows as a result the development of the Carrigtwohill North site for housing will include:

- permanent loss of hedgerows and treelines and the species that they support;
- temporary loss of habitat and species (construction phase);
- fragmentation of habitats and severance of wildlife corridors;
- creation of barriers to movement of animals and plants, and especially those with limited powers of dispersal.
- modification of habitat (in relation to treelines that are being retained).

Recommendations for Treelines and Hedgerows

- Consideration should be given to the treelines of significance (Section 5.6; Figure 9) and the potential for retaining them in the development proposals. Previous studies have shown that developments that have incorporated elements of the pre-existing landscape (e.g. treelines/hedgerows or watercourses and associated vegetated corridors) into a scheme can achieve higher levels of biodiversity post-development (Brennan et al. 2010). Treelines on the site boundaries that are to be retained can be protected/buffered by the planting of native shrub species; that also increases structural diversity with potential biodiversity gains.
- It should be ensured that the railway corridor is lined with good quality semi-natural vegetation, as this too will provide corridors and connectivity for wildlife to the wider landscape.
- The management of retained treelines determines their biodiversity value. For example, trees retained as features within amenity grassland offer little value other than the tree structure itself, while treelines that are allowed to retain or develop understorey and ground flora (ivy, ferns, fungi, leaf litter etc) offer more biodiversity potential.
- Any scheme to plant tree species should use species appropriate to the local environmental conditions and aim to use a high diversity of native trees. A list of suitable tree/shrub species is provided in Appendix 4. A useful reference is *'a guide to landscape treatments for national road schemes in Ireland* (NRA, 2006b).
- The fragmentation (severing) of habitats could be mitigated by the reconnection of linear features using tree planting. In addition, the use of hedgerows and smaller patches of semi-natural habitat connected via treelines could aid in the formation of extensive wildlife corridors throughout the site. Consideration should be given to linking green spaces and hedgerows/treelines within the site to similar habitats within the wider environment i.e. maintaining and creating ecological corridors into the wider landscape.

- Attention should be given to providing unlit treelines/hedgerows, especially in and around the watercourses as bats generally avoid lit areas.
- Treelines and individual trees suitable for retention should be protected during the construction phase using best practice methods as described in the NRA document 'guidelines for the protection of trees, hedgerows and scrub, prior to, during and post construction of national road schemes (NRA, 2006a).
- While relatively hedgerows within the site were deemed of lesser value, the impacts of their removal can be mitigated by a landscape/vegetation scheme that includes native plants and those that will provide dense structures that provide safe roosting and nesting structures for birds.
- The planting of native vegetation at the bases of treelines/hedgerows provide valuable habitat for insects, birds, mammals and amphibians.

Recommendations for fauna

- A mammal survey is recommended to assess (1) the potential for a badger sett in the wet scrub habitat and (2) assessment of other key areas of semi-natural vegetation as required. The survey should be followed by ecological impact assessment and the provision of mitigation/specialist recommendations.
- The importance of linear features in the urban environment is well known, and hedgerows and treelines provide important feeding and commuting corridors for bats. There is no baseline data on the use of the hedgerows/treelines within the site by bats. Where key treelines are to be removed, or where there may be a proposal to provide a lighted walk path close to a watercourse, it is recommended that a bat survey be undertaken to determine the use of the treelines by bats, and in particular to identify treelines that are commuting/foraging corridors. Specialist mitigation can then be provided as necessary.
- Several bat species roost in trees. The bat survey, recommended above should therefore be extended to survey mature trees proposed for removal to ascertain their use/potential use by roosting bats. The survey should be followed by ecological impact assessment and the provision of mitigation/specialist recommendations. For example, mitigation for the loss of potential bat roosts and enhancement of the general area for bats can be achieved through the erection of artificial bat roosting boxes.
- To avoid impacts upon breeding birds, no vegetation clearance should be undertaken during the bird breeding season (1st March – 31st August) (Wildlife (Amendment) Act 2000, Section 46 (amending Section 40 of the Wildlife Act, 1976)).

7.0 GENERAL RECOMMENDATIONS

General recommendations

- Connectivity through the provision of ecological corridors and semi-natural habitats that act as green stepping stones is paramount to providing the means by which species can move within the site, and between the site and the wider landscape. Treelines/hedgerows and watercourses are likely to have the highest biodiversity levels; they can be linked via other 'lower value' habitats such as grassland, scrub, or drainage ditches to provide sound ecological networks throughout the site.
- Amenity grassland is a common occurrence through modern housing development schemes. Of low ecological value, amenity grassland can be enhanced for wildlife e.g. leaving areas un-mown to allow seed heads to develop, use of a diverse mixture of native grass species, or incorporation of annual flowering plants (wild flower meadows). Incorporated in a sensitive way, such measures can both benefit biodiversity and be visually pleasing to householders.
- The creation of habitat mosaics maximises biodiversity. For example, an area of amenity grassland (green space) that borders a stream corridor could be enhanced for biodiversity by allowing a diversity of habitats to be maintained; e.g. amenity grassland edged with un-mown/unmanaged grassland that merges into scrub that merges into wetland/riparian vegetation. A mosaic of grassland, scrub, woodland and wetland creates the greatest species-richness and structural diversity (Brennan et al. 2010).
- The importance of scrub should be recognised. Gorse scrub is a common and widespread habitat throughout Co. Cork but is readily removed from agricultural land and is generally considered to have little value when in fact it provides dense and safe cover for faunal species and breeding habitat for several bird species. Retained in landscaping schemes; it is also visually pleasing due to its long flowering period and is pleasantly aromatic.
- The dangers of alien, invasive species should be recognised. While not recorded during the preliminary site visit; there is still a potential that stands of invasive species may occur in areas not observed. Of prime importance is the prevention of introduction of such a species to the site. Common examples of invasive terrestrial plants introduced to Ireland include rhododendron (*Rhododendron ponticum*), giant hogweed (*Heracleum mantegazzianum*), Japanese knotweed (*Fallopia japonica*) and Himalayan balsam *Impatiens glandulifera*. Many of these are occurring in new developments all the time due to accidental introductions (L. J. Lewis. *pers. obs*).

Final considerations

Overall, the Carrigtwohill North Masterplan site appears suitable for development as it contains largely agricultural habitats that are widespread within the general landscape. While this report has identified the habitats of greater sensitivity, the undertaking of further surveys and impact assessment resulting in targeted mitigation should enable the proposed housing development project to proceed without any large adverse effects on the ecology of the site or adjacent environment.

How green/open spaces are retained/developed is key to maintaining biodiversity within the site and connectivity to the wider landscape, and sensitive habitat management/enhancement will be required but is achievable, to preserve the current biodiversity value and allow these natural/semi-natural habitats to flourish within a predominantly residential area.

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APPENDIX 1

Ecological Evaluation and Ecological Impact Assessment (EcIA)

The significance of an ecological impact is directly related to the conservation importance of the particular area being affected. Evaluation of the conservation importance of an area (ecological evaluation) is therefore of critical importance in identifying the significance of an impact.

There are currently no standard guidelines for ecological evaluation within Ireland. Limosa Environmental has therefore adapted evaluation criteria and techniques based on previously published guidelines (e.g. Ratcliffe, 1977; Treweek, 1999; NRA, 2004) following best practice methodology (e.g. IEEM, 2006).

Evaluation methodology consists of evaluating each ecological resource (e.g. habitat, population, species) within the zone of influence (area to be affected) using the criteria outlined in Table 1a. Each ecological resource is then given an evaluation value (ranking) as described in Table 1b.

Table 1c gives impact terminology as per the EPA (2003).

Impact magnitude refers to the 'size' or 'amount' of an impact (IEEM, 2006). We attempt to assess the size of the potential impact based on the predicted extent of loss e.g. in the case of habitats, by estimating the area over which the impact will occur. In the case of species, it may be possible to estimate the proportion of the within-site population that will be affected by the impact. Estimation of impact magnitude however, is intrinsically linked to information known/received about the proposed development.

Impact Assessment takes into account not only the impact magnitude, but also the timing and frequency, duration (e.g. temporary or permanent), reversibility and cumulative effects of the impact(s) (IEEM, 2006).

Finally we predict the significance of impacts (Table 1d). Significance terminology is based on EPA (2003) while the rationale for assigning level of significant impact follows IEEM (2006).

Table 1a Established criteria for ecological evaluation

Evaluation criteria	Definitions and Notes
Site designations	<p>Designated areas for conservation are areas that are designated under national and/or European laws in order to conserve habitats and species of national or international conservation importance. These include:</p> <ul style="list-style-type: none"> • Natural Heritage Areas (NHA): a national designation given legal status by the Wildlife Amendment (2000) Act. • Special Areas of Conservation (SAC): areas considered of European and national importance whose legal basis is the EU Habitats Directive (92/43/EEC), transposed into Irish law through the European Union (Natural Habitats) Regulations, 1997. • Special Protection Areas (SPA): sites of conservation importance for birds whose legal basis is the EU Birds Directive (79/409/EEC). • Wildfowl Sanctuary: designated under the 1976 Wildlife Act. • Ramsar Site: European designation based on the Ramsar Convention, 1984.
Species designations/criteria	<p>Certain legislation refers directly to species/populations (e.g. annexed species):</p> <ul style="list-style-type: none"> • Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. • Council Directive 79/409/EEC on the Conservation of Wild Birds ('Birds Directive'). • Bern Convention on the Conservation of European Wildlife and Natural Habitats. • The Wildlife Act (1976) and The Wildlife (Amendment) Act (2000). • Birds of Conservation Concern in Ireland (Colhoun & Cummins, 2013). • Red Data Books of Britain and Ireland (e.g. Curtis & McGough, 1988). • Flora (Protection) Order, 1999.
Size	<p>Includes both size of habitats (area) and population size of individual species and is intrinsically linked to other criteria such as rarity and fragility (below). Habitats: considers minimum viable size of habitats, habitat heterogeneity, species/area relationships, home-range size. Populations: considers concept of minimum viable population size (population viability), national and local population trends, extinction risk...</p>
Diversity / Biodiversity	<p>At a minimum species richness (number of species). Biodiversity defined as 'the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part (Convention on Biological Diversity, 1993). Must be considered in terms of the habitat type - some habitats have low species diversity by nature. Keystone species deserve special attention – defined as a species whose removal would induce significant changes within the food web (Begon <i>et al.</i>, 1996).</p>
Rarity	<p>Applies to habitats and to species. The degree to which a habitat or community approximates a natural state. The degree to which the site is a good example of the habitat types. National, county, local scales e.g. within 10-km² squares.</p>
Naturalness	<p>The degree of modification by human intervention. Habitats that are least modified are generally regarded more highly (Treweek, 1999). Also considers the extent to which the habitat is free of alien invasive species.</p>
Representativeness/ Typicalness	<p>How well the area represents habitats or vegetation types on a wider scale (Treweek, 1999); 'degree of representativity of the natural habitat type on the area' (Council Directive 92/43/EEC; Habitats Directive).</p>
Fragility	<p>The degree of sensitivity of habitats, communities and species to environmental change.</p>
Stability/Resistance/Resilience	<p>Habitats and species. Stability refers to the ability of an ecosystem to maintain some form of equilibrium in the presence of a disturbance. Resilience is defined as the ability and speed with which a community returns to its former state following a disturbance. Resistance is defined as the ability of a community to avoid displacement by a disturbance (Begon <i>et al.</i>, 1996).</p>
<p>Other criteria include:</p>	
<p>Recorded history (scientific value), Potential value, Educational value, Amenity value.</p>	

Table 1b Ecological Evaluation

Ecological Value	Rationale
A International	Sites designated as Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar Sites. Sites meeting criteria for international designation.
B National	Sites designated as Natural Heritage Areas (NHA) or sites qualifying for designation. Undesignated sites containing good examples of Annex I habitats. Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Sites supporting viable populations of Red Data Book species (nationally rare species).
C Regional	Undesignated sites that are prime examples of the habitat (natural or semi-natural) type, exhibit high biodiversity or support important communities/assemblages of species within the region. Sites exhibiting habitats that are scarce within the region. Sites that support nationally scarce plant species (recorded from less than 65 10-km ² squares, unless they are locally abundant). Sites that hold regionally scarce vertebrate species.
D High Local	Sites that are prime examples of the habitat type, exhibit high biodiversity or important communities/assemblages of species within the local area. Habitats of importance in a local context – e.g. semi-natural habitats within an urban setting, hedgerows and treelines that serve as important ecological corridors within an otherwise modified landscapes. Sites exhibiting habitats/species that are generally scarce within the local area.
E Moderate Local	Sites that exhibit good quality semi-natural habitats. Hedgerows and treelines.
F Low Local	Artificial or modified habitats considered of low value for wildlife.

Adapted from IEEM, 2006; NRA, 2004; Regini, 2000; RPS Group, 2001.

Table 1c Impact Terminology as per the EPA (2003):

Positive Impact	A change which improves the quality of the environment.
Negative Impact	A change which reduces the quality of the environment.
Neutral Impact	A change which does not affect the quality of the environment.
Cumulative Impact	The addition of many small impacts to create one larger, more significant, impact.
Do-Nothing Impact	The environment as it would be in the future if no development was carried out.
Indeterminable Impact	When the full consequences of a change in the environment cannot be described.
Irreversible Impact	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
Residual Impact	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
Synergistic Impact	Where the resultant impact is of greater significance than the sum of its constituents.
Worst case Impact	Impacts arising from a development in the case where mitigation measures substantially fail.

Table 1d Impact Significance

Impact Significance <small>*terminology based on EPA (2003)</small>	Definition / Rationale
Imperceptible Impact	An impact without noticeable consequences in either direction (negative or positive).
Slight Impact	An impact (negative or positive) that has noticeable ecological consequences that are considered to only slightly affect the distribution and/or abundance of species or habitats within the defined site*; and to not affect their distribution on viability within the wider area.
Moderate Impact	An impact that has noticeable ecological consequences that are considered to moderately affect the distribution and/or abundance of species or habitats within the defined site*, and to not affect their distribution on viability within the wider area.
Significant Impact	An impact is considered to be ecologically significant if it impacts the integrity** of a defined site and/or the conservation status of habitats or species <u>within a given area</u> (IEEM, 2006). If impacts are not found to be significant at the highest geographical level at which the feature(s) has been valued, then the impacts may be significant at a lower level. For example, there may be a significant impact at a local level or a 'within-site' on a habitat that is valued at an international level.

** Integrity is defined as 'the integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified.'

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APPENDIX 2

Site Name: Great Island Channel SAC
Site Code: 001058

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1140] Tidal Mudflats and Sandflats
[1330] Atlantic Salt Meadows

The main habitats of conservation interest in Great Island Channel SAC are the sheltered tidal sand and mudflats and the Atlantic salt meadows. Owing to the sheltered conditions, the intertidal flats are composed mainly of soft muds. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algal species occur on the flats, especially *Ulva lactuca* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially at Rossleague and Belvelly.

The saltmarshes are scattered through the site and are all of the estuarine type on mud substrate. Species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Greater Sea-spurrey (*Spergularia media*), Lax-flowered Sea-lavender (*Limonium humile*), Sea Arrowgrass (*Triglochin maritimum*), Sea Mayweed (*Matricaria maritima*) and Red Fescue (*Festuca rubra*).

The site is extremely important for wintering waterfowl and is considered to contain three of the top five areas within Cork Harbour, namely North Channel, Harper's Island and Belvelly-Marino Point. Shelduck is the most frequent duck species with 800-1,000 birds centred on the Fota/Marino Point area. There are also large flocks of Teal and Wigeon, especially at the eastern end. A population of about 80 Grey Plover is a notable feature of the area. All the mudflats support feeding birds; the main roost sites are at Weir Island and Brown Island, and to the north of Fota at Killacloyne and Harper's Island. Ahanesk supports a roost also but is subject to disturbance. The numbers of Grey Plover and Shelduck, as given above, are of national importance.

The site is an integral part of Cork Harbour which is a wetland of international importance for the birds it supports. Overall, Cork Harbour regularly holds over 20,000 waterfowl and contains internationally important numbers of Black-tailed Godwit (1,181) and Redshank (1,896), along with nationally important numbers of nineteen other species. Furthermore, it contains large Dunlin (12,019) and Lapwing (12,528) flocks. All counts are average peaks, 1994/95 – 1996/97. Much of the site falls within Cork Harbour Special Protection Area, an important bird area designated under the E.U. Birds Directive.

While the main land use within the site is aquaculture (oyster farming), the greatest threats to its conservation significance come from road works, infilling, sewage outflows and possible marina developments.

The site is of major importance for the two habitats listed on Annex I of the E.U. Habitats Directive, as well as for its important numbers of wintering waders and wildfowl. It also supports a good invertebrate fauna.

SITE NAME: CORK HARBOUR SPA

SITE CODE: 004030

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poul nabibe inlets.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Some shallow bay water is included in the site. Rostellan Lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl. Of particular note is that the site supports internationally important populations of Black-tailed Godwit (1,896) and Redshank (2,149) - all figures given are five year mean peaks for the period 1995/96 to 1999/2000. At least 18 other species have populations of national importance, as follows: Little Grebe (57), Great Crested Grebe (253), Cormorant (521), Grey Heron (80), Shelduck (2,009), Wigeon (1,791), Teal (1,065), Pintail (57), Shoveler (103), Red-breasted Merganser (121), Oystercatcher (1,809), Golden Plover (3,342), Grey Plover (95), Lapwing (7,569), Dunlin (9,621), Bar-tailed Godwit (233) and Curlew (2,237). The Shelduck population is the largest in the country (over 10% of national total). Other species using the site include Mute Swan (38), Whooper Swan (5), Pochard (72), Gadwall (6), Mallard (513), Tufted Duck (64), Goldeneye (21), Coot (53), Ringed Plover (73), Knot (26), Greenshank (46) and Turnstone (113). Cork Harbour is an important site for gulls in winter and autumn, especially Black-headed Gull (3,640), Common Gull (1,562) and Lesser Black-backed Gull (783), all of which occur in numbers of national importance. Little Egret and Mediterranean Gull, two species which have recently colonised Ireland, also occur at this site.

A range of passage waders occurs regularly in autumn, including such species as Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter.

Cork Harbour has a nationally important breeding colony of Common Tern (102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually and the chicks are ringed.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, there are at least 20 species that have wintering populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Little Egret, Golden Plover, Bar-tailed Godwit, Ruff, Mediterranean Gull and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. Cork Harbour is also a Ramsar Convention site and part of Cork Harbour SPA is a Wildfowl Sanctuary.

21.11.2014

APPENDIX 3

Site walkover survey - Target Notes



Target Note	Field Notes
1	Roadside treeline species include Ash, Sycamore, Willow, understory Ivy, bramble, Hawthorn. Some Traveller's Joy here. Sycamore dominates some sections.
2a	Hawthorn dominates in sections plus Sycamore, Elder, Gorse. Treeline has associated earth bank.
2b	Old boundary, Holly, oak, Ivy, Sycamore, hawthorn, wet ditch along inside
3	Along railway line – gorse dominated bank; occasional trees including Oak, Willow and Ash. Wet ditch on inside.
4	Some nice mature trees along this roadside treeline.
5	Treeline – mature Beech and Oak. Old stone wall.
6	Mature Sycamore treeline, plus Ash, Holly and Elder.
7	Small stand of mixed deciduous woodland on private property. Remnant of woodland that is shown on OS 6" maps.
8	Roadside treeline incl. beech, Alder, hawthorn, Oak, Sycamore, Ivy, Holly.
9	Rough unmanaged grassland with piles of spoil/tarmac, grazed by two horses, wetter in east where standing pools water, abundant rushes. Occasional Willow and Oak trees.
10	Flock of feeding Curlew (c.45 birds).
11	Old treelines in this area contain some Oak.
12	Wet grassland becoming progressively wetter walking south into wet willow scrub. Mammal signs – rabbit warren. Fox scats are abundant. Potential for badgers within this dense area?
13	Unmanaged, rank fields, originated from grassland.

APPENDIX 4

Tree and shrub species suitable for use in landscape planting schemes (* denotes native species)

Common Name	Species Latin Name	Notes
Trees		
Alder*	<i>Alnus glutinosa</i>	Present on site; grows in a variety of soils and tolerates damp conditions. Useful planted along watercourses.
Ash*	<i>Fraxinus excelsior</i>	Present on site; grows in a variety of soils and tolerates damp conditions.
Beech	<i>Fagus sylvaticus</i>	Present on site; naturalised species in Ireland. Tolerates a variety of soils.
Crab Apple*	<i>Malus sylvestris</i>	Suitable for single/specimen planting. Native species undergoing decline.
Elder*	<i>Sambucus nigra</i>	Present on site; best used in hedging.
Pendunculate Oak*	<i>Quercus robur</i>	Present on site; grows on a wide variety of soil types and tolerates damp conditions. Treelines/specimen trees.
Sessile Oak*	<i>Quercus petraea</i>	Present on site; suitable for single/specimen planting as requires large space.
Willow*	<i>Salix spp.</i>	Present on site; quick growing; useful in hedging/buffer areas; grows in a variety of soils and tolerates damp conditions; can be invasive.
Birch*	<i>Betula pubescens/betula pendula</i>	Grows in a variety of soils and tolerates damp conditions.
Rowan*	<i>Sorbus aucuparia</i>	Grows in a variety of soils and tolerates damp conditions. Provides berries for birds.
Wych Elm*	<i>Ulmus glabra</i>	Large tree suitable for treelines/hedgerows, limestone/base-rich soils.
Shrubs		
Blackthorn*	<i>Prunus spinosa</i>	Grows on a variety of soils; present on site; will form dense thickets; not suitable for public places but useful in buffer areas.
Berberis	<i>Berberis frikartii</i>	Evergreen non-native shrub with berries for birds.
Bramble*	<i>Rubus fruticosus</i>	Present on site; can be invasive.
Cotoneaster	<i>Cotoneaster franchetti</i>	Non-native shrub providing ground cover; evergreen; flowers and berries. Attracts bees and butterflies.
Dog Rose*	<i>Rosa canina</i>	Grows locally
Gorse*	<i>Ulex europeus</i>	Present on site; can be invasive; attracts insects; useful in buffer areas.
Guelder Rose*	<i>Viburnum opulus</i>	
Hawthorn*	<i>Crataegus monogyna</i>	Present on site.
Hazel*	<i>Corylus avellana</i>	Best used in hedging.
Holly*	<i>Ilex aquifolium</i>	Best used in hedging.
Honeysuckle*	<i>Lonicera periclyrnenum</i>	Climbing; attracts insects.
Ivy*	<i>Hedera helix</i>	Climbing; attracts insects.

Appendix E. Waterbird Survey Report

**CARRIGTWOHILL WATERBIRD SURVEY,
NOVEMBER 2022 - FEBRUARY 2023**

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SUMMARY

This report presents the results of a waterbird survey of the Carrigtwohill URDF Initiative lands, and associated areas, between November 2022 and February 2023. The objective of the survey was to assess the usage of the Carrigtwohill URDF Initiative lands by field-feeding waterbirds.

The scope of the waterbird survey comprised eight waterbird surveys between November 2022 and February 2023. Each waterbird survey included daytime surveys of the Carrigtwohill URDF Initiative lands and known field-feeding sites outside the Carrigtwohill URDF Initiative, and an evening watch of field-feeding Curlews returning to roost in the Glounthaune Estuary / Slatty Water.

Field-feeding Curlew used a group of fields in the middle of the Carrigtwohill URDF Initiative lands in November and December 2022. The peak count of 86 Curlew on 11th December probably represented around half of the local field-feeding population, as indicated by the roost count. Small number of Black-tailed Godwits occurred with the Curlew on two dates.

Field-feeding Curlew and Black-tailed Godwit regularly occurred in the known field-feeding sites outside the Carrigtwohill URDF Initiative during the survey period, with peak counts of 101 Curlew on 29th December and 610 Black-tailed Godwits on 18th November. Small numbers of field-feeding Oystercatchers occurred in the known field-feeding sites outside the Carrigtwohill URDF Initiative on three dates. The peak Curlew count at the nocturnal roost in the Glounthaune Estuary / Slatty Water was 245 on 24th January.

1. INTRODUCTION

1.1. SCOPE OF REPORT

This report presents the results of a waterbird survey of the Carrigtwohill Urban Regeneration and Development Fund (URDF) Initiative lands between November 2022 and March 2023. The survey was commissioned by Atkins on behalf of Cork County Council. The objective of the survey was to assess the usage of the Carrigtwohill URDF Initiative lands by field-feeding waterbirds.

1.2. SURVEY DATA

The full survey data is included in the database that accompanies this report. Details of this database are provided in Appendix 1.

1.3. STATEMENT OF COMPETENCE

All the survey work, data analysis and assessment presented in this report was carried out by Tom Gittings.

Tom Gittings is an ecologist with 27 years' experience in professional consultancy work and research. Tom specialises in ecological surveying, monitoring and evaluation, ecological impact assessment, habitat management, and avian, invertebrate, wetland and woodland ecology. He is currently working as an independent ecological consultant. His previous experience includes working for the RPS Group (a multi-disciplinary environmental consultancy) and carrying out research into forest and wetland biodiversity in the Department of Zoology, Ecology and Plant Science at University College Cork. He has a BSc (Hons) and a PhD in Ecology and is a member of the Chartered Institute of Ecology and Environmental Management and has extensive professional experience in project management and ecological assessment. His recent consultancy work includes assessments for planning applications (including Appropriate Assessments, Environmental Impact Statements, and expert witness work at oral hearings), large-scale habitat surveys, preparation of management plans, contributions to multi-disciplinary conservation plans, and specialist ecological survey and research.

Tom has detailed knowledge of the ecology of Cork Harbour and its waterbird populations. He has been involved in I-WeBS counts of Cork Harbour since 1996 and has been the coordinator of the I-WeBS counts since 2002. He has also been involved in a wide variety of ecological consultancy work in Cork Harbour. Recent examples of his work in the Cork Harbour area includes assessment of the proposed development of a network of kayaking trails in Cork Harbour, monitoring of waterbird migration at Lough Beg for a proposed wind turbine, preparation of an Appropriate Assessment report on aquaculture in Cork Harbour, surveys of field-feeding waterbirds for the M28 road scheme, and vantage point surveys of waterbird activity at the Aghada Generating Station.

2. METHODOLOGY

2.1. SURVEY DESIGN

The objective of the survey was to establish the usage (if any) of the Carrigtwohill URDF Initiative lands by field-feeding waterbirds.

The survey included three components:

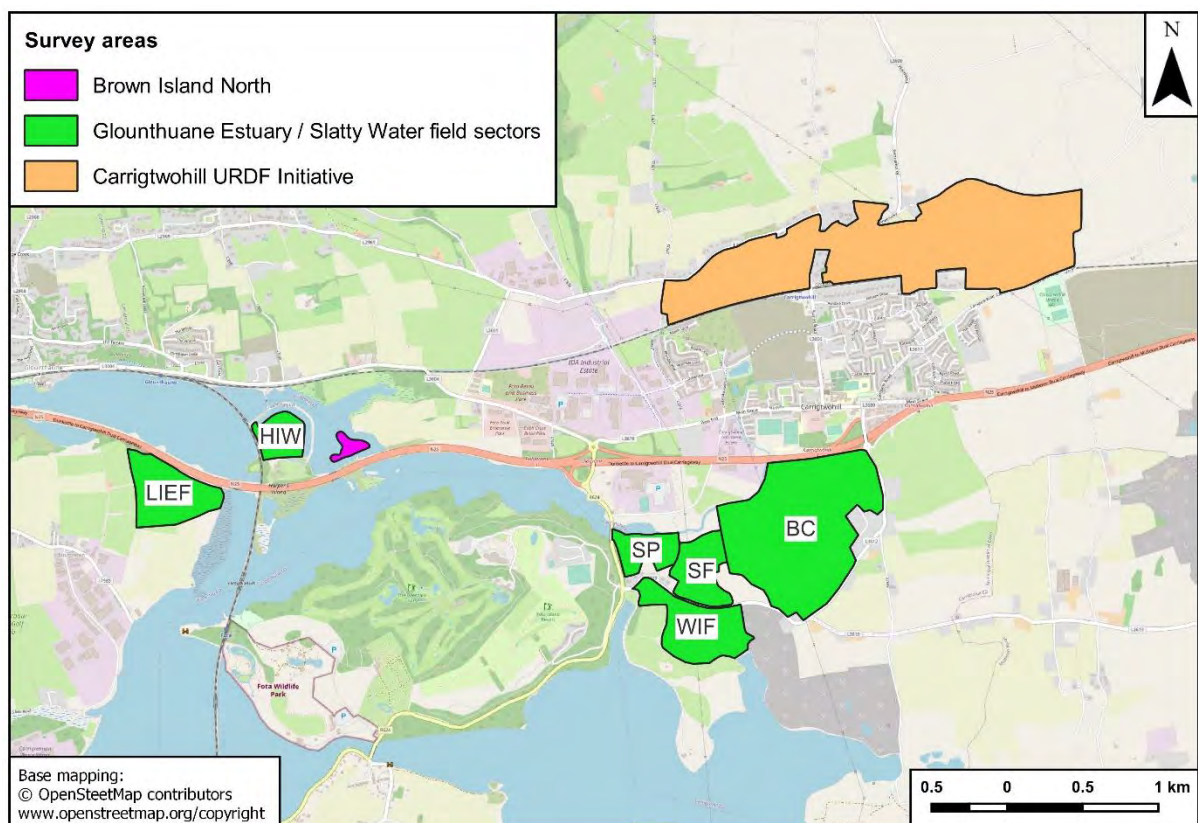
- Surveys of the Carrigtwohill URDF Initiative lands.
- Surveys of known areas for field-feeding waterbirds around the Glounthaune Estuary / Slatty Water.
- Surveys of the Brown Island North Curlew nocturnal roost, which is used by field-feeding Curlews.

2.2. SURVEY AREAS

The survey areas are shown in Map 2.1.

The Carrigtwohill URDF Initiative survey area comprised the mapped extent of the Carrigtwohill URDF Initiative lands, as supplied by Atkins. I did not divide this area into sectors, but simply recorded the exact locations of any waterbird records.

The Glounthaune Estuary / Slatty Water survey area comprised areas containing field habitats that I count as part of the I-WeBS counts of the Glounthaune Estuary / Slatty Water subsite. It also included an area of fields around Barryscourt Castle that are not included in the Glounthaune Estuary / Slatty Water subsite, but where I have previously observed large flocks of field-feeding waders. I divided this survey area into sectors corresponding to those that I use for other counts of the Glounthaune Estuary / Slatty Water.



Map 2.1. Survey areas.

The Brown Island North survey area comprised the saltmarsh island to the east of Harper's Island and to the north of the N25 that regularly holds a nocturnal Curlew roost. The vantage point that I used for this survey area also covered Harper's Island Wetlands, which can hold part, or all, of the Curlew roost on evening high tides. Any roosting Curlew counted in Harper's Island Wetlands during the roost counts are included in the totals for the Brown Island North roost. On some dates I also checked the upper section of Slatty Water and the southern side of Harper's Island, which can also hold the Curlew roost on evening low tides.

2.3. SURVEY DATES AND TIMINGS

The survey dates and timings are shown in Table 2.1. The high tide, low tide and sunset times on each survey date are shown in Table 2.2.

The survey dates were chosen so that the surveys of the Carrigtwohill URDF Initiative lands represented a range of tidal conditions, in case the incidence of field-feeding was influenced by the tide. The counts of the Brown Island North roost were carried out around sunset, with the final counts around 10-30 minutes after sunset, depending on the visibility.

Table 2.1. Survey dates and timings.

Date	Survey area	Start time	Finish time
18/11/2022	Carrigtwohill URDF Initiative	11:40	13:14
18/11/2022	Glounthaune Estuary / Slatty Water	14:35	15:29
18/11/2022	Brown Island North	16:01	17:20
07/12/2022	Carrigtwohill URDF Initiative	13:00	14:28
07/12/2022	Glounthaune Estuary / Slatty Water	14:40	16:05
07/12/2022	Brown Island North	16:11	17:05
11/12/2022	Carrigtwohill URDF Initiative	10:30	11:30
11/12/2022	Glounthaune Estuary / Slatty Water	11:40	12:16
11/12/2022	Brown Island North	16:10	16:50
29/12/2022	Carrigtwohill URDF Initiative	11:57	13:00
29/12/2022	Glounthaune Estuary / Slatty Water	13:41	15:20
29/12/2022	Brown Island North	16:23	16:55
16/01/2023	Carrigtwohill URDF Initiative	13:18	14:14
16/01/2023	Glounthaune Estuary / Slatty Water	14:28	15:40
16/01/2023	Brown Island North	16:30	17:20
24/01/2023	Carrigtwohill URDF Initiative	10:22	10:53
24/01/2023	Glounthaune Estuary / Slatty Water	11:25	12:12
24/01/2023	Brown Island North	15:58	17:23
15/02/2023	Carrigtwohill URDF Initiative	13:20	14:24
15/02/2023	Glounthaune Estuary / Slatty Water	15:06	16:00
15/02/2023	Brown Island North	17:40	18:00
26/02/2023	Carrigtwohill URDF Initiative	11:20	12:15
26/02/2023	Glounthaune Estuary / Slatty Water	12:21	13:00
26/02/2023	Brown Island North	17:56	18:20

The timings for the Carrigtwohill URDF Initiative survey area do not include the train trips that were taken, which provided views of fields adjacent to the railway line (see Section 2.4).

Table 2.2. Tide and sunset.

Date	High tide	Low tide	Sunset
18/11/2022	12:50	19:32	16:39
07/12/2022	17:01	11:20	16:23
11/12/2022	19:17	13:36	16:22
29/12/2022	10:08	16:49	16:30
16/01/2023	11:55	18:43	16:53
24/01/2023	19:38	13:55	17:06
15/02/2023	12:20	19:12	17:47
26/02/2023	09:42	16:19	18:07

2.4. SURVEY METHODS

I carried out the survey from suitable vantage points on the public roads around the survey area. On all but the first survey, I also took the train between Midleton and Glounthaune before, or after, the survey, which provided views of some fields in the Carrigtwohill URDF Initiative lands next to the railway that had limited visibility from the roads.

On each survey, I recorded all observations of waterbirds and raptors in field habitats in the Carrigtwohill URDF Initiative and Glounthaune Estuary / Slatty Water survey areas. The Glounthaune Estuary / Slatty Water survey area included some sectors with mixture of field and wetland habitat (HIW, LIEF and SP); in these sectors, I only counted waterbirds in the field sections.

During the Brown Island North roost counts, I carried out repeat counts of the roosting Curlew at 10-15 minute intervals.

I recorded the time of each observation and classified the behaviour of the birds using the categories in Table 2.3. I mapped the locations of all the flocks of field-feeding waterbirds that I recorded.

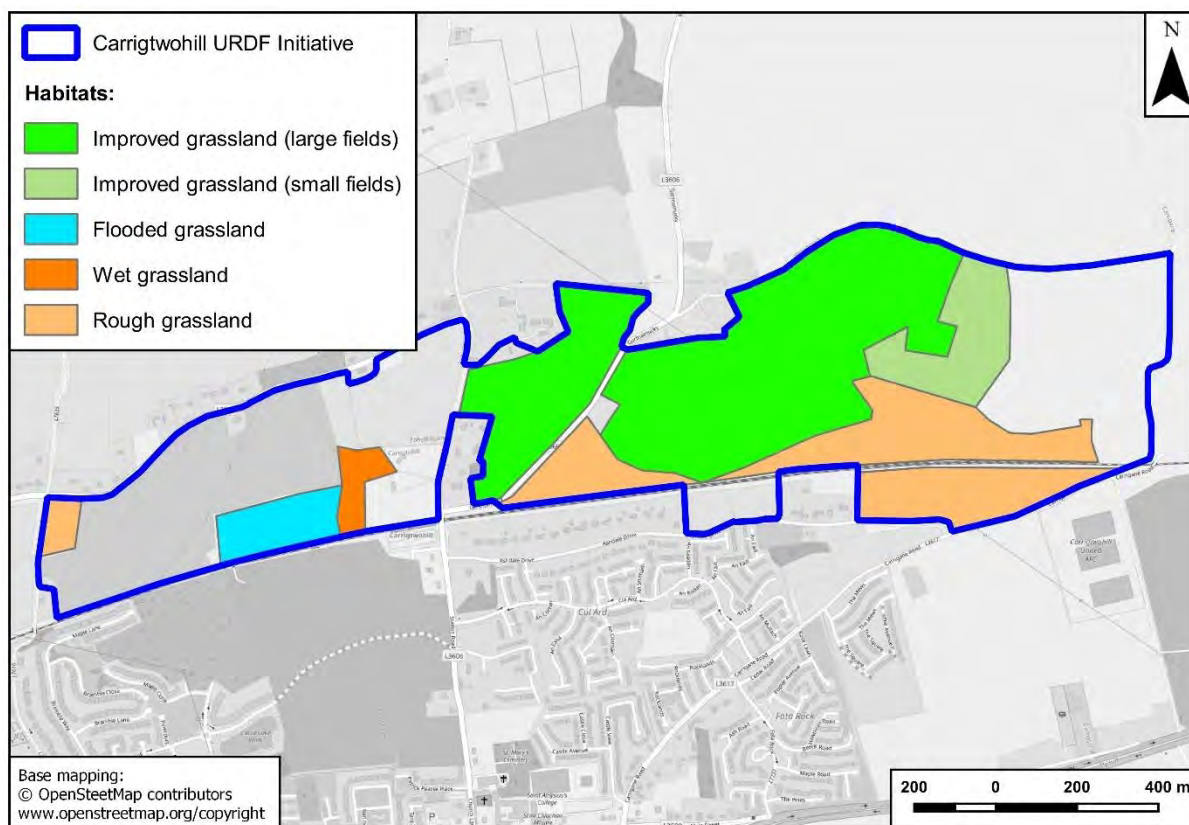
Table 2.3. Behavioural categories used for the waterbird survey.

Category	Behaviour
F	Feeding
R	Non-feeding behaviour, excluding Y1, Y2 and H categories
Y1	Flying bird that is using the sector: e.g., a bird that was present in the site, but flew off before its behaviour could be categorised
Y2	Flying bird that is not using the sector: e.g., a bird commuting across the sector
H	Bird flushed by the observer before its behaviour was categorised

3. RESULTS

3.1. HABITATS

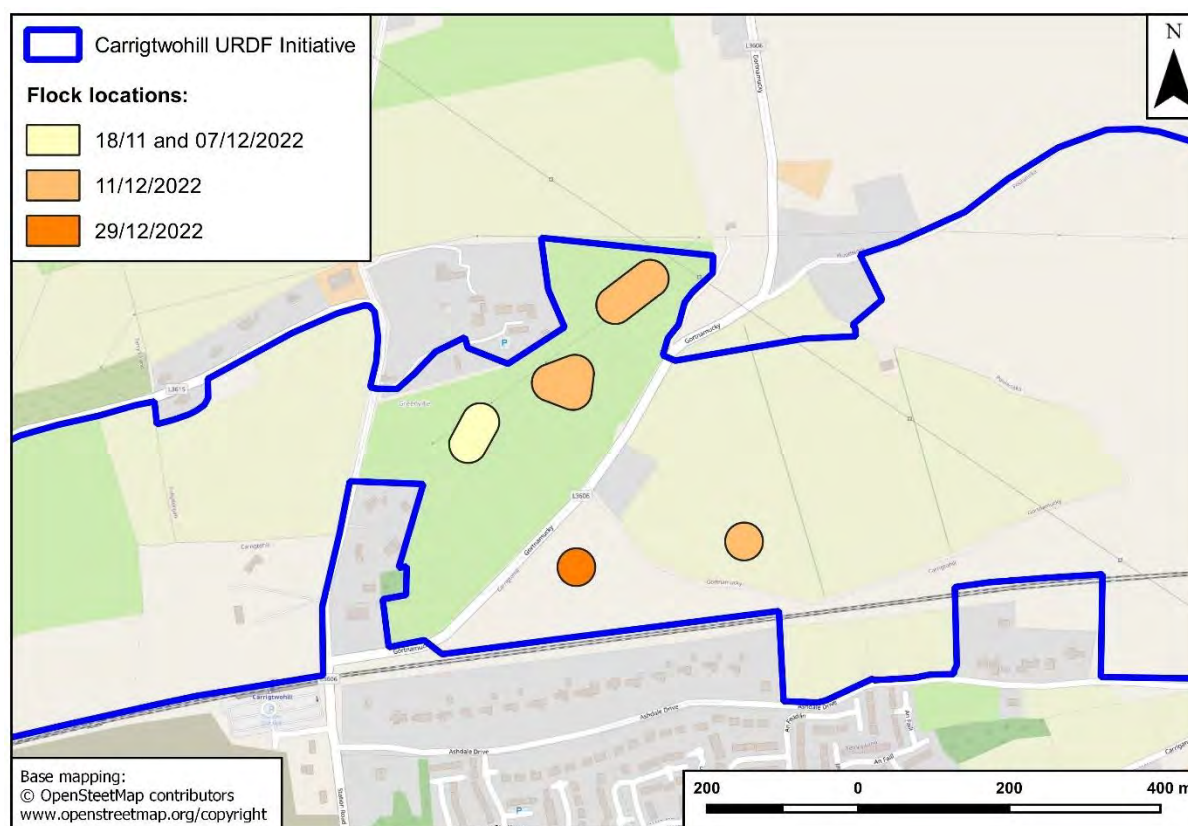
The main field-feeding waterbird species likely to occur in this area favour large open fields of improved grassland. This habitat occurred in the central-eastern section of the Carrigtwohill URDF Initiative lands (Map 3.1). At the eastern end of this section there were some smaller fields of improved grassland enclosed by tall hedges / treelines. The easternmost and most of the western sections of the UEA lands were occupied by arable land. In the eastern section, rough grassland occurred along the railway line. In the western section there was a field with pools of flood water next to the railway line, and another field of *Juncus*-dominated wet grassland next to it.



Map 3.1. Grassland habitats in the Carrigtwohill URDF Initiative lands.

3.2. CURLEW

I recorded field-feeding Curlews in the Carrigtwohill URDF Initiative lands on the first four surveys, but not on any of the subsequent surveys (Table 3.1). The numbers peaked at 86 on 7th December. Most of the records came from one area in the central part of the Carrigtwohill URDF Initiative lands, in a triangular group of fields enclosed by the two roads that fork from the Station Road after it crosses Barry's Bridge (Map 3.2). On 11th December, I also recorded the same flock in the large field across the road to the east (Map 3.2). On 29th December, I only recorded a single Curlew in the Carrigtwohill URDF Initiative lands and this bird was in the smaller field of rough grassland just to the east of Barry's Bridge (Map 3.2).



Map 3.2. Locations of field-feeding waterbird flocks recorded in the Carrigtwohill URDF Initiative lands.

Table 3.1. Summary of Curlew counts in the three survey areas.

Date	UEA	GSW	BN
18/11/2022	16	9	115
07/12/2022	22	42	172
11/12/2022	86	7	174
29/12/2022	1	101	105
16/01/2023	0	66	96
24/01/2023	0	58	245
15/02/2023	0	58	9
26/02/2023	0	28	55

I recorded field-feeding Curlews in the Glounthaune Estuary / Slatty Water survey area on all the survey dates (Table 3.2). The numbers peaked at 101 on 29th December. The highest counts and most frequent records came from the LIEF and WIF sectors, while there were no records from the HIW or SF sectors.

The Brown Island North roost counts peaked at 245 Curlews on 24th January, while I only recorded 9 Curlews on the roost count on 15th February. On the latter date, I checked the alternative roost sites in the upper part of Slatty Water and at Harper's Island South, but these were unoccupied.

On 11th December, when the peak Curlew count occurred in the Carrigtwohill URDF Initiative lands, that count represented just under half of the Brown Island North roost count.

The Brown Island North roost counts on 7th and 29th December coincided with evening high tides, which might be expected to result in higher counts due to the presence of non-field-feeding birds. However, the roost counts were not particularly high on either date. On 7th December, around two-thirds of the roosting Curlew were in Harper's Island Wetlands.

Table 3.2. Summary of Curlew counts in the Glounthaune Estuary / Slatty Water survey area.

Date	BC	WIF	SP	LIEF
18/11/2022	0	9	0	0
07/12/2022	0	42	0	0
11/12/2022	0	0	7	0
29/12/2022	0	23	40	38
16/01/2023	0	51	0	15
24/01/2023	18	0	0	40
15/02/2023	0	3	0	55
26/02/2023	22	1	0	5

There were no records from the HIW or SF sectors.

3.3. BLACK-TAILED GODWIT

I recorded field-feeding Black-tailed Godwits in the Carrigtwohill URDF Initiative lands on two dates: 38 on 11th December and 1 on 29th December. On both occasions, the Black-tailed Godwits occurred with the Curlews (see above).

I recorded field-feeding Black-tailed Godwits in the Glounthaune Estuary / Slatty Water field sectors on six dates. The peak numbers occurred on 18th November when there were 610 Black-tailed Godwits in the WIF sector. The overall pattern of usage was variable, with no one sector being regularly used. However, I did not record any field-feeding Black-tailed Godwit in the SF sector.

Table 3.3. Summary of Black-tailed Godwit counts in the Glounthaune Estuary / Slatty Water survey area.

Date	BC	WIF	SP	HIW	LIEF	Totals
18/11/2022	0	610	0	0	0	610
07/12/2022	400	0	12	0	0	412
11/12/2022	0	0	0	0	0	0
29/12/2022	0	7	40	0	58	105
16/01/2023	0	0	0	0	0	0
24/01/2023	0	0	0	32	0	32
15/02/2023	0	0	0	0	148	148
26/02/2023	0	0	0	0	4	4

There were no records from the SF sector.

3.4. OYSTERCATCHER

I did not record any field-feeding Oystercatchers in the Carrigtwohill URDF Initiative lands. Small numbers of field-feeding Oystercatchers occurred in the Glounthaune Estuary / Slatty Water field sectors on three dates with a peak count of 18 in the SP sector on 19th December. There were Oystercatcher roosting flocks at Brown Island North on 11th December and 24th January, although these may not have involved field-feeding birds.

3.5. OTHER WATERBIRDS

Records of single Black-headed Gulls on two dates were my only records of other waterbird species in the Carrigtwohill URDF Initiative lands.

I recorded four other waterbird species in the Glounthaune Estuary / Slatty Water field sectors: Mute Swan, Little Egret, Lapwing and Black-headed Gull.

Table 3.4. Records of other waterbird species in the Carrigtwohill URDF Initiative lands, and in the Glounthaune Estuary / Slatty Water field-feeding sectors.

Species	Sector	Details
Mute Swan	WIF	3 birds on 11/12/2022 and 29/12/2022
Little Egret	BC	9 birds on 18/11/2022
Lapwing	LIEF	Flock of 22 roosting on 29/12/2022
Lapwing	HIW	Flocks of 56 on 18/11/2022 and 140 on 29/12/2022
Black-headed Gull	BC	Flocks 26 on 18/11/2022 and 200 on 07/12/2022; both feeding
Black-headed Gull	UEA	Single birds on 07/12/2022 and 11/12/2022

4. CONCLUSIONS

4.1. GENERAL

The Carrigtwohill URDF Initiative lands are over 1 km from the nearest estuarine area (the upper end of Slatty Water). The wader populations in Cork Harbour that make significant use of non-adjacent agricultural land are Oystercatcher, Golden Plover, Lapwing, Curlew and Black-tailed Godwit. In addition, the heron (Little Egret and Grey Heron) and the gull populations of Cork Harbour make significant use of non-adjacent agricultural land.

The Cork Harbour Oystercatcher, Curlew and Black-tailed Godwit populations favour intensively managed grasslands, although Curlew may occur in rougher grasslands than the other two species. For all three species, grasslands probably support significant proportions of the Cork Harbour populations.

The large fields of improved grassland in the central-eastern section of the Carrigtwohill URDF Initiative lands provide the best potential habitat for field-feeding waders. The arable fields may be used by gulls at times (e.g., when recently ploughed), and also provide potential habitat for Golden Plover and Lapwing. I did not record any waterbirds in the flooded field next to the railway line in the western section. However, it may support small numbers of cryptic species such as Snipe.

The usage of the fields in the Carrigtwohill URDF Initiative lands by field-feeding waterbirds is likely to vary from year-to-year, with changes in agricultural land use and the effects of weather on food resources and feeding conditions.

4.2. CURLEW

The field-feeding Curlew in Cork Harbour feed on fields during the day and roost in estuarine areas at night. There are at least seven regularly used Curlew nocturnal roosts around the harbour. Based on roost counts, compared to I-WeBS counts, I have previously estimated that around half of the Cork Harbour Curlew population use grassland habitats in mid-winter. However, field-feeding is a strategy that estuarine waders generally exploit when the estuarine food resources are depleted below a certain level. Given the long-term reduction in Curlew populations in Cork Harbour, the importance of field-feeding for the Curlew population may be decreasing.

I have previously observed Curlew flocks commuting across the Elm Tree skew bridge to/from the Brown Island North roost, indicating the potential for field-feeding Curlew to use fields within the Carrigtwohill URDF Initiative lands. In the present survey, field-feeding Curlew used one area of fields within the middle of the Carrigtwohill URDF Initiative lands in November and December 2022, but there were no records in January and February 2023. This pattern of occurrence is probably quite typical for Curlew, and other field-feeding waders. Presumably the birds were exploiting a concentration of food resources in one area and abandoned the area when these resources had been depleted.

The peak count of 86 Curlew on 11th December probably represented around half of the local field-feeding population, as indicated by the Brown Island North roost count. However, the Brown Island North roost counts were quite variable. This variability did not appear to be due to increased number of non-field-feeding Curlew on days with evening high tides. It is possible that field-feeding Curlew may move between roosts depending on the locations of the fields that they are exploiting. In particular, there are alternative nocturnal Curlew roosts at Belvelly (adjacent to the WIF sector) and at Dunkettle.

4.3. OYSTERCATCHER AND BLACK-TAILED GODWIT

Oystercatcher and Black-tailed Godwit are the other two wader species with significant field-feeding populations in the Glounthaune Estuary / Slatty Water area. In particular, flocks of hundreds of Black-tailed Godwit often feed on the field adjacent to Slatty Pool (the SP sector). However, I did not record any Oystercatcher in the Carrigtwohill URDF Initiative lands, and only recorded small numbers of Black-tailed Godwit on two dates. I did record large flocks of Black-

tailed Godwit on two dates in the Glounthaune Estuary / Slatty Water field sectors. However, the incidence of Black-tailed Godwit field-feeding in this area appeared to be relatively low this winter with no records of large flocks from the SP sector during this survey, or on I-WeBS and other counts.

4.4. OTHER SPECIES

Golden Plover and Lapwing wintering populations are largely dependent on agricultural habitats and mainly visit estuarine habitats to roost. However, while large flocks of Golden Plover and Lapwing are fairly regular in the Glounthaune Estuary / Slatty Water, they are rarely (Lapwing) or never (Golden Plover) seen feeding on fields in the immediate hinterland of the estuary. Therefore, it was not surprising that there were no records of these species from the Carrigtwohill URDF Initiative lands. I did record Lapwing from the Glounthaune Estuary / Slatty Water HIW and LIEF sectors. The field sections of the HIW sector were extensively flooded when these records occurred, while the Lapwing flock recorded from the LIEF sector was roosting.

The gull populations in Cork Harbour show complex patterns of field-feeding behaviour. During the day, gulls often move between feeding areas in fields and estuarine areas where they roost and bathe. At night, the gull numbers in the harbour may increase by an order of magnitude, with gulls commuting over a wide area to roost in the harbour. Field-feeding gulls often exploit ephemeral conditions, such as recently ploughed fields. During the present survey, the only gull records were of single Black-headed Gulls on two occasions in the Carrigtwohill URDF Initiative lands, but large numbers of gulls may occur in these lands when suitable conditions arise.

Grey Heron and Little Egret also regularly occur in fields and other non-estuarine habitats around Cork Harbour. However, I did not record either species in the Carrigtwohill URDF Initiative lands.

Several other waterbird species can exploit agricultural habitats in the Cork Harbour area. However, these species generally only use habitats that are immediately adjacent to the estuaries (e.g., Wigeon) or permanently or temporarily flooded habitats (e.g., Teal and Redshank). The Carrigtwohill URDF Initiative lands are over 1 km from the nearest estuarine area (the upper end of Slatty Water), and comprise largely well-drained and sloping ground, which limits the potential usage of the area by these waterbird species. However, there was one field that held pools of flood water (Map 3.1), although I did not record any waterbirds in this field.

Appendix 1 Waterbird Survey Datasets

WATERBIRD SURVEY DATA TABLES ACCOMPANYING THIS REPORT

Filename: Carrigtwohill_2022_23_count_data.csv		
Contents: Waterbird count data		
Field	Data type	Details
Date	Date	Count date
Area	Text	Survey area (see Map 2.1)
Sector	Text	Brown Island North survey area: BN = Brown Island North; HIW = Harper's Island Wetlands Glounthaune Estuary / Slatty Water survey area: see Map 2.1 Carrigtwohill URDF Initiative survey area: no count sectors defined
Roost	Text	Brown Island North survey area: BN1 = Curlew nocturnal roost on the Brown Island North saltmarsh island; HIW1 = Curlew nocturnal roost in Harper's Island Wetlands; X = not at a defined roost site Glounthaune Estuary / Slatty Water and Carrigtwohill URDF Initiative survey areas survey area: X = not applicable
Time	Time	Observation time
Species	Text	BTO species code
Number	Integer	Species count
Behaviour	Text	F = feeding R = roosting H = flushed Y1 = flying (included in count totals) Y2 = flying (not included in count totals)
Quality	Text	Count quality: OK or LOW
DC	Text	Double-count: YES or NO For repeated Curlew roost counts in the Brown Island North survey area, this field can be used to filter out the most accurate final count
Ref	Integer	Reference number for cross-referencing with flock mapping shapefiles; 0 indicates that the observation was not mapped
Notes	Text	Free-form field for any additional notes: e.g., location details, movements, behaviour, etc.

Filename: Carrigtwohill_2022_23_count_details.csv		
Contents: Waterbird count timings and conditions		
Field	Data type	Details
Date	Date	Count date
Area	Text	Survey area (see Map 2.1)
Time_start	Time	Start time of survey area count
Time_finish	Time	End time of survey area count
Waterbirds	Text	YES = waterbirds recorded NO = no waterbirds recorded
Cloud	Integer	Cloud cover during count: 1 = 0-33% 2 = 34-66% 3 = 67-100%

Filename: Carrigtwohill_2022_23_count_details.csv		
Contents: Waterbird count timings and conditions		
Field	Data type	Details
Rain	Integer	Rainfall during count: 1 = no rain 2 = light showers/drizzle 3 = heavy shows/rain 4 = heavy rain
Wind_direction	Text	Compass bearing
Wind_speed	Integer	Beaufort scale
Visibility	Integer	Visibility during count: 1 = good 2 = moderate 3 = poor 4 = very poor
Notes	Text	Free-form field for any relevant additional details: e.g., further details when reduced visibility was recorded

WATERBIRD SURVEY GIS DATASETS ACCOMPANYING THIS REPORT

Filename: CWS_2021_22_survey_areas_polygon.shp		
Contents: Survey areas and count sectors		
Field	Data type	Details
Surv_area	Text	Survey area
Sector	Text	Count sector code; X = no count sectors defined

Filename: Carrigtwohill_URDF_2022_23_flocks_point.shp		
Contents: Waterbird flock locations (point mapping)		
Field	Data type	Details
Date	Date	Count date
Ref	Integer	Reference number for cross-referencing with count data table
Species	Text	BTO species code

Filename: Carrigtwohill_URDF_2022_23_flocks_polyline.shp		
Contents: Waterbird flock locations (line mapping)		
Field	Data type	Details
Date	Date	Count date
Ref	Integer	Reference number for cross-referencing with count data table
Species	Text	BTO species code

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