SCREENING FOR APPROPRIATE ASSESSMENT

Broadmeadow Way Greenway – Ground Investigation Works and Temporary Access Track on Northern Rail Causeway

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Screening for AA Report
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Dublin | Cork | Galway | Sligo
rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
RPS Consulting Engineers Limited, registered in Ireland No. 161581
RPS Planning & Environment Limited, registered in Ireland No. 160191
RPS Engineering Services Limited, registered in Ireland No. 99795
The Registered office of each of the above companies is West Pier Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7

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GLOSSARY

Term	Meaning
Annex I habitat	Habitat types listed on Annex I of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation.
Annex II species	Species listed on Annex II of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation.
Appropriate Assessment (AA)	An assessment carried out under Article 6(3) of the Habitats Directive as to whether or not a proposed development would adversely affect the integrity of a European site.
Biodiversity	The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (UN Convention on Biological Diversity 1992).
Birds Directive	Council Directive 2009/147/EC on the conservation of wild birds.
Catchment	An area of land contributing to a river, lake or other waterbody.
Competent Authority	The term 'Competent Authority' is construed in accordance with section 177S of the Planning and Development Act 2000 as amended. The competent authority is the national, regional or local authority charged with or responsible for consenting, authorising, adopting or deciding to proceed with a plan or project.
Cumulative impacts	The addition of many minor or significant effects, including effects of other plans and projects, to create larger, more significant effects.
Designated sites	Sites which have special status as protected areas because of their natural and cultural importance.
Disturbance	Disturbance caused to species or habitats for which the European site is selected.
Ecology	The study of the inter-relationships between living organisms and their environment.
Effect	The consequence of the impact on the environment.
European Commission	The Commission of the European Communities.
European site	'European site' has the meaning given to it by section 177R of Part XAB. Collective term used when referring to nature conservation sites protected under the Habitats or Birds Directives (Special Areas of Conservation (SAC) or Special Protection Areas (SPA)).
Groundwater vulnerability	Groundwater vulnerability denotes the intrinsic geological and hydrogeological characteristics that determine the ease at which groundwater may be contaminated by human activities.
Habitat	A place in which a particular plant or animal lives. Often used in a wider sense, referring to major assemblages of plants and animals found together such as woodlands or grassland.
Habitats Directive	Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EU Habitats Directive).
Impact	Changes to the environment resulting from the implementation of project.
Indirect impact	Impacts on the environment, which are not a direct result of the project, often produced away from (the site) or as a result of a complex pathway.
Magnitude	The size, extent and duration of an impact.
Monitoring	The observation, measurement and evaluation of environmental data over a period of time, to assess the efficiency of control measures. This is typically a repetitive and continued process carried out during construction, operation or decommissioning of a project.
Natura 2000	The Natura 2000 network is defined under the Habitats Directive 92/43/EEC (Article 3) and the Birds Directive 2009/147/EC (Article 4) as a coherent European ecological network of SACs and SPAs.
Natura Impact Statement (NIS)	'Natura impact statement' shall be construed in accordance with section 177T of the Planning and Development Act 2000 (as amended). The report of a scientific examination of a plan or project and the relevant European sites, to identify and characterise any possible implications for the site in view of the site's conservation objectives, to enable a consent authority to carry out an AA.
Pathway	The route by which an effect is conveyed between a source and a receptor.
Precautionary principle	A principle underlying the concept of sustainable development which implies that prudent action be taken to protect the environment even in the absence of scientific certainty.
Qualifying Interest (QI)	Relates to the habitats and/or (non-bird) species for which an SAC or SPA is selected.
Receptor	The Special Conservation Interests (SCI) of SPAs or QIs of SACs for which conservation objectives have been set for the European sites being assessed.
Screening for Appropriate Assessment	The screening of a plan or project to establish if an appropriate assessment of the plan or project is required. The Screening for AA assesses whether, in view of best scientific knowledge, if the proposed development, individually or in combination with other plans or projects is likely to have a significant effect on a European site.
Significant Effect	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

Term	Meaning
Source	The individual element of the proposed works that has the potential to impact on a European site, its qualifying features and its conservation objectives.
Source-Pathway-Receptor model (S-P-R)	A source-pathway-receptor model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur.
Special Areas of Conservation (SACs)	SACs are sites designated under European Communities Directive 92/43/EEC known as the 'Habitats Directive'. This requires the conservation of important, rare or threatened habitats and species across Europe. SACs are composed of sites hosting the QI habitat types listed in Annex I and/or species listed in Annex II (under Habitats Directive Article 3).
Special Conservation Interest (SCI)	Relates to birds species for which an SPA is selected.
Special Protection Areas (SPAs)	SPAs are sites designated under the European Communities Directive 2009/147/EC, known as the 'Birds Directive', to conserve the habitats of certain migratory or rare birds. SPAs are composed of sites supporting Special Conservation Interests (SCI) comprising Annex I bird species, regularly occurring migratory species and the supporting wetland habitats (under Article 4 Birds Directive).
Water Framework Directive (WFD)	The Water Framework Directive (2000/60/EC) requires all member states of the EU protect and improve the quality of their water within their respective states. This aims to achieve good ecological status of at least good by 2027 at the latest. It applies to rivers, lakes, groundwater, and transitional coastal waters.
Zone of Influence (ZoI)	The zone of influence of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on the QIs of a European site. This should be established on a case-by-case basis using the S-P-R framework (Office of the Planning Regulator (OPR), 2021).

1 INTRODUCTION

1.1 Scope of Report

RPS have been commissioned by Fingal County Council (FCC) to prepare a report to inform Screening for Appropriate Assessment (AA). This report will inform FCC's AA Screening of ground investigation (GI) works and a proposed temporary access track from Kilcrea Road to Malahide Estuary, which will enable access for the completion of the ground investigation (GI) works. The GI works will be used to inform the detailed design of the Broadmeadow Way Greenway across Malahide Estuary, which was consented subject to a number of planning conditions, by An Bord Pleanála (ABP) in May 2020 (ABP Reference: YA06F.304624)[1]. The consent was informed by an Environmental Impact Assessment Report (EIAR)[2], AA Screening and Natura Impact Statement (NIS)[3] submitted by FCC. The temporary access track and GI works, which are both subject to assessment in this report, are hereafter referred to as 'the proposed works'.

This report is an examination of whether, in view of best scientific knowledge and applying the precautionary principle, the proposed works, either individually or in combination with other plans or projects, is likely to have a significant effect on any European site(s). The assessment will be carried out in accordance with the legal context outlined in **Section 1.21.2.**

1.2 Legislative Context

1.2.1 European Sites

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as "The Habitats Directive", provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of a European Union-wide network of sites known as Natura 2000 (hereafter referred to as 'European sites').

The Natura 2000 network is defined under the Habitats Directive (Article 3) and the Birds Directive 2009/147/EC (Article 4) as a coherent European ecological network of Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SACs are composed of sites hosting the Qualifying Interest (QI) habitat types listed in Annex I and/or species listed in Annex II (under Article 3 Habitats Directive). SPAs are composed of sites supporting Special Conservation Interests (SCI) comprising Annex I bird species, regularly occurring migratory species and the supporting wetland habitats (under Article 4 Birds Directive). The purpose of the network is to enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.

Each European site has assigned Conservation Objectives (CO) and a list of QIs and/or SCI species. The CO concept appears in the eighth recital of Directive 92/43/EEC which reads: "*whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued*". Article 1 then explains that "*conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status*".

The National Parks and Wildlife Service (NPWS) publish COs for European sites on their website. NPWS advise in the general introductory notes of their site-specific CO series publications, that an appropriate assessment based on their "*published conservation objectives will remain valid even if the conservation objective targets are subsequently updated, providing they were the most recent objectives available when*

[1] Broadmeadow Way Greenway Planning Conditions: https://www.pleanala.ie/anbordpleanala/media/abp/cases/orders/304/d304624.pdf?r=029395506030

[2] FCC (2019) Broadmeadow Way Proposed Greenway Between Malahide Demesne and Newbridge Demesne. Volume 2 EIAR – Main Text. Fingal County Council.

[3] FCC (2019) Broadmeadow Way Proposed Greenway Between Malahide Demesne and Newbridge Demesne. Natura Impact Statement in Support of Appropriate Assessment. Fingal County Council.

the assessment was carried out". NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.2.2 Appropriate Assessment

1.2.2.1 European Context

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of European sites (Annex 1.1). Article 6(3) establishes the requirement for AA:

"*Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In 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.*"

Article 6(4) states:

"*If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.*"

1.2.2.2 National Context

The Habitats Directive has been transposed into Irish law by Part XAB of the Planning and Development Act, 2000, as amended and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended. In Ireland, these SAC and SPA sites are included within the meaning of 'European site' as per section 177U of the Planning and Development Act, 2000 as amended and Part 1(2) of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

1.2.3 Role of the Competent Authority

In accordance with subsection 177U(I) of the Planning and Development Act, 2000 as amended, the Screening for AA of an application for consent for proposed GI works shall be carried out by the competent authority, FCC, to assess in view of best scientific knowledge, whether the proposed works, individually or in combination with other plans and projects, is likely to have a significant effect on the European site. This report provides the necessary information to the competent authority in making their determination on the Screening for AA.

2 METHODOLOGY

2.1 Appropriate Assessment Guidance

EU and national guidance exist in relation to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this AA has had regard to the following guidance:

Guidance

- Balmer, D.E., Gillings, S., Caffrey, B.J., Swann, R.L., Downie, I.S. & Fuller, R.J. (2013). *Bird Atlas 2007–11: The Breeding and Wintering Birds of Britain and Ireland*. BTO Books, Thetford.
- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland*. Version 1.2 (Updated April 2022.) Chartered Institute of Ecology and Environmental Management;
- DoEHLG (2009, rev. 2010) *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities.* Department of the Environment, Heritage and Local Government;
- EC (2000). *Communication from the Commission on the Precautionary Principle*. Office for Official Publications of the European Communities, Luxembourg;
- EC (2013). *Interpretation Manual of European Union Habitats*. Version EUR 28. European Commission, Luxembourg;
- EC (2018). *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg;
- EC (2021a) (Amended). *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg. European Commission;
- EC (2021b) (Amended). *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC*. European Commission;
- NPWS (2013a). Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland;
- NPWS (2019a), *The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments* Volume 2. Version 1.0. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland;
- NPWS (2019b), *The Status of EU Protected Habitats and Species in Ireland. Species Assessments* Volume 3, Version 1.0. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland;
- OPR (2021), *Practice Note PN01: Appropriate Assessment Screening for Development Management*. Office of the Planning Regulator, Dublin Ireland.

Legislation

- European Union (Environmental Impact Assessment and Habitats) Regulations 2011 S.I No 473/2011 as amended,
- European Communities (Birds and Natural Habitats) Regulations 2011 S.I No 477/2011 as amended;
- Planning and Development Act 2000, as amended;
- Planning and Development Regulations 2001, as amended; and
- Recent Irish and European case law on the Habitats Directive.

2.2 Stages of Appropriate Assessment

2.2.1 Stage 1: Screening / Test of Significance

This process identifies whether the proposed development is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant effects upon a European site(s) either alone or in combination with other projects or plans.

The Screening for Appropriate Assessment will incorporate the following steps:

1. Determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites;
2. Describing the project or plan;
3. Identifying the European sites potentially affected by the project or plan;
4. Identifying and describing any potential effects of the project or plan on European sites, alone, in-combination and cumulatively with other plans/projects; and
5. Assessing the likelihood of significant effects on European sites.

This AA Screening report is concerned with Stage 1 of the Appropriate Assessment process. The output from this stage is a determination for each European site(s) of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2. The subsequent stages are detailed below.

2.2.2 Stage 2: Appropriate Assessment

This stage considers the impact of the proposed development on the integrity of a European site(s), either alone or in combination with other projects or plans, with respect to: (i) the site's COs; and (ii) the site's structure, function and its overall integrity. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts is undertaken.

The output from this stage is a Natura Impact Statement (NIS). This document must include sufficient information for the competent authority to carry out the appropriate assessment. If the assessment is negative, i.e. adverse effects on the integrity of a site cannot be excluded, then the process must consider alternatives (Stage 3) or proceed to Stage 4.

2.2.3 Stage 3: Assessment of Alternatives

This process examines alternative ways of achieving the objectives of the project that avoid adverse impacts on the integrity of the European site. This assessment may be carried out concurrently with Stage 2 in order to find the most appropriate solution. If no alternatives exist or all alternatives would result in negative impacts to the integrity of the European sites, then the process either moves to Stage 4 or the project is abandoned.

2.2.4 Stage 4: Assessment where Adverse Impacts Remain

This stage includes the identification of compensatory measures where, in the context of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

2.3 Identifying Relevant European Sites

The identification of relevant European sites to be included in this report was based on the criteria provided in OPR (2021), namely:

- Any European site within or immediately adjacent to the project area; and
- Identification of European sites where a Source-Pathway-Receptor (S-P-R) link exists, explained below in **Section 2.3.1**.

2.3.1 Source- Pathway-Receptor Model

The identification of relevant European sites and assessment of likely significant effects of the proposed works on any European site was carried out using the S-P-R model, where:

- A 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features and its COs;
- A 'pathway' is defined as the means or route by which a source can affect the ecological receptor; and
- A 'receptor' is defined as the SCI of SPAs or QI of SACs for which COs have been set for the European site(s) being assessed.

An S-P-R model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of European sites, and their QIs/SCIs, to which the proposed works are linked. These are termed as 'relevant' European sites/QIs/SCIs throughout this report.

2.3.2 Zone of Influence

Determination of the project's Zone of Influence (ZoI) was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to all ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors.

The proximity of the proposed project to European sites, and more importantly QIs/SCIs of the European sites, is of importance when identifying potentially likely significant effects. In accordance with the OPR AA Screening Guidelines (2021), the S-P-R model has been used to identify the ZoI to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g. 15 km), within which all European sites should be considered. This approach follows the DoEHLG 2010 guidance on AA which states that:

"*For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects" (DoEHLG, 2010; p.32, para 1).*

The ZoI of the proposed project on mobile species (e.g. birds, mammals, and fish), and static species and habitats (e.g. saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European site in which they are QI/SCI. The range of mobile QI/SCI species varies considerably, from several metres (e.g. in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of migratory wetland birds). Whilst static species and habitats are generally considered to have ZoIs within close proximity of the proposed project, they can be significantly affected at considerable distances from an effect source; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source.

In particular, hydrological linkages between the proposed works and European sites (and their QIs/SCIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact. Hydrogeological linkages are highly variable based on the characteristics of the groundwater body (GWB), construction methodologies, operational practices, and the presence of groundwater dependant habitats and species.

To this end, the ZoI for this project extends outside of the immediate GI works and proposed access track area to include ecological receptors connected to the project through overlap/intersection, proximity and connectivity through features such as watercourses and waterbodies in addition to potential connectivity through groundwater sources, land and air. The effect pathway and ZoI of each potential source of impact from the proposed works is defined in **Table 3.1**.

2.4 Desk Study

A desk study was carried out to identify all relevant European sites and their associated QI in proximity to the proposed works, by reviewing available literature and online ecological databases. Results were supplemented by citizen science biodiversity records in order to assess the potential for the QI and SCI of European sites to occur within the ZoI of the project, given their ecological requirements identified by Balmer *et al*. (2013) for SCIs, and the NPWS for QIs (NPWS, 2019, Volumes 1, 2 &3).

A number of datasets were consulted in order to identify any relevant SPAs/SACs in the area surrounding the proposed works. A list of rare, protected and invasive species within 5km of the proposed works area was generated from NBDC records, which were reviewed to identify historical records of species listed as QI or SCI for European sites within the ZoI. Desktop studies had particular regard for the following sources:

- Information on the location, nature and design of the proposed project;
- Environmental Protection Agency (EPA) online interactive mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/) for water quality data including surface and ground water quality status, and river catchment boundaries. EPA AA tool was used to determine the flow direction of watercourses into nearby protected sites in order to identify potential pathways for significant effects;
- BirdWatch Ireland (https://birdwatchireland.ie/)
- Mapping of European Site boundaries and Conservation Objectives for relevant sites, available online from the NPWS included site synopsis, Natura 2000 Data form and Conservation Objective Supporting Documents where available (https://www.npws.ie/protected-sites);
- Distribution records for QI and SCI species of European sites held online by the National Biodiversity Data Centre (NBDC) www.biodiversityireland.ie;
- Geohive online Environmental Sensitivity Mapping tool (https://airomaps.geohive.ie/ESM/);
- Geological Survey Ireland (GSI) (https://www.gsi.ie/en-ie/Pages/default.aspx);
- Any local surveys of flora, fauna and habitat available using the Heritage Councils mapping website (https://heritagemaps.ie/WebApps/HeritageMaps/index.html)
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie.

2.5 Field Study

In order to inform the assessment, site-specific surveys were undertaken using professional interpretation and application of the guidance, systems and methods referred to. The NRA's Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009) was also referenced on appropriate survey seasons and methods for many of Ireland's protected species.

Ecological walkover surveys were conducted by RPS ecologists along the proposed route for the Broadmeadow Way Greenway across lands in the townland of Kilcrea, Donabate, Co. Dublin on the 4th and 19th August 2021. The study area was assessed for any signs of, or potential for, protected or notable species, as well as noting any invasive species present along the route. A third walkover survey was conducted along the route of the proposed access track on the 12th October 2021. This survey investigated habitat types, protected and invasive species within the study area, and assessed trees for bat potential.

The data collected during these walkover surveys provided detailed information on the existing environment. The results informed the assessment of potential for QIs/SCIs of European sites to be present within the ZoI of the proposed works and invasive species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, to occur within the vicinity of the proposed works.

2.6 Limitations

The receiving environment (i.e. baseline condition) may naturally vary through seasons and between years (NRA, 2008). This limitation is acknowledged and incorporated into the assessment. Although, the surveys were undertaken at a suboptimal time of year this did not limit the information required to conclude the AA screening.

Sources of desk study information are neither exhaustive nor necessarily easily available, and a reasoned effort was made to obtain ecological data in the public domain to inform the description of the receiving environment and its assessment. Additional information, not in the public domain, is likely to exist. This limitation is acknowledged and incorporated into the assessment.

3 PROJECT DESCRIPTION

3.1 Need for the Proposed Works

The Broadmeadow Way Greenway is a shared cycle/walkway (Greenway) between the FCC owned heritage properties of Malahide Demesne and Newbridge Demesne Regional Parks via the Malahide railway viaduct. The Greenway will form part of the proposed Fingal Coastal Way, a strategic greenway extending along the Fingal coast from Kilbarrack to the county boundary north of Balbriggan. The route will form part of the National Transport Authority's (NTA) Greater Dublin Area Cycle Network. The Greenway was consented by An Bord Pleanála in May 2020 and the consent was informed by an EIAR[4], AA Screening and NIS[5]. Although the Greenway has been assessed and consented, the project has not yet commenced.

There is a requirement for additional GI works to inform the construction and detailed design of the proposed Broadmeadow Way Greenway. These additional GI works had not been envisaged during the consenting of the Greenway project. Therefore, the proposed temporary access track and GI works are being considered together as a "Project" in its own right, with reference as necessary to the consented Greenway project, its EIAR, AA Screening/NIS and associated planning conditions.

As part of the consented development a connecting ramp will be constructed to allow access from the agricultural field (Keeling) to the causeway. In order to access the GI sites, it is proposed to construct a temporary access track that runs from Keeling's farmyard, following an existing unsurfaced agricultural track, to the consented ramp giving access to the corridor of the Greenway. The Keeling's farmyard is accessed via Kilcrea Road which starts at the Donabate Distributor Road.

A detailed description of the proposed works, prepared by RPS Transport team, is included in **Appendix A Design Note – GI Works** (MDT0915-RPS-00-XX-NT-Z-NT0003). The identification of potential impacts and assessment of the likelihood of significance of effects on European site(s) within this report is based upon the information provided in the project description.

3.2 Site Location

The permitted Broadmeadow Way Greenway is c. 6km in length along the Fingal coastal corridor between Malahide and Donabate Peninsula. It will extend from the grounds of Malahide Demesne to the R106 Dublin Road, O'Hanlon's Lane and Bissets Strand in Malahide, cross Malahide Estuary, cross the agricultural land at Kilcrea and terminate at Newbridge Demesne, Donabate.

Aside from road surfaces, much of the proposed greenway base is already in place by way of the weir maintenance access track, which runs from Bissets Strand to the southern abutment of the railway bridge, the shoulder of the northern causeway to the northern estuary bank, and an access track from the River Pill to the Corballis Cottages Road.

Figure 3-1 highlights the location of the proposed GI sites and proposed access track required to enable the completion of the GI works, between Keeling's farmyard (Kilcrea Road) and the consented corridor.

[4] FCC (2019) Broadmeadow Way Proposed Greenway Between Malahide Demesne and Newbridge Demesne. Volume 2 EIAR – Main Text. Fingal County Council.

[5] FCC (2019) Broadmeadow Way Proposed Greenway Between Malahide Demesne and Newbridge Demesne. Natura Impact Statement in Support of Appropriate Assessment. Fingal County Council.

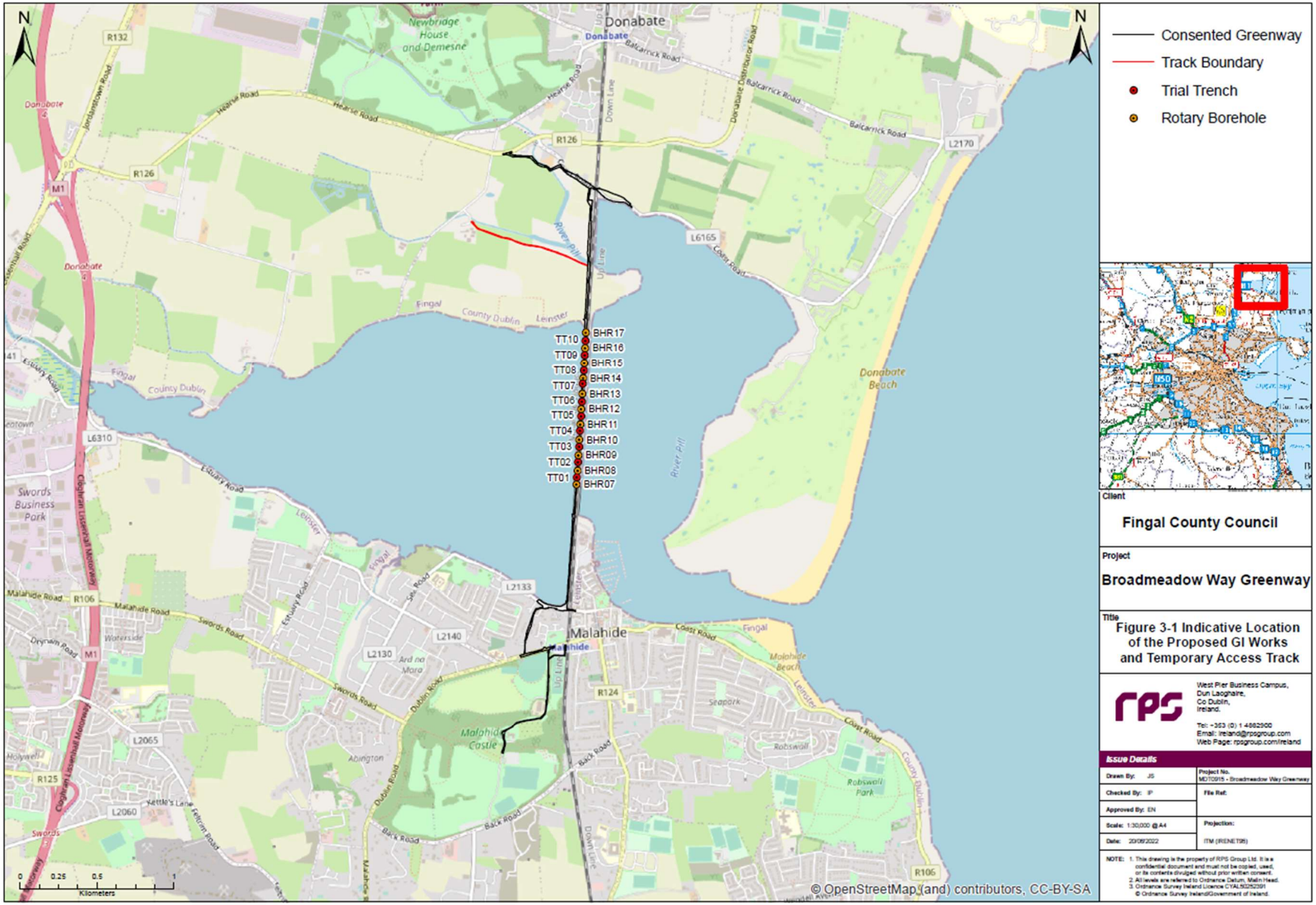

Figure 3-1: Indicative location of the proposed GI works and temporary access track

3.3 Description of European Sites

3.3.1 Assessment of Connectivity

Connectivity is identified via the potential S-P-R model which identifies the potential impact pathways (e.g. land, air, hydrological, hydrogeological pathways etc.) which may support direct or indirect connectivity of the proposed works to European sites and their qualifying features as a result of the proposed works.

Where it is evident that there is no connectivity between the proposed works and the receiving environmental receptors (i.e., European sites and/or features for which the sites are designated), the receptors are excluded from the AA process. Where connectivity exists between the proposed works and receptors, these receptors are taken forward to the assessment of likely significant effects (**Section 5.3**).

3.3.1.1 Identification of potential sources of impact

The proposed works (further detailed in the project description in **Appendix A**) will comprise the construction of a temporary access track and GI works to inform the consented Broadmeadow Way Greenway project. The construction of the proposed access track will involve the laying of a reinforced stone platform directly onto the topsoil. There are two options for this platform, both of which have similar construction methodologies but differ in terms of the reinforcement being used. The two options are:

- Option 1 - Reno mattress with granular stone and geosynthetic (separator); and
- Option 2 - Granular stone and geosynthetic (separator and geogrid).

It is anticipated that the construction of the proposed access track from Keeling's farmyard to the consented Broadmeadow Way corridor will take approximately 3 weeks to complete. The access track will have to be constructed in advance of the GI works to enable access. The timing of this will be agreed with the landowner.

The GI works will comprise rotary drilled boreholes (11 no.) and the excavation of trial trenches (10 no.) along the northern causeway. A number of trial trenches will also be used for in-situ drainage soakaway tests, as appropriate. The GI works are located within an existing operational railway line, but both the drilling rig and excavator will be tracked along the temporary access track from Keeling's farmyard to the consented corridor on the operational railway line. The GI works will be completed over approximately two months and are programmed to be commence in May 2023, which is in line with the An Bord Pleanála conditions for undertaking works outside of the bird overwintering period.

Following the completion of the GI works, the temporary access track will be removed. The surface under the track will be reseeded and reinstated to its original condition. The removal of the access track will take approximately 3 weeks to complete.

The potential impacts arising from the proposed works are as follows:

- Habitat destruction/fragmentation/deterioration;
- Surface water run-off carrying suspended silt and contaminants, such as petrol or diesel, into local watercourses;
- Changes to groundwater quality, yield and/or flow paths associated with the works;
- Noise, vibration, lighting and human presence-related disturbance during movements of vehicles and staff associated with the proposed works;
- Air pollution from releasing dust and vehicle emissions; and
- Disturbance and potential spread of invasive species during the proposed works.

The likelihood of each of the above potential impacts occurring is assessed using the S-P-R model in **Table 3.1**.

3.3.1.2 Identification of potential receptors

Receptor types which are QI/SCIs of European sites with the potential to be affected by the proposed GI works are:

- Marine and coastal habitats;
- Terrestrial habitats;
- Birds;
- Annex II terrestrial mammal species, namely otter;
- Annex II marine mammal species, namely harbour porpoise, bottlenose dolphin, harbour seal and grey seal; and
- Annex II fish species which migrate between freshwater and sea water, namely Atlantic salmon, twaite shad, sea lamprey, river lamprey.

Table 3.1: Zone of Influence for the Proposed Works

Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect
Habitat destruction /fragmentation/deterioration	Land take for the construction of, or access to the proposed development, trimming of trees/hedgerows could remove a viable habitat or cause fragmentation. This can result in interference to feeding routes and waterflow for individual species or/and diminish the quality of the habitat itself.	The proposed works areas are not within a European site and are within and adjacent to an operational railway. However, the proposed works are located directly adjacent to Malahide Estuary, which is designated as an SAC and SPA. The proposed works will not involve any clearance of vegetation or removal of substrate within the European sites. The temporary access track is being constructed along an existing agricultural track to the consented corridor of the Greenway and the proposed GI works will all be undertaken within the existing operational railway. The construction of the temporary access track and the GI works will both take place outside the boundary of both European sites. Therefore, there is no potential for habitat destruction/ fragmentation/ deterioration as a result of the proposed works. Therefore, the effects of habitat destruction/ fragmentation/ deterioration are scoped out from further assessment in this AA Screening.
Surface water run-off carrying suspended silt or contaminants, arising from proposed works, into local watercourses.	Silt, hydrocarbons, and/or other contaminants, such as oils and fuels accidentally released during the proposed works, may enter nearby watercourses and Malahide Estuary through surface water run-off with the potential to impact Annex I habitats.	As a precautionary measure, a reasonable worst-case ZoI for water pollution from proposed works is generally considered to be the downstream surface water catchment. In this case the surface water catchment is defined at the scale of the Transitional or Coastal Water Body with which run-off may interact. These are Broadmeadow Water Transitional Waterbody and Malahide Bay Coastal Waterbody, which are both within the Malahide Bay SPA and SAC. The proposed works are located adjacent to Malahide Estuary SAC and SPA and in close proximity to the River Pill, which discharges into the estuary. Therefore, there is direct hydrological connectivity to European sites.
Changes to groundwater quality, yield and/or flow paths associated with the works	The proposed works may result in silt, oil and/or other pollutants entering the underlying GWB. This could interfere with groundwater quality, yields and/or flow paths, potentially affecting the water quality or habitats dependent on groundwater supply.	Hydrogeological linkages between a proposed development and European site (and their QIs/SCIs) are highly variable based on the characteristics of the groundwater body and SI methodologies, and the presence of groundwater dependant terrestrial habitats and species. The proposed temporary access track is underlain by the Swords GWB (IE_EA_G_011)[6]. Groundwater flow direction within the Swords GWB is towards the coast (i.e. the Irish Sea) or towards overlying

[6] Geological Survey of Ireland (GSI) Groundwater Data Viewer ArcGIS Web Application

Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect
		rivers[7]. Groundwater flow likely discharges directly into Malahide Estuary/Dublin Bay and indirectly via the Pill River. The proposed track will be laid onto the existing ground surface and will not involve digging or drilling into the underlying GWB. The proposed GI works along the existing railway line are not within a groundwater body, so hydrogeological connectivity from these works is ruled out. As there is no pathway for effects on groundwater from the proposed temporary access track, hydrogeological connectivity is ruled out and is not included within the ZoI. The effects of changes to groundwater quality, yield and/or flow paths are therefore scoped out from further assessment in this AA Screening.
Noise, vibration, lighting and human presence-related disturbance	Noise or other construction-related disturbance could reduce the ability of populations of QI/SCI species to forage, roost or breed.	There is potential for effects from disturbance via noise, vibration, lighting and human presence as a result of the proposed works to impact on some of the site selection features of surrounding European sites. Disturbance is defined in in the general context as discrete events that disrupt ecosystem, community or population structures or in some way alter resource levels i.e. food and space (Cutts et al., 2009). The ZoI for disturbance varies by species. Effects are generally assessed within 500m of a proposed development footprint for wintering birds (see Madsen, 1985; Smit & Visser,1993; and Rees et al., 2005). However, distance can be significantly lower (e.g., 150 m for otter underground sites (NRA, 2006), or higher (e.g., hen harriers may take flight when nesting at up to 750m from disturbance (Whitfield et al., 2008)). The proposed works are located directly next to Malahide Estuary, which is designated as an SAC and SPA. There are no QI species associated with the SAC, so disturbance effects on non-bird species are scoped out from further assessment. There are 14 SCI birds associated with Malahide Estuary SPA. Given the small-scale and localised nature of the proposed works adjacent to an operational railway line and close to an urbanised centre with similar disturbance already present, it is considered proportionate to limit the ZoI to 500m to capture birds most likely to be present within the immediate vicinity of the proposed works.

[7] GSI (n.d.) Swords GWB: Summary of Initial Characterisation. https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/SwordsGWB.pdf

Source of Potential Effect	Description of Effect Pathway	Potential Zone of Influence of Effect
Air pollution from releasing dust and vehicle emissions	Air pollution from construction activities may affect the sensitive habitats in the vicinity of the works. Dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration, or particles falling into water can result in fine silt/sediment becoming suspended in the water.	The potential distance for significant vegetation effects from the source on major construction sites is 25m and 10m from minor sites, and soiling can occur up to 100m, 50m and 25m from major, moderate and minor construction sites respectively (NRA, 2011). The principal pollutants of concern which originate from construction plant and road vehicles are the nitrogen oxides (NOx), in terms of impact on sensitive ecosystems. Nitrogen oxides (NOx) may have a positive or negative impact by acting as a fertiliser or a phytotoxicant. Effects are mainly on vegetation growth, photosynthesis, and nitrogen assimilation/metabolism. Due to the location of the proposed works in close proximity to European sites, air pollution from construction activities may affect the sensitive habitats in the vicinity of the works. However, the proposed works are located adjacent to an existing operational railway line and close to an urban environment. Therefore, given the location and relatively small scale of the works, emissions released from construction activities during the proposed works are unlikely to increase existing background levels. Furthermore, the estuarine nature of the surrounding environment is already characterised by a high level of sediment and any dust or particles falling into water will not be significant. Therefore, the effects of air pollution are scoped out from further assessment in this AA Screening.
Disturbance and potential spread of invasive species during the proposed works	Construction activities could lead to the dispersal of scheduled invasive species either via machinery, materials, clothing or wild animals.	The ZoI of effects for spread of terrestrial invasive species is difficult to accurately estimate, as plant fragments may be spread on tyre treads to distant unrelated sites. In relation to water-borne spread of vegetation, the ZoI generally is restricted to the surface water Catchment Management Unit. The proposed works are adjacent to the Malahide Estuary SAC and SPA, so there is a potential effect pathway for invasive species to spread into the European sites. Under Regulation 49(2) of the 2011 Regulations, it is an offence to plant, disperse, allow or cause to disperse, spread or otherwise cause to grow in any place, any plant included in Part 1 of the Third Schedule without a licence from the Minister for Arts, Heritage and the Gaeltacht.

Based on the results of **Table 3.1**, the ZoI of effects of the proposed project have been identified as:

- The surface water catchment (Broadmeadow Water Transitional Waterbody and Malahide Bay Coastal Waterbody) downstream of the proposed works, for potential surface run-off effects and spread of invasive species; and
- 500m from proposed works for noise, vibration, lighting and human presence-related disturbance on SCI birds of Malahide Estuary SPA.

3.3.2 European Sites within the Zone of Influence

Based on the above ZoI of effects, the following European sites have been identified as relevant:

- Malahide Estuary SAC (Site code: 000205); and
- Malahide Estuary SPA (Site code: 004025).

The S-P-R model was used to identify the European sites that could potentially be impacted by the proposed works and these sites will therefore be "screened in" for further assessment in this report (**Table 3.2**). The location of the proposed works and their connectivity to European sites is shown in **Figure 3-2**.

Table 3.2: European sites identified by the Source-Pathway-Receptor model

Site Name & Code	SCI/QI Habitats and Species (*=Priority Habitat)[8]	Distance from Proposed GI works[9]	Connectivity (S-P-R)	Considered further in Screening
Malahide Estuary SAC (000205), Specific CO's, Version 1, 27/05/13 (NPWS, 2013b)	• Mudflats and sandflats not covered by seawater at low tide [1140] • *Salicornia* and other annuals colonising mud and sand [1310] • *Spartina* swards (Spartinion maritimae) [1320] • Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] • Mediterranean salt meadows (Juncetalia maritimi) [1410] • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] • Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]*	Within 3m	**Yes** The proposed GI works along the railway bridge across the estuary are less than 3m from Malahide Estuary SAC. The proposed temporary access track from Keeling's farmyard to the consented Greenway corridor is approximately 30m from the SAC and is also in close proximity to the River Pill, which discharges directly into Malahide Estuary. Therefore, there is hydrological connectivity between the proposed works and Malahide Estuary SAC.	**Yes**
Malahide Estuary SPA (004025), Specific CO's, Version 1, 16/08/13 (NPWS, 2013c)	• Great Crested Grebe (*Podiceps cristatus*) [A005] • Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Pintail (*Anas acuta*) [A054] • Goldeneye (*Bucephala clangula*) [A067] • Red-breasted Merganser (*Mergus serrator*) [A069] • Oystercatcher (*Haematopus ostralegus*) [A130] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa limosa*) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Redshank (*Tringa totanus*) [A162] • Wetlands [A999]	Within 3m	**Yes** The proposed GI works along the railway bridge across the estuary are less than 3m from Malahide Estuary SPA. The proposed temporary access track from Keeling's farmyard to the consented Greenway corridor is approximately 30m from the SPA and is also in close proximity to the River Pill, which discharges directly into Malahide Estuary. Therefore, there is hydrological connectivity between the proposed works and Malahide Estuary SPA. Furthermore, due to the proximity of the proposed works area to the SPA, there is a possibility that the proposed works could disturb the foraging, nesting and roosting habitat and behaviours of SCI bird species through noise, vibration and human presence-related disturbance.	**Yes**

[8] Sourced from Site Synopsis Form for each European Sites NPWS website, accessed March 2022

[9] Nearest straight-line distance "as the crow flies" measured via distance calculator tools in GIS.

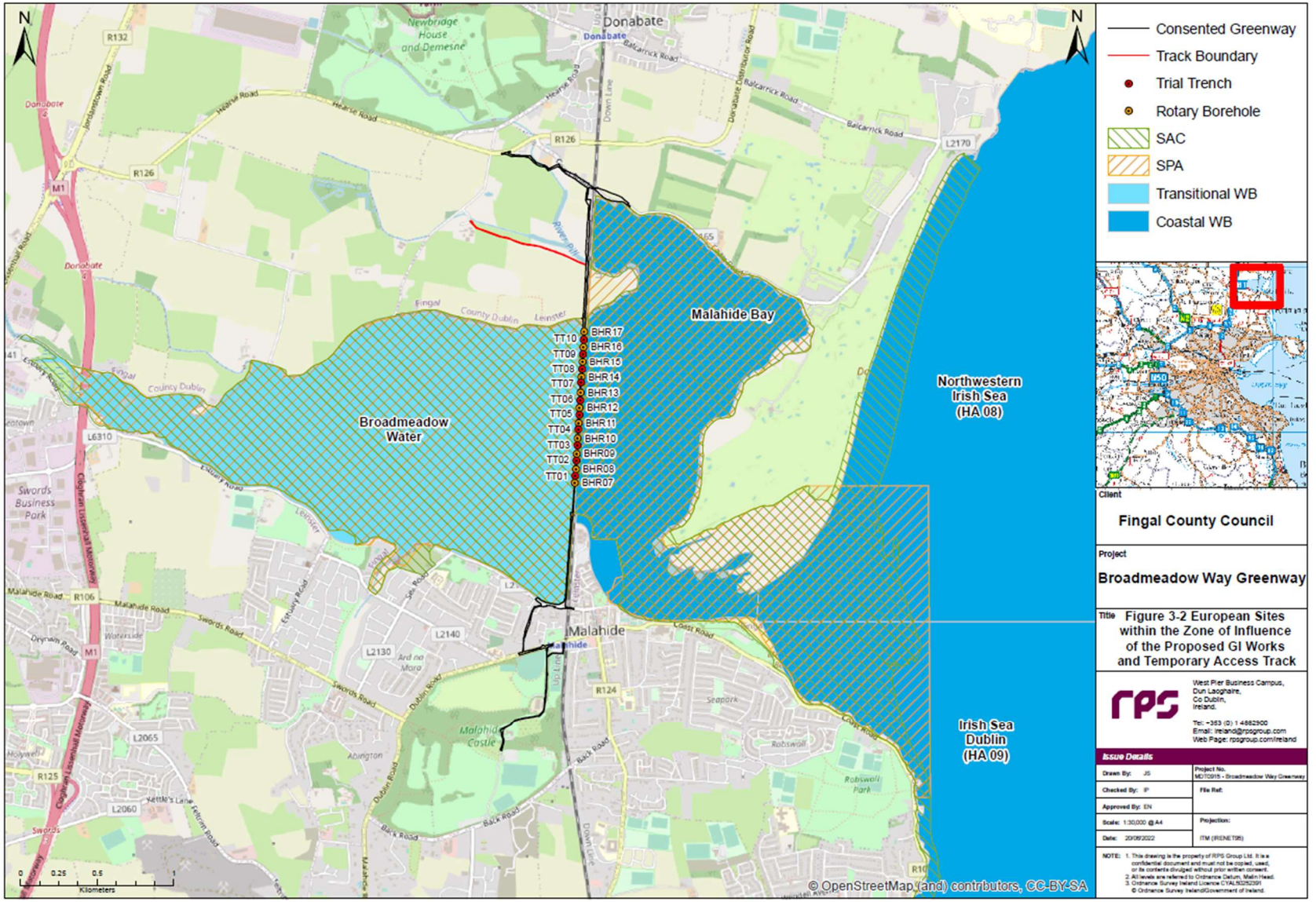

Figure 3-2: European sites within the zone of influence of the proposed GI works and temporary access track

3.3.3 Conservation Objectives of European Sites

The integrity of a European site (referred to in Article 6(3) of the EU Habitats Directive) is determined based on the conservation status of the qualifying features of the European Site(s) as set out above.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as SAC and SPA. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

Favourable conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing; and
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

3.3.3.1 Conservation Objectives of Malahide Estuary SAC (Site Code: 000205)

Site specific COs have been published for the features of qualifying interest of the Malahide Estuary SAC and are available on the NPWS website [10]. In addition, numerous documents supporting the COs for Malahide Estuary SAC are also available[11].

Table 3.3 provides detail on the conservation condition of the QIs of the site as per the Natura 2000 Data Form (NPWS, 2020a) for the site.

Table 3.3: Conservation condition of qualifying interests of Malahide Estuary SAC

Habitat Code	Annex I Qualifying Habitat	Cover (ha)	Representativity[12]
1140	Mudflats and sandflats not covered by seawater at low tide	310.7624	B
1310	Salicornia and other annuals colonising mud and sand	1.92475	A
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	25.14285	A
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	0.6356	C
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	1.7966	B
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	21.373	B

[10] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000205.pdf

[11] https://www.npws.ie/protected-sites/sac/000205

[12] Representativity gives a measure of 'how typical' a habitat type is. Representativity is ranked on a scale from A to D as follows; A - Excellent, B -Good, C – Significant and D - Non-significant.

3.3.3.2 Conservation Objectives of Malahide Estuary SPA (Site Code: 004025)

Site specific COs have been published for the features of qualifying interest of the Malahide Estuary SPA and are available on the NPWS website[13]. In addition, numerous documents supporting the COs for Malahide Estuary SPA are also available[14].

Table 3.4 provides detail on the conservation condition of the SCIs of the site as per the Natura 2000 Data Form (NPWS, 2020b) for the site.

Table 3.4: Conservation condition of the special conservation interests of Malahide Estuary SPA

Species Code	Special Conservation Interest Species	Population Significance[15]
A005	Great crested grebe (*Podiceps cristatus*)	C
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	B
A048	Shelduck (*Tadorna tadorna*)	B
A054	Pintail (*Anas acuta*)	B
A067	Goldeneye (*Bucephala clangula*)	C
A069	Red-breasted merganser (*Mergus serrator*)	B
A130	Oystercatcher (*Haematopus ostralegus*)	B
A140	Golden Plover (*Pluvialis apricaria*)	C
A141	Grey Plover (*Pluvialis squatarola*)	B
A143	Knot (*Calidris canutus*)	B
A149	Dunlin (*Calidris alpina*)	C
A156	Black-tailed Godwit (*Limosa limosa*)	B
A157	Bar-tailed Godwit (*Limosa lapponica*)	C
A162	Redshank (*Tringa totanus*)	C

3.3.4 Potential Pressures and Threats to European Sites

Table 3.5 and

Table 3.6 present the threats, pressures and activities that represent negative impacts to Malahide Estuary SAC and Malahide Estuary SPA as quoted on the Natura 2000 Data Form for each European site.

Table 3.5 Potential pressures and threats to Malahide Estuary SAC (NPWS, 2020a)

European Site	Threat Code[16]	Threat Type	Rank[17]	i (inside)/ o (outside)/ b (both)
Malahide Estuary SAC	F03.01	Hunting	L	i
	A08	Fertilisation	M	o
	D01.02	Roads, motorways	M	o
	D01.05	Bridge, viaduct	H	i
	J02.01.02	Reclamation of land from sea, estuary or marsh	H	b
	G02.01	Golf course	M	o

[13] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004025.pdf

[14] https://www.npws.ie/protected-sites/spa/004025

[15] Population Significance is this regard relates to the size and density of a species population present within the designated site in relation to that species populations present within the national territory scale. The significance categories are divided into four alphabetised groups: A: 100% >=p>15%; B: 15% >= p> 2%; C: 2% >=p> 0%; D: Non-significant population.

[16] Threat codes sourced from Natura 2000 data form and follow reference list provided on threats, pressures and activities for European Sites http://cdr.eionet.europa.eu/help/natura2000

[17] H – High, M – Medium, L - Low

	G01.02	Walking, horse-riding and non-motorised vehicles	H	i
	E01	Urbanised areas, human habitation	M	o
	I01	Invasive non-native species	M	i
	G01.01	Nautical sports	H	i
	G01.03	Motorised vehicles	H	i

Table 3.6 Potential pressures and threats to Malahide Estuary SPA (NPWS, 2020b)

European Site	Threat Code[18]	Threat Type	Rank[19]	i (inside)/ o (outside)/ b (both)
Malahide Estuary SPA	E01	Urbanised areas, human habitation	H	o
	J02.01.02	Reclamation of land from sea, estuary or marsh	H	b
	D01.05	Bridge, viaduct	M	o
	D01.04	Railway lines	M	b
	D01.01	Paths, tracks, cycling tracks	H	i
	E02	Industrial or commercial areas	M	o
	G01.02	Walking, horse-riding and non-motorised vehicles	M	i
	G01.01	Nautical sports	H	i
	A08	Fertilisation	M	o
	I01	Invasive non-native species	M	i

[18] Threat codes sourced from Natura 2000 data form and follow reference list provided on threats, pressures and activities for European Sites http://cdr.eionet.europa.eu/help/natura2000
[19] H – High, M – Medium, L - Low

4 RECEIVING ENVIRONMENT

4.1 Habitats within the Study Area

Key habitats and species were identified through the dedicated ecological walkover surveys conducted in August and October 2021 and supplemented with desk study results (**Table 4.1**). The land use in the vicinity of the railway causeway is 'coastal construction'.

Table 4.1: Habitat types and Ecological Valuation

Habitat type	Habitat category (Fossitt, 2000)	Ecological Valuation (NRA, 2009)	Description
Sea Walls, Piers and Jetties	CC1	Local (lower value)	The weir maintenance access track and the northern embankment are typical coastal constructions which are adjacent to the railway causeway to the east. This habitat is partially or totally inundated by sea water at high tide or subject to wetting by sea spray or wave splash.
Spoil and bare ground	ED2	Local (lower value)	This habitat is associated with areas disturbed in the past from weir construction.
Recolonising bare ground	ED3	Local (lower value)	This habitat refers to the areas that were disturbed in the past from weir construction but have not revegetated but became derelict and have been colonised by ruderals or weed plants.
Scrub (WS1)	WS1	Local (Low - Moderate)	Fringes of the higher established railway embankment have become overgrown with brambles. Common components include spinose plants such as bramble (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*) with occasional hawthorn (*Crataegus monogyna*) and some stunted trees, in particular the weedy sycamore.
Improved Grassland	GA1	Local (lower value)	This habitat refers to intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised and is now heavily grazed and/or used for silage making. The dominant species found within this habitat is a good mix of both perennial ryegrass (*Lolium perenne*) and red clover (*Trifolium pratense*). Some other species included hard rush (*Juncus inflexus*), Yorkshire fog (*Holcus lanatus*) and dandelions (*Taraxacum*) were also present throughout the site.
Dry calcareous and neutral grassland	GS1	Local (lower value)	Unimproved or semi-improved dry grassland that is either calcareous or neutral, but not acid. It is associated with low intensity agriculture and typically occurs on free-draining mineral soils of various depths. Dry calcareous and neutral grassland comprises a wide range of grasses and broadleaved herbs.
Drainage Ditch	FW4	Local (lower value)	Located on the northern boundary of the field, as one enters from Kilcrea road. It is a deep u-set cut in ditch, approximately 2 m wide and 2 m deep. It has a silt bottom and good flow in an easterly direction towards the River Pill. Common species found within the ditch included bullrush (*Typha*), float grass (*Glyceria fluitans*) and fools watercress (*Apium nodiflorum*). Some willowherb (*Epilobium*), brooklime (*Veronica beccabunga*) and duckweed (*Lemna*) were also observed. Along the banks there were a number of immature alder trees (*Alnus*). Further along the ditch there is evidence of water fluctuation which would indicate tidal influence due to the grey colour from silt coming in with the tide. Green algae was present at certain points along the ditch. Other species to note include creeping thistle (*Cirsium arvense*), meadowsweet (*Filipendula ulmaria*), common hogweed (*Heracleum sphondylium*) and prickly oxtongue (*Helminthotheca echioides*).
Hedgerows	WL1	Local (higher value)	Intermittent hedgerow ground level hedge with no evidence of management. Dominated by hawthorn (*Crataegus*), ivy (*Hedera*) alongside brambles (*Rubus*) and false brome (*Brachypodium*

			sylvaticum). A second hedgerow is present sitting on a bank, with dominant ivy and hawthorn. Other common species included dogrose (*Rosa canina*), common horsetail (*Equisetum*), grasses and several immature ash (*Fraxinus*). Some mature ash on the southern section of the hedgerow, all trees within the hedgerow have been identified as negligible or low bat potential.
Depositing/ Lowland river	FW2	Local (higher value)	The River Pill flows parallel to the proposed works and discharges directly into Malahide Estuary which is designated as an SAC and SPA.
Scrub	WS1	Local (Low - Moderate)	Fringes of the higher established railway embankment have become overgrown with brambles. Common components include spinose plants such as bramble (*Rubus fruticosus agg*.) and gorse (*Ulex europaeus*) with occasional hawthorn (*Crataegus monogyna*) and some stunted trees, in particular the weedy sycamore.

4.1.1 Qualifying Interest Habitats

The proposed works are located near Malahide Estuary SAC which is designated for a number of coastal – sand dune and saltmarsh QI habitats including the priority 'Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]' habitat. A search of the Environmental Sensitivity Mapping returned the following QI records in proximity to the proposed works:

- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Coastal lagoons [1150]
- Dunes with *Salix* repens ssp. *argentea* (*Salicion arenariae*) [2170]
- Embryonic shifting dunes [2110]
- Estuaries [1130]
- Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]
- Large shallow inlets and bays [1160]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- *Salicornia* and other annuals colonising mud and sand [1310]
- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]
- Spartina swards *(Spartinion martimae)* [1320]

The QI habitats tidal mudflats [1140], *Salicornia* flats [1310], *Spartina* swards [1320], Atlantic salt meadows [1330], Mediterranean salt meadows [1410], shifting dunes [2120] and the priority fixed coastal dunes [2130] are all QIs of Malahide Estuary SAC. In particular, sections of Atlantic salt meadows, *Spartina* swards and *Salicornia* flats are found directly adjacent to the proposed works area, where the River Pill discharges into the estuary.

The proposed temporary access track is located within agricultural grassland which runs adjacent to the River Pill. The consented greenway corridor, between the eastern end of the temporary access track and the railway bridge, will be traversed in order to facilitate the GI works on the northern causeway. This consented section runs parallel to the railway line which is situated on arable land. It is located in an eroded area comprising primarily of grassland habitats with an estuarine influence.

The coastline is considered to be dynamically stable, with natural fluctuations in sediment patterns and distribution of annexed habitats. Lagoons are among the Annex I habitats associated with the estuary. There is a small portion of shingle and gravel shore located on the northern side of the causeway embankment which does not support any QI habitats. Although it is outside of the SAC, it is still considered to have high value and links with Annex I, as it may contain examples of annexed habitat 'annual vegetation of drift lines [1210]'.

4.2 Species within the Study Area

4.2.1 Special Conservation Interests

No dedicated bird survey was carried out in respect of the proposed works. A search of the National Biodiversity Data Centre (NBDC) database found 61 SCI bird species from the preceding 10 years, within 5 km of the proposed works. Of these, 16 are also listed on Annex I of the EU Birds Directive. The closest European site that contains SCI bird species is Malahide Estuary SPA, which is directly adjacent to the proposed works area. Due to the close proximity to this SPA, there are habitats offering significant nesting, refuge and foraging sites for SCI species within the footprint of the proposed works.

Of the species recorded within 5 km of the proposed works, great crested grebe, light-bellied brent goose, shelduck, pintail, goldeneye, red-breasted merganser, oystercatcher, golden plover, grey plover, knot, dunlin, black-tailed godwit, bar-tailed godwit and redshank are SCI species of the Malahide Estuary SPA.

4.2.2 Qualifying Interest Species

As set out above in **Section 3.3.2**, Malahide Estuary SAC is designated for habitats and does not have any QI fauna species associated with it.

4.2.3 Invasive Species

There was no evidence of invasive alien plant or animal species recorded during the ecological walkover survey conducted by RPS ecologists along the proposed access track on 12th October 2021.

A search of the NBDC database was conducted for records of invasive species listed on the Third Schedule to the EC Birds and Natural Habitats Regulations 2011, as amended, within 2km of the proposed works. These species are referred to as 'Third schedule' species. A 2km radius was deemed sufficient in order to determine the potential for invasive plant species to be disturbed within close proximity to the proposed works. Five 'Third schedule' invasive species were identified within 2km of the proposed works, including four invasive plant species and one invasive animal species. A number of other non-Third Schedule listed invasive plant species have also been recorded.

Invasive species recorded on NBDC within 2km of the proposed works are displayed below in **Table 4.2**. The invasive species are classed as *Medium Impact Species* and *High Impact Species* by Kelly *et al.* (2013).

Table 4.2: Invasive Alien Species within 2km of the proposed works

Common Name (*Scientific Name*)	Record Count	Date of Last Record	Risk of Impact	Listed on the Third Schedule	Distance of closest record to proposed works (as the crow flies*)
Canadian fleabane (*Conyza canadensis*)	1	23/08/2017	Medium	No	At one location adjacent to the Island Golf Club, approximately 1.2 km to the east of the proposed works.
Common cord-grass (*Spartina anglica*)	4	20/08/2020	High	Yes	At a number of locations to the east of the railway line, approximately 500 m from the proposed works area.
Eastern grey squirrel (*Sciurus carolinensis*)	8	30/04/2018	High	Yes	Records for grey squirrel are present at numerous locations, with the closest record less than 200 m from the proposed works.
Elminius modestus	1	31/10/2017	Medium	No	Recorded in the middle of Malahide Estuary, approximately 1.2 km from the proposed works.
Field penny-cress (*Thlaspi arvense*)	1	22/06/2020	Medium	No	At one location approximately 770 m east of the proposed works, at Corballis Farm.
House mouse (*Mus musculus*)	1	03/09/2012	High	No	At one location approximately 1.5 km north of the proposed works, adjacent to Newbridge House & Farm.

Common Name (*Scientific Name*)	Record Count	Date of Last Record	Risk of Impact	Listed on the Third Schedule	Distance of closest record to proposed works (as the crow flies*)
Indian balsam (*Impatiens glandulifera*)	1	11/07/2018	High	Yes	Recorded in Newbridge Demesne, approximately 200 m from the proposed works.
Japanese rose (*Rosa rugosa*)	1	20/08/2020	Medium	No	At one location approximately 500 m north of the proposed works, along the Corballis Cottages Road.
Jenkins' spire snail (*Potamopyrgus antipodarum*)	2	31/10/2017	Medium	No	Recorded in Newbridge Demesne and Malahide Estuary, with the closest record approximately 200 m from the proposed works.
Rose-ringed parakeet (*Psittacula krameri*)	1	28/02/2020	High	No	At one location in Malahide town, over 1.5 km to the south east of the proposed works.
Sea-buckthorn (*Hippophae rhamnoides*)	1	19/06/2012	Medium	Yes	Recorded at Malahide Estuary near the Island Golf Club, approximately 500 m to the east of the proposed works.
Three-cornered garlic (*Allium triquetrum*)	6	28/05/2021	Medium	Yes	Recorded in Newbridge Demesne, approximately 200 m north of the proposed works.
Traveller's-joy (*Clematis vitalba*)	1	13/08/2012	Medium	No	At one location at the mouth of the estuary, approximately 600 m to the south east of the proposed works.
Turkey oak (*Quercus cerris*)	1	20/08/2020	Medium	No	At one location across the estuary on the island at Corballis, approximately 1 km from the proposed works.
Wall cotoneaster (*Cotoneaster horizontalis*)	3	23/08/2017	Medium	No	Recorded across the estuary on the island at Corballis, approximately 1 km from the proposed works.

4.3 Existing Water Environment

4.3.1 Surface Water

The study area is located within the Ballough (stream)_SC_010 (08_6) sub-catchment which is part of the Nanny-Devlin (08) catchment. The existing surface water drainage flows freely into the Malahide Bay (IE_EA_060_0000). The proposed works are within the tidal range of this coastal water body. The Coastal Water Body Status (2013-2018) for Malahide Bay is 'Moderate' and identified as 'At risk' of failing to meet its Water Framework Directive (WFD) objectives. Malahide Bay separates the Broadmeadow Water Transitional Water body from The North-western Irish Sea (HA 08) Coastal Water body which is classed as 'High' and identified as 'Not at risk' of failing to meet its Water Framework Directive (WFD) objectives.

To the north, the Lanestown Stream flows parallel to the proposed temporary access track. The Lanestown Stream is a small tributary stream that rises at a small upstream distance of the site which flows into the Turvey River (also known as the River Pill) and ultimately discharges into Malahide Estuary. The River Pill belongs to the WFD waterbody monitoring network and EPA registered waterbody Turvey stream_010, classed as 'poor' WFD status.

There is direct hydrological connectivity between Malahide Estuary SAC and SPA and the proposed works.

5 APPROPRIATE ASSESSMENT SCREENING

5.1 Management of European Sites

Appropriate Assessment screening is not required where the proposed development is connected with, or necessary to the management of any European site. In this case, the proposed development is not directly connected with or necessary to the management of any European site(s).

5.2 Summary of Information Required

The screening assessment for AA follows the methodologies set out in **Section 2**, and analysis of the following information:

- ZoI of effects from the proposed development; and
- Distribution of QIs and SCIs in relation to the ZoI.

5.3 Assessment of Likely Significant Effects

5.3.1 Impacts

As outlined in Table 3.1, the following potential direct and indirect effects during the proposed works are to be assessed for likelihood and significance:

- Surface water run-off carrying suspended silt or contaminants into local watercourses (habitats and birds);
- Noise, vibration, lighting and human presence-related disturbance (birds); and
- Disturbance and potential spread of invasive species during the proposed works.

5.3.2 Significance of Effects on European Sites and Qualifying Interests

5.3.2.1 Surface Water Run-off

There is direct hydrological connectivity between the proposed works and Malahide Estuary SAC/SPA, through the Broadmeadow Water Transitional Water body and Malahide Bay Coastal Water body. The proposed works are also in close proximity to the River Pill, which ultimately discharges into Malahide Estuary. The proposed works will involve the laying of a reinforced stone platform for the temporary access track, ground investigations, excavations and backfilling of material, and associated haulage of stone materials. These construction activities have the potential to generate silt and/or contaminants, such as fuels or oils. Suspended silt and contaminants can potentially cause degradation of water quality and smother or contaminate habitats and associated communities in Malahide Estuary SAC. Surface water pollution can potentially impact the foraging ability of SCI bird species of Malahide Estuary SPA, due to effects on prey species and associated habitats. Marine invertebrates, upon which SCI bird species feed, have been shown to be sensitive to pollution, including heavy metals and hydrocarbons (Dean, 2008).

Therefore, the potential for impacts from surface water run-off carrying suspended silt or contaminants, to the estuary must be assessed.

As stated in the project description, the access track works comprise the laying of reinforced stone platforms and this means there will be no stripping of topsoil to facilitate the access track. The use of a reinforced stone platform provides a more uniform load distribution onto the existing ground which avoids punching failure of stone, limiting the generation of fine material. Furthermore, the stone used will be crushed and processed granular stone, pre-washed at source (e.g. in quarry), that contains minimal fine materials. The use of a heavy-duty separator is included in the project design for the proposed access track, in both option 1 and option 2. This minimises the generation and migration of fine materials from the underlying soil. The project engineers confirm that the implementation of either option for the proposed track will not lead to the generation of silt-laden run-off. Furthermore, as Sustainable Drainage Systems (SuDS) are required as part of the Greater Dublin Strategic Drainage Study (GDSDS, 2005), only residual run-off is predicted during

construction of the access track. This will be intercepted and attenuated by the intervening vegetation that occurs between the proposed access track and the SAC/SPA.

Any run-off from the GI works, in particular that arising from borehole drilling, will be imperceptible in the context of the receiving estuarine environment. In the event that any small amount of silt does enter the estuary, this will not be in large enough quantities to have a significant impact on the food sources of SCI birds associated with Malahide Estuary SPA or on the QI habitats of Malahide Estuary SAC. The proposed works are small scale and temporary. It is anticipated that the vehicles used for the GI surveys on the northern causeway will be small sized plant; e.g. 5 tonne mini digger and similar. The works will involve a small number of machines and therefore a small volume of fuel will be used during the works. Any potential spills can be easily contained within the works area. All works will be undertaken on land, outside the boundaries of designated sites. It is predicted that the likelihood of residual pollution resulting in a likely significant effect to QIs/SCIs is low.

The SAC habitat to the east of the railway embankment has been mapped by NPWS as 'mudflats and sandflats not covered by seawater at low tide' (NPWS, 2013d), within which many SCI bird species forage. The habitat immediately to the west of the embankment has not been mapped by NPWS but based on local knowledge and review of aerial imagery, is expected to be similar, i.e. mudflats and sandflats. The mudflats and sandflats to the east of the embankment have been characterised by NPWS to be composed of 'sand to muddy sand dominated by *Peringia ulvae*, *Tubificoides benedii* and *Cerastoderma edule* community complex'. Other distinguishing species include polychaete worms such as *Hediste diversicolor* (ragworm) and *Scoloplos armiger*, suggestive of a polychaete and oligochaete-dominated, species-poor environment typical of estuarine environments with high resilience and rapid recoverability (Ashley and Budd, 2016).

It is therefore considered that due to the project design and the temporary and localised nature of the proposed works, it is unlikely that excavated silt or contaminants will enter the Malahide Estuary. In the event that any small amounts of silt do enter the estuary, this will not be in large enough quantities to impact the food sources of SCI birds of the SPA or result in significant effects to the adjacent mudflat habitats of Malahide Estuary SAC, which are characterised by a resilient estuarine community type. Due to the small scale of the works relative to the size of the estuary, it is not considered likely that any accidental contamination of surface water would be significant enough to impact QI habitats or SCI bird species indirectly through prey. It is predicted that any effects of surface water run-off will be slight adverse and short term in duration.

Therefore, likely significant effects arising from surface water run-off of suspended silt and contaminants on European sites can be ruled out.

5.3.2.2 Noise, Vibration, Lighting and Human Presence-related Disturbance

Malahide Estuary SPA is designated for the presence of 14 overwintering bird species and the SCI wetland habitat. Therefore, noise, vibration, lighting and human presence could potentially disturb roosting, nesting and feeding SCI birds. The significance of a disturbance event upon waterbirds varies according to a range of factors, including frequency/duration of the event, intensity of the activity and the response of waterbirds (NPWS, 2014c). Where disturbance is heavy or on-going, potential effects include displacement, reduced species fitness and breeding success, with subsequent consequences at population level.

In general, birds are able to see and hear better than humans and are thus, more sensitive to increased light and noise pollution. Light pollution can have a detrimental effect on the reproductive success of avian species (Senzaki *et al*., 2020), however, there will be no light pollution associated with the proposed works, which will take place during daylight hours.

The SCI birds for which Malahide Estuary is designated are all overwintering waterbirds. There are no breeding SCI birds designated for this SPA. As outlined in **Section 3,** the proposed GI works on the existing railway across the estuary will take place outside of the overwintering period, commencing in May 2023. As such, there will be no temporal overlap between the proposed GI works and the presence of overwintering birds and there will be no disturbance effects on the SCI species of Malahide Estuary SPA. While there is a possibility for the construction of the proposed access track to overlap with the overwintering birds season, any potential disturbance and/or avoidance of the area by SCI birds will be temporary. The access track works will take place outside the boundary of the SPA and will be undertaken within a 2 to 3 week period. Should any temporary disturbance occur, there is an abundance of similar habitat in the surrounding area to which these SCI birds will likely move. In addition, the existing environment surrounding Malahide Estuary SPA already has a relatively high level of noise, vibration and human-related disturbance, due to the presence of the existing operational railway line and urbanised areas in the surrounding townlands including

Donabate and Malahide. Birds consistently exposed to high levels of human-mediated disturbance are likely more tolerant to it, as observed in research carried out in Galway Bay (Gittings *et al.*, 2015). As such, it is expected that many of the SCI bird species occurring in Malahide Estuary and surrounding habitats are relatively tolerant of, or habituated to, these kinds of disturbance, should any of the SCIs remain during the proposed works.

It is considered that due to the project design, small scale and short term duration of the works, it is highly unlikely that noise, vibration and human presence-related disturbance will cause significant effects on the overwintering SCI birds of Malahide Estuary SPA.

5.3.2.3 Disturbance and Potential Spread of Invasive Species

The effects of disturbance and potential spread of invasive species during the proposed works, on SCIs and/or QI habitats, have been assessed. The ecological walkover survey conducted by RPS on 12th October 2021 did not identify any invasive plant species along the route of the proposed access track. The desk study identified no records of invasive plant species within the proposed works area. The closest record of Third Schedule invasive plant species, Indian balsam and three-cornered garlic, are at least 200m north west of the proposed temporary access track. These lands will not be traversed during the proposed works, ruling out the potential for disturbance and spread of these invasive plants. The majority of records for other invasive species are located across the Malahide estuary, so there is no pathway for their disturbance and spread during the proposed works.

Therefore, likely significant effects arising from disturbance and spread of invasive species on European sites can be ruled out.

5.3.3 Key Findings

The key findings of this AA Screening Report are that the proposed works are not predicted to result in any likely significant effects to European sites within the ZoI of the works.

5.4 In-Combination Effects

5.4.1 Plans

5.4.1.1 National Development Plan

The National Development Plan (NDP) 2021-2030 (DPER, 2021), which was subject to both SEA and AA, designates a number of National Strategic Outcomes and Priorities of the plan including Enhanced Regional Accessibility, Strengthened Rural Economies and Communities, Sustainable Mobility and Sustainable Management of Water and other Environmental Resources. Under the NDP, the government brought forward a €165 billion investment package up to 2030, towards urban regeneration and development, development of road and rail networks, telecommunications infrastructure and other projects.

These Strategic Priorities carry the potential for in-combination impacts with the proposed works on a variety of potential receptors, through pathways of habitat fragmentation/destruction, increased disturbance, and surface/groundwater pollution. Such individual projects arising from these priorities will, however, be subject to their own AA requirements. The NDP 2021-2030 also sets biodiversity as a priority (i.e. Enhanced Amenity and Heritage – National Strategic outcome 7).

Due to the strategic nature of plans and given the limited scale, extent, and duration of the proposed works, it is considered highly unlikely that the effects of the proposed works will act in cumulation with the National Development Plan 2021-2030 to result in significant effects on any European sites.

5.4.1.2 National Biodiversity Action Plan

The National Biodiversity Action Plan for 2017-2021 (DCHG, 2017) demonstrates Ireland's continuing commitment to meeting and acting on its obligations to protect biodiversity for the benefit of through a series of targeted strategies and actions. The action plan will be updated and replaced for the period 2022-2026. Investment under the NDP is being provided to support the objectives of the National Biodiversity Action

Plan, and its successor plan, including accelerating measures to conserve and restore peatlands and wetlands, combat the spread of invasive alien species, implement Local Biodiversity Action Plans and invest in agri-environment schemes. The overall aim of the plan is to protect biodiversity and to continue and improve the transposition of the EU Habitats Directive and the EU Birds Directive into national legislation.

Due to the strategic nature of plans and given the limited scale, extent, and duration of the proposed works, it is considered highly unlikely that the effects of the proposed works will act in cumulation with the National Biodiversity Action Plan 2017-2021 to result in significant effects on any European sites.

5.4.1.3 The Fingal County Development Plan 2017-2023

The Fingal County Development Plan 2017-2023 (FCC, 2017) highlights a number of potential larger infrastructural projects within the county. Within this Plan, the proposed works area is classified as 'HA – High Amenity'; a class attributed to areas of high landscape value. Two specific objectives are set for this area: Objectives NH51 and NH52. These objectives state the intention of protecting these areas from inappropriate development and that development reflects and reinforces the distinctiveness of these areas, which provide a higher level of protection against the development of large infrastructural projects or developments. The proposed works area is located adjoining '*Preserve Views*' to the south and is described as being within the '*Highly Sensitive Landscape: Naul*'.

An NIS completed of The Fingal County Development Plan 2017-2023 which concluded:

'*As a result of the assessment process, it is concluded that mitigatory measures identified in the stage 2 Appropriate Assessment are adequate to ensure the integrity of the European Sites which will not be significantly affected as a result of the potential impacts of the objectives contained with the Fingal Development Plan*.'

As such, it is considered highly unlikely that the effects of the proposed works will act in cumulation with the Fingal County Development Plan 2017-2023 to result in significant effects on any European sites.

5.4.1.4 Water Quality

The Water Framework Directive (WFD) provides a framework for the protection and improvement of rivers, lakes, marine and groundwaters in addition to water-dependent habitats. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high-water quality status where it exists. The second cycle River Basin Management Plan (RBMP), covering the period 2018 – 2021, sets out a proposed framework for the protection and improvement of Ireland's water environment in line with WFD objectives. The draft third RBMP for Ireland, covering the period 2022-2027, is currently in public consultation and is due to be published in 2022. The objectives of the RBMP are to:

- Prevent deterioration;
- Restore good status;
- Reduce chemical pollution; and
- Achieve water related protected areas objectives.

There are binding obligations on all Irish local authorities, including Fingal County Council, to achieve good status of surface waters, under the terms of the EU Water Framework Directive 2000/60/EC. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of the RBMP and achievement or maintenance of environmental objectives which will be set for the receiving water bodies will have a positive impact on water dependent habitats and species within European sites.

As the overall aim of the RBMP is to protect and improve Ireland's water environment in line with WFD objectives, no negative in-combination impacts with the proposed works are predicted.

5.4.1.5 Projects

Given the relatively small scale, extent and duration of the proposed works, the search area for in-combination plans/projects covered the same geographic scale as the ZoI of the proposed works (i.e.

Malahide Estuary). Those projects which it is understood were consented, but which have already completed works were excluded from the search as these projects are considered to be part of the baseline. Only those projects yet to be undertaken and which therefore could interact with the proposed works were considered.

A search was conducted of planning applications (projects) within the vicinity of the proposed works, using the Fingal County Council planning portal map viewer[20] and the Department of Housing, Planning and Local Government EIA portal map viewer[21]. The search was limited to the five year period preceding the date of issue of this report and excluded retention applications (i.e. typically local-scale residential or commercial developments where an impact has already occurred), withdrawn and refused applications. The search returned mostly one-off housing development applications (with associated waste water treatment facilities) and application for agricultural storage sheds (for both produce and machinery). No relevant in-combination LSEs were identified from these projects.

A search of the An Bord Pleanála website[22] was completed to identify any relevant applications, including Strategic Infrastructure Development (SID) and Strategic Housing Development (SHD) in the past three years, or in close proximity to the proposed development. No relevant in-combination LSEs were identified from these projects.

5.4.1.6 In-combination Conclusion

Having regard for the above, other projects and plans are not predicted to have LSEs on the integrity of any European sites, either alone or in-combination. No significant in-combination effects are predicted to affect the Malahide Estuary SAC and/or the Malahide Estuary SPA, having regard for the legal protection for the Malahide Estuary SAC and/or the Malahide Estuary SPA as European sites (through legislation at national level, and policy initiatives at national, county and local levels).

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6 SCREENING CONCLUSION

RPS has prepared this report to inform Screening for AA report to assess whether the proposed works, including the construction of the proposed access track, and completion of GI works to inform the consented Broadmeadow Way Greenway, individually or in-combination with other plans or projects, and in view of best scientific knowledge, are likely to have a significant effect on any European site(s).

The screening exercise was completed in compliance with the relevant European Commission guidance, national guidance, and current case law. The potential impacts of the proposed works have been considered in the context of the European sites potentially affected, their qualifying interests or special conservation interests and their conservation objectives.

Through an assessment of the S-P-R model, which considered the ZoI of effects from the proposed works and the potential in-combination effects with other plans or projects, it was determined that the proposed works are not likely to have significant effects on European sites and that an Appropriate Assessment is not required.

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Appendix A
Design Note – GI Works

Access for BMW GI Works on Northern Rail Causeway

Introduction

As part of the detailed design of Broadmeadow Way Greenway, geotechnical investigations are required on the existing railway causeway along the Dublin-Belfast rail-line. The geotechnical investigations are proposed on both the southern and northern causeway. The southern causeway runs from Bissetts Strand in Malahide out into Malahide Estuary to the railway viaduct bridge and access to carry out any GI works on this causeway will be from Bissetts Strand on the alignment of the consented Greenway scheme following the existing Irish Rail maintenance track.

The northern causeway extends from the railway viaduct bridge to the northern shore of the estuary in the townland of Kilcrea in Donabate. Currently there is no landward access to the northern causeway at Kilcrea, but to facilitate the GI work a connecting ramp is proposed to be constructed from the agricultural field (Keeling) and the causeway within the Broadmeadow Way site corridor.

In order to construct the ramp, temporary access is needed through the adjacent Keeling landholding (Plot 6). An access track is proposed to run from the Keeling farmyard following an existing established agricultural track to the corridor of the proposed Greenway. Within the Greenway corridor, the construction access track will be constructed along the route through Plot 6 to the northern shore of Malahide Estuary.

Keeling Access Track

The temporary Keeling access track commences at the existing field gate entrance at Keeling's farmyard and runs in an easterly direction along an existing agricultural track. The existing track is unsurfaced and not of a formed construction. The track is formed by agricultural vehicles traversing through the field and the vehicles wheels cutting a path along the existing field surface, refer to Figure 1 to Figure 4. The existing track is not suitable to accommodate a number of construction vehicles travelling in and out and will need to be upgraded to facilitate the works associated with Broadmeadow Way. The proposed access track is designed to accommodate construction vehicles.

The track will remain in place for the duration of the ground investigation, which may be 1 to 2 years.

Figure 1 Existing track in open field adjacent to Keeling farmyard

Figure 2 Existing track at west end of section between tree-lined hedgerows

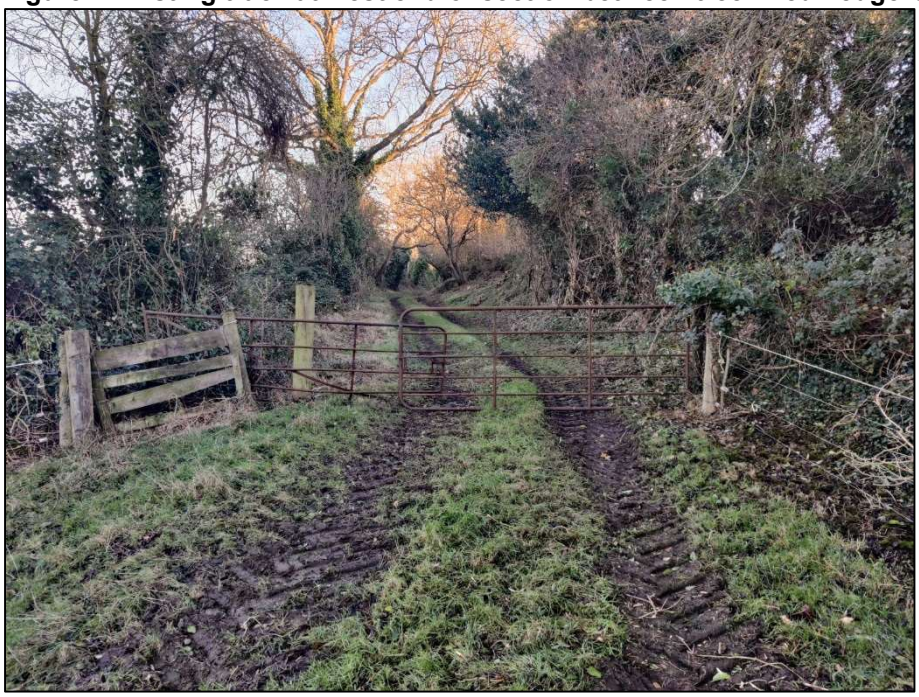


Figure 3 Existing track in open field east of tree-lined hedgerows

Figure 4 Existing track in open field approaching Broadmeadow Way corridor

Existing Ground Conditions along Proposed Access Track

The underlying ground conditions along the proposed access track are shown in

Figure **5** and are summarised below:

- Irish Sea Till derived from Lower Palaeozoic sandstones and shales underlies the proposed route. This generally comprises a competent ground surface.

- Estuarine silts and clays are located to the north of the proposed route. These estuarine deposits represent natural infilling of a relict estuary through which the Pill River flows.

Bedrock which comprises argillaceous bioclastic limestone and shale of the Malahide Formation is at depth, and has no effect on the proposed access track.

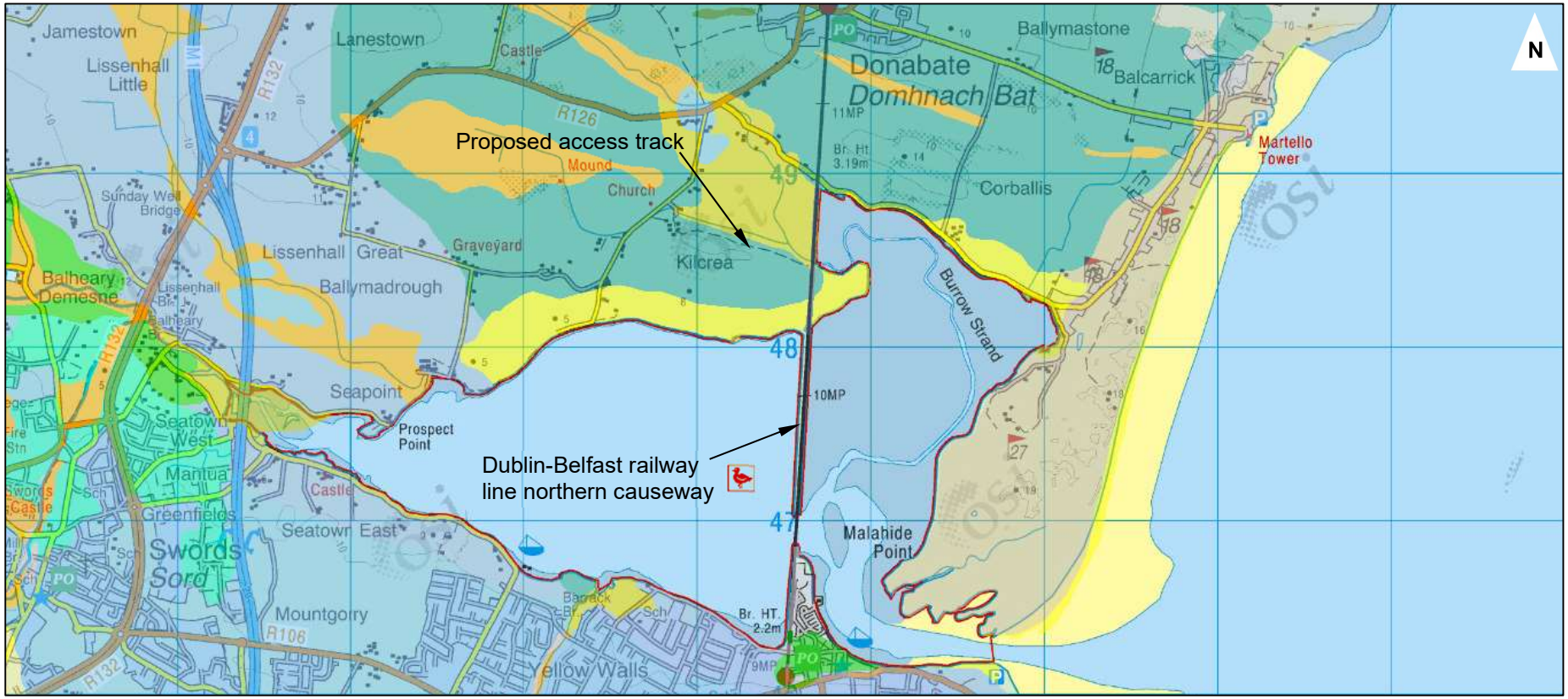
A visual inspection of the route of the proposed access track was carried out by RPS in December 2021. The inspection comprised a walkover and measurement of salient features along the proposed route. The proposed access track is to be constructed at the edge of a hard paved farmyard (at Keelings Farm) and follows an existing unpaved track to the acquired Broadmeadow Way boundary, see

Figure **5**.

A summary of the inspection findings is given Table 1.

The founding conditions for the access track will be directly onto topsoil. Based on the findings of the visual inspection of the route the likely strength of the founding medium (topsoil) would be in the range of CBR 1 to 1.5% (undrained strength of about 25 to 35kPa).

Figure 5 Quaternary deposits and proposed route of access track



Legend

- Alluvium
- Eskers comprised of gravels of basic reaction
- Irish Sea Till derived from Lower Palaeozoic sandstones and shales
- Irish Sea Till derived from Limestones
- Marine beach sands
- Estuarine silts and clays
- Bedrock outcrop or subcrop
- Till derived from limestones
- Urban
- Windblown sands and dunes

Table 1 Summary of inspection findings

Approximate chainage (m)	Length (m)	General Description	Figure
0 to 220	220	Access track starts at farmyard gate (width about 4m) into field with grass cover. Proposed access track passes diagonally across field to a further gate. Gate width about 4m. Ground surface generally level, with existing tractor ruts along track about 50 to 75mm deep. Ground conditions comprise topsoil underlain by Irish Sea Till. Existing track width about 3m.	Figure 1
220 to 420	200	Access track starts at gate into existing unpaved track between tree-lined hedge rows. Proposed access track follows existing track. Ground surface is rutted with existing tractor ruts along track about 100 to 200mm deep. Ground conditions comprise disturbed topsoil underlain by Irish Sea Till. No clearing of existing trees to be carried out with the proposed track to be constructed Existing track width about 3m.	Figure 2
420 to 830	410	Access track starts into field with grass cover. Proposed access track passes across field to a further gate into Broadmeadow Way corridor. Gate width 4m. Ground surface generally level with existing tractor ruts along track about 50 to 75mm deep. Ground conditions comprise topsoil underlain by Irish Sea Till. Slight rise in track elevation as it approaches BMW corridor. Existing track width about 3m.	Figure 3 Figure 4

Notes

1) Ground conditions based on Geological Survey Ireland (GSI) (2022) online viewer, web page: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

2) Existing track width of about 3m is a measure from the outer edge of ruts left by the passage of farm tractor.

Description of Proposed Access Track

General Considerations

The proposed Keeling access track will be constructed using a reinforced stone platform laid directly onto the topsoil. The purpose of the reinforced stone platform is to provide a stable running surface for traffic with minimal disturbance to the underlying ground.

An unreinforced stone platform could also be used but this would require a notably greater depth of stone (for example about 50 to 90% increase in depth of stone). The reinforcement also provides a more uniform load distribution onto the existing ground which avoids punching failure of stone, which can cause generation of fine material.

The reinforced stone platform will spread traffic loading to minimise disturbance of the underlying ground. Disturbance of the underlying ground will result in an uneven running surface and potentially destabilise the access track and is to be avoided.

The stone used will be crushed and processed granular stone pre-washed at source (e.g. in quarry) that contains minimal fines.

Construction Options

There are two nos. options for a reinforced stone platform, both of which have similar geometry and construction methodologies but differ in terms of the reinforcement being used. The two options are:

- Option 1 - Reno mattress with granular stone and geosynthetic (separator)
- Option 2 - Granular stone and geosynthetic (separator and geogrid)

From an engineering context both options are feasible and would provide a similar performance.

Description of the construction for the two nos. options is given below. An outline removal sequence of access track is also included, where the access track is required to be removed.

Option 1 - Reno Mattress with Granular Stone and Geosynthetic (separator)

Product details are included in Appendix A.

Construction comprises clean, hard durable stone within a shallow reinforced cage.

The reinforced caged comprises a Reno mattress formed of a shallow plastic-coated galvanized wire cage into which is placed clean, hard durable stone infilling. The mattress would be laid onto a heavy-duty separator to minimise the generation and migration of fines from the underlying soil.

Construction would be carried out in sections from the hardstand area of the farmyard towards the acquired Irish Rail land adjacent the Dublin-Belfast railway line.

General construction methodology:

(1) No construction plant permitted to track onto the existing field surface.

(2) Construction commences from the hardstand area of the farmyard.

(3) Access track to comprise 2 nos. mattresses laid side by side to form an access track running surface width of 4m. Mattress dimensions 6m long by 2m wide by 0.3m deep.

(4) Suitable excavator with rubber tracks used to handle materials together with suitable-sized dumper delivering materials along access track.

Outline of construction sequence:

(1) Heavy-duty separator laid manually by operatives onto existing ground surface over the footprint area of section of access where mattresses are to be placed.

(2) Mattresses in flatpack laid onto separator and assembled manually by operatives, that is erecting of side and inner (diaphragm) walls.

(3) Dumper delivers stone to excavator location. Stone is placed on farmyard (or section of competed access track for use by excavator.

(4) Mattresses filled by excavator located in farmyard by placing clean, hard durable stone into mattresses [1].

(5) Lid of mattresses is fixed manually by operatives.

(6) Repeat (1) to (5) with excavator re-located at end of completed section of access track.

Option 2 - Granular Stone and Geosynthetic (separator and geogrid)

Typical product details are included in Appendix B.

Construction comprises clean, hard durable stone laid onto a basal reinforcement layer.

The basal reinforcement layer comprises a separator and geogrid. The separator is typically a geotextile fabric with the geogrid comprising an extruded or a 'punched and stretched' high tensile polypropylene. Note that separator and geogrid can comprise either 2 separate layers or more commonly comprises a single composite layer with the geogrid and separator bonded together, such as Tensar Triax 160-G.

The geogrid will spread traffic loading uniformly to minimise disturbance of the underlying soil with the heavy-duty separator minimising the generation and migration of fines from the underlying soil. The overlying stone will be clean and will not generate much/any fines, notwithstanding any fines that are present in the stone will pass vertically through the stone and will be trapped by the separator.

Construction would be carried out in sections from the hardstand area of the farmyard towards the Broadmeadow Way corridor adjacent to the Dublin-Belfast railway line.

General construction methodology:

(1) No construction plant permitted to track onto the existing field surface.

(2) Construction commences from the hardstand area of the farmyard.

(3) Access track running surface width 3.5m.

(4) Suitable excavator used to handle materials together with suitable-sized dumper delivering materials.

Outline of construction sequence:

(1) Separator and geogrid laid manually by operatives onto existing ground surface over the footprint area of the access track. Typically, a 5 to 10m length to be laid. Width of roll is typically 4m. Separator is placed directly onto existing surface followed by geogrid.

(2) The track construction will involve the placement of approximately 1,000m^3 of clean stone along the track, which will require approximately 100 truckloads of stone. Stone will need to be placed working progressively from the existing field gate at the farmyard eastwards towards the railway. As a result, trucks will need to reverse into the field to deliver the stone for the track. Trucks will need to drive into the farmyard (past the existing gate) and then reverse along the track as it is being placed to protect the existing ground surface from disturbance. As part of the track construction, a turning area will be provided inside the field gate within the field to allow for trucks turning in and out of the field. The turning area will be approximately 100m2 and its construction will be the same as the track.

[1] Filled Reno mattresses can be lifted into place using a lifting frame but there is a risk of excessive deformation.

(3) Clean, hard durable stone to be placed onto separator and geogrid. Access track thickness [2] is estimated at 265mm thickness of pre-washed granular stone placed on Tensar Triax 160-G or similar.

(4) Excavator compacts and levels placed stone and moves to end of completed section.

(5) Repeat (1) to (4) with respect to track construction with excavator located at end of completed section of access.

It is anticipated the construction of the track will take 2 to 3 weeks to complete.

Construction of a Track along the Broadmeadow Way Greenway Corridor

Construction of an access track along the BMW corridor from near the River Pill to Malahide Estuary, parallel to the Dublin-Belfast Railway, will involve the placement of geotextile on the existing ground and placing 300m depth of clean stone along the 350m length between the River Pill and Malahide Estuary.

The track construction is expected to involve the placement of approximately 315m^3 of stone, which will require approximately 40 truckloads of stone. The section of track along the greenway corridor is anticipated to take 1 week to construct.

Construction of the Ramp Across to the Causeway

The construction of the ramp in the greenway corridor between the southern end of Keeling's field (northern shore of Malahide Estuary) and the causeway along the Dublin-Belfast Railway will require access for construction vehicles along the temporary track. The construction of the ramp will involve the following sequence of work:

- Preparation of foundation for a culvert to the existing channel near the foreshore.
- Installation of 600mm diameter piped culvert and precast headwalls
- Backfill around culvert and earthworks to construct embankment between the field and the causeway

The proposed ramp will have a cross section consisting of a 3m wide track with 1V:2H earthwork slopes and will be approximately 80m long. It is proposed to construct the temporary ramp with Class 1C material on top of a layer of geotextile. A temporary 600mm diameter concrete pipe will need to be installed with appropriate surround to act as a culvert for the stream which the proposed temporary ramp crosses.

It is expected that a 14t excavator, or similar, will be brought to site as part of the construction works associated with the ramp. It is expected that the excavator will be transported to the farmyard on a low-loader and then will be tracked along the access track from the farmyard as the low-loader would be not able to drive the full way to the site adjacent to the estuary due to difficulty in accessing the field and lack of enough turn-around area within. The excavator will be involved in the preparation and placing of the culvert pipes and headwall and construction of the backfill and ramp.

The embankment construction will involve the placement of approximately 225m^3 of Class 1C coarse granular material. It is expected that the importation of the fill material will involve 30 truckloads of material being brought to site via the access to the Keeling farmyard and along the proposed access track. It is expected the ramp construction can be completed on 2 to 3 weeks.

[2] Track construction make-up determined using TensarPave Software.

Fencing along Railway Causeway

Following construction of the ramp onto the railway causeway, a temporary 'Heras' fencing with kentledge block supports will need to be erected along the causeway offset from the railway track, see example in Figure 6. This will involve fencing panels and blocks being brought to site along the temporary access track on flatbed trucks to be placed on the causeway by excavator and ground personnel. The temporary fencing will also need to be removed at the completion of the GI works. It is expected that the fencing along the causeway will take 2 to 3 weeks to complete.

Figure 6 Example of temporary fence with supports

Following completion of the GI works on the causeway, the temporary fencing will be taken down and removed from site. Again, the trucks to transport the fencing panels and blocks off-site will access along the track through Plot 6. The removal of the fencing is expected to take approximately 2 to 3 weeks to complete.

Ground Investigation Works on Causeway

The GI works on the northern causeway will involve the use of a drilling rig and an excavator on the causeway. Both the drilling rig and excavator will need to be tracked along the access track from Keelings farmyard. The excavator and piling rig will be brought to the farmyard on a low-loader where they will be removed from the low-loader as it is not considered feasible to bring a low-loader along the access track due to trafficability difficulties. The excavator and drilling rig will be tracked along the access from the farmyard to the causeway. The GI works is expected to be about 6 to 8 weeks.

Existing Northern Embankment Conditions

The northern embankment is approximately 1000m long with the proposed greenway route located along the western side of the embankment on an enlarged shoulder which was formed as part of protection/ strengthening works in 2001. The width of the shoulder is variable and would not satisfy the requirements for a 4m width of greenway throughout its length.

The enlarged shoulder construction comprises a lower layer of armour stone with an upper granular layer. Exposed armour stone suggest weights up to about 2 tonnes.

For most of the embankment the upper granular layer comprises clean stone varying in size from about 50 to 200mm but is locally formed of ballast stone (50 to 60mm).

The outer sloping face of the granular layer varies in inclination from about 30 to 50 degrees and is locally unstable where it is over-steep. The outer edge of the granular layer would be unsuitable for foundations.

There is insufficient GI to confirm the potential founding conditions for either a shallow or piled foundation.

Ground Investigation (GI) Works

The scope of GI works on the causeway will involve rotary drilling (coring) and excavation of trial trenches along the northern causeway.

The scope includes 11 no. boreholes and 10 no. trial trenches (TT) along the northern causeway.

TTs will comprise a narrow (bucket width) trench excavated the full width of proposed greenway within predominantly the upper granular layer. Typical trench depths will vary from a maximum of about 2.5m to 1m. A number of TTs will be used for in-situ drainage soakaway tests, as appropriate. Unsupported side slopes in TTs within the granular material would naturally break-back to about 45 degree so to avoid excessive break-back a suitable sized trench box will be used to support TT excavations. Backfilling of granular material in TTs shall be in compacted layers using suitable plate compactor.

The drilling rig is expected to be a Comacchio 405, or similar (Figure 7 and

Figure **8**). The excavator will be a mini digger with typical weight less than 5 tonnes (Figure 9).

Figure 7 Comacchio 405 rig example

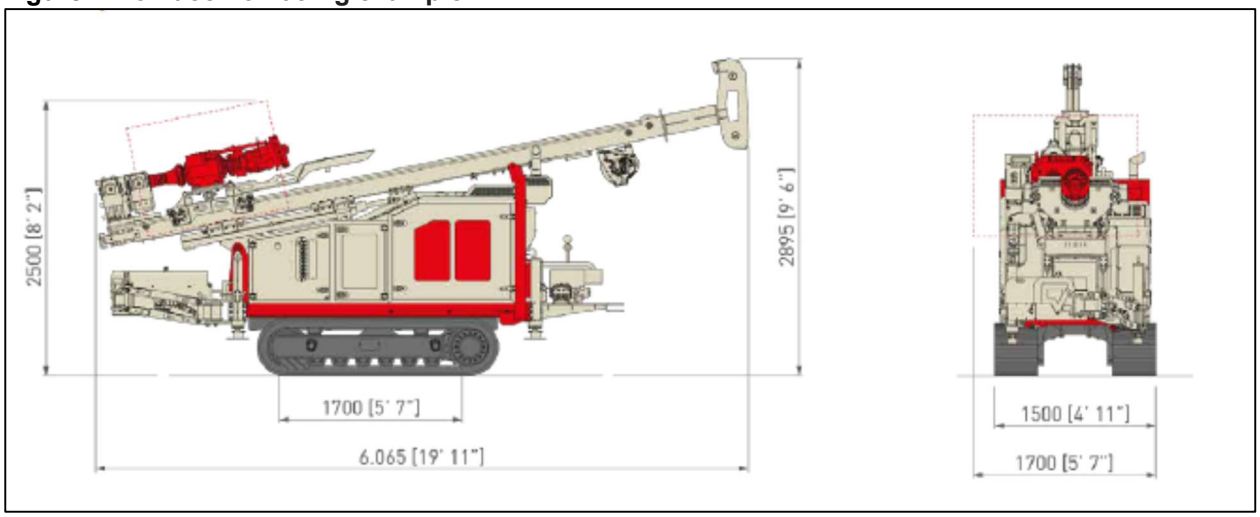


Figure 8 Comacchio 405 rig example

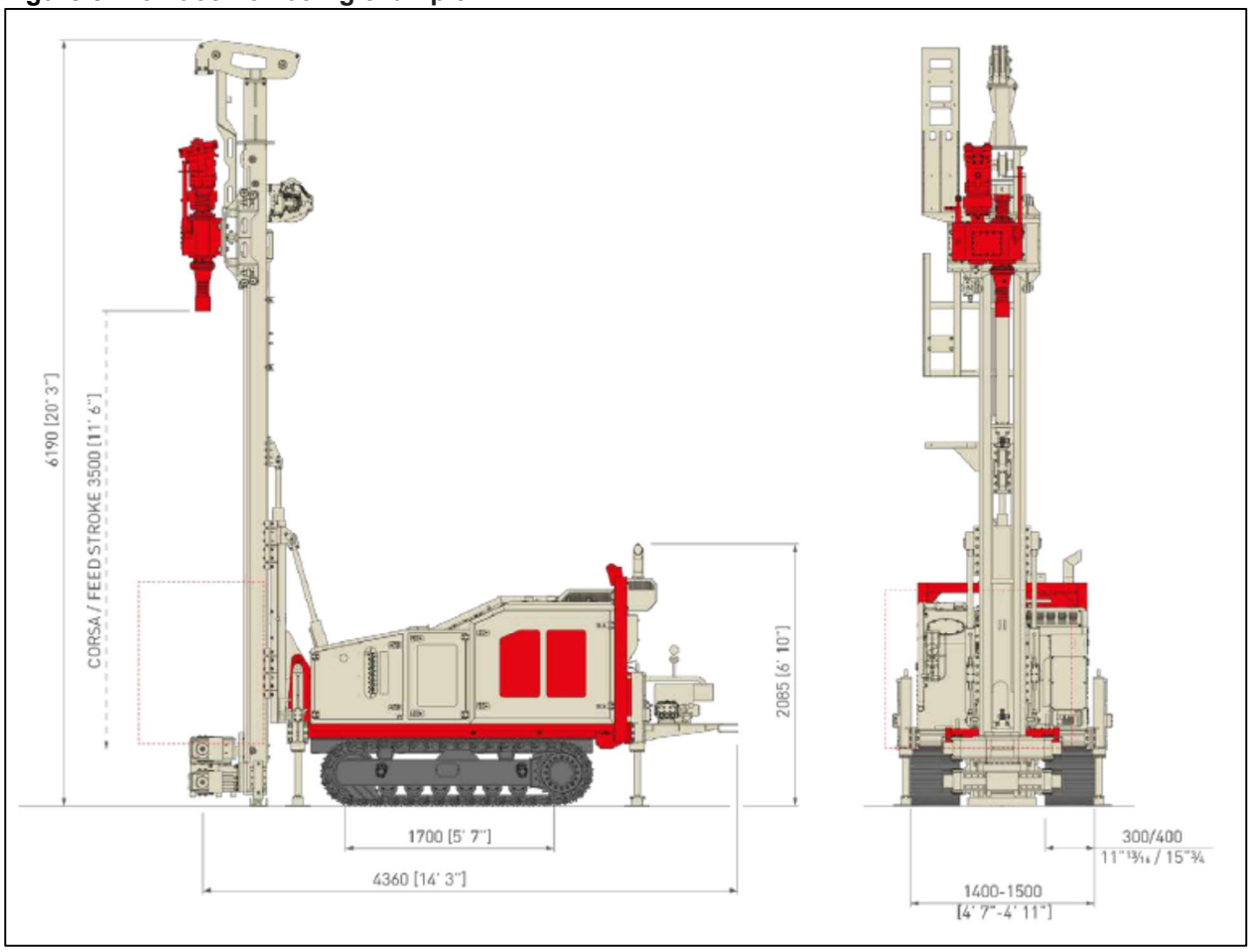
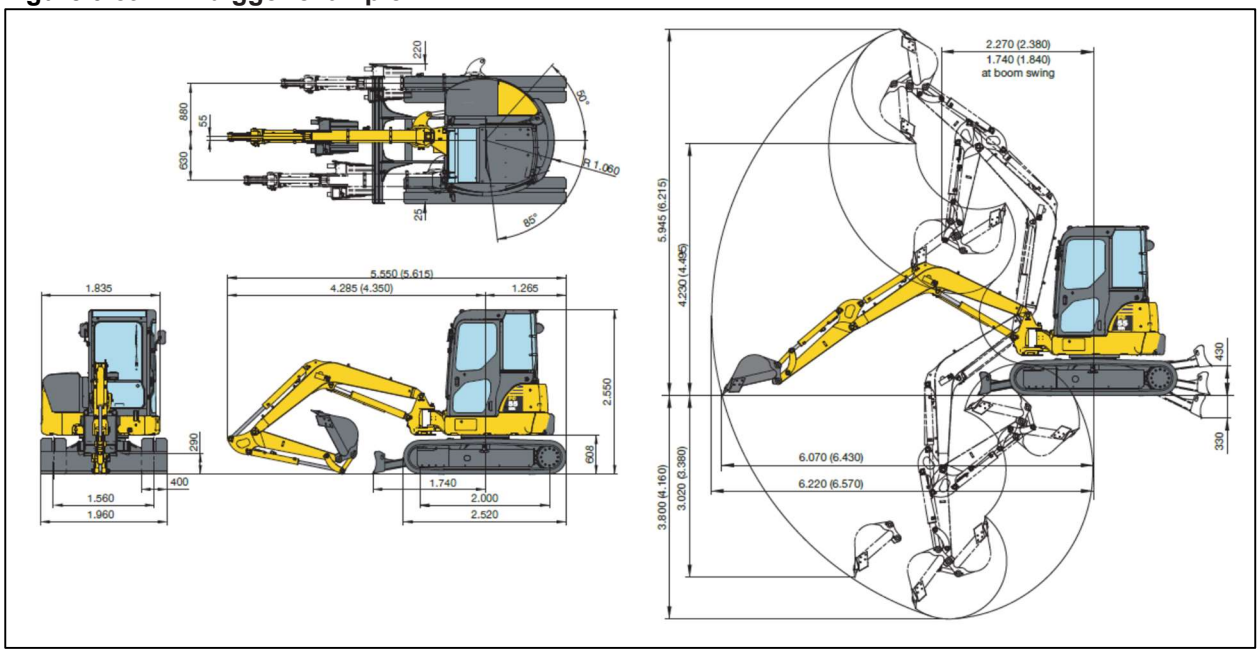


Figure 9 5t mini-digger example



Removal of Access Track

On complete of the ground investigation works associated with the detailed design of Broadmeadow Way Greenway, the temporary track through Plot 6 will be removed.

Outline of removal sequence is essentially the reverse of the construction sequence:

(1) Excavator working from furthest end of access track (initially from Broadmeadow Way corridor adjacent to the Dublin-Belfast railway line) removes stone over a discrete section and places in truck for stone to be removed from site.

(2) Excavator with operatives removes separator and geogrid, which are again placed in truck which transports material from site.

(3) Excavator retreats along access track.

(4) Repeat (1) to (3) with excavator located at end of remaining section of access.

Outline of removal sequence for reno mattress option:

(1) Working from furthest end of access track (initially from the greenway corridor adjacent the Dublin-Belfast railway line reno mattress is lifted [3] using excavator and placed in truck for stone to be removed from site.

(2) Excavator with operatives removes separator, which is again placed in truck which transports material from site.

(3) Excavator retreats along access track.

(4) Repeat (1) to (4) with excavator located at end of remaining section of access track.

The surface under the track is to be reseeded and reinstated to its original condition after removal of the temporary track.

It is anticipated that the removal of the track will take approximately 3 weeks to complete.

[3] Excessive deformation during removal of filled Reno mattresses does not represent an issue where mattresses are not being re-used.

Appendix A

Reno Mattress

MACCAFERRI LTD
Registered Office: 7600 The Quorum,
Oxford Business Park North, Garsington Road,
Oxford OX4 2JZ.
Telephone: 01865 770555
Fax: 01865 774550
Email: oxford@maccaferri.co.uk
Web: www.maccaferri.co.uk

Installation Instructions

Maccaferri Box Gabions and Reno Mattress units

The General notes on pages 1 and 2 must be studied first

List of Contents

General Information

PLEASE READ THIS GENERAL SECTION BEFORE STARTING INSTALLATION

Maccaferri Box Gabions and Reno Mattress units are easily and quickly assembled by unskilled labour after the minimum of instruction. The information in this leaflet will help to ensure that a well packed, structurally sound, durable and attractive structure is obtained.

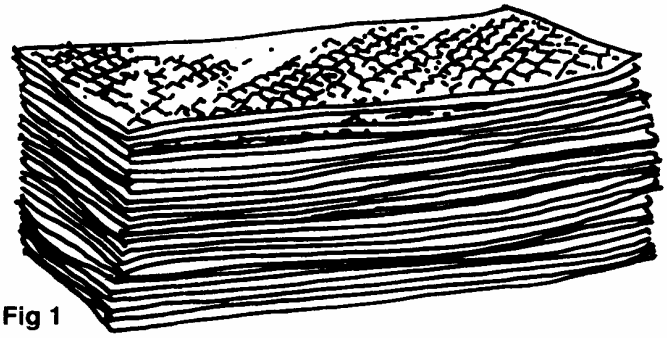


Fig 1

Packing

See Fig 1. The units are delivered to site folded flat and compressed into bundles weighing around 7/800kgs. The type and size of unit determines the number in each bundle. **Box Gabions** are usually wired together in pairs within the bundles. **Reno Mattress** bases and lids are usually packed in separate bundles and only occasionally with bases and lids in the same bundle. Check which type of pack has been supplied before starting work.

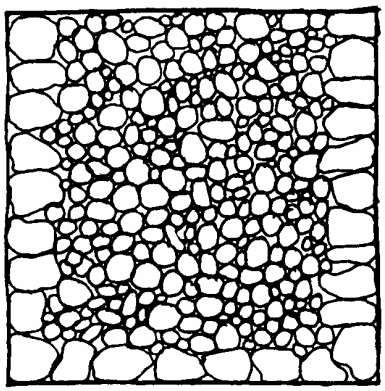


Fig 2

Stone Fill

The stone used should be hard and durable.

Unit Type	Grading:
All box gabions and 300mm deep mattress	**100 to 200mm.**
170mm deep mattress and 230mm deep mattress	**75 to 150mm (but never greater than $^2/_3$ mattress depth).**

A tolerance of 5% by weight of smaller stone is acceptable.

Where the correct size is difficult to obtain, the core can be filled with smaller material. **See Fig 2.**

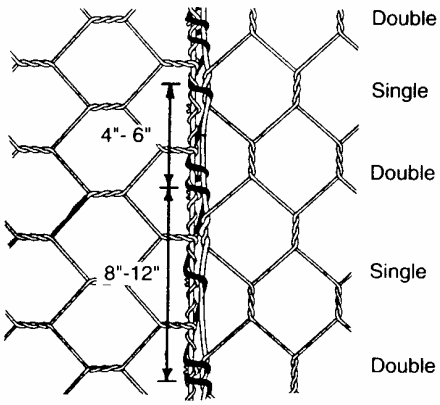


Fig 3

Wiring

Manual lacing is carried out in a continuous wiring operation, **not with individual ties or twists.** **See Fig 3.** Single and double twists are required alternately at approx. 100 to 150mm spacing (4 to 6ins).

A manageable length of binding wire is one complete turn from the coil as supplied.

Tests show that no other manual lacing method gives the necessary strength.

General Information

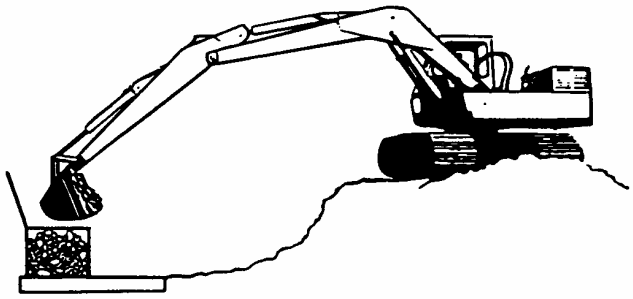
Plant and Tools

We recommend the use of 6"-8" long nose pliers to aid assembly and wiring of the units using the binding wire supplied with the gabions. Suitable pliers, cable winches and a special lid closing tool can be purchased from Maccaferri Ltd.

Although a back-actor is often the most suitable machine for filling the units it may on occasions be more economical or practical to employ other similar machines already on site. However, the bucket must not be wider than the width of one compartment and in particular wide front hoe loaders are not recommended. On all but the smallest jobs, two gangs (of 4 men) can be used on most sites to ensure that the machine is used to the optimum.

Foundation Preparation

Apart from the obvious requirement of line and level, the foundation for gabions and mattress work needs only to be sensibly level. However, for ease of working a layer of stone or hoggin is often provided under box gabion structures, and some mattress work. This layer may also be laid at a slope to facilitate the construction of a battered wall.



Non-rectangular Shapes

Maccaferri gabions units are flexible enough to conform to bends down to a radius of 20-25m without mitring: first wire a number of units together and offer them up to the curve set out previously, holding them in position during filling. For other shapes, bevels and mitres can be easily formed by cutting and folding the panels to the required angles. **See Figs 4 & 5.**

Gabions

An example of modification steps required to form a bevel.

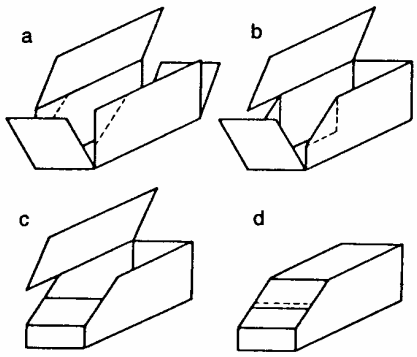


Fig 4

Mattresses

These may be cut to form sectors to construct curved sections as shown below.

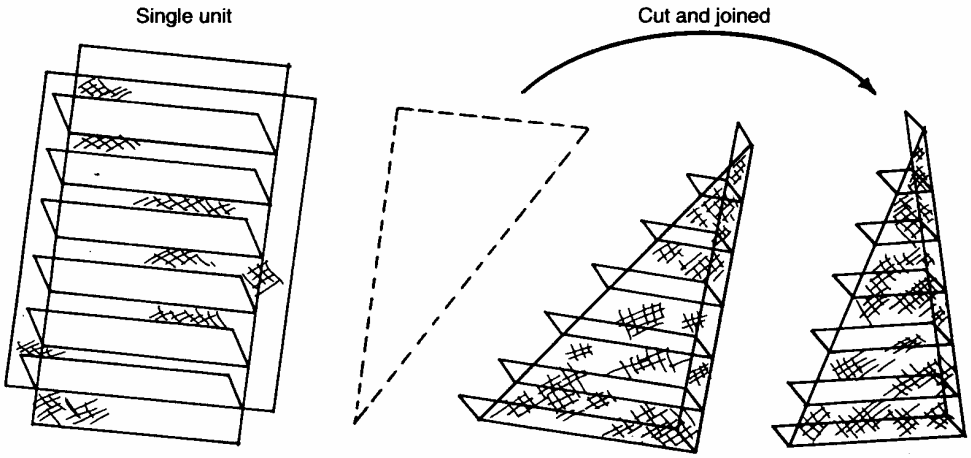


Fig 5

Instructions for

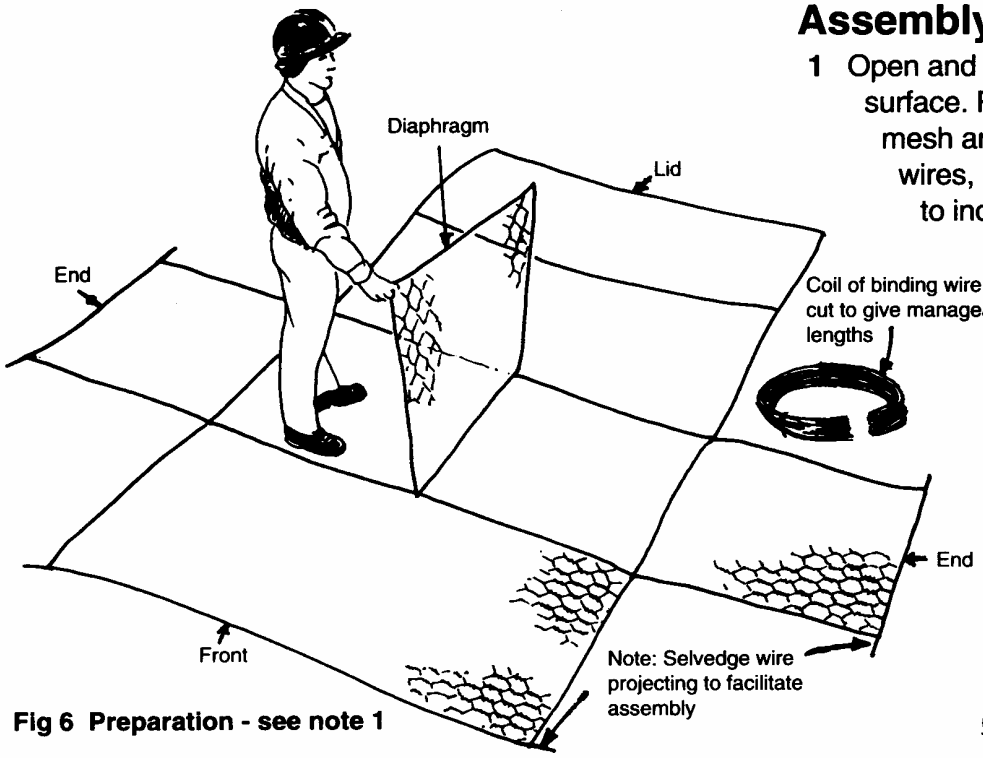


Fig 6 Preparation - see note 1

Assembly

1 Open and unfold the gabion on a hard surface. Press out the creases in the mesh and the kinks in the selvedge wires, since these are not intended to indicate the corners of the unit.

2 Lift up the sides, ends and diaphragms into a vertical position to form an open box shape. Ensure the tops of the corners are level and then join together with the thick selvedge wire projecting. Then lace the corners.

Refer to page 1 for correct lacing method.

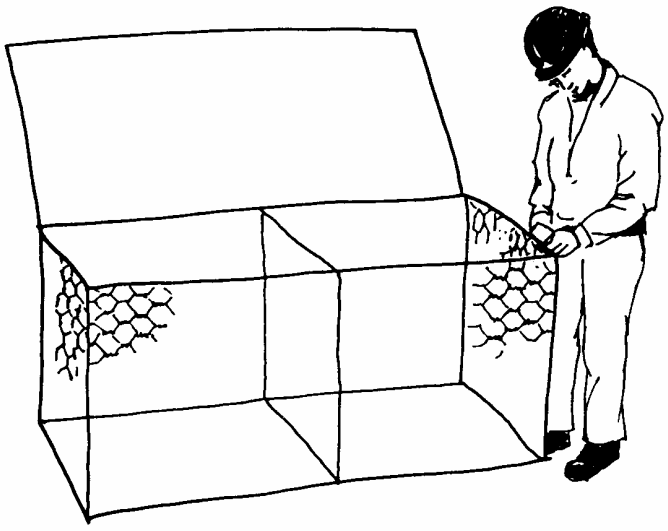


Fig 7 Forming - see note 2

Installation

3 Place a number of empty gabions in position and securely lace adjoining units together before they are tensioned and filled. A cable winch can be used to tension the units*.

4 Keep the gabions stretched and under tension longitudinally during filling to give a good alignment and finish.

See diagram opposite

* A winch is available for purchase.

ALWAYS MAINTAIN TENSION DURING FILLING

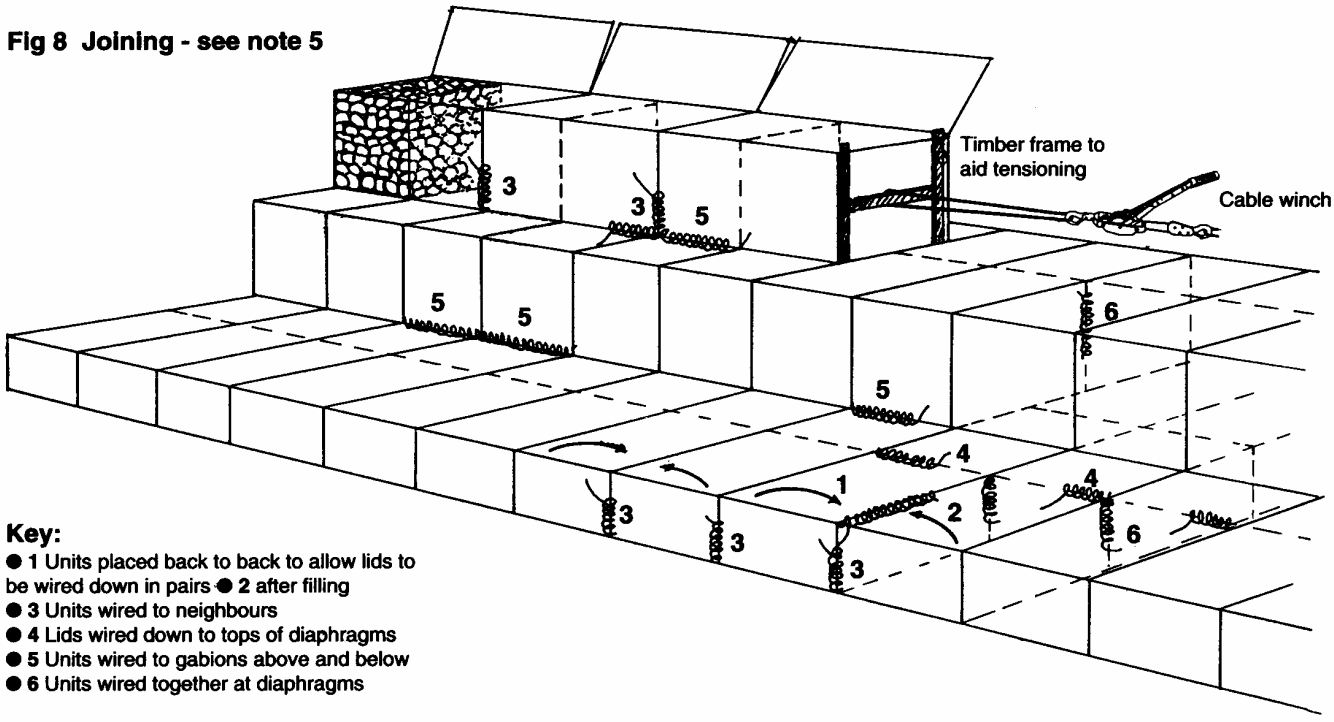
Box Gabions

Multi-layer structures

5 Almost all gabion structures consist of more than one course of gabions. In order that the individual gabions may become incorporated into one continuous structure, they should be wired to neighbouring gabions **before**, and the course below **after** tensioning, all before filling.

Treating the gabions individually by adding to the structure and filling them one at a time is time consuming, detrimental to the finished appearance, and may lead to a less of structural integrity of the finished structure.

Fig 8 Joining - see note 5



Key:
- **1** Units placed back to back to allow lids to be wired down in pairs
- **2** after filling
- **3** Units wired to neighbours
- **4** Lids wired down to tops of diaphragms
- **5** Units wired to gabions above and below
- **6** Units wired together at diaphragms

Filling

6 Fill 1 metre high gabions with hard durable quarried or rounded stone in the size range 100 to 200mm, keeping the gabions under tension at all times. **See Note 4.**

Minimise the number of voids by using a well graded stone and avoid large stones in order to achieve a dense, compact compartment.

Bracing wires are introduced at the 1/3 and 2/3 height - see Note 8

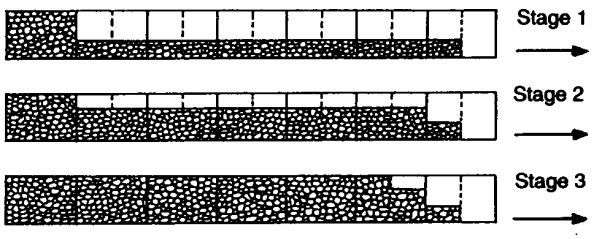


Fig 9

7 Fill each course of gabions in stages, stepping down towards the end of the row to prevent bulging of the transverse ends and diaphragms. The last compartment should be left empty to facilitate wiring on further gabions.

ALL LACING MUST BE IN ACCORDANCE WITH THE METHOD SHOWN ON PAGE 1.

Box Gabions

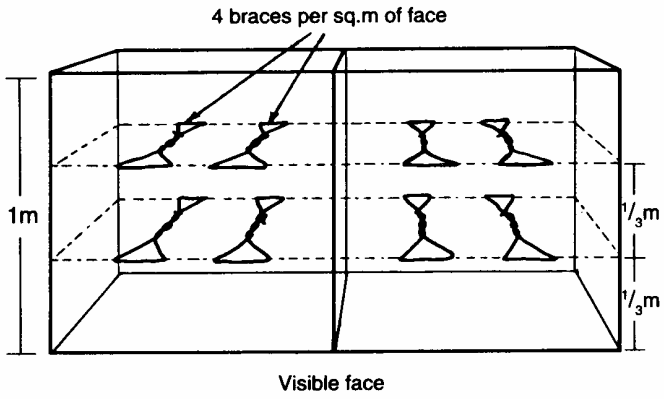


Fig 10 Bracing - see notes 8 & 9

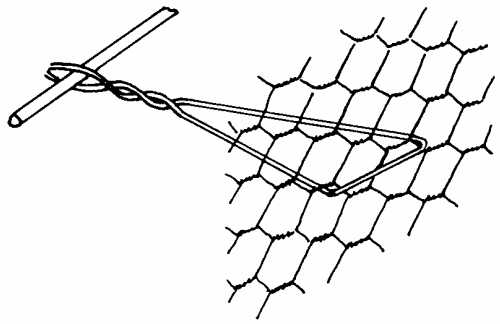


Fig 11 Method - see note 9

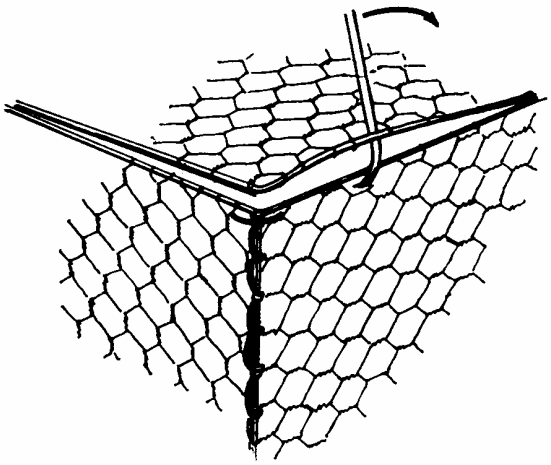


Fig 12 Closing the lid - see note 10

8 To ensure a good finished appearance all visible faces should be carefully hand-packed and braced to prevent bulging. Four bracing wires should be provided for each square metre of **visible** face, fixed at 1/3 and 2/3 levels for 1m deep gabions as shown in the sketch. For 0.5m deep units, bracing may be fixed at the half height level, if required.

9 Bracing wires are formed from a length of wire cut from the tying wire supplied. It has been found that two loops of a standard coil gives sufficient length of wire (approx. 2.7 - 3.0m) to form the brace. Thread the wire around two mesh openings on the front and rear faces and twist the ends together in the middle. Tension the brace by windlassing until the front face is in line. Care should be taken to ensure all the braces are of uniform length to avoid a concentration of load.

10 Overfill the gabion by approximately 50-75mm to allow for natural settlement. Take care to keep the top edge of the diaphragms exposed.

11 Fold the lid down, stretch into position with the aid of a suitable lever*, lace the lid to the front, the ends and to the top of the diaphragms.

* A special closing tool is available for purchase.

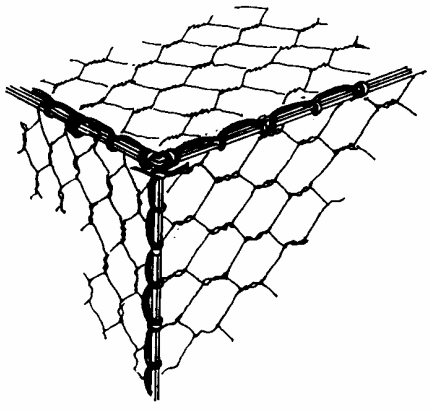


Fig 13 Lacing - see note 11 (& page 1)

Lifting pre-filled Gabions by crane

Maccaferri woven wire mesh gabions are strong enough to be lifted by crane from the top. Special lifting frames are available for hire from Maccaferri Ltd., to suit 2 x 1 x 1m and 2 x 1 x 0.5m Box units. The preparation of the units follows the general procedure indicated in this booklet, and in addition, the following notes should be read.

EVERY PRE-FILL AND LIFT GABION/MATTRESS OPERATION IS DIFFERENT. CUSTOMERS ARE STRONGLY RECOMMENDED TO CONTACT MACCAFERRI LTD., FOR ADVICE WHEN LIFTING PRE-FILLED UNITS IS BEING CONSIDERED FOR A SPECIFIC SCHEME.

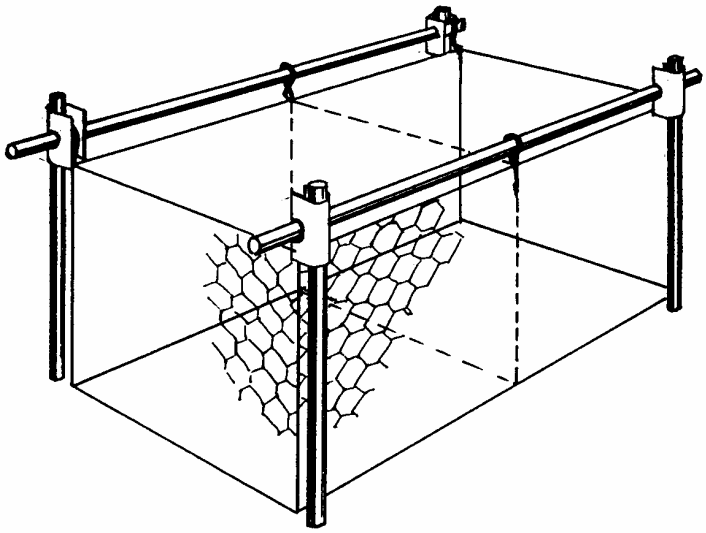


Fig 14 Filling - see note 2

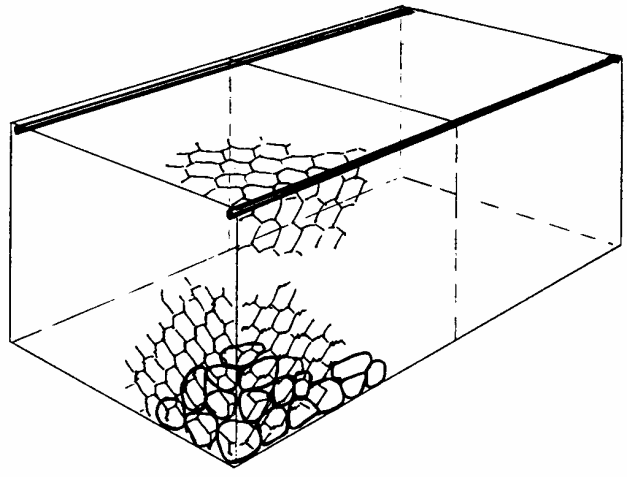


Fig 15 Lifting - see note 4

1 Unless it is intended to simply loose dump the gabions, every effort should be made to manufacture and keep the units in a rectangular form.

2 To help maintain the shape of the unit during filling, a frame of scaffolding or timber shuttering can be prepared slightly oversized in which the empty unit is assembled and stretched taut. Lacing should be generally as shown on page 1, but with **double** loops only, at 100 - 150mm spacing.

3 To prevent the faces from bulging, bracing wires must be fitted, at a minimum of four per square metre of face, as previously described, in both directions as the filling operation proceeds.

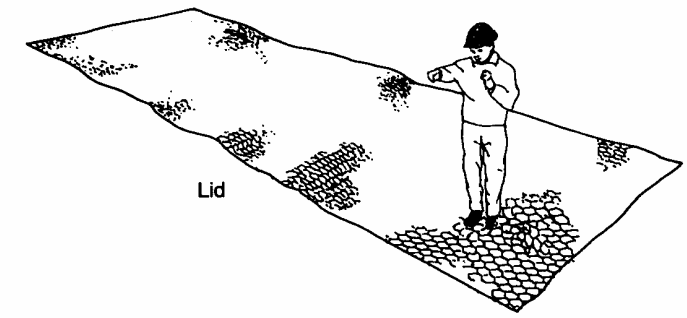
4 Stiffening the horizontal long sides of the top with re-bars helps considerably in maintaining the shape of the box when lifting. These rods should not project outside the box, unless they are to be removed later.

5 The lifting frames are provided with the correct number of slings for the size to be lifted, and all the slings should be used.

Weights of filled units	
2 x 1 x 1m	Up to 3.6 tonnes
2 x 1 x 0.5m	Up to 1.8 tonnes

Assembly

Reno Mattress bases and lids are usually packed in separate bundles and only occasionally with bases and lids in the same bundle. Check which type of pack has been supplied before starting work.



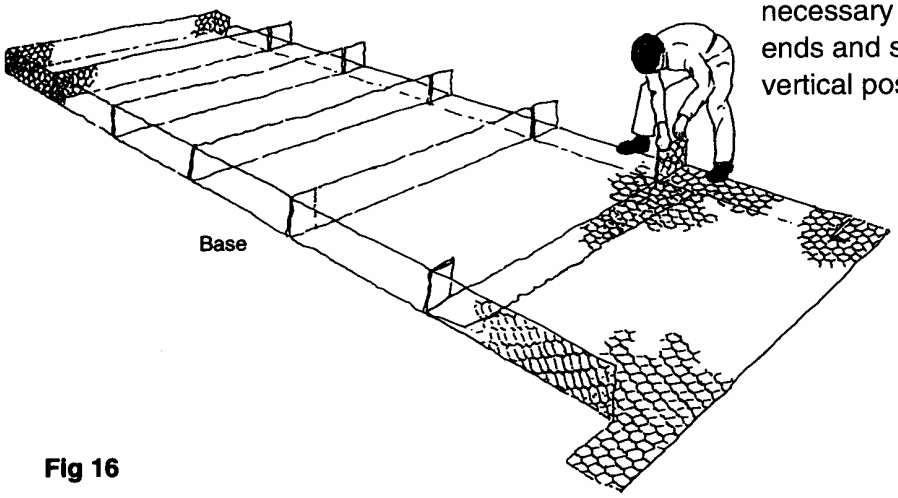


Fig 16

1 Open and unfold each mattress on a hard surface and press out any unwanted creases. If necessary use a board to form the folds at the ends and sides and then lift these into the vertical position.

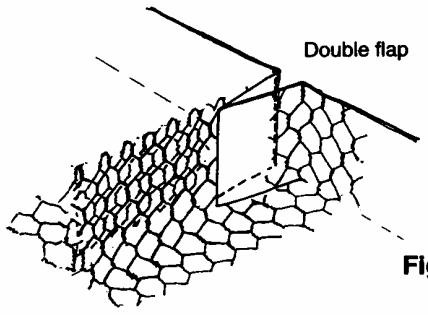


Fig 17

2 Fold in the double flap of the side panel and wire to the diaphragm. At the corners, fold the end flaps along the sides and lace up the joint.

ALL LACING MUST BE IN ACCORDANCE WITH THE METHOD SHOWN ON PAGE 1.

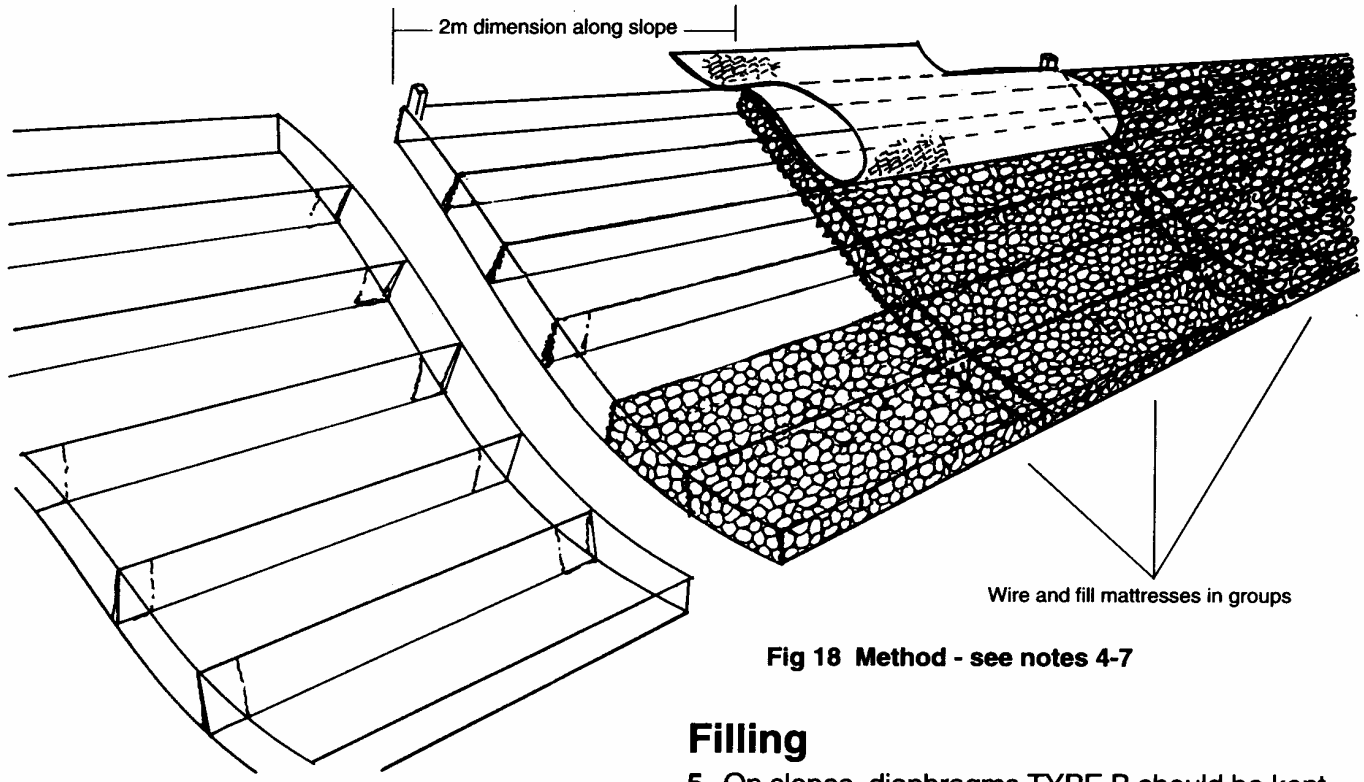


Fig 18 Method - see notes 4-7

Installation

4 Carry the wired-up mattress to its final position and wire it securely to the adjacent mattresses. On slopes, the mattress should be laid with the 2m dimension along the slope, not up and down it, except for very small ditches.

When the mattress is to be placed over a filter cloth, care must be taken to ensure that any projecting ends of wire are bent upwards to avoid puncturing or tearing the cloth. Mattresses should be placed and wired together empty - it is difficult to wire two mattresses together when one is full of stone.

Where staking is specified on steep slopes, the unit should be secured by hardwood pegs driven into the ground just below the upper end panel, at 2m centres or as necessary. On soft or sandy slopes pegs may be used to hold the mattress in position during filling.

For preparing units for lifting after filling see page 9

Filling

5 On slopes, diaphragms TYPE B should be kept taut during the filling operation, using wire stays, boards etc. This helps to locate them when the lid is finally laced down to their top edges.This is not necessary with diaphragms TYPE A which are self supporting.

6 The fill material can be placed in the compartments by machine, but some hand placing is necessary to ensure the compartment is completely filled. Start at the bottom if on a slope. Filling should be done unit by unit, but several units should be ready for filling at any one time. Ensure that the diaphragm tops are accessible for wiring.

7 Slightly over-fill to allow for settlement. Tie down the lids to the **ends** of the mattresses and then securely wire them to the **sides**, **and diaphragms**, using alternate single and double loops. **See page 1**.

To save both time and binding wire, prepare more than one unit before covering with the lids, so that adjacent lids can be wired down in one operation. In cases where a number of adjacent bases are to be covered at one time, rolls of mesh 25 x 2m or 1m wide can be used, saving time and strengthening the structure.

Lifting pre-filled Reno Mattresses

Maccaferri woven wire mesh mattresses are strong enough to be lifted by crane from the top. Special lifting frames are available for hire from Maccaferri Ltd., to suit 3 x 2m and 6 x 2m mattresses. The preparation of the units follows the general procedure indicated in this booklet, and in addition, the following notes should be read.

Customers are strongly recommended to contact Maccaferri Ltd., for advice when lifting pre-filled units is being considered.

The assembly of a mattress for lifting follows the instructions given on pages 7 and 8 with the following modifications.

1 **a)** The open gusset at the bottom of each diaphragm should be securely laced up by continuous wiring. The lid must be laced down to each mesh node at the top of the diaphragm with a double loop.

b) Check each end of the base panel. On current production units the selvedge is formed by folding the mesh back over the thick selvedge wire. This wire should be securely laced to the mesh to prevent it moving laterally during lifting operations.

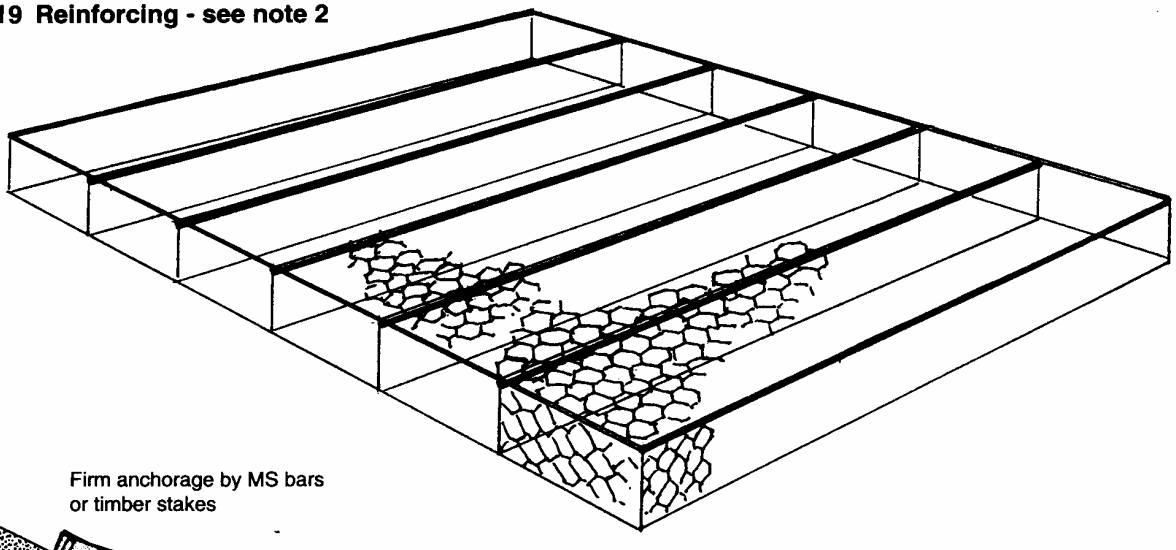
c) All lacing should be generally as shown on page 1 but with **double** twists only at approximately 100mm spacing.

2 There will be considerable deformation of the mesh as the units are lifted. This should not cause any concern since they will recover their shape after the units have been placed in their final position. If this is not acceptable from the point of view of appearance, 25mm bars may be fitted under the lids of the diaphragms to reduce the amount of distortion. These can be recovered if required.

3 For placing large areas of mattress, more sophisticated methods are available using purpose built pontoons etc. These can be used with either mastic grouted or ungrouted units.

Weights of filled units	
6 x 2 x 0.3m	Up to 6.5 tonnes

Fig 19 Reinforcing - see note 2



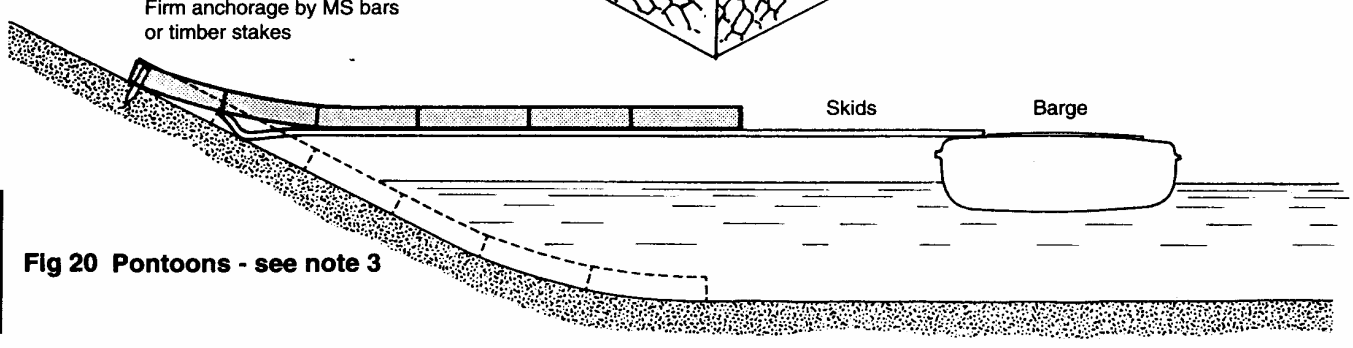
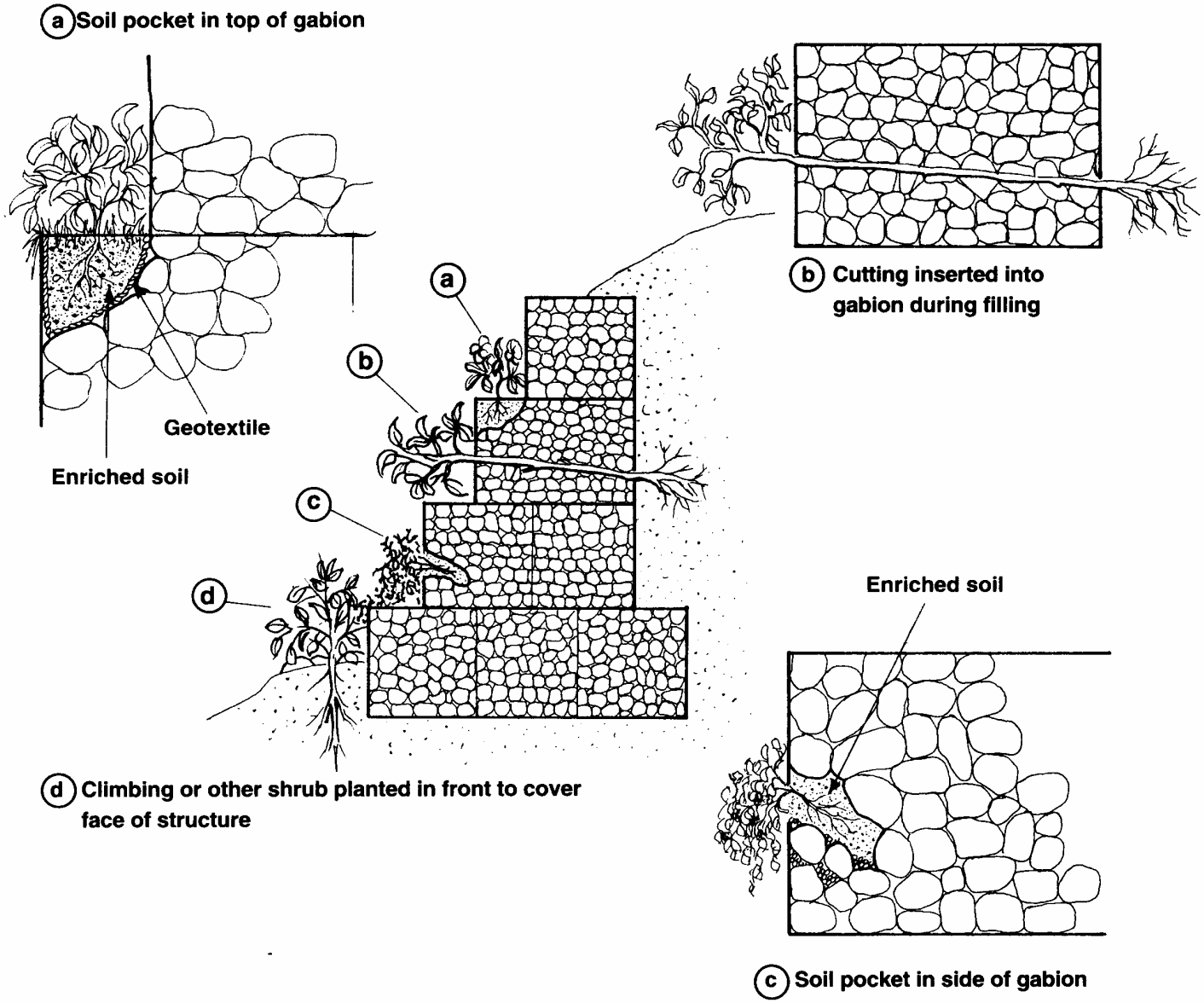


Fig 20 Pontoons - see note 3

"Greening" Gabion and mattress structures

In most cases the slow passage of water through the stone fill will deposit soil in the interstices and native vegetation will colonize the structure spontaneously. If an acceleration of the natural process is required then a few simple procedures as illustrated below may be implemented. Soil may be introduced into the structure during or after the stone filling operation and plants, shrubs or cuttings planted into it. Alternatively seeds can be scattered over the surface or incorporated into the soil. It is usual to enrich the soil with fertilizers to promote rapid initial growth.

Fig 21 Alternative methods of planting



We are always willing to discuss and advise on specific construction techniques

"Greening" Gabion and mattress structures

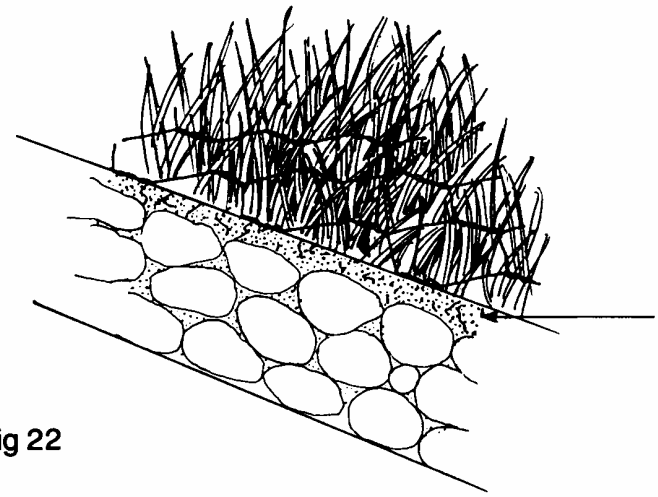


Fig 22

To encourage rapid growth on Reno mattresses, soil can be brushed into the stone fill - **see diagram left** - or alternatively bio-matting can be laid down before the mesh panel lid is placed - **see diagram below**.

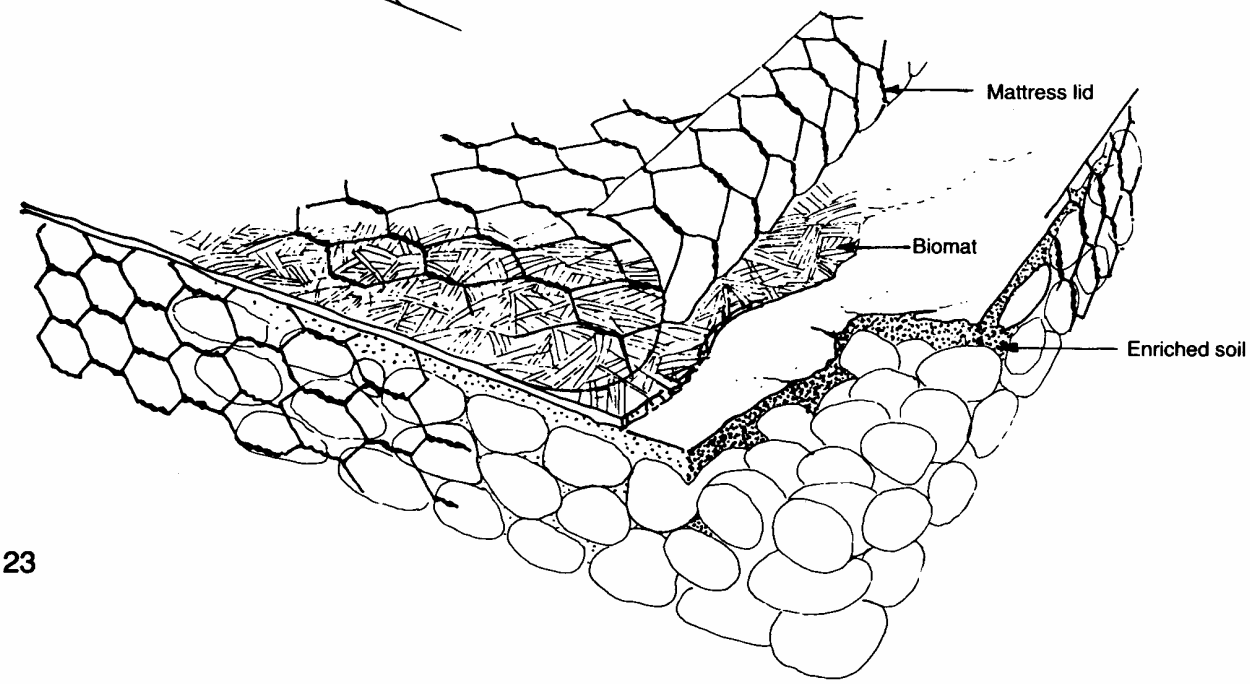


Fig 23

Useful addresses

Specialist Advice
Should you have any queries on any aspect of construction using Maccaferri woven wire mesh Gabions and Reno Mattress, please contact us.

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

MACCAFERRI LTD
Registered Office: 7400 The Quorum,
Oxford Business Park North, Garsington Road,
Oxford OX4 2JZ.
Telephone: 01865 770555
Fax: 01865 774550
Email: oxford@maccaferri.co.uk
Web: www.maccaferri.co.uk

Appendix B
Tensar Triax

ROADS AND PLATFORMS

SUBGRADE STABILISATION

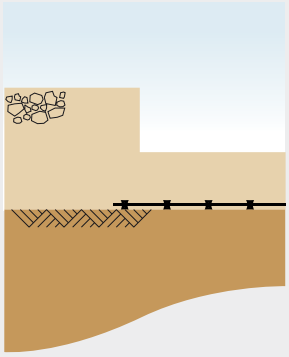
MECHANICALLY STABILISED LAYERS FOR ROADS AND TRAFFICKED AREAS

Tensar®

Tensar® TriAx® Geogrids have proven to be extremely efficient at confining and stabilising aggregate. TriAx has replaced Tensar biaxial geogrids in most stabilisation applications, delivering even greater cost savings.

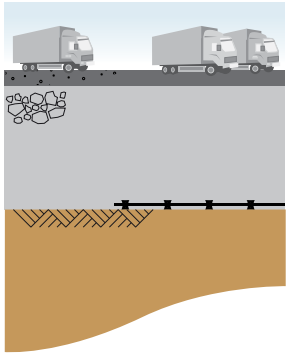
The Six Major Subgrade Stabilisation Applications for Tensar Technology

REDUCING LAYER THICKNESS



Numerous research programmes over the years have consistently proven the high stabilisation factors attributed to Tensar geogrids. With the improved performance from Tensar® TriAx® geogrids, Tensar Technology now offers even greater reductions in aggregate.

INCREASING LIFE



The use of Tensar TriAx geogrids in pavement layers can extend the service life of the road and therefore the use of Tensar Technology makes significant savings in maintenance budgets.

Tensar Technology – Proven Practical Solutions and the Know-How to Build Them

Based on the characteristic properties of Tensar geogrids, Tensar Technology is widely adopted for ground stabilisation and soil reinforcement problems, delivering real savings in cost and time. We can help you apply Tensar Technology to improve the bottom line on your project.

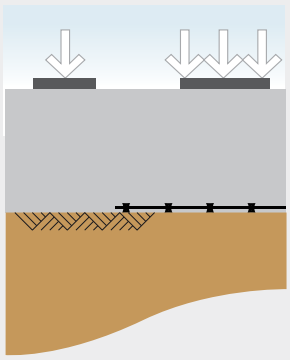
A GUIDE TO CHOOSING THE SUBGRADE STABILISATION SOLUTION FOR YOUR PROJECT

Since Tensar introduced stiff polymer geogrids, over 30 years ago, they have become a major component of civil engineering projects.

A project may require only one geogrid application or it may be necessary to devise solutions that involve a combination of applications.

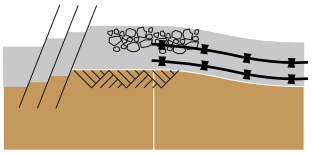
There are six major subgrade stabilisation applications for geogrids.

INCREASING BEARING CAPACITY



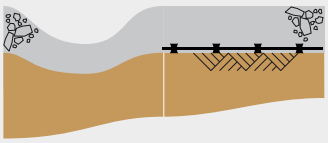
By applying Tensar Technology, the load spreading capability of a Tensar® TriAx® mechanically stabilised layer can increase the bearing capacity of working platforms for heavy-duty plant, cranes and piling rigs.

CONTROLLING DIFFERENTIAL SETTLEMENT



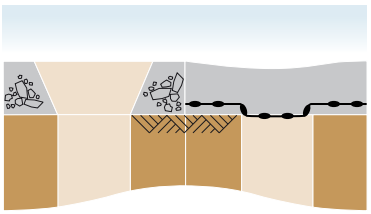
Multiple layers of Tensar TriAx geogrids in an aggregate layer create a flexurally stiff platform. Through the use of Tensar Technology the effects of a variable quality of support from a foundation soil can be smoothed out.

CAPPING WEAK DEPOSITS



Where the ground is exceptionally weak, Tensar TriAx Technology is available to enable a capping operation. Tensar TriAx geogrids enable safe placement and compaction of the fill when capping sludge lagoons and industrial waste deposits.

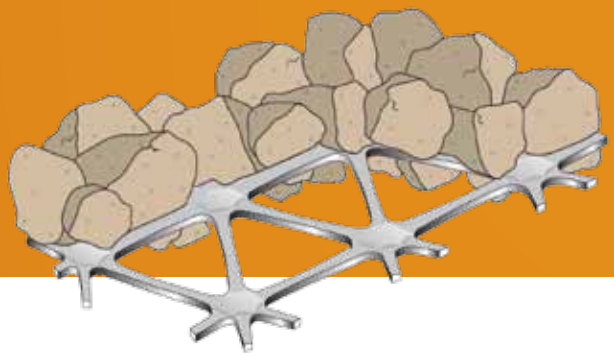
SPANNING VOIDS



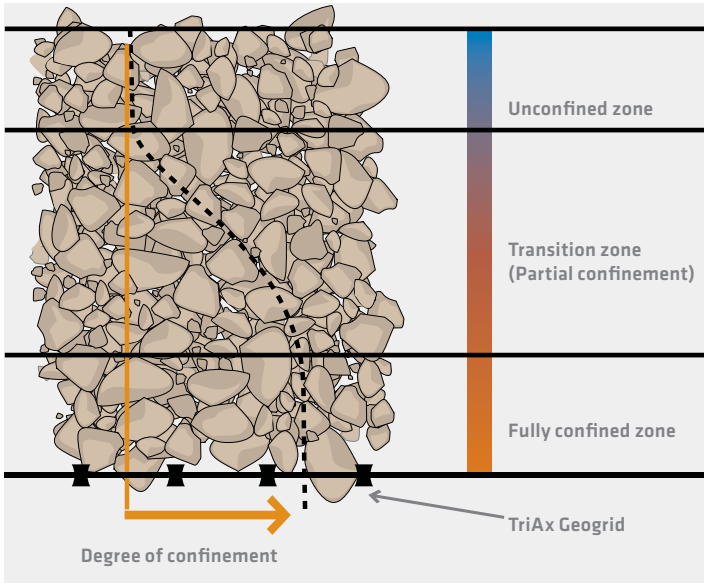
In areas where subgrade soils are prone to erosion, dissolution or collapse, Tensar biaxial geogrids along with Tensar Technology provide a support function to maintain safety pending response and a more permanent repair. This is not a true stabilisation application as the geogrid is required to perform more of a reinforcement function.

Tensar® TriAx® Geogrids Work by Confining Aggregate Particles

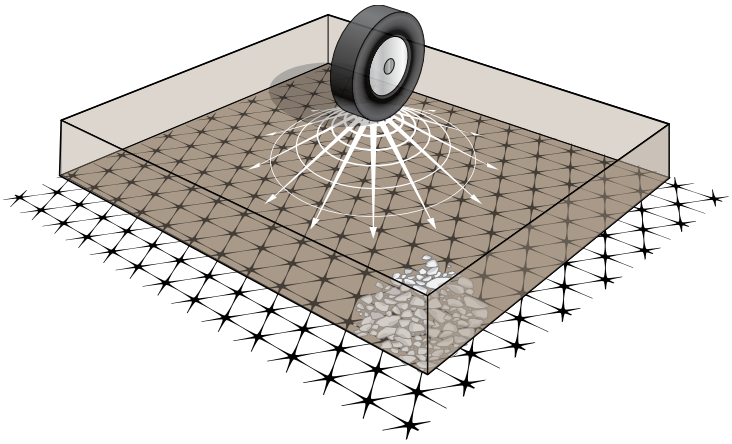
Tensar® TriAx® geogrids can solve stabilisation problems because they interlock very efficiently with granular materials. When granular particles are compacted over these geogrids, they partially penetrate and project through the apertures and abut against the ribs. Interlock is the mechanism by which the geogrid and aggregate interact under an applied load. This mechanism results in confinement and lateral restraint of the granular particles.



The Interlock Mechanism



Aggregate confinement within a mechanically stabilised layer. An efficient stabilisation material such as Tensar TriAx geogrid creates a high degree of internal confinement.



For a stabilised layer to be effective it must have the ability to distribute load through 360 degrees. To ensure optimum performance, the geogrid in a mechanically stabilised layer should have a high radial stiffness throughout the full 360 degrees.

The Versatility of Tensar® Geogrids

Since the early 1980s several hundred million square metres of Tensar geogrids have been used in tens of thousands of projects. In 2007, Tensar TriAx geogrids were introduced to provide a significant advancement in geogrid technology.

Tensar geogrids have been used in many countries in the world, under a wide variety of climates and soil conditions, and frequently Tensar Technology has been used to solve difficult design or construction problems. The Tensar TriAx manufacturing process produces a hexagonal geogrid structure consisting of high strength junctions and stiff ribs forming equilateral triangular apertures. The ribs present a thick square leading edge to the aggregate which allows the geogrid ribs to get a good "grip" on the aggregate particles, and results in effective mechanical interlock. Efficient interlock helps control lateral movement and dilation of aggregate particles, so that a very high effective angle of shearing resistance is mobilised. This effect is also referred to as "confinement," because interlock efficiently confines and restrains the aggregate particles.

The combination of these features ensures that, in Tensar TriAx geogrid stabilised granular layers:

- Tensile load in the geogrid is generated at very small deflections in supporting an applied vertical load
- The strain in the geogrid is very small at working loads
- Stabilisation benefit is localised and can be generated within the loaded area
- The Tensar geogrid and granular material together form a composite – a Tensar mechanically stabilised layer (msl)

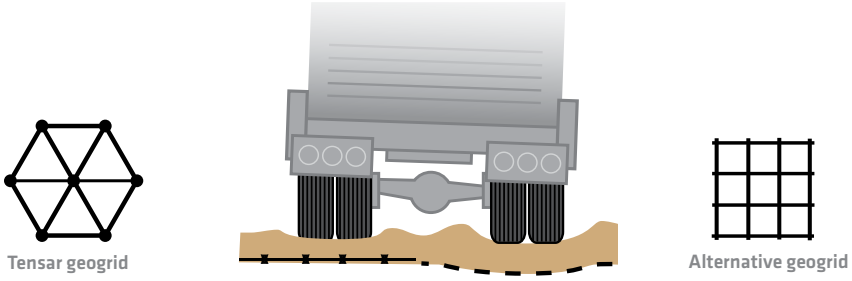
The essential features of TriAx are the strength and rigidity of junctions and thick ribs.

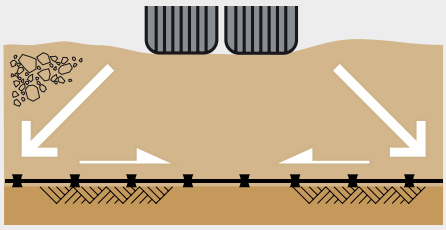
TriAx rib structure directly influences the efficiency of the stabilised layer.

Do All Geogrids Work in the Same Way?

This is a common question when considering the benefits of using geogrids – particularly in a road pavement. The answer is, **'No, geogrids perform differently and a good indicator of the reinforcing effect is the method of manufacture.'** The quality of the mechanical interlock is not the same when comparing the Tensar® manufacturing process with other methods of forming geogrids such as extruding, weaving and welding.

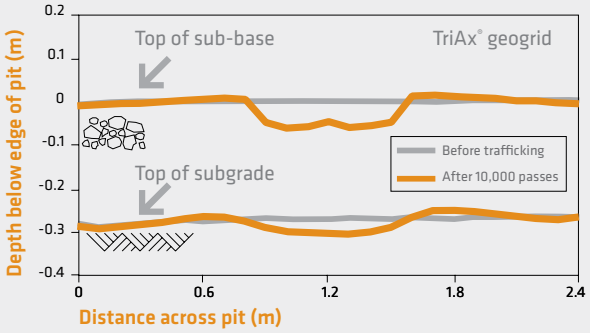
Tensar designs are based on the proven mechanism of interlock and the lateral confinement of the aggregate. Most geogrids produced by other methods of manufacture that create different ribs, junctions and apertures, perform as 'tensioned membranes.' The tensioned membrane performance requires large deformations along the fixed alignment of the wheel paths. See the evidence for this below.



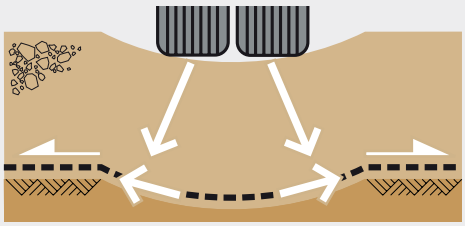


TENSAR GEOGRID STABILISED LAYER – INTERLOCK AND CONFINEMENT MECHANISM

- Interlock and confinement stiffens the aggregate layer
- Load spread is increased
- Vertical stress is reduced
- Performance is improved

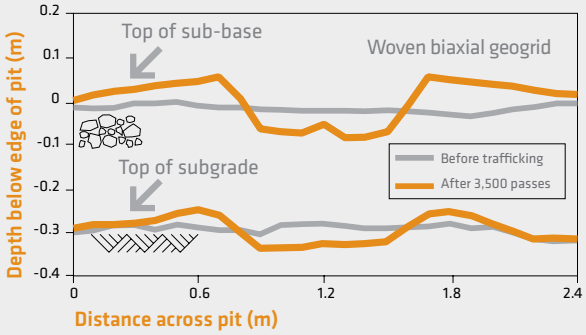


Tensar TriAx manufactured using punched and drawn process.



ALTERNATIVE GEOGRID REINFORCED LAYER – TENSIONED MEMBRANE MECHANISM

- Alternative geogrid tensioned membrane needs anchorage at edges
- Load is directed to geogrid membrane
- Geogrid and subgrade deform
- Performance gain only after extensive trafficking
- Wheel path must be maintained within rut line to maintain the effect



Alternative geogrid manufactured using alternative process.

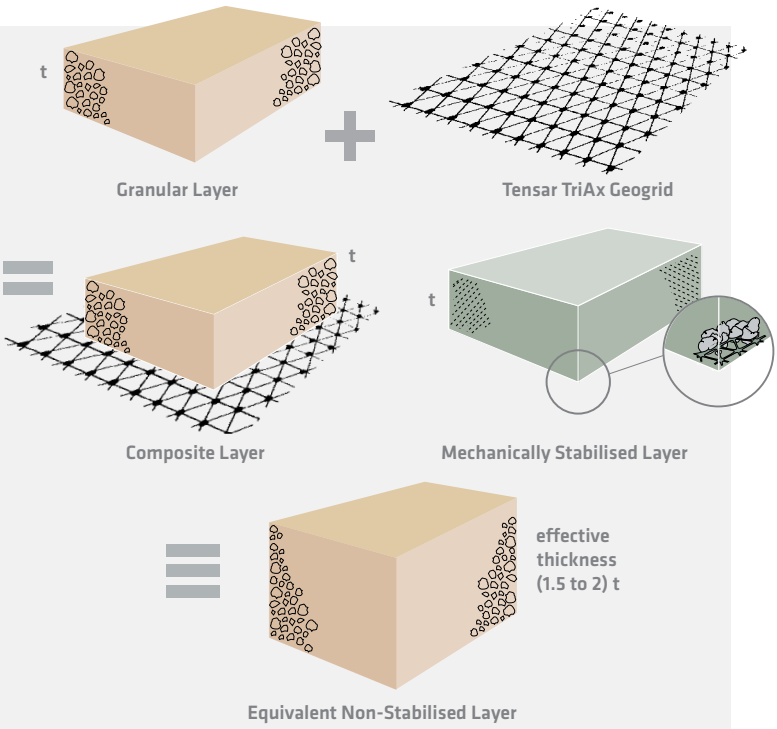
The confinement effect and physical properties of Tensar TriAx punched and drawn geogrid result in reduced rutting compared with other forms of geogrids. This difference in performance is emphasised by the rut profiles, shown above, measured as part of a detailed pavement trial carried out by TRL (Transport Research Laboratory, UK). These are cross-sections of the trial pavement, showing both the top of the sub-base (300 mm thick) and the top of the subgrade (CBR = 1.5%), before and after completion of trafficking. After 3,500 passes a deep rut has formed in the surface of the alternative geogrid (tensioned membrane) reinforced sub-base with a considerable amount of deformation. A similar rut has developed at the top of the subgrade. This results in remoulding and softening of the subgrade. For the Tensar section (interlock and confinement), after 10,000 passes the rut in the sub-base is much smaller with little deformation, and the rut in the subgrade is negligible. The performance of Tensar geogrid is clearly and significantly different to geogrids manufactured by other methods (welded, woven, etc.).

Tensar® Mechanically Stabilised Layers

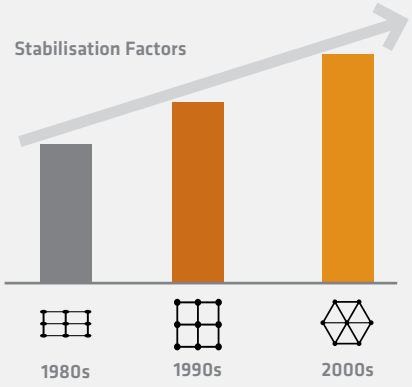
Granular layers stabilised with Tensar® TriAx® geogrids perform as a composite due to the interlock mechanism. The geogrid/aggregate composite can then be regarded as a Tensar® Mechanically Stabilised Layer (MSL).

Designers and specifiers can choose to specify a Tensar Mechanically Stabilised Layer and be confident in the knowledge that the properties and performance of the composite are known and definable.

The 'equivalent non-stabilised layer' can be thought of in different ways and therefore it can be introduced into existing design methods according to how the concept would fit best. The following ranges would normally apply in most designs.



Design parameters	Tensar range of effective increases	Units
Thickness 't'	1.5<t<2.5	mm
Modulus 'E'	1.5<E<3.0	kN/m²
Traffic load 'TIF'	3<TIF<15	Standard axles



Tensar Stabilisation Factors – Improvements in geogrid technology were achieved based on knowledge gained over the last 30 years.

Quantifying the Performance Benefit

Starting with small-scale laboratory work and moving to full-scale trafficking

In order to define the effective thickness of Tensar Mechanically Stabilised Layers, common performance data has been accumulated from numerous monitored trials on full-scale trafficking demonstrations over many years; initially with Tensar biaxial geogrids and more recently with TriAx geogrid.

A) 1981 – *Testing of Tensar geogrids for subgrade stabilisation commenced in 1981 with some very simple bearing tests that demonstrated the benefit of the interlock mechanism.*

B) 1985 – *Tensar has shown complete commitment to full-scale testing over a period of more than 20 years.*

1992 – *Laboratory testing is repeatedly confirmed by on-site trials*

1996 – *The lateral confinement function of Tensar geogrids leads to significant reductions in rut depth*

2000 – *Full-scale laboratory tests at the UK Transport Research Laboratory comparing Tensar geogrid with alternative forms of geogrid*

These pictures display the types of research in which Tensar® International has been involved over the years. The data in these tests have provided the factors to employ in empirical design methods. Now the trend in pavement design is moving towards more analytical design methods where the pavement response to traffic loads can be seen in numerical models. Tensar International is at the forefront of this development by modelling the effect of mechanical stabilisation from geogrids.

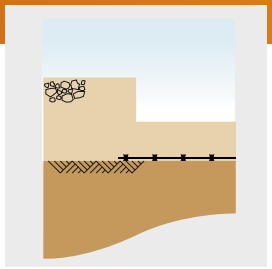
2004 – *Testing is not confined to one region but has involved independent laboratories and research across the globe*

2004 – *One of the longest monitored and severely trafficked trials took place in the Feiring Bruck Quarry, Norway*

2007 Tensar Technology Centre – *In-house trafficking facility enables geogrids, fills and subgrades to be investigated*

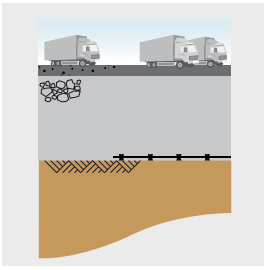
2008/2011 – *Controlled environment conditions ensure comparable trafficking test results*

Each of the Six Major Applications Brings Major Benefits and These Can Often be Converted to a Cost Advantage



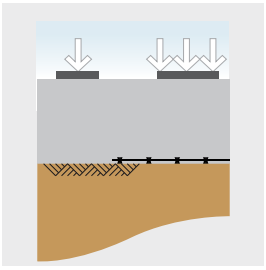
REDUCING LAYER THICKNESS

By reducing the capping layer thickness by up to 50% with no performance loss compared with a standard non-stabilised design, the contractor can save significant money on the costs of the ground improvement work as well as achieving savings of up to 50% in construction CO_2 emissions.



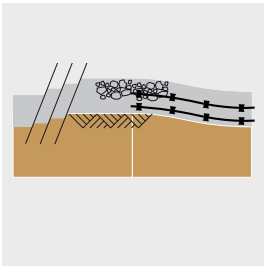
INCREASING LIFE

Road rehabilitation, especially if it involves full depth reconstruction, is an expensive item for any road owner. A value engineering exercise can show that the inclusion of a mechanically stabilised layer will increase a road pavement life by a factor of three or more and therefore reduce an annual maintenance budget, for asphalt course replacement, by over 50%.



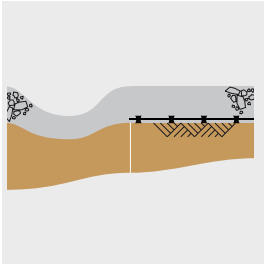
INCREASING BEARING CAPACITY

On weak subgrades, such as peat, it is sometimes necessary to construct access roads that have to bear very heavy loads. Crane access to wind farm installations are a prime example where the bearing capacity has to be increased and designed for safe site operations.



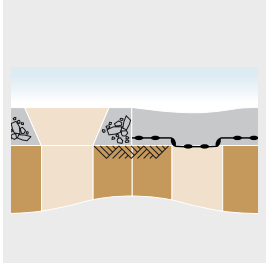
CONTROLLING DIFFERENTIAL SETTLEMENT

Many construction sites are taking place on 'brownfield' development areas where the subgrade will have variable qualities of support and the pavement layers are prone to differential settlement. Establishing Tensar's track record, projects have been visited after many years of service, confirming that the surface profile has been preserved. Cost savings of over 75% have been made on conventional solutions, such as working platforms, in providing a supporting substructure to a road pavement.



CAPPING WEAK DEPOSITS

Tensar® has developed techniques for the capping of weak deposits. The Tensar Technology has been refined over the years to 'make possible the impossible' and now becomes the preferred method for capping sludge lagoons and industrial waste deposits.



SPANNING VOIDS

Areas of abandoned mine workings frequently need some form of protection against the dangers of a sudden collapse and the opening up of a deep 'crown hole.' Tensar Technology has been put to the test in this critical application and, as intended, provided warning and sufficient time for the authorities to react and secure public safety.

Practical Examples of the Major Applications

TriAx installation, Stoke

- Reducing layer thickness
- Increasing life
- Controlling differential settlement

Stabilising weak soil in Ashbourne, Derbyshire

- Capping weak deposits
- Increasing bearing capacity

Improving and strengthening the A66 in Melsonby

- Reducing layer thickness
- Increasing life

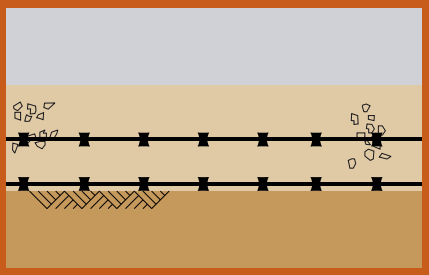
Stabilising ground to facilitate off-road parking at Lanarkshire

- Reducing layer thickness
- Increasing bearing capacity
- Controlling differential settlement

Specialist Pavement Designs

If heavy axles loading or highly concentrated wheel loads define the traffic loading, rather than repetitions of more moderate highway traffic, then specialist design methods for geogrids have been developed by Tensar® International.

The granular layer may then require multi-layer geogrid stabilisation. Commonly used design methods for heavy-duty pavements have been adopted and modified to include the geogrid stabilisation benefits.



TYPICAL HEAVY-DUTY PAVEMENT

Heavy-duty pavements may require multi-layer geogrid stabilisation.

New taxiway at Adelaide Airport (Australia)

AIRPORT PAVEMENTS

As the weight of newer generations of aircraft increases, the intense wheel loads need special consideration in providing a robust base to runways and taxiways.

Tensar geogrids are perfect for dockside paving (Latvia)

DOCK PAVEMENTS

Container handling and stacking areas, bulk cargo handling and fabrication sites commonly impose highly concentrated wheel or truck loads.

Heavyweight crane on Tensar ground stabilised working platform

SAFE WORKING PLATFORMS

Cranes and piling rigs require a working platform to operate safely and with controlled accuracy. Frequently, these operations have to take place over very weak subgrades.

Benefits of Tensar ground stabilisation on railway tracks

RAILWAY TRACKBED

Both the ballast layer and the sub-ballast bearing layer benefit from geogrid stabilisation – particularly over weak subgrades. A stabilised bearing layer introduces an increased modulus in support of the ballast. A stabilised ballast layer laterally confines the ballast and prolongs the effective support of the sleepers and rails.

Tensar® TriAx® large aperture geogrid - TXL

Tensar TriAx standard aperture geogrid - TX

Tensar TriAx geocomposite - TXG

Tensar® International Support Services

Use Our Experience and Reliability for Unsurpassed Product Support

PROFESSIONAL SOLUTIONS

We offer the services of a team of professionals who can assist in developing concepts to support your design or undertake full construction design. We also provide advice and training on-site to assist you to effectively install our products and systems in your project. Our range of innovative products is combined with our global experience of thousands of projects in a wide variety of climatic conditions and soil types. This means that we provide you with a unique specialist civil engineering viewpoint on how to use our products and systems and proven, best value solutions in your application.

We are committed to providing the highest levels of technical assistance in the field to support the use of our products and systems. Our own dedicated and trained teams of civil engineers or those of Tensar local distributors work in partnerships with you to ensure the success of your project.

TENSARPAVE™ DESIGN SOFTWARE

TensarPave is a software package developed by Tensar International, incorporating TriAx® design parameters for the most economical ground stabilisation and pavement design solutions. TensarPave software is available free of charge with specific user training from Tensar International.

INSTALLATION SUPPORT

We can also support your projects with construction and installation guidelines, with independent certification documentation and with specification notes to assist in the production of contract documents and installation procedures. These are backed by an extensive range of case studies, product specifications and in-depth technical papers.

RANGE OF DESIGN SCHEMES IN 3 CORE STREAMS

1 **SUPPLY ONLY**

2 **APPLICATION SUGGESTION & SUPPLY**
Conceptual drawing and advice

3 **DESIGN & SUPPLY**
Certified detailed design and construction drawings covered by Tensar's Professional Indemnity (PI) insurance cover

Our service range includes project specific advice on concepts, design, construction and installation, as well as general training on Tensar applications and your use of Tensar's proprietary software. By engaging our team at the earliest stages of your project, we can help you save time and money during the initial design phases by developing concepts and assessing the design feasibility of using Tensar products or systems, and by providing indicative budget costs.

CONSTRUCTION SUPPORT

- Installation advice on how to install Tensar on your project
- Installation training demonstrating installation of our product
- Construction advice to answer practical questions on Tensar installation while construction progresses

TRAINING

- Comprehensive hands-on technical workshops
- Personal training or seminars tailored to your requirements

DESIGN

- Design advice to assist you in incorporating Tensar products and systems in your project
- Detailed costing to enable you to competitively price Tensar in your project or bid
- Detailed design and construction drawings for using Tensar products and systems on your project

DESIGN SUPPORT

- Application advice to assist you with your design concept
- Application suggestion providing our design concept for further consideration and design by you
- Design review of your design which incorporates our products or systems

Contact Tensar® International or your local distributor to receive further literature covering Tensar products and applications.

Also available on request are product specifications, installation guides and specification notes.

The complete range of Tensar literature consists of:

- **Tensar Geosynthetics in Civil Engineering**
  A guide to products, systems and services
- **Subgrade Stabilisation**
  Stabilising unbound layers in roads and trafficked areas
- **TriAx®: A Revolution in Geogrid Technology**
  The properties and performance advantages of Tensar TriAx geogrids
- **Asphalt Pavements**
  Reinforcing asphalt layers in roads and trafficked areas
- **TensarTech® Earth Retaining Systems**
  Bridge abutments, retaining walls and steep slopes
- **Railways**
  Mechanical stabilisation of track ballast and sub-ballast
- **Foundations Over Piles**
  Constructing over weak ground without settlement
- **Basal Reinforcement**
  Using Basetex high-strength geotextiles
- **TensarTech Stratum™**
  Cellular foundation mattress system for foundations with controlled settlement
- **Tensar Erosion Control**
  A guide to products and systems

Your local distributor is:

Tensar®

Tensar International Limited
Cunningham Court
Shadsworth Business Park
Blackburn BB1 2QX
United Kingdom

Tel: +44 (0) 1254 262431
Fax: +44 (0) 1254 266867
e-mail: info@tensar.co.uk
tensar-international.com

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