ATKINS

Member of the SNC-Lavalin Group

Northwest Bridges Term Maintenance Contract No. 3

Culvert Inverts – Group ‘2’ - Coolturk Bridge. Natura Impact Statement

Transport Infrastructure Ireland

12/03/2021

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This document has 46 pages including the cover and excluding the Appendices.

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Authorised	Date
Rev 0	Draft for Comment	EN & AMcC	EN	POD	MJ	01-06-20
Rev 1	Appropriate Assessment	EN & AMcC	EN	POD	MJ	15-07-20
Rev 2	Appropriate Assessment	EN	NS	POD	MJ	13-11-20
Rev3	Minor Amendments – For Issue	NS	NS	POD	MJ	12-02-21
Rev 4	Minor Amendments – For Issue	NS	NS	POD	MJ	12-03-21

Client signoff

Client	Transport Infrastructure Ireland
Project	Northwest Bridges Term Maintenance Contract No. 3
Job number	5162160
Client signature / date	

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1. Introduction

Atkins have been commissioned by Transport Infrastructure Ireland (TII) to prepare a Natura Impact Statement (NIS) for the installation of a concrete invert at Coolturk Bridge (MO-N59-006.00), Co. Mayo. The proposed project falls under the TII Northwest Bridges Term Maintenance Contract No. 3.

1.1. Project Context

The Eirspan Bridge Management System covers all aspects of bridge management including routine maintenance. Over the past number of years routine maintenance contracts have been undertaken by private contractors under Bridge Term Maintenance contracts. A TII Bridges Term Maintenance Contract is currently being delivered for 693 bridges in the Northwest region.

Under the Northwest Bridges Term Maintenance Contract No. 3, Atkins has been appointed as the Consultant to carry out services under the Contract such as bridge inspections and reporting, ecological assessment, production of contract documents, tender assessment, contract administration and site supervision. The Contract involves the annual inspection and undertaking of routine maintenance works to 693 no. bridges across all counties in the Northwest region, namely counties Donegal, Mayo, Galway, Sligo, Roscommon, Cavan, Leitrim and Monaghan. This contract will run until 2021, where it is intended to carry out annual routine maintenance work between 1 March and 30 September in each of the years 2018, 2019, 2020 and 2021, with a defects period extending for a further year. Works from each year will be subject to the Appropriate Assessment (AA) process.

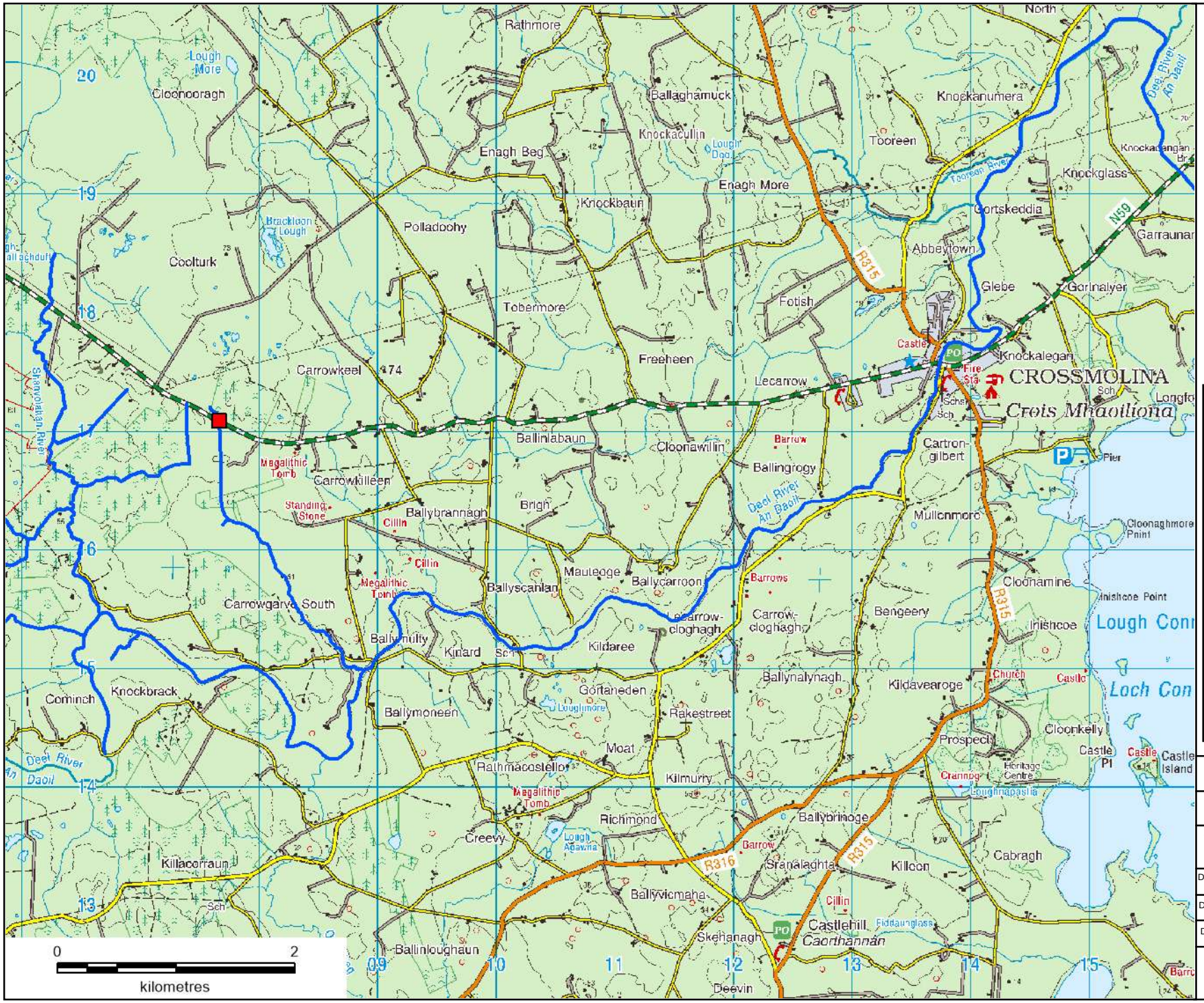
In total, it is proposed to install 5 concrete inverts to existing culverts in the Northwest. These culverts are steel corrugated circular structures that were installed under national roads during the 1970s and 80s. The culverts now show signs of significant corrosion and in order to maintain their structural integrity, a concrete invert liner is to be installed.

The culverts proposed for concrete invert installation initially underwent Screening for Appropriate Assessment in 2018. TII determined that likely significant effects to European sites, in view of their conservation objectives, could not be ruled out and thus required Appropriate Assessment. Thus, the proposed concrete invert installation at Coolturk Bridge requires further assessment.

For the purposes of assessment, the 5 culverts in the Northwest have been grouped according to their potential zone of influence and location within Water Framework Directive (WFD) catchments. Using this system, 4 groups were established. These groups are detailed in Table 1-1. Where European sites are located within the potential zone of influence of more than one grouping, the potential for in-combination impacts shall also be considered. Coolturk Bridge is assigned to Group 2, which is located in the Moy & Killala Bay WFD catchment.

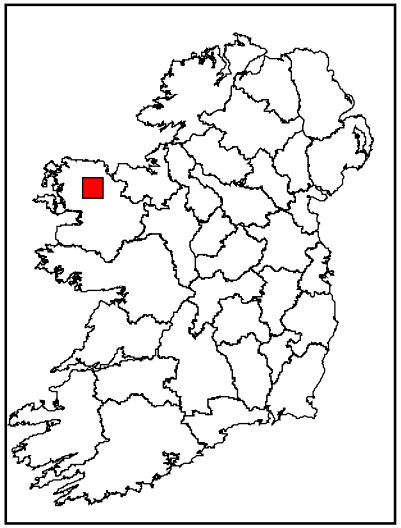
Table 1-1 - Grouping of Structures in the Northwest.

Group No.	Structure Name & No.	WFD Catchment
Group 1	Boherduff Bridge (MO-N17-012.00)	Corrib
Group 2	Coolturk Bridge (MO-N59-006.00)	Moy & Killala Bay
Group 3	Port Road Bridge (DL-N14-002.00)	Lough Swilly
Group 4	Glen Bridge 1 (DL-N56-007.00)	Donegal Bay North
	Glen Bridge 2 (DL-N56-008.00)	Donegal Bay North



Legend

- Coolturk Bridge
- Rivers



Client: Transport Infrastructure Ireland		
Project: Northwest Bridges Term Maintenance		
Title: Coolturk Bridge Site Location		
Drawn: EN	Checked: NS	Authorised: PO'D
Date: 21/05/2020	Date: 21/05/2020	Date: 21/05/2020
Drawing No: 1-1		Rev: 1.0

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1.2. Project Description

Transport Infrastructure Ireland undertake routine bridges maintenance works to structures associated with the National Roads Network. This project comprises the provision of a concrete lining and associated instream works to the invert to Coolturk Bridge (MO-N59-006.00), Co. Mayo. Coolturk Bridge is located on the N59, approximately 6km West of Crossmolina town. Coolturk Bridge is situated on the Rakestreet Stream, which is a tributary of the River Deel, 2.8km downstream, and is located in the Deel[Cossmolina] subcatchment. Figure 1.1 displays the location of Coolturk Bridge.

This corrugated steel structure has been identified as having durability and structural issues as a result of the erosion of previous bitumen protection linings and progressive corrosion of the metal particularly in the lower region. The purpose of the concrete invert is to mitigate further corrosion and section loss to the invert of the culvert and to restore and maintain it structural integrity.

It should be noted that the scope of the proposed project is the replacement of the existing concrete lining at the base of the culvert. Given engineering constraints for the structure, it is not feasible to retrofit a ledge for mammal passage within the existing structure. The design and installation of an entirely new structure would be required for this to be achieved, which is outside the scope of the proposed project.

The culvert will be dammed upstream and downstream within 10m of the culvert using double lined sand bags, filled with clean sand, tied and wrapped in heavy gauge polyethene.

There will be three dams erected in the stream; dam 1 upstream of the culvert and dam 2 &3 situated downstream of the culvert (Figure 1.2). Dam 2 and 3 will be erected first, 300mm high on the stream bed. Dam 1 will then be erected, and the stream flow pumped downstream of dam 3. The intake will be fitted with a filter to ensure no fish enter the pipeline. The outfall pipeline will be fitted with a silt sock. This will dissipate flow and prevent scour of the river bed. The stream between dam 1 & 2 will be electro fished and the fish placed in the pool created between dam 2 and 3. On completion of the electro fishing dam 2 and 3 will be raised to full height and a silt fence will be erected between dam 2 and dam 3 and a second silt fence will be erected just upstream of dam 3. The dimensions of the dams will be determined by using the rule that the depth of the base must be three time the height to ensure stability and impermeability. The water between dam 1 and dam 2 will be pumped into the pooled area between dam 2 and dam 3 in advance of the silt fences. A shallow sump will be excavated (or naturally occurring) in the stream bed upstream of dam 2 to catch surface water and cleaning water from power washing the culvert. The collected water in the sump will be pumped downstream between dam 2 and dam 3 and discharged in advance of the silt fences.

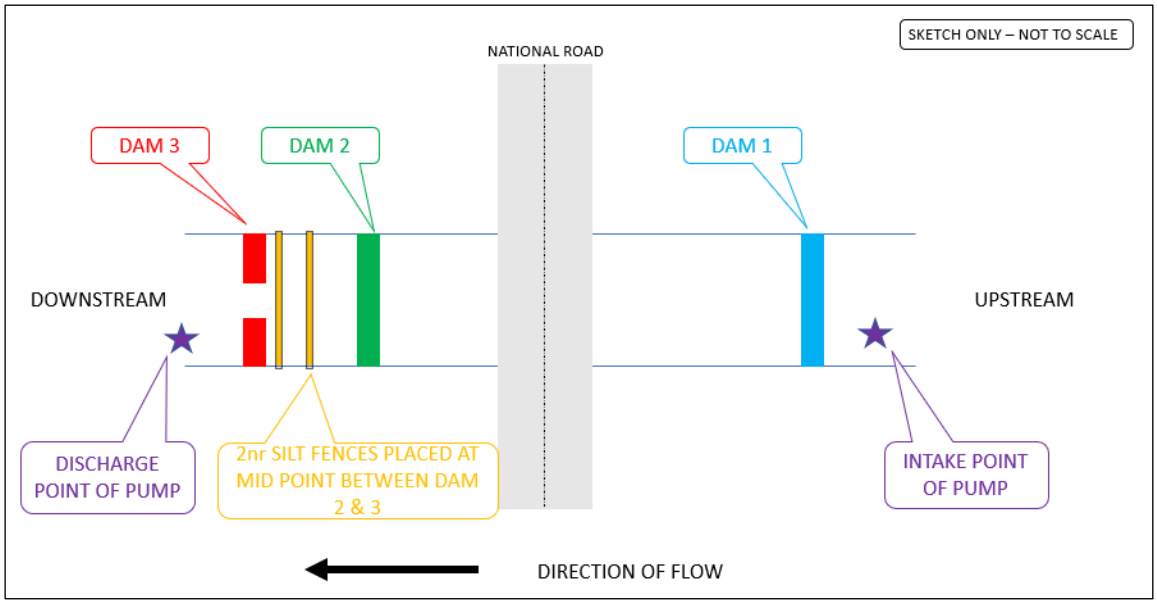


Figure 1-2 - Layout of dams and silt fences.

Any large boulders present will be removed from the riverbed prior to placing a heavy-duty geotextile on the river substrate and stored within the works area for reinstatement on completion of the works. A hardstanding working platform will be placed over the geotextile upstream and downstream of the culvert. The working platform will consist of clean gravel/ crushed rock (typically 250mm thick depending on the riverbed ground conditions). Existing stream bed material within the metal culvert will be captured and stored within the works area for reinstatement on completion of the concrete lining. The corrugated steel culvert will be cleaned by power washing and hand-held mechanical tools such as wire brushing and grinding. The power washing water will be collected in a sump within the works area (i.e. upstream of dam 2) and discharged through the double silt fencing and dam 3 before entering the downstream waters. Arisings from the corrugated metal culvert cleaning will be collected within the culvert and disposed off-site to a licensed waste facility. Prior to placement of the lining, the corrugated steel culvert invert area to be lined will be primed with anti-corrosion primer, prior to placing 150mm thick (nominal) reinforced (stainless steel) concrete to circa one-third of the culvert height. On completion of the culvert lining works the temporary working platform and geotextile will be removed. The culvert bed will be reinstated with stream bed material that was removed from the culvert prior to the works and the stream bed will be regraded locally to the culvert ends with clean natural gravels to realign the culvert and stream bed levels.

The drawing detail of the proposed works is included in Appendix A.

The Contractor's method statement details how the works will be carried out and the works sequence. The Contractor's method statement is included in Appendix B and is summarised in the text below along with general specifications of the works from the contract's Works Requirements Specifications.

1.2.1. Working Methods

Under the Northwest Bridges Term Maintenance Contract No. 3, the works are carried out according to the Works Requirements Specifications. This details the general specifications of the works, which includes the installation of concrete inverts to corrugated structures: -

> *'The contractor shall remove all silt/debris and deposit build-ups from the structure ensuring appropriate downstream silt containment measures are in place. The existing invert shall be prepared for the installation of the sprayed concrete invert (HTR-DR 1006 & 1007) by cleaning back to bright steel. Removal of all detrimental contamination and corrosion products using handheld tools to produce a generally bright appearance overall. The surfaces shall be free of embedded abrasive particles and corrosion products when viewed through a x10 illuminated magnifying glass. The invert shall then be coated with the corrosion inhibitor Galvafroid manufactured by Fosroc. An anti-corrosion steel primer, Nitoprime Zincrich Plus by Fosroc, will be used to prime the steel'*.

Fosroc were contacted regarding the above products proposed to be used during the installation of the concrete invert, as the Safety Data Sheets (SDS) for Galvafroid and Nitoprime Zincrich Plus categorise these products as 'Aquatic Acute (1-H400) and Aquatic Chronic (1-H410)'. The SDS states that the products '*contain a substance which is toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment*'. Fosroc confirmed that the danger to aquatic organisms arises from chlorinated paraffin, which is used as a plasticiser for the product when in a liquid state. These products will be applied during the installation of the concrete culvert in a dry working area. Once cured this material is bound in a polystyrene matrix and no longer mobile. Therefore, it is not regarded as a pollutant in its cured and solid state. These products are not epoxide resin-based coatings, which have been shown to potentially have adverse effects on the aquatic environment (Bell *et al*., 2020).

As stated in the Contract, existing deposits within the corrugated steel culvert will be removed and disposed of off-site, with the corrugated invert being cleaned back to bare steel using hand held tools. The exposed steel under the proposed concrete lining shall be treated with a corrosion inhibitor followed by an anti-corrosion steel primer. All shotcreting works shall be undertaken in accordance with 'BS EN 14487: Sprayed Concrete – Execution'.

The installation of the culvert invert lining will be carried out during low water conditions in the months of July to September inclusive. It is estimated that the works will be completed in approximately 2-3 weeks.

The Contractor's method statement details how the works will be carried out and the works' sequence. The Contractor's method statement is included in Appendix B. The works description and sequence are detailed in the text below.

Typical sequence of works

A Temporary Traffic Management (TTM) system will be set up within the road corridor above Coolturk Bridge. Permission will be sought from the landowner to gain temporary access to the culvert, both upstream and downstream. All deliveries and plant will be stored within the TTM during the works period.

A temporary timber walkway will be placed down the side of the riverbank to lessen disturbance to the bank and siltation of the stream.

Dams will consist of small sand bags filled with Pea Gravel, will be double bagged and sealed. The dimensions of the dam will be determined by the flow of the stream at the time of works – it will be three times as deep as it is tall. The dams will be wrapped in 1000-gauge polythene. As depicted in Figure 1.2 above, there will be one dam upstream (Dam 1) and 2 dams (Dam 2 and Dam 3) downstream, with 2no. silt fences between Dam 2 and Dam 3. All dams will be located within 10m of the bridge. Dam 3 will be erected to 300mm first, followed by Dam 2 to the same height. This will create a pool. Dam 1 will then be erected to full height. If required, electrofishing will be undertaken by a licenced operator between Dam 1 and 2. All fish will be relocated to the pool between Dam 2 and 3. A 500mm opening will be created in Dam 3 to allow fish passage. 2no. silt fences will be erected between Dam 2 and 3. Dam 2 will be raised to full height before dewatering the works area.

An over pumping pipe will be placed into a 225mm non perforated pipe installed through the culvert at high level. It will be secured by temporary brackets that will be fixed along the culvert. The bracket will consist of a threaded bar arrangement with unit strut drilled through the steel lining with an expanding anchor bolt fitting at the end to hold it in place. The threaded rod arrangement will allow for height adjustment to accommodate for a gravity fall on the pipe. The intake hose for over pumping will be positioned on the upstream side of dam 1 and will be wrapped in a layer of silt fencing. The discharge hose will be position on the downstream side of dam 3 – as indicated in Figure 1.2 above. A silt bag will be place on the end of the discharge hose to prevent discharge of any suspended solid / unwanted material into the live water course.

The work area between dam 1 and dam 2 will be pumped out and discharged between dam 2 and 3 and before the silt fences. A small natural sump / low point will be located within the works area (between dam 1 and 2) and a submersible pump will be used to over pump any water collected within the dams. This will be also discharged to the upstream side of the silt fences between dams 2 and 3.

A working platform will be constructed on the dried stream bed. It will consist of a layer of heavy-duty geotextile being placed over the existing river bed and a 250mm layer of clean, well graded aggregate being placed on the geotextile to give a solid, clean base for operatives to access the culvert. The platform will cover the full width of the stream and extend 5m either side of the culvert within the dammed area. The aggregate will be placed into location using an excavator placed on the embankment that will reach the mouth of the culvert without entering the bed of the stream. On completion of the culvert lining the geotextile and aggregate will be removed.

Once the water has been drained from the culvert the existing lining will be cleaned. Any silt or stones within the culvert will be removed by hand with a shovel & wheelbarrow, to be reinstate once works are complete. The lining will then be cleaned using a 25.000PSI Hydro Power Washer removing the loose / decayed material and exposing a clean Sa3 finish on the existing steel lining. If all material is not removed by the power washing a small angle grinder / wire brush will be used to remove the decayed material. Arisings from the corrugated metal cleaning with be collected within the culvert and disposed of at a licensed waste facility. Water from power washing the steel culvert will be collected in a sump within upstream of dam 2 and over pumped to discharge upstream of the silt fences between dams 2 and 3.

The exposed steel under the prosed concrete lining shall be treated with a corrosion inhibitor followed by and anti-corrosion steel primer. As stated above, the invert shall then be coated with the corrosion inhibitor Galvafroid manufactured by Fosroc. An anti-corrosion steel primer, Nitoprime Zincrich Plus by Fosroc, will be used to prime the steel. The stainless-steel mesh reinforcement will be delivered to site using a Hi-Abb truck. It will then be lowered over the barrier on the downstream side and placed on the outside of the culvert in the stream bed. The operatives will then carry the mesh to the point of placement and fix into position.

A curved shutter will be attached to the side walls with openings at the top of the shutter to allow the concrete to enter. To pour the concrete into position, it will be vibrated using a hi-frequency pencil poker that will be placed within the shutter through the openings. Once the concrete has set, the shutters will then be struck and moved forward to the remaining section of wall and secured into position. Once in position the concrete will be poured in the same manner as above.

All material removed from within the existing culvert will be reinstated once concrete works are complete. If additional material is required, clean, natural, well-graded gravel will be used. Any difference in levels between new concrete culvert lining and the stream bed on the upstream and downstream side, once the concrete works are complete, will also be regraded with clean natural gravel graded to match the existing.

Rock armour is required at the mouth of the entrance to the culvert to ease water access into the culvert. The bank at the edge of the stream will be hand dug 300mm below the current ground level, the excavated material placed into rubble bags and removed off site to a licenced waste facility. The limestone rock armour will be sourced from a local quarry in various sizes varying from 350mm to 500mm (boulders). Due to the location of the culvert all rock armour will need to be carried manually into position. The rock armour will then be placed by hand and built into position securely ensuring the first course is below water level to avoid any future undermining. Rock armour is to be built to match the height of the new culvert lining.

On completion of the culvert lining works the temporary working platform and the geotextile will be removed. The culvert bed will be reinstated with and stream bed material that was removed from the culvert prior to the works and the stream bed will be regraded locally to the culvert ends with natural clean gravels to realign the culvert and stream levels. The removal of the dams will be completed on a 2 stage basis. The level of Dam 1 will be lowered to allow the area between Dam 1 and 2 to partially fill with water. This will then be allowed to settle overnight and the remainder of the dams will then be removed completely. The area will be inspected and works approved before the flume and the sand bags are removed and the stream allowed to flow.

It is predicted that these works will be completed in 2 weeks weather permitting as this stream is susceptible to flash flooding during periods of heavy rain.

1.2.2. Hydraulic Assessment

A hydraulic impact assessment was prepared for the proposed project. The hydraulic assessment report is included in Appendix C. The hydraulic assessment was conducted to analyse the impact of the proposed lining on the culvert's flow capacity, change in predicted water levels upstream and downstream of the culvert, and changes in the velocities during low flow events. The hydraulic model shows that the proposed works to the existing culvert will not have a significant impact on the hydrological and hydraulic regime of the watercourse. The hydraulic impact assessment supports a Section 50 licence application to the Office of Public Works (OPW), granted on 23rd June 2020 (Appendix D). The granted Section 50 consent did not contain additional measures.

The following conclusions, based on the hydrology estimations and further hydraulic model assessment for the baseline and proposed scenarios, were made in the hydraulic assessment for Coolturk culvert: -

- '*This hydraulic capacity assessment has been prepared in consideration of the requirements under Section 50 of the Arterial Drainage Act 1945.*
- *ADAS methodology has been used to derive flows for QMED, Q100 and Q100C1, their magnitudes being 0.275 m3/s, 0.574 m3/s and 0.689 m3/s respectively*.
- *The proposed works, due to the reduced flow area and higher invert levels results in increase in water levels upstream of the Coolturk culvert. No changes in the maximum water levels are predicted at the downstream end of the culvert.*
- *For the three events analysed, the predicted increase in the maximum stage is in the range of 167 – 190 mm, out of which 150 mm is due to the raised invert level by proposed lining.*

- *A minimum freeboard of 1.49 m is available in the culvert under all conditions, and this meets the OPW minimum threshold criteria.*

- *During low flow conditions, there is sufficient depth of flow, above the recommended 150 mm water depth for fish passage. The proposed works is not expected to cause significant worsening of the present situation with regards to fish passage.*

- *No nearby properties are expected to be affected in the proposed scenario*.'

Atkins consulted with Inland Fisheries Ireland (IFI) in May 2020. IFI were of the opinion that "*the existing culvert at Coolturk (MO-N59-006.00) is a barrier to fish passage. The proposed culvert lining works will result in lower dry weather flows at higher velocities making fish passage less achievable. There is however limited fisheries habitat available upstream of this culvert and the proposed work, at this location, will not have a significant impact on the fishery. Measures must be put in place to ensure there is no discharge of silt, cement, hydrocarbons or other pollutants during construction. All work must be carried out in the dry during low flow and dry weather conditions.*" These concerns will be addressed through the implementation of measures detailed in the working methods, contractor's method statement (Appendix B) and mitigation measures set out in Section 6.3 of this NIS.

2. Scope of Study

The proposed project was previously subject to Screening for AA, where TII determined that the proposed project required Appropriate Assessment.

Thus, the aim of this report is to provide supporting information to assist the competent authority to carry out an Appropriate Assessment with respect to the proposed project.

2.1. Legislative Context

Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora, known as the 'Habitats Directive' provides legal protection for habitats and species of European importance. Article 2 of the Directive requires the maintenance or restoration of habitats and species of European Community interest, at a favourable conservation status. Articles 3 – 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservations of an EU-wide network of sites known as European sites. European sites are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/EEC).

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans or projects that could potentially affect European sites. Article 6(3) establishes the requirement for Appropriate Assessment: -

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

Article 6 (4) deals with the steps that should be taken when it is determined, as a result of Appropriate Assessment, that a plan or project will adversely affect a European site. Alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures need to be addressed in this case. Article 6(4) states: -

> *"If, in spite of a negative assessment of the implications for the 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, the Member State 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.*
>
> *Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."*

2.2. Appropriate Assessment Process

Guidance on the AA process was produced by the European Commission (EC, 2001; 2018), which was subsequently used to develop guidance for Ireland by the Department of Environment, Heritage and Local Government in 2009 (DEHLG, 2009) and also by the National Parks and Wildlife Service in 2018[1] (NPWS 2018). These guidance documents set out a staged approach to complete the AA process and outlines the issues and tests at each stage. The stages outlined below are taken from the guidance document Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (DEHLG, 2009).

[1] https://www.npws.ie/development-consultations

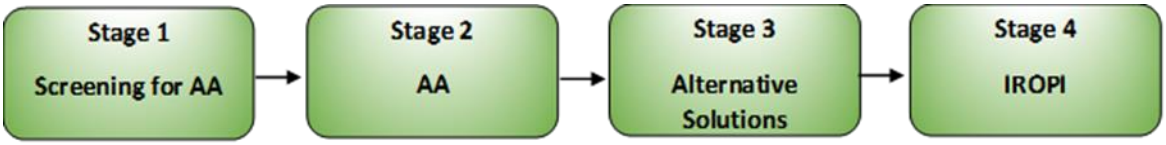


Figure 2-1 - Appropriate Assessment Process (Source: DEHLG, 2009).

2.2.1. Screening for Appropriate Assessment

Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3): -

i. Whether a plan or project is directly connected to or necessary for the management of the site, and
ii. Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a European site in view of its conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, then the process must proceed to Appropriate Assessment.

2.2.2. Appropriate Assessment

Appropriate Assessment considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a European site, and includes any necessary mitigation measures.

The competent authority can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of the site(s) concerned. If this cannot be determined, and where sufficient mitigation cannot be achieved, the alternative solutions need to be considered and the process proceeds to the consideration of alternative solutions.

2.2.3. Alternative Solutions

This examines any alternative solutions or options that could enable the plan or project to proceed without adverse effects on the integrity of a European site. The process must return to AA as alternatives will require assessment in order to proceed. Demonstrating that all reasonable alternatives have been considered and assessed, and that the least damaging option has been selected, it is necessary to examine whether there are imperative reasons of overriding interest (IROPI).

2.2.4. IROPI

This examines whether there are imperative reasons of overriding public interest for allowing a plan or project that will have adverse effects on the integrity of a European site to proceed in cases where it has been established that no less damaging alternative solution exists. Compensatory measures must be proposed and assessed, of which the Commission must be informed.

The AA process only progresses through each of the full process for certain plans and projects. For example, for a project not connected with the management of a European site and where no likely significant effects on a European site in view of its conservation objectives are identified, the process stops at Screening for AA. Throughout the process the precautionary principle must be applied, which requires that the conservation objectives of Natura 2000 should prevail where there is uncertainty (EC, 2001; 2018).

3. Methods

3.1. Legislation & Guidance Documents

This report was prepared with reference and due consideration to the following documents and due regard for relevant case law, including but not limited to: -

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna (Habitats Directive);
- Statutory Instrument No. 477/2011 — European Communities (Birds and Natural Habitats) Regulations 2011;
- National Parks and Wildlife Service - Development Consultations[2] (NPWS 2018)
- European Commission (2018). Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC;
- European Commission (2001). Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC;
- Department of the Environment, Heritage and Local Government (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities; and,
- Recent case law including, but not limited to, Case C-323/17 People Over Wind & anor. V. Coillte.

3.2. Desk Study

A desk study was carried out to collate information available on European sites in the vicinity of the proposed project. These areas were viewed using Google Earth, Google maps[3] and Bing maps[4] (last accessed on 25/05/2020).

The National Parks and Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) online databases were reviewed concerning European sites and their features of interest in the vicinity of the proposed project. The Environmental Protection Agency (EPA) mapping[5] system was used to identify any hydrological connection between the proposed project and European sites.

Locations and boundaries of all European sites within 15km of the proposed project were identified and reviewed using the NPWS online map viewer. Boundary shapefiles were also downloaded from this site to facilitate the preparation of project graphics.

Desktop information on relevant European sites were reviewed on the NPWS website, including the site synopsis for each SAC/SPA, the conservation objectives, the site boundaries as shown on the NPWS online map viewer, the standard Natura 2000 Data Form for the SAC/SPA which details conditions and threats of the sites, and published information and unpublished reports on the relevant European sites.

Relevant planning information for the surrounding area was reviewed using the planning enquiry systems of Mayo County Council. Search criteria were implemented to determine whether such projects or plans that would not be

[2] https://www.npws.ie/development-consultations
[3] https://www.google.ie/maps
[4] http://www.bing.com/maps/
[5] https://gis.epa.ie/EPAMaps/

relevant to this study. This information was used to determine potential cumulative impacts from other plans / projects with the proposed works.

3.2.1. Geographical Information System

Under the Northwest Bridges Term Maintenance Contract No. 3, Atkins developed a Geographic Information System (GIS) to store all ecological data relating to the Northwest bridges and to facilitate easy interrogation of data both within the dataset and spatially. The GIS was used during the assessment of the 5 structures proposed for the installation of concrete inverts for geospatial analysis of all data using MapInfo V. 16. This included the examination of the locations and boundaries of European sites within 15km of all structures and determination of surface water connectivity between structures and European sites, using the EPA's river network data.

Under the Northwest Bridges Term Maintenance Contract No. 3, Atkins submitted a data request to NPWS with regard to freshwater pearl mussel *Margaritifera margaritifera*. This dataset was also used in the GIS.

3.3. Site Visit

An ecological walkover survey of the site was conducted by an Atkins ecologist during September 2019. The purpose of the survey was to survey the site for invasive plant species and to record the habitats and flora in the vicinity of the proposed project. The survey was chiefly concerned with recording the presence or likely presence of protected species and recording protected habitats or those habitats suitable to support protected species, in particular qualifying interests of European sites. The survey had regard for guidance sources such as NRA (2009) and Smith *et al.* (2011).

Aerial photos and site maps assisted the ecological walkover survey. Mammals and birds were surveyed based on incidental sightings, signs of activity during the survey and the identification of possible suitable habitats to support these species. Habitats were classified and named according to Fossitt (2000).

During the ecological survey the presence of invasive plant species such as Japanese knotweed *Reynoutria japonica*, Himalayan balsam *Impatiens glandulifera* and Giant Hogweed *Heracleum mantegazzianum* were recorded.

3.4. Statement of Authority

This report was prepared by Avril McCollom, Emma Nickelsen and Niamh Sweeney, with fieldwork undertaken by Conor Ruane, under the direction of Paul O'Donoghue, who also provided peer review support.

Niamh Sweeney (BSc, MSc (Res)) is a freshwater ecologist with over 10 years' experience in ecological consultancy, with specialisms in macroinvertebrate and diatom taxonomy. Niamh has worked on numerous Screenings for Appropriate Assessment, Natura Impact Statements and Ecological Impact Assessments for private architect firms, waste companies, numerous County Councils, the OPW and Inland Fisheries Ireland. Niamh carried out the preparation of this report.

Paul O'Donoghue has a BSc (Zoology), MSc (Behavioural Ecology) and a PhD in avian ecology and genetics. Paul is a chartered member of the Society for the Environment (CEnv) and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Paul has over 18 years' experience in ecology; including extensive experience in the preparation of Habitat Directive Assessments / Natura Impact Statements (i.e. Appropriate Assessment under Article 6(3) of the EU Habitats Directive). Paul carried out the technical review of this report.

Conor Ruane has a BSc (Hons) in Environmental Science. Conor has worked in ecological and environmental consultancy since 2014, working on a wide range of projects including road construction, housing construction and development. A focus of Conor's work to date has been on conducting Appropriate Assessment screenings, ecological appraisals and supporting the preparation of Natura Impact Statements and Ecological Impact Assessments. Conor Ruane undertook the site visit.

Emma Nickelsen has a BSc (Hons) in Environmental Biology and an MSc in Marine Biology. Emma has worked in ecological and environmental consultancy since 2017, working on a wide range of projects including bridge

works, road construction, local amenity development and renewable energy. A focus of Emma's work to date has been on conducting Appropriate Assessment screenings, ecological appraisals and supporting the preparation of Natura Impact Statements and Ecological Impact Statements. Emma assisted in the preparation of this report.

Avril McCollom has a BSc (Hons) in Freshwater and Marine Biology. Avril has worked in ecological and environmental consultancy since 2017, working on a wide range of projects including road construction, Strategic Housing Developments and Strategic Infrastructure Developments. A focus of Avril's work to date has been on the preparation of Appropriate Assessments Screenings, Environmental Impact Assessment Screenings and Outline Construction Environmental Management Plans and Construction and Demolition Waste Management Plans. Avril assisted in the preparation of this report.

4. Existing Environment

4.1. Desktop Review

Coolturk Bridge carries the Rakestreet Stream (EPA code 34R58) under the N59 road which extends from Ballysadare to Galway. The Rakestreet Stream is a first order stream that originates approximately 150m north of Coolturk Bridge. The Rakestreet Stream flows for 2.8km in a southern trajectory from Coolturk Bridge to its confluence with the River Deel. The stream and River Deel are of 'Good' Status under the Water Framework Directive.

[redacted]

Otter have been recorded on the River Deel, near the confluence with the Rakestreet Stream, as displayed on the NBDC online mapping service. Inland Fisheries Ireland's Water Framework Directive monitoring of the Deel River have recorded the following species; Roach, Perch, European eel, salmon, juvenile lamprey, Pike and Brown Trout[6].

Rakestreet Stream is hydrologically connected to the River Moy SAC (002298). The confluence with the River Deel, 2.8km downstream of the bridge, also marks the confluence with the SAC. Lough Conn and Lough Cullen SPA (004228) is located 21km downstream via the River Deel.

4.2. Site Visit

An ecological walkover survey of the site was conducted by an Atkins ecologist during September 2019. At the time of the survey flows in the upper reaches of the Rakestreet Stream were low with a wetted with of 0.25m – 0.5m across and a depth of <0.1m. Upstream the substrate comprises largely of sand and gravel, downstream of the culvert was also gravel. The stream has been significantly altered to facilitate drainage of the forested area upstream and the adjoining agricultural field downstream. The watercourse travels due south along a field boundary. The flow in the ditch is a glide downstream of the culvert. No invasive species were encountered during the site visit. Plate 4.1 shows the Rakestreet Stream below Coolturk Bridge.

Plate 4.1: Instream conditions below Coolturk Bridge.

[6] IFI Interactive GIS Map Viewer - https://ifigis.maps.arcgis.com/apps/webappviewer/index.html?id=9a31fedb077c4fb2991184842b7ef025 (Last accessed 26.05.2020)

Upstream the watercourse has cut a narrow channel through forestry and along the N59. A treeline (WL2) containing willow (*Salix sp.*) and birch (*Betula sp.*) has established on the right bank with bramble (*Rubus fruticosus*), herb-robert (*Geranium robertianum*), hogweed (*Heracleum sphondylium*), lady fern (*Athyrium filix-femina*) and American willowherb (*Epilobium ciliatum*). On the left bank immature birch and willow have colonised the road embankment, with an understory of bramble, field horsetail (*Equisetum arvense*), soft rush (*Juncus effusus*), common figwort (*Scrophularia nodosa*), lady fern and common bent grass (*Agrostis capillaris*). Plate 4.2 displays the habitat present upstream of the bridge.

Plate 4.2: Upstream of Coolturk Bridge.

Downstream, either side of the watercourse there is reed and large sedge swamps (FS1) habitat. A treeline (WL2) comprised of mature Sitka Spruce (*Picea sitchensis*) lines the left bank top. Improved agricultural grassland (GA1) is located on the left bank. Common reed (*Phragmites australis*), ling heather (*Calluna vulgaris*) and purple-moor grass (*Molinia caerulea*) are the dominant species within the field on the right bank. Scots pine (*Pinus sylvestris*), gorse (*Ulex europaeus*) and willow are occasional. Closer to the road a large number of devil's bit scabious (*Succisa pratensis*) was recorded. Plate 4.3 displays the habitat present downstream of the bridge.

Plate 4.3: Downstream of Coolturk Bridge.

5. Screening for Appropriate Assessment

5.1. Connectivity of Proposed Project to European Sites

The '*zone of influence'* (ZoI) for a project is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change (CIEEM, 2019).

A distance of 15km is recommended in the case of plans, as a potential zone of influence and this distance is derived from UK guidance (Scott Wilson *et al.*, 2006). However, for projects the distance could be much less, and in some cases less than 100m. National Parks and Wildlife Service guidance[7] advises that this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, the sensitivities of the ecological receptors, and the potential for in-combination effects.

Thus, given the nature, scale and extent of the proposed project, the potential zone of influence will consider European sites with regard to the location of a European site, the QIs of the site and their potential mobility outside that European site, the Cause-Pathway-Effect model and potential environment effects of the proposed project.

5.1.1. Special Areas of Conservation

There are seven SACs located within 15km of the proposed project. These SACs are listed in Table 5-1 along with their features of interest.

River Moy SAC is located approximately 2.8km downstream of Coolturk Bridge and is therefore within the potential zone of influence. Bellacorick Bog Complex SAC is located approximately 650m west of Coolturk Bridge (by land). There is no hydrological connection to this European Site. Given the proximity of the SAC to the bridge it could potentially be with the potential zone of influence but based on the scale and nature of the proposed works, the species and habitats for which this site has been designated will not be impacted and therefore this site will not be considered further in this assessment.

There are no hydrological connections to the remaining 5 no. SACs within 15km nor are they connected to Coolturk Bridge via. land features. Therefore, these SACs are not within the potential zone of influence of the proposed project and are not considered further in this assessment.

5.1.2. Special Protection Areas

There are two SPAs located within 15km of the proposed project. These SPAs are listed in Table 5-2 along with their features of interest.

Lough Conn and Lough Cullin SPA is located approximately 7km east of Coolturk Bridge by land and is 21km downstream via the River Deel. Although the proposed project is connected to the SPA via surface water pathways, given the nature and scale of the proposed project, as well as the ecology of the species for which it is designated, it is not anticipated that likely significant effects will occur to the SPA.

Owenduff/Nephin Complex SPA is located approximately 13.5km west of Coolturk Bridge and is not connected to the proposed project via. watercourses or land features. Therefore, Owenduff/Nephin Complex SPA is not within the potential zone of influence of the proposed project and is not considered further in this assessment.

[7] DoEHLG (2009*). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of Environment, Heritage and Local Government, Dublin, Ireland.

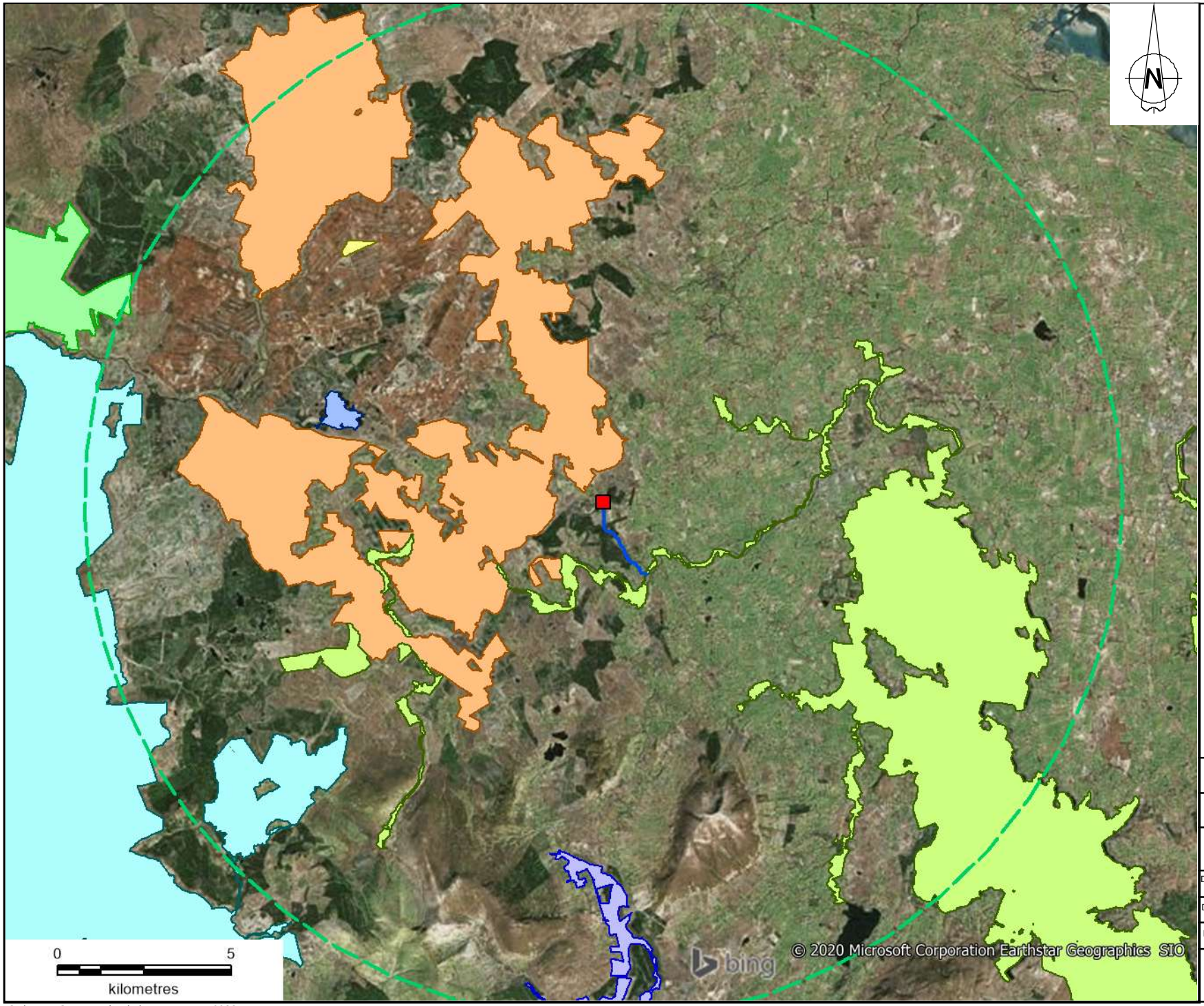
Table 5-1 - SACs within potential ZoI of the proposed project.

Site Name	Approximate distance	Features of Interest	Within ZoI
River Moy SAC (002298)	2.8km instream distance	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • Alkaline fens [7230] • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] • Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • *Austropotamobius pallipes* (White-clawed Crayfish) [1092] • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355]	Yes. This site is hydrologically linked to Coolturk Bridge
Bellacorick Bog Complex SAC (001922)	650m straight line distance. No hydrological connection	• Natural dystrophic lakes and ponds [3160] • Northern Atlantic wet heaths with *Erica tetralix* [4010] • Blanket bogs (* if active bog) [7130] • Depressions on peat substrates of the Rhynchosporion [7150] • Alkaline fens [7230] • *Vertigo geyeri* (Geyer's Whorl Snail) [1013] • *Saxifraga hirculus* (Marsh Saxifrage) [1528]	No. No connectivity via. watercourses or land features
Lough Dahybaun SAC (002177)	7.4km straight line distance. No hydrological connection	• *Najas flexilis* (Slender Naiad) [1833]	No. No connectivity via. watercourses or land features
Owenduff / Nephin Complex SAC (000534)	9.8km straight line distance. No hydrological connection	• Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] • Natural dystrophic lakes and ponds [3160] • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] • Northern Atlantic wet heaths with *Erica tetralix* [4010] • Alpine and Boreal heaths [4060] • *Juniperus communis* formations on heaths or calcareous grasslands [5130] • Blanket bogs (* if active bog) [7130] • Transition mires and quaking bogs [7140] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355] • *Drepanocladus vernicosus* (Slender Green Feather-moss) [1393] • *Saxifraga hirculus* (Marsh Saxifrage) [1528]	No. No connectivity via. watercourses or land features

Site Name	Approximate distance	Features of Interest	Within ZoI
Bellacorick Iron Flush SAC (000466)	10km straight line distance. No hydrological connection	• *Saxifraga hirculus* (Marsh Saxifrage) [1528]	No. No connectivity via. watercourses or land features
[redacted]	[redacted]	[redacted]	[redacted]
Carrowmore Lake Complex (000476)	14.5km straight line distance. No hydrological connection	• *Blanket bogs (* if active bog) [7130]* • *Depressions on peat substrates of the Rhynchosporion [7150]* • *Drepanocladus vernicosus* (Slender Green Feather-moss) [1393] • *Saxifraga hirculus* (Marsh Saxifrage) [1528]	No. No connectivity via. watercourses or land features

Table 5-2 - SPAs within potential ZoI of the proposed project.

Site Name	Approximate distance	Features of Interest	Within ZoI
Lough Conn and Lough Cullin SPA (004228)	7km straight line distance/ 21km instream distance	• Tufted Duck (*Aythya fuligula*) [A061] • Common Scoter (*Melanitta nigra*) [A065] • Common Gull (*Larus canus*) [A182] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]	No. Given the nature and scale of the proposed project, as well as the ecology of the Features of Interest for which the SPA is designated
Owenduff/Nephin Complex SPA (004098)	13.5km straight line distance. No hydrological connection	• Merlin (*Falco columbarius*) [A098] • Golden Plover (*Pluvialis apricaria*) [A140]	No. No connectivity via. watercourses or land features



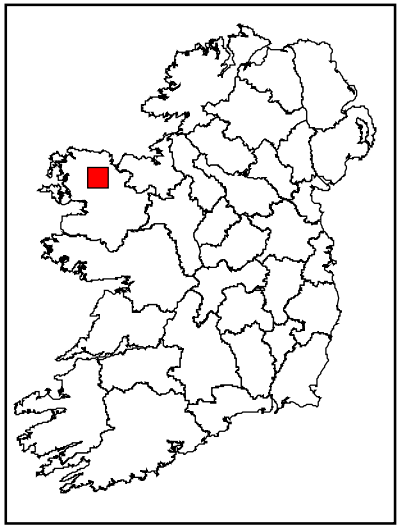
Legend

Coolturk Bridge

15km Buffer

Special Area of Conservation

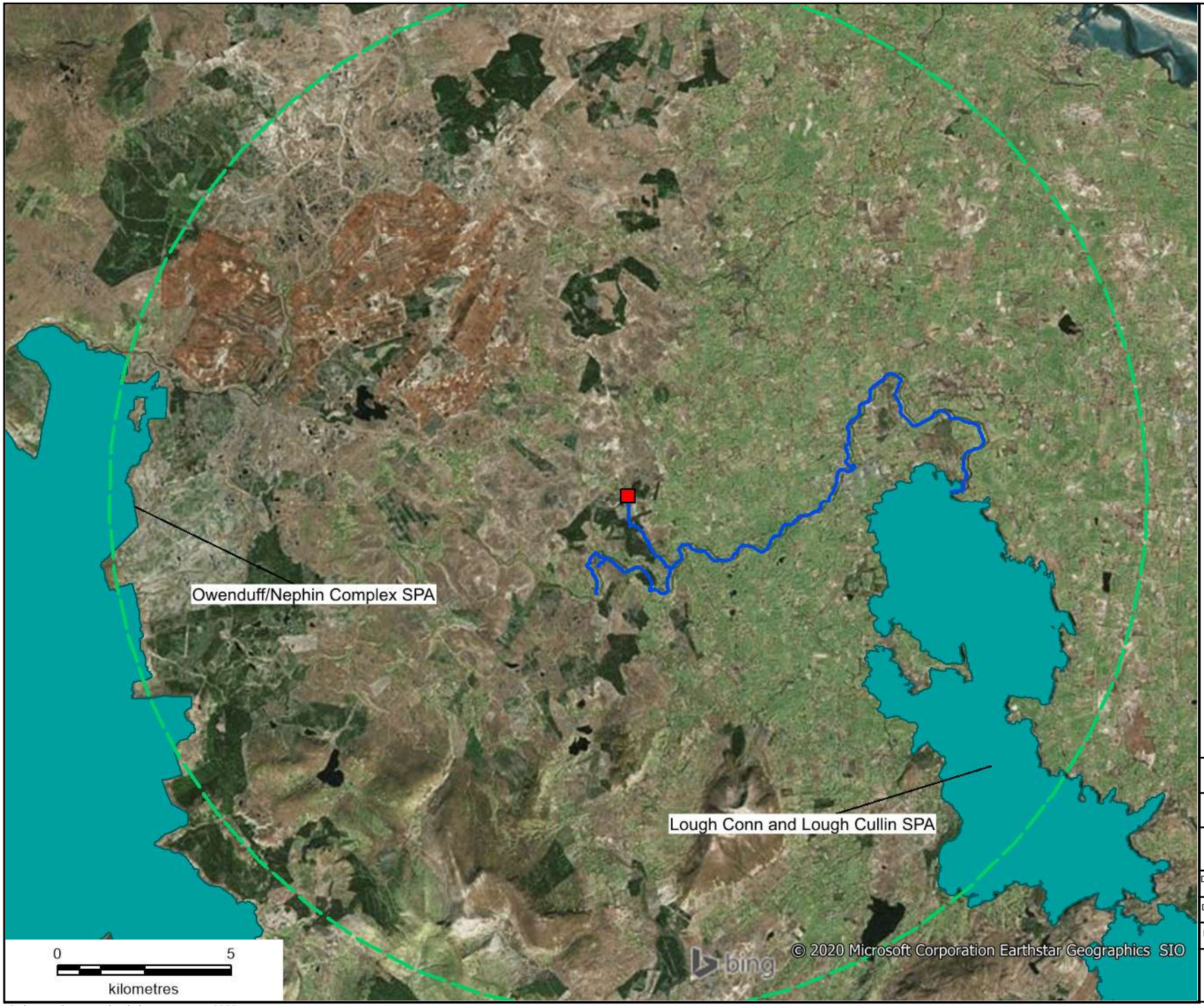
- Bellacorick Bog Complex SAC
- Bellacorick Iron Flush SAC
- Carrowmore Lake Complex SAC
- Lough Dahybaun SAC
- Newport River SAC
- Owenduff/Nephin Complex SAC
- River Moy SAC



Client:	Transport Infrastructure Ireland
Project:	Northwest Bridges Term Maintenance
Title:	SACs within 15km of Coolturk Bridge

Drawn:	Checked:	Authorised:
EN	NS	PO'D
Date: 21/05/2020	Date: 21/05/2020	Date: 21/05/2020
Drawing No: 5-1		Rev: 1.0

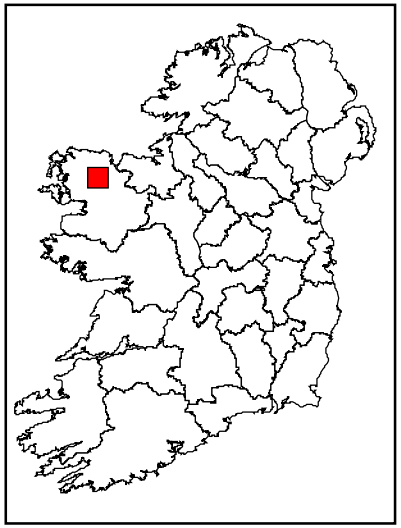
ATKINS [redacted]



N

Legend

- Coolturk Bridge
- 15km Buffer
- Hydrological connectivity
- Special Protection Area



Client:	Transport Infrastructure Ireland
Project:	Northwest Bridges Term Maintenance
Title:	SPAs within 15km of Coolturk Bridge

Drawn:	Checked:	Authorised:
EN	NS	PO'D
Date: 21/05/2020	Date: 21/05/2020	Date: 21/05/2020
Drawing No: 5-2		Rev: 1.0

ATKINS [redacted]

5.2. Brief Description of European sites

5.2.1. River Moy SAC (002298)

The River Moy SAC is described as follows: -

"*On the slopes and rising ground around the southern shores of Loughs Conn and Cullin, oak woodlands are found. Sessile Oak (*Quercus petraea*) is the dominant tree species, with an understorey of Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Ash (*Fraxinus excelsior*). Additional species are associated with the lakeshore such as Rock Whitebeam (*Sorbus rupicola*), Aspen (*Populus tremula*), Silver Birch (*B. pendula*) and the shrubs Guelder-rose (*Viburnum opulus*), Buckthorn (*Rhamnus catharticus*) and Spindle (*Euonymus europaeus*). The ground flora is usually composed of Bilberry (Vaccinium myrtillus), Great Wood-rush (Luzula sylvatica), Wood-sorrel (*Oxalis acetosella*), buckler-ferns (*Dryopteris aemula *and* D. dilatata*), Hard Fern (*Blechnum spicant*), Common Cowwheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*). The rare Narrow leaved Helleborine (*Cephalanthera longifolia*), protected under the Flora (Protection) Order, 1999, occurs in association with the woodlands. Also found in these woodlands is the snail* Spermodea lamellata*, a species associated with old natural woodlands. Alluvial woodland occurs at several locations along the shores of the lakes but is particularly well developed along the river at Coryosla Bridge. Principal tree species are willows (including* Salix cinerea subsp. oleifolia*) and Alder (*Alnus glutinosa*). Herbaceous species include Royal Fern (*Osmunda regalis*), Meadowsweet (*Filipendula ulmaria*) and Reed Canary-grass (*Phalaris arundinacea*). The woods are flooded by seasonal fluctuations in lake level.*

*On higher ground adjacent to the woodlands is blanket bog with scattered shrubs and trees on the drier areas. The rocky knolls often bear Juniper (*Juniperus communis*) or Gorse (*Ulex europaeus*), with some unusual rare herb species such as Intermediate Wintergreen (*Pyrola media*) and Lesser Twayblade (*Listera cordata*). Within the site are a number of raised bogs including those at Kilgarriff, Gowlaun, Derrynabrock, Tawnaghbeg and Cloongoonagh. These are examples of raised bogs at the north-western edge of the spectrum and possess many of the species typical of such in Ireland, including an abundance of Bog Asphodel (*Narthecium ossifragum*), Carnation Sedge (*Carex panicea*) and the moss* Campylopus atrovirens*. Some of the bogs include significant areas of active raised bog habitat. Well-developed pool and hummock systems with quaking mats of bog mosses (Sphagnum spp.), Bog Asphodel and White Beaked-sedge (*Rhynchospora alba*) are present. Many of the pools contain a diversity of plant species, including Bogbean (Menyanthes trifoliata), the bog moss* Sphagnum cuspidatum, Campylopus atrovirens*, Common Cottongrass (Eriophorum angustifolium), Great Sundew (*Drosera anglica*) and occasional Lesser Bladderwort (*Utricularia minor*). Several of the hummock-forming mosses (*Sphagnum fuscum *and* S. imbricatum*) which occur here are quite rare in this region and add to the scientific interest of the bogs within the overall site.*

*Depressions on the bogs, pool edges and erosion channels, where the vegetation is dominated by White Beaked-sedge comprise the habitat 'Rhynchosporion vegetation'. Associated species in this habitat at the site include Bog Asphodel, sundews, Deergrass (*Scirpus cespitosus*) and Carnation Sedge. Degraded raised bog is present where the hydrology of the uncut bogs has been affected by peat cutting and other land use activities in the surrounding area, such as afforestation and associated drainage, and also the Moy arterial drainage. Species typical of the active raised bog habitat may still be present but the relative abundances differ. A typical example of the degraded habitat, where drying has occurred at the edge of the high bog, contains an abundance and more uniform cover of Heather (*Calluna vulgaris*), Carnation Sedge, Deergrass and sometimes Bog-myrtle (*Myrica gale*). Occurring in association with the uncut high bog are areas of wet regenerating cutover bog with species such as Common Cottongrass, bog mosses and sundew, while on the drier areas, the vegetation is mostly dominated by Purple Moor-grass (*Molinia caerulea*). Natural regeneration with peat-forming capability will be possible over time with some restorative measures.*

*Other habitats present within the site include wet grassland dominated by rushes (*Juncus spp.*) grading into species-rich marsh in which sedges are common. Among the other species found in this habitat are Yellow Iris (*Iris pseudacorus*), Water Mint (*Mentha aquatica*), Purple Loosestrife (*Lythrum salicaria*) and Soft Rush (*Juncus effusus*). Rusty Willow (*Salix cinerea *subsp*. oleifolia*) scrub and pockets of wet woodland dominated by Alder (*Alnus glutinosa*) have become established in places throughout the site.*

*Ash (*Fraxinus excelsior*) and Downy Birch (*Betula pubescens*) are common in the latter and the ground flora is typical of wet woodland with Meadowsweet (*Filipendula ulmaria*), Wild Angelica (*Angelica sylvestris*), Yellow Iris, horsetails (Equisetum spp.) and occasional tussocks of Greater Tussock-sedge (*Carex paniculata*).*

*The Moy system is one of Ireland's premier salmon waters and it also encompasses two of Ireland's best lake trout fisheries in Loughs Conn and Cullin. Although the Atlantic Salmon (*Salmo salar*) is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the E.U. Habitats Directive. The Moy is a most productive catchment in salmon terms and this can be attributed to its being a fingered system with a multiplicity of 1st to 5th order tributaries which are large enough to support salmonids < 2 years of age while at the same time being too small to support significant adult trout numbers and are therefore highly productive in salmonid* nursery terms."

5.2.1.1. Features of Interest

The River Moy SAC is designated for the habitats and species listed in Table 5-1. Due to the size and geographic range of River Moy SAC, not all qualifying interests of the SAC are within the zone of influence (ZoI) of the proposed project. It is important to note that this SAC is located ca. 2.8km downstream of Coolturk Bridge and therefore, potential impacts could be indirect in nature to habitats and species in the vicinity of the of the Deel River.

Given the location of the proposed project and the nature and scale of the proposed works, the qualifying interests of the SAC that are within the ZoI are habitats and species that are present in the vicinity of the bridge and surface water dependent habitats and species. These are summarised in Table 5-3 and are listed below: -

- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

5.2.1.2. Conservation Objectives

The conservation objectives of the qualifying interests within the ZoI of the proposed works are broadly summarised below (NPWS, 2016).

- To maintain the favourable conservation condition of White-clawed Crayfish in River Moy SAC, which is defined by a of attributes and targets.
- To maintain the favourable conservation condition of Sea Lamprey in River Moy SAC, which is defined by a list of attributes and targets.
- To maintain the favourable conservation condition of Brook Lamprey in River Moy SAC, which is defined by a list of attributes and targets.
- To maintain the favourable conservation condition of Salmon in River Moy SAC, which is defined by a list of attributes and targets.
- To maintain the favourable conservation condition of Otter in River Moy SAC, which is defined by a list of attributes and targets.

5.2.1.3. Potential Threats to the River Moy SAC

The site synopsis for the River Moy SAC describes the land use and management within the site as follows:-

> *"Agriculture, with particular emphasis on grazing, is the main land use along the Moy. Much of the grassland is unimproved but improved grassland and silage fields are also present. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the large lakes. Fishing is the main tourist attraction on the Moy and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The North Western Regional Fishery Board have erected fencing along selected stretches of the river as part of their salmonid enhancement programme. Other aspects of tourism are concentrated around Loughs Conn and Cullin.*
>
> *Afforestation has occurred in the past around the shores of Loughs Conn and Cullin. The coniferous trees are due for harvesting shortly. It is proposed to replant with native tree species in this area. Forestry is also present along many of the tributaries and in particular along the headwaters of the Deel. Forestry poses a threat in that sedimentation and acidification can occur. Sedimentation can cover the gravel beds resulting in a loss of suitable spawning grounds. The Moy was arterially dredged in the 1960s. Water levels have been reduced since that time. This is particularly evident along the shores of Loughs Conn and Cullin and in the canal-like appearance of some river stretches. Ongoing maintenance dredging is carried out along stretches of the river system where the gradient is low. This is extremely destructive to salmonid habitat in the area."*

The negative threats, pressures and activities with impacts on the SAC are itemised in Table 5.3.

Table 5-3 - Threats, pressures and activities with impacts on the River Moy SAC.

Rank[8]	Threats and pressures [code]	Threats and pressures [type][9]	inside/outside/both [i/o/b]
H	I01	invasive non-native species	b
H	H01.05	diffuse pollution to surface waters due to agricultural and forestry activities	b
M	D04.02	aerodrome, heliport	b
H	A02.01	agricultural intensification	b
M	C01.03	Peat extraction	b
H	B05	use of fertilizers (forestry)	b
H	B01	forest planting on open ground	b

[8] Rank: H = high, M = medium, L = low
[9] Given at http://cdr.eionet.europa.eu/help/natura2000

Table 5-4 - Qualifying interests of the SAC within the ZoI of the proposed project.

Qualifying Interest	Location	Within Zone of Influence
Active raised bogs [7110] **Degraded raised bogs still capable of natural regeneration [7120]** **Depressions on peat substrates of the Rhynchosporion [7150]** **Alkaline fens [7230]**	Bog /Peat habitat type is located a significant distance from the proposed project and given the nature, scale and extent of the works, these habitats are not anticipated to be directly or indirectly impacted by the proposed project.	No
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Pandion, Alnion incanae, Salicion albae*) [91E0]**	Small areas Woodland habitats are restricted to Lough Cullin which is located a significant distance from the proposed project and given the nature, scale and extent of the works, these habitats are not anticipated to be directly or indirectly impacted by the proposed project.	No
***Austropotamobius pallipes* (White-clawed Crayfish) [1092]**	White clawed crayfish are located at Crossmolina and further downstream from the proposed works. Crossmolina is located ca.15km downstream of the proposed project and therefore white clawed crayfish may be indirectly impacted by the proposed project.	Yes
***Petromyzon marinus* (Sea Lamprey) [1095]** ***Lampetra planeri* (Brook Lamprey) [1096]** ***Salmo salar* (Salmon) [1106]**	Juvenile lamprey and salmon have been reported by the IFI within the River Deel. Therefore, the proposed project could potentially indirectly impact these species.	Yes
***Lutra lutra* (Otter) [1355]**	Otter has been recorded close to the confluence between the Rakestreet Stream and the River Deel. There is potential for commuting in the vicinity of the bridge. Therefore, there is potential for indirect impact on otter.	Yes

5.3. Likelihood of Potential Impacts on Natura 2000 sites

The available information on Natura 2000 sites was reviewed to establish whether or not the proposed works are likely to have a significant effect on a Natura 2000 site in view of its conservation objectives. The likelihood of impacts on the qualifying interests of the Natura 2000 sites identified in this report is based on information collated from the desk study, site visit, site plans and other available existing information.

The likelihood of impacts occurring are established in light of the type and scale of the proposed works, the location of the proposed works with respect to Natura 2000 sites and the features of interest and conservation objectives of the Natura 2000 sites.

This report is prepared following the Cause – Pathway – Effect model. The potential impacts are summarised into the following categories for screening purposes.

- Direct impacts refer to habitat loss or fragmentation arising from land-take requirements for development or agricultural purposes. Direct impacts can be as a result of a change in land use or management, such as the removal of agricultural practices that prevent scrub encroachment.

- Indirect and secondary impacts do not have a straight-line route between cause and effect. It is potentially more challenging to ensure that all the possible indirect impacts of the project – in combination with other plans and projects - have been established. These can arise, for example, when a development alters the hydrology of a catchment area, which in turn affects the movement of groundwater to a site and the qualifying interests that rely on the maintenance of water levels. Deterioration in water quality can occur as an indirect consequence of development, which in turn changes the aquatic environment and reduces its capacity to support certain plants and animals. The introduction of invasive species can also be defined as an indirect impact. Disturbance to fauna can arise directly through the loss of habitat (e.g. displacement of roosting bats) or indirectly through noise, vibration and increased activity associated with construction and operation.

The proposed project is located 2.8km upstream of the River Moy SAC. The proposed project is not directly connected with or necessary to the management of the SAC. Therefore, it is necessary for the competent authority to assess whether the proposed project, either individually or in combination with other plans or projects, would be likely to have significant effects on the Natura 2000 sites.

Given the nature of the proposed project during the construction phase, hydrological connectivity via surface water pathways and the potential impacts posed by the proposed works on the SAC, it is concluded by the authors of this report that in the absence of additional measures, it is not possible to screen-out likely significant effects on the SAC. Thus, it is recommended by the authors of this report that the proposed project should be brought forward to the second stage of the assessment process, i.e. full Appropriate Assessment.

6. Appropriate Assessment

6.1. Introduction

This section of the report assesses the European site(s) in more detail and examines where likely significant effects may arise. Where potential adverse effects are identified that may affect the integrity of the River Moy SAC, avoidance and mitigation measures are proposed to offset these effects. These are discussed below in the following sections.

6.2. Impact Evaluation

6.2.1. 'Do Nothing' Impact

In the case of the proposed project the 'do nothing' approach would be not to repair the existing culvert and not to install the concrete invert to its base. As the existing culvert is experiencing corrosion, in the absence of repair works, this corrosion will continue and could ultimately result in structural failure of the culvert.

The existing culvert may present an artificial barrier to fish migration. The 'do nothing' approach would result in the status of the culvert regarding fish passage remaining unchanged.

Coolturk culvert is located ca. 2.8km upstream of the River Moy SAC. Otter from the SAC could travel upstream and travel through the culvert. Given the nature of Coolturk culvert, the sides of the culvert are dry at normal flows. Therefore, otter can freely pass through the culvert during normal flows. It is possible that during high flows, where the sides of the culvert are no longer dry, otter may not be able to travel through the culvert and may access the N59 road as a result. The proposed project is for the installation of a concrete invert at Coolturk culvert. The hydraulic assessment demonstrates that the proposed project will not significantly affect the hydrological regime of the watercourse, nor the capacity of the culvert. Therefore, the installation of the concrete invert will not change the conditions under which Coolturk culvert is passable to otter.

6.2.2. Potential impacts during the works

In summary and as outlined in Section 5 above, the features of interest that are within the zone of influence of the proposed works are: -

River Moy SAC

- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

The attributes and targets for the conservation objectives of the qualifying interests within the zone of influence of the proposed project listed above are set out in Table 6-1.

6.2.2.1. Direct impacts

The proposed project is located upstream of the SAC boundary. Given the nature and extent of the proposed project, direct impacts to the qualifying interests of the SAC will not occur during the construction phase of the proposed project.

6.2.2.2. Indirect impacts

There is potential for indirect impacts via surface water pathways to the River Deel. The works could cause the release of silt-laden run-off and the mobilisation of instream silts, which could in turn also release nutrients to the water column. There is also the potential for the release of hydrocarbons and the occurrence of pollution incidents during the works. Spillages of products in their liquid state, e.g. primer products, could also potentially occur during the works.

The species downstream of the proposed works, i.e. the Features of Interest (FOI) of the SAC, are sensitive to a deterioration in water quality.

The release and entry of these materials to the respective watercourses, and in turn the River Deel, has the potential to result in localised impacts of sedimentation and increased algal and macrophyte growth in the watercourses downstream, which in turn could impact on the aquatic biota that the watercourses support and hence, their ecological status.

Through the release of silt-laden run-off, there is potential for increased settlement of solids in the River Deel. This could potentially result in the loss of clean gravel beds through the infiltration of fine sediment which would affect the spawning habitats of lamprey and salmon. The release of silts, nutrients and potential occurrence of pollution incidents could also negatively affect lamprey and salmon through the deterioration of water quality.

[redacted]

The potential impacts to species such as salmon and lamprey and salmon may also impact on otter through a reduced fish biomass availability. Fish are important sources of food for otter and a decline in fish biomass would have an indirect negative impact on otter.

The release of silt to the areas supporting white-clawed crayfish has the potential to cause a negative impact on the population. Accumulation of soft, loose silt makes refuges unfavourable for crayfish. The fine sediments can also clog and abrade the gills of crayfish. A release of nutrients to the water column can promote the growth of filamentous algae which can trap more silt, worsening the impact as it creates a barrier to crayfish passage, and furthers the clogging of cobble and boulder refuges.

The potential entry of polluting materials such as hydrocarbons and concrete material into the watercourses would have a negative impact on all aquatic qualifying interests of the SAC that are within the zone of influence of the proposed project.

Due to the presence of site staff at the culvert for 2 weeks, i.e. the duration of the works, there is potential for temporary disturbance of otter that may travel upstream from the SAC. However, given the scale, extent and duration of the works, this impact is not anticipated to be significant. The dam setup will not cause fragmentation of the riparian corridor and thus, otter will be free to travel through the culvert. However, it is acknowledged that this will most likely be when the work crew is not present at the site, i.e. at the end of each working day until the following morning when works re-commence and at weekends.

6.2.2.3. Spread of invasive species

No invasive species, aquatic or terrestrial, were recorded at Coolturk Bridge, however there is a risk that invasive species may be introduced to the area as a result of the works. Therefore, biosecurity protocols are detailed below in the mitigation measures.

6.2.3. Potential impacts post completion of the works

The proposed works will not alter the function of the existing bridge.

As shown by the hydraulic model, the proposed repair works to the existing culvert will not impact on the hydrological and hydraulic regime of the watercourse. The installation of the concrete invert at Coolturk Culvert will not alter the conditions under which the culvert is passable to otter, nor will it alter the status of the culvert regarding fish passage. The operation of the proposed project will not generate further emissions to the watercourse.

Table 6-1 - Site-specific Conservation Objectives of QIs within ZoI of the proposed project.

Qualifying Interest	Attribute	Measure	Target
White-clawed crayfish	Distribution	Occurrence	No reduction from baseline.
	Population structure: recruitment	Occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in all occupied tributaries.
	Negative indicator species	Occurrence	No alien crayfish species.
	Disease	Occurrence	No instances of disease.
	Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA.
	Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality.
Sea lamprey	Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary.
	Population structure of juveniles	Number of age/size groups	At least three age/size groups present.
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density at least 1/m².
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds.
	Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive.
Brook lamprey	Distribution	Percentage of river accessible	Access to all watercourses down to first order streams.
	Population structure of juveniles	Number of age/size groups	At least three age/size groups or brook/river lamprey present.
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m².
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds.
	Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive.

Salmon	Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary.
	Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded.
	Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling.
	Out-migrating smolt abundance	Number	No significant decline
	Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes.
	Water quality	EPA Q value	At least Q4 at all sites sampled by EPA.
Otter	Distribution	Percentage positive survey sites	No significant decline
	Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 1068.8ha.
	Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 479.4km.
	Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 1248.2ha.
	Couching sites and holts	Number	No significant decline.
	Fish biomass available	Kilograms	No significant decline.
	Barriers to connectivity	Number	No significant increase.

6.2.4. In-combination Impacts

In-combination impacts with the following plans and projects were considered during the preparation of this report. The search of Mayo County Council was based on a map-based search of their online planning portal.

Mayo County Development Plan sets out strategies and objectives to provide sustainable development within Co. Mayo.

The Plan contains a number of natural heritage and biodiversity policies, which includes the monitoring of significant environmental effects of plans and to promote various sustainable developments without having a significant adverse effect on the environment including the integrity of the Natura 2000 network.

A Natura Impact Report was prepared for the Plan, which assessed the Plan regarding its potential to adversely affect the integrity of European sites. The findings of the AA were integrated into the Plan, ensuring that potential adverse effects have been and will be avoided, reduced or offset. Thus, an AA determination was made by Mayo County Council that the Plan is not foreseen to have any adverse effects on the ecological integrity of any European Site. The current NIS is being prepared to ensure that the proposed project will not have an adverse

impact on the integrity of European sites. Given the elements outlined above, the County Development Plan is not anticipated to act in-combination with the proposed project.

Farmers and landowners may undertake general agricultural operations in areas adjacent to the proposed works and along the river, which could potentially result in an additional increased risk to water quality. Many agricultural operations are periodic, not continuous in nature, and qualify as a Notifiable Action that requires consultation with National Parks and Wildlife Service in advance of the works e.g. reclamation, infilling or land drainage within 30m of the river, removal of trees or any aquatic vegetation within 30m of the river, and harvesting or burning of reed or willow (NPWS, 2018). Agricultural operations must also comply with the EC (Environmental Impact Assessment) (Agriculture) Regulations 2011 and amendment 2017 S.I. No. 456/2011 and 407/2017 in relation to activities covered by the regulations;

- restructuring of rural land holdings,
- commencing use of uncultivated land or semi-natural areas for intensive operations,
- land drainage works on lands used for agriculture.

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

In the vicinity of the proposed project, developments that have obtained planning permission include retention of existing developments, typically extensions to domestic dwellings, or the construction of new domestic dwellings or extensions to such dwellings. Regarding potential impacts to water quality, these projects will have to comply with the EPA's Code of Practice for Wastewater Treatment Systems for Single Houses (EPA, 2009; 2018).

The 4 Groupings of culverts proposed for repair works in the Northwest region (Table 1-1) are located in the WFD catchments; Corrib, Moy & Killala Bay, Lough Swilly and Donegal Bay North respectively. The proposed project is located in the Moy & Killala catchment that drains to the River Moy SAC and Lough Conn and Lough Cullin SPA. The culverts in Group 1, 3 and 4 are located in separate WFD catchments to Group 1 and these WFD catchments do not drain to the River Moy SAC and Lough Conn and Lough Cullin SPA. Therefore, in-combination effects between the proposed project and other proposed culvert projects will not occur.

The OPW has an arterial drainage scheme in the Moy & Killala Bay catchment, however the extent of the drainage scheme is in vicinity of Crossmolina and therefore ca.13km downstream of Coolturk Bridge. Thus, in-combination effects with the OPW drainage programme of the Moy & Killala Bay scheme and the proposed project are not anticipated.

6.3. Mitigation Measures

This section describes the mitigation measures required to ensure there are no residual effects on the integrity of the River Moy SAC. Table 7-1 summaries how these mitigation measures will result in no adverse effect on the integrity of European sites. Proposed methods are described in full in the Contractors method statement; refer to Appendix B.

6.3.1. General Measures

1. An Ecological Clerk of Works (ECoW) will be appointed and will supervise all aspects of the critical works on site, in particular initial site set up, dam/ silt fence installation, pouring of concrete and use of chemicals. The ECoW will be a suitably qualified and experienced ecologist, which will be appointed by TII. The ECoW will ensure compliance of mitigation measures on site and liaise with IFI and NPWS staff where required.

2. A pre-construction survey for otter will be carried out upstream and downstream of the culvert within one month of commencement of works on site.

3. In accordance with the NRA guidelines, the following guidelines shall be followed: -

    - No physical damage or disturbance to an otter holt shall occur.
    - No works shall be undertaken within 150m of any holt at which breeding females or cubs are present.
    - No wheeled or tracked vehicles should be used within 20m of an active non-breeding holt.

4. If an otter holt is recorded during the pre-construction survey and is likely to be damaged or disturbed by the proposed works, a derogation licence will be applied for from NPWS. Any further mitigation measures required by the derogation licence shall be implemented.

5. The proposed works shall be carried out during July 1st to September 30th inclusive.

6. The site manager shall monitor the 10-day weather forecast. The works shall not take place during high river flows or prior to forecasts of heavy rainfall. High river flows constitute river flows that will top the dams or will be in excess of pumping capabilities. If such conditions are forecast, the works area shall be secured and all materials, including the elements of the dam system (sandbags, silt fences, pumps and associated pipes and silt socks) will removed from the works area and riverbanks. Upon subsidence of flows, the dam system shall be re-instated upstream and downstream of the culvert and the works area de-watered before works can re-commence. This shall be supervised by the ECoW. A Temporary Traffic Management zone will be created within the road corridor. This shall be used for parking and deliveries of materials.

7. All site staff will be informed of best practice methodologies to be employed on site via the dissemination of a tool-box talk. This shall include the requirement for protection of aquatic habitats, the sensitivity of the SAC and the potential presence of invasive species pending a pre-construction survey.

8. Works will be carried out during day-time hours, except in the event of an emergency.

9. Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume.

10. Biodegradable oils and fuels will only be used.

11. Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 20m).

12. Emergency spill kits will be available on site and staff will be trained in their use. A reporting system will be established on site to record accidents and/or spillages on site and the resultant action taken to remedy the incident.

13. Operators will check all equipment, machinery and vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages should be reported immediately and addressed.

14. Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.

6.3.2. Specific Measures

15. A dry working area will be achieved by setting up a dam system. There shall be three dams in total; one upstream of the culvert and two downstream of the culvert. Each dam will consist of tightly packed sandbags that are filled with clean sand. The sandbags will be double lined and sealed by tying. Only sealed sandbags will be used to create the dams. No clay or soil material is permitted to 'seal' the sandbag dams. A geotextile membrane may be used to aid the creation of a watertight dam.

16. The integrity of the sandbag dams must be monitored to ensure that the works area is isolated from the live channel. This shall be monitored by the site manager twice daily; in the morning before the commencement of works and at the end of the day prior to leaving site.

17. Two silt fences shall be installed between the two sandbag dams situated downstream of the culvert. Any water pumped into this dammed area shall be in advance of the silt fences. Thus, all water pumped from the work area must pass through both silt fences before re-entering the river.

18. The pipe used to flume flows through the works area will be fitted with a filter to ensure no fish enter the pipe. The outfall of the pipe will be fitted with a silt sock. The silt sock shall be changed and/ or cleaned at regular intervals. The interval for replacing the silt sock will be dependent on the turbidity of the watercourse and therefore this shall be monitored by the site manager twice daily at a minimum; in the morning before the commencement of works and at the end of the day prior to leaving site.

19. The temporary working platform, i.e. terram and 300m thick class 6F granular capping, must be clean and free of any foreign debris before being installed on the existing riverbed gravels.

20. There can be no entry of debris and / or waste material from the works area to the live channel. The debris must be collected within the dry work area, removed from the work area and disposed of appropriately off site at a licensed waste facility.

21. Power washing of the culvert will not involve any water abstraction from the river. Water will be brought to site in a bowser by the Contractor. Power washing can only take place when the sandbag dam system and silt fences are in place. The wash unit generator will be positioned on the road and the lance hose will run down the bank into the work area.

22. Any water arising in the work area, as a result of power washing or seepage through the upstream dam, will be pumped from the working area into the area between the two downstream dams in advance of the silt fences. The pump will be located on the temporary working platform and fitted with a drip tray. All associated pipes will be fitted with a silt sock and/ or de-watering bag.

23. Primer products shall be applied to surfaces in the morning of a workday. This is to ensure that the required 6-hour curing time can be achieved before leaving the site at the end of the day. Primer products shall not be applied to surfaces within 48 hours of a heavy rain forecast.

24. Only quantities of primer products required for use in that working day shall be available at the site. These shall be kept is a bunded container located at least 20m from the watercourse until required for use.

25. The Shotcrete pump will be located on the road above the work area. The integrity of pump hoses must be checked prior to commencing works Pump hoses will be located within the dry work area to ensure no spillage of concrete to the live channel.

26. At no point will any equipment be washed out within the work area or adjacent to a watercourse.

27. Sandbag dam no. 3 and the silt fences shall be left in place until any sediment plume has dissipated.

28. The gravel area on which the temporary working platform was located will be loosened, as it may have been compacted during the works. This area will be reinstated with washed and clean gravel.

29. All material used on site, including the sandbags, silt fences, silt socks, de-watering bags and components of the temporary working platform, will be removed from site and disposed of at a licensed waste facility.

6.3.3. Biosecurity protocols

The following biosecurity protocols shall be implemented during the construction phase of the proposed project to prevent the introduction of invasive species listed on the third schedule of the 2011 Regulations to site and the further spread of diseases.

1. All equipment intended to be used at the site shall be dry, clean and free from debris prior to being brought to site.

2. If drying out of equipment is not feasible, equipment should be either: -

    i. power steam washed at a suitably high temperature or at least 65 degrees, or

    ii. disinfected with an approved disinfectant, e.g. Virkon or an iodine-based product. It is important that the manufacturer's instructions are followed and if required, the correct contact times are allowed for during the disinfection process. Items that are difficult to soak should be sprayed or wiped down with disinfectant.

3. During the duration of the proposed project, if equipment is removed off-site to be used elsewhere, the said equipment shall be cleaned and disinfected prior to being brought back to the works area of the proposed project.

4. Appropriate facilities shall be used for the containment, collection and disposal of material and/or water resulting from washing facilities of vehicles, equipment and personnel.

5. Importation of materials shall comply with Regulation 49 of the EC (Birds and Natural Habitats) Regulations 2011.

A pre-construction invasive species survey will be conducted prior to the commencement of works on site. If any invasive species are recorded, these shall be fenced off using a 7m buffer from the outermost edges of the invasive species plant(s).

7. Conclusions

This NIS provides the competent authority with supporting information to undertake the Appropriate Assessment in relation to the proposed project at Coolturk Bridge [MO-N59-006.00], County Mayo, and its potential indirect impacts via surface water pathways on the River Moy SAC.

The NIS has examined the potential impacts of the proposed project on the integrity of the SAC, alone and in combination with other plans and projects, taking into account the site's structure, function and conservation objectives. Where potentially significant effects were identified, mitigation measures have been recommended to assist in offsetting these effects.

Following a comprehensive evaluation of the potential direct, indirect and in-combination impacts on the qualifying interests of the SAC, and the implementation of the proposed mitigation measures, it has been concluded by the authors of this report that there will be no residual impacts and the proposed project will not have an adverse effect on the integrity of River Moy SAC.

To confirm this conclusion, the following checklist taken from DEHLG (2009) has been completed.

Table 7-1 - Checklist of Site Integrity (DEHLG, 2009).

Does the project or plan have the potential to:-	Y/N
Cause delays in progress towards achieving the conservation objectives of the sites?	No - Following mitigation, no residual impacts have been identified that will prevent achievement of the conservation objectives of the River Moy SAC
Interrupt progress towards achieving the conservation objectives of the sites?	No - Following mitigation, no residual impacts have been identified that will prevent achievement of the conservation objectives of the River Moy SAC
Disrupt those factors that help to maintain the favourable conditions of the site?	No - Potential significant effects identified during the screening process, including potential changes to water quality and pollution, can be avoided or mitigated against.
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No – Potential significant effects can be avoided by implementing a range of measures to maintain water quality and thus protect the surface water dependent species of the SAC
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No - Potential significant effects from sediment mobilisation and pollution, which could impact upon ecosystem functioning, can be effectively mitigated
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No - Potential significant effects relating to changes in the physical and hydrological regime of the SAC will not occur as a result of the project and therefore will not impact on the functioning of the SAC
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No - Potential significant effects from changes to the physical and hydrological regime will not occur and therefore will not impact upon the functioning of the SAC
Reduce the area of key habitats?	No - There will be no loss of habitat as a result of the works and there will be no changes to the physical and hydrological regime that could cause habitat loss in the future.
Reduce the population of key species?	No - Following mitigation, potential impacts to surface water quality and thus indirect impacts to surface water dependent species of the SAC will not occur. Mitigation measures will ensure that the works will not cause a deterioration in water quality
Change the balance between key species?	No - Potential disturbance impacts to species of the SAC will not occur. Mitigation measures will ensure that the works will not cause a deterioration in water quality

Does the project or plan have the potential to:-	Y/N
Reduce diversity of the site?	No - There shall be no direct impacts to habitats and species of the SAC. The identified mitigation measures to protect water quality will ensure that the current diversity of the SAC is maintained.
Result in disturbance that could affect population size or density or the balance between key species?	No - There shall be no disturbance impacts to species of the SAC and therefore, population size and density will not be reduced
Result in fragmentation?	No - The proposed works will not result in the fragmentation of habitats within the SAC or surrounding habitat
Result in loss or reduction of key features?	No - There shall be no loss or reduction of key features within the SAC.

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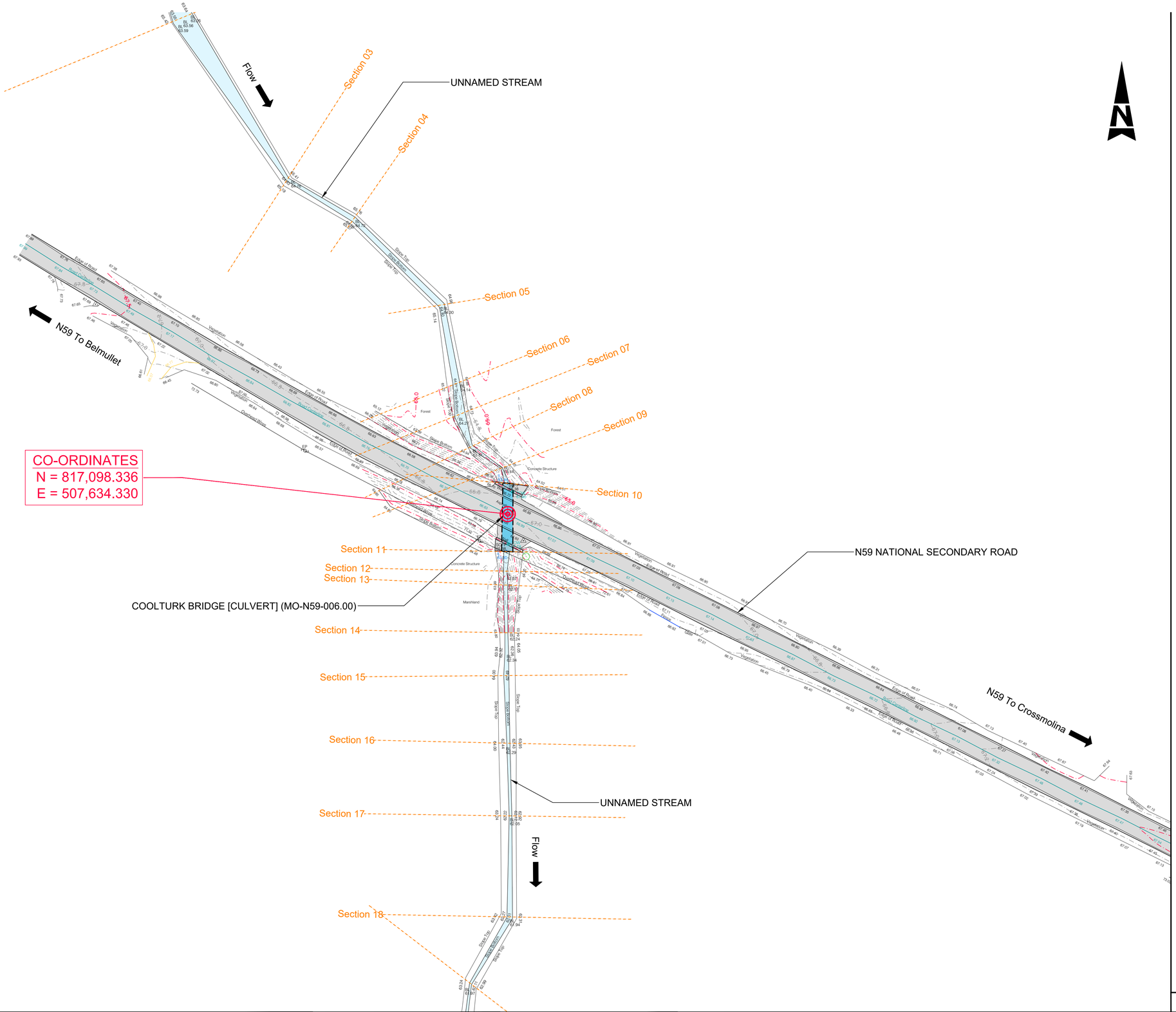
Appendices

Appendix A. Design Detail



N

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

DRAWING NOTES

1. FOR RIVER CROSS SECTIONS 01 TO 21, REFER TO TOPOGRAPHICAL SURVEYS DRAWING

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DO NOT SCALE

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Date: May 20, 2020 - 8:45am Plotted by: aosullivan

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
Oifig Boichne Naisiunta
Dhun na nGall

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project
NOR WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose
ISSUED FOR REVIEW

Title
COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING SITE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:500	AOS	MG	MJ
	Date 11/11/19	Date 11/11/19	Date 11/11/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0230	A

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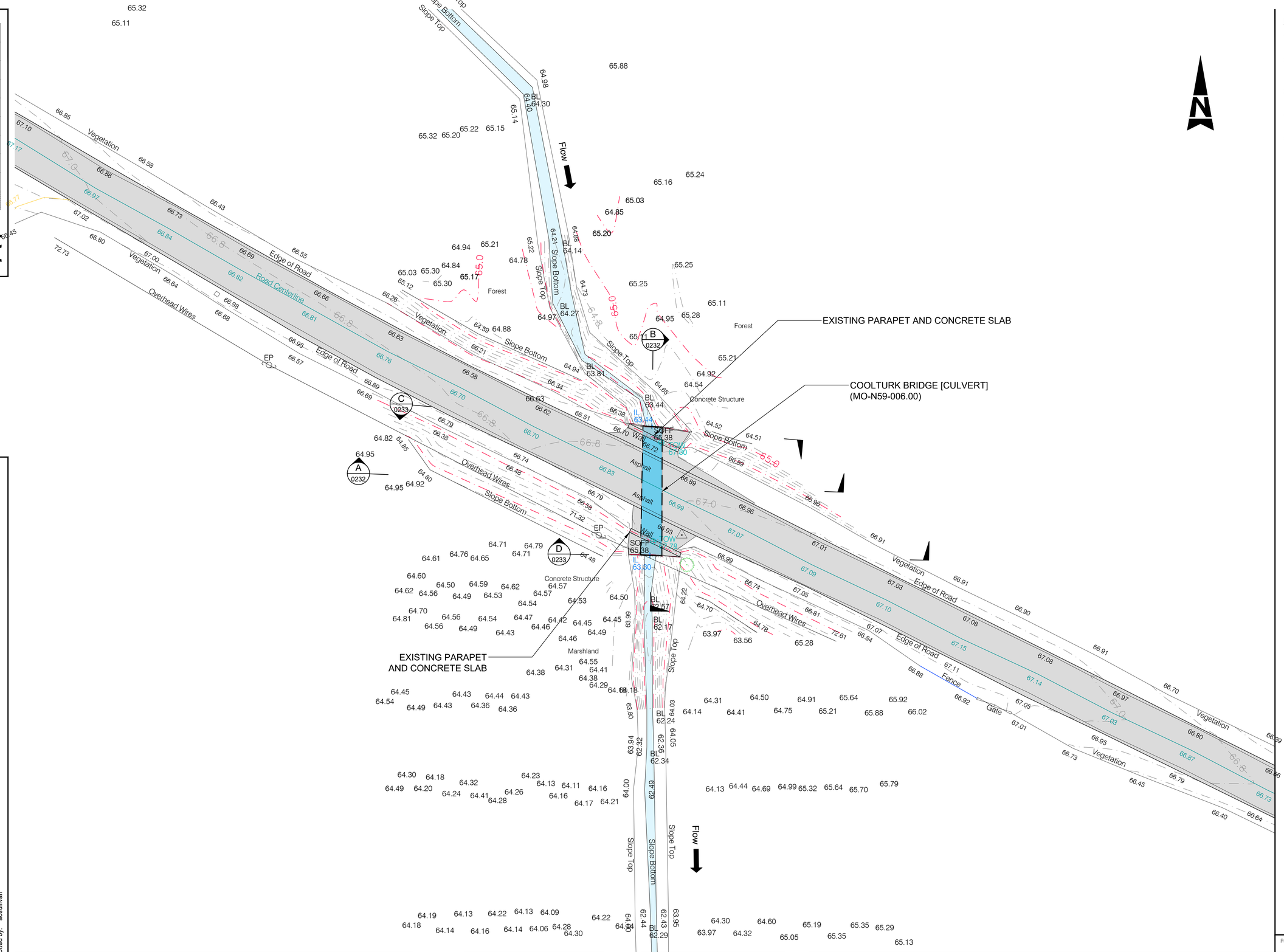

A1

DO NOT SCALE

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Tel (+353) 091 786 050

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING STRUCTURE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 11/11/19	Date 11/11/19	Date 11/11/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0231	A

File: 5162160-HTR-DR-0230 to 0233.dwg
Date: May 15, 2020 - 3:55pm Plotted by: aosullivan

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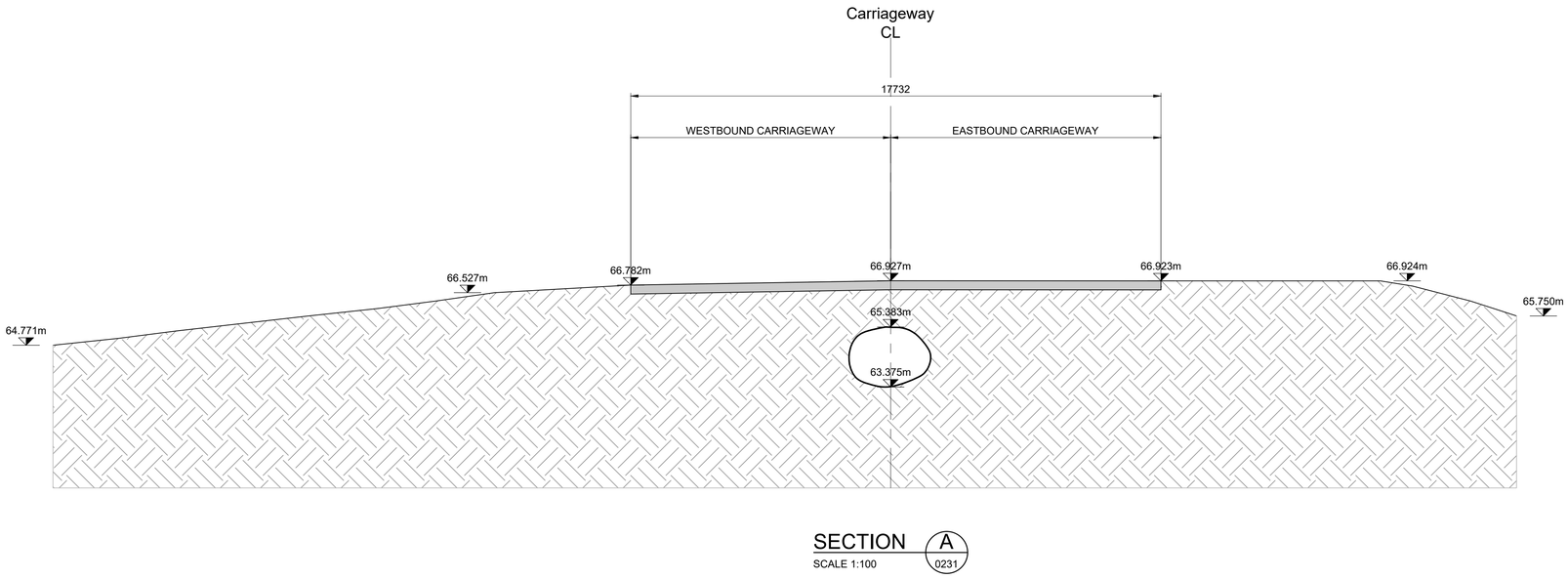
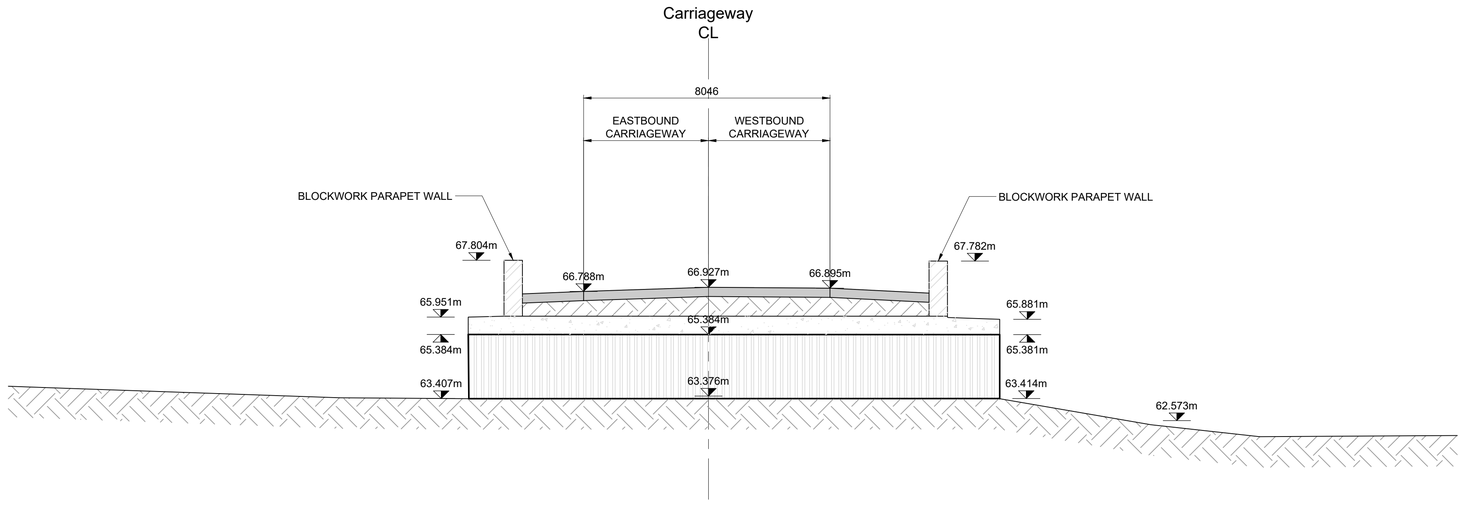


SECTION A
SCALE 1:100 0231



SECTION B
SCALE 1:100 0231

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A1

DO NOT SCALE

File: 5162160-HTR-DR-0230 to 0233.dwg
Date: May 15, 2020 - 3.55pm Plotted by: aosullivan

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Údarás Náisiúnta Iompair

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client
TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project
NOR[redacted] WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose
ISSUED FOR REVIEW

Title
COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING SECTIONS A AND B

Original Scale	Des/Drawn	Checked	Authorised
1:150	AOS Date 11/11/19	MG Date 11/11/19	MJ Date 11/11/19

Status	Drawing Number	Rev
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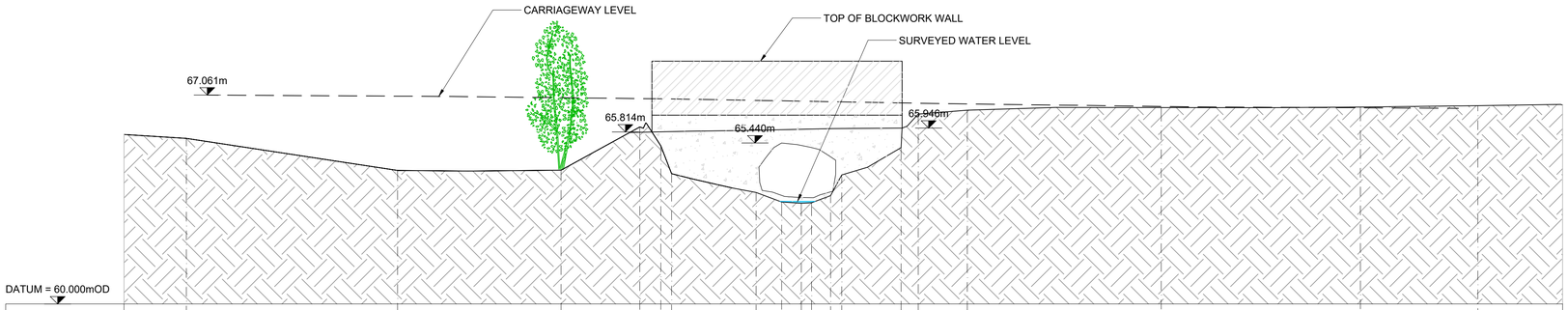

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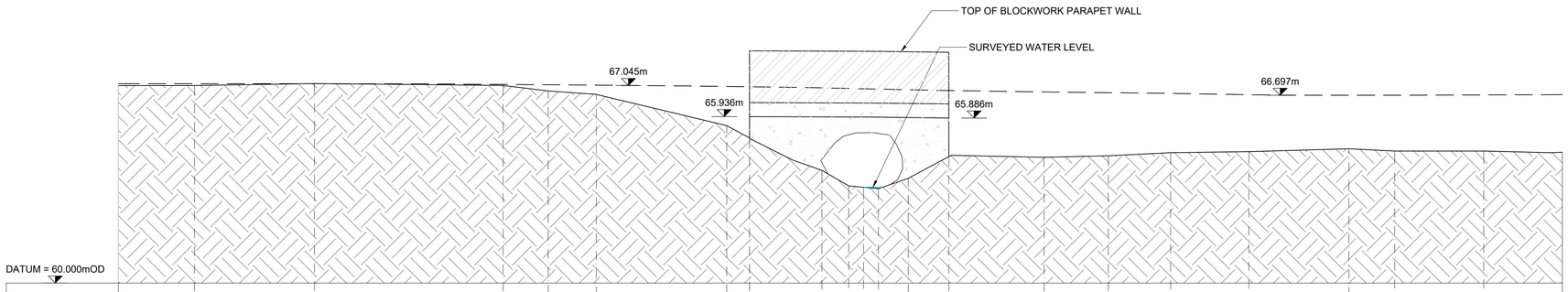
SECTION C
SCALE 1:100
0231



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Level (mOD)	67.038	67.044	67.113	67.042	66.851	66.726	65.612	65.171	64.017	63.462	63.415	63.367	63.733	64.510	64.484	64.539	64.650	64.687	64.788	64.707	64.707	64.664

SECTION D
SCALE 1:100
0231

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Údarás Náisiúnta Iompair
National Transport Authority

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client
TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project
NOR [redacted] WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose
ISSUED FOR REVIEW

Title
COOLTURK BRIDGE [CULVERT]
(MO-N59-006.00) REMEDIAL WORKS
EXISTING SECTIONAL ELEVATIONS C AND D

Original Scale	Des/Drawn	Checked	Authorised
1:150	AOS Date 11/11/19	MG Date 11/11/19	MJ Date 11/11/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0233	A

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Date: May 19, 2020 - 4:00pm Plotted by: aosullivan
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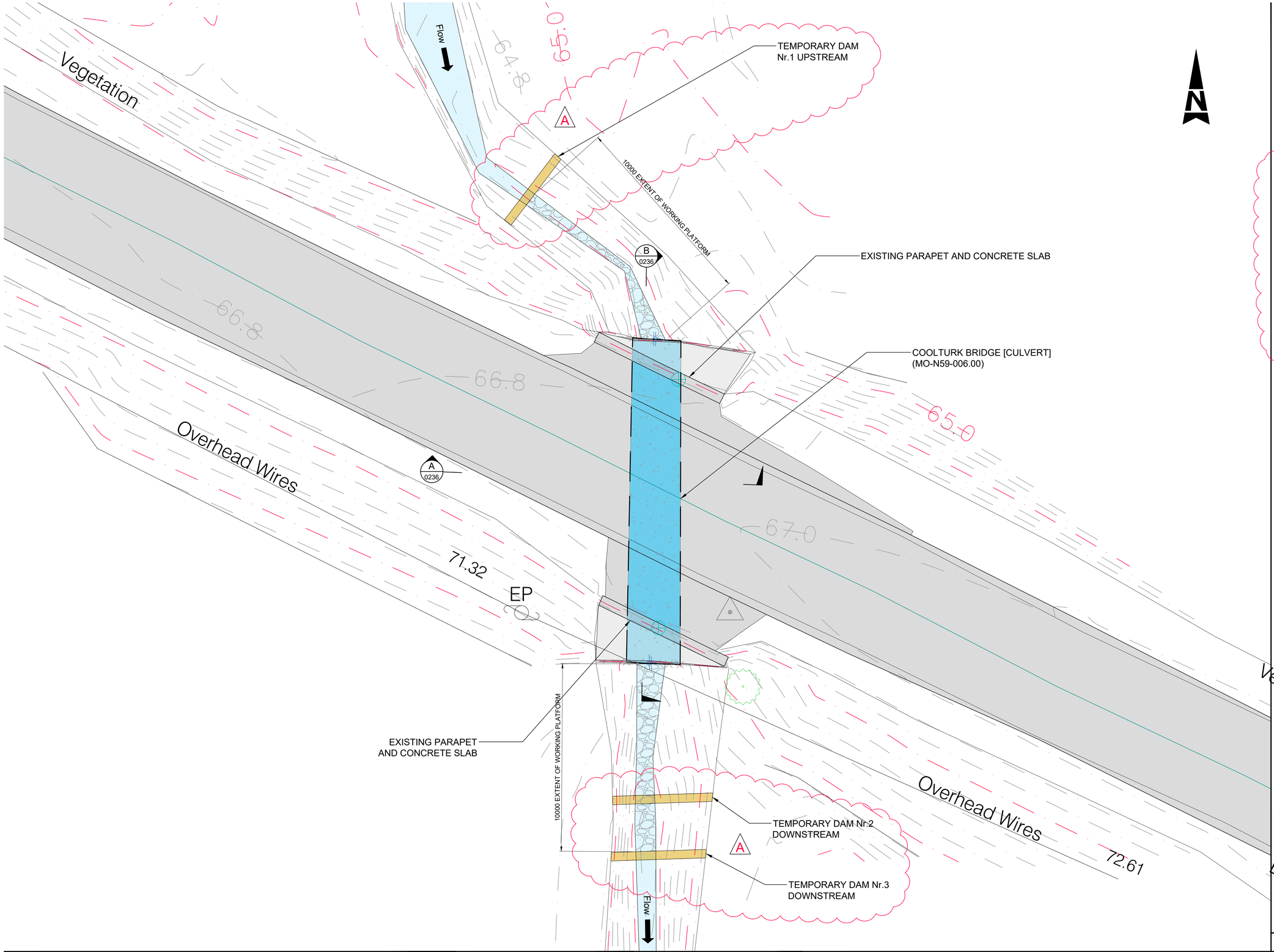

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SEQUENCE OF WORKS A

- REMOVE ANY LARGE STONES WITHIN THE WORKING PLATFORM AREAS AND STORE ON SITE FOR REINSTATEMENT.
- PLACE HEAVY DUTY TERRAM 2000 GT OR EQUIVALENT APPROVED GEOTEXTILE ON THE EXISTING STREAM BED OVER THE EXTENT OF THE WORKING PLATFORM AREA.
- PLACE WORKING PLATFORM ON THE GEOTEXTILE CONSISTING NOMINAL 250mm THICK CLEAN GRAVEL.
- EXCAVATE THE EXISTING STREAM BED MATERIAL WITHIN THE CULVERT. THIS MATERIAL SHALL BE STORED WITHIN THE WORKS AREA FOR REINSTATEMENT.
- ON COMPLETION OF THE CONCRETE LINING WORKS, REMOVE THE WORKING PLATFORM AND GEOTEXTILE.
- REINSTATE THE EXCAVATED STREAM BED MATERIAL WITHIN THE CULVERT AND THE LARGE STONES IN THE STREAM BED
- ALIGN THE STREAM BED LEVEL LOCAL TO THE CULVERT ENDS WITH WASHED GRAVEL

A1

DO NOT SCALE

File: 5162160-HTR-DR-0235 to 0236.dwg
Date: Jul 09, 2020 - 3:46pm Plotted by: aosullivan

Rev	Description	By	Date	Chk'd	Auth
A	NOTES ADDED	AOS	07/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) PROPOSED REMEDIAL WORKS - SHEET 1 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0235	A

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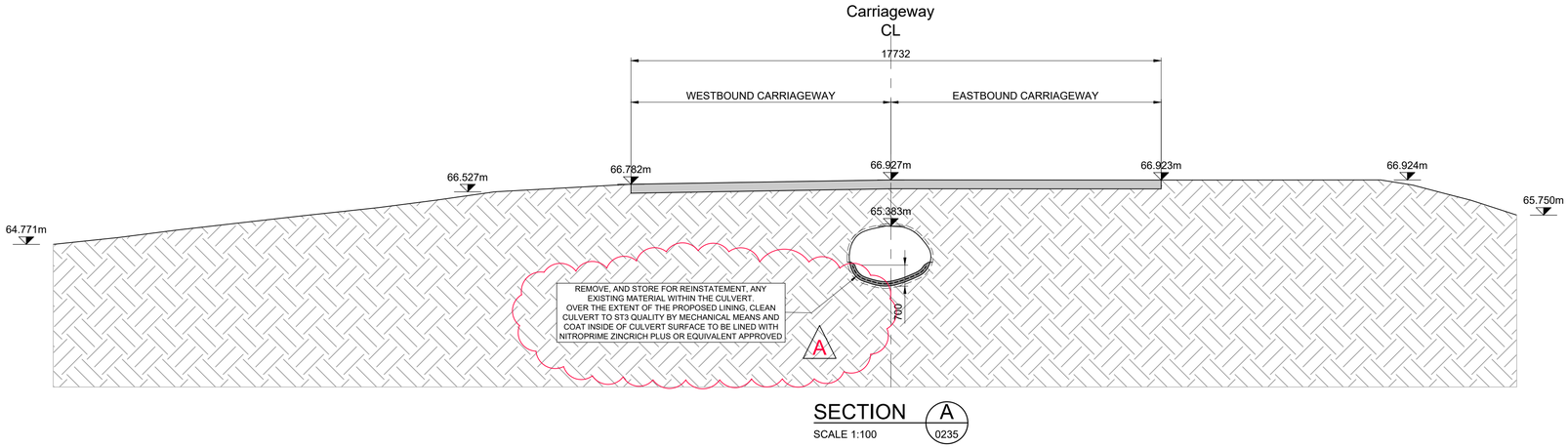
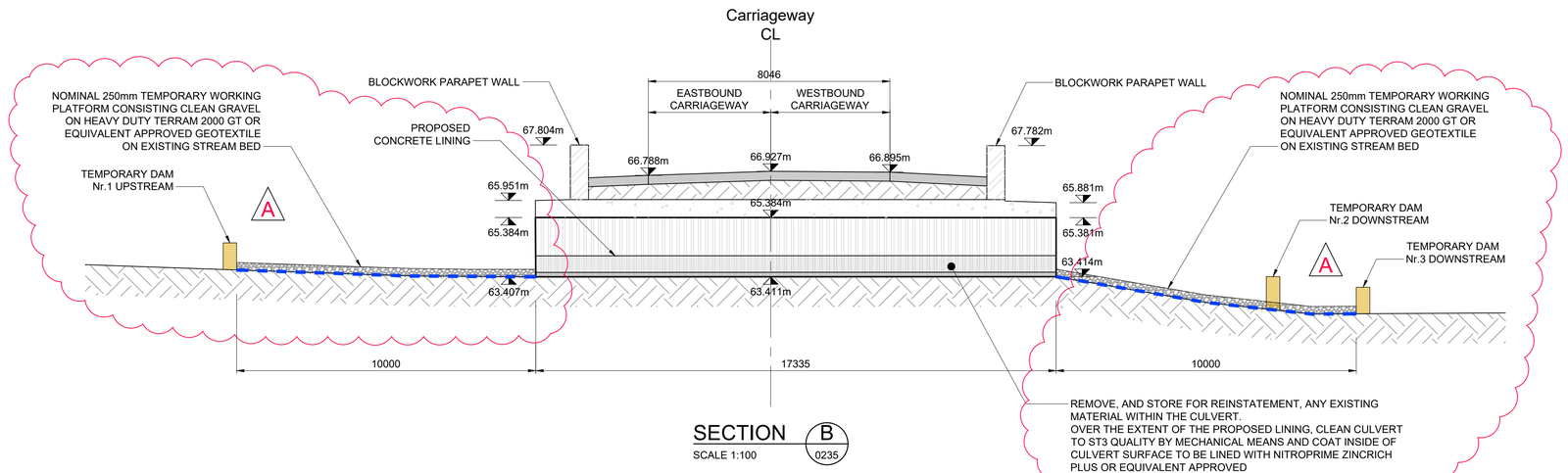


SECTION A

SCALE 1:100



SECTION B

SCALE 1:100

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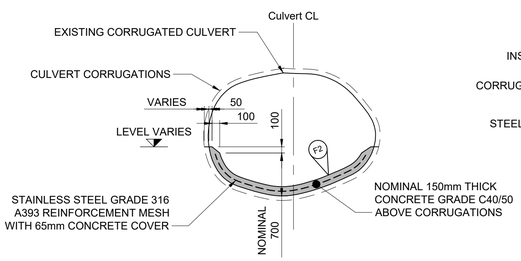
- ALIGN THE STREAM BED LEVEL LOCAL TO THE CULVERT ENDS WITH WASHED GRAVEL



TYPICAL CULVERT CROSS SECTION

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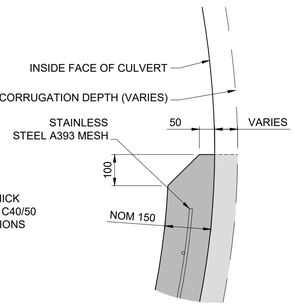
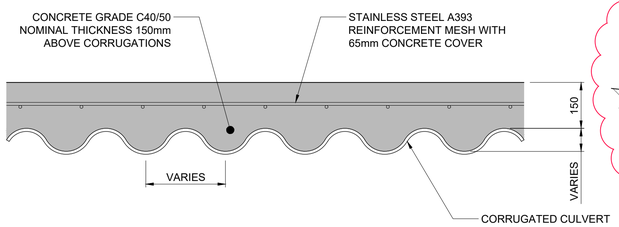
Scale at A3 1:100



TOP OF LINING DETAIL

Scale at A1 1:10
Scale at A3 1:20



CULVERT LINING DETAIL

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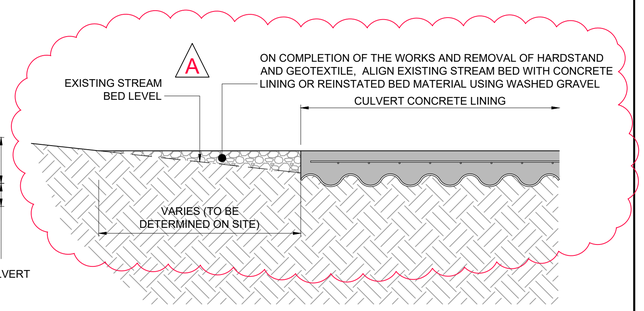

DETAIL AT ENTRY / EXIT OF CULVERT

Scale at A1 1:20
Scale at A3 1:40

Rev	Description	By	Date	Chk'd	Auth
A	NOTES ADDED, DETAILS UPDATED	AOS	07/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR · · WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) PROPOSED REMEDIAL WORKS - SHEET 2 OF 2

Original Scale	Des/Drawn	Checked	Authorised
As Shown	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0236	A

A1 DO NOT SCALE

File: 5162160-HTR-DR-0235 to 0236.dwg
Date: Jul 15, 2020 - 9:55am Plotted by: aosullivan

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Appendix B. Contractor's Method Statement

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3
Project No.: C0131

Document Title:	Culvert Lining Construction MO-N59-006.00	Document Number	Rev
		ST-MET-11	7

[redacted]

Circulation:

☑ All listed above	☑ Project File G 26	☑ ER	☐ Contractors Representative (front page only)
☐ Third party (if applicable)	☐	☐	☐

Scope of Work	This method statement outlines the full scope of works required to complete the concrete lining to Culvert as part of the NWBTM3 Contract. Detail to include works include: • Traffic Management • IFI Environmental Requirements • Stream / River over pumping / fluming • Cleaning of existing lining. • Installation of mesh / rebar • Concrete Works • Rock Armour Installation

[redacted]

Equipment and Plant Requirements				
	Major Plant	Quantity	Description	Certification Yes / No
		2	JCEL Pick up [For all equipment]	☐
		1	Concrete pump	☐
		1	Lighting Tower	☐
		1	Water Pump	☐
		1	Petrol Generator	☐
		2	Tracked excavators – 13T & 2.7T	☐
		1	6Tonne site dumper	
	Small Tools/ Plant	Quantity	Description	Certification Yes / No
		1	String task lighting	☐
		1	Battery Powered Hammer action drill + cordless drill	☐
		1	TTM set	☐
		1	generator	☐
		1	110v kango	☐
		1	Power Washer	☐
				☐
				☐
				☐
				☐
				☐

Labour Resources	Quantity	Position and Specific Job Description	Certification Yes / No
	1 No.	**Health and Safety Coordinator (Mr. Gerard Caffrey)** [Observes the implementation of TTMS and advises Project Manager]	☑

	1 No.	**Project Manager /** [redacted] [Overall control, planning of works and safety adviser. Reports to Health and Safety Coordinator in relation to all aspects of health and safety. Consults with the Engineer, the Roads Authority and the Garda Síochána.]	☐
	1 No.	**Site Agent / Traffic Safety and Control Officer** [redacted] [Coordinates workplans. Reports to Project Manager]	☐
	1 No.	**Site Engineer** [redacted] [Coordinates workforce and gives working instructions to General Operatives and Plant Operators. Reports to Supervising Engineer]	☐
	1 No.	**Site Foreman** [redacted]	☑
	2 No.	**Carpenters** [redacted]	☐
	2 No.	**General Operatives** [redacted]]	☐
	Note: Names, job descriptions and CV details of key personnel utilised in this Method Statement are contained in the Project Quality Plan.		

Materials Required	Quantity	Description	Supplier / Manufacturer	Technical Sheet Agreement Yes / No
		Concrete	TBC	☐
		A393 Mesh	TBC	☐
		Shuttering plywood and Timber	TBC	☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐

Personnel and Vehicular Access	Personnel and Vehicular to park in the small layby close to the works until TTM has been erected. Once TTM is erected all construction vehicles will park withing the TTM designated area.

Temporary Works Design Required	N/A	**Responsibility for Temporary Works Design**	N/A
Schedule of Attached Documents /Drawings	1137-TM-06 Single Lane Closure controlled by traffic lights.		

Witness / Hold Points					
Item	**Description**	**Hold Point**	**Witness Point**	**Responsibility**	**Appropriate Form / Checklist**

HP 1	Consultation with Local Authorities: Mayo County Council	☑	☐	Site Agent	
HP 2	Consultation with Regional IFI Inspectors IFI Ballina Mayo	☑	☐	Site Agent	
HP 3	Consultation with Regional National Parks & Wildlife Rangers/Inspectors	☑	☐	Site Agent	
HP 4	Consultation with Regional Waterways Ireland Office	☑	☐	Site Agent	
WP	Implementation of Temporary Traffic Management Scheme	☐	☑	Site Agent & Health and Safety Coordinator	
WP 2	Inspection of completed works	☐	☑	Assistant Resident Engineer	
		☐	☐		

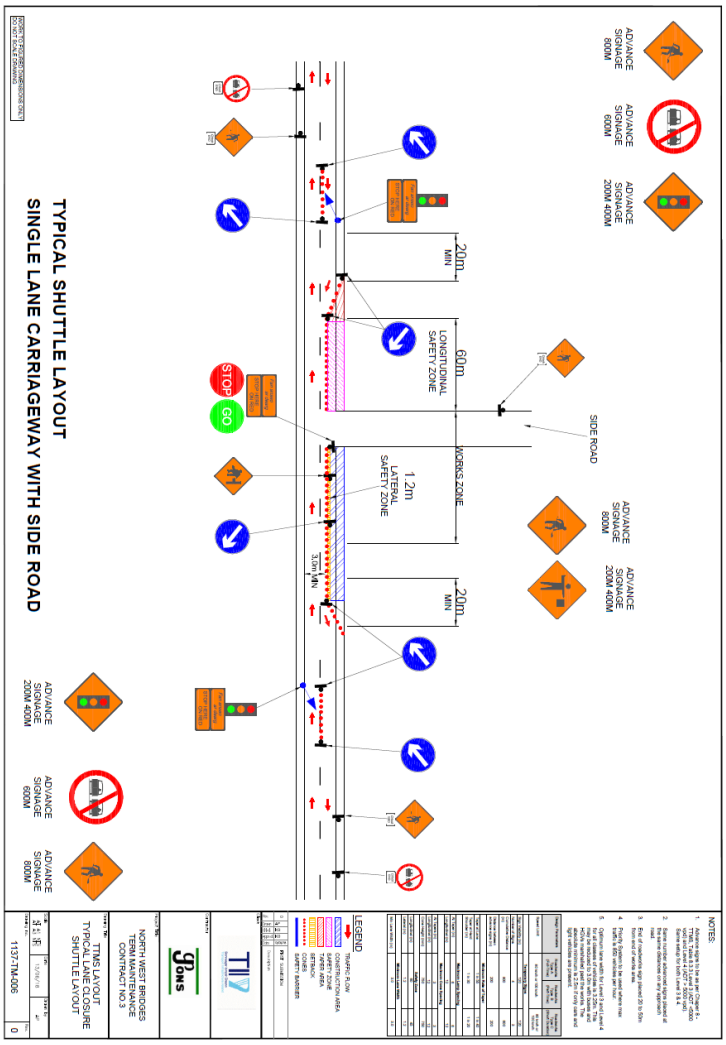
Work Method

Local Authorities / IFI:

- Respective County Council to be notified of TTM erection and proposed works at least 1 week prior to works commencing.
- If electrofishing is required, IFI will be notified and a competent contractor (JCEL will consult with IFI regarding the contractor to complete the electrofishing) will be used to complete the task.
- The de-watering process of the stream has been reviewed on site by JCEL and IFI and the over pumping method has been agreed rather than the fluming method due to the potential clash between the flume and the concrete works. IFI have requested to see a final copy of the MSRA BEFORE the works commence.
- IFI Contact: [redacted]

Temporary Traffic Management:

- JCEL to install TTM (Single Lane Carriageway) as per drawing 1137–TM–006 by SLG operative Nigel Crowe.
- Periodic inspections to be completed by qualified SLG operative.
- SLG to be erected each morning and removed every evening during the works.

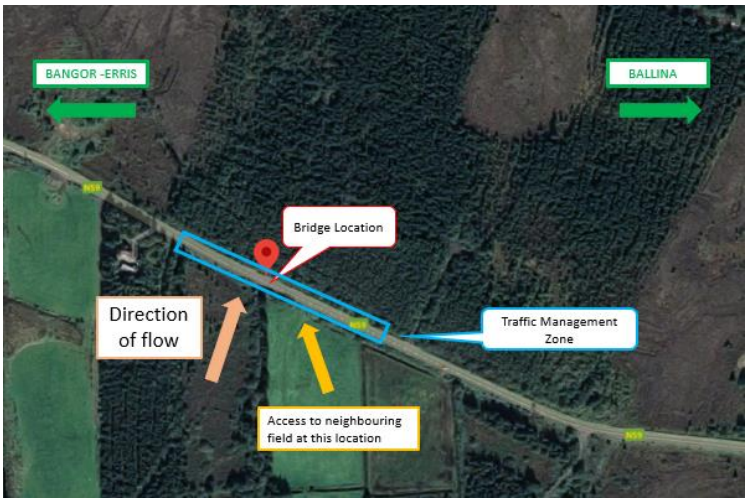


Weather:

- The weather will be monitored prior to commencing with the works. Every effort will be made to avoid periods of rainfall therefore ensuring water volumes through the culvert are at a minimum.

Access to work area:

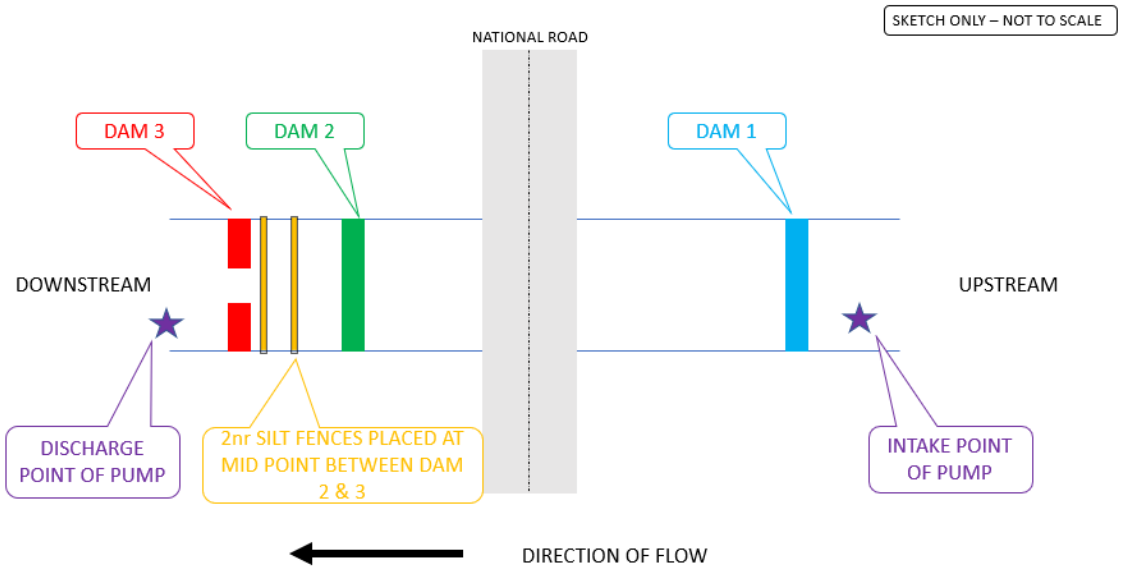
- Permission will be sought from the land owner to gain temporary access to the mouth of the culvert at both sides prior to works commencing.
- All JCEL plant, concrete deliveries and the concrete pump will be parked within the TTM during the completion of the works.



- Once the TTM is in place, operative will be able to access the stream from within the TTM by walking down the shallow embankment to the mouth of the culvert.
  A timber walkway with a handrail will be constructed from the top of the embankment to the bottom to remove the likelihood of disturbing the soil on the embankment and contaminating the stream. This will be removed once the works are complete.

Diversion of stream-

At the time of the JCEL pre-survey 110mm of water in the stream and 50mm of water through the culvert was recorded during a period of 2 weeks heavy rain. During a dry weather spell, it is predicted that the flow in the stream would be minimal therefore damming and over pumping onto the downstream side of the culvert will be the de-watering method used.



The Dam Construction –

- The dams will consist of small sand bags filled with Pea Gravel. Each bag will be double bagged and sealed thoroughly. A rule of 3 times the height will be used when building the dam (eg.1m high x 3m wide). The dam will also be wrapped in 1000-gauge polythene.
- Dam height will depend on water levels at the time of erection and the 14-day predicted rainfall.

Installation Sequence:

Down Stream Dam–

- (Dam 3). JCEL will level a section of the stream to place the dam. The sand bags for the dam will be carried by hand and placed into position within 10 meters of the structure, 500mm in height, across the full width to prevent downstream water returning into the work area.
  Once all dams are erected a 500mm opening will then be created in this dam.
- (Dam 2) JCEL will level a section of the stream be to place the dam. A dam of sand bags will be erected 500mm in height to retain a pool of water (between Dam 2 & Dam 3) for the completion of the electrofishing.

Up Stream Dam –

- (Dam 1) JCEL will level a section of the stream to place the dam along the high point in the stream bed as shown below. The sand bag dam will be within 10m upstream of the culvert opening.

Electrofishing

- If required, the section of stream will be electro-fished by a licensed operator. All fish will be relocated into the pool between Dam 2 & 3.

Silt Fencing –

- Two silt fences will be erected behind the dams on the downstream side (as shown in the above) diagram). This will act as a final filter for potential surface water run off before it re-enters the live

watercourse. The MSDS sheet for the fencing to be used is attached to the end of this document.

Down Stream Dam–

- Dam 2 will then be raised full height with sand bags.

Over pumping of water

- The over pumping pipe will be placed into a 225mm non perforated pipe installed through the culvert at high level. It will be secured by temporary brackets that will be fixed along the culvert.
- The bracket will consist of a threaded bar arrangement with unit strut drilled through the steel lining with an expanding anchor bolt fitting at the end to hold it in place. The threaded rod arrangement will allow for height adjustment to accommodate for a gravity fall on the pipe.
- The intake hose for over pumping will be positioned on the upstream side of dam 1 and will be wrapped in a layer of silt fencing. The discharge hose will be position on the downstream side of dam 3 – as indicated in the sketch above.
- A silt bag will be place on the end of the discharge hose to prevent discharge of any suspended solid / unwanted material into the live water course.
- The work area between dam 1 and dam 2 will be pumped out and discharged between dam 2 and 3 and before the silt fences
- A small natural sump / low point will be located within the works area (between dam 1 and 2) and a submersible pump will be used to over pump any water collected within the dams. This will be also discharged to the upstream side of the silt fences between dams 2 and 3.

Pump Sizing:

- The flow of the stream will be reviewed 1 week prior to commencing works and a 50% safety factor allowed to accommodate periods of rain during the works.

Working Platform:

- The stream will be allowed to dry before this platform is installed.
- The platform will consist of a layer of heavy-duty geotextile being placed over the existing river bed and a 250mm layer of washed, well graded aggregate being placed on the geotextile to give a solid, clean base for operatives to access the culvert.
- The platform will cover the full width of the stream and continue for 5m along the stream (on the dry side of the bund)
- The aggregate will be placed into location using an excavator placed on the bank that will reach the mouth of the culvert without entering the bed of the stream.
- On completion of the culvert lining the geotextile and aggregate will be removed.

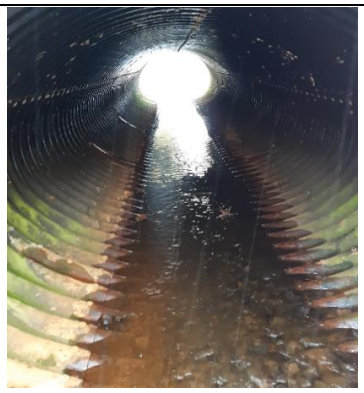
Temporary Lighting

- Temporary LED task lighting will be used to luminate the work area during the works. The lights will be powered by a generator placed in a bund at road level.
- The lighting will be secure with cable ties to the bracketry described above.
- The generator will be placed within a plant nappy at all times.

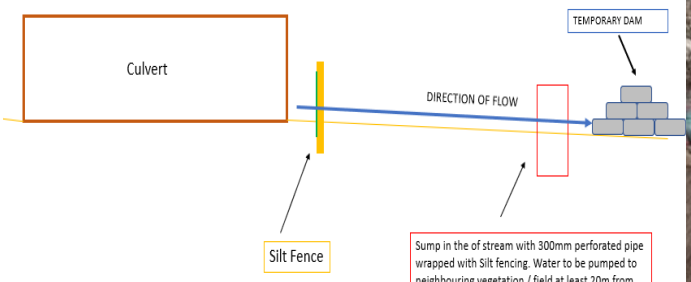
Silt Removal:

- On inspection of the culvert there is no silt present due to high velocity flow during wet weather conditions (winter periods)

Power Washing of Culvert Area to be lined



- The high-pressure washing will be completed by McBreen Environmental
- The washing unit generator will be positioned in the Council yard with the lance hose running down the bank into the mouth of the culvert.
- The washing will commence on upstream side and washing in the downstream direction.
- The culvert area to be lined will be cleaned using a 25,000 PSI Hydro Power Washer removing the loose material on the existing steel culvert.
- It is expected that the power washing will remove all loose material but as necessary small handheld angle grinders and wire brushes will be used to clean the steel to the ST3 finish. This area will then be power washed again to ensure it is completely clean.
- Water from power washing the steel culvert will be collected in a sump within upstream of dam 2 and over pumped to discharge upstream of the silt fences between dams 2 and 3.
- Arisings from the cleaning of the culvert lining will be collected within the culvert and disposed of off-site to a licensed tip.



Treatment of exposed steel:

- The exposed steel under the proposed concrete lining area shall be treated with a corrosion inhibitor and primer.

Installation of Reinforcement

- The A393 stainless steel mesh will be delivered to site using a Hi-Abb truck. It will then be lowered over the barrier on the down stream side and placed on the outside of the culvert in the stream bed. The JCEL operatives will then carry the mesh to the point of placement and fix into position as indicated below.

Pouring of concrete lining

Pouring of concrete lining (1st half of culvert – 0m to 8m)

- A Prefabricated curved shutter will be placed to the side walls with openings at the top of the shutter to allow the concrete to enter the shutter.
- The shutter will be fixed in placed to a 6x3 timber at high level that will be fixed to the culvert lining and the braced at low level using 4x2 timber from the wall on the opposite side.
- The concrete will be vibrated using a hi-frequency pencil poker that will also be placed within the shutter through the high level openings.

Pouring of concrete lining (2ndt half of culvert – 8m to 17m)

- The existing shutters will then be struck and moved forward to the remaining section of wall and secured into position using the method stated aboved.
- Once in position the walls will be poured using a concrete above as stated above also.

Embedding of new culvert lining to existing stream bed:

Upstream/Downstream

- The entrance to the culvert will be re-shaped using a clean, well gradeded aggregate that will match the existing stream bed level to the new concrete culvert level. (see picture below of existing)

Removal of the Dam:

The removal of the dam will be completed on a 2-stage basis. The level of dam 1 will be lowered to allow the area between dams 1 and 2 to partially fill with water. The water within dam 1 and 2 will be allowed to settle overnight and the remainder of the dams will be removed the following morning.

Bio-Security Measures:

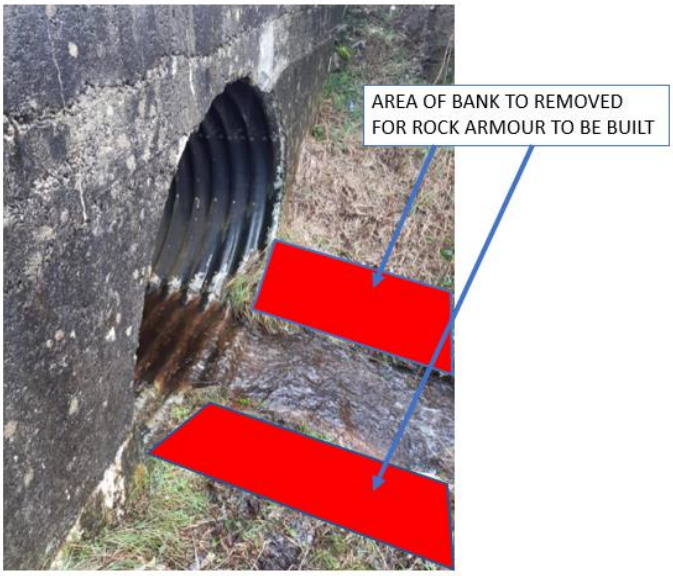
- Al tools and PPE are to be washed down with Virkon Aquatic after each day to prevent to risk of cross contamination to other streams.

Re-Fuelling / Bunding of Plant

- All pumps and generators are to be placed in a bunded tray to avoid any potential of contamination of the local ground.
- All pumps to be located on the bank of the stream within the bund when pumping amd removed from the vacinity of the stream when not in use.
- All pumps must be kept at a safe working distance from the edge of the stream.
- All re-fuelling is to be completed at road level over a bunded tray using a syphon to avoid spillage.
- A Spill Kit will be avialbe at all times if in the JCEL pick-ups in the event of an emergency.
- A back-up pump and generator will be avialable on site during the full completion of the works.

Installation of Rock Armour:

- Rock Armour will be placed at the entrance to the culvert to ease water flow into the culvert.
- The bank at the edge of the stream will be hand dug 300mm below the current ground level the material placed into sealed bags and removed off site.
- Various sizes of clean limestone rock armour will be selected from a local quarry and brought to site. The rock armour sizes will vary from 350mm to 500mm.
- Due to the location of the culvert rock armour will be manually placed in position.
- Rock Armour is to be built to match the height of the new culvert lining.



Site Clearance:

- On completion of the culvert lining works the temporary working platform and geotextile will be removed.
- Once all of the shotconcreting works have been completed all of the pipes will be thouroughly cleaned and excess concrete material placed into tonne bags and removed off site.
- The new concrete will receive a thorough clean with a yard brush to remove any loose concrete and debris from the area. This will be collected and removed off site.
- The area will be inspected by JCEL / Atkins and works approved before the pump and the dams are removed and the stream allowed to flow.

Emergency Procedures:

- A standby pump and generator will be kept on stand-by during the completion of the works.
- IFI will be contacted in the case of a spill of cement, hydrocarbons, silt or any other polluting material to surface waters.
- IFI Contact – [redacted]
  JCEL Contact [redacted]

Work Duration;

- It is predicted that these works will be completed in 2 weeks weather permitting as this stream is susceptible to flash flooding during periods of heavy rain.

Contractor Task Table:

TASK	JONS	MCBREEN	N/A
Site Set up	X		
Pump install	X		
Damming / Overpumping of stream	X		
Erection / Maintenance of silt fencing and IFI requirements	X		
Temporary Lighting	X		
Cleaning of Culvert lining		X	

Installation of mesh	X		
Concreting Works	X		
Site Clearance	X		

COVID 19:

- The precautions listed below are to be implemented in tandem with the procedures outlined in the "NWBTM3 COVID 19 Site Operating procedures" received during the site Induction.
- Each operative must complete the Corona Virus Questionnaire via Google Forms before arrival to site.
- Each operative must have the online COVID 19 CIF course completed and a copy of their pass presented to JCEL management prior to entering site. Each work crew must also have a CIF qualified Compliance Officer.
- All operatives use the JCEL vehicles sanitisation station on arrival to site and before each break time and before leaving suite each evening.
- All operatives are to responsible for cleaning all touch surfaces on tools, plant and vehicles with disinfectant wipes after use.
- Disinfectant wipes and sprays will be available and re-stocked as required.
- Face visors, masks etc will also be provided by JCEL on site.
- 1 operative will be assigned to an item of plant or tools at the start of each day. Each operative will be in control of sanitising all contact points in their item of plant / tools at regular intervals (morning, break times, evening).
- A PPE / Sanitation station will be provided in each pick-up. All used PPE is to be placed into a designated bin and disposed of in the Milltown office. This will be re-stocked weekly by the Compliance Officer for each crew.
- 2m Social Distancing must be followed. If this is unachievable increased levels of PPE are required and a Close Proximity Permit" must be completed and signed off as per the Risk Assessment below.
- Delivery of required materials will be ordered in bulk for the full scope of the works on receipt of the Works Orders and delivered to the Milltown offices. All deliveries will be left to sit for a minimum of 3 days before being used. No signing of dockets is permitted by JCEL operatives. The JCEL" delivery Protocols" are to be followed.
- Also, normal OHS requirements must be maintained.

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Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
Setting Up Traffic Management Signage	Being Struck by Public Traffic	Operatives	2	4	H	A Highway maintenance vehicle with flashing beacons and reflectors will be used to transport the operatives and their equipment. The Highway maintenance vehicle will remain on hard shoulder with flashing beacons illuminated Operatives to emerge from vehicle using Passenger side of vehicle only for installation of signage on hard shoulder and for installation of signs on median operatives are to use driver side of vehicle only. Operatives to work in advance of maintenance vehicle All operatives to be given a tool box talk prior to commencing activity. All Operatives to wear high visibility clothing.	L	Engineer, Safety Officer, Operatives

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Manual Handling	MH	Operatives	3	3	H	All personnel involved to use correct manual handling procedures A LITE assessment should be performed. And All individuals to ensure that all is aware of the correct lifting procedure	L	Engineer, Safety Officer, Operatives
Working Near Plant / Equipment	Contact with moving plant	Plant & Site Operatives	3	5	H	• Al operatives to have full eye contact with plant operatives at al times. • Survey area before commencing work. • A 2m safe working zone to be maintained at all times. • Expose cables by hand and identify. • Provide adequate supervision of excavations. • Work permits for digging operations must be completed prior to excavating	L	Site Agent Site Engineer Foreman Operative

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Prevention of Fire	Incorrect storage of flammable liquids and gasses. Faulty electrical equipment. Use of oxy-acetylene equipment. Rubbish burning. Faulty plant. Inappropriate smoking Vandalism / arson	Site Occupants/staff	1	4	L	• All works to be undertaken in accordance with method statements and best practice. • Adequate supervision of works to be provided at all times. • Plant to be regularly inspected for faults. • Enforce good working practices for Oxy-acetylene / welding operations. • All hazardous materials to be securely stored. • Fire extinguishers to be provided as required. • Site to be secured and checked at the end of each day. • Security to be provided as required. • Ensure first aid point and emergency contact numbers are complete and available and emergency plan in place. Reference procedures PR-(HO)-EHS-18, 22, 28, 41 46, 50 and 55	L	Site Agent /Office Manager Site Engineer Site Foreman/ Staff

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			L	S	R			
Working near / over Water	Falls from height Falling materials from height Drowning	Site Operatives	2	4	H	• Ensure Life Buoys are available on both sides of bridge • If water level is high, ensure additional protection measures are put in place on the down stream side e.g. Life lines • Use Life jackets where necessary • Use a harness to a secured anchorage point where necessary • Buoyance aids to be checked as per procedure	L	Site Agent /Office Manager Site Engineer Site Foreman/ Staff

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			L	S	R			
Use of Ladders, working at heights	Falls from ladders Collapse of ladders Overreaching Defective ladders Carrying materials/ equipment on ladders	Persons using ladders Persons near ladders	2	4	M	• Where it is not practical to h aver a handrail harnesses must be used when working at heights • An exemption for this is short term short duration work which can be carried out from a ladder • Ladders to be in good condition. • Ladders to be correct way up – strengtheners to be on underside of rung. • Ladder to be sited on level ground and secured at top. • Ladder to extend 1m (min.) above landing or adequate handholds provided. • Ladder to be inclined at 1in 4. • Ensure ladder is positioned to avoid need to overreach. • Ladders must be tied or footed whilst in use • Do not use metal ladders in proximity to overhead cables. • Wooden ladders to remain unpainted	L	Site Agent Site Engineer Foreman Operative

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			L	S	R			
Working with Dangerous Substances including concrete	Contact with Skin Incorrect Use of Dangerous Substance Accidental Spillage Theft / Vandalism	Site Operatives / General Public / Watercourses Trespassers	2	4	M	• All works to be undertaken in accordance with method statements and best practice. • Adequate supervision of works to be provided at all times. • Data sheets to be provided for all dangerous substances. • Gloves and other PPE should be worn as required. • All dangerous substances to be clearly marked and securely stored. • Dispose of used containers, etc. as per manufacturers recommendations. Reference procedure PR-EHS-28 and 54 and the employee handbook.	L	Site Agent Site Engineer Foreman Operative
Biological and Organic Hazards	Contact with blood / blood products Contact with waste products Weill's disease Discarded syringes	Site Operatives/	2	4	M	• Adequate supervision of works to be provided at all times. • Gloves and other PPE should be worn as required. • Procedures for disposal of waste products. • Health surveillance as appropriate. • Adequate and suitable storage and disposal facilities for contaminated waste. Reference procedure PR-EHS-07 and 28 and the employee handbook.	L	Site Agent Site Engineer Foreman Operative

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			L	S	R			
Use of power tools / plant	Striking of personnel Striking of other people Striking of oncoming traffic	Site Operatives Pedestrians Oncoming traffic	2	4	M	• Al operatives to have full eye contact with plant operatives at all times. • Survey area before commencing work. • Expose cables by hand and identify. • Provide adequate supervision of excavations. • Work permits for digging operations must be completed prior to excavating • TTM in place • Operative with CSCS training • Machine GA1 test cert • Machine GA2 Daily inspection carried out	L	Site Agent Site Engineer Foreman Operative Machine operator

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Close Working Activities	Covid 19	Site Operatives	2	5	H	• Full PPE to be worn as per CIF guidelines inclusive of face visor, mask, goggles and gloves. • Covid 19 compliance officer to review task before works commence. • New PPE to be required each morning and to be changed at each break during the shift. Old PPE to be disposed of in the PPE bin. • All tolls to be disinfected each morning and at break times, with ne operative assigned to each tool. • Site Operating procedures to be followed. • A close proximity permit must be completed and sent to JCEL management via WhatsApp.	M	Site Agent Site Engineer Site Foreman Site Operatives Covid 19 compliance Officer

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Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
General Site Activities	Covid 19	Site Operatives	2	5	M	• Return to Work protocols to be adhered to at all times. • MSRA protocols to be adhered to at all times. • Gloves / face masks / masks to be work where appropriate. • Covid 19 Compliance office to be present on site at all times. • Appropriate PPE available on site at all times in the site office. • All site facilities to be thoroughly cleaned before each break and after each use with disinfectant spray, including all “touch points”. • Site Management to keep updated with all CIF advisory notes regarding Covid 19.	M	Site Agent Site Engineer Site Foreman Site Operatives Covid 19 compliance Officer

Note:

- ***Ensure you have consulted with the most up to date service drawings.***
- ***Ensure you have made contact with the relevant service provider.***
- ***No work is to commence until all services are identified, moved or protected in agreement with the utility provider.***
- ***Ensure you have assessed Traffic Management for the works.***
- ***Ensure you have you made arrangements for access and egress to and from the works area.***

Hazard Identification, Risk Assessment and Control Measures

Emergency Procedures

In the event of accident:

- Discontinue operations immediately
- Observe accident location and status of injured person.
- Notify emergency services and site office immediately. Call supervisor / site agent and medical assistance. The senior person is to take charge and a first aider will be in attendance.
- If there is a risk of further injury, move person to safety, provided that this can be done without undue risk to the rescuer or the injured person.
- First aid shall be administered by the first aider. First aiders on site are Ryan Fallon (mob. 087 9431396).
- Make arrangement for the transportation of injured person to the nearest hospital (by ambulance if necessary).
- Make scene of accident safe.
- Investigate and report accident (see Site Safety and Health Plan for details).

Name	Position	Mobile Number
[redacted]		
[redacted]		
[redacted]		[redacted]
	[redacted]	

In the event of a traffic accident occurring adjacent to any of the works, immediately contact one of the JCEL personnel listed above and report:

- Location of the accident;
- The seriousness of the accident and whether any persons were trapped, whether the collision involves vehicles carrying inflammable, corrosive or hazardous substances, whether there is a possibility of ignition from leaking fuel or chemicals.

Additional Information

Name of Project:	North West Bridge Term Maintenance Contract No.2
[redacted]	
[redacted]	
	[redacted]
	[redacted]
	[redacted]

Documents of Works

Traffic Signs Manual, Chapter 8.
SHWW Act 2005.
SHWW (Construction Regulations) Regulations 2006
SHWW (General Applications) Regulations 2007

Tool Box Talk

North West Bridge Term Maintenance No.3

Given By:
Date:

Topics

Name (Block Capitals)	**Signed**	**Company**
Issues Raised		

*The above toolbox talk sheet is to be completed prior to the works with the relevant operators and returned to the Safety File in the Safety Office.

Proposed Silt Fencing Data Sheet

SSI Environmental Ltd.
Unit 243, Block A
Blanchardstown Corporate park 2
Blanchardstown,
Dublin 15

Tel: 01 8855555
Fax: 01 8855559

Mail: enquiries@ssienvironmental.ie
Web: www.ssienvironmental.ie

SSI ENVIRONMENTAL – SILT FENCE (Terrastop TM Premium)






Tensile Strength:	20 kN/m
Strain at Maximum Load:	18 %
Grab Tensile Strength:	0.85/0.70 kN
Trapezoid Tear Strength:	0.40 kN
Dynamic Perforation:	17 mm
Static Puncture (CBR):	2,700 N
Water Permeability:	0.035 m/s
Opening Size:	400 micron
UV Rating:	400 kLy
Weight:	170g/m^2
Thickness:	900 micron
Composition:	PP
Colour:	Green
Roll Size:	0.75 x 50 or 100 m

The Problem - Many construction activities result in disturbed or bare ground that is vulnerable to weather erosion (e.g. building areas, haul roads, spoil heaps and quarries). The consequential silt laden storm-water **run-off**, plus site debris, often contaminates surrounding land, watercourses, lakes and drains - resulting in significant environmental **pollution** and potentially costly fines.

The Solution - Terrastop™ Premium is a special, high quality, permeable, technical filter fabric that can be installed as an entrenched vertical entrapment fence, and is designed to intercept and detain **run-off**, trapping harmful silt through settlement and filtration before it leaves the site



SSI ENVIRONMENTAL – SOLUTIONS DRIVEN

Proposed De-Watering Bag Data Sheet

Silt Dewatering Bag

SSI Environmental

Tel: 00353 (0) 1 8855555

Material Specifications

Properties	ASTM Test	Value
Material: Non-Woven, Polyethylene Geotextile	-	-
Grab Tensile	D 4632	205 lbs
Elongation at break	D 4632	50%
Trapezoid Tear	D 4533	80 lbs
Puncture	D 4833	525 lbs
Mullen Burst	D 3786	420 psi
Permittivity	D 4491	1.5 sec^{-1}
A.O.S. (U.S. sieve no.)/ mm	D 4781	80/0.18
UV Stability (strenth retained %) 500 Hours	D 4355	70%
Fabric Weight ($oz./yd^2$)(typical)	D 5261	8 oz/yd^2
Flow Rate	D 4491	90 gpm/ft^2

Install the Ultra-Dewatering Bag® on a slope so incoming water flows downhill through the Ultra-Dewatering Bag® without creating more erosion. Strap the neck of the Ultra-Dewatering Bag® tightly to the discharge hose. To increase the efficiency of filtration, place the bag on an aggregate or hay bale bed to maximize water flow through the surface area of the bag.

The Ultra-Dewatering Bag® is full when it no longer can efficiently filter sediment or pass water at a reasonable rate. Flow rates will vary depending on the size of the Ultra-Dewatering Bag®, the type and amount of sediment discharged into the Ultra-Dewatering Bag®, the type of ground, rock or other substance under the bag and the degree of the slope on which the bag lies. Under most circumstances Ultra-Dewatering Bag® will accommodate flow rates of 1500 gallons per minute. Use of excessive flow rates or overfilling Ultra-Dewatering Bag® with sediment will cause ruptures of the bags or failure of the hose att chment straps.

Dispose of the Ultra-Dewatering Bag® as directed by the site engineer. If allowed, the Ultra-Dewatering Bag® may be cut open and the contents seeded after removing visible fabric.

The facts stated and the recommendations made herein are offered free of charge and are accurate to the best of our knowledge. UltraTech International, Inc. assumes no liability for the accuracy or completeness of this information or for the ultimate use by the purchaser. UltraTech disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing o usage of trade as to any equipment, material, or information furnished herewith. Final determination of the use of any information or material, or how it is useful, and whether the use infringes any patents is the sole responsibility of the user.

Unit Specifications

Model	Fabric QTY	Max Flow Rate (GPM)	Sediment Capacity (Cu Ft)	Sediment Capacity (lbs.)	Oil Capacity
Oil & Sediment 6'x6' Part # 9724-O/S	74 sq ft	500	36	4320	3.7 gal
Oil & Sediment 10'x15' Part # 9725-O/S	302 sq ft	500	150	18000	15.1 gal

Proposed Plant Nappy

NEW

THE PLANT NAPPY

The Plant Nappy® is a new, light and user friendly method of spill containment; designed to replace existing, traditional drip trays. Designed to withstand all weather conditions, it is rugged enough to stand plant on it all year round to contain the odd mishap that could occur on site.

Sizes – 500 x 685mm 2 litre, 1000 x 685mm 4.5 litre, 2000 x 1370mm 16 litre

Whilst encapsulating any drips or spills of oil the mat freely allows passage of water, such as rainfall, thus eliminating costly emptying of contaminated trays after use. The mat can be stood on uneven ground or slight inclines with no loss of performance ensuring your company is protected at all times.
The Plant Nappy® is an easy and cost-effective way to ensure environmentally friendly practice on site, avoiding possible prosecution or monetary fine for contamination of ground and water.

The Plant Nappy® liner is a useful addition to complement and extend the life of the Plant Nappy®. The liner sits snugly onto the base of the Plant Nappy® but is easily removed for cleaning or replacement. Just as the Plant Nappy® has a non-permeable base and a tough top cover so has the liner to give prolonged efficient service.

Cleaning of the liner couldn't be easier, simply remove the liner from the Plant Nappy® and squeeze out the oil into a suitable receptacle, and then replace back into the Plant Nappy® for reuse. Because the liner is flat, a pair of rollers such as a mangle would prove quite useful for this procedure.

The capacity of a standard liner is approximately 4.5 lts and may become quite heavy, in which case it would probably be beneficial to clean at 50% capacity.

SSI ENVIRONMENTAL – SOLUTIONS DRIVEN

Appendix C. Hydraulic Assessment

Construction, Replacement or Alteration of Bridges and Culverts
Application for Consent under Section 50 of the Arterial Drainage Act, 1945 & EU (Assessment and Management of Flood Risks) Regulations SI 122 of 2010

Project Name	**Culvert Lining Hydraulic Impact Assessment - Coolturk**	Structure Ref No.	**Culvert Lining Hydraulic Impact Assessment - Coolturk**

Applicant (Correspondence will issue to agent)	
Company or Organisation Name:	
Postal Address:	
Contact Person:	
Phone:	Fax:
E-mail:	

Agent (Correspondence will issue to agent)
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]

Location and Parameters of crossing						
Watercourse:	**Unnamed Stream**			Catchment:	**Unnamed Stream**	
Address (Townland – County):		**Crossmolina**				
Grid Reference	X:	**507638.51**		Y:	**817100.35**	
Hydrometric Station(s) utilized (including reference number):		**N/A**				
Area of Contributing Catchment:		**0.151**	Km^2	Road Reference:	**N59**	
Design Flood Flow:	**0.574**	m^3/s		Annual Exceedance Probability (AEP):		**1** %

Statement of Authenticity	
I hereby certify that the information contained in this application form, along with all appended supporting information, has been checked by me and that all statements are true and accurate.	
Name:	[redacted]
Company/Organisation:	[redacted]
Signature:	
Date:	

Application Check List	☐
COMPLETED APPLICATION FORM	☒
SUPPORTING HYDROLOGICAL AND HYDRAULIC INFORMATION	☒
PHOTOGRAPHS COVERING SITE OF ALL PROPOSED WORKS	☒
SCALED PLAN OF BRIDGE/CULVERT/APPROACH EARTHWORKS	☒
SCALED CROSS SECTION OF BRIDGE/CULVERT/APPROACH EARTHWORKS	☒
SCALED LONG SECTION OF CHANNEL THROUGH BRIDGE/CULVERT	☒
DETAILS OF RELEVANT EXISTING STRUCTURES	☒
COMPLETED STATEMENT OF AUTHENTICITY	☐
PLAN OF CATCHMENT AREA	☒
COPY OF NOTICE OF GRANT OF PLANNING PERMISSION WITH CONDITIONS *1	☐

If the application form is not completed correctly, and in its entirety, the application may be deemed invalid and returned for correction.

For OPW use only	*Date of Receipt*							
OPW Drainage Maintenance Region	*East*	☐	*South East*	☐	*South West*	☐	*West*	☐
Correspondence Number			*OPW Register No:*					
			Consent Issued	☐				

ADDITIONAL INFORMATION

Hydrological Analysis

Methodology Applied

Method Used	Tick box if used or state other	Flow *2 (m^3/sec)
Flood Studies Update characteristics		0.049 (QMED)
3 – Variable Catchment Characteistics		0.106 (Q_{BAR})
IH 124	☒	0.108 (Q_{BAR})
Gauged Flow	☐	
Unit Hydrograph	☐	
Other (ADAS)	☒	0.125 (Q_{BAR})
Other	☐	

FSR ☒ FSU ☒ Other ☒

Comments: Flows calculated using ADAS method was taken forward for the hydraulic modelling as these flows were more conservative than FSR3, IH124 and FSU estimates.

Factors Applied

Type of Factor	Value Used
Climate Change	1.2
Irish Growth Curve	1.96 (ADAS)
Factor for Standard Error	1.88 (FSU) 2.50 (FSR3) 2.72 (IH 124) 2.35 (ADAS)
Drained Channel	
Other	

Tidal ☐

Comments

Q100 estimates from different methods:
FSU = 0.183 m^3/s
IH124 = 0.575 m^3/s
FSR3 = 0.517 m^3/s
ADAS= 0.574 m^3/s

Hydraulic/Structure Details

Description of Structure*3

The existing culvert is made of corrugated steel and is oval in shape. The upstream face has the opening height of 1.94m, and width of 2.59m. The downstream face has the opening height of 2.07m and width of 2.67m. The culvert is 17.301m long.

Proposed works consist of cleaning out the silt from the existing culvert and lining the culvert with 150mm thick reinforced concrete at the bottom third.

Effective Conveyance Area *4 m^2

Upstream Invert Level **63.59** mOD	Downstream Invert Level **63.44** mOD
Upstream Soffit Level **65.23** mOD	Downstream Soffit Level **65.21** mOD
Upstream Design Flood Level **64.09** mOD	Downstream Design Flood Level **63.57** mOD

NOTES :

1. In line with OPW policy, section 50 approvals should be sought for bridges and culverts that are necessary for access or deemed acceptable by the planning authority. A copy of the notice of grant of planning permission

with all conditions should be enclosed with all applications, that are not exempt development under the Planning and Development Act, 2000, as evidence that these factors have been considered.

2. Flow is the estimated flow from the catchment, without any factors applied.

3. The following details are to be included: the channel bed level, invert and soffit levels of the structure along with the width, length and total conveyance area. Any environmental considerations such as bed depression, baffles, mammal walkways etc. should be described.

4. Effective conveyance area is from channel bed level to design flood level.

5. All levels must be given to Ordnance Datum, Malin Head.

If the application form is not completed correctly, and in its entirety, the application may be deemed invalid and returned for correction.

Culvert Lining Hydraulic Impact Assessment

Coolturk Culvert: MO-N59-006

Transport Infrastructure Ireland

March 2020

Notice

This document and its contents have been prepared and are intended solely as information for Transport Infrastructure Ireland and use in relation to Coolturk Culvert (MO-N59-006)

WS Atkins Ireland Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 24 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 0.0	Issued for Review	PA	KC	PC	MJ	March 2020

Client signoff

Client	Transport Infrastructure Ireland
Project	Culvert Lining Hydraulic Impact Assessment
Job number	5162160
Client signature / date	

Contents

Tables

Figures

1. Introduction

Atkins has been commissioned by Transport Infrastructure Ireland (TII) in respect of National Roads bridges maintenance for Munster and North West regions of Ireland. As a part of this, 45 corrugated steel culverts inverts are proposed to be lined with concrete.

This assessment for Coolturk culvert (MO-N59-006.00) is to analyse the impact of proposed lining on the culvert's flow capacity and its impacts on the flood levels upstream and downstream of the culvert.

2. Site location

The Coolturk culvert (MO-N59-006.00) is located under the national road N59 near Carrowkilleen townland, approximately 6km to the west of Crossmolina as shown in Figure 2-1. There are two properties identified nearby, however they are outside the catchment that drains to the Coolturk culvert.

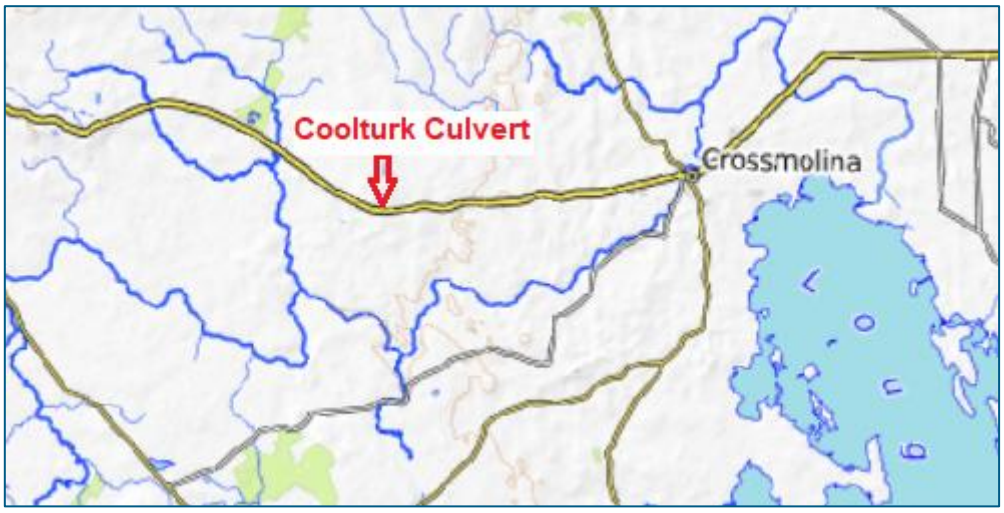


Figure 2-1 - Coolturk culvert location

3. Existing culvert description

The existing culvert structure is corrugated steel and is oval in shape. The upstream face has the opening height of 1.94m, and width of 2.59m. The downstream face has the opening height of 2.07m and width of 2.67m. The inlet and outlet are 'headwall' type. The culvert is 17.301m long.

For hydraulic modelling, the culvert is assumed as circular with the diameter of 1.94m and 2.07m (least dimensions) at the entrance and exit of the culvert respectively, as stated further in the Section 6.2.

The culvert is located on an unnamed tributary, approximately 2 km upstream of its confluence with the Deel River. The tributary is very narrow, with the widths varying around 3m – 4m. The tributary is relatively wider at the immediate upstream and downstream of the Coolturk culvert.

The current condition of the culvert at the exit and inside is shown in Figure 3-1 and Figure 3-2.

Figure 3-1 – Coolturk culvert at exit

Figure 3-2 – Inside view of the culvert

4. Proposed Works

The proposed works consist of cleaning out the silt from the existing culvert and bringing it back to bare steel along with lining the culvert with 150mm thick reinforced concrete for the bottom third of the culvert, as detailed in Figure 4-1. The hydraulic modelling discussed in Section 7 will identify any other proposed works that may be needed to reduce the hydraulic impact of the lining.

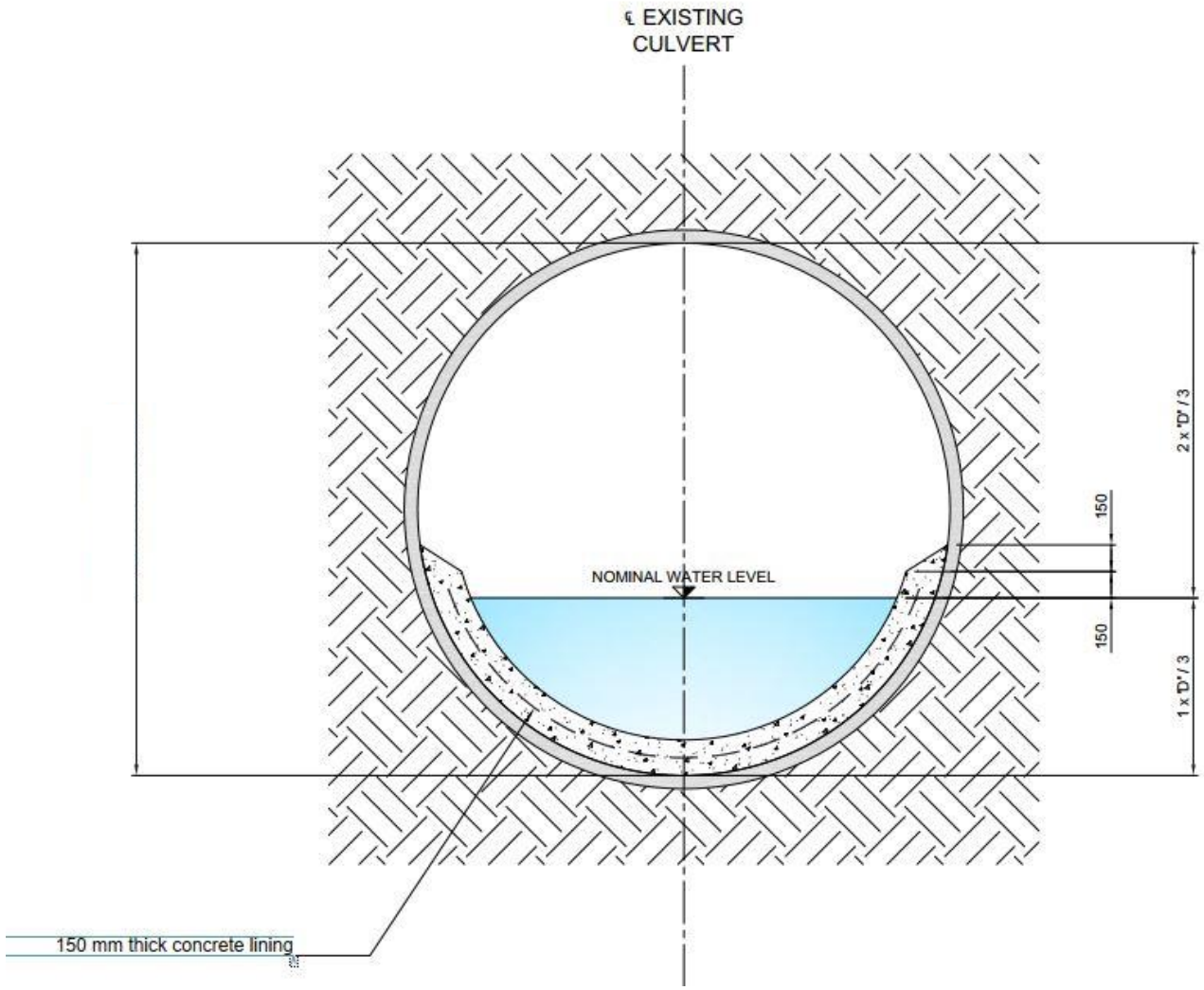


Figure 4-1 - Typical proposed culvert section

5. Culvert Catchment Description

The culvert is located on an unnamed tributary approximately 2 km upstream of the confluence with Deel River. The catchment has an area of 0.151 km^2 and is mainly rural. From the FSU portal, the culvert is contained within an ungauged catchment (Location Number: 34_1895_1, FSU Portal) as shown in Figure **5-1**. The outlet of the ungauged catchment is at the subject site, and is located downstream of the Coolturk culvert. The Coolturk culvert location is shown in Figure **5-1**, and the portion of the ungauged catchment to the north of N59 is expected to be draining to the culvert, assuming that the road acts as the ridge for the catchment.

According to the OPW web portal (floodmaps.ie), there is no historical flooding reported at the culvert location.

The catchment descriptors from the FSU Portal for the subject site are tabulated in Table 5-1. The main stream is steep as can be noted from a high value of main stream slope (S1085 = 3.562 m/km). The catchment is flashy as it is moderately impermeable (BFISOIL = 0.4477), and there is no attenuation due to lakes/reservoirs (FARL = 1). This indicates that the catchment has a quick response to the rainfall events. The catchment is completely rural indicated by UREXTENT =0.

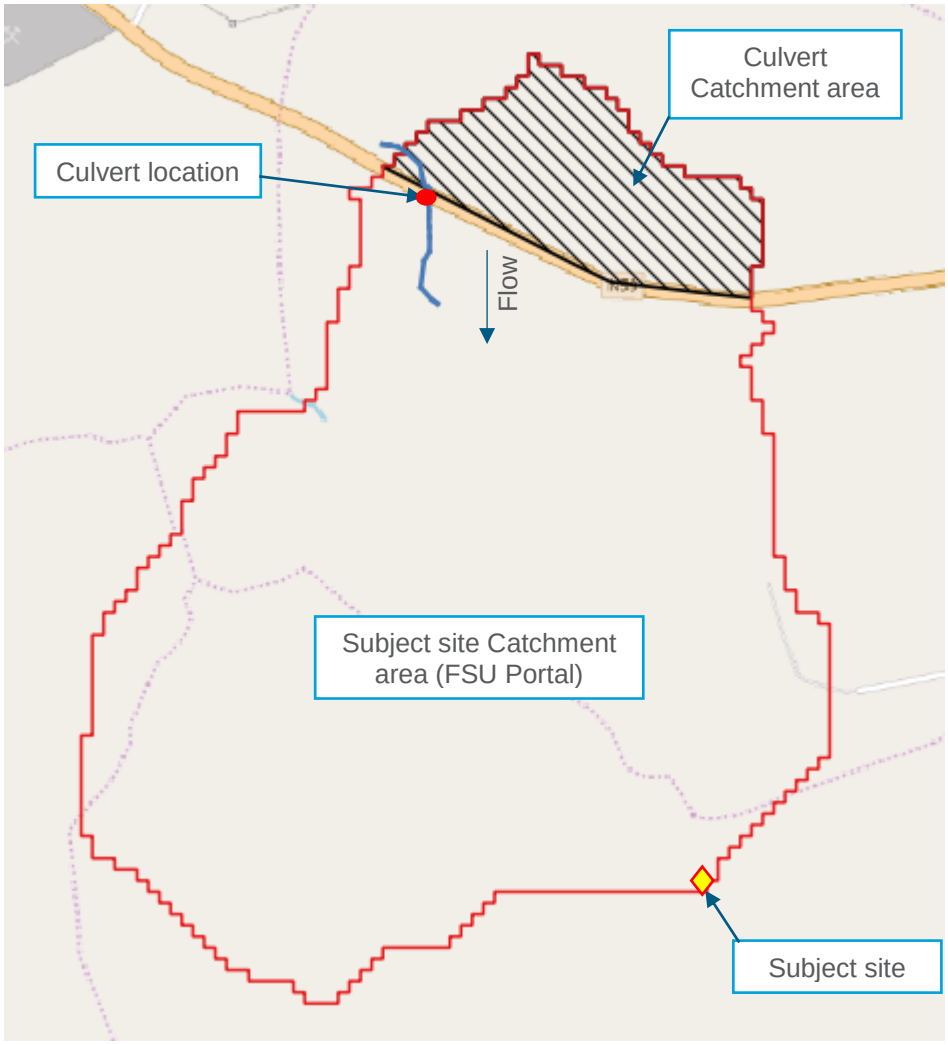


Figure 5-1 **– Ungauged catchment downstream of the Coolturk culvert (taken from FSU portal)**

Table 5-1 - Physical catchment descriptors for ungauged catchment at the subject site

Parameter	Value (units)
Location Number	34_1895_1
Contributing Catchment Area	1.46 km^2
BFISOIL	0.4477
SAAR	1361.83 mm
FARL	1
DRAIND	0.552 km/km^2
S1085	3.562 m/km
ARTDRAIN2	0
URBEXT	0
Centroid Distance	2202.8 km

5.1. Flow Assessment

For the assessment of inflows to the hydraulic model, four methods for flow estimation viz. Flood Studies Update (FSU), FSR3, ADAS and IH124 were used.

As the Coolturk culvert catchment area is less than 0.4 km^2, only ADAS method is applicable. However, other methods have been computed to compare the flow estimates and gain confidence.

5.1.1. Flood Studies Update (FSU) Analysis

FSU method has been included here for comparison purpose only, as the catchment size is less than 25 km^2.

The catchment that drains to the Coolturk culvert is smaller than the catchment used in the FSU Portal to compute QMED, with the latter having an additional area of 1.305 km^2 downstream of the N59 road. To reduce the flow pro-rata by area, a multiplying factor has been applied to the QMED estimate, which is computed as below:

$$Flow\ reduction\ factor = \frac{catchment\ area\ of\ the\ culvert}{catchment\ from\ FSU\ Portal} = \frac{0.151}{1.456} = 0.104$$

The PCD (physical catchment descriptors) rural estimate of QMED for the downstream ungauged outlet from the FSU Portal is 0.4724 m^3/s, hence for the culvert upstream, QMED is calculated as 0.0490 m^3/s (0.4724 x 0.104). As the catchment is completely rural, only the rural estimates were taken for computation.

FSU QMED Estimation

As the subject site is ungauged, pivot catchments were reviewed for hydrological similarity. However, all the pivot catchments were very big (>100 km^2), and the closest hydrological similarity value computed was 4.0522 (recommended value is 1), hence all pivot catchments were rejected.

Thus, the PCD QMED estimate was applied with the standard factorial error of 1.37^2 (for 95% confidence interval - upper limit) to ensure that the flows are not underestimated due to the uncertainty in culvert's catchment area estimation. The final QMED values was calculated to be **0.092 m^3/s** (0.0490 x 1.37^2).

FSU 100yr Design Flow Estimation

Pooled flood frequency analysis was performed for the subject site in the FSU Portal, and the growth factor for various flood frequencies was estimated as shown in the Figure 5-2 below.

Distribution	EV1										
	t=1.3	t=2	t=5	t=10	t=20	t=30	t=50	t=100	t=200	t=500	t=1000
Growth Factors	0.83	1	1.25	1.42	1.58	1.68	1.79	1.95	2.11	2.31	2.47
Design Peak Flows (m^3/s)	0.43	0.52	0.65	0.74	0.82	0.87	0.93	1.01	1.09	1.2	1.28

Figure 5-2 - Growth factors from FSU Portal

The growth factor of 1.95 for 100-year design flood was used for the assessment.

The upper limit of the standard error associated with growth factor in pooling analysis for EV1 distribution is 2%, and hence the error adjusted growth factor is 1.989. Finally, the 100-year flood (Q100) is calculated as **0.183 m^3/s**.

A 20% uplift for climate change was applied to obtain 100-year flood with 20% climate change (Q100C1) as **0.219 m^3/s.** Table 5-2 summarizes the design flows for Coolturk culvert from the FSU analysis.

Table 5-2 - Design flows for Coolturk culvert – FSU method (rural estimates)

Event	Design flood (m^3/s)
QMED	0.092
Q100	0.183
Q100C1	0.219

5.1.2. Institute of Hydrology Report No. 124 Method

The Institute of Hydrology (IoH) Report 124 method was used for comparative purposes to determine the mean annual flow (QBAR), hence Q100 and Q100C1 for Coolturk culvert catchment. The Institute of Hydrology Report No.124 (IH 124) 3 parameter equation to determine mean annual flow (QBAR) is shown below:

$$QBAR_{rural} = 0.00108\, Area^{0.89}\, SAAR^{1.17}\, SOIL^{2.17}$$

A desktop study was carried out to determine the values of the parameters for the Coolturk culvert catchment. The soil for both the catchments was classified as Class 3 based on maps from the UKSUDS website. The description of parameters of the IoH 3-variable equation and the determined values for the catchment are listed in Table 5-3.

Table 5-3 - Catchments parameters (for use in IoH 124 and FSR 3)

Parameter	Description	Values
Area	Catchment area (km^2)	0.1508
SAAR	Standard Average Annual Rainfall (mm)	1361.83
SOIL	Soil index (no units)	0.37

The values listed above were applied to the calculations, and the QBAR was calculated. Further, the standard factorial error of 1.65^2 (for 95% confidence interval) was applied and the estimate is shown in Table 5-4.

The area of the catchment is one of the important factors for estimating the flows. For the Coolturk culvert, the only available DTM is of 25 m resolution, which is not detailed enough to delineate the catchment and is also very sensitive to the location of catchment outlet for delineation. Hence, the catchment was assumed to be bounded by the road on the southern side. A higher confidence interval (95%) is thus applied considering the uncertainty in the catchment area estimation for the culvert.

For IoH 124 method, the growth factor for 1 in 100-year flood (Q100) is 1.96 (Flood Studies Report). Further, a 20% uplift for climate change was applied to obtain 100-year flood with 20% climate change (Q100C1). Thus, Q100 and Q100C1 are estimated and listed in Table 5-4.

Table 5-4 - Q100 - IoH 124 method

Event	Flow (m3/s)
QBAR	0.293
Q100	0.575
Q100C1	0.690

5.1.3. FSR3 Analysis

The FSR 3-variable equation for estimating mean annual flood (QBAR) for an ungauged rural catchment is:

$$QBAR\ (rural) = 0.00066\ Area^{0.92} SAAR^{1.22}\ SOIL^{2.0}$$

The catchment parameters listed in Table 5-3 were used and the QBAR was calculated with a factorial error of 1.58^2 for 95% confidence interval) applied to the estimate and is listed in Table 5-5. A higher confidence interval is applied considering the uncertainty in the catchment area estimation for the culvert.

For FSR3 method, the growth factor for 1 in 100-year flood is 1.96 (Flood Studies Report). Thus, Q100 and Q100C1 are estimated and listed in Table 5-5.

Table 5-5 – Design flow estimates – FSR3 method

Event	Flow (m^3/s)
QBAR	0.264
Q100	0.517
Q100C1	0.620

5.1.4. Agricultural Development and Advisory Service (ADAS)

The design flow for 75-year return period (Q75) is given by:

$$Q_{75\ year} = AREA\ x\ (0.0443\ x\ SAAR - 11.9)\ \ SOIL^{2.0}\ x \left[\frac{18.79T^{0.28} - 1}{10T}\right]$$

$$T = \frac{w^{0.78}}{z^{0.39}}\ x\ 0.1677$$

Table 5-6 - Catchment parameters for ADAS method

Parameter	Description	Values
Area	Catchment area (km^2)	0.1508
SAAR	Standard Average Annual Rainfall (mm)	1361.83
SOIL	Soil index (no units)	0.37
W	Maximum catchment width (m) – estimated using GIS	3.145
Z	Average height of catchment (m) -estimated from DTM	700
T	Time of concentration (hrs) -calculated from above equation	17.76

The catchment parameters listed in Table 5-3 were used and the Q75 was calculated as 0.234 m^3/s. The QBAR was calculated by dividing the Q75 by a factor of 1.88 and a standard factorial error of 1.538 [2] (95% confidence interval) was applied to obtain the QBAR estimates listed in Table 5-7. The Q100 was derived by applying a growth factor of 1.96 and then a 20% uplift for climate change was applied for Q100C1 estimate and is tabulated in Table 5-7.

Table 5-7 – Design flow estimates – ADAS method

Event	Flow (m^3/s)
QBAR	0.294
Q100	0.574
Q100C1	0.689

5.1.5. Design flows for hydraulic modelling

The flows determined using the four methods discussed in Sections 5.1.1, 5.1.2, 5.1.3 and 5.1.4 were reviewed, and Q100 estimates are listed in Table 5-8.

Table 5-8 - Comparison of Q100 estimates

Event	Flow (m^3/s)
FSU	0.183
IH124	0.575
FSR3	0.517
ADAS	0.574

The FSU method is applicable on catchment areas greater than 25 km^2, and FSR3 & IH124 methods are better suited for catchment sizes greater than 0.4 km^2. However, the flow estimation was performed with all methods for comparative purposes. The Q100 estimates from IH124, FSR3 and ADAS methods are comparable, thereby indicating the robustness and reliability of estimates for the study area.

ADAS method gives the conservative estimate for Q100 and is also the most relevant method for the Coolturk catchment area (0.15 km^2). Further, the QMED flow for ADAS method is estimated as:

$$QMED = {}^{QBAR}/_{1.07}$$

Thus, the estimated QMED is (0.294/1.07) = **0.275 m^3/s.** The summary of flows taken forward for hydraulic modelling is listed in Table 5-9.

Table 5-9 - Design flow estimates for hydraulic modelling - derived by ADAS method

Event	Flow (m3/s)
QMED	0.275
Q100	0.574
Q100C1	0.689

6. Development of Hydraulic Model

A 1D hydraulic model was developed for the tributary with the Coolturk culvert added. The purpose was to estimate the impact of the proposed lining on the culvert capacity, change in predicted water levels upstream and downstream, and changes in the velocities during the low flow events.

Due to the uncertainty and limitations in hydrologic and hydraulic modelling along with assumptions as listed in Section 6.2, the reader is advised to exercise caution and interpret the results as indicative changes in river channels levels due to the proposed works. The results should not be used for any direct assessment of flood risk in the region.

6.1. Hydraulic Model Selection

Flood Modeller v4.5 was selected to construct the 1D hydraulic model for the study area.

6.2. Hydraulic Modelling Assumptions

The following are the main assumptions in the hydraulic model development:

1. For modelling purposes the shape of the culvert was assumed to be circular as discussed in Section 3
2. No significant blockage at all conditions due to silt deposition within the culvert (however, roughness offered due to silt at the bottom of the culvert is considered)
3. In the proposed scenario, lining is assumed to be done all round inside the culvert. This is a conservative assumption that simplifies the modelling process.

6.3. Topographical Survey Data

Topographical survey data from Murphy Surveys (2019) has been used to develop the hydraulic model. The data includes river cross sections and culvert and deck details. The survey covers the watercourse for a length of 102m in the upstream of the culvert, and 196 m downstream of the culvert.

The extent of the survey and the survey data received are shown in Appendix A of the report.

6.4. Channel & Associated Bank Roughness Values

Manning's roughness values were also provided along with the survey data (Murphy Surveys, 2019). The channel and overbanks are assigned Manning's 'n' values of 0.04 and 0.06 respectively, which is appropriate for the site conditions. Hence, the same have been retained within the hydraulic model.

In the proposed scenario, the culvert is assumed to be lined entirely with reinforced concrete.

Table 6-1 below lists the assigned Manning's roughness values in the hydraulic models.

Table 6-1 - Roughness values for the watercourse and Coolturk culvert

Watercourse Features	Manning's Roughness
River bed	0.040
River banks	0.060
Culvert bottom (existing)	0.029
Culvert top (existing)	0.029
Culvert bottom (proposed)	0.012
Culvert top (proposed)	0.012

6.5. Boundary Conditions

A constant flow boundary was applied at the upstream and a normal depth boundary was applied as the downstream boundary conditions.

6.6. Hydraulic Model Development

A total channel length of 298 m along the unnamed tributary to the River Deel was modelled. This includes river cross sections, the Coolturk culvert and the boundaries. The location of cross sections used for hydraulic model development is shown in Figure 6-1. The cross sections and their relative positions to the culvert is tabulated in Table 6-2.

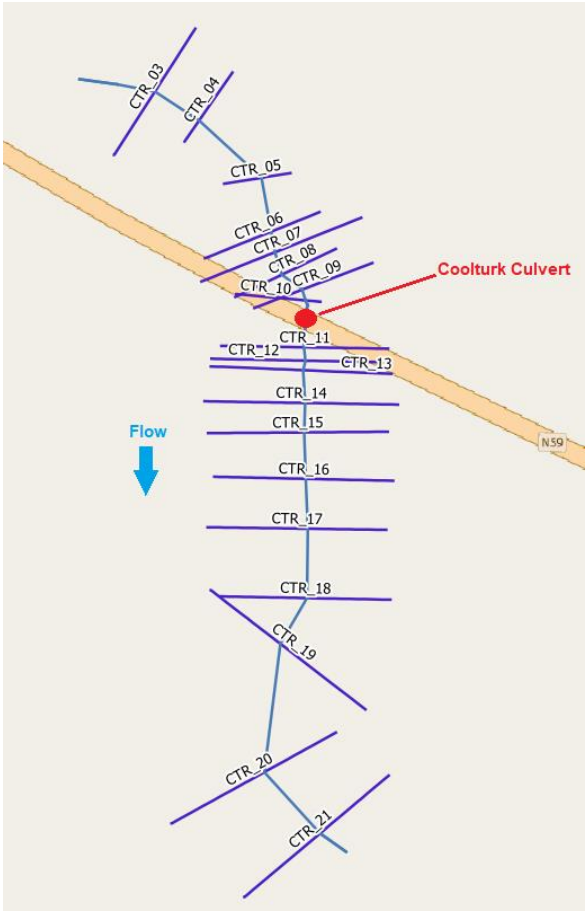


Figure 6-1 - Location of cross-sections

Table 6-2 - Cross section locations

Cross section label	Relative distance to Coolturk culvert
CTR_03	103 from upstream face of the culvert
CTR_04	83 from upstream face of the culvert
CTR_05	51 from upstream face of the culvert
CTR_06	30 from upstream face of the culvert
CTR_07	23 from upstream face of the culvert
CTR_08	14 from upstream face of the culvert
CTR_09	4 from upstream face of the culvert
CTR_10	upstream face of culvert
CTR_11	downstream face of culvert
CTR_12	5 from downstream face of the culvert
CTR_13	9 from downstream face of the culvert
CTR_14	21 from downstream face of the culvert
CTR_15	32 from downstream face of the culvert
CTR_16	49 from downstream face of the culvert
CTR_17	67 from downstream face of the culvert
CTR_18	93 from downstream face of the culvert
CTR_19	112 from downstream face of the culvert
CTR_20	166 from downstream face of the culvert
CTR_21	197 from downstream face of the culvert

The survey data was used to develop a 'baseline' model representing the existing situation. The 'baseline' hydraulic model was further used to create a 'proposed' scenario model, where lining is provided in the culvert. Below are the changes in the 'proposed' scenario model.

- Manning's roughness value was updated to 0.012 for the culvert to represent the concrete liner, considering that no silt will be deposited (also see assumption-2 under Section 6.2.)
- The invert levels at the entry and exit, and diameter of the culvert were updated to reflect the 150mm thick concrete lining.

  Culvert details before and after the lining are shown in Table 6-3.

Table 6-3 - Culvert details

	Before lining			After lining 150mm concrete		
	Invert level (mAD)	*Soffit level (mAD)*	*Diameter (m)*	*Invert level (mAD)*	*Soffit level (mAD)*	*Diameter (m)*
Culvert entrance	63.44	65.38	1.94	63.59	65.23	1.64
Culvert exit	63.29	65.36	2.07	63.44	65.21	1.77
Culvert length	17.301 m			17.301 m		

7. Analysis of Model Simulations

The baseline and proposed models were simulated under steady state mode for the following scenarios:

- Impact of proposed works (Q100)
- Impact of climate change (Q100C1)
- Low flow condition (QMED)

7.1. Impact of Proposed Works

The baseline and proposed hydraulic models were simulated for 1 in 100-year event to predict the impacts of proposed works. The maximum stage and depth results from hydraulic modelling for Q100 are presented in Table 8-1 and Table 8-2 respectively.

A long section plot indicating the maximum stages along the watercourse for 1 in 100-year event is also shown in Figure 7-1.

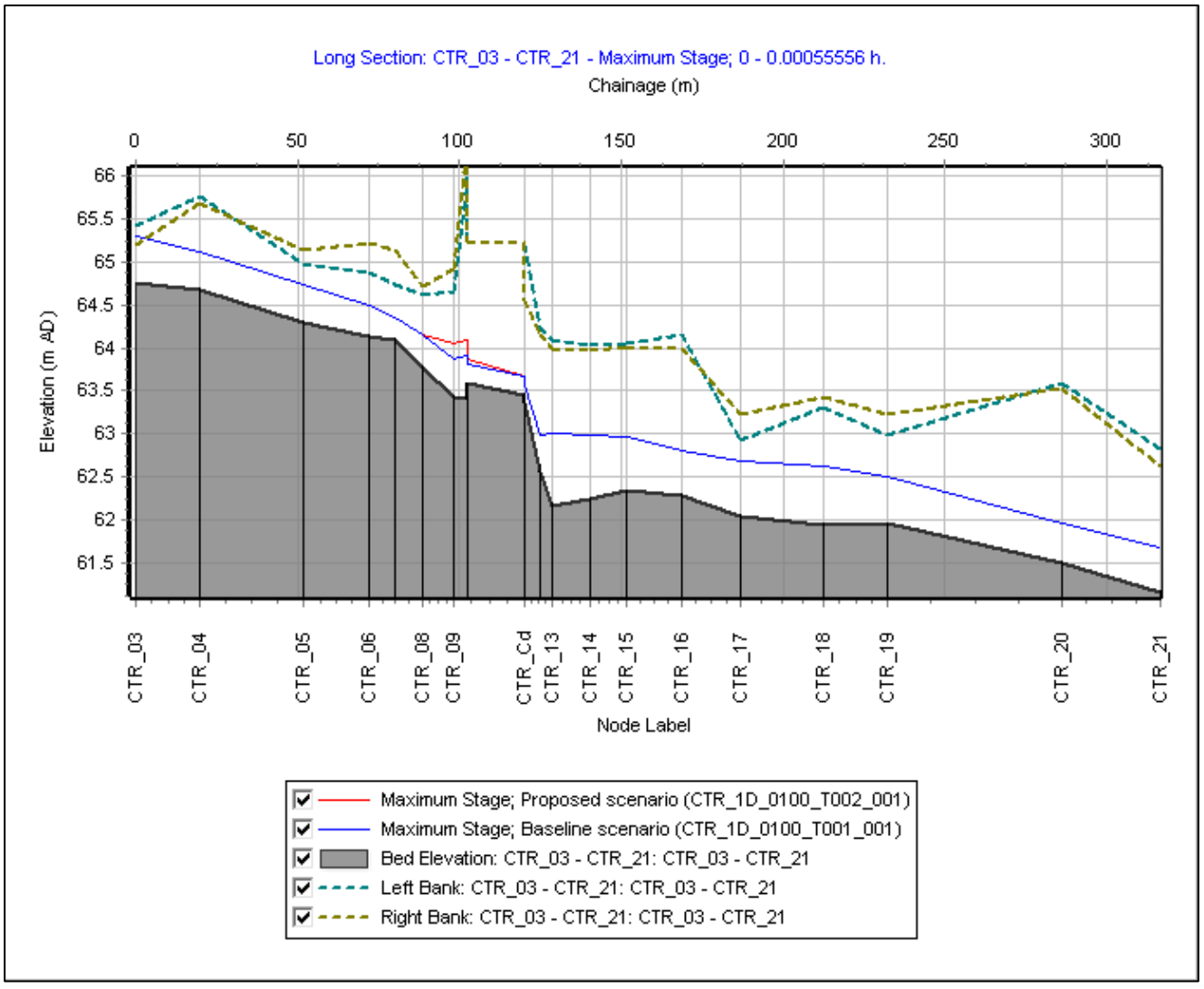


Figure 7-1 - Long section plot -Q100

The results demonstrate that the impact due to lining is predicted only in the reach upstream of the culvert. For the 1 in 100-year event, the maximum increase in the water level is 177mm, out of which 150mm increase is due to raising the culvert invert levels by 150mm.

There is enough freeboard available (minimum 1.51 m) in the proposed scenario, and the proposed works do not affect the water levels in the reach beyond 15 m upstream of the culvert. The N59 road remains unaffected due to the proposed scenario.

Hence, the proposed works to the Coolturk culvert is predicted to have little hydraulic impact on its tributary.

7.2. Impact of Climate Change

The baseline and proposed hydraulic models were simulated for 1 in 100-year plus 20% climate change event. The purpose of these simulations was to assess whether the proposed lining works to the Coolturk culvert will have any hydraulic impacts under a climate change scenario. The maximum stage and depth results from hydraulic modelling for Q100C1 are presented in Table 8-1 and Table 8-2 respectively.

The results of the simulation indicate that the maximum increase in the water level is 191mm, out of which 150mm increase is due to raising the culvert inverts by 150mm by installing proposed lining and the remaining 41mm increase is due to the proposed lining works. There are no changes predicted downstream of the culvert.

The maximum water level during a 1 in 100 year climate change event is predicted to be within bottom third of the culvert during proposed scenario (max. stage = 63.891 mAD; bottom third elevation = 64.137 mAD). Hence, the assumption that the culvert is lined fully inside, does not affect the results. This assumption, as stated under Section 6.2, was to simplify hydraulic model development.

There is enough freeboard available (1.49 m) in the proposed scenario. Hence, the results indicate that no extra allowances are needed during proposed works to account for a climate change event.

7.3. Impact on the Low Flows

The availability of water for fish passage is important during low flow conditions. Hence, the baseline and proposed models were simulated for QMED event. Model predicted stage and depths along the watercourse are listed in Table 8-1 and Table 8-2 respectively.

The results show that in the existing situation, water depth and maximum flow velocity within the culvert are 261mm and 1.157m/s respectively.

Following completion of the works water depth and maximum flow velocity within the culvert become 160mm and 2.493m/s respectively.

The proposed works will raise the culvert invert by 150mm. This is predicted to reduce the minimum depth in the culvert from 261mm to 160mm in the QMED scenario and increase maximum flow velocity from 1.157m/s to 2.493m/s.

The impact of these changes on fish passage and any necessary mitigation works will be discussed and agreed with Fisheries Ireland before commencement of the works.

8. Conclusions

Based on the hydrology estimations, and further hydraulic model assessment for the baseline and proposed scenarios, following conclusions are made:

- This hydraulic capacity assessment has been prepared in consideration of the requirements under Section 50 of the Arterial Drainage Act 1945.
- ADAS methodology has been used to derive flows for QMED, Q100 and Q100C1, their magnitudes being 0.275 m^3/s, 0.574 m^3/s and 0.689 m^3/s respectively.
- For all the events, the impact due to lining is predicted only in the upstream, and no changes in the maximum water levels are predicted downstream of the Coolturk culvert post lining.
- For the three events analysed, the predicted increase in the maximum stage due to lining is in the range of 167 – 190 mm, out of which 150 mm is due to the raised invert level by proposed lining.
- Sufficient freeboard (min. 1.49 m) is available under all conditions within the culvert.
- During low flows, minimum depth in the culvert will reduce from 261mm to 160mm and flow velocity increase from 1.157m/s to 2.493m/s. The impact of these changes on fish passage and any necessary mitigation works will be discussed and agreed with Fisheries Ireland before commencement of the works.
- No nearby properties are expected to be affected in the proposed scenario.

Table 8-1 - Hydraulic model results (max. stage)

Node Label (upstream to downstream)	Chainage (m)	Maximum stage for different return periods (in mAD)								
		QMED event			1 in 100-year event			1 in 100-year plus 20% climate change event		
		Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference
CTR_03	0	65.185	65.185	0.000	65.302	65.302	0.000	65.340	65.340	0.000
CTR_04	19.593	64.984	64.984	0.000	65.113	65.113	0.000	65.151	65.151	0.000
CTR_05	51.916	64.604	64.604	0.000	64.726	64.726	0.000	64.760	64.760	0.000
CTR_06	72.256	64.412	64.412	0.000	64.493	64.493	0.000	64.519	64.519	0.000
CTR_07	80.048	64.295	64.295	0.000	64.362	64.362	0.000	64.386	64.386	0.000
CTR_08	88.796	64.029	64.029	0.000	64.154	64.157	0.004	64.191	64.197	0.006
CTR_09	98.327	63.757	63.905	0.148	63.879	64.055	0.177	63.914	64.105	0.191
CTR_10	102.548	63.759	63.926	0.167	63.910	64.086	0.177	63.958	64.137	0.180
CTR_Cu	102.548	63.701	63.785	0.084	63.817	63.866	0.050	63.853	63.891	0.038
CTR_Cd	119.849	63.562	63.600	0.038	63.664	63.678	0.014	63.694	63.700	0.006
CTR_11	119.849	63.506	63.506	0.000	63.566	63.566	0.000	63.581	63.581	0.000
CTR_12	124.822	62.777	62.777	0.000	62.989	62.989	0.000	63.051	63.051	0.000
CTR_13	128.364	62.821	62.821	0.000	63.014	63.014	0.000	63.071	63.071	0.000
CTR_14	140.492	62.803	62.803	0.000	62.989	62.989	0.000	63.045	63.045	0.000
CTR_15	151.356	62.781	62.781	0.000	62.963	62.963	0.000	63.018	63.018	0.000
CTR_16	168.504	62.662	62.662	0.000	62.810	62.810	0.000	62.851	62.851	0.000
CTR_17	186.944	62.510	62.510	0.000	62.680	62.680	0.000	62.729	62.729	0.000
CTR_18	212.561	62.462	62.462	0.000	62.623	62.623	0.000	62.670	62.670	0.000
CTR_19	232.346	62.371	62.371	0.000	62.509	62.509	0.000	62.548	62.548	0.000
CTR_20	285.855	61.811	61.811	0.000	61.960	61.960	0.000	62.009	62.009	0.000
CTR_21	316.451	61.494	61.494	0.000	61.673	61.673	0.000	61.726	61.726	0.000

Table 8-2 - Hydraulic model results (max. depth)

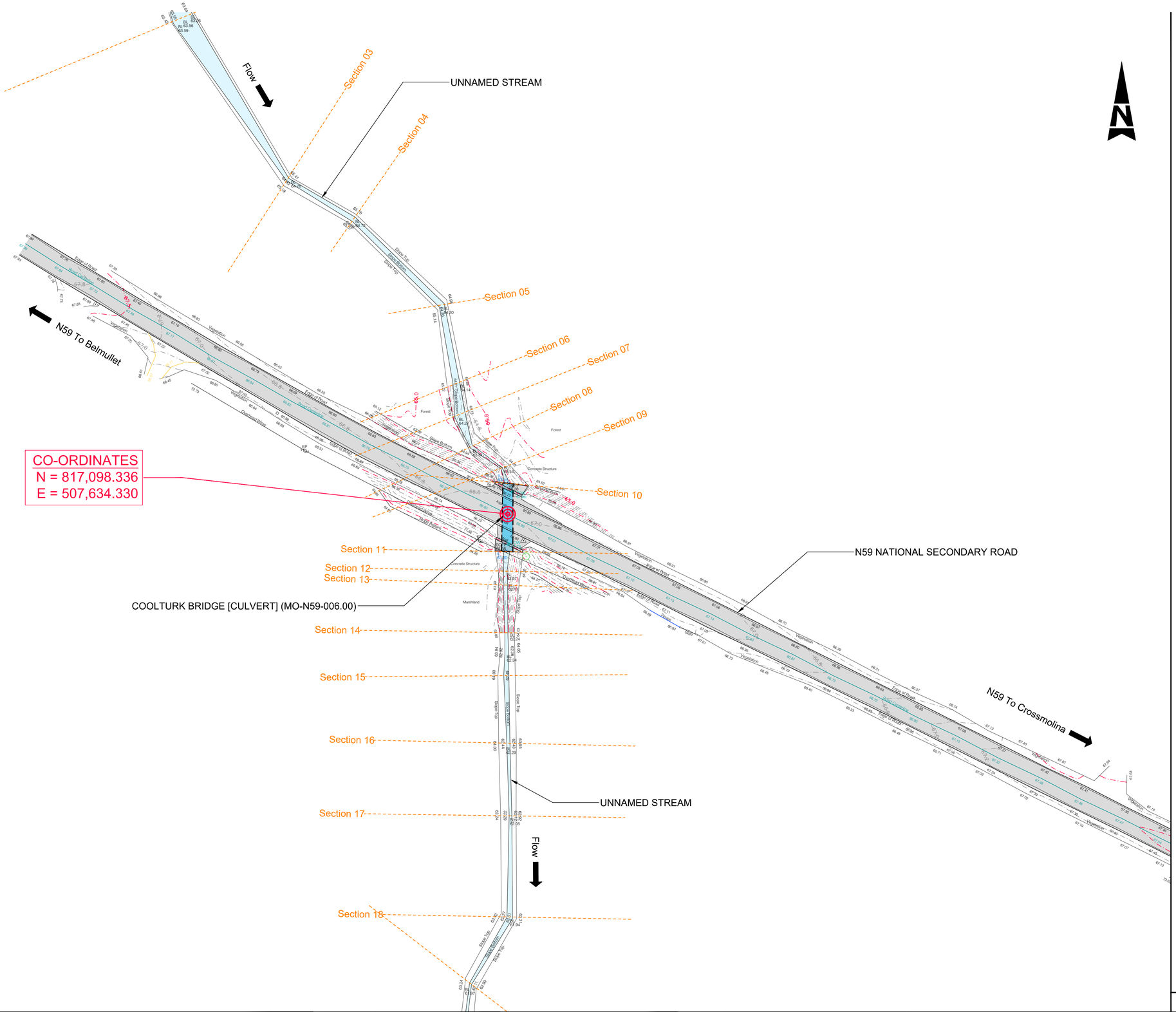
Node Label (upstream to downstream)	Chainage (m)	Maximum depth for different return periods (m)								
		QMED event			1 in 100-year event			1 in 100-year plus 20% climate change event		
		Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference
CTR_03	0	0.429	0.429	0.000	0.546	0.546	0.000	0.584	0.584	0.000
CTR_04	19.593	0.307	0.307	0.000	0.436	0.436	0.000	0.474	0.474	0.000
CTR_05	51.916	0.307	0.307	0.000	0.429	0.429	0.000	0.463	0.463	0.000
CTR_06	72.256	0.273	0.273	0.000	0.354	0.354	0.000	0.380	0.380	0.000
CTR_07	80.048	0.212	0.212	0.000	0.279	0.279	0.000	0.303	0.303	0.000
CTR_08	88.796	0.260	0.260	0.000	0.385	0.388	0.004	0.422	0.428	0.006
CTR_09	98.327	0.321	0.469	0.148	0.443	0.619	0.177	0.478	0.669	0.191
CTR_10	102.548	0.352	0.519	0.167	0.503	0.679	0.177	0.551	0.730	0.180
CTR_Cu	102.548	0.261	0.195	-0.066	0.377	0.276	-0.101	0.413	0.301	-0.112
CTR_Cd	119.849	0.272	0.160	-0.112	0.374	0.238	-0.136	0.404	0.260	-0.144
CTR_11	119.849	0.139	0.139	0.000	0.199	0.199	0.000	0.214	0.214	0.000
CTR_12	124.822	0.218	0.218	0.000	0.430	0.430	0.000	0.492	0.492	0.000
CTR_13	128.364	0.654	0.654	0.000	0.847	0.847	0.000	0.904	0.904	0.000
CTR_14	140.492	0.565	0.565	0.000	0.751	0.751	0.000	0.807	0.807	0.000
CTR_15	151.356	0.446	0.446	0.000	0.628	0.628	0.000	0.683	0.683	0.000
CTR_16	168.504	0.375	0.375	0.000	0.523	0.523	0.000	0.564	0.564	0.000
CTR_17	186.944	0.458	0.458	0.000	0.628	0.628	0.000	0.677	0.677	0.000
CTR_18	212.561	0.527	0.527	0.000	0.688	0.688	0.000	0.735	0.735	0.000
CTR_19	232.346	0.403	0.403	0.000	0.541	0.541	0.000	0.580	0.580	0.000
CTR_20	285.855	0.303	0.303	0.000	0.452	0.452	0.000	0.501	0.501	0.000
CTR_21	316.451	0.338	0.338	0.000	0.517	0.517	0.000	0.570	0.570	0.000

Table 8-3 - Hydraulic model results for QMED (max. velocity)

Node Label (upstream to downstream)	Chainage (m)	Maximum velocity in m/s		
		Baseline	Proposed	Difference
CTR_03	0	0.586	0.586	0.000
CTR_04	19.593	0.911	0.911	0.000
CTR_05	51.916	0.771	0.771	0.000
CTR_06	72.256	0.837	0.837	0.000
CTR_07	80.048	1.003	1.003	0.000
CTR_08	88.796	1.150	1.153	0.003
CTR_09	98.327	1.611	0.777	-0.835
CTR_10	102.548	0.420	0.233	-0.187
CTR_Cu	102.548	1.157	1.942	0.785
CTR_Cd	119.849	1.051	2.493	1.442
CTR_11	119.849	2.092	2.092	0.000
CTR_12	124.822	1.237	1.237	0.000
CTR_13	128.364	0.336	0.336	0.000
CTR_14	140.492	0.451	0.451	0.000
CTR_15	151.356	0.480	0.480	0.000
CTR_16	168.504	0.989	0.989	0.000
CTR_17	186.944	0.581	0.581	0.000
CTR_18	212.561	0.382	0.382	0.000
CTR_19	232.346	0.870	0.870	0.000
CTR_20	285.855	0.837	0.837	0.000
CTR_21	316.451	0.922	0.922	0.000

Appendices

Appendix A. Survey Data & Proposed Construction Drawings



GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

DRAWING NOTES

1. FOR RIVER CROSS SECTIONS 01 TO 21, REFER TO TOPOGRAPHICAL SURVEYS DRAWING

A1

DO NOT SCALE

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Date: May 20, 2020 - 8:45am Plotted by: aosullivan

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Transport Infrastructure Ireland

Donegal
Oifig Boichne Naisiunta
Dhun na nGall

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR . . WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING SITE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
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	Date 11/11/19	Date 11/11/19	Date 11/11/19

Status	Drawing Number	Rev
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DO NOT SCALE

EXISTING PARAPET AND CONCRETE SLAB

COOLTURK BRIDGE [CULVERT]
(MO-N59-006.00)

EXISTING PARAPET
AND CONCRETE SLAB

Flow

Flow

N

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Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING STRUCTURE LAYOUT PLAN

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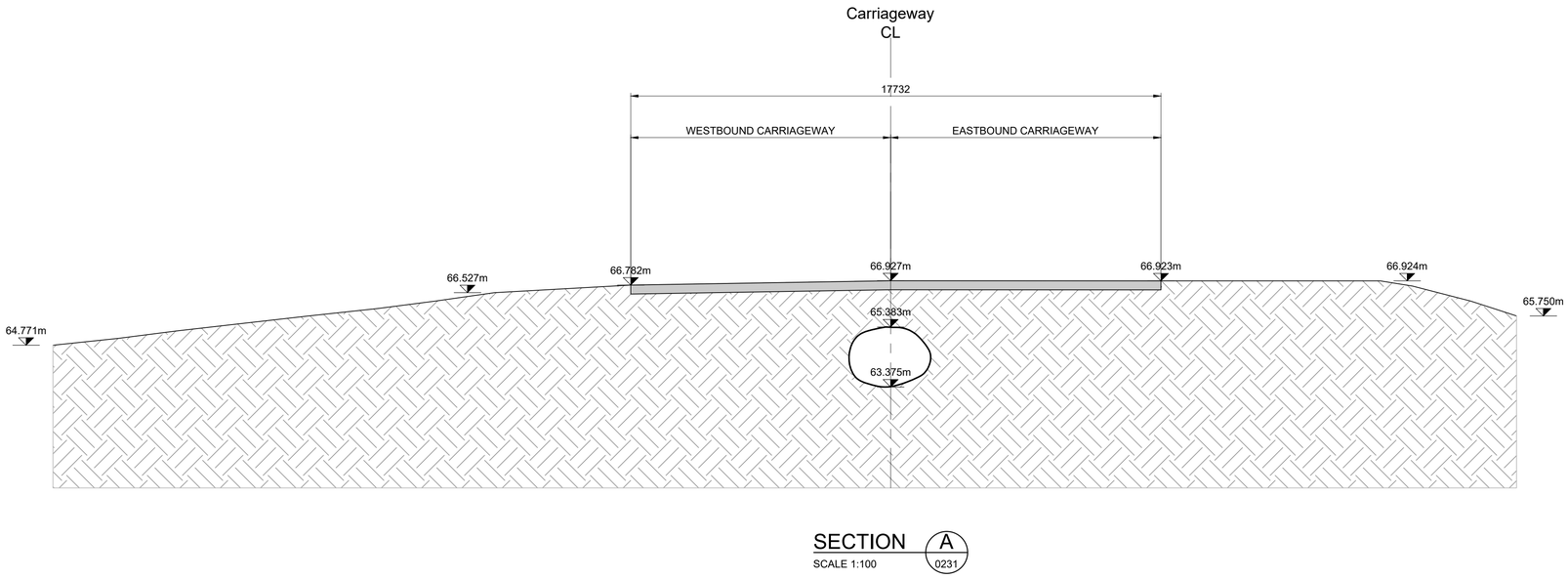

SECTION A
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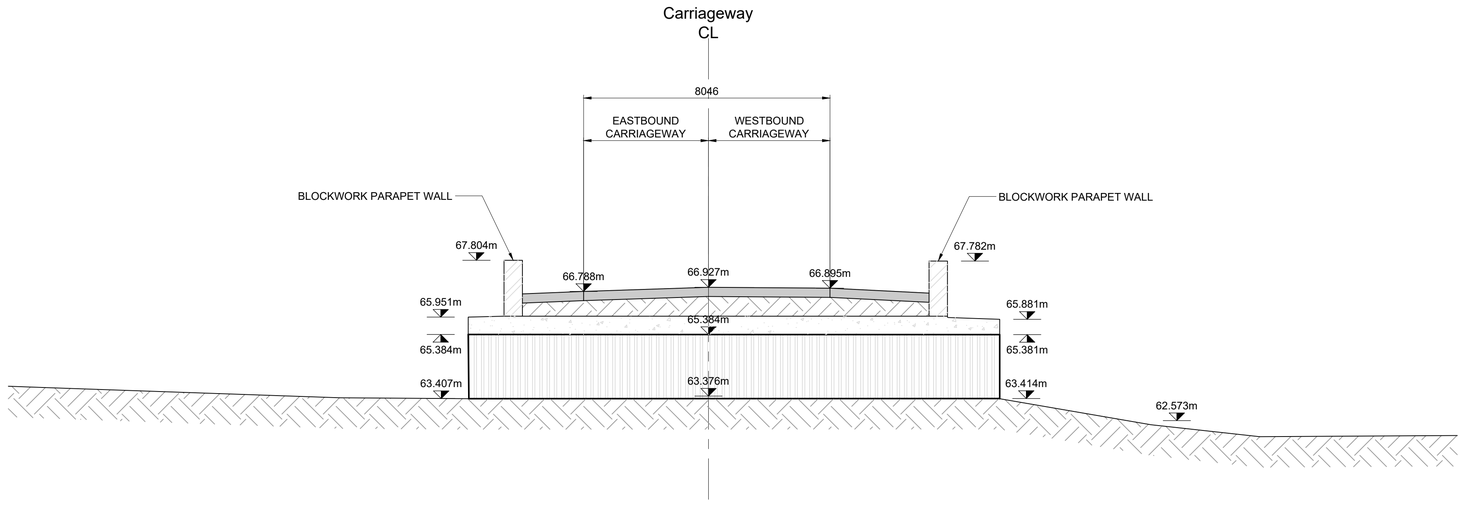

SECTION B
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A1

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
Oifig Boichte Naisiunta
Dhun na nGall

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING SECTIONS A AND B

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Status	Drawing Number	Rev
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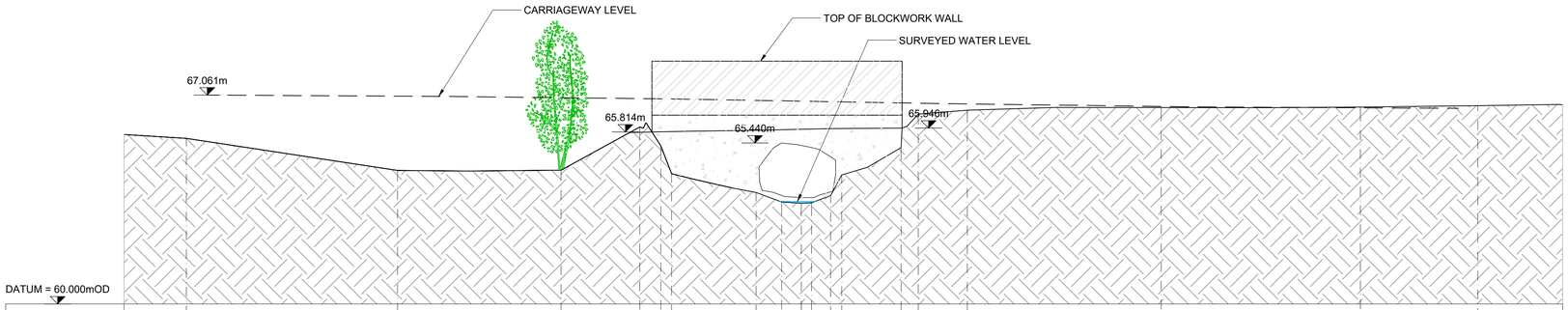

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Level (mOD)	65.730	65.598	64.514	64.523	64.984	65.342	64.406	63.768	63.447	63.407	63.421	63.663	64.360	65.286	66.421	66.552	66.640	66.658	66.703	66.737

SECTION C
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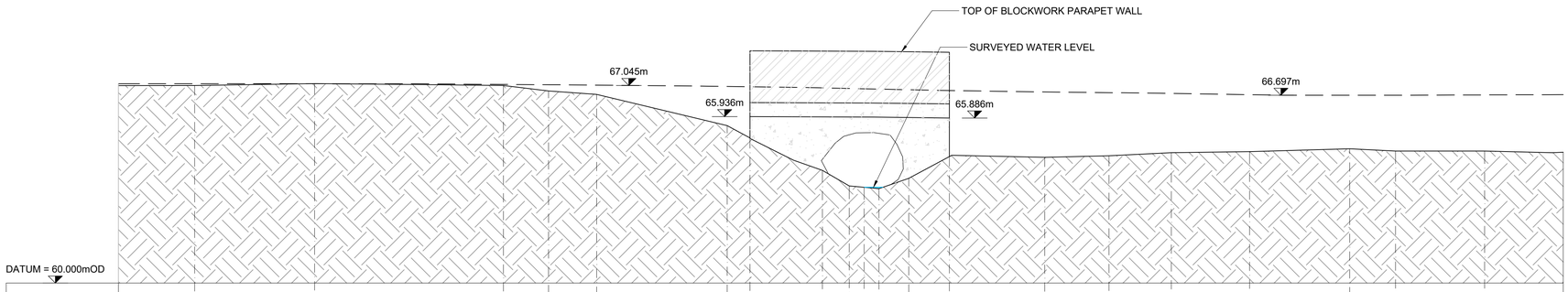
0231



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Level (mOD)	67.038	67.044	67.113	67.042	66.851	66.726	65.612	65.171	64.017	63.462	63.415	63.367	63.733	64.510	64.484	64.539	64.650	64.687	64.788	64.707	64.707	64.664

SECTION D
SCALE 1:100
0231

GENERAL NOTES

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3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

A1 0 10 100

DO NOT SCALE

File: 5162160-HTR-DR-0230 to 0233.dwg
Date: May 19, 2020 - 4:00pm Plotted by: aosullivan

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Donegal NRO Oifig Boichtne Naisiunta Dhun na nGall

Rev	Description	By	Date	Chk'd	Auth
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR[redacted]WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) REMEDIAL WORKS EXISTING SECTIONAL ELEVATIONS C AND D

Original Scale	Des/Drawn	Checked	Authorised
1:150	AOS	MG	MJ
	Date 11/11/19	Date 11/11/19	Date 11/11/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0233	A

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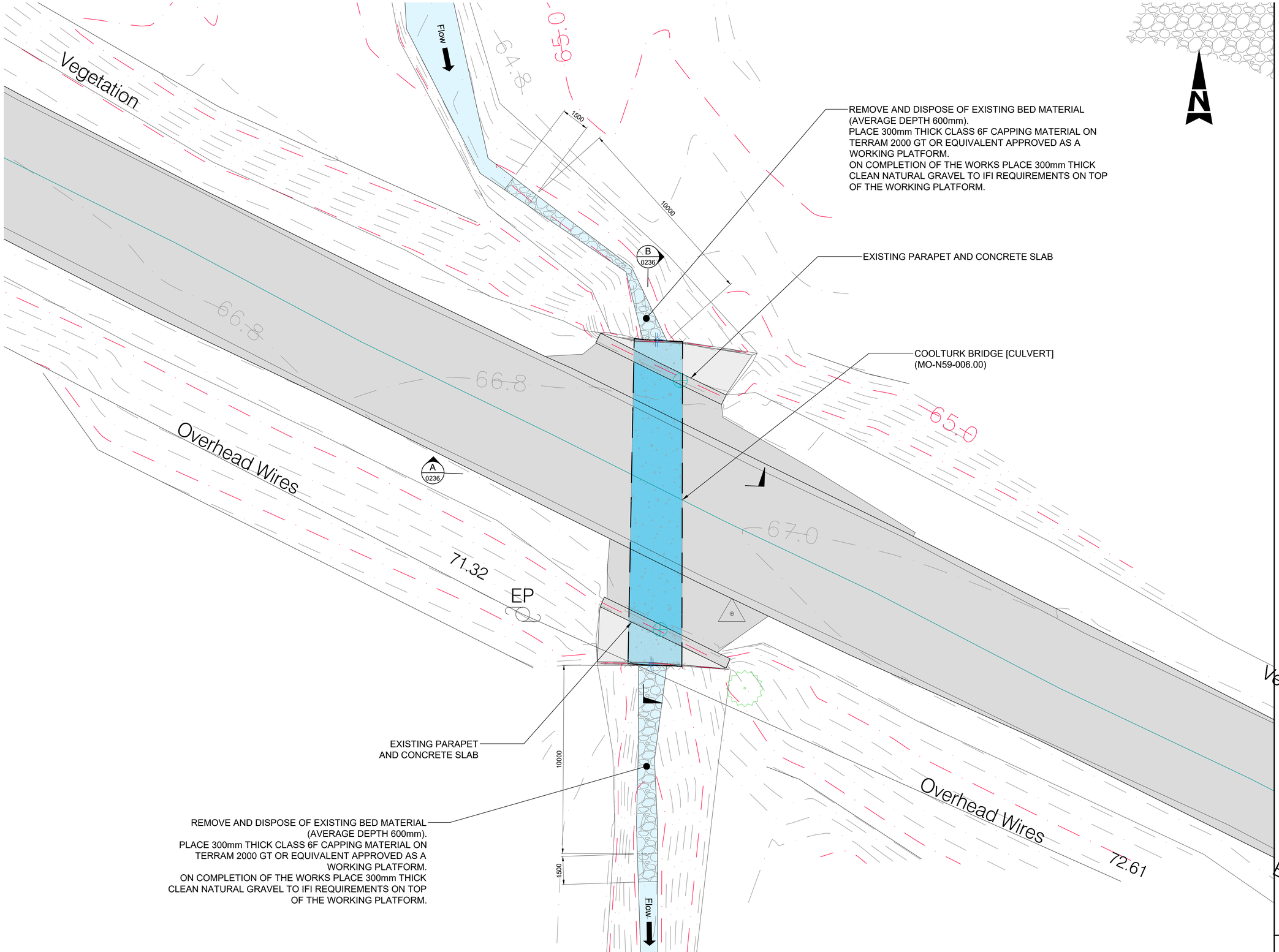

GENERAL NOTES

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A1

DO NOT SCALE

File: 5162160-HTR-DR-0235 to 0236.dwg
Date: May 19, 2020 - 4:05pm Plotted by: aosullivan

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
NRO
Oifig Boichte Naisiunta
Dhun na nGall

Rev	Description	By	Date	Chk'd	Auth
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR - WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) PROPOSED REMEDIAL WORKS - SHEET 1 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0235	-

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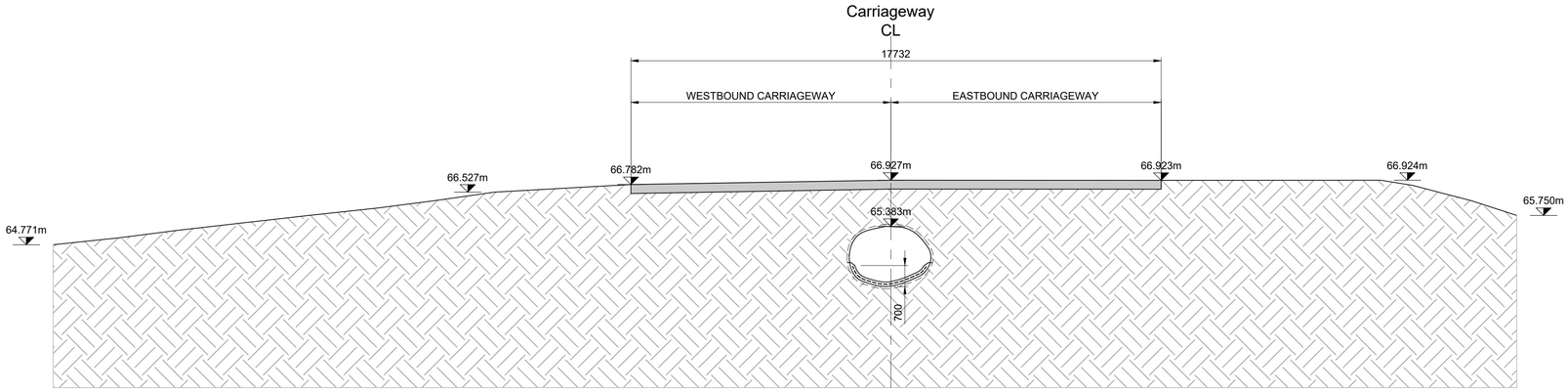
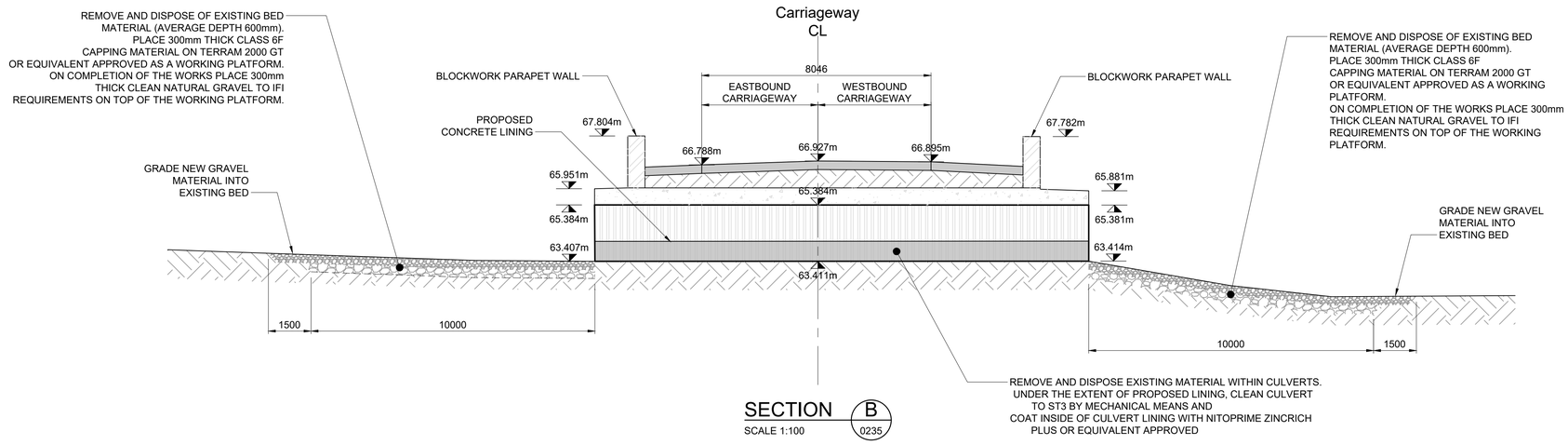
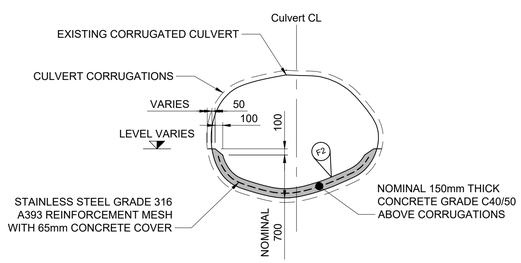


SECTION A
SCALE 1:100 0235

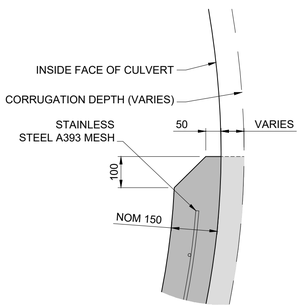


SECTION B
SCALE 1:100 0235



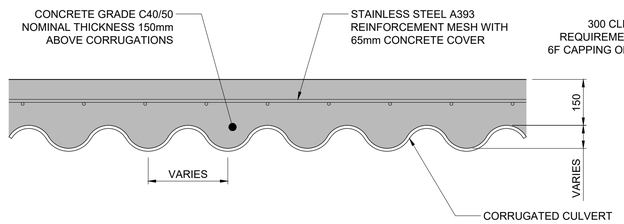
TYPICAL CULVERT CROSS SECTION

Scale at A1 1:50
Scale at A3 1:100



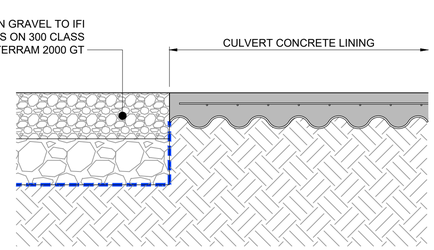
TOP OF LINING DETAIL

Scale at A1 1:10
Scale at A3 1:20



CULVERT LINING DETAIL

Scale at A1 1:10
Scale at A3 1:20



DETAIL AT ENTRY / EXIT OF CULVERT

Scale at A1 1:20
Scale at A3 1:40

GENERAL NOTES

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5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

Rev	Description	By	Date	Chk'd	Auth
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

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Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR - WEST BRIDGES TERM MAINTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: COOLTURK BRIDGE [CULVERT] (MO-N59-006.00) PROPOSED REMEDIAL WORKS - SHEET 2 OF 2

Original Scale	Des/Drawn	Checked	Authorised
As Shown	AOS Date 14/05/20	MG Date 14/05/20	MJ Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0236	-

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DO NOT SCALE
File: 5162160-HTR-DR-0235 to 0236.dwg
Date: May 19, 2020 - 4:07pm Plotted by: acsullivan

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[redacted]

Appendix D. Section 50 Consent

OPW Oifig na nOibreacha Poiblí Office of Public Works

[redacted]

[redacted]

Our Ref: 228 - 2020

Re: Section 50 Application – Lining of Coolturk Culvert (MO-N59_006)

[redacted]

I refer to the above Section 50 applications received by this office.

Atkins Ireland Ltd on behalf of Transport Infrastructure Ireland have applied for Section 50 Consent to line the bottom third of the corrugated steel culvert with 150mm thick reinforced concrete.

The documentation submitted has been examined and I recommend that the consent of the Commissioners of Public Works under Section 50 of The Arterial Drainage Act, 1945 be given for the proposed culvert as detailed in documentation submitted.

Description of lining of culvert recommended for approval:
Lining the culvert with 150mm thick reinforced concrete at the bottom third as per figure 4-1.

It should be noted that consent is given only for the purpose of Section 50 and does not absolve the recipient of responsibility for any adverse effects caused by this installation to any third party.

The Commissioners of Public Works are not responsible and accept no liability for any loss or damage whatsoever caused because of this development.

Yours sincerely

[redacted]

Engineering Services Administration Unit
23rd June 2020

Ceann Oifig, Sráid Jonathan Swift, Baile Átha Troim, Co. na Mí, C15 NX36
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