ATKINS

Member of the SNC-Lavalin Group

CLOSING DATE FOR PUBLIC CONSULTATION 19th MAY 2021

Northwest Bridges Term Maintenance Contract No. 3

Culvert Inverts – Group '1' - Boherduff Bridge. Natura Impact Statement.

Transport Infrastructure Ireland

12/03/2021

Notice

This document and its contents have been prepared and are intended solely as information for Transport Infrastructure Ireland and use in relation to the proposed project.

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 46 pages including the cover.

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Authorised	Date
Rev 0	Draft for Comment	AMcC/EN	EN	POD	MJ	01/06/20
Rev 1	For Issue	AMcC/EN	EN	POD	MJ	15/07/20
Rev 2	For Issue	EN	NS	POD	MJ	13/11/20
Rev 3	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	

Contents

Tables

Figures

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 Boherduff Bridge (MO-N17-012.00), 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 Boherduff 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. Boherduff Bridge is assigned to Group 1, which is located in the Corrib 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

Client: Transport Infrastructure Ireland

Project: Northwest Bridges Term Maintenance

Title: Boherduff 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

ATKINS [redacted]

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 invert lining and associated instream works to Boherduff Bridge (MO-N17-012.00), Co. Mayo. Boherduff Bridge is located on the N17, approximately 1km North east of Claremorris town. Boherduff Bridge is situated on an unnamed stream, which is a tributary of the Robe Tributary North River, located in the Robe subcatchment. The location of Boherduff Bridge is shown in Figure 1.1.

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 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 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 discharge in advance of the silt fences.

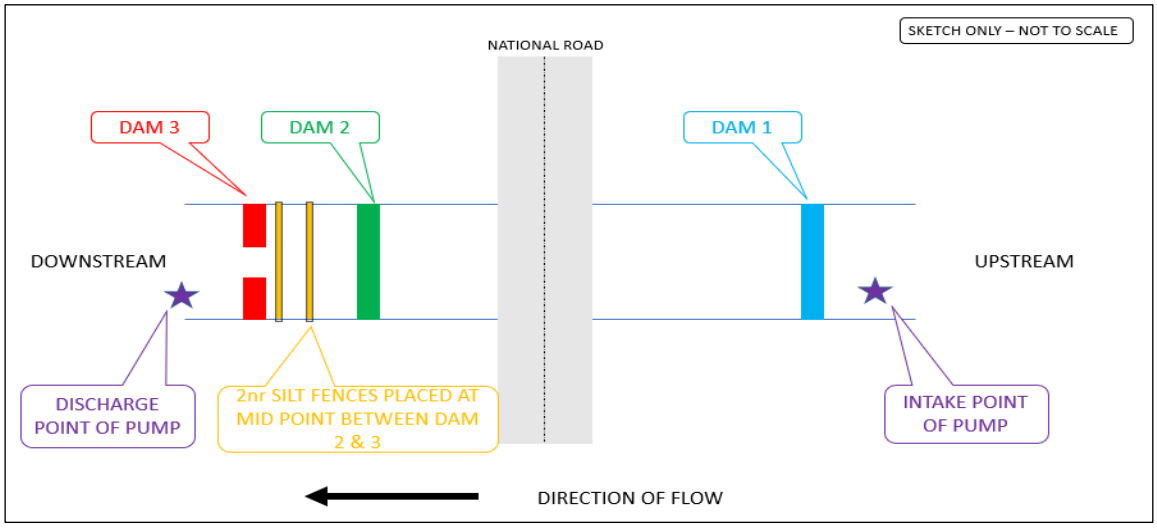


Figure 1-2 – Layout of dams and silt fences

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. Due to the nature of the channel and the structure, silt deposits have built up over time at the mouth of the culverts. These silt deposits will have to be removed prior to the commencement of the works to facilitate access to the culvert structures. 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 on the N17 with closure of the hard shoulder. The closure of the hard shoulder will accommodate all plant, deliveries and the concrete pump. 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. An existing timber fence will be removed to allow operatives to walk down a slight embankment from the N17 and this will give access to the bank of the stream.

Dams will be constructed of 1 tonne and small sand bags filled halfway with pea gravel, then double bagged and sealed. The depth of the dams will be three times the height. The height of dams will be dependent on the flow and level of the river at the time of works. Dams will be wrapped in 1000-gauge polythene. Upon the Contractor's inspection of the culvert, there was approx. 800-900mm of silt accumulation on the river bed. In order for dams to sit flush on the river bed and to avoid any leaks, sections of loose silt within the area of the base of the dams will be excavated and stored for reinstatement post-works.

A section of the silt max. 1m in depth with an area of the required base of Dam 3 (see Figure 1.2) will be excavated from the stream to reach the bed of the stream. An excavator will be used for this task and it will be positioned on the bank of the stream. The large sand bags (1m X 1m X 1m sandbags) for the dam will then be lifted into position and placed by the excavator within 10 meters of the structure, 500mm in height, across the full width to prevent downstream water returning into the work area.

A section of the silt from the stream at the Dam 2 location with an area of the required base of the dam will then be excavated to reach the bed of the stream. An excavator will be used for this task and it will be positioned on the bank of the stream. A dam of sand bags (1m X 1m X 1m sandbags) will then be erected 500mm in height to retain a pool of water (between Dam 2 & Dam 3) for the completion of the electrofishing.

A section of the silt max. 1m in depth with an area of the required base of Dam 1 will be excavated from the stream to reach the bed of the stream. An excavator will be used for this task and it will be positioned on the bank of the stream. The large sand bags (1m X 1m X 1m sandbags) for the dam will then be lifted into position and placed by the excavator within 10 meters upstream of the structure and raised to full height.

Once all of the dams are erected the 500mm opening in Dam 3 will then be created. If required, the pool between Dam 1 and Dam 2 will be electro fished by a licenced operator and fish placed in the pool between Dam 2 and Dam 3.

Two silt fences will be erected between Dam 2 and Dam 3. Dam 2 will then be raised to full height.

The over pumping pipe will be placed into a 225mm non perforated pipe installed through the culvert at a high level. It will be secured by temporary threaded bar brackets that will be fixed along the culvert. 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 positioned on the downstream side of Dam 3. A silt bag will be place on the end of the discharge hose to prevent to 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 upstream of 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 installed upstream and downstream of the culvert within the dammed area. The platform will consist of a layer of heavy-duty geotextile placed over the existing river bed and a 250mm layer of washed, well graded clean aggregate placed on the geotextile to give a solid, clean base for operatives to access and work on the culvert concrete lining. The platform will cover the full width of the stream and will be circa 10m upstream and circa 5m downstream of the culvert. 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 and any large stones or boulders that may need to be removed prior to laying the geotextile layer will be reinstated.

Silt will be removed from the culvert by suctioning. The vacuum unit will be parked within the closed hard shoulder of the TTM and the hoses placed within the culvert. Silt will then be sucked into the unit and stored on the bank for reinstatement once works are complete. All of the silt for the full length of the culvert will be removed exposing the culvert metal surface to be cleaned for concrete lining.

Once the silt has been removed from the culvert the lining will be cleaned by high-pressure washing. The washing unit generator will be positioned on the hard shoulder 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 required, 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 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. Upon cleaning the culvert, the exposed steel under the proposed concrete lining area shall be treated with a corrosion inhibitor and 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-Ab truck. It will then be lowered over the barrier on the downstream side and placed on the outside of the culvert on the working platform. Operatives will then carry the mesh to the point of placement and fix into position.

A concrete pump will be placed on the hard shoulder of the road above, the concrete pumping lines placed down the bank and into the culvert. The pour will start on the upstream side working downstream. A layer of 1000 gauge polythene will be placed on the ground underneath the ‘mouth’ of the pump to capture any concrete that may spill when offloading from the delivery truck.

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.

On completion of the culvert concrete lining works the temporary working platform and geotextile will be removed and disposed of off-site to licenced waste facility. Silts removed to facilitate dams will be reinstated. The culvert bed within the culvert will be reinstated with the silt material that was removed from the culvert prior to the concrete works.

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 the following morning.

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 24th June 2020. The granted Section 50 consent did not contain any 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 Boherduff culvert: -

- '*This hydraulic capacity assessment has been prepared in consideration of the requirements under Section 50 of the Arterial Drainage Act 1945.*

- *IoH 124 methodology has been used to derive flows for QMED, Q100 and Q100C1, their magnitudes being 0.903 m3/s, 1.894 m3/s and 2.273 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 Boherduff culvert. No changes in the maximum water levels are predicted at the downstream end of the culvert.*

- *For the Q100 and Q100C1 events, the predicted increase in the maximum stage is in the range of 7 mm to 70 mm. The change due to the proposed works is within the OPW limit of 300 mm.*

- *A minimum freeboard of 2.106 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 flow velocity in the watercourse is also acceptable. The proposed works is not expected to cause significant worsening of the present situation with regards to fish passage.*

- *For the events analysed, the properties and N17 road are not expected to be at flood risk due to the proposed works*'

Atkins consulted with Inland Fisheries Ireland (IFI) in May 2020. IFI stated in their response "*This watercourse forms part of the Ballygowan River catchment which is a brown trout spawning tributary of the River Robe. Unfortunately, this river suffered a large fish kill on the 5th of June 2018 and the fish population is still in a recovery phase, therefore it is imperative that no pollution event occurs as a result of these proposed works.*" They also sought to confirm that the base of the culvert would be curved and not flat, and that the concrete lining will taper out at the ends rather than presenting a step-formed obstacle to fish.

These concerns have been 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 purpose of this report is to determine the likelihood of significant effects, if any, that the proposed project could have on European designated sites.

The aim of this report is to provide supporting information to assist the competent authority to carry out a Natura Impact Statement 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

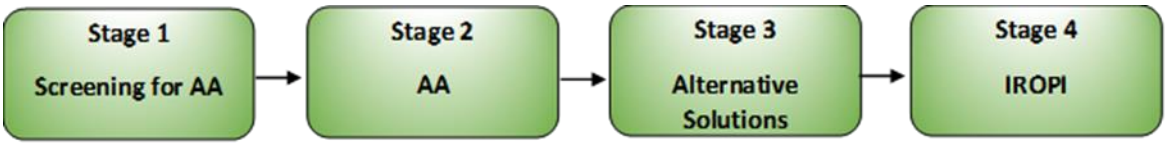


Figure 2-1 - Appropriate Assessment Process (Source: DEHLG, 2009).

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 21/05/2020).

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

[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/

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 16 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

Boherduff Bridge is located on the N17, approximately 1km North east of Claremorris town. Boherduff Bridge is located in the Robe subcatchment. The bridge carries an unnamed stream (EPA segment code 30_3415) beneath the N17 road from ca. 500m downstream of its source to join with the Robe Trib North River and further to the Robe River.

The unnamed stream flows for approximately 4km in a general eastern direction where it joins the Robe Trib North River. The Robe Trib North River is a tributary of the Robe River. The Robe Trib North – Robe River confluence is located approximately 6.5km downstream of the Boherduff Bridge.

The Boherduff Bridge is hydrologically connected to the Lough Carra/Mask Complex SAC (001774) and the Lough Mask SPA (004062). The Bridge is located 53km upstream of the Lough Carra/Mask Complex SAC and 53.5km upstream of Lough Mask SPA (Instream distance).

The unnamed stream, the Robe Trib North and Robe River rivers are categorised as 'Good' status under the Water Framework Directive (WFD).

There are no records of Freshwater Pearl Mussel (*Margaritifera margaritifera*) in any of the waterbodies hydrologically connected to Boherduff Bridge, according to a data request submitted to the NPWS.

Inland Fisheries Ireland's Water Framework Directive monitoring of the Robe River have recorded the following species; Minnow, brown trout, perch and eel. White-clawed crayfish (*Austropotamobius pallipes*) has been recorded in both the Robe Trib North and the Robe River, downstream of the Boherduff bridge, according to NBDC data. Otter have also been recorded downstream of the bridge, in both the Robe Trib North Stream and the Robe River.

4.2. Site Visit

The waterbody is spanned by the corrugated steel arch culvert under the N17 carriageway. There is no perceptible flow in the stream. The waterbody is linear in nature and has been excavated to enhance drainage within the wider area. Upstream of the culvert there is a deep layer of fine silts, thick with instream vegetation and heavy filamentous algae suggesting the waterbody is receiving nutrient inputs. Downstream the channel has a similar hydrological regime. No invasive species were recorded during the site visit. Plate 4.1 displays the view from the deck of the bridge, upstream and downstream.

Plate 4.1: Upstream and downstream of Boherduff Bridge.

4.2.1. Habitat Types

The waterbody is considered to be a drainage ditch under the Fossitt (2000) nomenclature (FW4). Instream species include reed sweet-grass (*Glyceria maxima*), Fool's-water-cress (*Apium nodiflorum*) and water-starwort (*Callitriche* sp.). The instream vegetation in the channel most closely corresponds to *Apium nodiflorum – Rorippa nasturtium-aquaticum* agg. aquatic community (FW2E). The characteristics of this community is its greater component of marginal and emergent vegetation. In terms of conservation value, almost all examples of this community with a relative abundance of crowfoots (*Ranunculus* spp. subgenus *Batrachion*) correspond with the Annex I habitat 3260 Floating river vegetation (Weekes *et al*., 2018). Therefore, the dominance of emergent and marginal species, and the absence of water-crowfoot species means that the instream vegetation present in the channel is not classified as Annex I *'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]*'. Upstream the channel has been completely overgrown with common reed (*Phragmites australis*) and reed sweet-grass (*Glyceria maxima*) covering the entire channel. Downstream of the culvert there is a similar instream composition with additional amounts of filamentous algae. Plate 4.2 displays the instream vegetation present at Boherduff bridge.

Plate 4.2: Instream vegetation at Boherduff Bridge.

On the upstream side of the culvert dogwood (*Cornus sanguinea)* and gorse (*Ulex europaeus*) are the dominant species on either bank. Coltsfoot (*Tussilago farfara*), perennial ryegrass (*Lolium perenne*) and common bent grass (*Agrostis capillaris*) have colonised a mowed strip under the protective fence. Some mature alder (*Alnus glutinosa*) line the banks. The habitat on either bank is consistent ornamental/non-native scrub (Fossitt: WS3).

Downstream habitats within the immediate environs of the culvert are again considered to be ornamental/non-native scrub (WS3). Here gorse (*Ulex europaeus*) is more abundant with blackthorn (*Prunus spinosa*) and alder (*Alnus glutinosa*) also present on the left bank. Cock's-foot (*Dactylis glomerata*), perennial ryegrass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), ragwort (*Senecio jacobaea*) and purple moor-grass (*Molinia caerulea*) line the mowed section around the culvert fence. Downstream on the right bank top species comprised of abundant soft rush (*Juncus effusus*) with occasional cock's-foot (*Dactylis glomerata*); plantain (*Plantago sp.*); false oat grass (*Arrhenatherum elatius*); compact rush (*Juncus conglomeratusi)*; purple moor-grass (*Molinia caerulea*) and silver weed (*Potentilla anserina*). Further away from the drainage ditch there is a well-developed moss layer with rush species and purple moor-grass (*Molinia caerulea*) becoming more prevalent. This field on the right bank is considered to be wet grassland (GS4). This habitat shares links with '*Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)*'. However, the species composition does not have the necessary composition of indicator species for it to be classified as Annex I 6410 habitats. Downstream on the left bank top is also colonised by cock's-foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), sweet vernal (*Anthoxanthum odoratum*), soft rush (*Juncus effusus*) with encroaching gorse (*Ulex europaeus*) and willow (*Salix* sp.), this is also considered wet grassland (GS4). Plate 4.3 displays the habitats present downstream of the bridge.

Plate 4.3: Habitats present downstream of Boherduff Bridge.

4.2.2. Species

Due to the dense collection of instream vegetation the channel is sub optimal for fish passage. Low flows and fine substrates would preclude populations of freshwater pearl mussel (*Margaritifera margaritifera*) [1029] and white-clawed crayfish (*Austropotamobius pallipes*) [1092] from establishing here. While fine silts are required for juvenile lamprey populations, the presence of thick vegetation downstream would impede adults from commuting within this channel. No signs of otter were noted at the time of the survey given the likely lack of fish biomass and open nature of the bank downstream it is unlikely otter will use this habitat to forage. As detailed above the structure is a corrugated steel culvert with no potential to roosting bats.

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[6] 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 eight SACs located within 15km of the proposed project. These SACs are listed in Table 5-1 along with their features of interest. None of these SACs are within the potential zone of influence of the proposed project and are therefore not considered further in this assessment. Although not within 15km, the Lough Carra/Mask Complex SAC (Site Code 001774) is located approximately 53km downstream of Boherduff Bridge (ca. 16km by land) and is therefore considered within the potential ZoI due to the hydrological connection.

5.1.2. Special Protection Areas

There are no SPAs located within 15km of the proposed project. The Lough Mask SPA (004062) is however located ca. 16km from the site (by land) and is hydrologically linked to Boherduff Bridge (53.5km downstream). Despite the hydrological connection to Lough Mask SPA, due to the species for which the site is designated, and their ecology, this site is not considered within the zone of influence of the proposed works at Boherduff Bridge. The adjacent Lough Carra SPA (004051) is located 15.5km west of the site by land and has no hydrological connectivity to Boherduff Bridge. Therefore, it is not considered in this assessment.

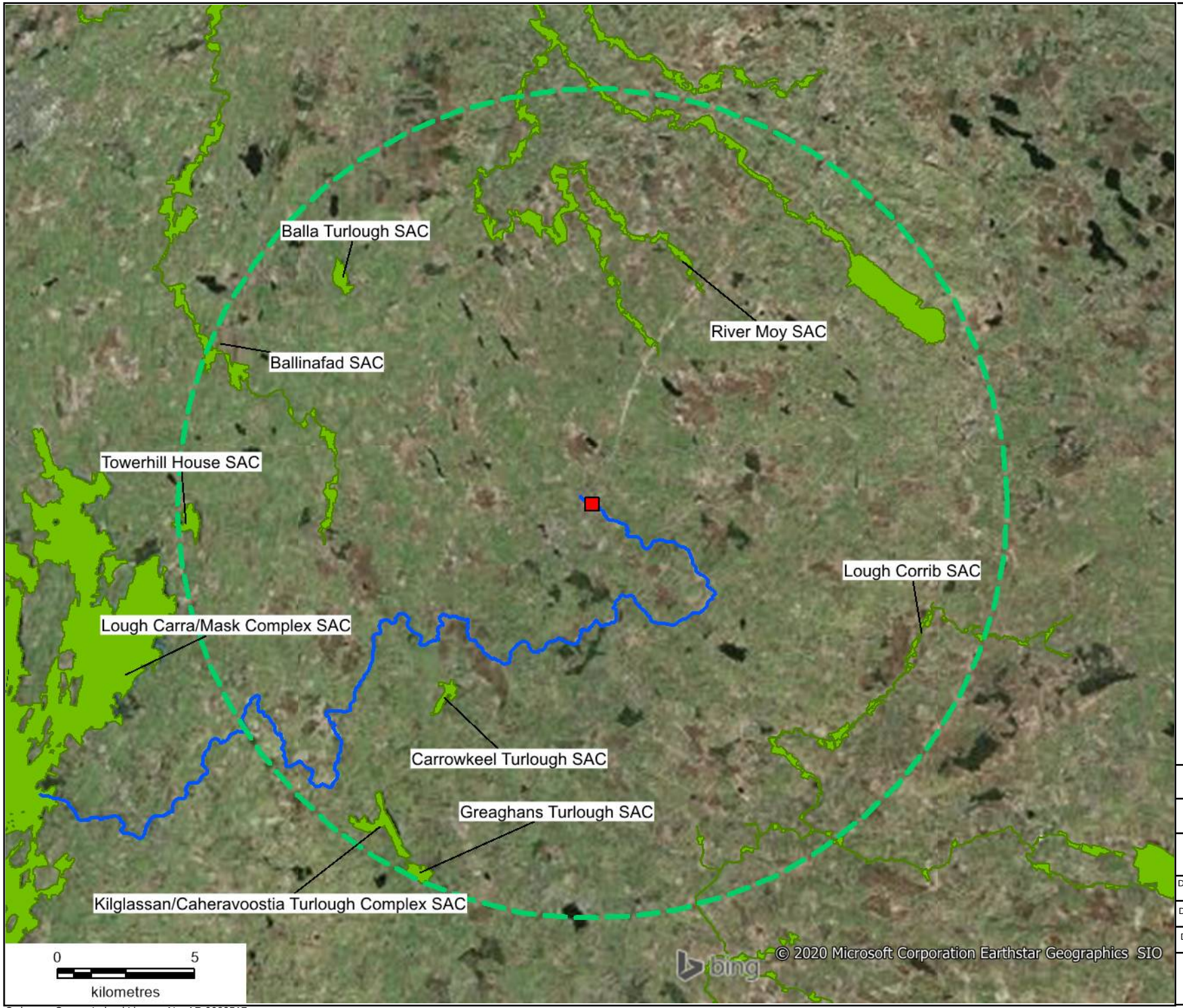
[6] DoEHLG (2009*). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of Environment, Heritage and Local Government, Dublin, Ireland.

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

Site Name	Approximate distance	Features of Interest	Within ZoI
River Moy SAC (002298)	6km straight line; no hydrological connection	• 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]	No – no hydrological connection exists and not connected via. land features
Balla Turlough SAC (000463)	11.5km straight line; no hydrological connection	• Turloughs [3180]	No - no hydrological connection exists
Towerhill House SAC (000463)	14km straight line; no hydrological connection	• *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]	No - no hydrological connection exists and no landscape connectivity
Carrowkeel Turlough SAC (000475)	8km straight line; no hydrological connection	• Turloughs [3180]	No - no hydrological connection exists
Kilglassan/Caheravoostia Turlough Complex SAC (000504)	13km straight line; no hydrological connection	• Turloughs [3180]	No - no hydrological connection exists
Lough Corrib SAC (000297)	13km straight line; no hydrological connection	• Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] • Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*. [3140] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	No - no hydrological connection exists

Site Name	Approximate distance	Features of Interest	Within ZoI
		• Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] • Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] • Petrifying springs with tufa formation (*Cratoneurion*) [7220] • Alkaline fens [7230] • Limestone pavements [8240] • Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] • Bog woodland [91D0] • [redacted] • *Austropotamobius pallipes* (White-clawed Crayfish) [1092] • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Salmo salar* (Salmon) [1106] • *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] • *Lutra lutra* (Otter) [1355] • *Drepanocladus vernicosus* (Slender Green Feather-moss) [1393] • *Najas flexilis* (Slender Naiad) [1833]	
Lough Carra/Mask Complex SAC (001774)	16km straight line distance; 53km instream distance	• Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] • Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140] • European dry heaths [4030] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] • Alkaline fens [7230] • Limestone pavements [8240]	Yes – hydrologically linked via. North Robe Trib and Robe Rivers

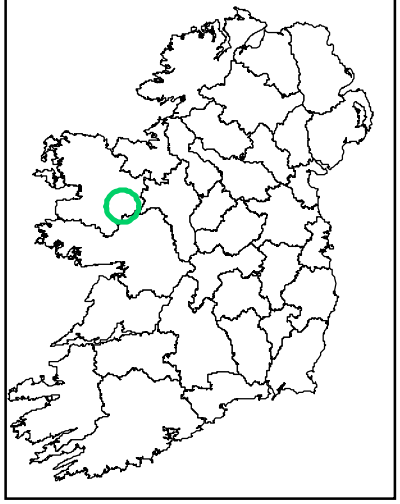
Site Name	Approximate distance	Features of Interest	Within ZoI
		• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] • *Lutra lutra* (Otter) [1355] • *Drepanocladus vernicosus* (Slender Green Feather-moss) [1393]	
Lough Mask SPA (004062)	16km straight line distance; 53.5km instream distance	• Tufted Duck (*Aythya fuligula*) [A061] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Common Gull (*Larus canus*) [A182] • Lesser Black-backed Gull (*Larus fuscus*) [A183] • Common Tern (*Sterna hirundo*) [A193] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]	No – due to the species for which the site is designated, and their ecology, this site is not considered within the zone of influence



N

Legend

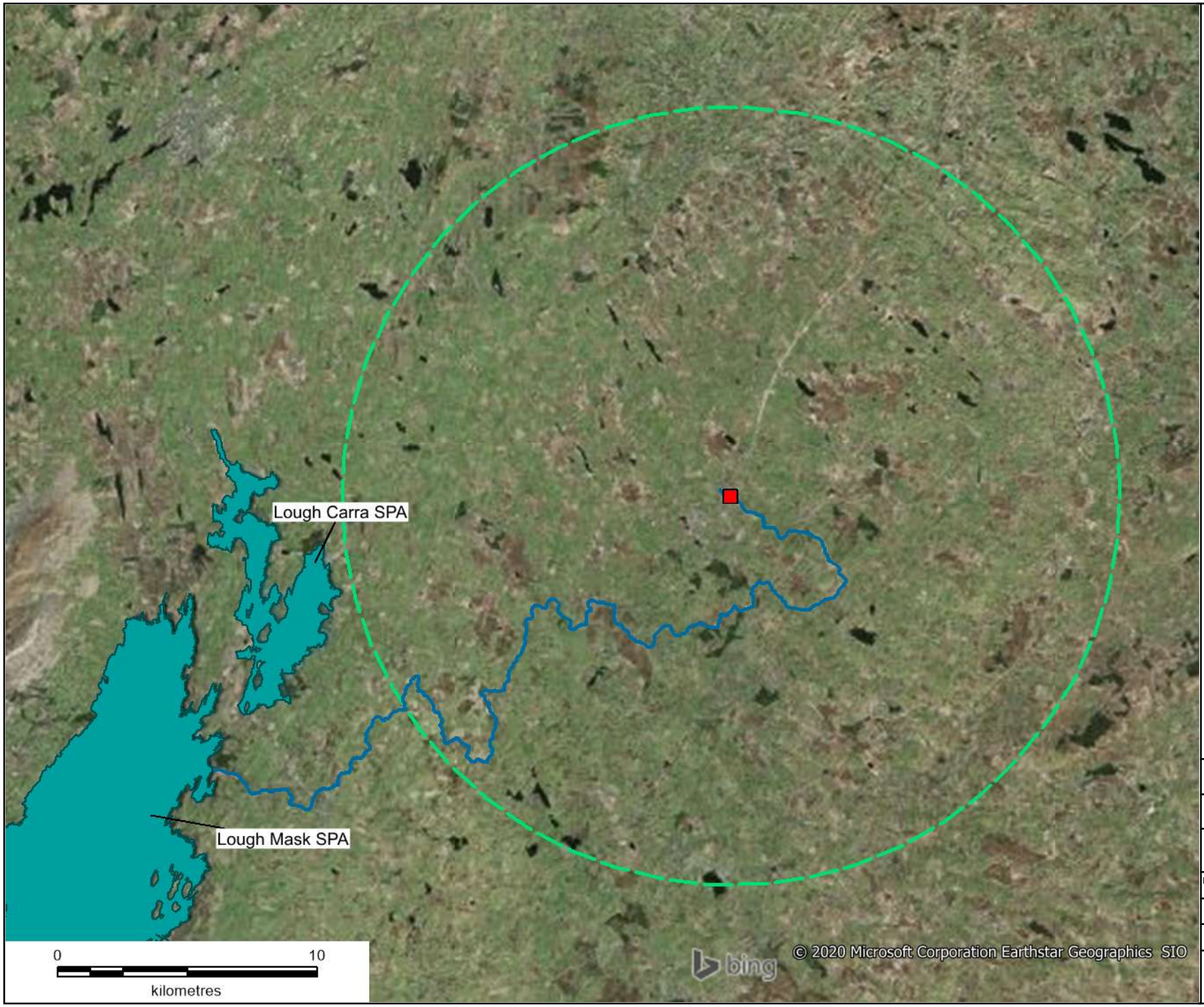
- Boherduff Bridge
- 15km Buffer
- Hydrological connectivity
- Special Area of Conservation



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

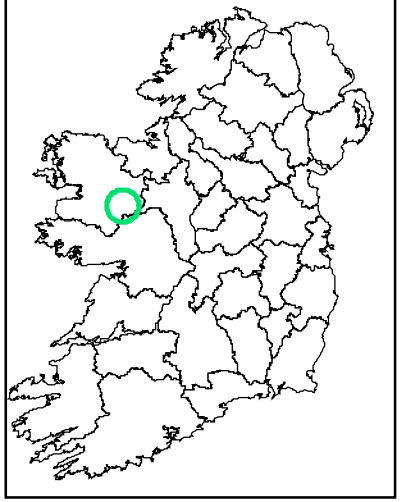
ATKINS [redacted]



N

Legend

- Boherduff Bridge
- Hydrological connectivity
- Special Protection Areas
- 15km Buffer



Client: Transport Infrastructure Ireland		
Project: Northwest Bridges Term Maintenance		
Title: SPAs within 15km of Boherduff		
Drawn: EN	Checked: NS	Authorised: 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

As described above, the potential zone of influence for the proposed project is limited to Lough Carra/Mask Complex SAC. All other European sites have been excluded from the potential zone of influence of the project due to the nature and extent of the proposed project, or type of connectivity between the proposed project and other European sites.

Descriptions of Lough Carra/Mask Complex SAC, taken from the supporting documents available on the NPWS website[7], are summarise below.

5.2.1. Lough Carra/Mask Complex SAC (001774)

The site is described as follows: -

> "*The limestone pavement within this site represents the northern limit of the limestones of Clare and Galway. The limestone is variable in character, from open bare pavement to areas covered with dense scrub. Associated with the pavement are areas of dry calcareous grassland and dry heath. Characteristic species of the rocky, limestone formations where soil may only occur in pockets include Bloody Cranesbill (*Geranium sanguineum*), Yellow-wort (*Blackstonia perfoliata*), Blue Fleabane (*Erigeron acer*), Wild Madder (*Rubia peregrina*) and Rustyback (*Ceterach officinarum*).*
>
> *Areas of calcareous grassland, often orchid-rich, occur interspersed amongst the limestone. These grasslands support species such as Carline Thistle (*Carlina vulgaris*), Quaking-grass (*Briza media*), Blue Moor-grass (*Sesleria albicans*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Cowslip (*Primula veris*), Common Knapweed (*Centaurea nigra*), Fairy Flax (Linum catharticum), Lady's Bedstraw (Galium verum) and Wild Thyme (*Thymus praecox*). A good diversity of orchid species has been recorded from these grasslands, including Pyramidal Orchid (*Anacamptis pyramidalis*), Early-purple Orchid (*Orchis mascula*), Bee Orchid (*Ophrys apifera*), Fragrant Orchid (*Gymnodenia conopsea*) and Dense-flowered Orchid (*Neotinea maculata*). Several of these species, notably Dense-flowered Orchid and Spring Gentian (*Gentiana verna*), are typical Burren species and occur here towards the northern end of their distribution.*
>
> *The scrub vegetation is variable in character, with extensive areas dominated by Hazel (*Corylus avellana*) and Hawthorn (*Crataegus monogyna*), with Buckthorn (*Rhamnus catharticus*), Alder Buckthorn (*Frangula alnus*), Spindle (*Euonymus europaeus*) and Ash (*Fraxinus excelsior*).*
>
> *The dry heath is well developed in places and is characterised by Gorse (*Ulex europaeus*), Bell Heather (*Erica cinerea*), Heather (*Calluna vulgaris*) and St. Dabeoc's Heath (*Dabeocia cantabrica*). The diminutive orchid Lesser Twayblade (*Listera cordata*) occurs within the heath communities.*
>
> *A wide range of wetland habitats occur around Lough Carra and along parts of the eastern and southern shores of Lough Mask, including Cladium fen and alkaline fen. Great Fen-sedge (*Cladium mariscus*) occurs as pure stands in places but also grades into areas of alkaline fen, where it is intermixed with Black Bog-rush (*Schoenus nigricans*), Common Club-rush (*Scirpus lacustris*), Common Reed (*Phragmites australis*) and a number of sedge species (*Carex spp.*). The areas of alkaline fen are more extensive than the Cladium fens, and here Black Bog-rush is generally the dominant species. A rich diversity of flowering plant occurs in the fen communities. In addition to the fen habitats, there are sparse but widespread reed swamps, wet grassland and some freshwater marsh communities around the lake shores.*
>
> *Broadleaved deciduous woodland occurs fairly frequently around much of the shores of the lakes and on some of the islands. This is often scrub-type woodland, which may be either dry (dominated by Hazel, Hawthorn and Ash) or wet. In the case of the latter, dominant species include birches (*Betula spp.*), willows (*Salix spp.*) and Alder (*Alnus glutinosa*). The wet areas of woodland flood seasonally and represent alluvial woodland, a habitat that is listed with priority status on Annex I of the E.U. Habitats Directive. These are particularly well developed in the Ballykine and Clonbur areas of Lough Mask. In*

[7] https://www.npws.ie/protected-sites

*some places the woodlands contain Sessile Oak (*Quercus petraea*), Holly (*Ilex aquifolium*) and Rowan (*Sorbus aucuparia*).*

*A high concentration of rare plants is found at this site. Five species protected under the Flora (Protection) Order, 2015, occur: Irish St. John's-wort (*Hypericum canadense*), Chives (*Allium schoenoprasum*), Pillwort (*Pilularia globulifera*), Irish Lady's-tresses (*Spiranthes romanzoffiana*), and Small Cudweed (*Logfia minima*). Two other Red Data Book plants, Alder Buckthorn and Bird's-nest Orchid (*Neottia nidus-avis*), also occur, along with two Red Data Book stonewort species,* Chara curta *and* C. rudis*.*

The site provides excellent habitat for Otter, also an Annex II species, and the area has Pine Marten (Martes martes), a species listed in the Irish Red Data Book.

The site has important bird interests, both in winter and summer. It provides feeding areas for part of the Erriff/Derrycraff population of Greenland White-fronted Goose. This flock has declined somewhat in recent years but is still of national importance, with an average spring peak from 1989-94 of 124 birds. The following count figures are the averages from surveys in January 1995 and January 1996: Wigeon 167, Mallard 397, Shoveler 57, Pochard 91, Tufted Duck 757, Goldeneye 158, Lapwing 233 and Curlew 118. Also, 68 Whooper Swan and 25 Gadwall were recorded in January 1996. The Shoveler, Tufted Duck and Goldeneye populations are of national importance. Both lakes are traditional sites for breeding gulls and terns. In 1995, 44 pairs of Common Tern nested at Lough Mask, while in 1992 a census of gulls at both lakes resulted in the following counts: Black-headed Gull 1,451 pairs, Common Gull 407 pairs and Lesser Black-backed Gull 361 pairs. The Common Gull colony represents 11.3% of the national total, and the Lesser Black-backed Gull colony is 6.9% of the total."

5.2.1.1. Features of Interest

The Lough Carra/Mask Complex SAC is designated for the habitats and species listed in Table 5-1. Due to the size and geographic range of site, 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. 53km downstream of Boherduff Bridge and therefore, potential impacts could be indirect in nature to habitats and species in the vicinity of the of the Robe 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 5-2 and are listed below: -

- 1355 Otter (*Lutra lutra*)

5.2.1.2. Conservation Objectives

Site specific conservation objectives have not been set for Lough Carra/Mask Complex SAC (NPWS, 2020a).

The generic conservation objective for the SAC is "*to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected*".

The favourable conservation status of a species is achieved when:

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

5.2.1.3. Potential Threats

The negative threats, pressures and activities with impacts on the SAC are itemised in Table 5.1.

Table 5-2 – Negative threats and pressures on Lough Carra/Mask SAC.

Rank[8]	Threats and pressures [code]	Threats and pressures [type][9]	inside/outside/both [i/o/b]
H	H01	Pollution to surface waters (limnic, terrestrial, marine & brackish)	i
M	A03.03	abandonment / lack of mowing	i

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

Table 5-3 - Qualifying interests of the SAC within the ZoI of the proposed project.

Qualifying Interest	Location	Within Zone of Influence
3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) **3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea** **3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.**	These aquatic habitats are all located within the SAC, at least 53km downstream from the proposed project and given the nature, scale and extent of the works, and the dilution factor these habitats are not anticipated to be directly or indirectly impacted by the proposed project	No
4030 European dry heaths **6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites)**	These heath and grassland habitats are all located terrestrially within the SAC with no hydrological or terrestrial connection to the proposed works.	No
7210 Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* **7230 Alkaline fens**	These fen habitats are located within the SAC, at least 53km downstream from the proposed project and given the nature, scale and extent of the works, and the dilution factor these habitats are not anticipated to be directly or indirectly impacted by the proposed project	No
8240 Limestone pavements*	Limestone pavements located terrestrially within the SAC with no hydrological or terrestrial connection to the proposed works.	No
91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*	Alluvial woodland is located within the SAC least 53km downstream from the proposed project and given the nature, scale and extent of the works, and the dilution factor these habitats are not anticipated to be directly or indirectly impacted by the proposed project	No
1303 Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	The steel culvert at Boherduff does not provide potential roosting habitat for bats and proposed works will not interact with any such habitat.	No
1355 Otter (*Lutra lutra*)	According to the NBDC, there are records of otter downstream of the bridge on the Robe Trib North	Yes

Qualifying Interest	Location	Within Zone of Influence
	stream. There is potential for commuting in the vicinity of the bridge. Potential impacts on water quality could possibly impact upon the food source of otter. Therefore, there is potential for indirect impact on otter.	
1393 Slender Green Feather-moss (*Drepanocladus vernicosus*)	This species occurs within the fen habitats for which the SAC is designated. They are located within the SAC, at least 53km downstream from the proposed project and given the nature, scale and extent of the works, and the dilution factor these habitats are not anticipated to be directly or indirectly impacted by the proposed project	No

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 53km upstream of the Lough Carra/Mask Complex 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 in more detail and examines where likely significant effects may arise. Where potential adverse effects are identified that may affect the integrity of the Lough Carra/Mask Complex 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.

Boherduff culvert is located ca. 53km upstream of the Lough Carra/Mask Complex SAC. Otter from the SAC could potentially travel upstream and travel through the culvert. Given the nature of Boherduff culvert, the sides of the culvert are wet at normal flows. Therefore, otter must swim through the culvert during normal flows. It is possible that during high flows, otter may not be able to travel through the culvert and may access the N17 road as a result. The proposed project is for the installation of a concrete invert at Boherduff 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 Boherduff culvert is passable to otter. However, it is important to note that the river and riparian habitat in the vicinity has limited suitability for 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: -

- *Lutra* (Otter) [1355]

Please note that site specific conservation objectives have not been set for Lough Carra/Mask Complex SAC (NPWS, 2020a).

6.2.2.1. Direct impacts

As the proposed works to Boherduff Bridge will not occur within the Lough Carra/Mask Complex SAC, there is no potential for direct impacts.

6.2.2.2. Indirect impacts

There is potential for indirect impacts via surface water pathways to the Robe River. 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.

Otter downstream of the proposed works; i.e. the Feature of Interest (FOI) of the SAC, is sensitive to a deterioration in water quality.

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

The potential impacts to species such as salmon and lamprey and salmon may 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.

Additionally, dewatering works may cause a temporary obstruction to the passage of otter on the unnamed stream which flows under the Boherduff Bridge. Note, that due to the proximity of the proposed works to the source of the stream (500m), the likelihood of these impacts occurring on otter in the area is low.

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.

The release of silt to the areas downstream 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.

6.2.2.3. Spread of invasive species

No invasive species, aquatic or terrestrial, were recorded at Boherduff 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.

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 also undertake general agricultural operations in areas adjacent to the proposed works and along the river, which could potentially give rise to impacts of a similar nature to those arising from the proposed works. This could potentially result in additional an 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,
- 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 Corrib catchment that drains to the Lough Carra/Mask Complex SAC. The culverts in Group 1, 3 and 4 are located in separate WFD catchments to Group 2 and these WFD catchments do not drain to the Lough Carra/Mask Complex SAC. Therefore, in-combination effects between the proposed project and other proposed culvert projects will not occur.

The OPW operates the Corrib-Mask-Robe arterial drainage scheme which includes the waterbody carried by Boherduff Bridge. However, given the short duration of proposed works it is not anticipated that there will be in-combination impacts resulting from the drainage scheme and proposed works. We are not aware of any further works proposed at this time close to Boherduff Bridge.

6.3. Mitigation Measures

This section describes the mitigation measures required to ensure there are no residual effects on the integrity of Lough Carra/Mask Complex 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

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 Boherduff Bridge [MO-N17-012.00] and its potential indirect impacts via surface water pathways on the Lough Carra/Mask Complex 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, considering 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 Lough Carra/Mask Complex 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 Lough Carra/Mask Complex 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 Lough Carra/Mask Complex 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.

Does the project or plan have the potential to:-	Y/N
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
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.

References

Bell, A.M., Baier, R., Kocher, B., Reifferscheid, G., Buchinger, S. and Ternes, T. (2020). Ecotoxicological characterization of emissions from steel coatings in contact with water. *Water Research*. 173, 2020, 115525. https://www.sciencedirect.com/science/article/pii/S0043135420300610.

CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1*. Chartered Institute of Ecology and Environmental Management, Winchester.

Cooper, L. M. (2004). *Guidelines for Cumulative Effects Assessment in SEA of Plans*, EPMG Occasional Paper 04/LMC/CEA, Imperial College London.

DoEHLG (2009). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

EPA (2009). *Code of Practice; Wastewater Treatment Systems and Disposal Systems serving Single Houses (p.e. ≤10).* Environmental Protection Agency, Co. Wexford, Ireland.

EPA (2018). C*ode of Practice, Domestic Waste Water Treatment Systems (Population Equivalent ≤10) Draft 26 November 2018*. Environmental Protection Agency, Ireland.

European Commission (2001). *Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*.

European Commission (2017). *Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.*

European Union Habitats Directive, (1992). *Council Directives 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.*

IFI (2016). *Guidance on Protection of Fisheries During Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland. Dublin, Ireland.

Masters-Williams, H., Heap, A. & Kitts, H. (2001). *C532 Control of water pollution from construction sites. Guidance for consultants and contractors*. Construction Industry Research and Information Association. London, Great Britain.

Murnane, E. (2002). *SP156 Control of water pollution from construction sites – guide to good practice.* Construction Industry Research and Information Association. London, Great Britain.

NPWS (2020a). *Conservation objectives for Lough Carra/Mask Complex SAC [001774]. Generic Version 7.0*. Department of Culture, Heritage and the Gaeltacht.

NPWS (2020b). *Conservation objectives for Lough Carra SPA [004051]. Generic Version 7.0*. Department of Culture, Heritage and the Gaeltacht.

NRA (2009). *Survey Guidelines for National Road Schemes*. National Roads Authority. Dublin, Ireland.

Preene, M., Roberts, T.O.L & Powrie, W. (2016). *C750 Groundwater control: design and practice*. Construction Industry Research and Information Association. London, Great Britain.

Scott Wilson and Levett-Therivel, (2006). *Appropriate Assessment of Plans*. Scott Wilson, Levett-Therivel Sustainability Consultants, Treweek Environmental Consultants and Land Use Consultants.

Smith, G.F, O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council. Kilkenny, Ireland.

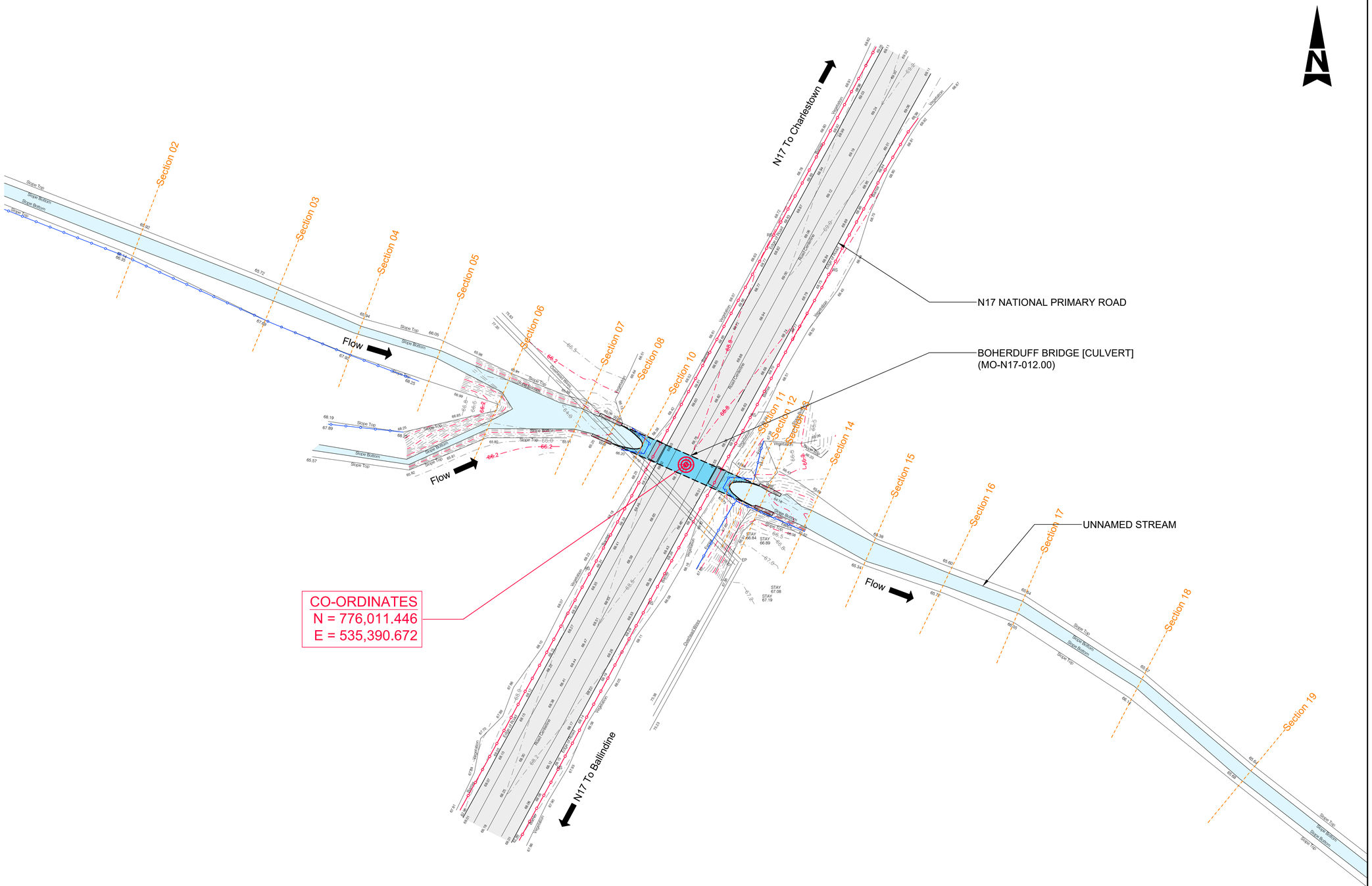
Weekes, L., Kacki, Z., Fitzpatrick, U., Kelly, F., Matson, R., Kelly-Quinn, M. (2018). An Irish national vegetation classification system for aquatic river macrophytes. *Applied Vegetation Science*. 21, 322-340.

Appendices

Appendix A. Design Detail

A1

DO NOT SCALE



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 20, REFER TO TOPOGRAPHICAL SURVEY DRAWINGS

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
Oifig Boichte Naisiunta
Ohun 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

ATKINS
Member of the SNC-Lavalin Group

[redacted]

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

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

Purpose: ISSUED FOR REVIEW

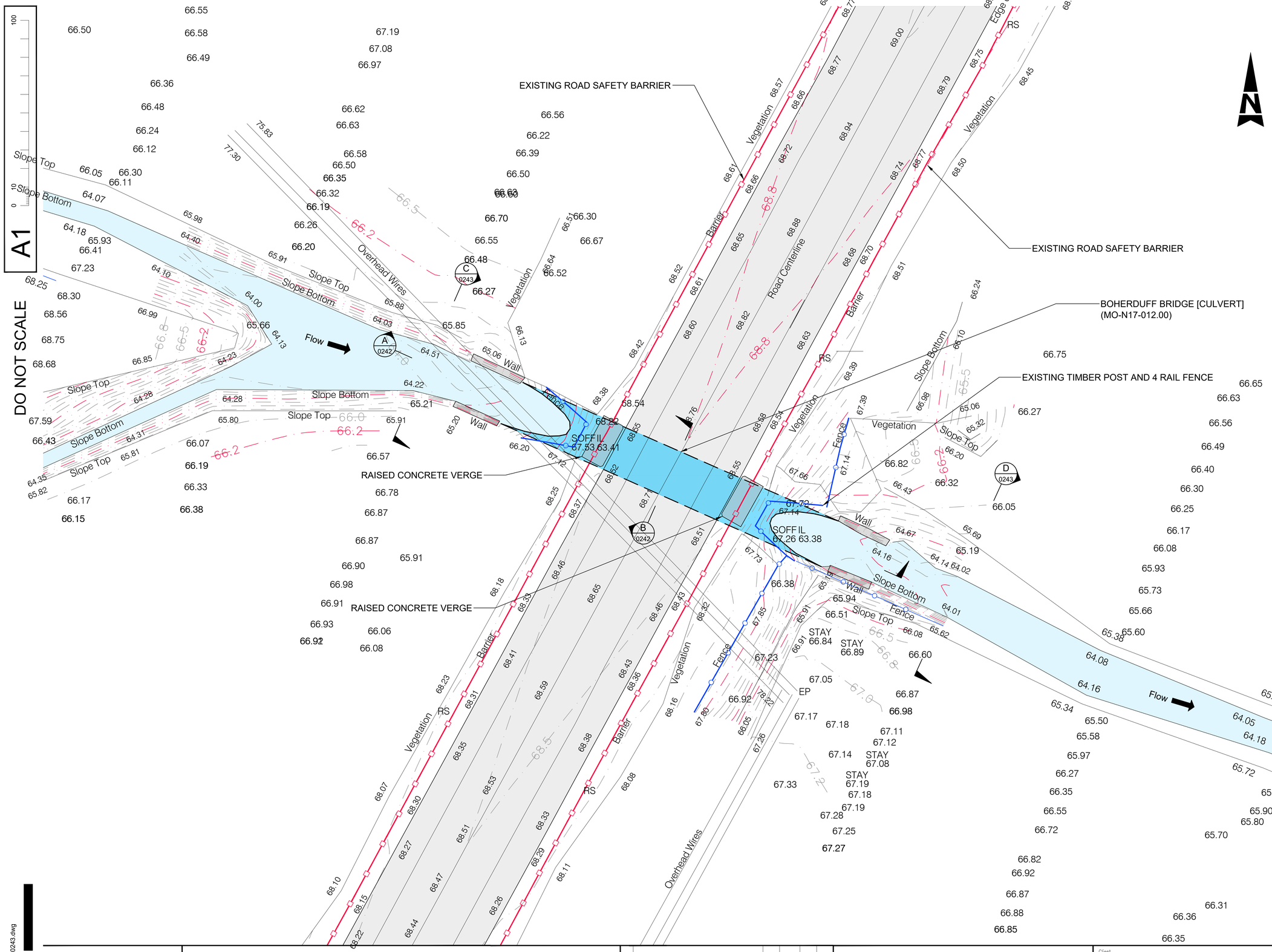
Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SITE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:500	AOS Date 31/10/19	MG Date 31/10/19	MJ Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0240	A

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 20, 2020 - 8:50am

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg



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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
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

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

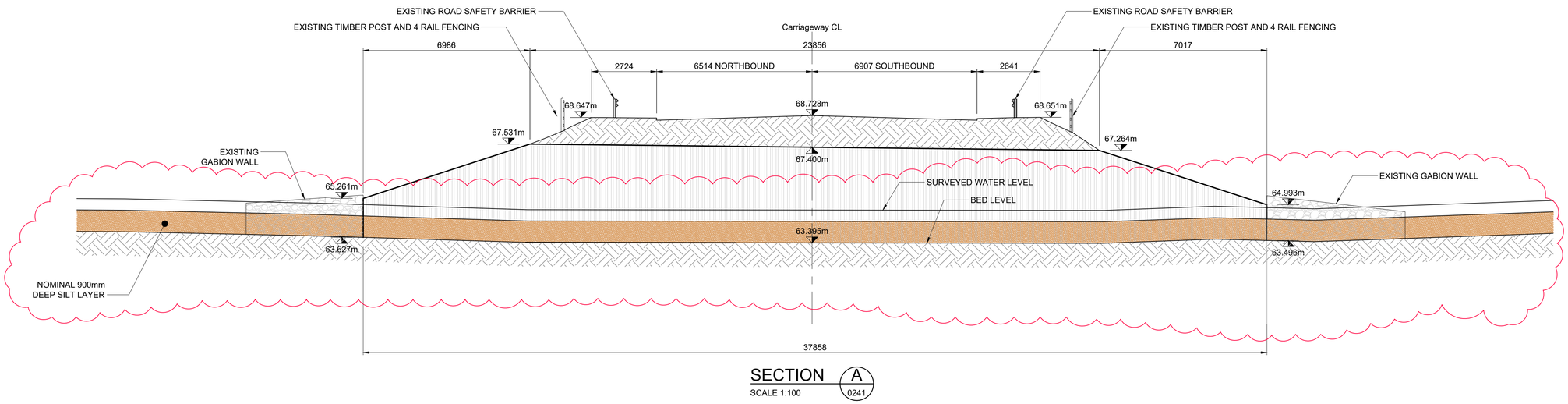
Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING STRUCTURE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 31/10/19	Date 31/10/19	Date 31/10/19

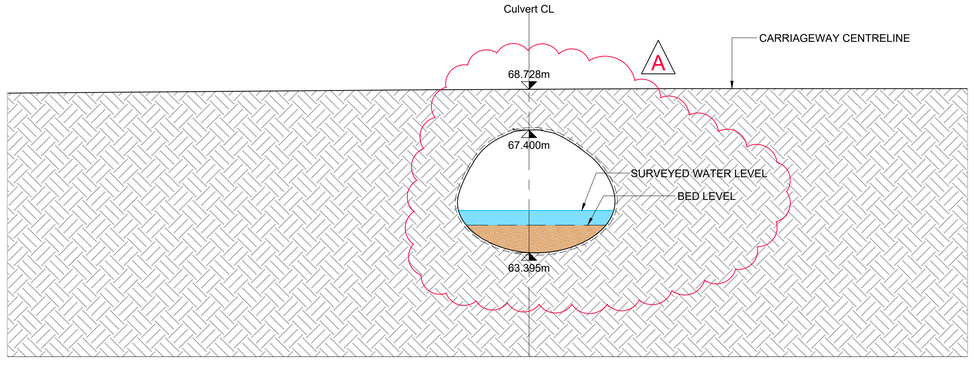
Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0241	A

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 19, 2020 - 4:29pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg



SECTION A
SCALE 1:100
0241



SECTION B
SCALE 1:100
0241

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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
NRO
Oifig Boichte Naisiunta
Ohun na nGall

Rev	Description	By	Date	Chk'd	Auth
B	LONGITUDINAL SECTION UPDATED	AOS	07/20	MJ	MJ
A	REVIEW COMMENTS INCORPORATED	AOS	05/20	MJ	MJ
-	ISSUED FOR REVIEW	AOS	11/19	MG	MJ

ATKINS
Member of the SNC-Lavalin Group

Client
TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project
NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose
ISSUED FOR REVIEW

Title
BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SECTIONS A AND B

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS Date 31/10/19	MG Date 31/10/19	MJ Date 31/10/19

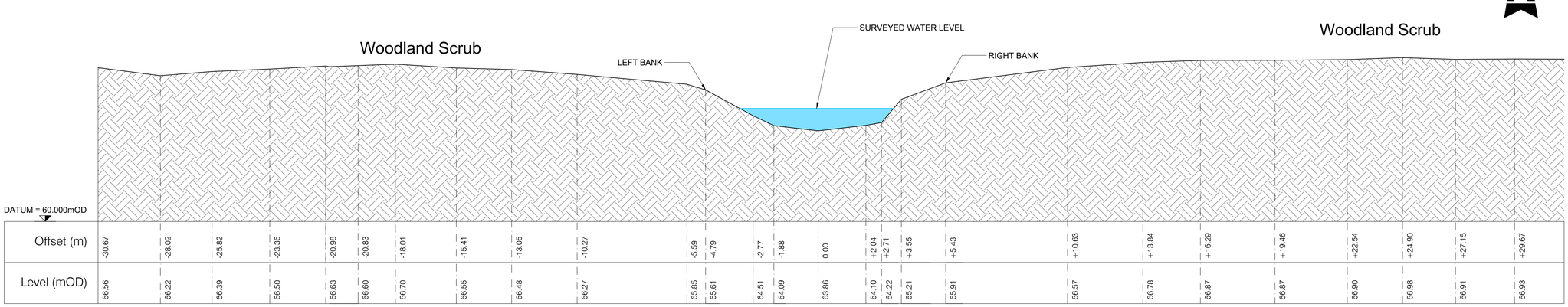
Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0242	B

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: Jul 15, 2020 - 3:23pm
V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg

A1

0 10 100

DO NOT SCALE

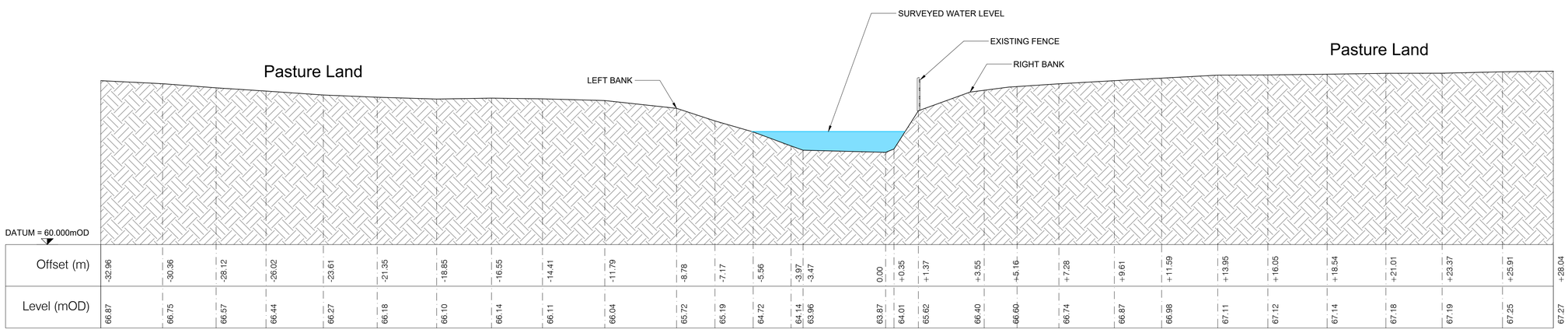


Offset (m)	-30.67	-28.02	-25.82	-23.36	-20.98	-20.83	-18.01	-15.41	-13.05	-10.27	-5.59	-4.79	-2.77	-1.88	0.00	+2.04	+2.71	+3.55	+5.43	+10.63	+13.84	+16.29	+19.46	+22.54	+24.90	+27.15	+29.67
Level (mOD)	66.56	66.22	66.39	66.50	66.63	66.60	66.70	66.55	66.48	66.27	65.85	65.61	64.51	64.09	63.86	64.10	64.22	65.21	65.91	66.57	66.78	66.87	66.87	66.90	66.98	66.91	66.93

SECTION C
SCALE 1:100
0241

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



Offset (m)	-32.96	-30.36	-28.12	-26.02	-23.61	-21.35	-18.85	-16.55	-14.41	-11.79	-8.78	-7.17	-5.56	-3.97	-3.47	0.00	+0.35	+1.37	+3.55	+5.16	+7.28	+9.61	+11.59	+13.95	+16.05	+18.54	+21.01	+23.37	+25.91	+28.04
Level (mOD)	66.87	66.75	66.57	66.44	66.27	66.18	66.10	66.14	66.11	66.04	65.72	65.19	64.72	64.14	63.96	63.87	64.01	65.62	66.40	66.60	66.74	66.87	66.98	67.11	67.12	67.14	67.18	67.19	67.25	67.27

SECTION D
SCALE 1:100
0241

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Oifig Bóithe Náisiúnta
Údarás 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

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

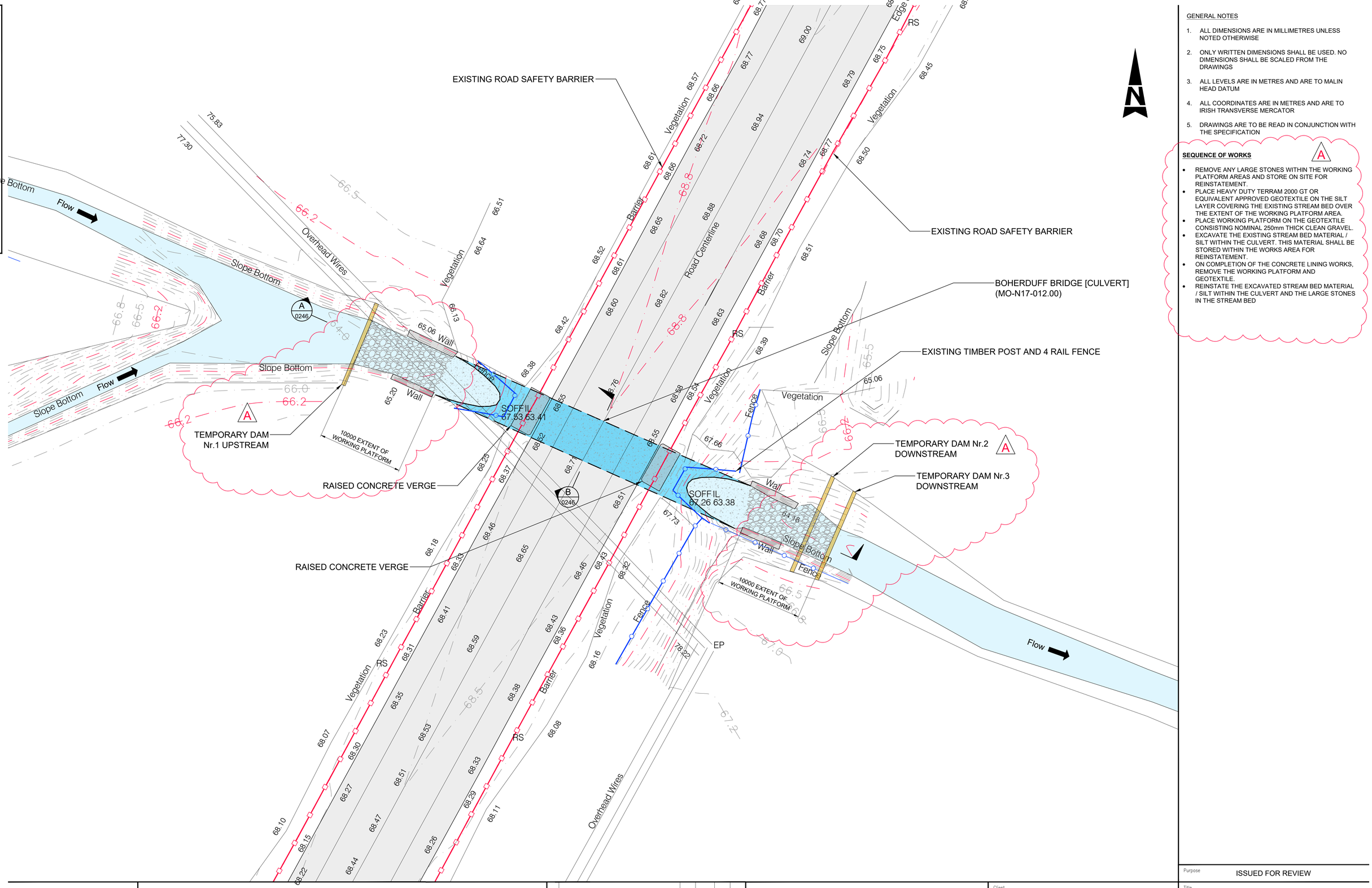
Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SECTIONAL ELEVATIONS C AND D

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 31/10/19	Date 31/10/19	Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0243	A

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 15, 2020 - 12:04pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg



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

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 SILT LAYER COVERING 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 / SILT 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 / SILT WITHIN THE CULVERT AND THE LARGE STONES IN THE STREAM BED

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

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) PROPOSED REMEDIAL WORKS -SHEET 1 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

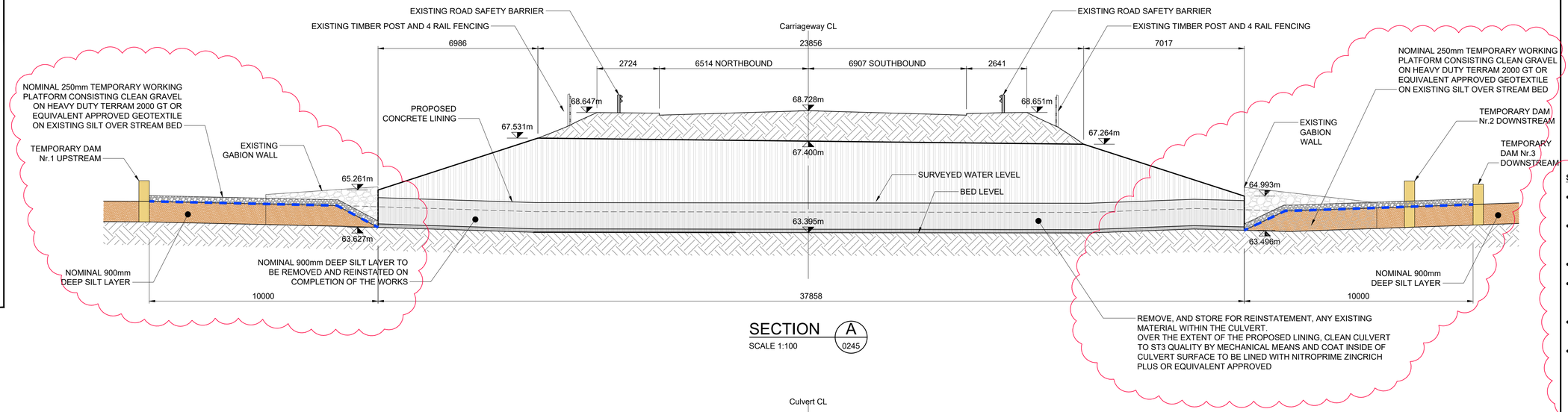
Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0245	A

File: 5162160-HTR-DR-0245 to 0246.dwg
Date: Jul 15, 2020 - 10:24am

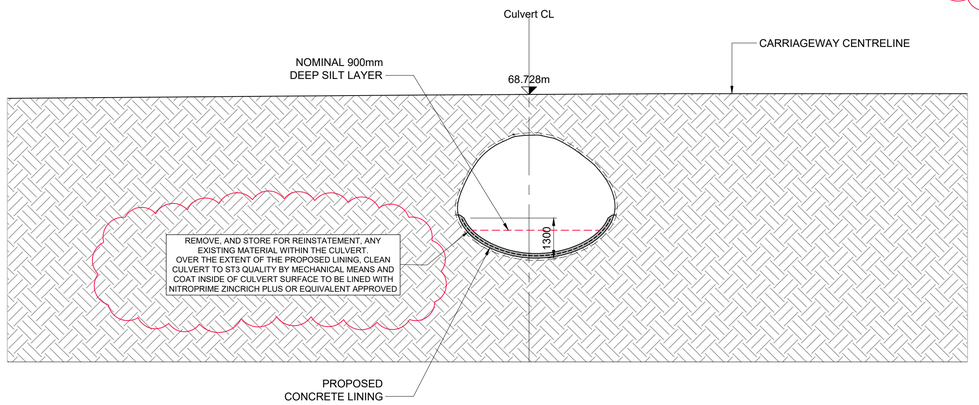
V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0245 to 0246.dwg

100
0
10
A1

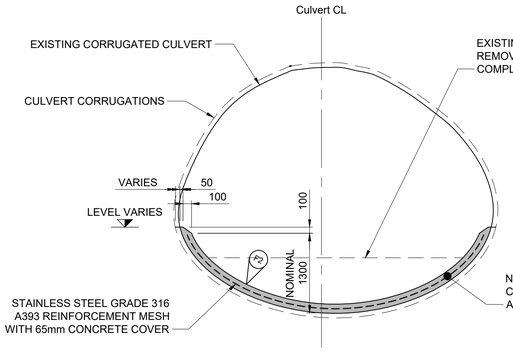
DO NOT SCALE



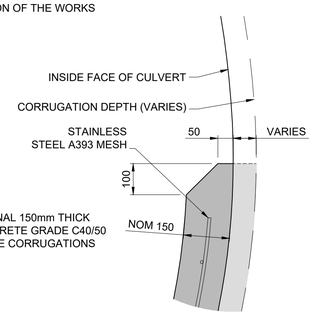
SECTION A
SCALE 1:100 — 0245



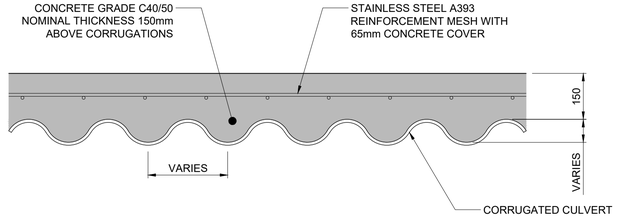
SECTION B
SCALE 1:100 — 0245



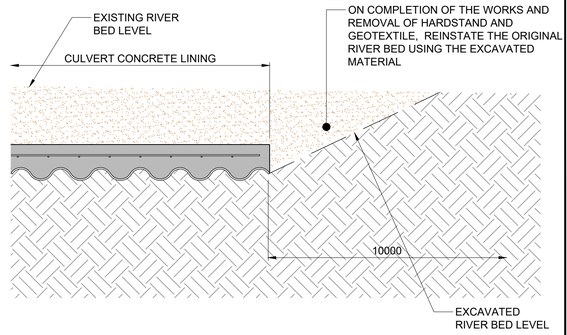
TYPICAL CULVERT CROSS SECTION
Scale at A1 1:50
Scale at A3 1:100



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

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

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 SILT LAYER COVERING 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 / SILT 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 / SILT WITHIN THE CULVERT AND THE LARGE STONES IN THE STREAM BED

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Comhairle Contae Dhún na nGall

Rev	Description	By	Date	Chk'd	Auth
A	NOTES ADDED, DETAILS UPDATED	AOS	07/08	MJ	MJ
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) PROPOSED REMEDIAL WORKS -SHEET 2 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0245	A

File: 5162160-HTR-DR-0245 to 0246.dwg
Date: Jul 15, 2020 - 12:07pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0245 to 0246.dwg

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-N17-012.00	Document Number	Rev
		ST-MET-10	5

Prepared By:	[redacted]	**Date:**	08/07/2020	**Signature:**	[redacted]
Reviewed By:	[redacted]	**Date:**		**Signature:**	[redacted]
Approved By (Agent or above):	[redacted]	**Date:**		**Signature:**	[redacted]
Reviewed by H &S:	[redacted]	**Date:**		**Signature:**	[redacted]
Engineer's Approval By:		**Date:**		**Signature:**	

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 • Stream / River over pumping / fluming • Cleaning of existing lining. • Installation of mesh / rebar • Temporary Propping / shuttering. • Concrete Works

Responsibility for Control on Site	**Overall**	[redacted] – Project Manager	**Local**	Site Agent – [redacted] Site Engineer [redacted]

		Quantity	Description	Certification Yes / No
Equipment and Plant Requirements	**Major Plant**	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	☐
				☐
				☐
				☐
				☐
				☐

	Quantity	Position and Specific Job Description	Certification Yes / No
Labour Resources	1 No.	**Health and Safety Coordinator** [redacted] [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 (Depending on location of Culvert Works)	☑	☐	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	
		☐	☐		

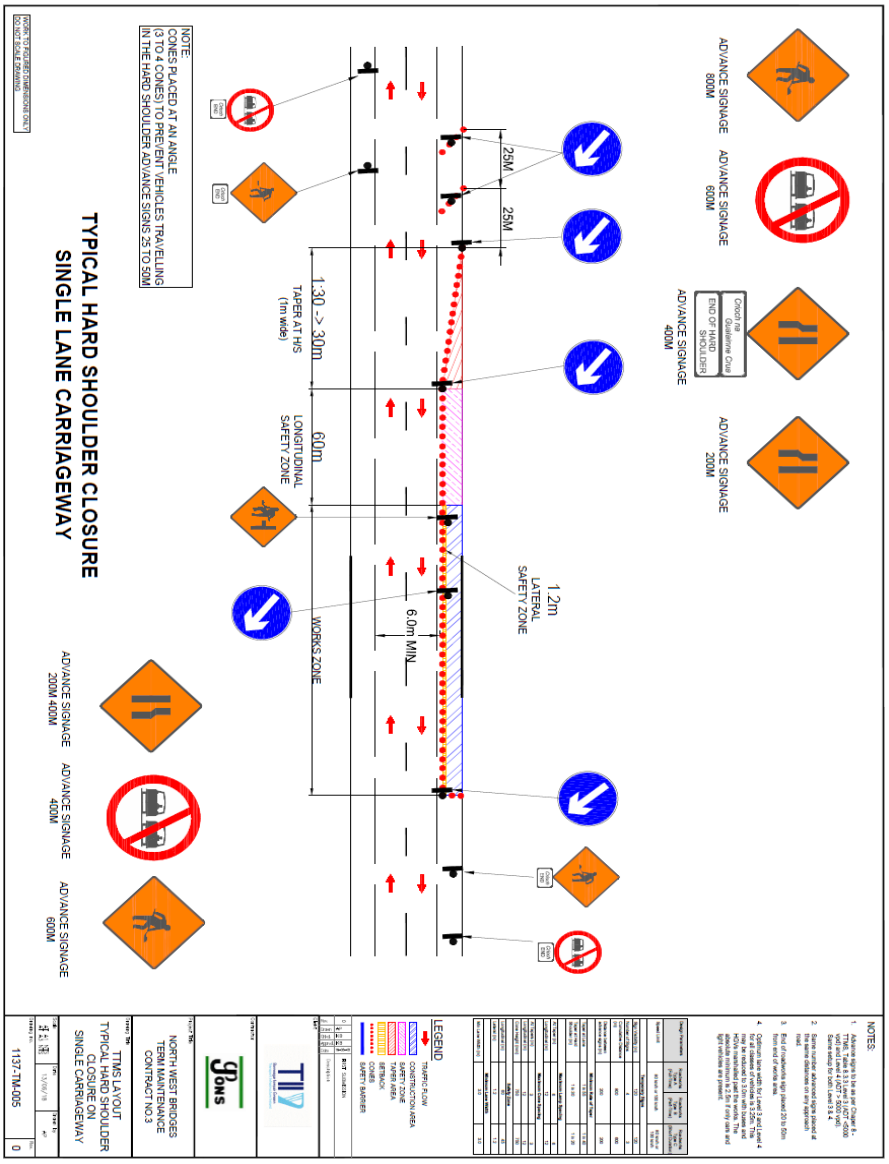
Work Method

Local Authorities / IFI:

- Mayo County Council to be notified of TTM erection and proposed works at least 1 week prior to works commencing.
- 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.
- Once the stream has been adequately dammed it will be electro fished by a licensed operator. JCEL will notify IFI of the proposed date and licensed operator prior to commencing.
- [redacted]

Temporary Traffic Management:

- JCEL to install TTM as per drawing 1137–TM–005 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.

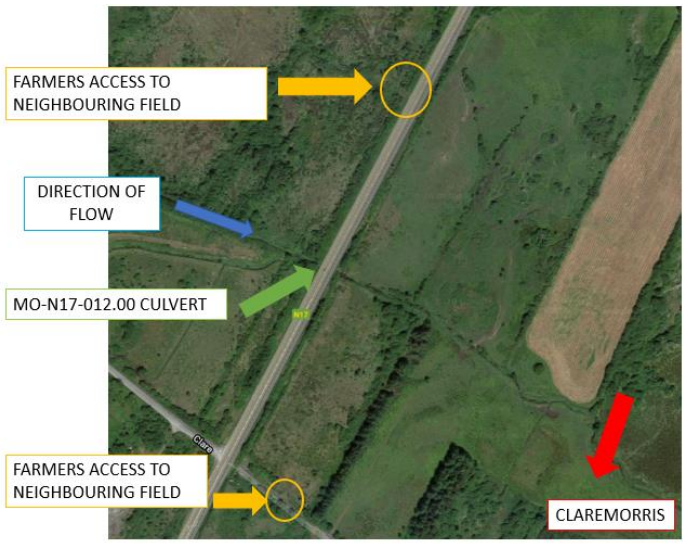


Weather:

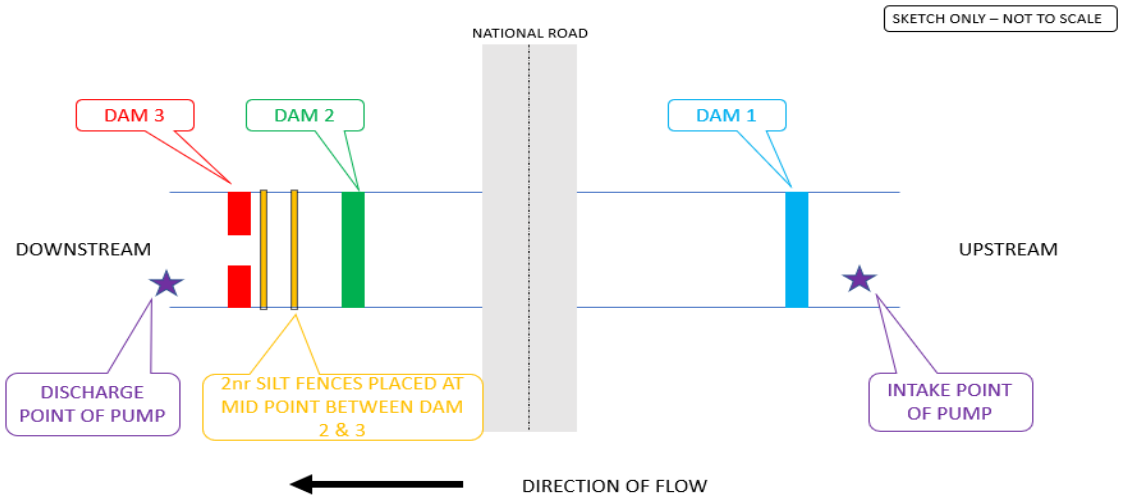
- The weather will be monitored prior to commencing with the works. Every effort will be made to avoid periods of rainfall therefore ensuring water volumes through the culvert are at a minimum.

Operative/Access to work area:

- Permission will be sought from the land owner to gain temporary access to the ends of the culvert at both sides prior to works commencing.
- An existing timber fence will be removed to allow operatives to walk down a slight embankment from the N17 and this will give them access to the bank of stream.
- All JCEL plant, concrete deliveries and the concrete pump will be positioned in the hard shoulder behind the Hard Shoulder Lane closure.



Diversion of stream (in sequence):



NOTE: A recent on-site inspection found there is approx. 800/900mm of silt build up throughout the whole stream,

Typical Dam Construction –

- The dams will consist of 1 tonne bags / 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.

Down Stream Dam–

- (Dam 3) JCEL will excavate a section of the silt (approx. 1m in depth over the full 4m width) from the stream to reach the bed of the stream, an excavator will be used for this task and it will be positioned on the bank of the stream. The large sand bags (1m X 1m X 1m sandbags) for the dam will then be lifted into position and placed by the excavator 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 excavate a section of the silt from the stream at the Dam 2 location (approx. 1m in depth over the full 4m width) to reach the bed of the stream, an excavator will be used for this task and it will be positioned on the bank of the stream A second dam of sand bags (1m X 1m X 1m sandbags) will then be erected 500mm in height to retain a pool of water (between Dam 2 & Dam 3) for the completion of the electrofishing.

Upstream

- (Dam 1) JCEL will be required to excavate a section of the silt (approx. 1m in depth over the full 4m width) to allow for the installation of the sand bag dam (1m X 1m X 1m sandbags) at the bed of the stream within 10m of the culvert opening.

  .

Electrofishing

- If required, the section of stream between dams 1 and 2 will be electro fished by a licensed operator. All fish will then be relocated into the pool between Dam 2 & 3.

Silt Fencing –

- Two silt fences will be erected behind the dam on the downstream side (as shown in the above diagram). This will act as a final filter for potential rain 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 –

- 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 to 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 upstream of 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 working platform will be installed upstream and downstream of the culvert.
- The platform will consist of a layer of heavy-duty geotextile placed over the existing river bed and a 250mm layer of washed, well graded clean aggregate placed on the geotextile to give a solid, clean base for operatives to access and work on the culvert concrete lining.
- The platform will cover the full width of the stream and will be circa 10m upstream and circa 5m downstream of the culvert
- 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 and the stream bed reinstated.

Removal of Silt from Culvert:

- JCEL will engage McBreen Environmental to undertake the silt removal from within the culvert.
- The McBreen Environmental tanker will park on the hard should behind the Temporary Traffic Management.
- The hoses on the vacuum unit will be placed into the stream and the silt will be sucked into the self-contained unit.
- The silt will be stored on the bank within the works area for reinstatement
- All of the silt for the full length of the culvert will be removed exposing the culvert metal surface to be cleaned for concrete lining.

Cleaning of existing culvert lining:

Once the silt has been removed from the culvert the lining will be cleaned.

- The high-pressure washing will be completed by McBreen Environmental
- The washing unit generator will be positioned on the hard shoulder 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 A393stainless 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 on the working platform. The JCEL operatives will then carry the mesh to the point of placement and fix into position.

Poistioning of concrete pump and concrete delivery trucks.

- The concrete pump will be placed on the hard shoulder of the road above, the concrete pumping lines placed down the bank and into the culvert. The pour will start on the upstream side working downstream.
- A layer of 1000 gauge polythene will be placed on the ground underneath the 'mouth' of the pump to capture any concrete that may spill when offloading from the delivery truck.

Pouring of concrete lining (1st half of culvert – 0m to 16m)

- 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 – 16m to 32m)

- 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 stream / Restoration of stream beds:

- On completion of the culvert concrete lining works the temporary working platform and geotextile will be removed and disposed off site to licenced tip.
- The culvert bed within the culvert will be reinstated with the silt material that was removed from the culvert prior to the works

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 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 the following morning.

Bio-Security Measures:

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

Emergency Measures

- 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.
  [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			
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.

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote-*** Unlikely to occur in the relevant period**.**
2 ***Occasional-*** likely to occur at least once in the relevant period.
3 ***Probable-*** likely to occur several times in the relevant period

S = Severity
1 ***Negligible-*** very minor, little consequence
2 ***Marginal -*** First aid accident/ routine repair
3 ***Serious -*** Loss of time/injury, illness or damage or environmental impact.
4 ***Critical -*** major injury, illness or damage, or major environmental impact.
5 ***Catastrophic -*** Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

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
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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote*****-** Unlikely to occur in the relevant period**.**
2 ***Occasional*****-** likely to occur at least once in the relevant period.
3 ***Probable*****-** likely to occur several times in the relevant period

S = Severity
1 ***Negligible*****-** very minor, little consequence
2 ***Marginal*** **-** First aid accident/ routine repair
3 ***Serious*** **-** Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** **-** major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** **-** Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00	Document Number	Rev
		ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote*****-** Unlikely to occur in the relevant period**.**
2 ***Occasional*****-** likely to occur at least once in the relevant period.
3 ***Probable*****-** likely to occur several times in the relevant period

S = Severity
1 ***Negligible*****-** very minor, little consequence
2 ***Marginal*** **-** First aid accident/ routine repair
3 ***Serious*** **-** Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** **-** major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** **-** Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			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 have 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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title: Culvert Lining Construction MO-N17-012.00

Document Number: ST-MET-10 | Rev: 5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
Working with Dangerous Substances	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 Wails 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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
Use of Excavator	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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00	Document Number	Rev
		ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
Lifting & placing of sand bags with excavator	• Overturning due to overloading, lack of support or operator error • Fall of load due to failure of lifting gear • Trapping Injuries / Impact Injuries • Contact with overhead power lines • Unsuitable ground • Wind	Site Operatives Pedestrians Oncoming traffic	2	5	H	• Capacity and type of lifting appliance determined in advance by Site Engineer. • Lifting appliance operators and banksmen must not use mobile phones once lifting operations commence • Ground conditions to be assessed by Machine operator & Site Engineer. • S.W.L to be marked and clearly visible on lifting appliance on cab. • Lifting appliance to be checked in accordance with legal requirements –12 monthly GA1 and Weekly GA2 forms • Load charts MUST be with lifting appliance • Loads must not be suspended by the lifting appliance if unattended. • CSCS training for Cranes, Excavators, Teleporters and Training Certificates/tickets for truck mounted cranes to be verified and copied to file. • Lifting slings etc to be inspected daily by user and thoroughly examined 6 monthlies by competent person. • Tag lines to be used on all lifts. • Personnel advised of trapping hazards.	L	Site Agent Site Engineer Foreman Operative Machine operator

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

Work Activity	Potential Hazards	Person(s) at Risk	Risk Rating			Control Measures (to Control and Reduce Risk)	Residual Risk Rating	Responsibility
			L	S	R			
Working 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 downstream 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
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

Method Statement & Risk Assessment

Project: NORTH WEST BRIDGES TERM MAINTENANCE CONTRACT No. 3

Project No.: C0131

Document Title:	Culvert Lining Construction MO-N17-012.00

Document Number	Rev
ST-MET-10	5

RISK RATING:

L = Likelihood
1 ***Remote***- Unlikely to occur in the relevant period**.**
2 ***Occasional***- likely to occur at least once in the relevant period.
3 ***Probable***- likely to occur several times in the relevant period

S = Severity
1 ***Negligible***- very minor, little consequence
2 ***Marginal*** - First aid accident/ routine repair
3 ***Serious*** - Loss of time/injury, illness or damage or environmental impact.
4 ***Critical*** - major injury, illness or damage, or major environmental impact.
5 ***Catastrophic*** - Death or total system loss.

R = Risk Rating (likelihood x severity)

Low (L) = 1 – 4
Medium (M) = 5– 8
High (H) = 9 – 15

GENERAL NOTES:
1) Everybody has the responsibility to familiarise themselves with the Construction Stage Health and Safety Plan and Safety Statement which is available in the Site Office.
2) Everybody has the responsibility to familiarise themselves with the site environmental plan and consider the environmental aspects when assessing the risks.
3) All activities should be in the Low (L) risk category.
4) All operatives must be SAFE PASS trained.

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. [redacted].
- Make arrangement for the transportation of injured person to the nearest ospital (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
Name of Contractor:	Jons Civil Engineering Company Ltd.
Contractor's Contact Details:	Head Office: [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.2

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

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/m²
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

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 – Boherduff culvert**	Structure Ref No.	**MO-N17-012**

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

Agent (Correspondence will issue to agent)	
Company or Organisation Name:	**Atkins (t/a WS Atkins Ireland Limited)**
Postal Address:	[redacted]
[redacted]	
[redacted]	
[redacted]	

Location and Parameters of crossing						
Watercourse:	**Unnamed Stream**			Catchment:	**Unnamed Stream**	
Address (Townland – County):		**Claremorris**				
Grid Reference	X:	**535383.06**		Y:	**776018.58**	
Hydrometric Station(s) utilized (including reference number):		**N/A**				
Area of Contributing Catchment:		**2.084**	Km^2	Road Reference:	**N17**	
Design Flood Flow:	**1.894**	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:	**Atkins (t/a WS Atkins Ireland Limited)**
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	☐

For OPW use only	*Date of Receipt*							
OPW Drainage Maintenance Region	*East*	☐	*South East*	☐	*South West*	☐	*West*	☐

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

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)
6 – Variable Catchment characteristics		0.519 (Q_{BAR})
Flood Studies Update Characteristics		0.421 (QMED)
IH 124	☒	0.586 (Q_{BAR})
Gauged Flow	☐	
Unit Hydrograph	☐	
Other	☐	
Other	☐	

FSR ☒ FSU ☒ Other ☐

Comments: Flows calculated using IH 124 method was taken forward for the hydraulic modelling as these flows were more conservative than FSR6 and FSU estimates.

Factors Applied

Type of Factor	Value Used
Climate Change	1.2
Irish Growth Curve	2.275 (FSU) 1.96 (FSR6, IH124)
Factor for Standard Error	1.37 (FSU) 1.47 (FSR6) 1.65 (IH 124)
Drained Channel	
Other	

Tidal ☐

Comments

Q100 estimates (with factors applied) from different methods:
FSU = 1.310 m3/s
FSR6 = 1.494 m3/s
IH 124 = 1.894 m3/s
(Flows presented here exclude the climate change allowances)

Hydraulic/Structure Details

Description of Structure*3	**The proposed culvert is oval in shape and made of corrugated steel. It is 24.15 m long and dimensions at entry and exit of the culvert are:** **Entrance – 3.82 m height, 4.96 m maximum width** **Exit – 3.58 m height, 4.98 m maximum width**
Effective Conveyance Area *4	**Culvert Lining Hydraulic Impact Assessment6.52 m^2**

Upstream Invert Level **63.562** mOD	Downstream Invert Level **63.529** mOD
Upstream Soffit Level **67.38** mOD	Downstream Soffit Level **67.11** mOD
Upstream Design Flood Level **65.14** mOD	Downstream Design Flood Level **65.12** 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.

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

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

Boherduff Culvert: MO-N17-012

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 Boherduff Culvert (MO-N17-012)

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 21 pages including the cover.

Document history

Document title: Boherduff Culvert (MO-N17-012)

Document reference: 5162160DG0005

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 is being undertaken to Boherduff culvert (MO-N17-012.00) 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 Boherduff culvert (MO-N17-012.00) is located underneath the national road N17 near Boherduff, approximately 1.6 km north-east of Claremorris town as indicated in Figure 2-1 below. The properties of interest for the study include those adjacent to the Knock Road, the Claremount Creche & Playschool and the Damien Fahey Steel Fabrication unit. No historical flooding has been reported at these properties (floodmaps.ie web portal).

Figure 2-1 - Boherduff culvert location

3. Existing Culvert Description

The existing culvert is made of corrugated steel and is oval in shape. The upstream face has the opening height of 4.12m, and width of 4.96m at the bottom. The downstream face has the opening height of 3.88m and width of 4.98m at the bottom. The inlet and outlet are 'mitred to slope' type. The culvert is 24.15m long.

For hydraulic modelling, the culvert is assumed as circular with the diameter of 4.12m and 3.88m (least dimensions) at the entrance and exit of the culvert respectively, as stated further in the Section 6.2.

The cross sections upstream and downstream of the culvert have the river widths approximately equal to the width of the culvert. The banks are approximately 1.5m higher than the soffit of the culvert and are flat and covered with pasture.

Figure 3-1 and Figure 3-2 represents the current condition of the culvert and the thick silt deposition suggests that the culvert is regularly drowned.

Figure 3-1 **- Boherduff culvert entrance**

Figure 3-2 - Boherduff culvert

4. Proposed Works

The proposed works consist of cleaning out the silt from the existing culvert and lining the culvert with 150mm thick reinforced concrete for the bottom-third of the culvert, as detailed in Figure 4-1. However, for the purpose of hydraulic assessment, the culvert has been assumed to be lined at the top as well, as discussed further in Section 6.2.

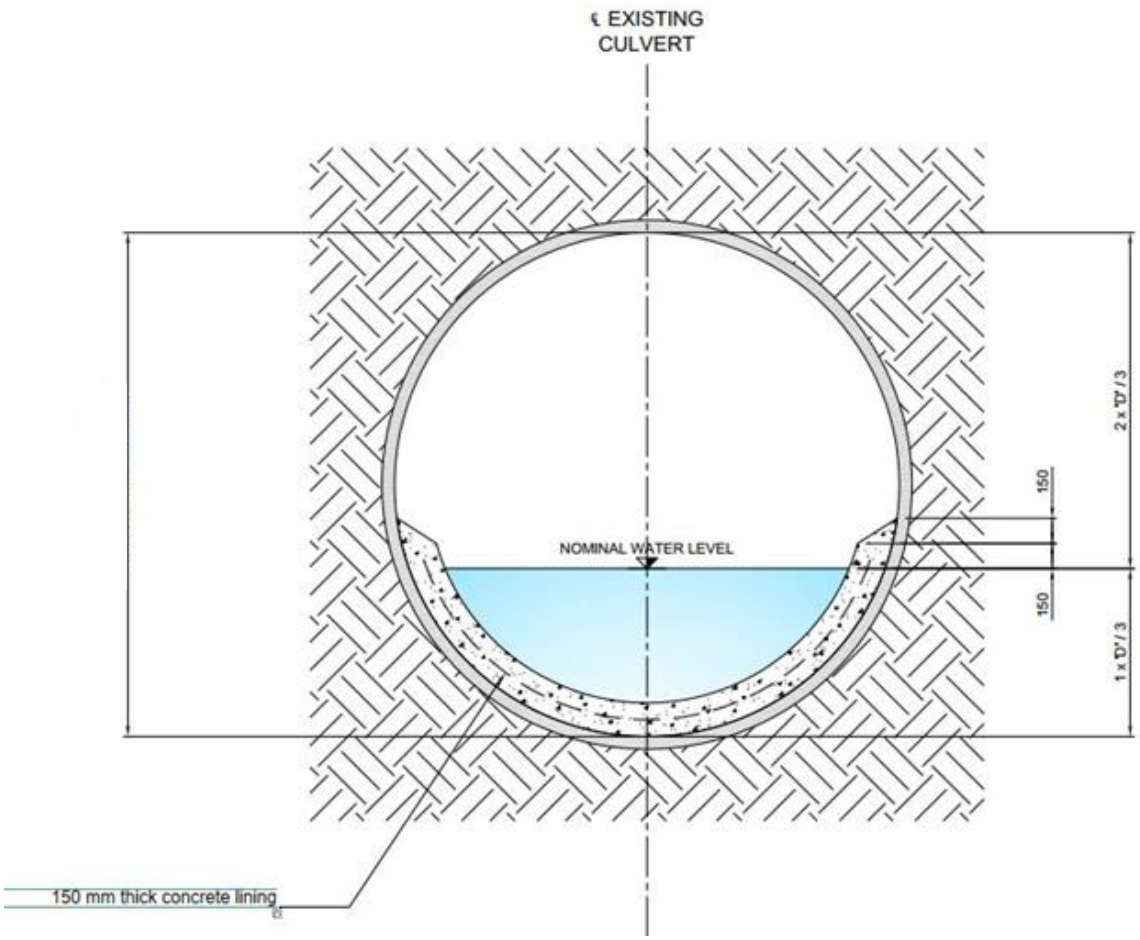


Figure 4-1 - Typical proposed culvert section

5. Catchment Description

The existing culvert is on an un-named tributary to the River Robe, and approximately 6.3 km upstream of the confluence with River Robe. The catchment has an area of 2.297 km^2 and is mainly rural with small urban settlements near Claremont from where the tributary originates. The outlet node of the ungauged catchment is slightly downstream of the Boherduff culvert (Location Number: 30_3415_2, FSU Portal). The Boherduff culvert drainage catchment and the culvert location are shown in Figure 5-1.

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 given by S1085 (3.1961 m/km). The catchment is flashy as it is moderately impermeable (BFISOIL = 0.6077), and there is no attenuation due to lakes/reservoirs (FARL = 1). This indicates that the catchment has a quick response to the rainfall events.

No existing flood risk to the properties of interest have been identified based on historical reports from floodmaps.ie web portal.

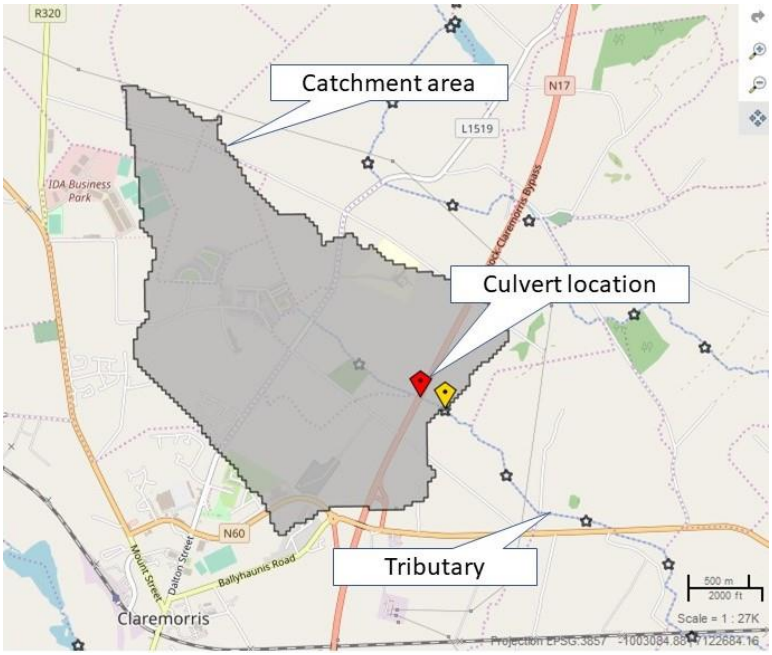


Figure 5-1 - Catchment upstream of Boherduff culvert

Table 5-1 - Physical catchment descriptors of the ungauged catchment from FSU portal

Location Number	30_3415_2
Contributing Catchment Area	2.297 km^2
BFISOIL	0.6077
SAAR	1160.8 mm
FARL	1
DRAIND	0.291 km/km^2
S1085	3.1961 m/km
ARTDRAIN2	1
URBEXT	0.0316
Centroid Distance	14.4759 km

5.1. Flow Assessment

For the assessment of inflows to the hydraulic model, the catchment was assessed by three methods such as Flood Studies Update (FSU), FSR6 and IH124. Since the catchment area is small (<25 km^2), the FSU method is not applicable. However, to obtain the catchment parameters and for comparative purposes, the FSU method was considered.

5.1.1. Flood Studies Update (FSU) Programme Method

The catchment that drains to the Boherduff culvert is smaller than the catchment used in the FSU Portal to compute QMED, with the latter having an additional area of 0.213 km^2 downstream of the Knock-Claremorris Bypass. To reduce the flow pro-rata by area, a multiplying factor has been applied to the QMED estimate, which is computed as below:

$$Flow\ reduction\ factor = \frac{catchment\ of\ the\ culvert}{catchment\ from\ FSU\ Portal} = \frac{(2.297 - 0.213)}{2.297} = 0.907$$

The PCD rural estimate of QMED for the downstream ungauged outlet from the FSU Portal is 0.4636 m^3/s, hence for the culvert upstream, QMED is calculated as 0.421 m^3/s (0.4636 x 0.907).

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 3.0463 (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 (for 68% confidence interval - upper limit) to ensure that the flows are not underestimated, and the final QMED values was calculated to be **0.576 m^3/s** (0.421 x 1.37).

FSU 100yr Design Flow Estimation

Pooled flood frequency analysis is the recommended approach for ungauged catchments to derive flood growth curves. Suitable donor stations with sufficient gauging data availability are grouped and analysed to derive growth factors for different return periods.

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	0.78	1	1.33	1.55	1.76	1.88	2.03	2.23	2.43	2.7	2.9

Figure 5-2 - Growth factors from FSU Portal

The growth factor of 2.23 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 2.275. Finally, the 100-year flood (Q100) is calculated as **1.31 m^3/s**.

A multiplying factor of 1.2 was applied to the above value to obtain 100-year flood with 20% climate change (Q100C1) as **1.572 m^3/s.** Table 5-2 summarizes the design flows for Boherduff culvert from the FSU analysis.

Table 5-2 - Design flows for Boherduff culvert

Event	Design flood (m^3/s)
QMED	0.576
Q100	1.310
Q100C1	1.572

5.1.2. FSR6 Analysis for Boherduff Culvert

The FSR 6-variable equation for estimating mean annual flood (QBAR) for an ungauged catchment is:

$$QBAR = 0.0172\ Area^{0.94}\ STMFRQ^{0.27}\ S1085^{0.16}\ SOIL^{1.23}\ RSMD^{1.03}\ (1 + LAKE)^{-0.85}$$

A desktop study was carried out to determine the values of the parameters for the Boherduff culvert catchment. The soil for the catchment was classified into Class 2 based on maps from the UKSUDS website. The description of parameters of the FSR 6-variable equation and the determined values for the catchment are listed in Table 5-3.

Table 5-3 - FSR6 Parameters

Parameter	Description	Values
Area	Catchment area (km^2)	2.084
STMFRQ[#]	Stream frequency (no units)	1.042
S1085	Main stream slope (m/km)	3.196
SOIL	Soil index (no units)	0.3
RSMD[##]	1-day net rainfall (mm)	48.61
LAKE	Lake contributing area (km^2)	0.000

[#] *STMFRQ = (catchment area) / (main stream length * no. of junctions) = 2.084 / (2.0*1) = 1.042*

[##] *RSMD = ($M_{5\text{-}1day}$ * ARF) – SMD = (49.4 * 0.984) – 0.0 = 48.61 (SMD assumed 0.0 for worst case)*

SOIL factor is derived from WRAP maps

Based on the above values of the parameters, the QBAR was calculated. Further, the standard factorial error of 1.47 (for 68% confidence interval) was applied. For FSR6 method, the growth factor for 1 in 100-year flood is 1.96 (Flood Studies Report). Thus, the flows estimated are listed in Table 5-4.

Table 5-4 – Design flow estimates – FSR6 method

Event	Flow (m3/s)
QBAR	0.762
Q100	1.494
Q100C1	1.793

5.1.3. 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 Boherduff 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 Boherduff culvert catchment. The soil for the catchment was classified into Class 2 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 5-5.

Table 5-5 - IoH 124 parameters

Parameter	Description	Values
Area	Catchment area (km^2)	2.084
SAAR	Standard Average Annual Rainfall (mm)	1160.8
SOIL	Soil index (no units)	0.3

The values listed above were applied to the calculations, and the QBAR was calculated. Further, the standard factorial error of 1.65 (for 68% confidence interval) was applied and the estimate.For IoH 124 method, the growth factor for 1 in 100-year flood is 1.96 (Flood Studies Report). Thus, the flows estimated are listed in Table 5-6.

Table 5-6 - Q100 - IoH 124 method

Event	Flow (m^3/s)
QBAR	0.966
Q100	1.894
Q100C1	2.273

Table 5-7 - Comparison of Q100 estimates

Event	Flow (m^3/s)
FSU	1.310
IH124	1.894
FSR6	1.494

The flows determined using the three methods discussed in Section 1.1.1, Section 5.1.2 and Section 5.1.3 were reviewed. The FSU analysis was carried out just for comparative purposes as it is applicable on catchment areas greater than 25 km^2.

The comparison of Q100 estimates (Table 5-7) from different methods are comparable, thereby indicate the robustness and reliability of estimates for the study area. The FSR6 and IH124 methods are better suited for catchment sizes greater than 0.4 km^2 and 1.5 km^2 respectively. The flows computed using IoH 124 methodology was taken forward for hydraulic modelling as these flows are more conservative.

The QMED event corresponds to the median flood flow (1 in 2-year return period) and is a reasonable estimate for low flows as there is 50% exceedance probability. The QMED flow for IoH 124 method is estimated as:

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

Thus, QMED is computed as (0.966/1.07) = **0.903 m^3/s.** The summary of flows taken forward for hydraulic modelling is listed in Table 5-8.

Table 5-8 - Design flow estimates for hydraulic modelling - derived by IH124 method

Event	Flow (m^3/s)
QMED	0.903
Q100	1.894
Q100C1	2.273

6. Development of Hydraulic Model

A 1D hydraulic model was developed for the tributary with the Boherduff culvert added. The purpose was to estimate the impact of the proposed lining on the culvert capacity, 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 flowing are the main assumptions in the hydraulic model development:

1. The shape of the culvert is assumed to be circular from the information available from survey data
2. The culvert inlet unit was assumed to be mitred to slope type, corresponding to corrugated metal conduits
3. 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)
4. For model simplification, lining is assumed to be done all round inside the culvert for the proposed scenario.

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 184m upstream of the culvert, and 200m 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.

The survey data doesn't provide enough information about the soft bed depths. Also, in the proposed scenario, silt deposition has not been accounted as the objective is to assess the impact of the concrete liner which results in a smoother flow through the culvert. Hence, based on the photographs, for the existing culvert, the deposited silt is assumed to increase the roughness only, and not reduce the diameter of the culvert.

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 Boherduff culvert

Watercourse Features	Manning's Roughness
River bed	0.040
River banks	0.060
Culvert bottom (existing)	0.035
Culvert top (existing)	0.029
Culvert bottom (proposed)	0.035
Culvert top (proposed)	0.012

6.5. Boundary Conditions

A constant flow 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 408.6m along the unnamed tributary to the River

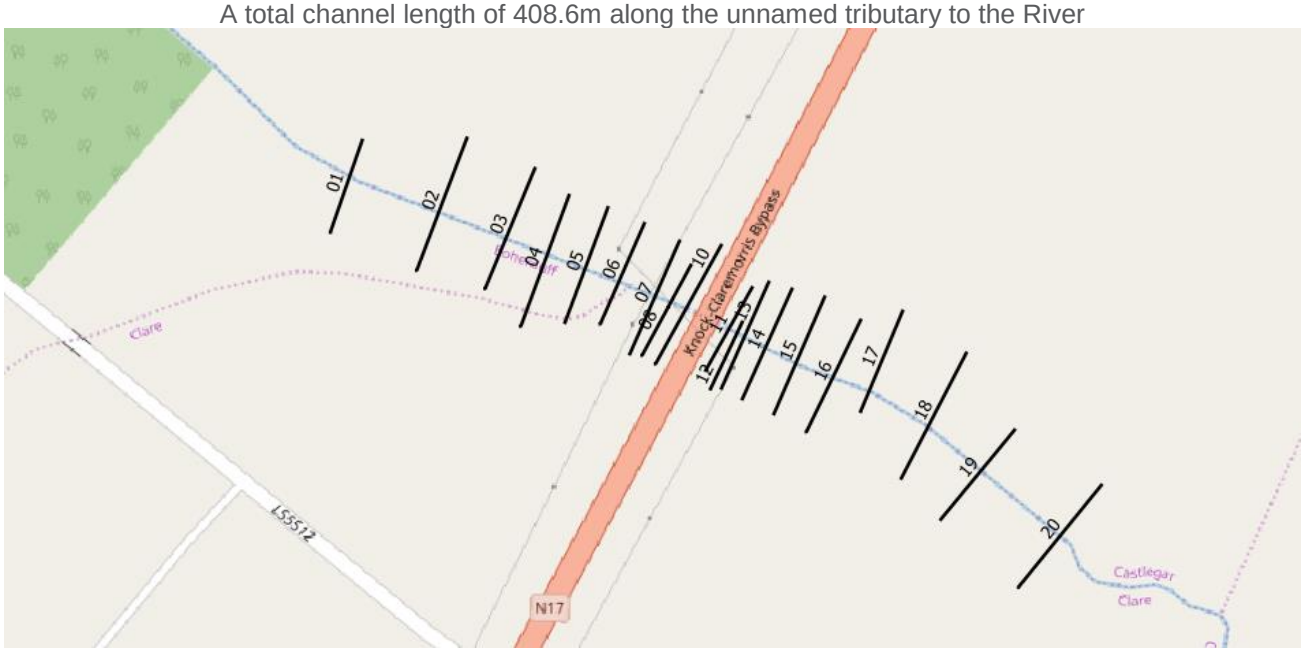


Figure 6-1 – Location of cross sections

The cross sections and their relative positions to the culvert is tabulated in Table 6-2.

Table 6-2 - Cross section locations

Cross section label	Relative distance to Boherduff culvert
BHR_01	184 from upstream face of culvert
BHR_02	135 from upstream face of culvert
BHR_03	98 from upstream face of culvert
BHR_04	76 from upstream face of culvert
BHR_05	55 from upstream face of culvert
BHR_06	37 from upstream face of culvert
BHR_07	17 from upstream face of culvert
BHR_08	8 from upstream face of culvert
BHR_10	upstream face of culvert
BHR_11	downstream face of culvert
BHR_12	5 from downstream face of culvert
BHR_13	9 from downstream face of culvert
BHR_14	21 from downstream face of culvert
BHR_15	38 from downstream face of culvert
BHR_16	58 from downstream face of culvert
BHR_17	78 from downstream face of culvert
BHR_18	113 from downstream face of culvert
BHR_19	148 from downstream face of culvert
BHR_20	201 from downstream face of 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 top of the culvert to represent the concrete liner, considering that the silt will be deposited at the bottom of the culvert post-lining also (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	63.412	67.53	4.118	63.562	67.38	3.818
Culvert exit	63.379	67.26	3.881	63.529	67.11	3.581
Culvert length	24.146m			24.146m		

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 - Long section plot - Q100.

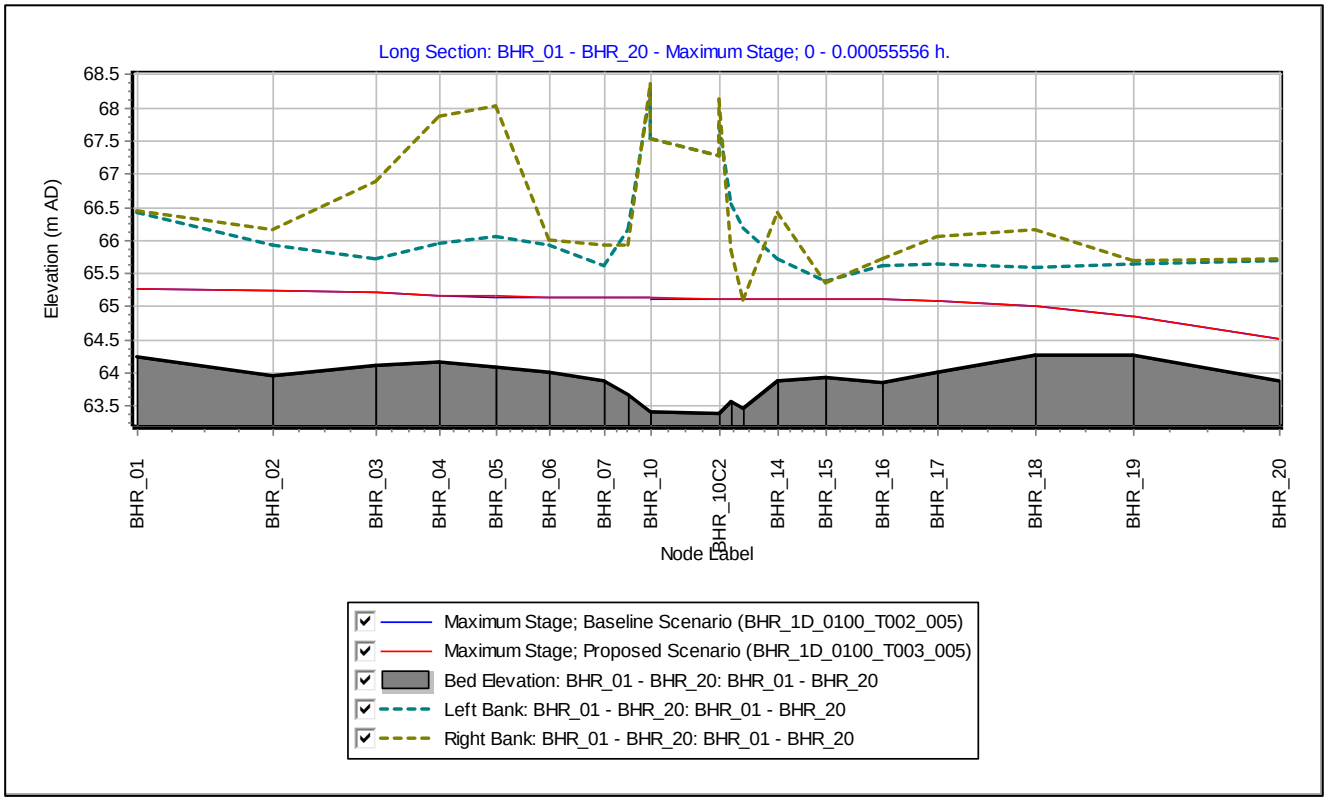


Figure 7-1 - Long section plot - Q100

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 impact is negligible, with the maximum increase in the water level being only 7mm. There is enough freeboard available (2.247m) in the proposed scenario. The flow remains in-channel and hence the properties are not expected to be at risk due to the proposed works. The N17 road is also not overtopped due to the lining works.

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 Boherduff 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 ~70mm. There are no changes predicted downstream of the culvert.

There is enough freeboard available (2.106m) in the proposed scenario. Hence, the results indicate that no extra allowances are needed during proposed works to account for a climate change event. Therefore, the assumption of an all-round lining to the culvert does not impact the hydraulic results.

7.3. Impact on the Low Flows

To assess the availability of water for fish passage during low flows, the hydraulic model was assessed for the QMED event. The model simulated flow depths are tabulated in Table 8-2 and flow velocity in Table 8-3

The modelling results in Table 8-2 suggest that for the baseline scenario, the depth of flow is 1.465 m at the upstream and 1.493 m at the downstream end of the culvert. The corresponding flow velocities are in the range of 0.33 m/s to 0.165 m/s for the upstream and downstream ends respectively (Table 8-3).

From Table 8-2, it can be noted that the proposed works causes the flow depth at the upstream end of the culvert to have a small increase by 3 mm, to 1.468 m. There is a corresponding decrease in velocity from 0.330 m/s to 0.328 m/s. At the downstream, the flow depth and velocity remains unchanged at 1.493 m and 0.165 m/s.

From the above analysis, the proposed works is not expected to cause significant worsening of the present situation. The flow depth and velocity in the watercourse post-lining are not expected to affect fish movement.

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.
- IoH 124 methodology has been used to derive flows for QMED, Q100 and Q100C1, their magnitudes being 0.903 m^3/s, 1.894 m^3/s and 2.273 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 Boherduff culvert post lining.
- For the Q100 and Q100C1 events, the predicted increase in the maximum stage is in the range of 7 mm to 70 mm. The change due to the proposed works is within the OPW limit of 300 mm.
- A minimum freeboard of 2.106 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 flow velocity in the watercourse is also acceptable. Hence, the proposed works is not expected to cause significant worsening of the present situation with regards to fish passage.
- For the events analysed, the properties and N17 road are not expected to be at flood risk due to the proposed works

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
BHR_01	0	64.982	64.983	0.002	65.267	65.272	0.004	65.355	65.399	0.044
BHR_02	48.831	64.968	64.970	0.002	65.248	65.253	0.005	65.334	65.381	0.047
BHR_03	85.53	64.952	64.954	0.002	65.223	65.228	0.005	65.306	65.357	0.051
BHR_04	108.047	64.906	64.909	0.003	65.173	65.180	0.006	65.256	65.318	0.061
BHR_05	128.635	64.889	64.892	0.003	65.152	65.159	0.007	65.233	65.300	0.066
BHR_06	147.169	64.883	64.886	0.003	65.144	65.151	0.007	65.225	65.293	0.068
BHR_07	167.067	64.883	64.886	0.003	65.145	65.152	0.007	65.226	65.295	0.068
BHR_08	175.529	64.882	64.885	0.003	65.144	65.151	0.007	65.225	65.294	0.068
BHR_10	183.932	64.877	64.880	0.003	65.132	65.139	0.007	65.211	65.281	0.071
BHR_10C1	183.932	64.875	64.878	0.002	65.127	65.133	0.005	65.205	65.274	0.069
BHR_10C2	208.078	64.873	64.875	0.001	65.123	65.125	0.003	65.199	65.203	0.003
BHR_11	208.078	64.872	64.872	0.000	65.120	65.120	0.000	65.196	65.196	0.000
BHR_12	212.706	64.872	64.872	0.000	65.119	65.119	0.000	65.195	65.195	0.000
BHR_13	216.887	64.872	64.872	0.000	65.119	65.119	0.000	65.195	65.195	0.000
BHR_14	228.957	64.871	64.871	0.000	65.117	65.117	0.000	65.193	65.193	0.000
BHR_15	246.294	64.869	64.869	0.000	65.114	65.114	0.000	65.189	65.189	0.000
BHR_16	266.469	64.865	64.865	0.000	65.105	65.105	0.000	65.178	65.178	0.000
BHR_17	286.157	64.860	64.860	0.000	65.094	65.094	0.000	65.166	65.166	0.000
BHR_18	321.409	64.810	64.810	0.000	65.016	65.016	0.000	65.080	65.080	0.000
BHR_19	356.479	64.669	64.669	0.000	64.852	64.852	0.000	64.911	64.911	0.000
BHR_20	408.597	64.329	64.329	0.000	64.517	64.517	0.000	64.578	64.578	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
BHR_01	0	0.748	0.749	0.002	1.033	1.038	0.004	1.121	1.165	0.044
BHR_02	48.831	1.013	1.015	0.002	1.293	1.298	0.005	1.379	1.426	0.047
BHR_03	85.53	0.847	0.849	0.002	1.118	1.123	0.005	1.201	1.252	0.051
BHR_04	108.047	0.745	0.748	0.003	1.012	1.019	0.006	1.095	1.157	0.061
BHR_05	128.635	0.823	0.826	0.003	1.086	1.093	0.007	1.167	1.234	0.066
BHR_06	147.169	0.880	0.883	0.003	1.141	1.148	0.007	1.222	1.290	0.068
BHR_07	167.067	1.019	1.022	0.003	1.281	1.288	0.007	1.362	1.431	0.068
BHR_08	175.529	1.208	1.211	0.003	1.470	1.477	0.007	1.551	1.620	0.068
BHR_10	183.932	1.465	1.468	0.003	1.720	1.727	0.007	1.799	1.869	0.071
BHR_10C1	183.932	1.463	1.466	0.002	1.715	1.721	0.005	1.793	1.862	0.069
BHR_10C2	208.078	1.494	1.496	0.001	1.744	1.746	0.003	1.820	1.824	0.003
BHR_11	208.078	1.493	1.493	0.000	1.741	1.741	0.000	1.817	1.817	0.000
BHR_12	212.706	1.320	1.320	0.000	1.567	1.567	0.000	1.643	1.643	0.000
BHR_13	216.887	1.426	1.426	0.000	1.673	1.673	0.000	1.749	1.749	0.000
BHR_14	228.957	1.003	1.003	0.000	1.249	1.249	0.000	1.325	1.325	0.000
BHR_15	246.294	0.940	0.940	0.000	1.185	1.185	0.000	1.260	1.260	0.000
BHR_16	266.469	1.026	1.026	0.000	1.266	1.266	0.000	1.339	1.339	0.000
BHR_17	286.157	0.864	0.864	0.000	1.098	1.098	0.000	1.170	1.170	0.000
BHR_18	321.409	0.560	0.560	0.000	0.766	0.766	0.000	0.830	0.830	0.000
BHR_19	356.479	0.421	0.421	0.000	0.604	0.604	0.000	0.663	0.663	0.000
BHR_20	408.597	0.445	0.445	0.000	0.633	0.633	0.000	0.694	0.694	0.000

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

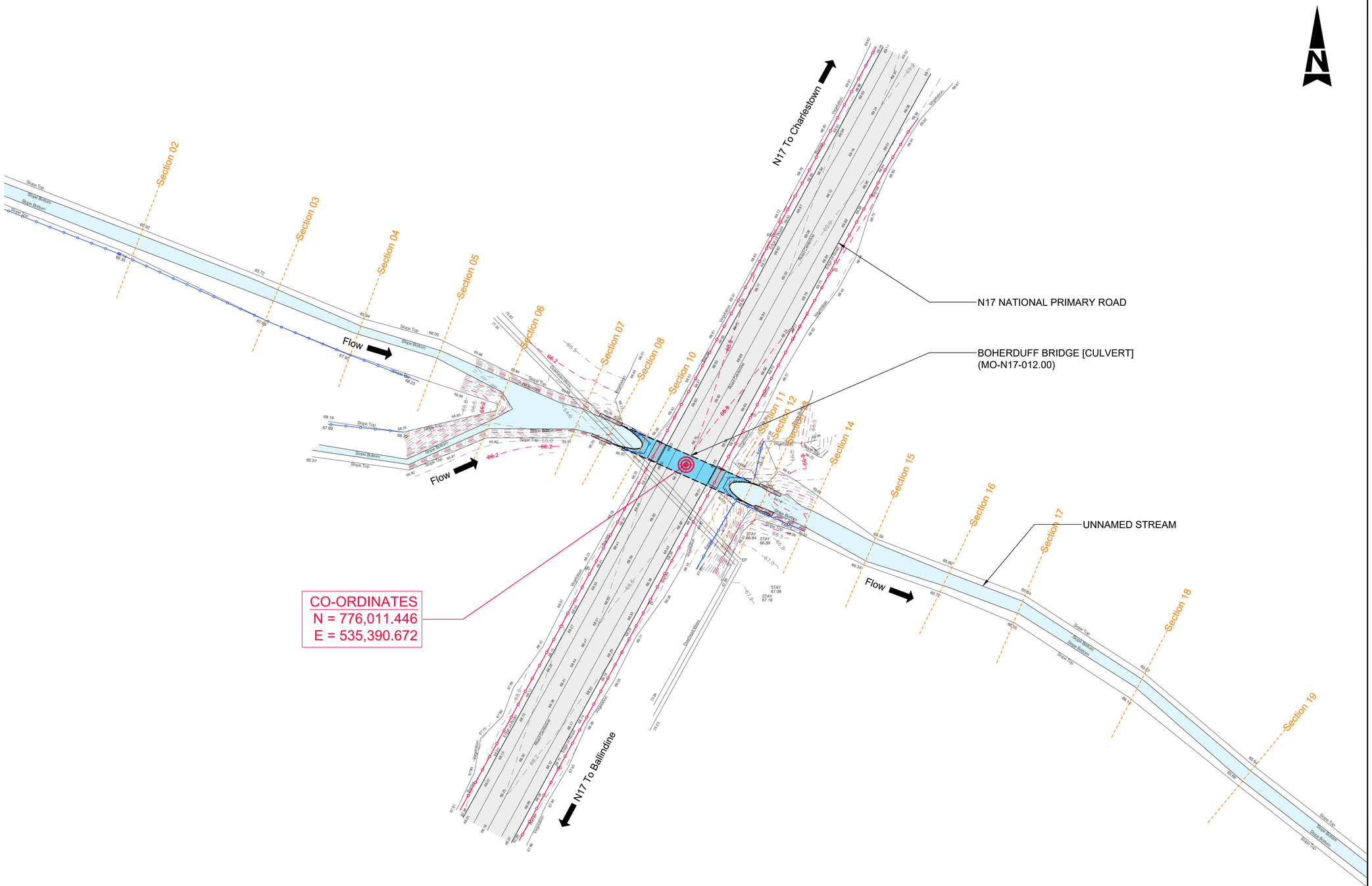
Node Label (upstream to downstream)	Chainage (m)	Maximum velocity in m/s		
		Baseline	Proposed	Difference
BHR_01	0	0.388	0.387	-0.001
BHR_02	48.831	0.258	0.258	-0.001
BHR_03	85.53	0.373	0.372	-0.001
BHR_04	108.047	0.677	0.672	-0.005
BHR_05	128.635	0.413	0.411	-0.002
BHR_06	147.169	0.328	0.326	-0.002
BHR_07	167.067	0.186	0.185	-0.001
BHR_08	175.529	0.162	0.162	0.000
BHR_10	183.932	0.330	0.328	-0.001
BHR_10C1	183.932	0.213	0.258	0.045
BHR_10C2	208.078	0.215	0.261	0.046
BHR_11	208.078	0.165	0.165	0.000
BHR_12	212.706	0.166	0.166	0.000
BHR_13	216.887	0.154	0.154	0.000
BHR_14	228.957	0.179	0.179	0.000
BHR_15	246.294	0.180	0.180	0.000
BHR_16	266.469	0.264	0.264	0.000
BHR_17	286.157	0.293	0.293	0.000
BHR_18	321.409	0.662	0.662	0.000
BHR_19	356.479	0.853	0.853	0.000
BHR_20	408.597	0.886	0.886	0.000

Appendices

Appendix A. Survey Data & Proposed Construction Drawings

A1

DO NOT SCALE



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 20, REFER TO TOPOGRAPHICAL SURVEY DRAWINGS

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
Oifig Boichte Naisiunta
Ohun 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

ATKINS
Member of the SNC-Lavalin Group

[redacted]

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

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

Purpose: ISSUED FOR REVIEW

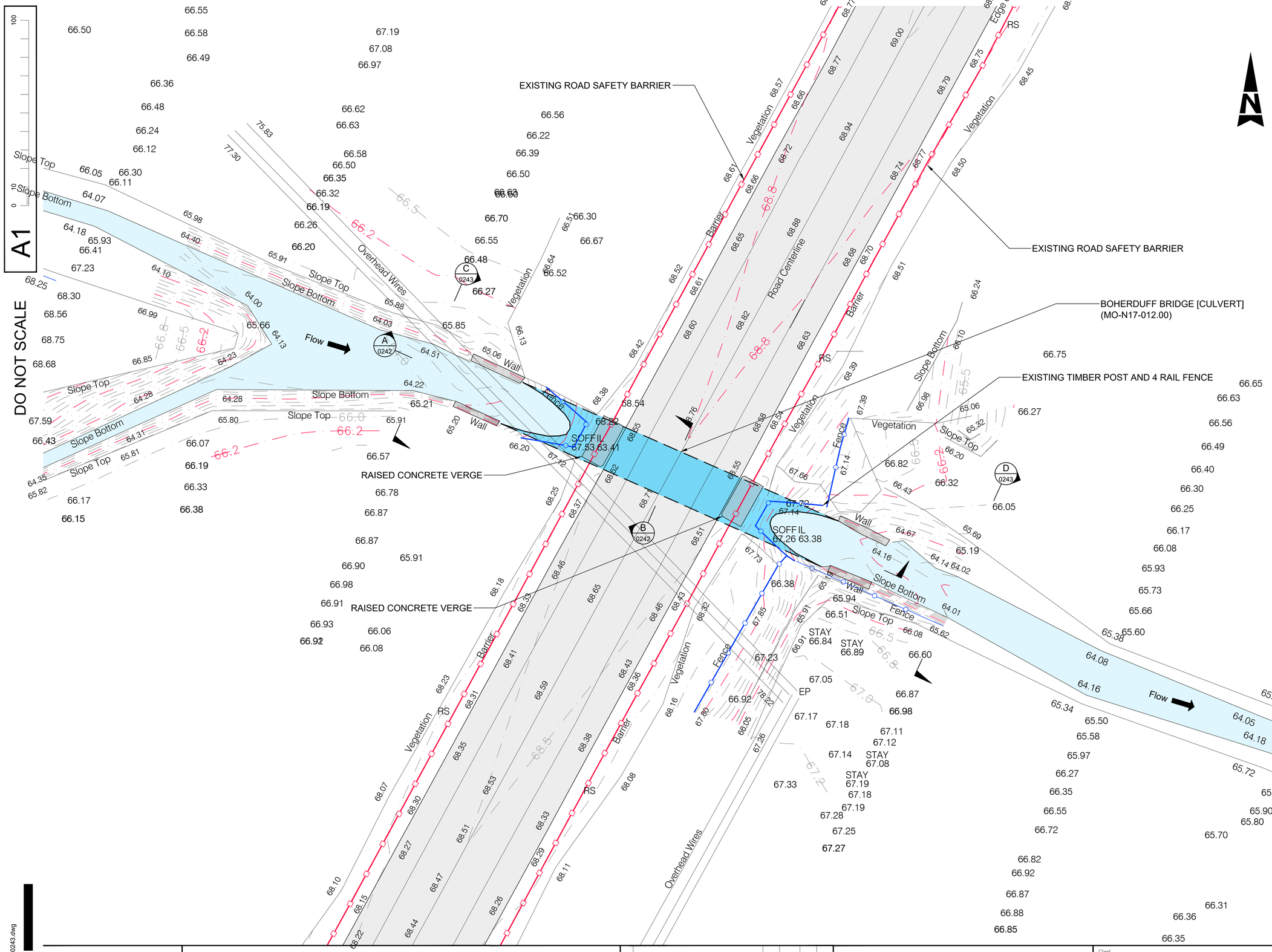
Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SITE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:500	AOS Date 31/10/19	MG Date 31/10/19	MJ Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0240	A

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 20, 2020 - 8:50am

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg



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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
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

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING STRUCTURE LAYOUT PLAN

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 31/10/19	Date 31/10/19	Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0241	A

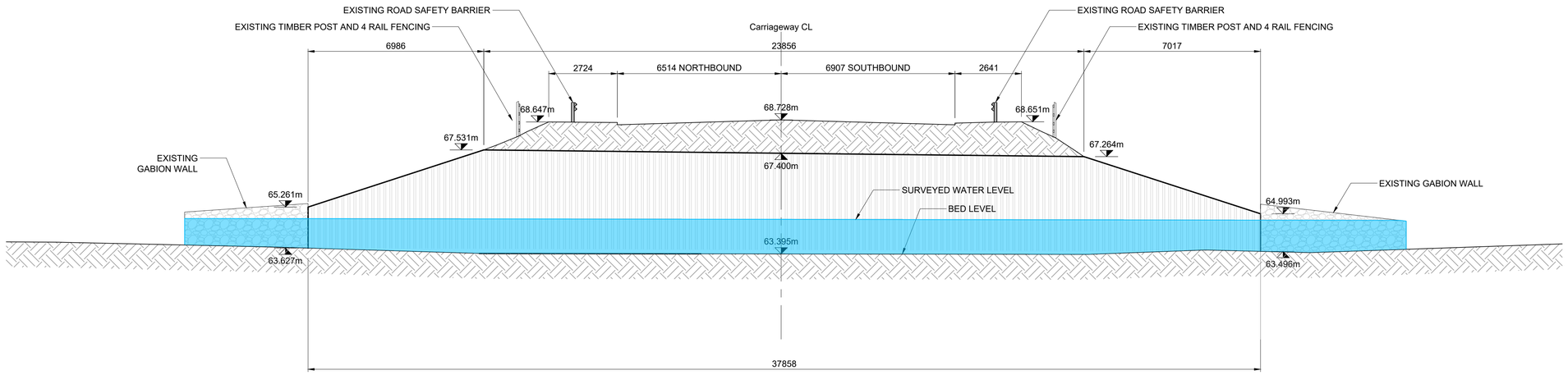
File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 19, 2020 - 4:29pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg

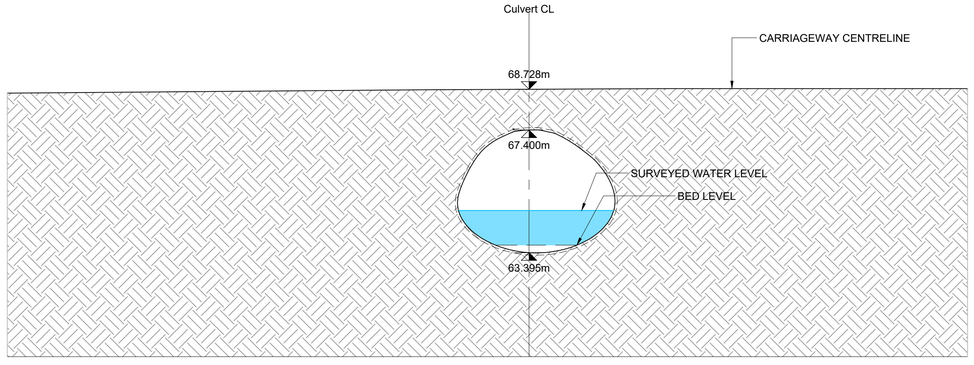
100
0
10

A1

DO NOT SCALE



SECTION A
SCALE 1:100 0241



SECTION B
SCALE 1:100 0241

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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Donegal
Oifig Bóithe Náisiúnta
Ohun 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

ATKINS
Member of the SNC-Lavalin Group

Client
TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project
NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose
ISSUED FOR REVIEW

Title
BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SECTIONS A AND B

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 31/10/19	Date 31/10/19	Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0242	A

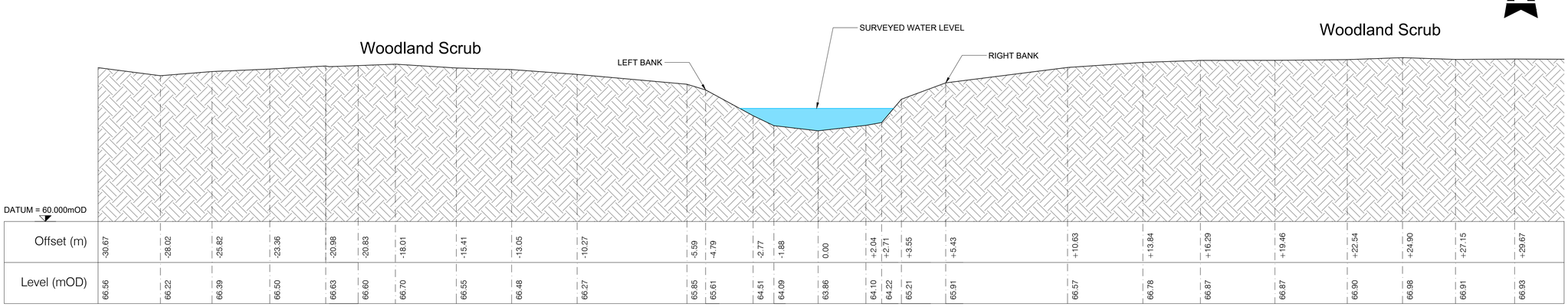
File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 15, 2020 - 12:03pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg

A1

0 10 100

DO NOT SCALE

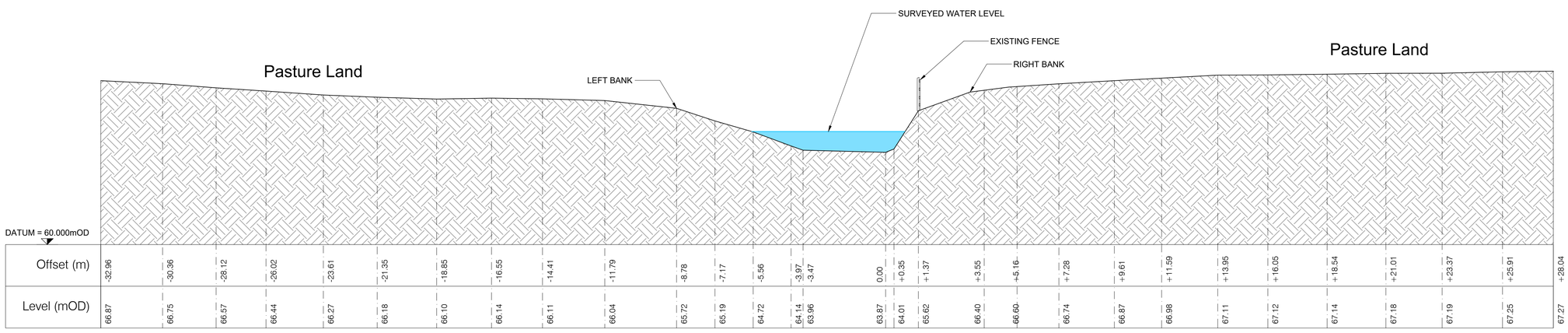


Offset (m)	-30.67	-28.02	-25.82	-23.36	-20.98	-20.83	-18.01	-15.41	-13.05	-10.27	-5.59	-4.79	-2.77	-1.88	0.00	+2.04	+2.71	+3.55	+5.43	+10.63	+13.84	+16.29	+19.46	+22.54	+24.90	+27.15	+29.67
Level (mOD)	66.56	66.22	66.39	66.50	66.63	66.60	66.70	66.55	66.48	66.27	65.85	65.61	64.51	64.09	63.86	64.10	64.22	65.21	65.91	66.57	66.78	66.87	66.87	66.90	66.98	66.91	66.93

SECTION C
SCALE 1:100
0241

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



Offset (m)	-32.96	-30.36	-28.12	-26.02	-23.61	-21.35	-18.85	-16.55	-14.41	-11.79	-8.78	-7.17	-5.56	-3.97	-3.47	0.00	+0.35	+1.37	+3.55	+5.16	+7.28	+9.61	+11.59	+13.95	+16.05	+18.54	+21.01	+23.37	+25.91	+28.04
Level (mOD)	66.87	66.75	66.57	66.44	66.27	66.18	66.10	66.14	66.11	66.04	65.72	65.19	64.72	64.14	63.96	63.87	64.01	65.62	66.40	66.60	66.74	66.87	66.98	67.11	67.12	67.14	67.18	67.19	67.25	67.27

SECTION D
SCALE 1:100
0241

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Oifig Bóithe Náisiúnta
Údarás 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

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

Project: NOR WEST BRIDGES TERM INTENANCE CONTRACT NR.3

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) REMEDIAL WORKS EXISTING SECTIONAL ELEVATIONS C AND D

Original Scale	Des/Drawn	Checked	Authorised
1:100	AOS	MG	MJ
	Date 31/10/19	Date 31/10/19	Date 31/10/19

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0243	A

File: 5162160-HTR-DR-0240 to 0243.dwg
Date: May 15, 2020 - 12:04pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0240 to 0243.dwg

A1

DO NOT SCALE

EXISTING ROAD SAFETY BARRIER

EXISTING ROAD SAFETY BARRIER

BOHERDUFF BRIDGE [CULVERT]
(MO-N17-012.00)

EXISTING TIMBER POST AND 4 RAIL FENCE

RAISED CONCRETE VERGE

REMOVE AND DISPOSE OF EXISTING BED MATERIAL
(AVERAGE DEPTH 600mm).
PLACE 300mm THICK CLASS 6F CAPPING MATERIAL ON
TERRAM 2000 GT OR EQUIVALENT APPROVED AS A
WORKING PLATFORM.
ON COMPLETION OF THE WORKS PLACE 300mm THICK
CLEAN NATURAL GRAVEL TO IFI REQUIREMENTS ON TOP
OF THE WORKING PLATFORM.

RAISED CONCRETE VERGE

REMOVE AND DISPOSE OF EXISTING BED MATERIAL
(AVERAGE DEPTH 600mm).
PLACE 300mm THICK CLASS 6F CAPPING MATERIAL ON
TERRAM 2000 GT OR EQUIVALENT APPROVED AS A
WORKING PLATFORM.
ON COMPLETION OF THE WORKS PLACE 300mm THICK
CLEAN NATURAL GRAVEL TO IFI REQUIREMENTS ON TOP
OF THE WORKING PLATFORM.

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
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

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

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) PROPOSED REMEDIAL WORKS -SHEET 1 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

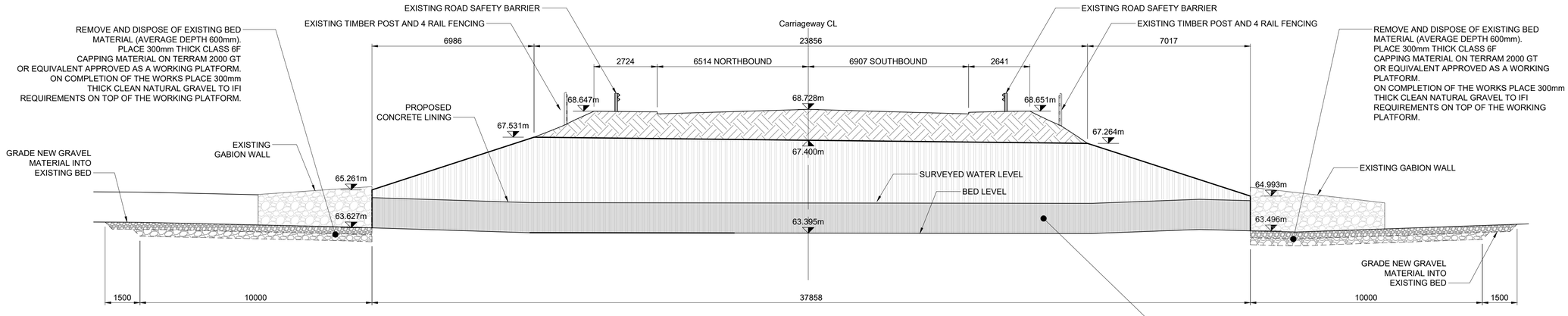
Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0245	-

File: 5162160-HTR-DR-0245 to 0246.dwg
Date: May 19, 2020 - 4:36pm

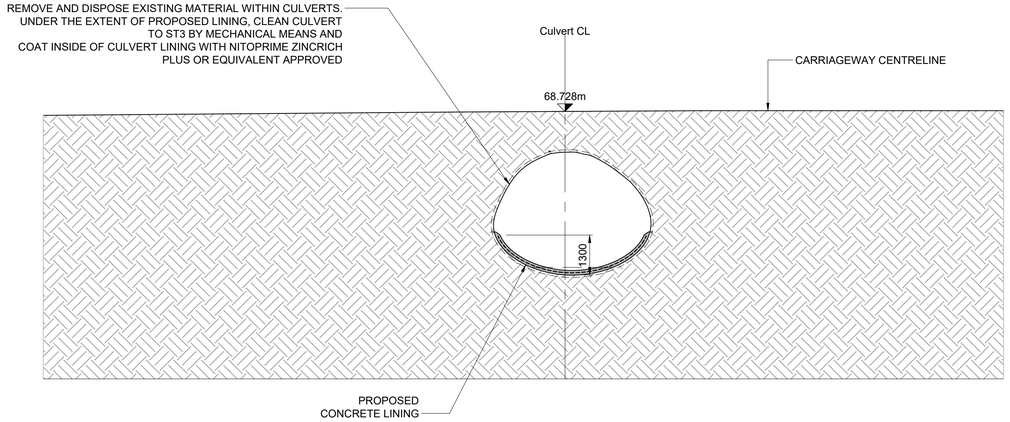
V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0245 to 0246.dwg

A1

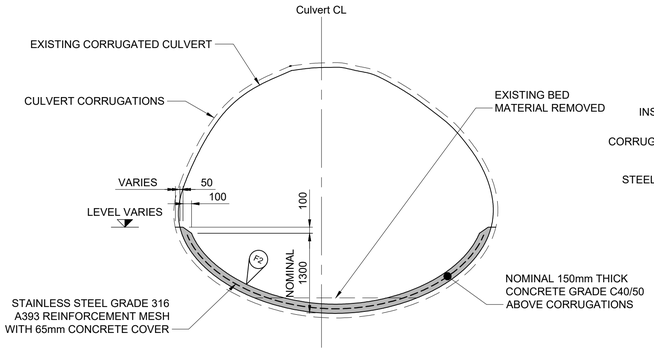
DO NOT SCALE



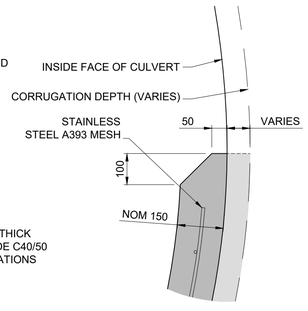
SECTION A
SCALE 1:100 — 0245



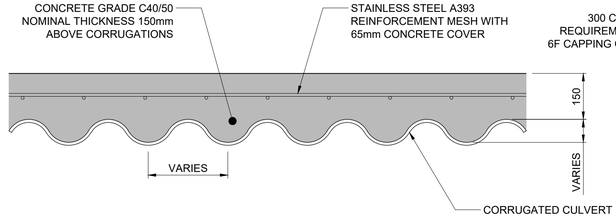
SECTION B
SCALE 1:100 — 0245



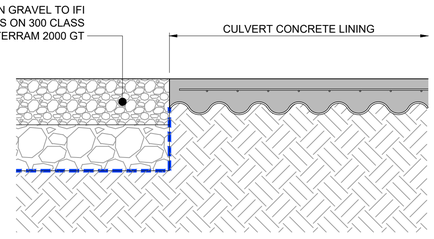
TYPICAL CULVERT CROSS SECTION
Scale at A1 1:50
Scale at A3 1:100



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

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
-	ISSUED FOR REVIEW	AOS	05/20	MJ	MJ

ATKINS
Member of the SNC-Lavalin Group

Client: TRANSPORT INFRASTRUCTURE IRELAND (TII)

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

Purpose: ISSUED FOR REVIEW

Title: BOHERDUFF BRIDGE [CULVERT] (MO-N17-012.00) PROPOSED REMEDIAL WORKS -SHEET 2 OF 2

Original Scale	Des/Drawn	Checked	Authorised
1:200	AOS	MG	MJ
	Date 14/05/20	Date 14/05/20	Date 14/05/20

Status	Drawing Number	Rev
P	5162160 / HTR / DR / 0245	-

File: 5162160-HTR-DR-0245 to 0246.dwg
Date: May 15, 2020 - 1:14pm

V:\5162160\6 Dwgs-Graphics\61 AutoCad\5162160-HTR-DR-0245 to 0246.dwg

[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]

_____

[redacted]

Engineering Services Administration Unit
23rd June 2020

Ceann Oifig, Sráid Jonathan Swift, Baile Átha Troim, Co. na Mí, C15 NX36
Head Office, Jonathan Swift Street, Trim, Co. Meath, C15 NX36
T +353 46 942 6000 | info@opw.ie
www.opw.ie

[redacted]