McCloy Consulting

Surface Water Management Plan

Kellystown Wind Farm

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DISTRIBUTION

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APPENDICES

1 INTRODUCTION

This report has been reviewed and updated where necessary considering any subsequent modifications, updates, and additional information acquired for the Further Information Request issued by Louth County Council (LCC) on the 6th February 2025 (Reference No: 2460766). It is noted that for ease of reference, all changes from the original report are shown in orange. Where text has been removed, it is shown as ~~strikethrough~~.

Following a review of the proposed development based on the Request for Further Information, it has been determined that site entrance 4 is not required for the construction, operation and decommissioning of the proposed development, as all works can be accommodated via the proposed site entrances 1-3. Therefore, it is proposed that entrance 4 will not be taken forward as part of the proposed development, and the initially proposed use of entrance 4 will instead be accommodated at entrance 2. The author of this chapter has reviewed the revision, and no implications for the assessment presented in this chapter have been identified.

1.1 Terms of Reference

EDF via its lead consultant (Jennings O'Donovan) has appointed McCloy Consulting Ltd to prepare a Surface Water Management Plan (SWMP) to support a planning application for the proposed Kellystown Wind Farm (the Proposed Development).

The purpose of this SWMP assessment is to provide further details of proposed mitigation measures specifically in relation to management of surface water from the Proposed Development where there is initially a perceived risk of deterioration in the Water Framework Directive (WFD) ecological status of any affected waterbody (refer to section 1.3 for further information), which would similarly be reflected as a significant adverse impact in Environmental Impact Assessment terms.

This appendix is intended to supplement the Environmental Impact Assessment Report (EIAR) specifically **Chapter 11: Hydrology and Hydrogeology** and Technical **Appendix 11.3 Water Framework Directive Assessment** submitted in support of the planning application for the proposal.

1.2 Statement of Authority

McCloy Consulting is an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological assessments, sustainable drainage systems (SuDS), drainage, river modelling, and flood risk assessment.

McCloy Consulting has ongoing involvement in numerous water environment studies and Sustainable Drainage Systems (SuDS) projects across the UK and Ireland and has developed expertise in surface water management for wind farms. The company has successfully designed numerous SuDS/surface water management solutions for wind farms in accordance with current best practice guidance. The primary personnel responsible for preparing this SWMP / WFD assessment are:

- Iain Muir MSc CEnv MIEnvSc – Senior Consultant and Chartered Environmentalist experienced in Environmental Impact Assessment (EIA) specialising in the water environment, undertaking hydrology, water quality and flood risk assessments for major infrastructure projects; and
- Kyle Somerville BEng (Hons) CEng MIEI – Director and Chartered Engineer specialising in hydrology and surface water management for wind farm developments and has overseen outline and detailed design of surface water management for more than thirty onshore wind farm developments in the UK and Ireland including site supervision, direction and monitoring.

1.3 Water Framework Directive

The European Water Framework Directive (2000/60/EC) was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). It applies to rivers, lakes, groundwater, and transitional coastal waters.

A requirement of the WFD is to attain good ecological water status and that deterioration in the status of water is prevented. The Environmental Impact Assessment Directive (85/337/EEC) requires likely significant environmental impacts to be identified, assessed, and mitigated. An impact that would compromise achievement of a WFD objectives or result in the deterioration in the status of waters would be considered a significant impact.

Any new development must ensure that this fundamental requirement of the Directive is not compromised. **Chapter 11: Hydrology and Hydrogeology** of the EIAR outlines mitigation measures specifically in relation to management of surface water (detailed further in this SWMP) to prevent deterioration of water quality and quantity. **Technical Appendix 11.3 Water Framework Directive Assessment** specially assess the effect of the Proposed Development on WFD objectives.

1.4 Hydrological / Drainage Setting

The hydrological setting is established at **EIAR Chapter 11.**

2 PERMANENT DRAINAGE

2.1 Approach

The permanent drainage plan will drain the permanent tracks, hardstanding, and compound areas to their finalised footprint after removal of areas of temporary widening during the construction phase.

The approach to drainage planning adopts a sustainable drainage approach and considers water quantity (rate of discharge affecting flood risk), water quality (to protect downstream receptors), amenity insofar as that is a limited consideration at the site, and biodiversity where water can be used to aide habitat management and improvement objectives.

2.2 Water Quantity Standards

Surface water drainage design is per the requirements of Louth County Council Development Plan and to the standards of Louth County Council Water Services Department, insofar as those standards apply to a development of this nature.

The County Development Plan includes objectives to promote the use of Sustainable Drainage Systems (SuDS). SuDS components are considered in relation to the nature and character of the site. The SuDS design demonstrates how water quantity and quality are dealt with as well as making provision for amenity and biodiversity where practicable.

Parts of the Proposed Development will cause an increase in the peak rate and volume of runoff from the site without mitigation. Permanent surface water drainage design, therefore, adopts SuDS principles and ensures that runoff from new impermeable and semi-impermeable surfaces (tracks, hard standings and ancillary infrastructure) shall be reduced to the pre-development greenfield rate. The principles adopted in the Drainage Plan are as follows:

The drainage system caters for protection for up to a 1% AEP rainfall event including allowance for climate change, common to the standard of protection for flooding from surface water drainage afforded by the Greater Dublin Strategic Drainage Study (GDSDS) as best practice.

Proposed changes of surface are limited to proposed permeable or semi-impermeable (unbound gravel) tracks, hardstanding areas at turbine cranepads, and hardstanding areas at the proposed substation and Battery Energy Storage (BES). Flat lying track surfaces (gradients < 3%) will not require drainage where water will migrate vertically through the unbound gravel surface and subbase, and respond to rainfall in an identical way as existing greenfield runoff.

On all other steeper sections of tracks (conservatively adopted as >3%, where highly efficient permeable pavements are unsuitable at gradients >5%) where runoff is likely to flow laterally rather than infiltrate, runoff from access tracks shall be collected via open swales. Run-off shall be attenuated with the use of check dams in order to reduce the peak rate of run-off and to encourage infiltration of surface water. Outlets from swales will discharge to a control feature (basin) where water will be controlled and discharged. Disposal of water from positively drained areas will adopt a hierarchical approach to suit guidance in the SuDS manual and will either (in decreasing order of preference):

- be by infiltration at a designed feature (infiltration basin, infiltration other soakaway)
- be attenuated in an attenuation basin to a greenfield equivalent rate (Qbar) with the attenuated discharge being encouraged to disperse overland via a “level spreader”
- where a discharge to a watercourse is unavoidable, be attenuated in an attenuation basin to a greenfield equivalent rate (Qbar) and discharged to an outlet to a watercourse or drain.

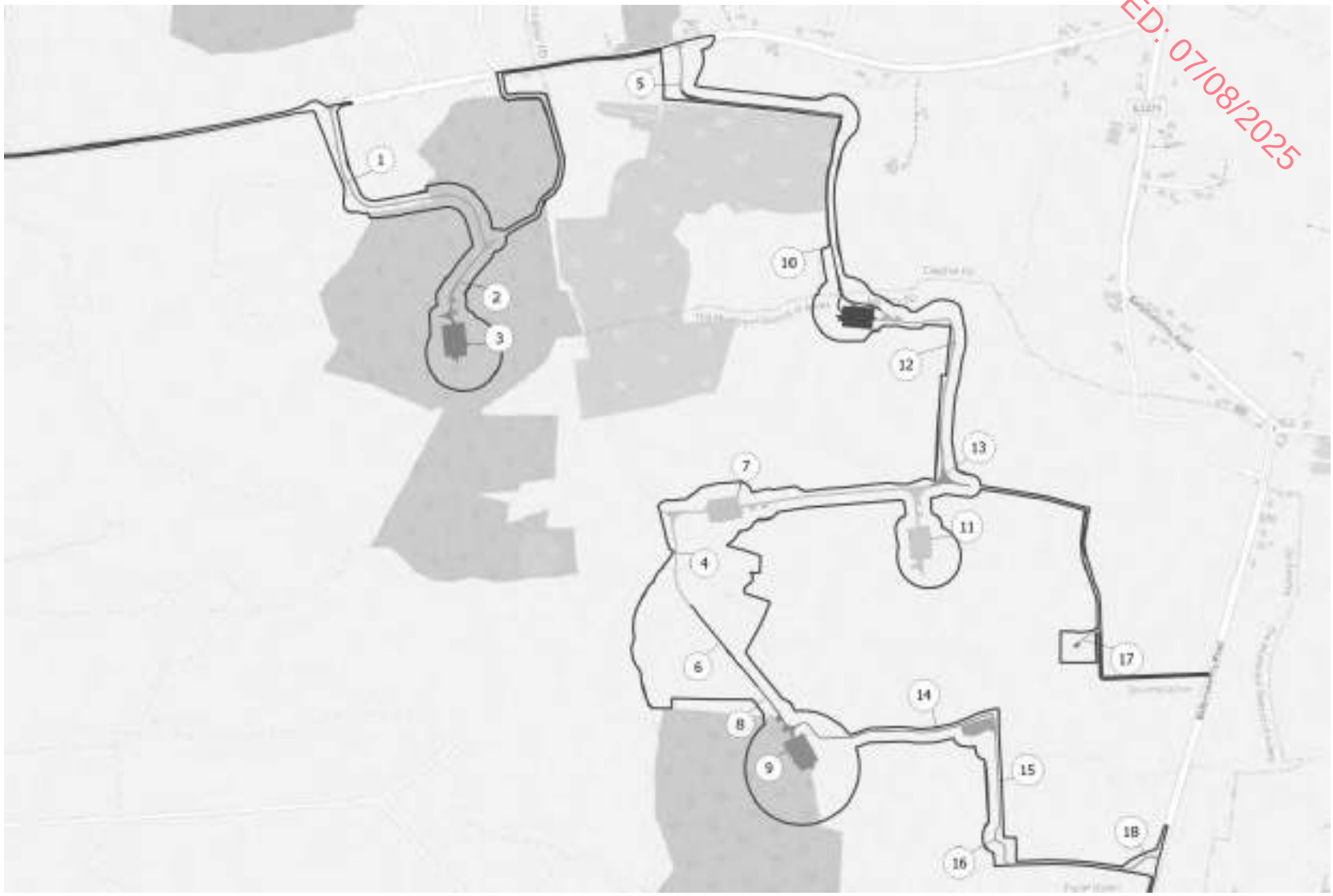
In addition, a drainage grip is to be installed at site entrances where ground / tracks fall towards a public road in order to direct residual runoff away from the public road and into swales.

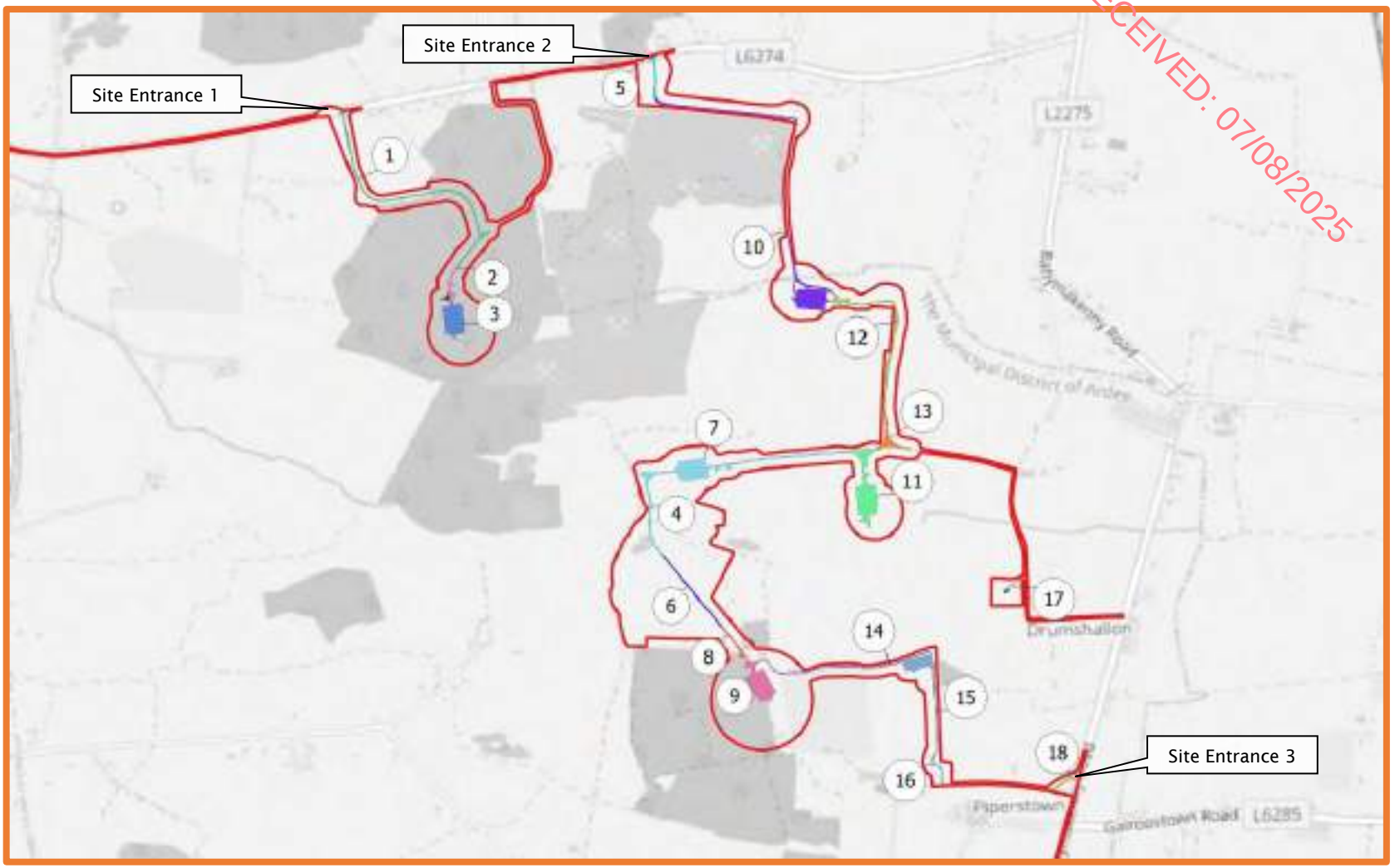
Proposed permanent surface water drainage (SuDS) layout and typical detail drawings are included in Annex A and Annex B.

2.2.1 Sub catchments

Semi-impermeable areas have been split into sub-catchments and are shown on the following Figure 2.1 (overleaf).

Figure 2.1: Drainage Plan – Subcatchment Map





2.2.2 Drainage Schedule

A summary of the drainage approach per Subcatchment is scheduled as follows:

Table 2-1: Drainage Subcatchment Schedule

Catchment ID	Area sq. m	Drainage Approach	Discharge Rate (lps)
1	5659	Attenuated Discharge to Watercourse (Drain)	2.2
2	1075	Attenuated Discharge overland by Level Spreader	2
3	6203	Attenuated Discharge overland by Level Spreader	2.4
4	1803	Attenuated Discharge overland by Level Spreader	2
5	964	Infiltration Basin - Discharge to Ground	NIL
6	1589	~~Infiltration through track subbase~~ Attenuated Discharge overland by Level Spreader	~~NIL~~ 2
7	9898	Attenuated Discharge overland by Level Spreader	3.8
8	866	Attenuated Discharge overland by Level Spreader	2
9	7420	Attenuated Discharge to Watercourse (Drain)	2.8
10	11862	Attenuated Discharge overland by Level Spreader	4.5
11	9226	Attenuated Discharge overland by Level Spreader	3.5
12	4004	Attenuated Discharge overland by Level Spreader	2
13	2121	Attenuated Discharge overland by Level Spreader	2
14	2045	Attenuated Discharge to Watercourse (Drain)	2
15	4770	~~Infiltration Basin - Discharge to Ground~~ Attenuated Discharge to Watercourse (Drain)	~~NIL~~ 2
16	388	Attenuated Discharge to Watercourse (Drain)	2
17	297	Infiltration through track subbase (gradient < 3%; moderately permeable)	NIL
18	757	~~Infiltration Basin - Discharge to Ground~~ Attenuated Discharge to Watercourse (Drain)	~~NIL~~ 2

2.2.3 Infiltration Design

Ground conditions are suitable for infiltration on parts of the site. Geology and soils are described in **EIAR Chapter 10.** Site investigation data and Teagasc soil mapping indicates that parts of the site are underlain by sand, sandy clay, and some deep well drained soils.

~~Infiltration rates characteristic of the soil types encountered have been derived through comparison with relevant industry guidance. Selection of a mid-range infiltration coefficient of 1 x 10^{-5} m/s (0.018 m/hr), characteristic of clayey sand has been selected for purposes of planning design, and as such is conservative within the range permitted by all consulted industry guidance.~~

~~The planning design will be verified by in-situ infiltration testing per BRE 365, with testing to occur at the depth of formation of the planned infiltration basin.~~

Infiltration rates have been determined by in-situ infiltration testing per BRE 365, with testing carried out at the depth of formation of the planned infiltration basin.

Where infiltration is planned (per Table 2-1 above), applicable infiltration rates are as follows:

Catchment ID 5	2.78×10^{-5} m/s (0.100 m/h)	(moderately permeable)
Catchment ID 17	3.49×10^{-6} m/s (0.0126 m/h)	(moderately permeable)

Supporting calculations are included at Annex E.

2.2.4 Attenuation Design

The preliminary drainage plan intends surface water from the site to discharge either overland or directly to a minor watercourse/field drain via an attenuation basin at ~~13 no.~~ 16 no. locations. A flow control shall be installed at the basin outflow point to ensure that flows are discharged at a greenfield limited rate up to the 1% AEP Climate Change event, which will ensure that there is no effect to flooding downstream

The storage calculation has not included the storage provided within the drainage conveyance system i.e. by check dams in swales. The attenuation sizes required are therefore considered conservative.

The pre-development greenfield runoff rate has been determined based on methods described in IH124. The specific runoff rate (QBar) at the site is 3.8 lps/Ha. Qbar based on observations per the Wallingford method indicating a HOST class of 3 is adopted and is consistent with the Teagasc soil description and observed ground conditions.

The volume control approach for purposes of the design conservatively excludes long term storage and loss by infiltration, and therefore adopts a flow control rate of Qbar or max 2 l/s/Ha but with a minimum practicable flow control rate of 2 lps, dictated by the need to manage potential maintenance / blockage issues.

Supporting calculations are included at Annex E. Proposed surface water drainage (SuDS) layout and detail drawings are included in Annex A and Annex B respectively.

2.2.5 Existing Local Road Drainage

There are existing local road drainage features at the site entrances (shown in Figure 2.1), summarised as follows:

- At Site Entrance 1, the L6274 local road is drained by road gullies conservatively presumed connected by a pipe. There is a road gully adjacent to Site Entrance 1.
- At Site Entrance 2, the L6274 local road is drained by a filter drain on its southern side.
- At Site Entrance 3, an open drain (characteristic of a sunken verge adjacent to the hedge line) runs along the L2275 local road. The drain deepens further north (outside the area affected by the proposed site entrance).

Existing roadside drainage at Site Entrances 1 and 2 is to be reinstated like for like where crossed by the entrances. Proposed drainage is per TII standard construction details for road drainage (adopted as best practice for local roads).

At Site Entrance 3, where the proposed entrance crosses the verge / ditch, a proposed drainage pipe has been sized to convey the 1% AEP climate change design flow under free inlet conditions in a 300 mm dia. pipe that meets TII standards. The pipe shall include a grill and silt trap to prevent debris and silt being washed into the pipe.

Drawings for site entrance arrangements are included in Annex G. Flow estimation and pipe sizing calculations are included in Annex H.

2.2.6 Clean Water Drainage

The permanent drainage plan adopts a SuDS hierarchy and unless unavoidable, surface water from the proposed development is infiltrated or dispersed overland. The permanent drainage plan includes clean water drainage pipes where tracks are to cross existing field boundaries / drains and natural surface water flow routes / depressions to allow provision for clean water to pass through and under track structures separate to drainage provided for track runoff. This ensures existing natural flow routes are maintained and minimises landslide susceptibility and impact on wildlife habitat.

Proposed clean water drainage pipes have been sized to convey the 1% AEP climate change design flow under free inlet conditions in a 300 mm dia. pipe. Sizing is conservative in that it was determined based on flow estimated based on the largest catchment.

Clean water drainage pipes are shown on drawings included at Annex A. Flow estimation and pipe sizing calculations for the proposed clean water drainage pipes are included in Annex I.

2.3 Water Quality & Pollution Control

2.3.1 Wastewater Disposal

Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. All wastewater will be tankered off-site by a licensed waste collector to the nearest wastewater treatment plant, There will be no on-site treatment of wastewater.

2.3.2 Pollution Control (Oil)

Requirements vary dependent on drained surface type and specific measures are in place dependent on the proposed land use.

Operations on the site will involve infrequent visits by non-permanent staff. The site has been assessed as having sufficiently few traffic movements to be low risk, i.e. risk of infrequent light contamination and small spills only. The operational phase risk of minor spillages will be managed through the provision of SuDS which in sequence (swale > basin) provide a pollution control “Management Train”.

Section 20 of the Greater Dublin Region Code of Practice for Drainage Works V6 states that where SuDS cannot be utilised or in areas where risk of pollution by petrol, oil, silt or other suspended materials appropriate interceptors must be installed. The substation / control compound includes transformers that use oil, however all oil storage is integrally bunded or external bunds are covered and so are not drained. The site will be drained via a comprehensive SuDS Management Train. No oil interceptor or separator is required.

Effectiveness of the proposed SuDS components in managing and remediating pollutants, using the CIRIA SuDS Manual ‘simple index approach’ is outlined in the following sections.

2.3.3 Emergency Response

The environmental assessment is precautionary and assesses the very unlikely potential for loss of control of a battery cell container. In that event fire suppression may include the fire service dousing adjacent units for cooling. Contaminated firefighting water migrating laterally to a surface water or vertically to groundwater may have potential to adversely affect the quality of surface or groundwater receptors. The approach is precautionary and presumes that the potential concentration of contaminants in water could reach a level that could cause potential environmental harm.

To mitigate the unlikely potential for contaminated water due to mixing of firefighting water with battery constituents, consideration has been given to potential for the need for firewater management at the battery storage site. NIEA / SEPA Pollution Prevention Guidelines (PPG) 18: Managing Firewater and Major Spillages which is adopted as good practice in the absence of Irish-specific guidance sets out requirements for containment of runoff likely to carry firefighting contamination.

Measures adopted at the site prevent vertical and lateral pathways to waterbodies. Runoff in the event of a firefighting event will be stored within the permeable subbase and an adjacent open lagoon/basin, with infiltration to ground prevented by installation of an impermeable liner to the subbase and lagoon, and control of outflows by a pollution control valve. Storage in the BESS subbase (c. 1013 sq. m x 0.5m deep x typical 30% voids, c. 150 cu.m storage), contained to the site by an impermeable membrane, will eventually drain via perforated pipes to a lagoon with a capacity of a further min. 80 cu.m capacity. Total containment storage within the site will exceed the minimum recommended volume (228cu m) required to contain water used for boundary cooling per National Fire Chiefs Council (UK) - Grid Scale Battery Energy Storage System

Planning – Guidance for Fire & Rescue Services, which is adopted as the best applicable guidance in the absence of an Irish equivalent.

Where loss of control is limited to a single BESS unit, fire suppression is by a mix of gas and internally supplied coolant by sprinkler which is self-contained. The drainage system is designed to give sufficient time to contain that water and allow for the arrangement of pumping facilities to remove the contaminated water from the network. Pumped firewater will be removed into suitable lorries which will transport this to a licensed facility for disposal.

The drainage layout including siting of the pollution control valve is shown on the Drainage Plan at Annex A.

2.3.4 Water Quality Indices

Provision of water quality protection and treatment of runoff is per the indices guidance in the CIRIA SuDS Manual. The permanent access track, cranepads and substation area are taken as land use with low pollution risk, Table 26.2 of the SuDS Manual defines the pollution hazard as low, with pollution indices as follows.

- Total Suspended Solids 0.5
- Metals 0.4
- Hydrocarbons 0.4

Provision of permeable surfaces, swale and infiltration basin in sequence will have a Pollution Mitigation Index per Table 26.3 and 26.15 of the SuDS Manual as shown in the following tables.

Table 2-2: Water Quality Indices – Infiltration from Subbase

Pollutant	Source Hazard Index	Permeable pavement / surface	Total Mitigation Index	Sufficient?
TSS	0.5	0.7	0.7	Yes
Metals	0.4	0.6	0.6	Yes
Hydrocarbons	0.4	0.7	0.7	Yes

Table 2-3: Water Quality Indices – Trackside drainage to Infiltration Basin

Pollutant	Source Hazard Index	Swale	Infiltration Basin (0.5 mitigation index)	Total Mitigation Index	Sufficient?
TSS	0.5	0.7	0.025	0.725	Yes
Metals	0.4	0.4	0.025	0.425	Yes
Hydrocarbons	0.4	0.6	0.025	0.625	Yes

Table 2-4: Water Quality Indices – Trackside drainage to Attenuation Basin

Pollutant	Source Hazard Index	Swale	Infiltration Basin (0.5 mitigation index)	Total Mitigation Index	Sufficient?
TSS	0.5	0.5	0.25	0.75	Yes
Metals	0.4	0.6	0.25	1.0	Yes
Hydrocarbons	0.4	0.6	0.3	1.0	Yes

In relation to previous Table 2-1, discharges from attenuation basins that discharge overland via level spreader have an additional stage of treatment (percolation through drainage stone, percolation and filtration over intact vegetated ground) which further increases the water quality provision.

In summary there is certainty that the permanent drainage will ensure that runoff from the Proposed Development is treated to a standard that would not cause an adverse change to water quality elsewhere.

2.4 Maintenance Requirements

Permanent drainage assets shall be the responsibility of the site operator to maintain. The developer shall put in place drainage management procedures as part of the overall facility management. Maintenance plans for drainage features are shown in the following table.

Table 2-5 Permanent Drainage – Operational Maintenance Schedule

Feature	Maintenance Requirements	Time
Swales	Vegetation maintenance – replace / repair scour Rebuild check dams	Inspect annually. Repair as required.
Attenuation Basins	Vegetation control – clear obstructions Inlets & outlets – clear obstructions	Annual and / or After significant storm events
Infiltration Basin	Excessive depth or duration of standing water within basins following a rainfall event (48hrs +) may indicate failure of infiltration due to blinding of the base with fine sediment. Maintenance requirements would entail removal of silt by excavator and reinstatement of the basin in accordance with design drawings Compacted or smeared soil layers in basins should be loosened by mechanical tilling (min. top 300mm) and re-planted	To suit observed conditions
Level Spreaders	Vegetation control – clear obstructions Clearing / replacement of drainage stone Checking for blockage of perforated outlet pipes and jetting as required.	Inspect annually. Repair as required.
Flow control devices	Checking of devices for siltation/blockages and clearing as required Checking of device outlets for damage and undertaking remediation	Annual and / or After significant storm events

Feature	Maintenance Requirements	Time
Oil Interceptors	Clearing/ desludging	Per manufacturers recommendations and after any spills
Inlets/Gullies/Drainage channels	Checking for siltation/blockage and jetting as required	Annual and / or After significant storm events

3 PERMANENT WATERCOURSE CROSSINGS

3.1 Watercourse Crossing Design

To allow the built footprint of the Proposed Development the following is required:

- 3 no. crossings of minor watercourses.

No other temporary watercourse crossings are required.

~~Works to watercourse crossings will be subject to future authorisation by the Office of Public Works (OPW) under Section 50 of the Arterial Drainage Act 1945.~~

Works to watercourse crossings has been subject to authorisation by the Office of Public Works (OPW) under Section 50 of the Arterial Drainage Act 1945. Consent was obtained 14th May 2025 (OPW Ref: 160-2025). OPW Section 50 consent is included in Appendix B of the Flood Risk Assessment (Technical Appendix 11.1).

A sufficiently detailed design to allow assessment of environmental effects has been prepared as part of this assessment. Final design of watercourse crossings will be undertaken at detailed design stage, post planning consent.

The following guidance has been adhered to in the preliminary design and will be similarly applied in the detailed design of watercourse crossings:

- Hydrological assessments made using appropriate methods to determine the design flow. Culverts are designed to convey the 1% AEP flood, including climate change (MRFS scenario), with free inlet conditions. The design of WX01 allows for future changes to flows as a result of planned restoration work at the adjacent quarry;
- CIRIA Culvert design and operation guide (C689); and
- Fisheries considerations shall incorporate guidance stated in 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' as published by Inland Fisheries Ireland (2016).

Minimum dimensions are established in the watercourse crossing schedule at a Watercourse Crossing Schedule at Annex F to this report, including supporting calculations.

Watercourse crossings on the site shall comprise conventional closed culverts. Factors considered in the design and orientation of all watercourse crossings includes:

- Crossing direction to generally be perpendicular with access track direction, therefore minimising the length of stream affected;
- Consideration of the passage of out-of-bank flood flows; and
- Additional mitigation will be designed to prevent pollution of the watercourse during the construction of the watercourse crossing to reduce residual risk; comprising the temporary installation of silt fences in the stream channel downstream or similarly effective measures.

Design ensures that culverts are installed at a level lower than existing bed levels in order to create a 'stilling' effect and reduce potential for increased local flow velocities in the culvert in addition to promoting the formation of a natural substrate within the culvert. A piped culvert detail is shown on drawing SWMP_24 included in Annex B.

3.2 Construction Phase Mitigation

Residual risk to watercourses specific to the construction stage will be fully addressed in the Contractor's construction method statement and will include the following:

- Works to install all crossings shall be programmed to coincide with a period of anticipated low drain flow and firm ground conditions in order to minimise potential for silt laden runoff draining toward the stream;
- For closed crossings (culverts) the channel will be dammed upstream of the proposed culvert location using sandbags or similar in order to provide a dry working environment at the culvert location. Dammed flows will be pumped out of channel and returning directly to the drain shortly downstream of the culvert location. Erosion protection shall be placed at the point of pump return. All pumping will be controlled on a contractor permit-to-pump scheme, such that pumping operations can be carefully planned, installed and monitored;

- Geotextile silt fences shall be installed adjacent to the drain bank upstream and downstream of the culvert location to filter contaminated runoff that may be caused by plant movement associated with the culvert installation. A sequence (minimum 2 no.) in-channel geotextile check dams will be installed within the drain channel downstream of the culvert location and downstream of the pump-return; Silt fence arrangements are shown on drawing SWMP_41 included in Annex D.
- The culvert comprising pre-cast concrete or pre-formed plastic pipes shall be installed and backfilled with suitable aggregate. Headwalls and scour protection to the drain bed shall be formed at the culvert inlet and outlet using dry formed components (lean-mix concrete-filled sandbags or similar). Washed gravel or pebbles (including if feasible that material recovered from the natural substrate excavated to permit the culvert installation) shall be introduced to cover and protect the extent of the drain channel affected by excavations. No wet concrete or cementitious material shall be required to be used within the channel;
- Over pumping and upstream dams shall be removed and water permitted to pass through the culvert. Downstream in-channel filtration check dams shall be retained and renewed as necessary in order to trap sediment until any residual washout of sediment from the exposed excavation has stabilised to a normal (pre-construction) level; and
- Geotextile or equivalent splash-guards shall be erected to the track embankment over the culvert or clear span crossing prior to trafficking.

3.3 Maintenance

Permanent drainage assets shall be the responsibility of the site operator to maintain. The developer shall put in place drainage management procedures as part of the overall facility management. Maintenance plans for drainage features are shown in the following table.

Table 3-1 Permanent Culverts – Operational Maintenance Schedule

Feature	Maintenance Requirements	Time
Culvert Inlets / outlets	Vegetation maintenance – remove Clear siltation and debris causing blockage	Inspect twice annually and after significant storms. Repair as required.
Culvert barrel	Inspect (visual / by camera) for cracking / fracturing and deflection. Repair as required.	Inspect prior to any heavy traffic movements for maintenance during the operation phase.

4 CONSTRUCTION PHASE - TEMPORARY DRAINAGE & WATER MITIGATION

4.1 Preamble

The following key considerations have been identified in the planning-stage design of hydrology and drainage for the site to preserve water quality, downstream hydrology and preserve stream morphology sufficiently that there is certainty that the measures can be implemented effectively and to ensure that the assessment of residual effects can be predicted with certainty. The measures at planning stage will provide a framework within which any future design will match or better. Key concerns addressed by the planning-stage design are as follows:

- Definition of Buffer Zones;
- Separation of 'clean' and 'dirty' water; and
- Management and treatment of reduced quality runoff from the works ("dirty water").

A temporary works SuDS design has been prepared for purposes of the planning application. The design as presented in the planning application is conservative in its approach and is sufficiently detailed to allow a robust appraisal of the scheme in EIA terms, including consideration of the scheme earthworks footprint. Temporary drainage layouts prepared to inform the planning application are shown at Temporary Drainage Management Drawings at Annex C.

Specific requirements to be imposed on any Contractor involved in the construction of the scheme will be further outlined in a detailed Construction Environmental Management Plan (CEMP) which will include Construction Method Statements, which can be subject to be approval by the relevant local authority prior to construction.

All site personnel will be made aware of their environmental responsibilities at the site induction prior to being allowed to work on site, and through the production of a Method Statement outlining Environmental Requirements for Sub-Contractors, which will include environmental emergency response procedures to deal with spillages, should they occur.

This section of the report outlines the steps which will be undertaken during the construction phase of the project to ensure compliance with relevant best practice guidance stated in **EIA Chapter 11**. Site visits by the SuDS Engineer will be agreed in advance and will be undertaken at various stages of the construction process to ensure that the proposed SuDS scheme is being constructed in line with the design.

Essential mitigation measures relevant to controlling erosion and runoff from construction of the SuDS are described in best practice guidance stated in **EIA Chapter 11.**

The measures proposed for the Construction Phase shall be similarly implemented for the Decommissioning Phase.

4.2 Pollution Prevention Buffer Zones

Buffer zones to water features have been established within the Site Boundary in **Chapter 11: Hydrology and Hydrogeology.** Proposed infrastructure is designed to lie out with stated hydrological buffer zones as described in the EIAR.

The same buffers and additional buffers to known potable water supplies will apply during the construction phase to limit the types of construction activities permissible in proximity to water, and to ensure additional precautions are applied in relation to pollution prevention (spills etc). Buffer areas will act as riparian zones allowing filtration and settlement, minimising sediment transport, attenuating flows and maximising infiltration.

Construction phase buffers are shown on the Temporary Drainage Management Drawings at Annex C.

The following procedures apply to the general construction activities in the vicinity of watercourses (i.e., within buffer zones):

- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff to on-site water features;

- Works will be planned so that trackside drains do not discharge directly into watercourses, but rather through a buffer area of adequate width or via a constructed settlement feature such as pond or sequence of silt fences;
- Cement and concrete will be kept out with buffer zone to avoid contamination of watercourses;
- Runoff from excavations will not be pumped directly to watercourses. Where dewatering of excavations is required, water shall be pumped to the head of a treatment train (swale, basin, or detention pond) to receive full treatment prior to re-entry to the natural drainage system; and
- SuDS treatment techniques will be utilised to remove silts from runoff prior to the discharge of flows over open vegetated areas.

If a specific short-term risk to water quality is identified on site, specific localised measures will be implemented including:

- Placing temporary filtration silt fences within drainage channels where siltation is observed; and
- Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons where required.

4.3 Timing of Works

Works on the site likely to cause a high risk to surface water will be programmed to avoid unfavourable prevailing ground conditions and high volumes or extended periods of seasonal rainfall. Site clearance will take place in advance of construction works.

4.4 Temporary Drainage

4.4.1 Main Principles

During the construction phase the following principles have been employed when planning temporary drainage requirement:

"clean" drainage / runoff from land upslope of the works footprint will be managed through or around the works in order to avoid mixing clean and "dirty" water.

- "Clean" drainage / runoff from land upslope of the works footprint will be managed through or around the works in order to avoid mixing clean and "dirty" water;
- Reduced quality runoff ("dirty water") from the works will be managed and treated before it is discharged to any watercourse;
- Dirty water collected in temporary drainage will be dispersed frequently overland to allow filtration in vegetation, which is likely to be more effective in removing sediment than larger settlement basins; and
- Significant accumulations of dirty water at low points where water will be treated at temporary settlement ponds prior to any discharge to a watercourse.

The measures are more fully described in the following sections.

4.4.2 Site-Wide Requirements

Temporary pollution prevention measures and temporary or permanent drainage and surface water management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works including felling) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development.

Temporary drainage measures in advance of earthworks will include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g., watercourse crossing locations and areas where development (such as felling) unavoidably lie within watercourse buffer zones;
- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas. This will prevent washout by surface flows of exposed clays in excavations and fine sediments in track makeup, and increase efficiency of silt removal in future trackside drainage swales;

- Minor drains, other flow paths and cut-off drain outlet locations will be identified and charted, to ensure that piped crossings can be installed in advance of or adjacent to the track construction;
- Settlement ponds will be constructed in advance of commencing excavations for foundations and at any other locations identified as required at detailed design stage; and
- Trackside drainage swales will be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

In addition, spoil management is to be planned in advance of earthworks and on an ongoing basis, to allow planning of drainage required in advance of spoil being deposited.

Suitable prevention measures will always be in place to prevent the conveyance of silts to receiving watercourses.

4.4.3 Clean / Polluted Water Separation

Drainage management ensures that significant flows of clean water is not permitted to mix with contaminated water from sources such as excavation dewatering or track runoff, where "clean water" should be interpreted as natural surface runoff unaffected by construction / earthworks runoff.

Design ensures that upslope cut off ditches are to be installed to intercept and divert clean upslope surface water runoff flowing overland prior to it meeting areas of excavation. Design and construction sequencing ensures that clean water cut off ditches are installed ahead of main earthworks wherever practical. This is intended to reduce the flow of clean water onto any exposed areas of rock and soil, thereby reducing the amount of potential silt laden runoff requiring treatment.

Installed drainage allows provision for clean water intercepted in cut-off ditches to pass through and under track structures separate to drainage provided for track runoff.

Temporary silt / pollution prevention and scour protection measures (such as check dams) is provided in artificial clean water drainage installed to mitigate potential for scouring and transport of sediment from newly excavated channels.

Diversion drainage is to be dispersed over vegetated ground. Diversions are designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity.

Temporary drainage is intended to be reinstated on completion of the temporary works.

Clean water drainage is shown on drawings included at Annex C, and cutoff arrangements and culvert arrangements to pass clean water through / around works is shown at SWMP_43 in Annex D.

4.4.4 Temporary Track Drainage

All track runoff (dirty water) will be directed to flow to ditches / swales installed to the track-edge, to be installed as tracks are constructed.

Dirty water will be discharged via frequent spillways created on the downhill sides of the access tracks.

Temporary drainage will be reinstated to the permanent drainage (refer to Section 2) to suit the permanent infrastructure footprint. Drainage track shoulders will be re-vegetated as soon as feasible after completion of the track and drainage across the site.

4.4.5 Check Dams

Initial treatment is provided "at source" by check dams installed within trackside drainage at regular frequencies, to reduce flow velocities and improve conditions for the settlement of solids in transit.

Check dams shall be of stone formation however compacted clay check dams may be used should suitable stone be unavailable locally.

Where stone is used, the aggregate used to form check dams will be a small 'clean' graded stone. On steeper slopes the check dams will be anchored using larger stone placed on the downhill side of the check dam to prevent washing away of the smaller graded stone.

The check dams will serve dual functions, by both removing and settling out silts and reducing flow velocities, therefore mitigating against the effects of erosion within the swale and improving the design life of end of line settlement and attenuation features.

4.4.6 Settlement Basins

Washout pits to be located local to large excavations (i.e. turbine bases) are to accommodate the anticipated volume of contaminated water to be removed from the excavation, either through unavoidable surface water runoff or accumulation of shallow groundwater. Washout pits for concrete (washdown of concrete delivery plant) will be treated separately and shall be lined, with washwater removed for treatment offsite.

4.4.7 Vegetative Filtration

Wherever possible, runoff from swales, ponds, or other pumped discharges will be dispersed over undisturbed intact vegetation, nominally over agreed riparian watercourse buffer zones, to allow vegetative filtration of runoff prior to water entering receiving watercourses.

4.5 Turbine Bases and Crane Pads

Excavated turbine foundations are likely to result in large volumes of displaced excavated material as spoil, as well as concrete operations. Specific measures are, therefore, required to manage potential for silt laden runoff from spoil, silt laden runoff from pumped dewatering, and cementitious contamination in pumped dewatering from turbine bases.

Concrete will not be allowed to enter watercourses under any circumstances, and drainage from excavations in which concrete is being poured will not be discharged directly into existing watercourses without appropriate treatment. Delivery trucks, tools and equipment will be cleaned at designated washout areas located conveniently and within a controlled area of the construction compound. Runoff from wash-out areas will be appropriately stored within bunded containers and removed off-site by an appropriate waste disposal company. In addition, the following drainage measures will apply:

- Installation of cut-off drains around the working areas to intercept clean surface runoff and divert it around and away from the works;
- Minimising the stockpiling of materials and locating essential stockpiles outside any watercourse buffer zone;
- Polluted (silt laden) water collected in the base of any excavation would be gathered in a sump and pumped at a low flow rate into either the mini-settlement pond or track swale for treatment. Dewatering of excavations direct to watercourses will not be permitted; and
- The foundation working areas will be re-vegetated as soon as possible after construction.

4.6 Cable Trenches

The following shall apply to the construction of all cable trenches at the site:

- To minimise impacts from disturbance, cables will be laid in small trenches along the side of access tracks, as far as possible;
- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff from excavations;
- Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches, to minimise opportunity for the ingress of water into open trenches;
- Temporary silt traps will be provided in longer trench runs and on steeper slopes; and
- Where constructed trackside swales are disturbed by cable installation, swale slopes will be correctly reinstated post infilling of the cable trench.

4.7 Dewatering

To control dewatering activities and to ensure that all dewatering allows for pollution prevention measures, a permit-to-work system will be implemented by the Contractor, particularly to ensure pumped dewatering

from excavations is controlled. A permit will be required to be issued to a competent person prior to allowing any specific dewatering to commence.

4.8 Spoil Management

Design of permanent and temporary spoil management ensures the following:

- There will be no depositing of material within the watercourse buffer zones;
- Spoil shall be placed in such a manner to ensure no ponding of surface water on top of spoil heaps. Temporary spoil will be graded to ensure that all direct precipitation will run directly off the surface;
- Temporary spoil deposition areas ensure that natural flow paths (drainage channels) are not altered or blocked by deposited spoil; and

4.9 Temporary Foul Drainage

The project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 52 to 65 on site at peak. A holding tank is proposed for wastewater management. Wastewater will be removed off-site weekly, by a licensed wastewater disposal company and disposed at an appropriate licenced facility, likely to be situated in the Drogheda area.

4.10 Forestry Felling

Felling to facilitate construction works will take place prior to groundworks commencing. Water protection measures will reduce the risk of suspended solids and nutrient release in surface watercourses.

- Felling and extraction of timber, as far as possible, should be conducted during periods of dry weather. During a period of heavy rainfall, harvesting works should cease until the site has dried out to reduce the risk of siltation, rutting and soil compaction; and
- Any drains crossed during the extraction phase to be kept clear of any residues/debris to ensure no drainage issues arise for the remaining trees.

4.11 Construction Phase Maintenance

It is envisaged that an Engineer specialising in surface water management and SuDS would be required to undertake site inspections during the construction phase of the wind farm, to validate that any detailed SuDS design and associated requirements to ensure construction methods are adhered to on site, and in order to identify areas where additional or enhanced mitigation is required.

In addition to the regular site inspections carried out by the Engineer, the following inspections will be undertaken during the construction phase of the project. The list is not exhaustive and will be added to as per the requirements of the site.

4.11.1 Drains / Check Dams

- All check dams and settlement basins to be checked weekly in dry weather and daily during periods of heavy rainfall via a walkover survey during the construction phase. Excess trapped silt to be removed and disposed of / re-used as may be agreed with relevant authorities;
- Where check dams have become fully blocked with silt, they will be replaced. Procedure for replacement of the check dam as follows:
    - silt deposits to be removed from the upstream side of check dams;
    - removed silt to be buried or re-used by spreading in an area of the site where surface runoff will not convey silt deposits back to a watercourse;
    - where there are regular incidents of check dam blockage further check dams to be installed (every 15-20 m intervals) within the swales;
- Should there be noticeable effects of erosion along the swales or at discharge points, suitable erosion protection measures such as placement of large stones or erosion protection textiles will be installed at the area affected; and
- Any temporarily stored or stockpiled material will be placed in a manner to ensure stability and set back sufficiently far such that in the case of unforeseen collapse, spoil would not cause infilling of swales.

4.11.2 Settlement Basins

- Basin inlets to be cleared of debris;
- Silt in aggregate forebays to be removed by excavator and disposed of. Any aggregate removed to be replaced with clean stone; and
- Any flow control device (orifice, weir or similar) to be checked and cleared of any debris.

4.11.3 Drainage Pipes

- Piped drainage (clean water / dirty water) to be monitored at inlets. Silt to be removed by hand or by excavator and disposed of; and
- Pipe deflection to be monitored. Ineffective gradients to be identified and pipes excavated and replaced to ensure drainage function.

Annex A

Permanent Drainage - Layouts

706900 707000 707100 707200 707300 707400 707500

784700 784600 784500 784400 784300

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
1	Attenuated Discharge to Watercourse (Drain)	5659		2.2	144	18 x 8 x 1

EXISTING ROADSIDE DRAINAGE TO BE REINSTATED LIKE FOR LIKE WHERE CROSSED BY SITE ENTRANCE PER TII STANDARD DETAILS FOR ROAD DRAINAGE. REFER TO DWG_61 AT ANNEX G

Basin 1

NEW TREATED CLEAN WATER DISCHARGE TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

110 105 95 100 105 110 115

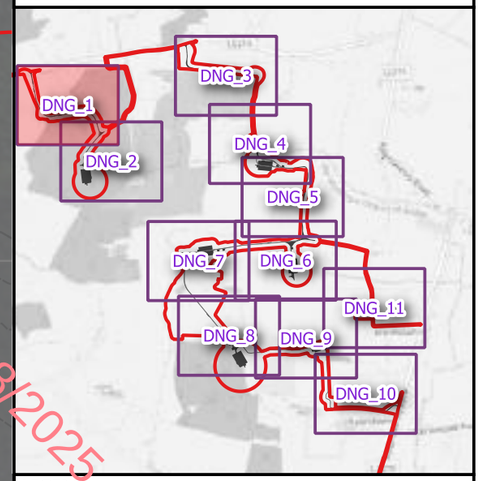
0 50 100 150 200 m

N

RECEIVED: 07/08/2025

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

NOTES
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3. BACKGROUND MAPPING REPRODUCED © OPENSTREETMAP CONTRIBUTORS

4. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT DETAIL DRAWINGS.

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 1

PROJECT / FIGURE NO.
M02207-01_DNG_1

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

707200 707300 707400 707500 707600 707700 707800

784400 784300 784200 784100 784000

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
2	Attenuated Discharge overland by Level Spreader	1075		2	16	5 x 4 x 0.8
3	Attenuated Discharge overland by Level Spreader	6203		2.4	160	16 x 10 x 1

N

Basin 2

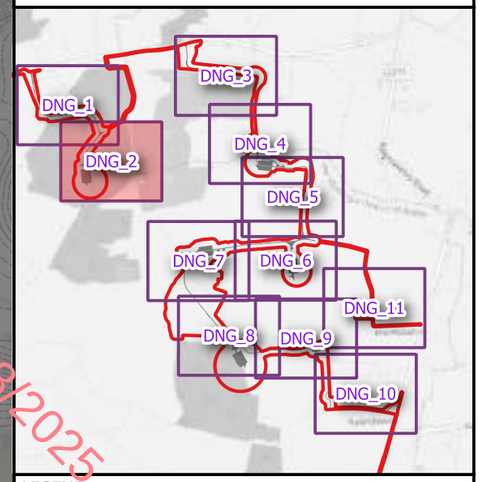
NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

Basin 3

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

0 50 100 150 200 m

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 2

PROJECT / FIGURE NO.
M02207-01_DNG_2

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	25/10/2024

707900 708000 708100 708200 708300 708400 708500

784900 784800 784700 784600 784500

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
5	Infiltration Basin - Discharge to Ground	964		NIL	24	6 x 5 x 0.8
10	Attenuated Discharge overland by Level Spreader	11862		4.5	300	25 x 12 x 1

DRAINAGE GRIP TO DIRECT RESIDUAL RUNOFF AWAY FROM PUBLIC ROAD AND INTO SWALE

EXISTING ROADSIDE DRAINAGE TO BE REINSTATED LIKE FOR LIKE WHERE CROSSED BY SITE ENTRANCE PER TII STANDARD DETAILS FOR ROAD DRAINAGE. REFER TO DWG_62 AT ANNEX G

Basin 5

DISCHARGE BY INFILTRATION TO GROUND (ALLUVIUM / DEEP WELL DRAINED SOIL) AT NEW INFILTRATION BASIN

WX01

NEW CULVERT TO MINOR WATERCOURSE TO ALLOW ACCESS TRACK. CULVERT SIZED TO SECTION 50 STANDARD TO ALLOW FOR GREATER OF EXISTING MAXIMUM DISCHARGE FROM QUARRY AND FUTURE RESTORED QUARRY OUTLET. REFER TO WATERCOURSE CROSSING SCHEDULE

NEW TREATED CLEAN WATER DISCHARGE TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

Basin 10

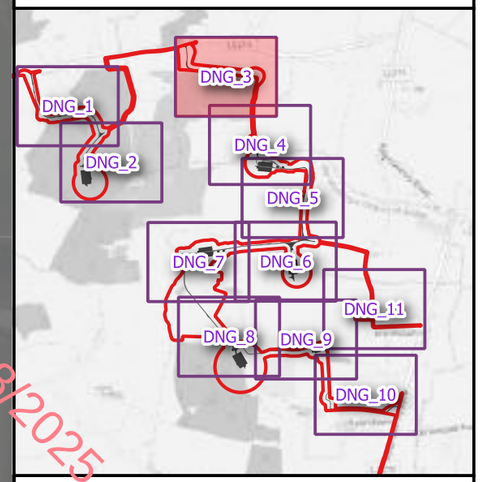
80 85 90 95 100 105

0 50 100 150 200 m

RECEIVED: 07/08/2025

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

Culvert ID	Dimension (m)	DESCRIPTION
WX01	0.9	NEW 0.9M DIA PIPE CULVERT (CLASS 120 CONCRETE OR EQUIVALENT)

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 3

PROJECT / FIGURE NO.
M02207-01_DNG_3

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	3	14/07/2025

708200 708300 708400 708500 708600 708700

784500 784400 784300 784200 784100

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
12	Attenuated Discharge overland by Level Spreader	4004		2	96	12 x 8 x 1

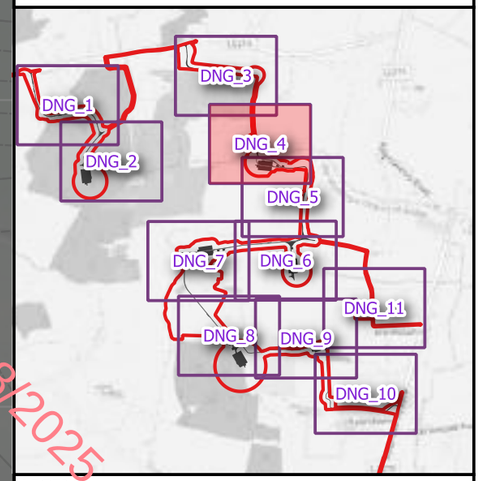
N

105 105 100 100 105 110

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 4

PROJECT / FIGURE NO.
M02207-01_DNG_4

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

708400 708500 708600 708700 708800 708900

784100 784000 783900 783800 783700

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
12	Attenuated Discharge overland by Level Spreader	4004		2	96	12 x 8 x 1

N

Basin 12

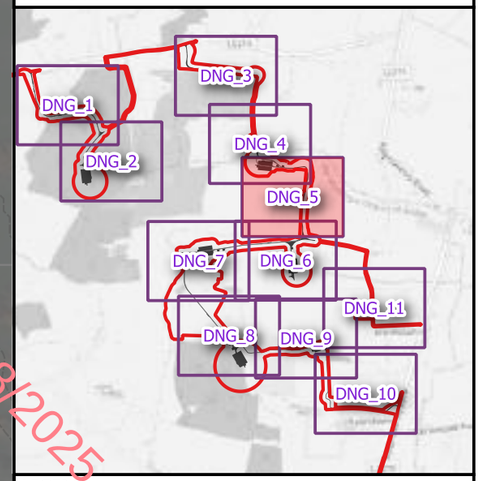
NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

105 115 110 100

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 5

PROJECT / FIGURE NO.
M02207-01_DNG_5

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
11	Attenuated Discharge overland by Level Spreader	9226		3.5	240	24 x 10 x 1
13	Attenuated Discharge overland by Level Spreader	2121		2	42	10 x 7 x 0.6

708300 708400 708500 708600 708700 708800 708900

783700 783600 783500 783400 783300

N

115 110 105 100 95 90

Basin 13

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

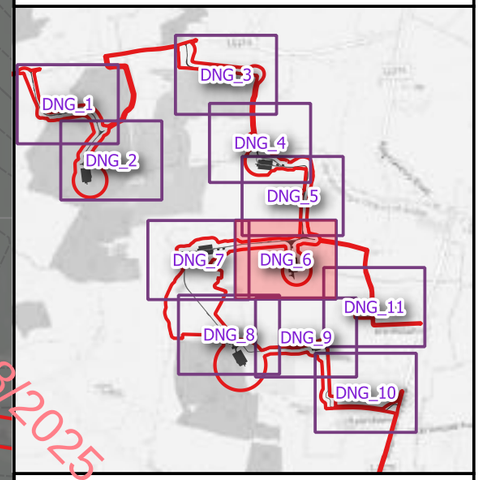
Basin 11

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

NOTES
GENERAL
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2. ADDITIONAL TEMPORARY DRAINAGE / MITIGATION WILL BE PROVIDED DURING THE CONSTRUCTION PHASE ON AN OBSERVATIONAL BASIS. REFER TO SEPERATE TEMPORARY DRAINAGE LAYOUTS.

3. BACKGROUND MAPPING REPRODUCED © OPENSTREETMAP CONTRIBUTORS

4. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT DETAIL DRAWINGS.

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 6

PROJECT / FIGURE NO.
M02207-01_DNG_6

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
4	Attenuated Discharge overland by Level Spreader	1803		2	33	11 x 5 x 0.6
6	Attenuated Discharge overland by Level Spreader	1589		2	25.6	8 x 4 x 0.8
7	Attenuated Discharge overland by Level Spreader	9898		3.8	264	22 x 12 x 1

707800 707900 708000 708100 708200 708300

783700 783600 783500 783400 783300

N

Basin 7

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

Basin 4

CONSTRUCTION OF BASIN AND OUTLET TO BE SUPERVISED BY ECOW IN HABITAT MANAGEMENT AREA. DISPERSAL OF CLEAN TREATED RUNOFF AT A GREENFIELD RATE COMPATIBLE WITH THE WET NATURE OF THE HABITAT.

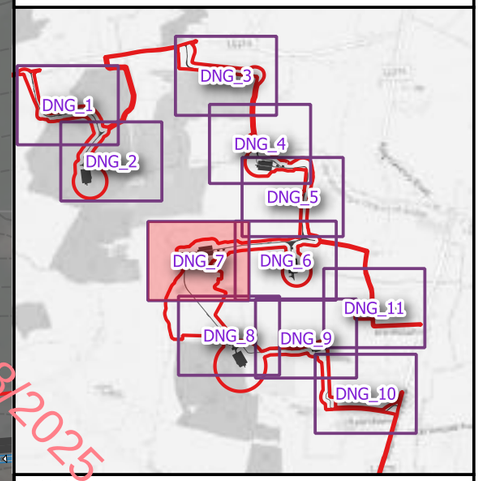
NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

Basin 6

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

NOTES
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3. BACKGROUND MAPPING REPRODUCED © OPENSTREETMAP CONTRIBUTORS

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 7

PROJECT / FIGURE NO.
M02207-01_DNG_7

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
8	Attenuated Discharge overland by Level Spreader	866		2	12.8	4 x 4 x 0.8
9	Attenuated Discharge to Watercourse (Drain)	7420		2.8	198	22 x 9 x 1

NEW TREATED CLEAN WATER DISCHARGE OVERLAND BY LEVEL-SPREADER ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE

NEW TREATED CLEAN WATER DISCHARGE TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

NEW CULVERT TO MINOR WATERCOURSE TO ALLOW ACCESS TRACK. CULVERT SIZED TO SECTION 50 STANDARD. REFER TO WATERCOURSE CROSSING SCHEDULE

Basin 8

Basin 9

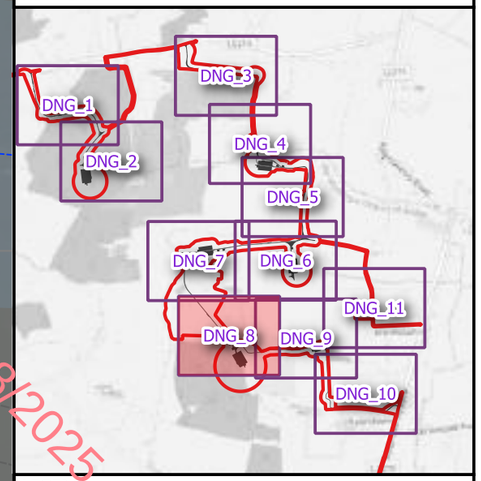
WX02

708000 708100 708200 708300 708400 708500

783200 783100 783000 782900 782800

0 50 100 150 200 m

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

Culvert ID	Dimension (m)	DESCRIPTION
WX02	0.9	NEW 0.9M DIA PIPE CULVERT (CLASS 120 CONCRETE OR EQUIVALENT)

NOTES
GENERAL
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3. BACKGROUND MAPPING REPRODUCED © OPENSTREETMAP CONTRIBUTORS

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 8

PROJECT / FIGURE NO.
M02207-01_DNG_8

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

708500 708600 708700 708800 708900 709000

783200 783100 783000 782900 782800

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
14	Attenuated Discharge to Watercourse (Drain)	2045		2	38.4	8 x 6 x 0.8
15	Attenuated Discharge to Watercourse (Drain)	4770		2	120	20 x 10 x 0.6

N

95 100 105

NEW TREATED CLEAN WATER DISCHARGE TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

Basin 14

PERMANENT FOUL DRAINAGE FROM SUBSTATION / CONTROL BUILDING TO SEALED TANK - REFER TO TLI DRAWING DR-125 FOR SUBSTATICN COMPOUND LAYOUT

BES DRAINAGE TO DISCHARGE TO MAIN SITE DRAINAGE UNDER NORMAL CONDITIONS

HATCH INDICATES AREA AT BESS COMPOUND FROM UNBOUND GRAVEL TO HAVE LINED IMPERMEABLE SUBBASE, NOMINAL VOLUME 150 CU.M SUBBASE TO DRAIN BY FILTER DRAINS TO NEW DETENTION BASIN FOR POLLUTION CONTROL

INDICATES FILTER DRAIN NETWORK DRAINING BES COMPOUND

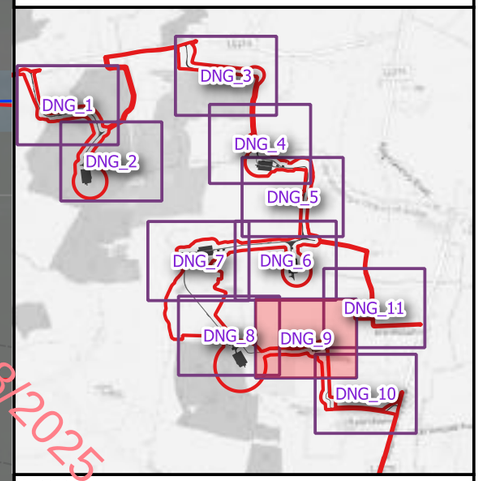
NEW POLLUTON CONTROL VALVE TO ISOLATE DISCHARGE FROM THE BES / BASIN.

NEW BASIN WITH NOMINAL MIN. VOLUME 80 CU.M TO GIVE TOTAL STORAGE VOLUME WITH BES SUBBASE NOT LESS THAN 228 CU.M

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 9

PROJECT / FIGURE NO.
M02207-01_DNG_9

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

708900 709000 709100 709200 709300 709400

782900 782800 782700 782600 782500 782400

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
15	Attenuated Discharge to Watercourse (Drain)	4770		2	120	20 x 10 x 0.6
16	Attenuated Discharge to Watercourse (Drain)	388		2	3.2	2 x 2 x 0.8
18	Attenuated Discharge to Watercourse (Drain)	757		2	9.6	4 x 3 x 0.8

N

Basin 15

NEW TREATED CLEAN WATER DISCHARGE TO EXISTING FIELD DRAIN / DITCH AT LIMITED (QBAR) GREENFIELD RATE

EXISTING PIPED LAND DRAINAGE TOWARDS EAST DISCHARGE TO FIELD DRAIN / MINOR WATERCOURSE

WX03

NEW TREATED CLEAN WATER DISCHARGES TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

Basin 16

NEW CULVERT TO MINOR WATERCOURSE TO ALLOW ACCESS TRACK. CULVERT SIZED TO SECTION 50 STANDARD. REFER TO WATERCOURSE CROSSING SCHEDULE

NEW TREATED CLEAN WATER DISCHARGE TO EXISTING FIELD DRAIN / DITCH AT LIMITED (QBAR) GREENFIELD RATE

Basin 18

DRAINAGE GRIP TO DIRECT RESIDUAL RUNOFF AWAY FROM PUBLIC ROAD AND INTO SWALE

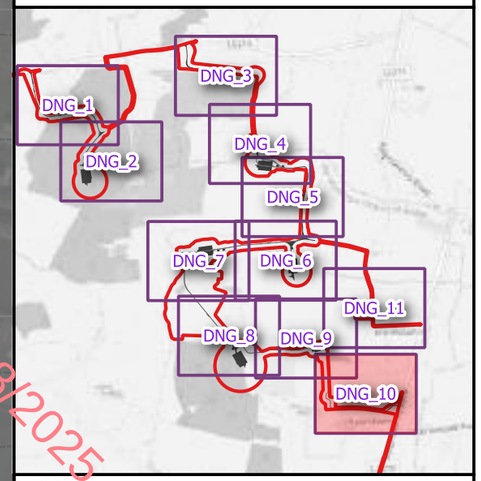
EXISTING ROADSIDE VERGE / DITCH TO BE PIPED UNDER SITE ENTRANCE PER TII STANDARD DETAILS FOR ROAD DRAINAGE (INLET STRUCTURE WITH GRILL AND SILT TRAP). PIPE SIZED TO 1% AEP CLIMATE CHANGE DESIGN FLOW. REFER TO DWG. 63 AT ANNEX G

90 95 100 105 110

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other Existing Drainage
- Land Drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)
- Clean Water Drainage Pipes
- Drainage Grip

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

Culvert ID	Dimension (m)	DESCRIPTION
WX03	0.9	NEW 0.9M DIA PIPE CULVERT (CLASS 120 CONCRETE OR EQUIVALENT)

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DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 10

PROJECT / FIGURE NO.
M02207-01_DNG_10

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	2	14/07/2025

708900 709000 709100 709200 709300 709400 709500

783400 783300 783200 783100 783000

Basin	Outfall	Drained Area sqm	Outfall Locn.	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
14	NULL	2045		2	38.4	8 x 6 x 0.8

N

85 90 95

NO ADDITIONAL DRAINAGE PROPOSED - PERMEABLE ACCESS TRACK FROM GRAVEL AGGREGATE TO FUNCTION AS A PERMEABLE PAVEMENT WHERE GRADIENT IS <3%

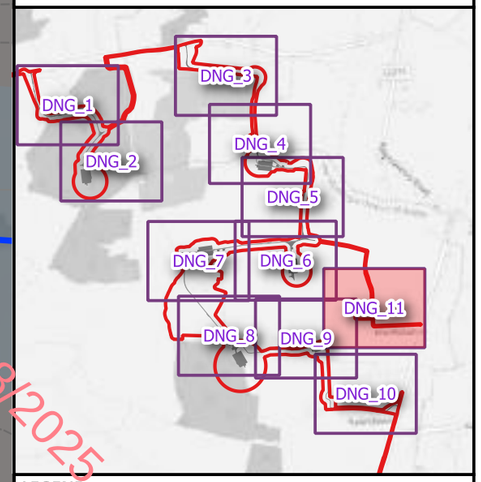
NEW TREATED CLEAN WATER DISCHARGE TO WATERCOURSE AT LIMITED (QBAR) GREENFIELD RATE

Basin 14

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Permanent Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland

Permanent Drainage Features
- Swale / Track Edge Drainage with Check Dams
- Track Drainage Pipe
- Attenuation Basin
- Infiltration Basin
- Flow Control + Outlet to Watercourse
- Flow Control + Outlet to Level Spreader (discharge overland)
- Proposed Watercourse Crossing (Culvert)

BESS Pollution Control Features
- Detention Basin
- Lined Impermeable Subbase
- BES Drainage & Pollution Control Valve

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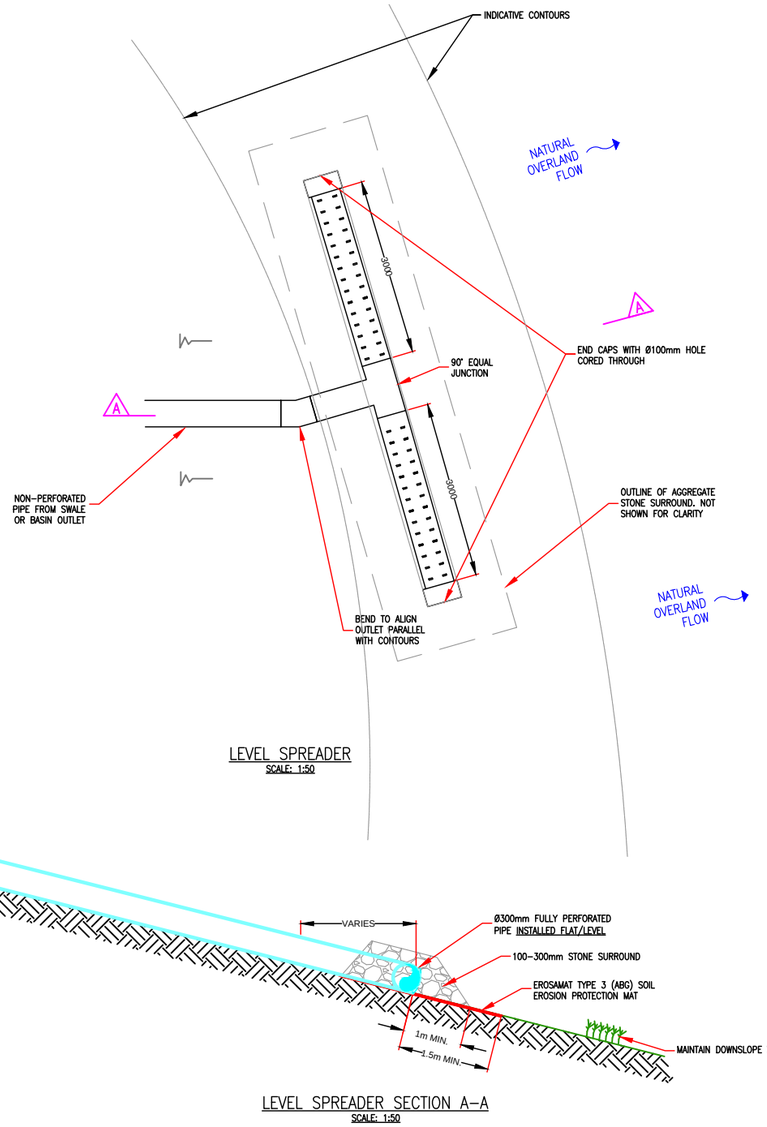
DESCRIPTION
KELLYSTOWN WIND FARM - PERMANENT DRAINAGE LAYOUT SHEET 11

PROJECT / FIGURE NO.
M02207-01_DNG_11

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	25/10/2024

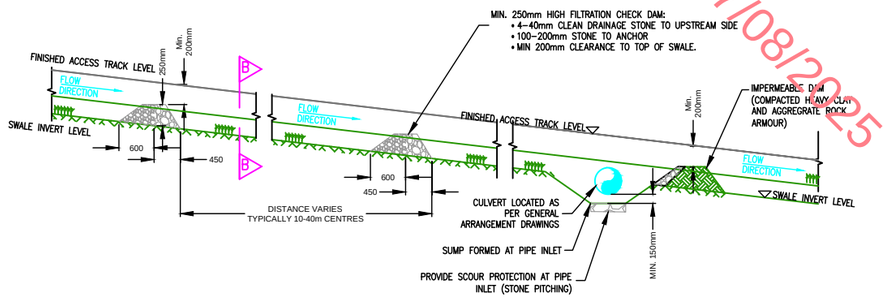
Annex B

Permanent Drainage - Details

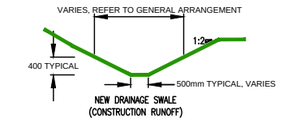


LEVEL SPREADER
SCALE: 1:50

LEVEL SPREADER SECTION A-A
SCALE: 1:50



TYPICAL TRACKSIDE SWALE & CHECK DAMS
SCALE 1:50



TYPICAL TRACKSIDE SWALE SECTION
SCALE 1:50

CHECK-DAM SPACINGS (MAXIMUM)	
CHANNEL GRADIENT	SPACING (m)
<1%	80
1-2.5%	40
2.5-5%	20
>5%	10

NOTE: DURING CONSTRUCTION PHASE THE LEVEL OF SUSPENDED SOLIDS IN TRACK RUN-OFF IS LIKELY TO NECESSITATE THE INCREASED FREQUENCY OF TEMPORARY CHECK DAMS FOR INCREASED SETTLEMENT POTENTIAL

TRACK DRAINAGE NOTES

1. ROAD CONSTRUCTION TO BE AS PER CIVIL WORKS DESIGN & SPECIFICATION. (BY OTHERS)
2. REFER TO LAYOUT PLAN DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC. MICRO-SITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
3. FEATURES SHOWN ARE TO SUIT PERMANENT INFRASTRUCTURE. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.
4. ALL EXCAVATED SLOPES TO BE BATTERED BACK TO A SAFE ANGLE OF REPOSE.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	24/10/2024	FOR PLANNING

STATUS: PLANNING

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Mossley Mill, Lower Ground (West)
Carnmoney Road North
Newtownabbey
Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WIND FARM

CLIENT: EDF RENEWABLES

DRAWING TITLE: SURFACE WATER MANAGEMENT TYPICAL DRAINAGE DETAILS LEVEL SPREADER, CHECK DAMS

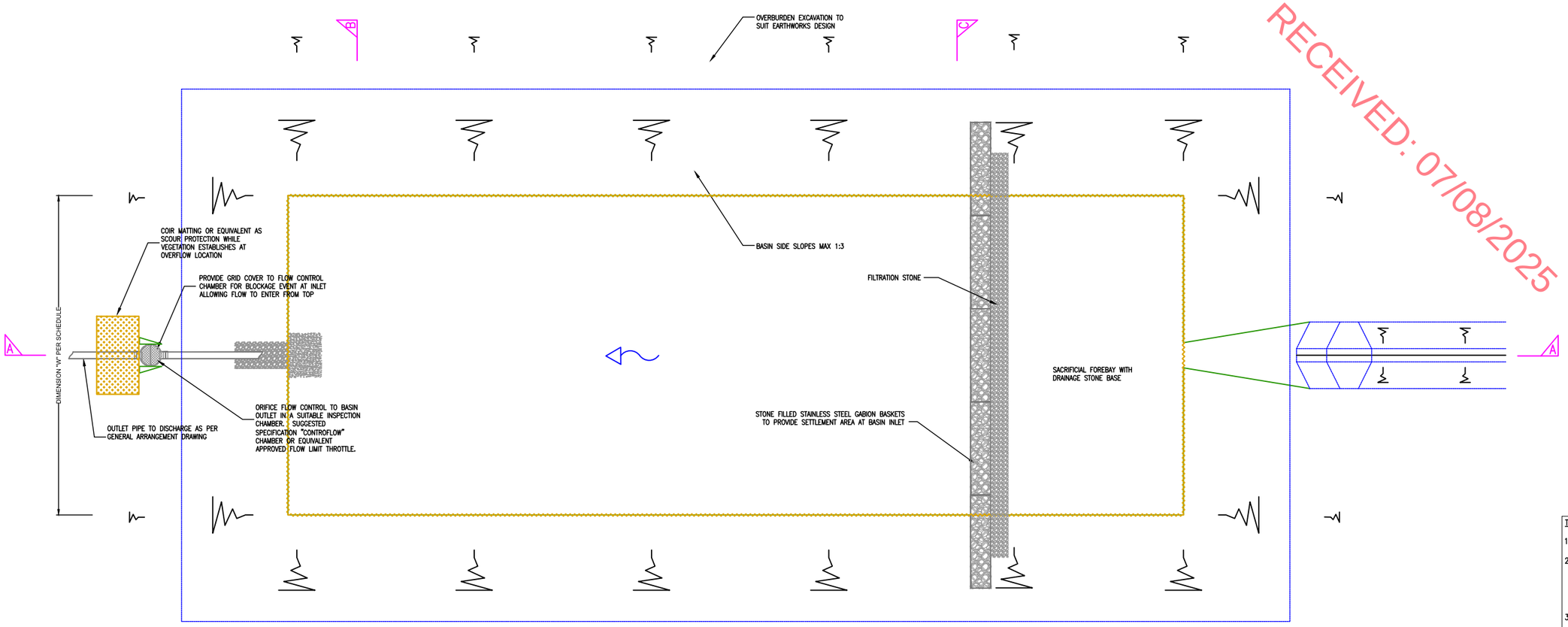
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

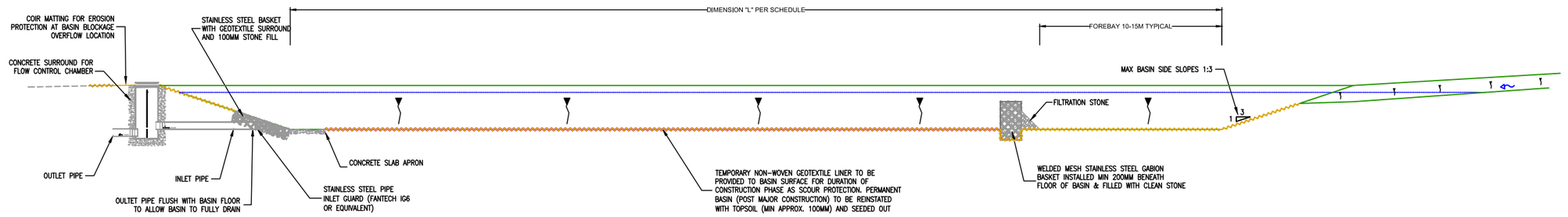
DRAWN	CHECKED	DATE
KS	PDD	14/11/2023

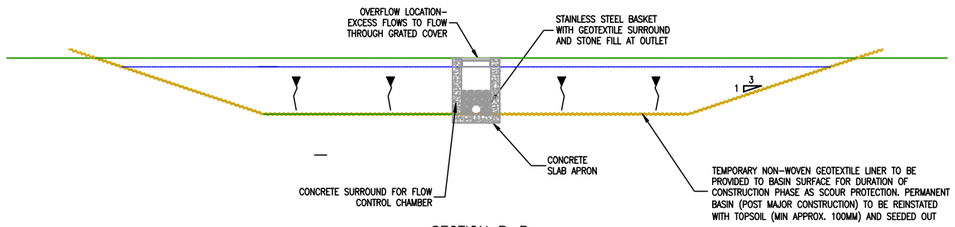
PROJECT No.	DRAWING No.	ISSUE NO.
M01944-02	DWG_21	1

DETENTION BASIN PLAN

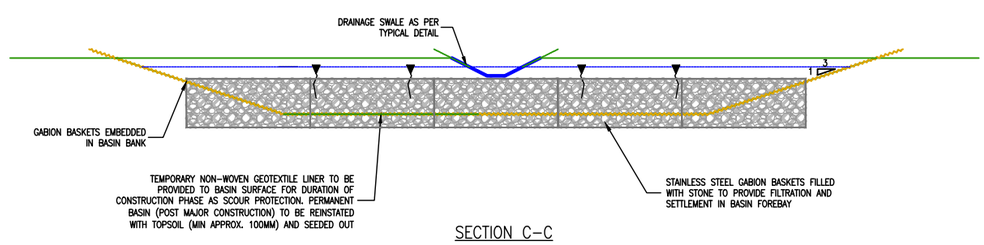
SCALE 1:50







SECTION B-B



SECTION C-C

TRACK DRAINAGE NOTES

1. ROAD CONSTRUCTION TO BE AS PER CIVIL WORKS DESIGN & SPECIFICATION. (BY OTHERS)
2. REFER TO LAYOUT PLAN DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC. MICRO-SITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
3. FEATURES SHOWN ARE TO SUIT PERMANENT INFRASTRUCTURE. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.
4. ALL EXCAVATED SLOPES TO BE BATTERED BACK TO A SAFE ANGLE OF REPOSE.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	24/10/2024	FOR PLANNING

STATUS: PLANNING

McCloy Consulting
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Carnmoney Road North
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Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WIND FARM

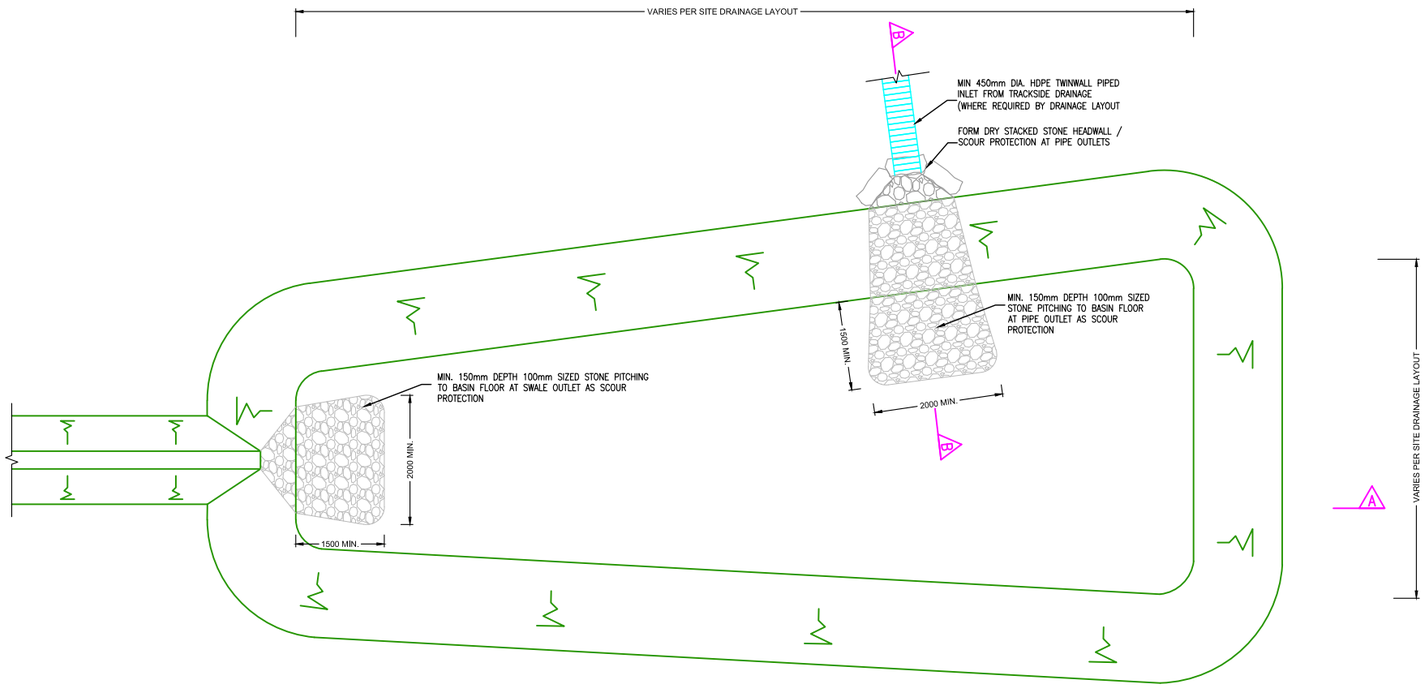
CLIENT: EDF RENEWABLES

DRAWING TITLE: SURFACE WATER MANAGEMENT ATTENUATION BASIN DETAILS

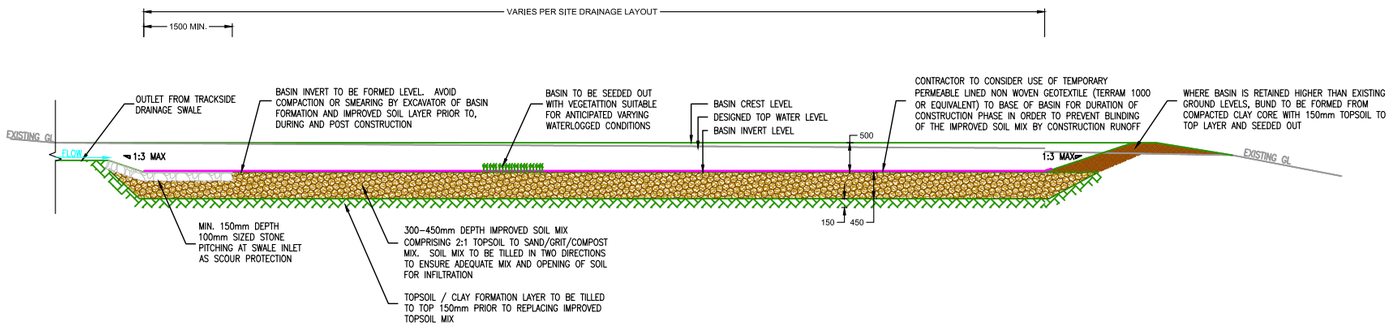
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
KS	PDD	14/11/2023

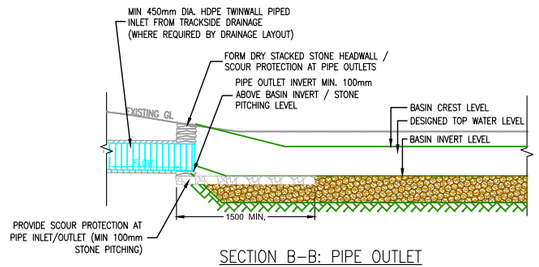
PROJECT No.	DRAWING No.	ISSUE NO.
M01944-02	DWG_22	1



PLAN



SECTION A–A



SECTION B–B: PIPE OUTLET

INFILTRATION BASIN NOTES

1. REFER TO DETAILED PLAN SuDS DRAWINGS FOR DETAILS OF DRAINAGE LAYOUT. MICROSITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
2. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.
3. SAMPLE SOIL IMPROVEMENT PROCEDURE:
   - 3.1. TOPSOIL FROM BASIN AREAS TO BE REMOVED AND STORED FOR RE–USE PRIOR TO ESTABLISHMENT OF INFILTRATION BASINS
   - 3.2. AVOID COMPACTION OF INFILTRATION BASINS BY MECHANICAL PLANT OR OTHERWISE PRIOR TO AND DURING CONSTRUCTION
   - 3.3. BASIN FORMATION LEVEL IN TOPSOIL / CLAY TO BE TILLED TO MIN. DEPTH 150mm IN TWO DIRECTIONS BY MECHANICAL ROTAVATOR OR SIMILAR AND SURFACE TRIMMED AND PREPARED.
   - 3.4. TOPSOIL TO BE REPLACED IN RATIO 2:1 WITH SAND / GRAVE/ ORGANIC COMPOST. LAYERS TO BE TILLED IN TWO DIRECTIONS BY MECHANICAL ROTAVATOR OR SIMILAR TO ACHIEVE AN EVEN SOIL MIX. TARGET BULK DENSITY FOR IMPROVED LAYER TO BE <1.10g/cm3.
   - 3.5. CONTRACTOR TO GIVE CONSIDERATION TO PLACEMENT OF A NON–WOVEN PERMEABLE GEOTEXTILE (TERRAM 1000 OR SIMILAR) TO THE BASIN FLOOR FOR THE DURATION OF CONSTRUCTION UNTIL SUCH TIMES AS FINES WASHOUT FROM NEW TRACK STRUCTURES HAS STABILISED
4. VEGETATION FOR BASIN FLOOR TO BE DETERMINED IN CONJUNCTION WITH PROJECT ECOLOGIST.
5. ALL DIMENSIONS SUBJECT TO DETAILED DESIGN POST DETAILED INFILTRATION TEST SITE INVESTIGATION.

TRACK DRAINAGE NOTES

1. ROAD CONSTRUCTION TO BE AS PER CIVIL WORKS DESIGN & SPECIFICATION. (BY OTHERS)
2. REFER TO LAYOUT PLAN DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC. MICRO–SITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
3. FEATURES SHOWN ARE TO SUIT PERMANENT INFRASTRUCTURE. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.
4. ALL EXCAVATED SLOPES TO BE BATTERED BACK TO A SAFE ANGLE OF REPOSE.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
01	IB	KS	24/10/2024	FOR INFORMATION

STATUS: FOR INFORMATION

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Carnmoney Road North
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Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WIND FARM

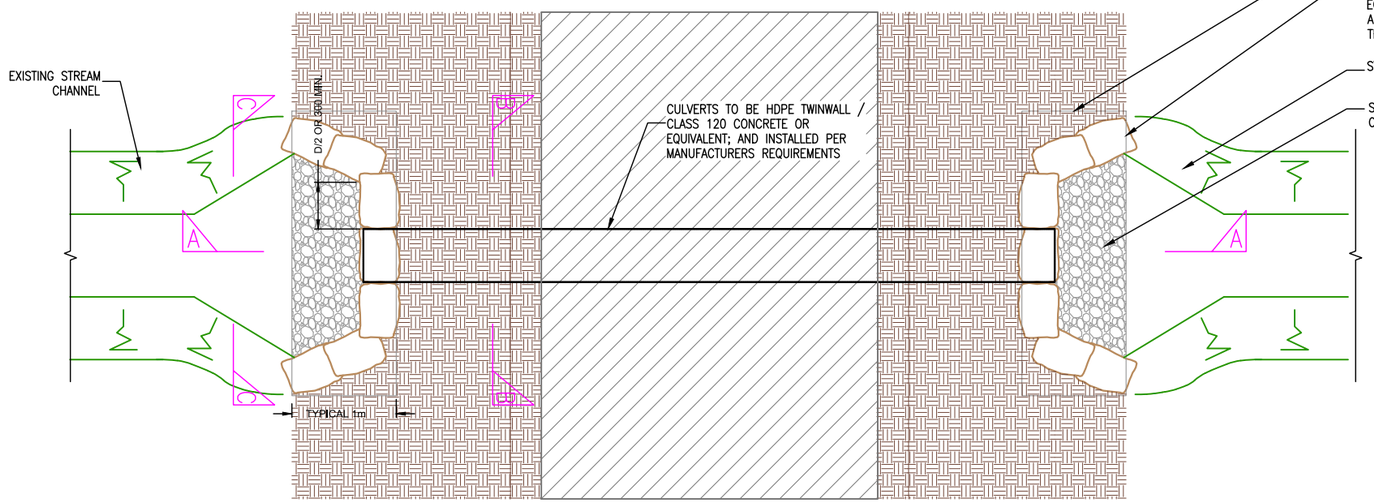
CLIENT: EDF RENEWABLES

DRAWING TITLE: INFILTRATION BASIN DETAILS

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
KS	PDD	14/11/2023

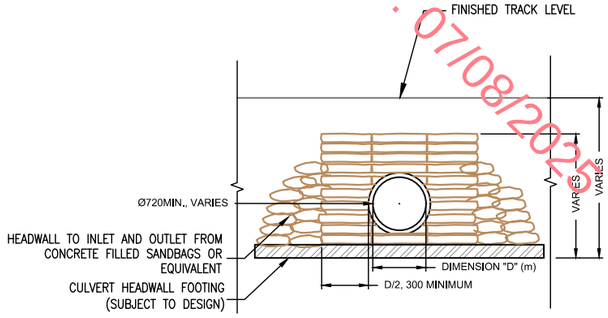
PROJECT No.	DRAWING No.	ISSUE NO.
M01944–02	DWG_23	01



PLAN
SCALE 1:40

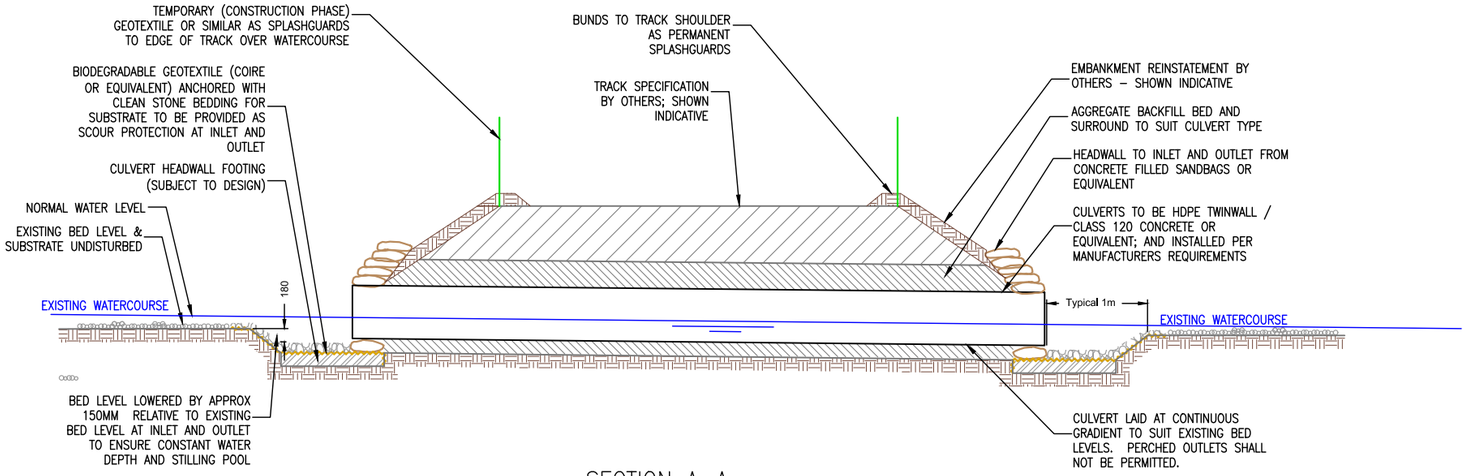
NOTES FOR CONSTRUCTION METHODS & ENVIRONMENTAL PROTECTION

1. WORKS TO BE PROGRAMMED TO SUIT PERIODS OF LOW RIVER FLOW AND RAINFALL. DUE COGNISANCE GIVEN TO THE PREVAILING GROUND CONDITIONS AND SEASONAL WEATHER CONDITIONS.
2. CULVERT LOCATION TO BE DAMMED UPSTREAM BY USE OF SANDBAGS OR EQUIVALENT AND OVERPUMPED IN ORDER TO PROVIDE A DRY WORKING ENVIRONMENT.
3. IN CHANNEL SILT FENCING TO BE INSTALLED DOWNSTREAM OF THE WORKS AND DOWNSTREAM OF OVERPUMPING FOR THE DURATION OF THE CULVERT INSTALLATION WORKS.

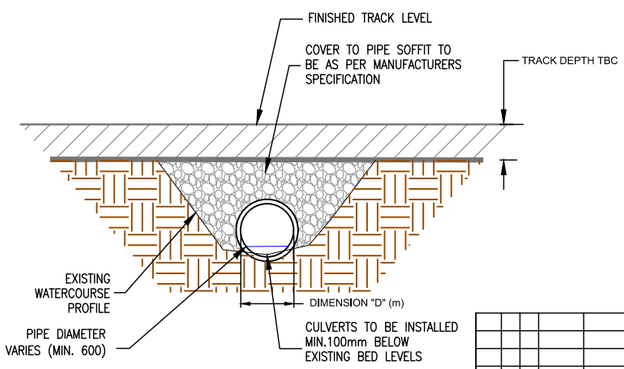


ELEVATION C–C (WITH HEADWALL)
1:40

CULVERT WATERCOURSE CROSSING
SCALE AS SHOWN



SECTION A–A
SCALE 1:40



SECTION B–B
SCALE 1:40

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	24/10/2024	FOR PLANNING

STATUS: PLANNING

McCloy Consulting
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Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WIND FARM

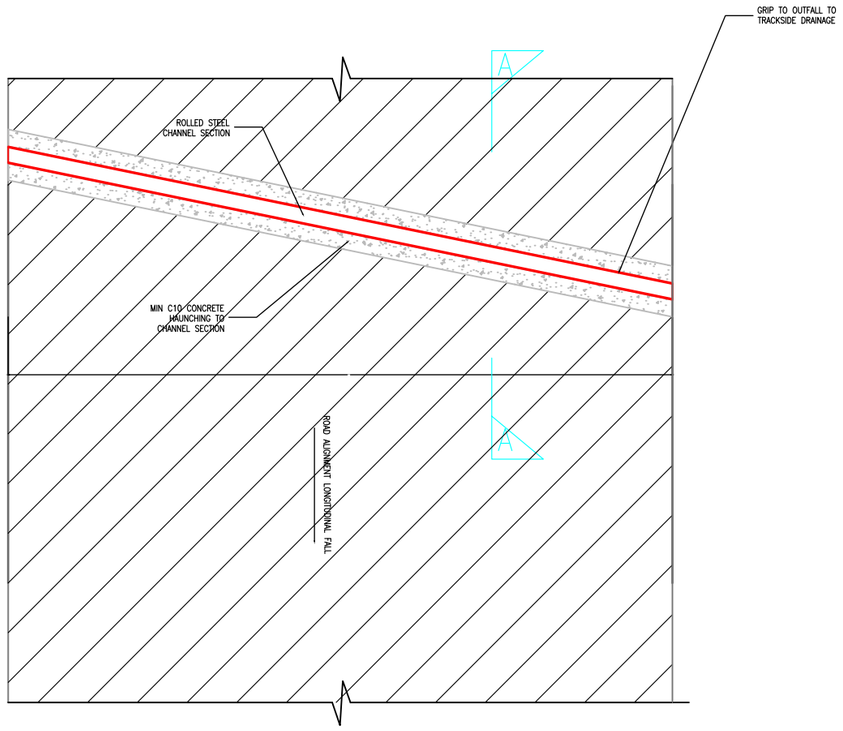
CLIENT: EDF RENEWABLES

DRAWING TITLE: PIPED CULVERT DETAIL

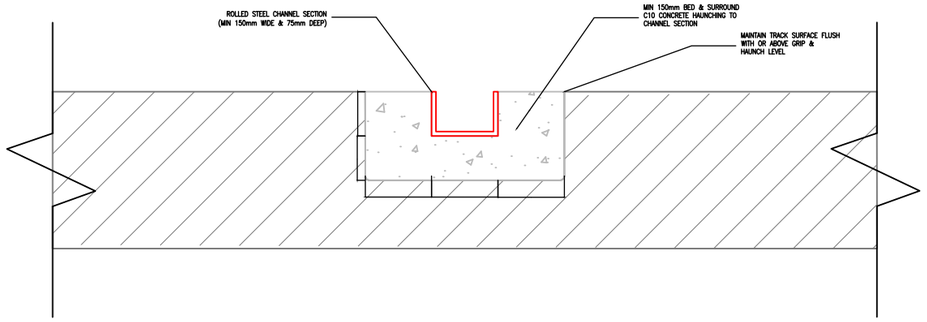
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
KS	PDD	14/11/2023

PROJECT No.	DRAWING No.	ISSUE NO.
M01944–02	DWG_24	1



ROAD GRIP – PLAN
SCALE 1:25



ROAD GRIP –
SECTION A–A
SCALE 1:25

EXAMPLE OF ROAD GRIP INSTALLATION
NTS

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	11/07/2025	FOR PLANNING

STATUS
PLANNING

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PROJECT
KELLYSTOWN WIND FARM

CLIENT
EDF RENEWABLES

DRAWING TITLE
DRAINAGE GRIP DETAIL

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
KS	PDD	14/11/2023

PROJECT No.	DRAWING No.	ISSUE NO.
M01944–02	DWG_25	1

Annex C

Temporary Drainage - Layouts

706900 707000 707100 707200 707300 707400 707500

784700 784600 784500 784400 784300

POLLUTION PREVENTION MEASURES APPLY IN BOREWELL PROTECTION ZONE - NO FUEL STORAGE / REFUELLING / SPILL CONTROL MEASURES

TEMPORARY COMPOUND - ALL FUEL / OIL STORAGE TO BE IN IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

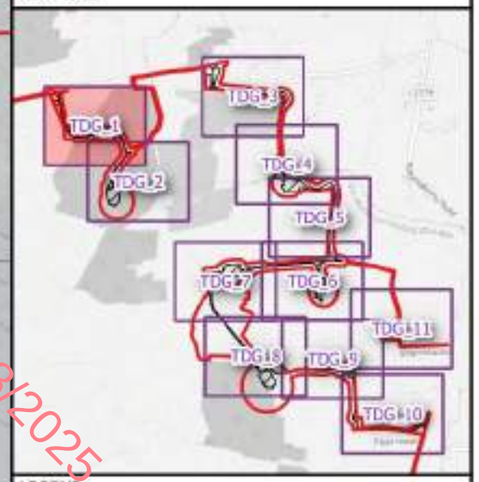
0 50 100 150 200 m

N

RECEIVED: 07/08/2025

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES:
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FIXTURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT BEING DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIORTO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6.OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
7.THIS DRAWING INDICATES IDEALLY MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO SUPPORTS PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES (ATTENUATION PONDS) MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORK FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE REINSTATEMENT.
8. CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WON WELL GRADED STONE. AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 3-40MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PUNCHMINT OF 300MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON GRADIENT/ERSION GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS8 HAMS APPROVED.

MAINTENANCE
11.THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND / OR BY SILT LEVELS IN ANY AREA TO BE TEMPORARILY DRAINED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINMENT OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SOCKS / SEDIMENT MATS).
12.BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT.

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DESCRIPTION: KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 1			
PROJECT / FIGURE NO.: M02207-01_TDG_1			
DRAWN BY: DKS	SCALE: 1:2000	REVISION: 1	DATE: 29/10/2024

707200 707300 707400 707500 707600 707700 707800

784400 784300 784200 784100 784000

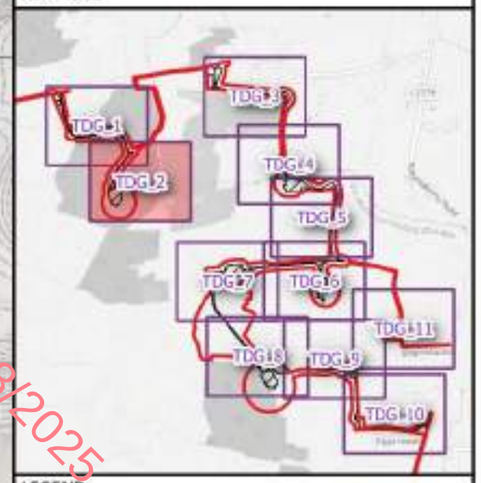
TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT DETAIL DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6. OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
7. THIS DRAWING INDICATES ABSOLUTE MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO SEPARATE PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES (ATTENUATION PONDS) MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORK FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE REINSTATEMENT.
8. CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WON (4/6), GRADED STONE. AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 3-40MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PLACEMENT OF 300MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM.
9. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON GRADIENT/EROSION. GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS8 HAMS APPROVED.

MAINTENANCE
11. THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SACKS / SEDIMENT MATS).
12. BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT

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DESCRIPTION	KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 2
PROJECT / FIGURE NO.	M02207-01_TDG_2
DRAWN BY	DKS
SCALE	1:2000
REVISION	1
DATE	29/10/2024

BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2024)

707900 708000 708100 708200 708300 708400 708500

784900 784800 784700 784600 784500

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

TEMPORARY COMPOUND - ALL FUEL / OIL STORAGE TO BE IN IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

IN-CHANNEL SILT BARRIERS TO BE PLACED DURING / AFTER CULVERT INSTALLATION

NO REFUELLING / STOCKPILING OF SPOIL WITHIN POLLUTION PREVENTION BUFFER

WX01

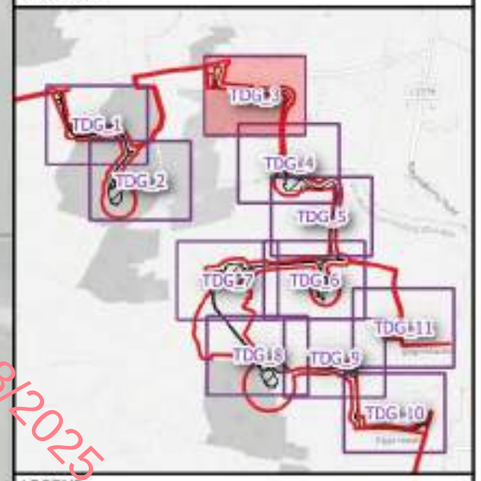
GPP5 APPLIES TO WORK TO CONSTRUCT WATERCOURSE CROSSING CULVERT. WORK TO AVOID INCLEMENT WEATHER

SILT FENCES AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE

N

0 50 100 150 200 m

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

S 1:20

NOTES:
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICRO-SITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT SITING DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6. OIL/ FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
7. THIS DRAWING INDICATES (ONLY) MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO (SEPARATE) PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES / ATTENUATION PONDS MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORKS FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE REINSTATEMENT.
8. CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WORN WELL GRADED STONE AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 5-40MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PLACEMENT OF 300MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDENT UPON GRADIENT/LENGTH/ GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS6 HUMS APPROVED.

MAINTENANCE
11. THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SACKS / SEDIMENT MATS).
12. BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT.

PLANNING DESIGN

McCloy Consulting
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UK +44 (0) 28 9084 8694
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DESCRIPTION
KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 3

PROJECT / FIGURE NO.
M02207-01_TDG_3

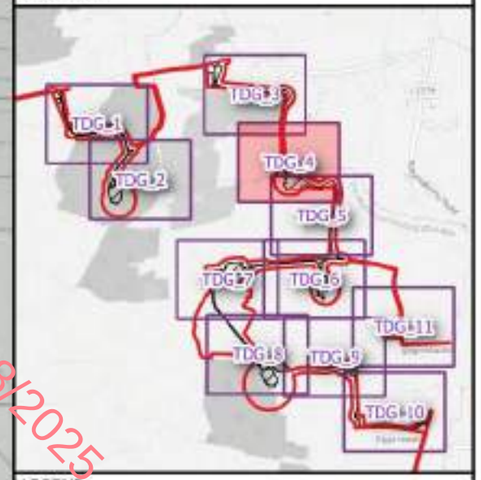
DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	29/10/2024

708200 708300 708400 708500 708600 708700

784500 784400 784300 784200 784100

N

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

0 50 100 150 200 m

PLANNING DESIGN

NOTES
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICRO-SITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT BEING DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN POLLUTION PREVENTION ZONES SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6. OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
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8. CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WON WELL GRADED STONE. AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 1-40MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PLACEMENT OF 300MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDENT UPON GRADIENT/ GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS8 HAINS APPROVED.

MAINTENANCE
11 THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN AND AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SKIT SOCKS / SEDIMENT MATS).
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DESCRIPTION			
KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 4			
PROJECT / FIGURE NO.			
M02207-01_TDG_4			
DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	29/10/2024

708400 708500 708600 708700 708800 708900

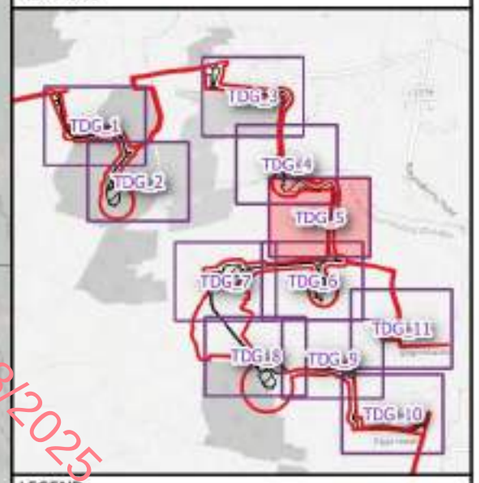
784100 784000 783900 783800 783700

TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

N

0 50 100 150 200 m

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES:
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT BSTNG DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIORTO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6.OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
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WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BSS PIPES APPROVED.

MAINTENANCE
11.THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY DRAINAGE THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SACKS / SEDIMENT MATS).
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PLANNING DESIGN

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DESCRIPTION: KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 5			
PROJECT / FIGURE NO.: M02207-01_TDG_5			
DRAWN BY: DKS	SCALE: 1:2000	REVISION: 1	DATE: 29/10/2024

708300 708400 708500 708600 708700 708800 708900

783700 783600 783500 783400 783300

N

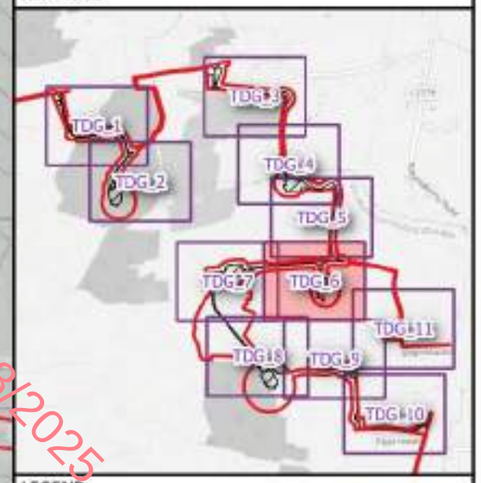
TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
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POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6. OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED (IN THE CEMENT MIX).

TRACK / INFRASTRUCTURE DRAINAGE
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9. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDANT UPON GRADIENT(S) OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS8 HAMS APPROVED.

MAINTENANCE
11. THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SACKS / SEDIMENT MATS).
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DESCRIPTION: KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 6			
PROJECT / FIGURE NO.: M02207-01_TDG_6			
DRAWN BY: DKS	SCALE: 1:2000	REVISION: 1	DATE: 29/10/2024

707800 707900 708000 708100 708200 708300

783700 783600 783500 783400 783300

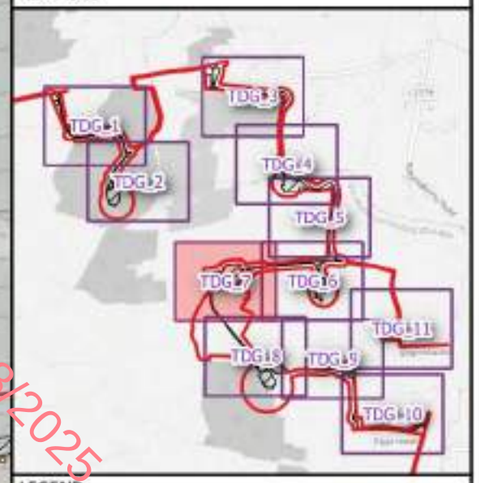
TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES:
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT DESIGN IS INTENDED TO BE FURTHER DEVELOPED POST-CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF ILIDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT DETAIL DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6.OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
7.THIS DRAWING INDICATES IDEALLY MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO SUPPORTS PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES, ATTENUATION PONDS MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORK FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE RE-INSTATEMENT.
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WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BSG HARRIS APPROVED.

MAINTENANCE
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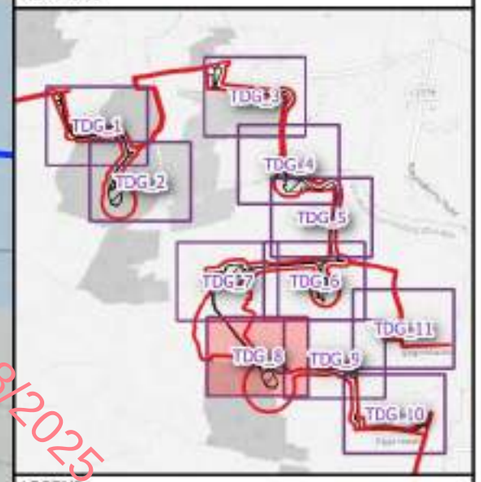
DESCRIPTION	KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 7
PROJECT / FIGURE NO.	M02207-01_TDG_7
DRAWN BY	DKS
SCALE	1:2000
REVISION	1
DATE	29/10/2024

708000 708100 708200 708300 708400 708500

783200 783100 783000 782900 782800

N

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
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- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

S 120

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

IN-CHANNEL SILT BARRIERS TO BE PLACED DURING / AFTER CULVERT INSTALLATION

WX02

NO REFUELLING / STOCKPILING OF SPOIL WITHIN POLLUTION PREVENTION BUFFER

SILT FENCES AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE

GPP5 APPLIES TO WORK TO CONSTRUCT WATERCOURSE CROSSING CULVERT. WORK TO AVOID INCLEMENT WEATHER

TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO MAINTAIN CLEAN / DIRTY WATER SEPERATION

0 50 100 150 200 m

PLANNING DESIGN

NOTES:
GENERAL
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TRACK / INFRASTRUCTURE DRAINAGE
7. THIS DRAWING INDICATES WHERE MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO SUPPORTING PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES / ATTENUATION PONDS MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORK FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE REINSTATEMENT.
8. CLEAN STONE CHECK DAMS TO BE INSTALLED IN ALL DRAINAGE CHANNELS IN ORDER TO PROMOTE SETTLEMENT OF SUSPENDED SOLIDS AND CONTROL FLOW RATES. CHECK DAMS GENERALLY TO BE LOCALLY WON WELL GRADED STONE AGGREGATE SIZE FOR STONE CHECK DAMS TO BE TYPICALLY 140MM CLEAN STONE. ON STEEP SECTIONS SMALL STONE TO BE ANCHORED THROUGH THE PLACEMENT OF 300MM STONE ON THE DOWNHILL FACE OF THE CHECK DAM. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDENT UPON GRADIENT.
GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS6 MARKS APPROVED.

MAINTENANCE
11. THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS (SILTBUSTER / SILT SACKS / SEDIMENT MATS).
12. BUILD UP OF SILT LEVELS AT CHECK DAMS TO BE REMOVED AND DISPOSED OF. SILT LEVELS AT CHECK DAMS TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND REPLACED SUBSEQUENT TO THE REMOVAL OF SILT.

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E: info@mccloyconsulting.com
w: www.mccloyconsulting.com

DESCRIPTION: KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 8			
PROJECT / FIGURE NO.: M02207-01_TDG_8			
DRAWN BY: DKS	SCALE: 1:2000	REVISION: 1	DATE: 29/10/2024

708500 708600 708700 708800 708900 709000

783200 783100 783000 782900 782800

N

TEMPORARY SILT FENCE ADJACENT TO WATERCOURSE FOR DURATION OF CONSTRUCTION PHASE

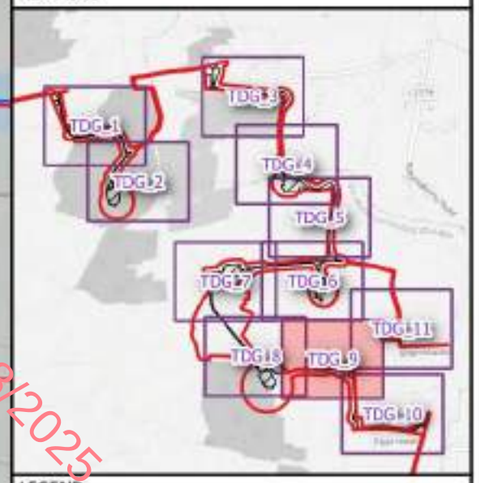
TEMPORARY COMPOUND - ALL FUEL / OIL STORAGE TO BE IN IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

NOTES
GENERAL
1. DRAWINGS ARE INTENDED TO INFORM THE PLANNING APPLICATION. DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION AND SHOULD NOT BE USED AS SUCH. FOR AVOIDANCE OF DOUBT, SURFACE WATER MANAGEMENT SHOWN IS INDICATIVE TO BE FURTHER DEVELOPED POST CONSENT OF THE PLANNING APPLICATION INCLUDING MICROSITING.
2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT DETAIL DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN (POLLUTION PREVENTION ZONES) SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
5. DRAINAGE MANAGEMENT FEATURES TO BE INSTALLED PRIOR TO OR IN PARALLEL WITH TRACK CONSTRUCTION.
6. OIL FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
7. THIS DRAWING INDICATES WIDELY MINIMUM TEMPORARY DRAINAGE REQUIREMENTS. REFER TO SEPARATE PERMANENT DRAINAGE DRAWING SERIES. PERMANENT DRAINAGE FEATURES, ATTENUATION PONDS) MAY BE INSTALLED IN THE TEMPORARY PHASE FOR USE FOR SETTLEMENT. TEMPORARY DRAINAGE TO BE REMOVED OR AMENDED TO SUIT THE PERMANENT WORK FOOTPRINT AND DRAINAGE PLAN AS PART OF FINAL SITE REINSTATEMENT.
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9. SPACING AND FREQUENCY OF CHECK DAMS WILL BE DEPENDENT UPON LONGITUDINAL GRADIENT OF SWALE.

WATERCOURSE & TRACK DRAINAGE CROSSINGS
10. THE MINIMUM PIPE DIAMETER FOR ANY TRACK DRAINAGE CROSSING SHALL BE 450MM. ALL HDPE PIPES SHALL BE TWINWALL TYPE, BS6 MARKS APPROVED.

MAINTENANCE
11. THE LEVEL OF SILT IN RUNOFF DURING CONSTRUCTION IS TO BE MONITORED VISUALLY AND EXCESSIVE SILT LEVELS IN ANY AREA TO BE TEMPORARILY MANAGED THROUGH USE OF SILT FENCES / CONSTRUCTED SETTLEMENT FEATURES / CONTAINERISED OR PROPRIETARY SOLUTIONS) (SILTBUSTER / SKIT SOCKS / SEDIMENT MATS).
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DESCRIPTION: KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 9			
PROJECT / FIGURE NO.: M02207-01_TDG_9			
DRAWN BY: DKS	SCALE: 1:2000	REVISION: 1	DATE: 29/10/2024

708900 709000 709100 709200 709300 709400

782900 782800 782700 782600 782500 782400

N

SILT FENCES AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE

IN-CHANNEL SILT BARRIERS TO BE PLACED DURING / AFTER CULVERT INSTALLATION

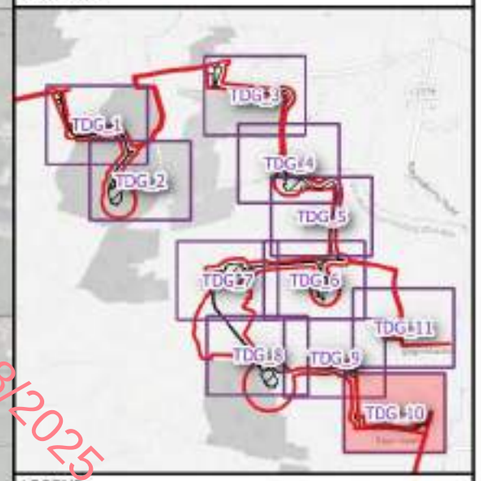
WX03

CPPS APPLIES TO WORK TO CONSTRUCT WATERCOURSE CROSSING CULVERT. WORK TO AVOID INCLEMENT WEATHER

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
- "Major" Watercourse
- "Minor" Watercourse
- Other existing drainage
- Potable Borewell Location
- Water Feature Setback / Buffer Zone (10m / 50m)
- Habitat Management Areas
- Wetland
- Proposed Watercourse Crossing (Culvert)

Temporary Drainage
- CLEAN INTERCEPTOR
- DIRTY WATER DRAINAGE
- TEMPORARY PIPED DRAINAGE
- Silt Fence
- Settlement / Washout Basin

S 1:20

NOTES
GENERAL
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2. DETAILED SITING OF SUDS FEATURES SHALL BE UNDERTAKEN ON AN OBSERVATIONAL BASIS DEPENDANT ON LOCAL TOPOGRAPHY AND CONSTRUCTION SEQUENCING.
3. ALL DRAINAGE MANAGEMENT FEATURES SHOWN SHOULD BE READ IN CONJUNCTION WITH RELEVANT BSTAG DRAWINGS.

POLLUTION PREVENTION
4. ALL WORK IN POLLUTION PREVENTION ZONES SHALL BE SUBJECT TO PLANNING IN CONJUNCTION WITH THE ENVIRONMENTAL CONSULTANT. WORKS TO BE PLANNED TO SUIT WEATHER FORECASTS.
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6. OILS, FUEL SHOULD BE STORED WITHIN CONTAINMENT AREA IN THE SITE COMPOUND. CEMENT SHOULD BE MIXED WITHIN COMPOUND. TOOLS SHOULD BE WASHED IN THE SAME AREA AND WATER RECYCLED ON THE CEMENT MIX.

TRACK / INFRASTRUCTURE DRAINAGE
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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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DESCRIPTION			
KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 10			
PROJECT / FIGURE NO.			
M02207-01_TDG_10			
DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	29/10/2024

708900 709000 709100 709200 709300 709400 709500

783400 783300 783200 783100 783000

N

TEMPORARY SILT FENCE WHERE TRACK CONSTRUCTION ENCROACHES ON POLLUTION PREVENTION BUFFER

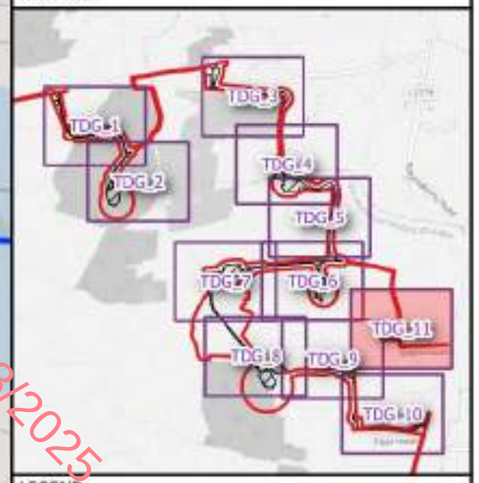
NO REFUELLING / STOCKPILING OF SPOIL WITHIN POLLUTION PREVENTION BUFFER

LINED CONCRETE / CEMENT WASHOUT PIT - COLLECTED WATER TO BE DISPOSED OF OFFSITE

0 50 100 150 200 m

PLANNING DESIGN

KEY PLAN



LEGEND

Infrastructure
- Application Boundary
- Temporary Infrastructure Footprint

Hydrology Features & Constraints
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- Settlement / Washout Basin

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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MAINTENANCE
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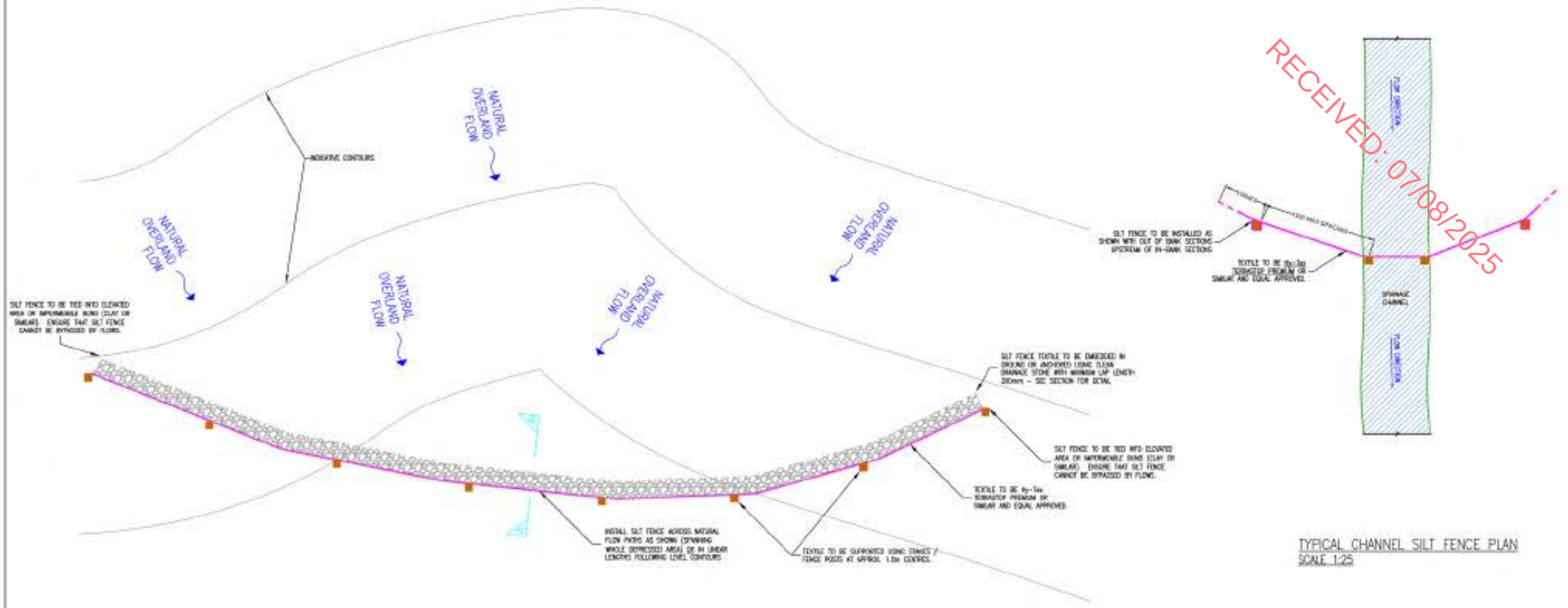
DESCRIPTION
KELLYSTOWN WIND FARM - TEMPORARY DRAINAGE LAYOUT SHEET 11

PROJECT / FIGURE NO.
M02207-01_TDG_11

DRAWN BY	SCALE	REVISION	DATE
DKS	1:2000	1	29/10/2024

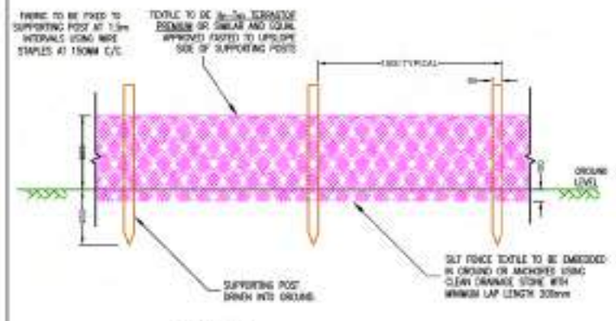
Annex D

Temporary Drainage - Details

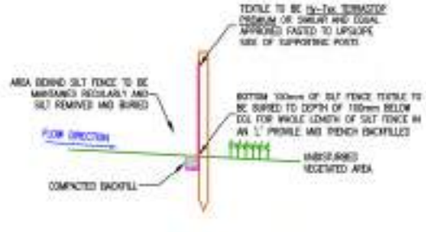


TYPICAL OVERLAND SILT FENCE PLAN
SCALE 1:25

TYPICAL CHANNEL SILT FENCE PLAN
SCALE 1:25



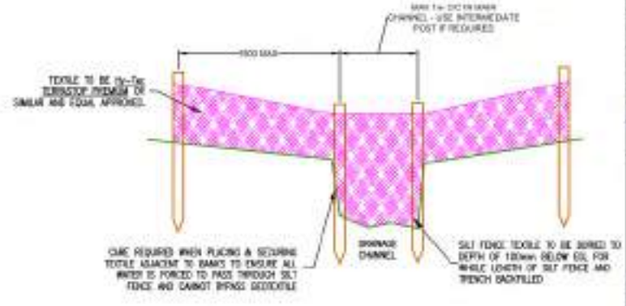
ELEVATION
SCALE 1:25



SECTION A-A
BURIED TYPE OPTION
SCALE 1:25

EXAMPLE OF CHANNEL SILT FENCE INSTALLATION
NTS

NOTE - IN-CHANNEL SILT FENCE BARRIERS ARE SUITABLE ONLY FOR PEAT / FORESTRY DRAINS AND ARE NOT FOR INSTALLATION IN WATERCOURSES



TYPICAL CHANNEL SILT FENCE ELEVATION
SCALE 1:25

1	DL	KS	24/10/2024	FOR PLANNING

PLANNING

McCloy Consulting

KELLYSTOWN WIND FARM

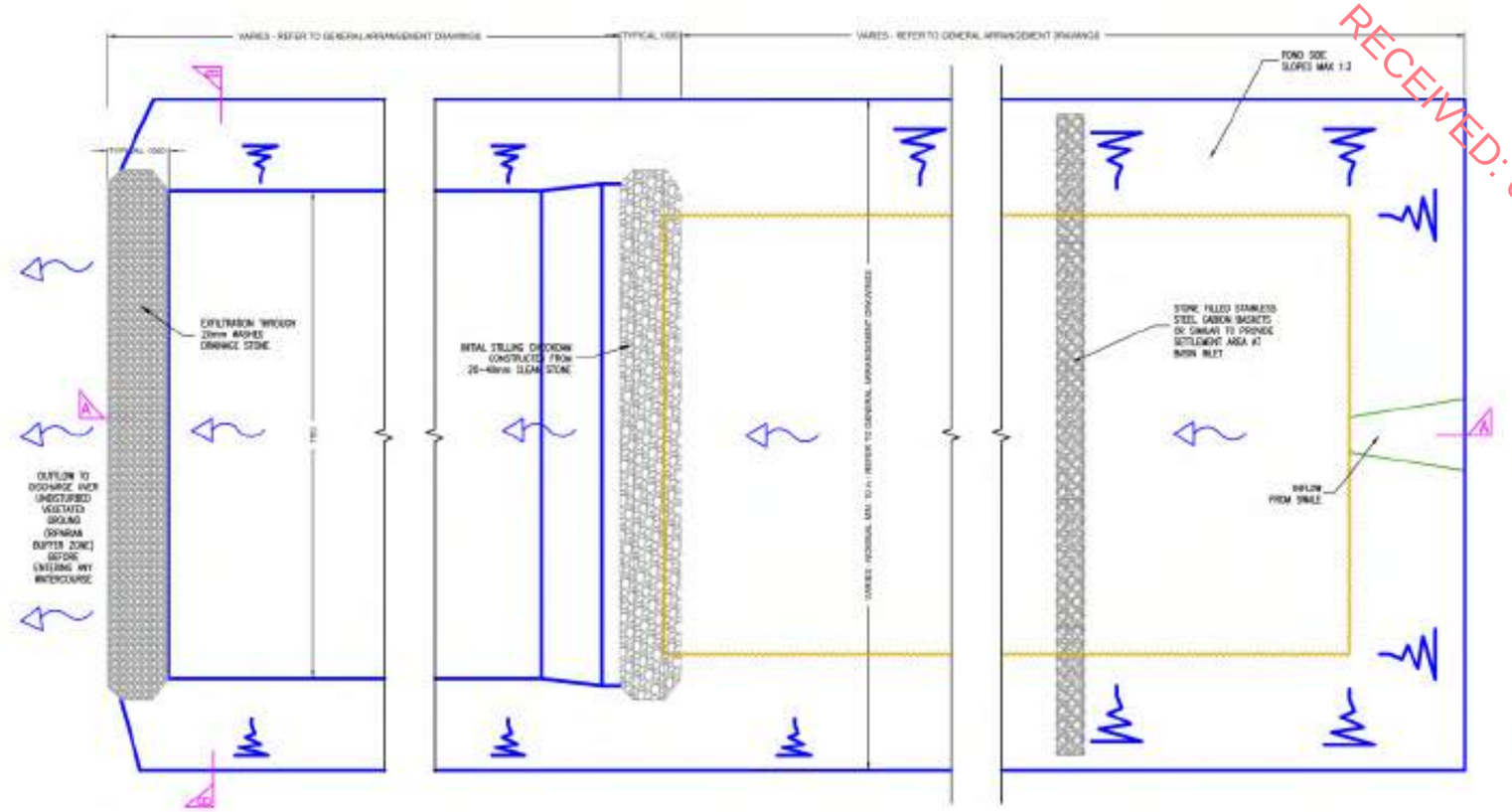
EDF RENEWABLES

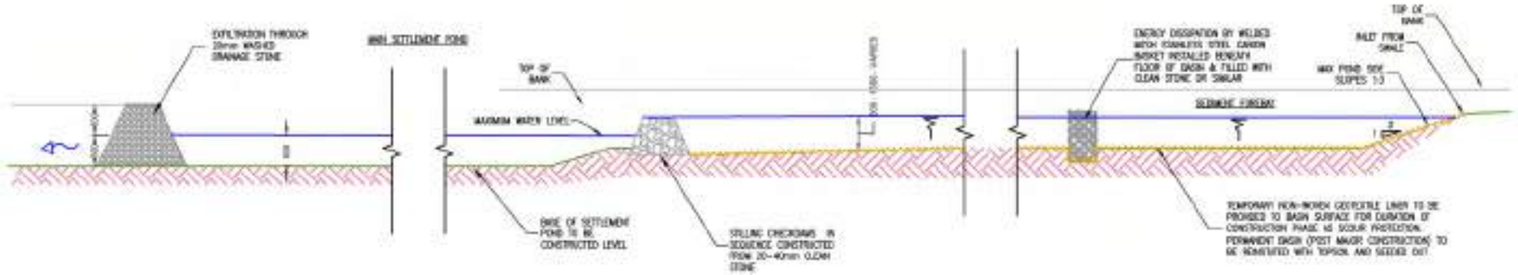
SURFACE WATER MANAGEMENT
SILT FENCE

AS SHOWN@A1	A1

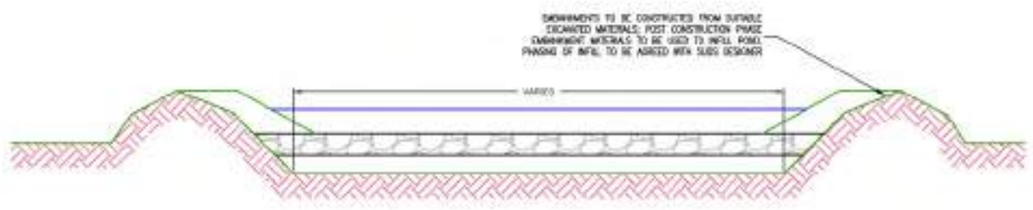
KS	PDD	14/11/2023
M01944-02	DWG_41	1

PLANNING DESIGN





SECTION A-A



SECTION B-B

PLANNING DESIGN

1	DL	KS	24/10/2024	FOR PLANNING

PLANNING

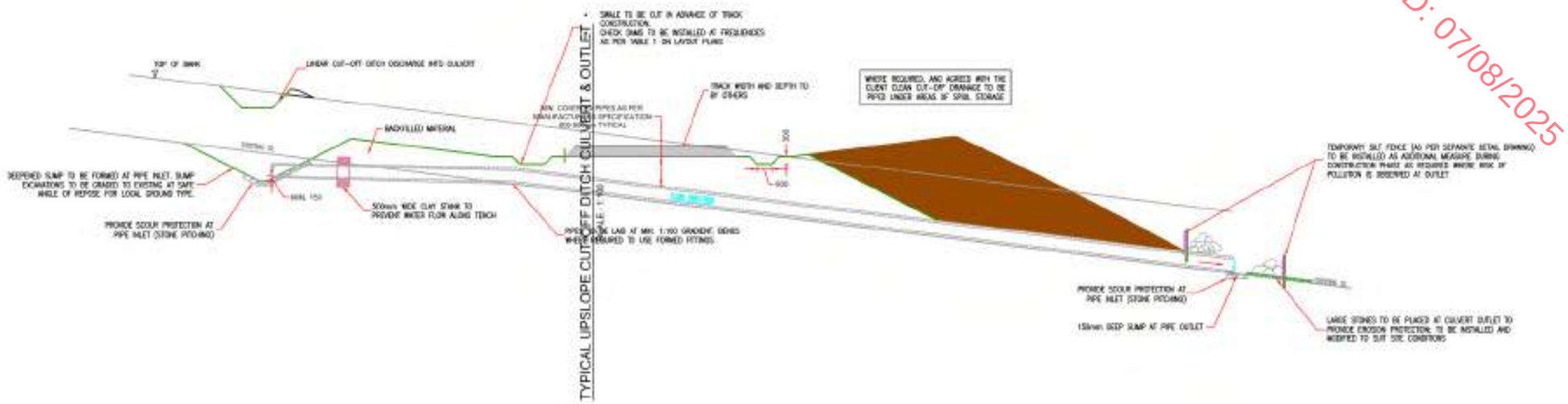
McCloy Consulting

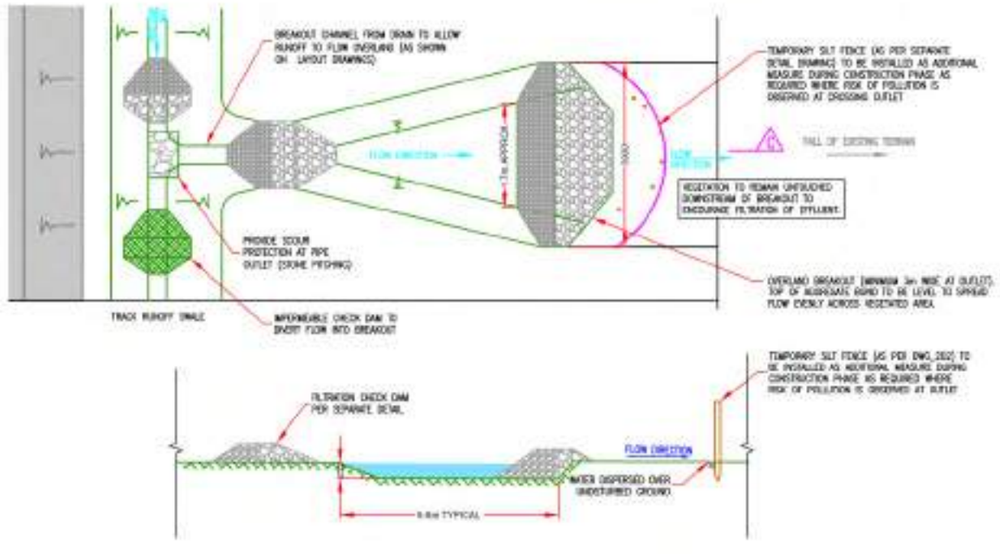
KELLYSTOWN WIND FARM

EDF RENEWABLES

SURFACE WATER MANAGEMENT SETTLEMENT BASIN

AS SHOWN@A1		A1
KS	PDD	14/11/2023
M01944-02	DWG_42	1





TYPICAL BREAKOUT – PLAN AND SECTION

NOTES

1. SUDS SYSTEM TO BE CONSTRUCTED PRIOR TO, OR AT THE SAME TIME AS THE ACCESS ROAD & HARDSTANDINGS. INTERIM MEASURES SUCH AS THE PLACEMENT OF SILT FENCES TO BE USED AROUND WATERCOURSES AND RETAINED IN PLACE UNTIL SUDS ARE ESTABLISHED AND PROVIDING SUFFICIENT SILT REMOVAL.
2. LEVEL OF SEDIMENT AND DEBRIS TO BE MONITORED ON SILT FENCING AND REMOVED AND DEPOSITED IN A SUITABLE AREA, A MINIMUM OF 50m FROM A WATERCOURSE OR WATERBODY.
3. ALTERNATIVE FORMS OF SEDIMENT CONTROL MAY BE SUITABLE AND USED BUT MUST BE MONITORED ON AN OBSERVATIONAL BASIS AND IF DEEMED UNSUITABLE HY-TEX SILT FENCES MAY BE UTILISED.
4. IN AREAS WHERE THERE ARE HIGH SILT LOADINGS OF RUN-OFF SILT NETTING MAY BE USED IN SERIES WITH A MINIMUM GAP OF 1m BETWEEN ROWS TO PROVIDE ADDITIONAL TREATMENT.

1	DL	KS	24/10/2024	FOR PLANNING

PLANNING

McCloy Consulting

KELLYSTOWN WIND FARM

EDF RENEWABLES

SURFACE WATER MANAGEMENT
CLEAN CUTOFF DRAINAGE

AS SHOWN@A1		A1
KS	PDD	14/11/2023
M01944-02	DWG_43	1

Annex E

Supporting Calculations

E1

Tracks & Hardstandings; Qbar Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Kyle Somerville
Site name:	Kellystown
Site location:	Kellystown, Dunleer

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.79633° N
Longitude:	6.36553° W
Reference:	3596306499
Date:	Oct 22 2024 15:46

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	7.1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	894	894
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	17.23	27.16
1 in 1 year (l/s):	14.64	23.08
1 in 30 years (l/s):	28.42	44.81
1 in 100 year (l/s):	33.59	52.95
1 in 200 years (l/s):	37.04	58.38

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E2

Tracks & Hardstandings; Attenuation / Infiltration Calculations

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 1

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	5659	m^2	x 50 %
Effective Area	2829.5	m^2	

Storage Details:

Length	18	m
Width	8	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	35.038
10 min	15.9	114.8	52.815
15 min	19.6	94.0	64.541
30 min	26.4	63.3	85.593
45 min	30.4	48.6	97.125
60 min	33.3	40.0	105.246
2 hours	41.1	24.7	123.681
6 hours	55.6	11.1	141.325
24 hours	79.8	4.0	80.877

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2.2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.47 hrs
Hmax	0.982 m
Time to half empty	8.9 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 2

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1075	m^2	x 50 %
Effective Area	537.5	m^2	

Storage Details:

Length	5	m
Width	4	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	6.181
10 min	15.9	114.8	9.084
15 min	19.6	94.0	10.837
30 min	26.4	63.3	13.412
45 min	30.4	48.6	14.179
60 min	33.3	40.0	14.297
2 hours	41.1	24.7	12.104
6 hours	55.6	11.1	0.000
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	57 min
Hmax	0.715 m
Time to half empty	59.6 min

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 3

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6203	m^2	x 50 %
Effective Area	3101.5	m^2	

Storage Details:

Length	16	m
Width	10	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	38.409
10 min	15.9	114.8	57.899
15 min	19.6	94.0	70.756
30 min	26.4	63.3	93.842
45 min	30.4	48.6	106.493
60 min	33.3	40.0	115.405
2 hours	41.1	24.7	135.653
6 hours	55.6	11.1	155.159
24 hours	79.8	4.0	89.644

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2.4	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.5 hrs
Hmax	0.971 m
Time to half empty	9 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 5

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	964	m^2	x 50 %
Effective Area	482	m^2	

Storage Details:

Length	6	m
Width	5	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	5.902
10 min	15.9	114.8	8.852
15 min	19.6	94.0	10.766
30 min	26.4	63.3	14.082
45 min	30.4	48.6	15.766
60 min	33.3	40.0	16.862
2 hours	41.1	24.7	18.832
6 hours	55.6	11.1	17.480
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0.1	m/hr
Infiltration by CIRIA 3D method		
Safety Factor against flooding	1.5	
Attenuation Control	None	
Control Diameter	-	mm
Discharge rate	0	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.95 hrs
Hmax	0.64 m
Time to half empty	3.6 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 7

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	9898	m^2	x 50 %
Effective Area	4949	m^2	

Storage Details:

Length	22	m
Width	12	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	61.298
10 min	15.9	114.8	92.405
15 min	19.6	94.0	112.931
30 min	26.4	63.3	149.795
45 min	30.4	48.6	170.009
60 min	33.3	40.0	184.256
2 hours	41.1	24.7	216.673
6 hours	55.6	11.1	248.224
24 hours	79.8	4.0	145.604

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	3.8	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.57 hrs
Hmax	0.941 m
Time to half empty	9.1 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 9

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	7420	m^2	x 50 %
Effective Area	3710	m^2	

Storage Details:

Length	22	m
Width	9	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	45.966
10 min	15.9	114.8	69.301
15 min	19.6	94.0	84.702
30 min	26.4	63.3	112.381
45 min	30.4	48.6	127.578
60 min	33.3	40.0	138.302
2 hours	41.1	24.7	162.778
6 hours	55.6	11.1	187.131
24 hours	79.8	4.0	113.355

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2.8	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.72 hrs
Hmax	0.947 m
Time to half empty	9.3 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 10

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	11862	m^2	x 50 %
Effective Area	5931	m^2	

Storage Details:

Length	25	m
Width	12	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	73.477
10 min	15.9	114.8	110.773
15 min	19.6	94.0	135.388
30 min	26.4	63.3	179.615
45 min	30.4	48.6	203.889
60 min	33.3	40.0	221.012
2 hours	41.1	24.7	260.054
6 hours	55.6	11.1	298.644
24 hours	79.8	4.0	179.161

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	4.5	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.67 hrs
Hmax	0.997 m
Time to half empty	9.2 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 11

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	9226	m^2	x 50 %
Effective Area	4613	m^2	

Storage Details:

Length	24	m
Width	10	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	57.149
10 min	15.9	114.8	86.157
15 min	19.6	94.0	105.302
30 min	26.4	63.3	139.701
45 min	30.4	48.6	158.580
60 min	33.3	40.0	171.898
2 hours	41.1	24.7	202.265
6 hours	55.6	11.1	232.279
24 hours	79.8	4.0	139.348

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	3.5	l/s

Results:

Outcome:	Pass
Critical Storm Duration	6.67 hrs
Hmax	0.969 m
Time to half empty	9.2 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 12

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	4004	m^2	x 50 %
Effective Area	2002	m^2	

Storage Details:

Length	12	m
Width	8	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	24.658
10 min	15.9	114.8	37.103
15 min	19.6	94.0	45.267
30 min	26.4	63.3	59.763
45 min	30.4	48.6	67.523
60 min	33.3	40.0	72.870
2 hours	41.1	24.7	84.318
6 hours	55.6	11.1	90.417
24 hours	79.8	4.0	18.915

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	4.7 hrs
Hmax	0.951 m
Time to half empty	6.3 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 13

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	2121	m^2	x 50 %
Effective Area	1060.5	m^2	

Storage Details:

Length	10	m
Width	7	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	12.780
10 min	15.9	114.8	19.090
15 min	19.6	94.0	23.132
30 min	26.4	63.3	29.965
45 min	30.4	48.6	33.229
60 min	33.3	40.0	35.215
2 hours	41.1	24.7	37.893
6 hours	55.6	11.1	27.579
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.13 hrs
Hmax	0.542 m
Time to half empty	2.6 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 14

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	2045	m^2	x 50 %
Effective Area	1022.5	m^2	

Storage Details:

Length	6	m
Width	8	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	12.300
10 min	15.9	114.8	18.363
15 min	19.6	94.0	22.239
30 min	26.4	63.3	28.762
45 min	30.4	48.6	31.845
60 min	33.3	40.0	33.695
2 hours	41.1	24.7	36.019
6 hours	55.6	11.1	25.043
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.03 hrs
Hmax	0.75 m
Time to half empty	2.5 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 15

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	4770	m^2	x 50 %
Effective Area	2385	m^2	

Storage Details:

Length	20	m
Width	10	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	29.490
10 min	15.9	114.8	44.430
15 min	19.6	94.0	54.271
30 min	26.4	63.3	71.885
45 min	30.4	48.6	81.474
60 min	33.3	40.0	88.189
2 hours	41.1	24.7	103.203
6 hours	55.6	11.1	115.979
24 hours	79.8	4.0	55.591

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	5.87 hrs
Hmax	0.58 m
Time to half empty	8.1 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 16

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	388	m^2	x 50 %
Effective Area	194	m^2	

Storage Details:

Length	2	m
Width	2	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	1.848
10 min	15.9	114.8	2.512
15 min	19.6	94.0	2.761
30 min	26.4	63.3	2.540
45 min	30.4	48.6	1.667
60 min	33.3	40.0	0.559
2 hours	41.1	24.7	0.000
6 hours	55.6	11.1	0.000
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	20 min
Hmax	0.701 m
Time to half empty	11.7 min

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 18

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	757	m^2	x 50 %
Effective Area	378.5	m^2	

Storage Details:

Length	4	m
Width	3	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	4.175
10 min	15.9	114.8	6.042
15 min	19.6	94.0	7.099
30 min	26.4	63.3	8.379
45 min	30.4	48.6	8.387
60 min	33.3	40.0	7.938
2 hours	41.1	24.7	4.264
6 hours	55.6	11.1	0.000
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	38 min
Hmax	0.705 m
Time to half empty	35.3 min

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 4

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1803	m^2	x 50 %
Effective Area	901.5	m^2	

Storage Details:

Length	11	m
Width	5	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	10.774
10 min	15.9	114.8	16.048
15 min	19.6	94.0	19.394
30 min	26.4	63.3	24.932
45 min	30.4	48.6	27.437
60 min	33.3	40.0	28.856
2 hours	41.1	24.7	30.052
6 hours	55.6	11.1	16.967
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	1.75 hrs
Hmax	0.548 m
Time to half empty	2.1 hrs

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 8

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	866	m^2	x 50 %
Effective Area	433	m^2	

Storage Details:

Length	4	m
Width	4	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	4.863
10 min	15.9	114.8	7.084
15 min	19.6	94.0	8.380
30 min	26.4	63.3	10.104
45 min	30.4	48.6	10.372
60 min	33.3	40.0	10.118
2 hours	41.1	24.7	6.951
6 hours	55.6	11.1	0.000
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	45 min
Hmax	0.648 m
Time to half empty	43.2 min

CRM Stormflow Stormwater Management Software

Client:	EDF RENEWABLES - JOD
Project:	KELLYSTOWN WIND FARM
Location:	NR DUNLEER
Catchment:	Subcatchment 6

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1589	m^2	x 50 %
Effective Area	794.5	m^2	

Storage Details:

Length	8	m
Width	4	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.32	
M5-60	17	mm

	mm	mm/h	storage (m^3)
5 min	10.5	151.4	9.424
10 min	15.9	114.8	14.001
15 min	19.6	94.0	16.879
30 min	26.4	63.3	21.546
45 min	30.4	48.6	23.540
60 min	33.3	40.0	24.576
2 hours	41.1	24.7	24.776
6 hours	55.6	11.1	9.826
24 hours	79.8	4.0	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	1.52 hrs
Hmax	0.788 m
Time to half empty	1.8 hrs

E3

Temporary Settlement Calculations

Project Kellystown Wind Farm
Ref M02207-01
Date 24/10/2024

Purpose
To determine settlement pond parameters (hydraulic retention time) to allow primary treatment of water quality for suspended solids in temporary construction phase runoff.

Approach

Design assumes:
- This calculation set considers the temporary construction phase. The calculation approach adopted assumes discharges at breakouts every c. 80m
- Settlement sizing for a drained area equivalent to the track surface.

Determination of Inflow Characteristics

Water quality design event adopted as a 2-year rainfall event; assumes 1hr duration for peak intensity + 20% climate change

Inflow to Pond calculated using Rational method
Q=CiA

Rainfall Intensity (i)	15	mm/hr	*Assuming 1hr event for peak inflow flow rate*
Runoff Coefficient (C)	50	%	*Runoff from unbound surfaces*
Drained Works Area	0.048	Ha	*Based on 6m working strip x outflow interval*
Design Inflow (Q)	100	lps	
or	0.100	m3/sec	
Design Outflow	33	lps	Outflow controlled by gravel checkdam
or	0.033	m3/sec	

Characterisation of Influent

Median Concentration of TSS	2000	mg/l	per Construction Site Erosion and Sediment Controls - Planning Design & Performance, Pitt *et al*, 2007
Kinematic Viscosity of Water (n)	0.0000015	m^2/s	
Gravitational Constant (g)	9.81	m/s^2	
Particle Density (p_p)	2.76	kg/m^3	
Water Density (p_s)	1	kg/m^3	

Settlement Velocity for Silts
based on Stokes Law

$$v = \frac{d^2 g(\rho_p - \rho_s)}{18\eta}$$

Of Which (based on characteristic particle size distribution bearing in mind observed ground conditions)

	Particle Size		% passing	%-age by mass	Median Concentration	Settling Velocity (based on Stokes Law)	Hydraulic Retention Time (HRT) (Time to Fully Settle) (based on 0.6m depth)
	mm	m	%	%	mg/l	m/s	hrs
	150um	0.00015	100	19	380	0.014388	0.0
	63um	0.000063	86	74	1480	0.002538043	0.1
	20um	0.00002	14	4	80	0.000255787	0.7
Clay Range	6um	0.000006	4	2	40	2.30208E-05	7.2
	2um	0.000002	1	1	20	2.55787E-06	65.2

Project	Kellystown Wind Farm
Ref	M02207-01
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Determination of Outflow Characteristics

For purposes of the design, outflow from settlement feature dictated by flow control. Maximum permitted outflow Qbar per attenuation design requirements. Refer to seperate Stormflow calculation for analysis of routing / maximum outflow rates across orifice. As a conservative measure, the effect of filtration via drainage stone media is excluded and the design assumes an unlimited overflow rate dictated by the inflow rate.

Determination of Initial Settlement Pond Characteristics for Water Quality Treatment

Surface Overflow Rate is dictated by the flow rate divided by the total surface area of the sedimentation feature, and is equivalent to the Terminal Settlement Velocity

Assuming a lagoon with base dimensions:

Length	10	m
Breadth	3	m
Total Depth	1	m
Of which flowing layer is say	0.6	m
Volume	64	m3
Side Slope (1 in)	2	n/a
Area	30	m2
Therefore Surface Overflow Rate	0.0011	m/s

Average Flow velocity across lagoon 0.0185 m/s

Retention time in the lagoon is equivalent to the length of travel (lagoon length) relative to the outflow rate.
Retention time: 0.15 hrs

Initial settlement pond effluent is therefore characterised as follows:

Particle Size	HRT	Residence sufficient for full settlement?	Residual Concentration	
um	hrs		mg/l	
150	0.01	OK	0	
63	0.07	OK	0	
20	0.65	NO	62	
Clay Range 6	7.24	NO	39	
2	65.16	NO	20	
	Concentration in Outflow		121	mg/l
	Equivalent to		94%	removal

- Clay range not settle-able - all discharges overland over vegetation where vegtative filtration will offer a further stage of treatment that will reduce concentrations such that the discharge does not harm water receptors.78:78
- Provide increased frequency of breakouts to reduce inflows at key locations (proximal to pollution prevention buffers)

Calc	Checked	Date	Revision	Notes	
IB	KS	29/10/2024	Original	N/A	

R:_Projects\M02207 Jennings O'Donovan & Partners\01 Kellystown Wind Farm, Co Louth\12 GIS\Data\SWMP Geopackages\Linked Calculations\[CALC01 - WQ Settle

Annex F

Watercourse Crossing Schedule

WX REF	EASTING	NORTHING	DESCRIPTION	PHOTO	CATCHMENT MAP
WX01	708244.82	784749.53	PROPOSED TRACK CROSSES EPA WATERCOURSE (SLIEVEBOY 06). NEW MIN. 900 MM BOTTOMLESS CULVERT (PCC OR EQUIVALENT). DESIGNED FOR FREE INLET CONDITIONS FOR THE 1% AEP + CLIMATE CHANGE PEAK FLOW. POST QUARRY RESTORATION ESTIMATED FLOW IS CONSERVATIVE IN THAT IT DOES NOT ACCOUNT FOR FLOW ATTENUATION FROM RESERVOIRS AND LAKES (FARL). FARL FACTOR WOULD BE SIGNIFICANT AND LIKELY REDUCE PEAK FLOW VS. WHAT HAS BEEN ESTIMATED. HYDROLOGY & HYDRAULIC ASSESSMENT IN ANNEX A & B RESPECTIVELY.	 *TAKEN DOWNSTREAM OF PROPOSED CROSSING LOCATION (FACING UPSTREAM TOWARDS QUARRY DISCHARGE POINT)*	 *CATCHMENT AREA: 0.598 KM²*

WX REF	EASTING	NORTHING	DESCRIPTION	PHOTO	CATCHMENT MAP
WX02	708378.03	782918.56	PROPOSED TRACK CROSSES MINOR WATERCOURSE (UNNAMED). NEW MIN. 900 MM BOTTOMLESS CULVERT (PCC OR EQUIVALENT). DESIGNED FOR FREE INLET CONDITIONS FOR THE 1% AEP + CLIMATE CHANGE PEAK FLOW. HYDROLOGY & HYDRAULIC ASSESSMENT IN ANNEX A & B RESPECTIVELY.	 *TAKEN DOWNSTREAM OF PROPOSED CROSSING LOCATION (FACING UPSTREAM)*	 *CATCHMENT AREA: 0.08 KM²*

WX REF	EASTING	NORTHING	DESCRIPTION	PHOTO	CATCHMENT MAP
WX03	708876.91	782631.93	PROPOSED TRACK CROSSES MINOR WATERCOURSE (UNNAMED). NEW MIN. 900 MM BOTTOMLESS CULVERT (PCC OR EQUIVALENT). DESIGNED FOR FREE INLET CONDITIONS FOR THE 1% AEP + CLIMATE CHANGE PEAK FLOW. HYDROLOGY & HYDRAULIC ASSESSMENT IN ANNEX A & B RESPECTIVELY.	 *TAKEN DOWNSTREAM OF PROPOSED CROSSING LOCATION (FACING UPSTREAM)*	 *CATCHMENT AREA: 0.169 KM²*

ANNEX A – HYDROLOGY / FLOW ESTIMATON SUMMARY

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX01
Date	22/10/2024

McCloy Consulting

Purpose: To estimate design flows for an Irish catchment by the FSSR No. 6 3-Variable Eqn method

This spreadsheet is suitable for estimating design flows on small catchments (less than 20 km^2) using the FSSR no. 6 3-Variable equation for QBAR plus the FSR (FSSR14) regional growth curves.

AREA	*Max from FSU / Height Data*	0.598	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.14	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.13	2.10	
30	0.00	0.00	0.00	
50	2.33	0.32	5.31	100-year + 20%
100	2.61	0.36	5.95	0.43
500	3.33	0.45	7.58	
1000	3.62	0.49	8.26	

Outcomes are exclusive of the effect of climate change, estimated seperately

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX01
Date	22/10/2024

McCloy Consulting

Purpose: To estimate a design flow for a catchment in the Irish hydrological region by the Institute of Hydrology Report 124 (IoH 124) "Flood Estimation on Small Catchments" method.

This spreadsheet is suitable for estimating design flows on small rural catchments (less than 25 km^2) using the IH Report 124 equation for QBAR plus the FSR regional growth curves. Rural can be taken as meaning URBAN less than 0.05, or equivalently URBEX. This sheet does not adopt the <5 sq km alternative method (for plot scale equations) in order to ensure a conservative approach to flood estimation.

AREA	*Max from FSU / Height Data*	0.598	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.13	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor (from FSSR 14 and FSU research)	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.12	2.03	
30	2.11	0.28	4.66	
50	2.33	0.31	5.13	100-year + 20%
100	2.61	0.34	5.75	0.41
500	3.33	0.44	7.33	
1000	3.62	0.48	7.99	

Outcomes are exclusive of the effect of climate change, estimated seperately

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX02
Date	22/10/2024

McCloy Consulting

Purpose: To estimate design flows for an Irish catchment by the FSSR No. 6 3-Variable Eqn method

This spreadsheet is suitable for estimating design flows on small catchments (less than 20 km^2) using the FSSR no. 6 3-Variable equation for QBAR plus the FSR (FSSR14) regional growth curves.

AREA	*Max from FSU / Height Data*	0.08	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.02	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.02	2.46	
30	0.00	0.00	0.00	
50	2.33	0.05	6.24	100-year + 20%
100	2.61	0.06	6.98	0.07
500	3.33	0.07	8.90	
1000	3.62	0.08	9.70	

Outcomes are exclusive of the effect of climate change, estimated seperately

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX02
Date	22/10/2024

McCloy Consulting

Purpose: To estimate a design flow for a catchment in the Irish hydrological region by the Institute of Hydrology Report 124 (IoH 124) "Flood Estimation on Small Catchments" method.

This spreadsheet is suitable for estimating design flows on small rural catchments (less than 25 km^2) using the IH Report 124 equation for QBAR plus the FSR regional growth curves. Rural can be taken as meaning URBAN less than 0.05, or equivalently URBEX. This sheet does not adopt the <5 sq km alternative method (for plot scale equations) in order to ensure a conservative approach to flood estimation.

AREA	*Max from FSU / Height Data*	0.08	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.02	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor (from FSSR 14 and FSU research)	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.02	2.53	
30	2.11	0.05	5.81	
50	2.33	0.05	6.41	100-year + 20%
100	2.61	0.06	7.18	0.07
500	3.33	0.07	9.14	
1000	3.62	0.08	9.97	

Outcomes are exclusive of the effect of climate change, estimated seperately

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX03
Date	22/10/2024

McCloy Consulting

Purpose: To estimate design flows for an Irish catchment by the FSSR No. 6 3-Variable Eqn method

This spreadsheet is suitable for estimating design flows on small catchments (less than 20 km^2) using the FSSR no. 6 3-Variable equation for QBAR plus the FSR (FSSR14) regional growth curves.

AREA	*Max from FSU / Height Data*	0.169	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.04	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.04	2.32	
30	0.00	0.00	0.00	
50	2.33	0.10	5.87	100-year + 20%
100	2.61	0.11	6.58	0.13
500	3.33	0.14	8.38	
1000	3.62	0.15	9.14	

Outcomes are exclusive of the effect of climate change, estimated seperately

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	WX03
Date	22/10/2024

McCloy Consulting

Purpose: To estimate a design flow for a catchment in the Irish hydrological region by the Institute of Hydrology Report 124 (IoH 124) "Flood Estimation on Small Catchments" method.

This spreadsheet is suitable for estimating design flows on small rural catchments (less than 25 km^2) using the IH Report 124 equation for QBAR plus the FSR regional growth curves. Rural can be taken as meaning URBAN less than 0.05, or equivalently URBEX. This sheet does not adopt the <5 sq km alternative method (for plot scale equations) in order to ensure a conservative approach to flood estimation.

AREA	*Max from FSU / Height Data*	0.169	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.04	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor (from FSSR 14 and FSU research)	Design flow (m^3/s)	Specific runoff (l/s/ha)	
2	0.92	0.04	2.33	
30	2.11	0.09	5.35	
50	2.33	0.10	5.90	100-year + 20%
100	2.61	0.11	6.61	0.13
500	3.33	0.14	8.42	
1000	3.62	0.16	9.18	

Outcomes are exclusive of the effect of climate change, estimated seperately

ANNEX B - HYDRAULICS – CULVERT SIZING

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

McCloy Consulting

Purpose

To determine the adequacy of hydraulic capacity for culverts in accordance with the requirements of CIRIA C689

1.0 *Input Data:*

Culvert Ref:		WX01		
Watercourse Name		Unnamed		
Design Discharge Q		*0.43*	*m3/sec*	As per Hydrological Analysis
Design Return Period		*100+CC*	*Yrs*	As per LA Requirement
Elevation of Stream Bed @ Culvert Inlet		85.5	m AOD	From Survey
Elevation of Stream Bed @ Culvert Outlet		83.6	m AOD	From Survey
Culvert Length		15	m	From Survey
Elevation of Stream bed upstream of Culvert		85.7	m AOD	From Survey
Distance upstream of Culvert		2.5	m	From Survey
Elevation of Stream bed downstream of Culvert		83.5	m AOD	From Survey
Distance downstream of Culvert		3.1	m	From Survey
Elevation of Proposed Embankment Crest		87	m AOD	From Survey
Average channel invert width		0.9	m	From Survey
Average channel top of bank width		1	m	From Survey
Average Channel Depth to Bank		0.2	m	From Survey
Left Over-Bank Ground Level (Floodplain) (Culvert Inlet)		85.9	m AOD	From Survey
Distance from bank		1	m	From Survey
Right Over-Bank Ground Level (Floodplain) (Culvert Inlet)		85.8	m AOD	From Survey
Distance from bank		2	m	From Survey
Mannings n - Channel		0.045		From C689 Table A1.1
Mannings n - Overbanks		0.035		From C689 Table A1.1
Bedslope upstream of Culvert 1 in S1	S1	12.50	-	Calculated
Bedslope downstream of Culvert 1 in S2	S2	31.00	-	Calculated
Bedslope across Culvert 1 in S3	S3	7.89	-	Calculated
Bedslope across whole reach considered 1 in S4	S4	9.36	-	Calculated
Channel Side Slopes 1 in X	X =	0.25	-	Calculated
Upstream Left Over- Bank Slope	Y =	5.00	-	Calculated
Upstream Right Over- Bank Slope	Z =	20.00	-	Calculated

2.0 *Calculate Tailwater Depth and Level:*

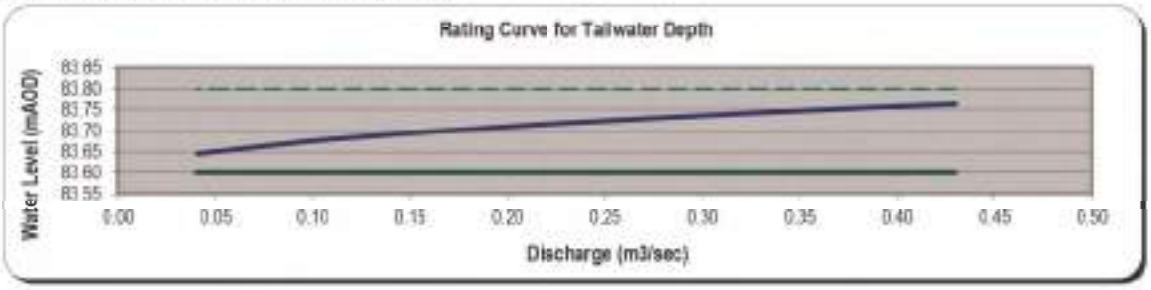
Mannings Equation:

$$Q = VA = \left(\frac{1.00}{n}\right) A R^{\frac{2}{3}} \sqrt{S} \quad [SI] \qquad R_h = \frac{A}{P}$$

Discharge Contained in Channel, Depth of Normal Flow Considered

Depth of water in channel is	y_{dc}	0.16	m	Calculated
Therefore water level at downstream extent of culvert is	WL_t	83.76	mAOD	Calculated
	V_{dc}	1.70	m/s	Calculated

2.1 Rating Curve for Tailwater Channel Discharge



3.0 *Calculate Tailwater Elevation (Total Head) Ht:*

$$H_t = Z_{bo} + y_{dc} + \frac{V_{dc}^2}{2g}$$

Where: Z_{bo} Elevation @ Culvert Outlet
y_{dc} Water depth in downstream channel
V_{dc} Velocity in downstream channel

Tailwater Elevation:	H_t	83.92	mAOD	Calculated

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

4.0 *Calculate Froude No.*

Cross Sectional Area (A)		0.25	m2
Top Width (B)		2.21	m
Hydraulic mean depth (A per unit B)	d_m	0.11	m
Froude Number	Fr	1.60	*Supercritical*
Critical depth in channel	h_c	0.26	m
Critical Velocity	v_c	1.06	m/s

5.0 *Initial Design*

Initial Estimate of required culvert cross sectional area required. Analysis is based on new culvert, therefore design should allow for freeflow conditions. Applicable method is Flow Area Method

5.1 *Flow Area Method - refer to C689 Section 6.7.1*

Depth; Min. Tailwater depth	D	0.16	m	Calculated
Assume 20% Initial loss of culvert height due to Freeboard / Si		0.20	m	Calculated
where freeboard depth is:	F	0.02	m	Calculated
Area required as per tailwater flow calculation:	A_t	0.25	m2	Calculated
Nominal width (Area / Depth (not inc. freeboard):		1.55	m	Calculated
Therefore prelim culvert dimensions (incl freeboard + si	D_1	*0.20*	*m*	Calculated
	B_1	*1.55*	*m*	Calculated

6.0 *Detailed Design*

6.1 *Try Culvert dimensions...*

Based on previous Initial Design

Height / Diameter	D	0.90	m
Breadth (BLANK IF CIRCULAR)	B		m
Number of Culverts	nr	1	n/a
Shape		CIRCULAR	
Freeboard		0.10	m
Siltation / Depth lowered below ex. stream invert		0.15	m

Therefore:

Upstream Pipe Invert		*85.35*	*mAOD*
Upstream Pipe Base (w/Silt)Elevation	Z_1	*85.50*	*mAOD*
Upstream Soffit Elevation		*86.25*	*mAOD*
Downstream Pipe Invert Elevation		*83.45*	*mAOD*
Downstream Pipe Base (w/ Silt) Elevation	Z_2	*83.60*	*mAOD*
Downstream Soffit Elevation		*84.35*	*mAOD*

6.2 *Calculation of Discharge Intensity*

$$q_i = \frac{1.811Q}{A_b D^{0.5}}$$

Where

Discharge	Q	0.43	m3/s
Depth / Diameter of barrell	D	0.75	m
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2
Discharge Coefficient	qi	2.36	n/a
Discharge Intensity classification is:		Free Flow Inlet Control	

6.3 *Calculation of headwater depth for free flow inlet control*

Based on Table A1.3, Culvert type is Nr 2 n/a
i.e, Circular pipe; headwall, socket end of pipe

$$\frac{E_{sh}}{D} = \frac{E_{hc}}{D} + k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M - 0.5S_o \qquad \text{Eqn 6.23}$$

$$\frac{E_{sh}}{D} = k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M \qquad \text{Eqn 6.25}$$

Therefore applicable CIRIA C689 equation reference: Equation 6.23

Where

Discharge	Q	0.43	m3/s	
Depth / Diameter of barrell	D	0.75	m	
Unsubmerged analysis constant	k	0.0078		Table A1.3
Unsubmerged analysis constant	M	2		Table A1.3
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2	
Culvert Slope	So	0.13	m/m	1 in 7.89
Critical depth calculated as:	y_c	0.310	m	
Specific Energy at Critical Depth	E_{sc}	0.46	m	
Therefore Specific Energy of Headwater	E_{sh}	0.45	m	

$$\frac{Q^2 W}{gA^3} = 1$$

$$E_{sc} = \frac{3}{2} y_c$$

6.4 *Calculation of headwater elevation for inlet control*

Headwater Elevation H_{hic} determined by:

$$H_{hic} = Z_i + E_{sh} + h_s$$

Where

Headloss due to inlet screen	h_s	N/A	(No Screen Proposed)
Stream Elevation at Inlet	Z_i	85.50	mAOD
Specific Energy of Headwater	E_{sh}	0.45	m
Therefore Headwater Elevation:	H_{hic}	85.95	mAOD

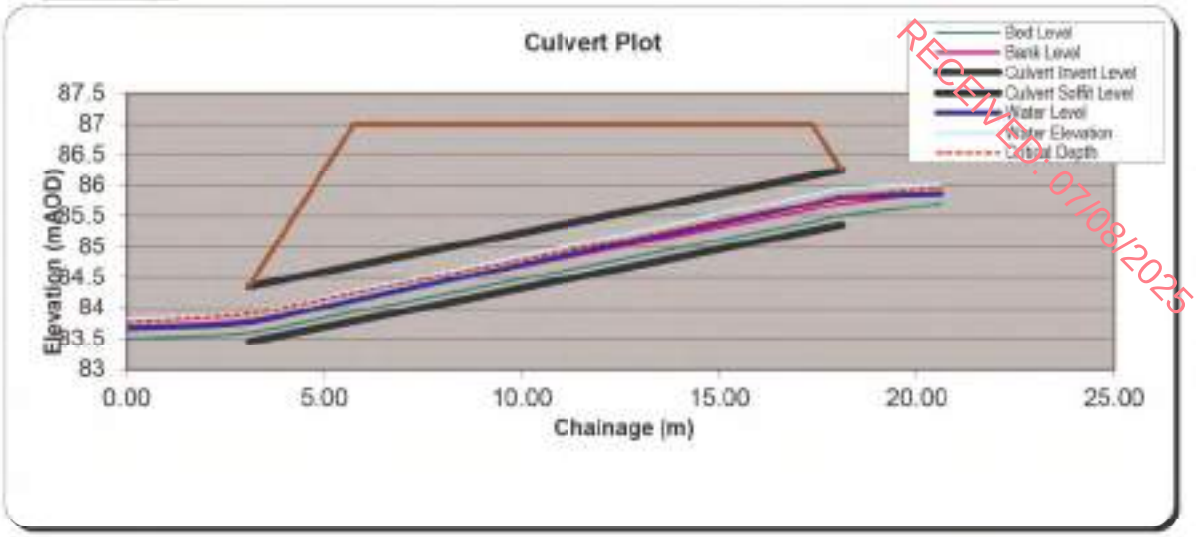
Water Level at the headwater for inlet control WL_{hic} determined by:

$$WL_{hic} = H_{hic} - \frac{V_{uc}^2}{2g}$$

Where

Headwater Elevation:	H_{hic}	85.95	mAOD
Velocity in Upstream Channel	V_{uc}	1.70	m/s
Therefore Water Level at Inlet:	WL_{hic}	85.80	mAOD

6.5 *Culvert Profile*



7.0 *Summary*

	Complies	Fails	Comment
Culvert Inlet Soffit Elevation > Headwater Elevation for Inlet Co	X		
Adequate Freeboard provided to water level?	X		

Therefore proposed culvert dimensions: **1 nr** **Diameter** **0.90 m**

By	Checked	Revision	Date
DH	KS	Original	22/10/2024

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

McCloy Consulting

Purpose

To determine the adequacy of hydraulic capacity for culverts in accordance with the requirements of CIRIA C689

1.0 *Input Data:*

Culvert Ref:		WX02		
Watercourse Name		Unnamed		
Design Discharge Q		0.07	***m3/sec***	As per Hydrological Analysis
Design Return Period		100+CC	*Yrs*	As per LA requirement
Elevation of Stream Bed @ Culvert Inlet		105.9	m AOD	From Survey
Elevation of Stream Bed @ Culvert Outlet		105.8	m AOD	From Survey
Culvert Length		9	m	From Survey
Elevation of Stream bed upstream of Culvert		106	m AOD	From Survey
Distance upstream of Culvert		5.2	m	From Survey
Elevation of Stream bed downstream of Culvert		105.7	m AOD	From Survey
Distance downstream of Culvert		5.1	m	From Survey
Elevation of Proposed Embankment Crest		107	m AOD	From Survey
Average channel invert width		0.8	m	From Survey
Average channel top of bank width		0.9	m	From Survey
Average Channel Depth to Bank		0.5	m	From Survey
Left Over-Bank Ground Level (Floodplain) (Culvert Inlet)		106.5	m AOD	From Survey
Distance from bank		1.5	m	From Survey
Right Over-Bank Ground Level (Floodplain) (Culvert Inlet)		107	m AOD	From Survey
Distance from bank		0.5	m	From Survey
Mannings n - Channel		0.045		From C689 Table A1.1
Mannings n - Overbanks		0.05		From C689 Table A1.1
Bedslope upstream of Culvert 1 in S1	S1	52.00	-	Calculated
Bedslope downstream of Culvert 1 in S2	S2	51.00	-	Calculated
Bedslope across Culvert 1 in S3	S3	90.00	-	Calculated
Bedslope across whole reach considered 1 in S4	S4	64.33	-	Calculated
Channel Side Slopes 1 in X	X =	0.10	-	Calculated
Upstream Left Over- Bank Slope	Y =	15.00	-	Calculated
Upstream Right Over- Bank Slope	Z =	0.83	-	Calculated

2.0 *Calculate Tailwater Depth and Level:*

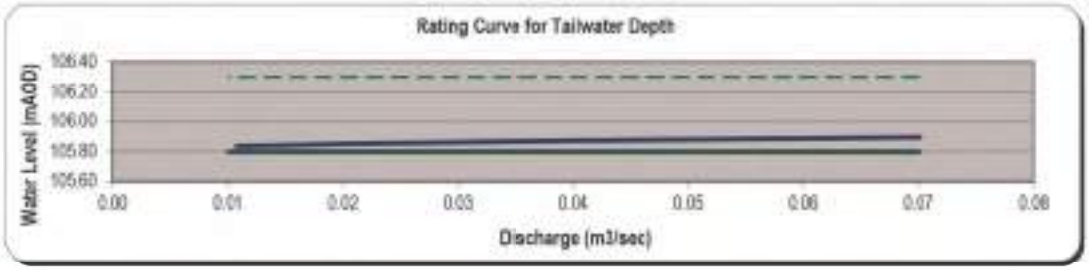
Mannings Equation:

$$Q = VA = \left(\frac{1.00}{n}\right) A R^{\frac{2}{3}} \sqrt{S} \quad [SI] \qquad R_h = \frac{A}{p}$$

Discharge Contained in Channel, Depth of Normal Flow Considered

Depth of water in channel is	y_{ds}	0.09	m	Calculated
Therefore water level at downstream extent of culvert i	WL_t	105.89	mAOD	Calculated
	V_{ds}	0.43	m/s	Calculated

2.1 Rating Curve for Tailwater Channel Discharge



3.0 *Calculate Tailwater Elevation (Total Head) Ht:*

$$H_t = Z_{ds} + y_{dc} + \frac{V_{dc}^2}{2g}$$

Where: Z_{ds} Elevation @ Culvert Outlet
y_{dc} Water depth in downstream channel
V_{dc} Velocity in downstream channel

Tailwater Elevation:	H_t	105.90	mAOD	Calculated

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

4.0 *Calculate Froude No.*

Cross Sectional Area (A)		0.16	m2
Top Width (B)		2.68	m
Hydraulic mean depth (A per unit B)	d_m	0.06	m
Froude Number	Fr	0.55	*Subcritical*
Critical depth in channel	h_c	0.06	m
Critical Velocity	v_c	0.77	m/s

5.0 *Initial Design*

Initial Estimate of required culvert cross sectional area required. Analysis is based on new culvert, therefore design should allow for freeflow conditions. Applicable method is Flow Area Method

5.1 *Flow Area Method - refer to CIRIA C689 Section 6.7.1*

Depth; Min. Tailwater depth	D	0.09	m	Calculated
Assume 20% Initial loss of culvert height due to Freeboard / S		0.12	m	Calculated
where freeboard depth is:	F	0.01	m	Calculated
Area required as per tailwater fllow calculation:	A_t	0.16	m2	Calculated
Nominal width (Area / Depth (not inc. freeboard)):		1.74	m	Calculated
Therefore prelim culvert dimensions (incl freeboard + s	D_i	*0.12*	*m*	Calculated
	B_i	*1.74*	*m*	Calculated

6.0 *Detailed Design*

6.1 *Try Culvert dimensions...*

Based on previous Initial Design

Height / Diameter	D	0.90	m
Breadth (BLANK IF CIRCULAR)	B		m
Number of Culverts	nr	1	n/a
Shape		CIRCULAR	
Freeboard		0.30	m
Siltation / Depth lowered below ex. stream invert		0.15	m

Therefore:

Upstream Pipe Invert		*105.75*	*mAOD*
Upstream Pipe Base (w/Silt)Elevation	Z_1	*105.90*	*mAOD*
Upstream Soffit Elevation		*106.65*	*mAOD*
Downstream Pipe Invert Elevation		*105.65*	*mAOD*
Downstream Pipe Base (w/ Silt) Elevation	Z_2	*105.80*	*mAOD*
Downstream Soffit Elevation		*106.55*	*mAOD*

6.2 *Calculation of Discharge Intensity*

$$q_i = \frac{1.811Q}{A_b D^{0.5}}$$

Where

Discharge	Q	0.07	m3/s
Depth / Diameter of barrell	D	0.75	m
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2
Discharge Coefficient	qi	0.38	n/a
Discharge Intensity classification is:		Free Flow Inlet Control	

6.3 *Calculation of headwater depth for free flow inlet control*

Based on Table A1.3, Culvert type is i.e. Circular pipe, headwall, socket end of pipe — Nr = 2 n/a

$$\frac{E_{sh}}{D} = \frac{E_{sc}}{D} + k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M - 0.5S_o \quad \text{Eqn 6.23}$$

$$\frac{E_{sh}}{D} = k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M \quad \text{Eqn 6.25}$$

Therefore applicable CIRIA C689 equation reference: Equation 6.23

Where

Discharge	Q	0.07	m3/s	
Depth / Diameter of barrell	D	0.75	m	
Unsubmerged analysis constant	k	0.0078		Table A1.3
Unsubmerged analysis constant	M	2		Table A1.3
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2	
Culvert Slope	So	0.01	m/m	1 in 100

$$\frac{Q^2 W}{g A^3} = 1$$

Critical depth calculated as: y_c = 0.099 m

$$E_{sc} = \frac{3}{2} y_c$$

Specific Energy at Critical Depth E_{sc} = 0.15 m

Therefore Specific Energy of Headwater E_{sh} = 0.15 m

6.4 *Calculation of headwater elevation for inlet control*

Headwater Elevation H_{hic} determined by:

$$H_{hic} = Z_i + E_{sh} + h_s$$

Where

Headloss due to inlet screen	h_s	N/A	(No Screen Proposed)
Stream Elevation at Inlet	Z_i	105.90	mAOD
Specific Energy of Headwater	E_{sh}	0.15	m
Therefore Headwater Elevation:	H_{hic}	106.05	mAOD

Water Level at the headwater for inlet control WL_{hic} determined by:

$$WL_{hic} = H_{hic} - \frac{V^2}{2g}$$

Where

Headwater Elevation:	H_{hic}	106.05	mAOD
Velocity in Upstream Channel	V_{us}	0.43	m/s
Therefore Water Level at Inlet:	WL_{hic}	106.04	mAOD

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
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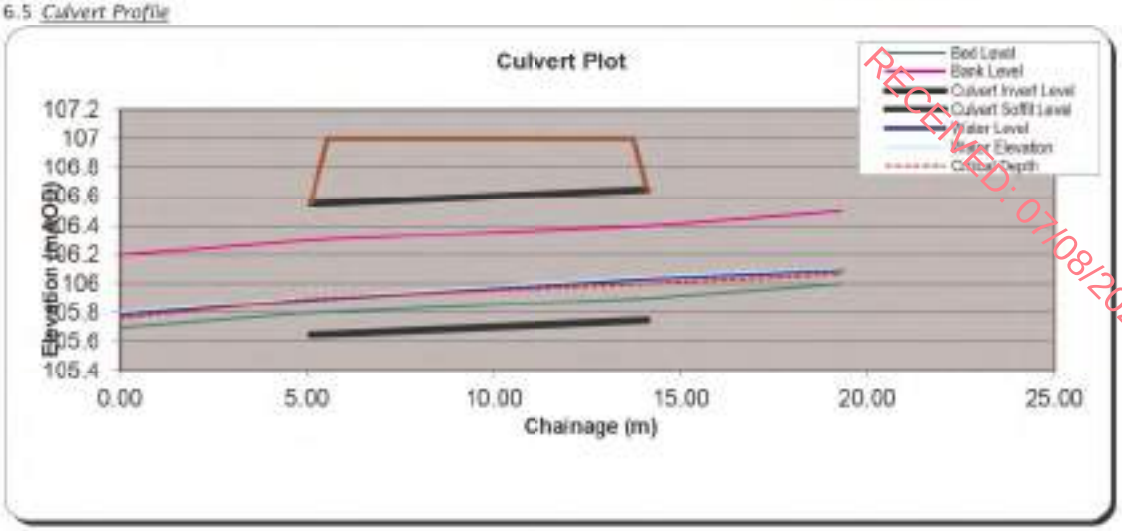
6.5 *Culvert Profile*



7.0 *Summary*

	Complies	Fails	Comment
Culvert Inlet Soffit Elevation > Headwater Elevation for Inlet C	X		
Adequate Freeboard provided to water level?	X		

Therefore proposed culvert dimensions: **1 nr** **Diameter** **0.90 m**

By	Checked	Revision	Date
DH	KS	Original	22/10/2024

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

McCloy Consulting

Purpose

To determine the adequacy of hydraulic capacity for culverts in accordance with the requirements of CIRIA C689

1.0 *Input Data:*

Culvert Ref:		WX03		
Watercourse Name		Unnamed		
Design Discharge Q		*0.13*	*m3/sec*	As per Hydrological Analysis
Design Return Period		*100+CC*	*Yrs*	As per LA Requirement
Elevation of Stream Bed @ Culvert Inlet		100	m AOD	From Survey
Elevation of Stream Bed @ Culvert Outlet		99.5	m AOD	From Survey
Culvert Length		9	m	From Survey
Elevation of Stream bed upstream of Culvert		100.3	m AOD	From Survey
Distance upstream of Culvert		12.9	m	From Survey
Elevation of Stream bed downstream of Culvert		99.3	m AOD	From Survey
Distance downstream of Culvert		5.7	m	From Survey
Elevation of Proposed Embankment Crest		101.5	m AOD	From Survey
Average channel invert width		0.7	m	From Survey
Average channel top of bank width		0.9	m	From Survey
Average Channel Depth to Bank		0.5	m	From Survey
Left Over-Bank Ground Level (Floodplain) (Culvert Inlet)		101	m AOD	From Survey
Distance from bank		0.5	m	From Survey
Right Over-Bank Ground Level (Floodplain) (Culvert Inlet)		102	m AOD	From Survey
Distance from bank		2	m	From Survey
Mannings n - Channel		0.04		From C689 Table A1.1
Mannings n - Overbanks		0.05		From C689 Table A1.1
Bedslope upstream of Culvert 1 in S1	S1	43.00	-	Calculated
Bedslope downstream of Culvert 1 in S2	S2	28.50	-	Calculated
Bedslope across Culvert 1 in S3	S3	18.00	-	Calculated
Bedslope across whole reach considered 1 in S4	S4	27.60	-	Calculated
Channel Side Slopes 1 in X	X =	0.20	-	Calculated
Upstream Left Over- Bank Slope	Y =	1.00	-	Calculated
Upstream Right Over- Bank Slope	Z =	1.33	-	Calculated

2.0 *Calculate Tailwater Depth and Level:*

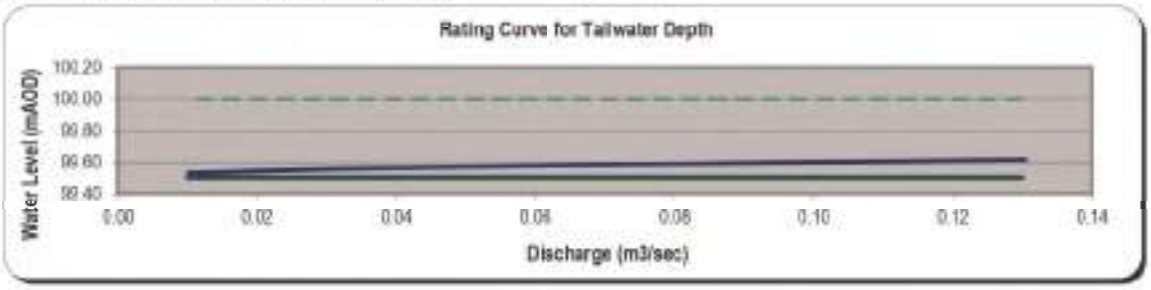
Mannings Equation:

$$Q = VA = \left(\frac{1.00}{n}\right) A R^{\frac{2}{3}} \sqrt{S} \quad [SI] \qquad R_h = \frac{A}{P}$$

Discharge Contained in Channel, Depth of Normal Flow Considered

Depth of water in channel is	y_{dc}	0.12	m	Calculated
Therefore water level at downstream extent of culvert is	WL_t	99.62	mAOD	Calculated
	V_{dc}	0.88	m/s	Calculated

2.1 Rating Curve for Tailwater Channel Discharge



3.0 *Calculate Tailwater Elevation (Total Head) Ht:*

$$H_t = Z_{bo} + y_{dc} + \frac{V_{dc}^2}{2g}$$

Where: Z_{bo} Elevation @ Culvert Outlet
y_{dc} Water depth in downstream channel
V_{dc} Velocity in downstream channel

Tailwater Elevation:	H_t	99.66	mAOD	Calculated

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

4.0 *Calculate Froude No.*

Cross Sectional Area (A)		0.15	m2
Top Width (B)		1.86	m
Hydraulic mean depth (A per unit B)	d_m	0.08	m
Froude Number	Fr	0.99	*Subcritical*
Critical depth in channel	h_c	0.09	m
Critical Velocity	v_c	0.89	m/s

5.0 *Initial Design*

Initial Estimate of required culvert cross sectional area required. Analysis is based on new culvert, therefore design should allow for freeflow conditions. Applicable method is Flow Area Method

5.1 *Flow Area Method - refer to C689 Section 6.7.1*

Depth; Min. Tailwater depth	D	0.12	m	Calculated
Assume 20% Initial loss of culvert height due to Freeboard / Si		0.15	m	Calculated
where freeboard depth is:	F	0.01	m	Calculated
Area required as per tailwater flow calculation:	A_t	0.15	m2	Calculated
Nominal width (Area / Depth (not inc. freeboard):		1.28	m	Calculated
Therefore prelim culvert dimensions (incl freeboard + si	D_1	*0.15*	*m*	Calculated
	B_1	*1.28*	*m*	Calculated

6.0 *Detailed Design*

6.1 *Try Culvert dimensions...*

Based on previous Initial Design

Height / Diameter	D	0.90	m
Breadth (BLANK IF CIRCULAR)	B		m
Number of Culverts	nr	1	n/a
Shape		CIRCULAR	
Freeboard		0.10	m
Siltation / Depth lowered below ex. stream invert		0.15	m

Therefore:

Upstream Pipe Invert		*99.85*	*mAOD*
Upstream Pipe Base (w/Silt)Elevation	Z_1	*100.00*	*mAOD*
Upstream Soffit Elevation		*100.75*	*mAOD*
Downstream Pipe Invert Elevation		*99.35*	*mAOD*
Downstream Pipe Base (w/ Silt) Elevation	Z_2	*99.50*	*mAOD*
Downstream Soffit Elevation		*100.25*	*mAOD*

6.2 *Calculation of Discharge Intensity*

$$q_i = \frac{1.811Q}{A_b D^{0.5}}$$

Where

Discharge	Q	0.13	m3/s
Depth / Diameter of barrell	D	0.75	m
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2
Discharge Coefficient	qi	0.71	n/a
Discharge Intensity classification is:		Free Flow Inlet Control	

6.3 *Calculation of headwater depth for free flow inlet control*

Based on Table A1.3, Culvert type is Nr 2 n/a
i.e, Circular pipe; headwall, socket end of pipe

$$\frac{E_{sh}}{D} = \frac{E_{hc}}{D} + k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M - 0.5S_o \quad \text{Eqn 6.23}$$

$$\frac{E_{sh}}{D} = k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M \quad \text{Eqn 6.25}$$

Therefore applicable CIRIA C689 equation reference: Equation 6.23

Where Discharge	Q	0.13	m3/s	
Depth / Diameter of barrell	D	0.75	m	
Unsubmerged analysis constant	k	0.0078		Table A1.3
Unsubmerged analysis constant	M	2		Table A1.3
Culvert cross section area excl. freeboard + siltation	Ab	0.38	m2	
Culvert Slope	So	0.06	m/m	1 in 18
$\frac{Q^2W}{gA^3}=1$ Critical depth calculated as:	y_c	0.147	m	
$E_{sc}=\frac{3}{2}y_c$ Specific Energy at Critical Depth	E_{sc}	0.22	m	
Therefore Specific Energy of Headwater	E_{sh}	0.20	m	

6.4 *Calculation of headwater elevation for inlet control*

Headwater Elevation H_{hic} determined by:

$$H_{hic} = Z_i + E_{sh} + h_s$$

Where

Headloss due to inlet screen	h_s	N/A	(No Screen Proposed)
Stream Elevation at Inlet	Z_i	100.00	mAOD
Specific Energy of Headwater	E_{sh}	0.20	m
Therefore Headwater Elevation:	H_{hic}	100.20	mAOD

Water Level at the headwater for inlet control WL_{hic} determined by:

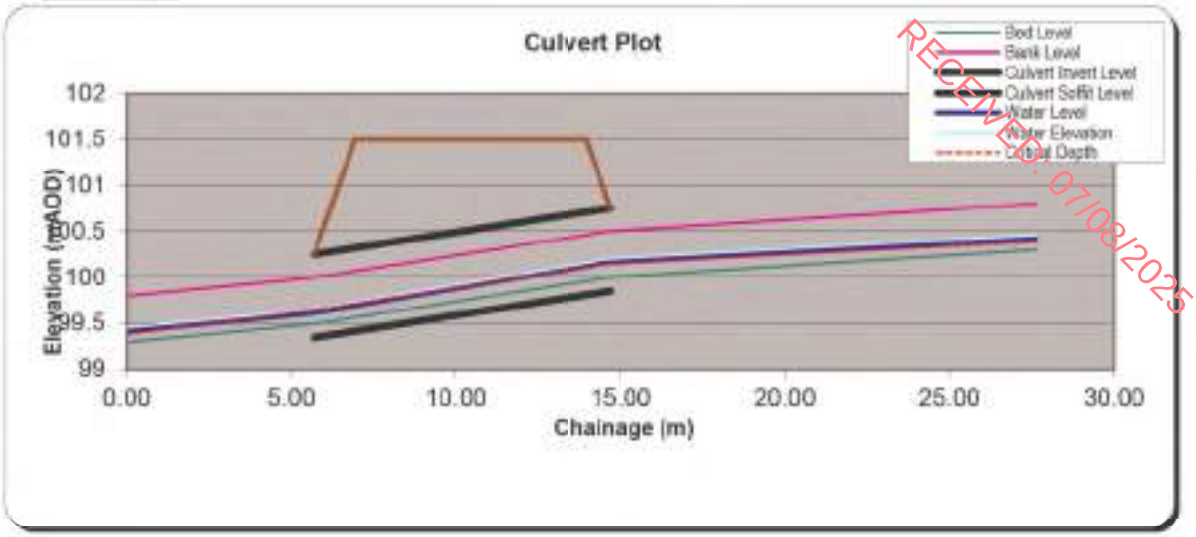
$$WL_{hic} = H_{hic} - \frac{V_{uc}^2}{2g}$$

Where

Headwater Elevation:	H_{hic}	100.20	mAOD
Velocity in Upstream Channel	V_{uc}	0.88	m/s
Therefore Water Level at Inlet:	WL_{hic}	100.16	mAOD

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Date	22/10/2024

6.5 *Culvert Profile*



7.0 *Summary*

	Complies	Fails	Comment
Culvert Inlet Soffit Elevation > Headwater Elevation for Inlet Co	X		
Adequate Freeboard provided to water level?	X		

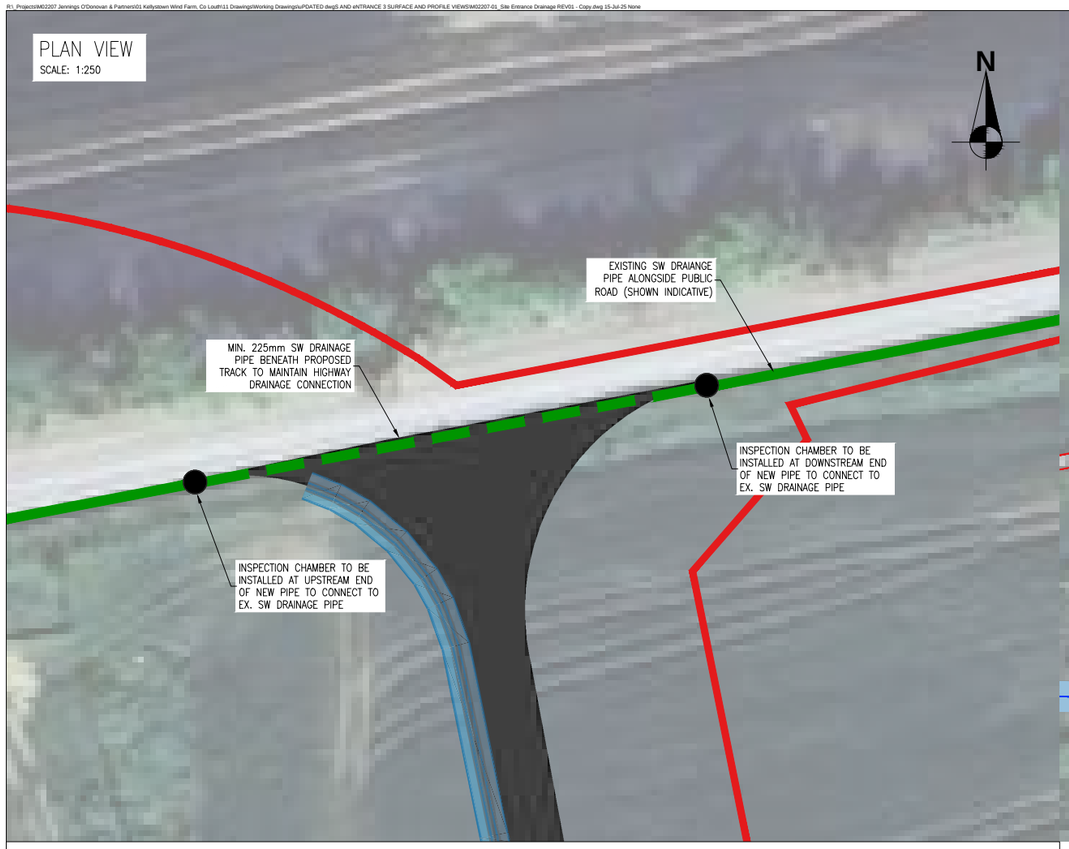
Therefore proposed culvert dimensions: **1 nr** **Diameter** **0.90 m**

By	Checked	Revision	Date
DH	KS	Original	22/10/2024

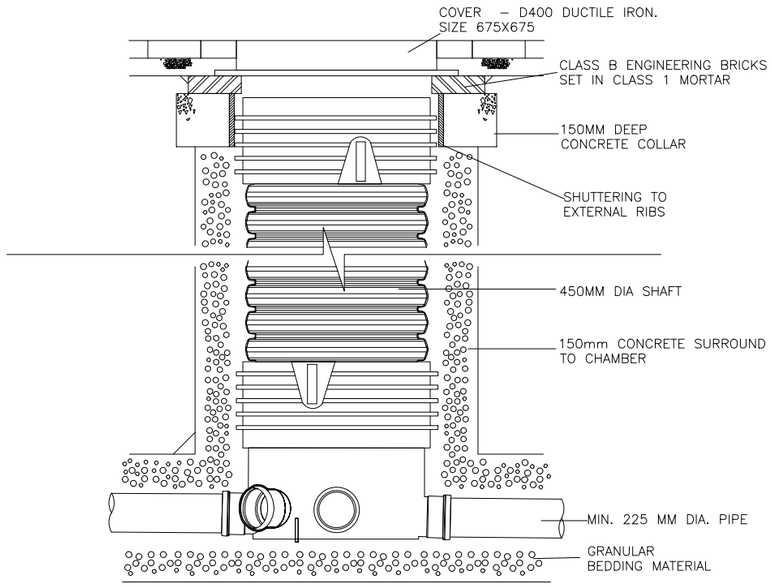
Annex G

Site Entrance Drainage Drawings

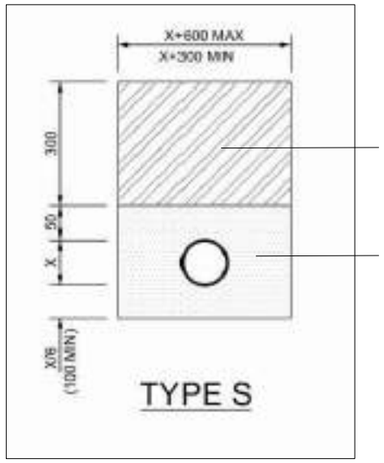
PLAN VIEW
SCALE: 1:250



SITE CONTEXT MAP
SCALE 1:2000



POLYPROPYLENE INSPECTION CHAMBER DETAIL
SCALE: NTS



SURFACE WATER DRAIN TRENCH AND BEDDING DETAIL
SCALE: NTS

NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. DIMENSION X IS THE EXTERNAL DIAMETER OF THE PIPE.
3. THE MINIMUM AND MAXIMUM WIDTH OF THE TRENCH APPLIES ON AND BELOW A LINE 300mm ABOVE THE OUTSIDE TOP OF THE PIPE. ABOVE THE 300mm LINE THE TRENCH BACKFILL MATERIAL SHALL BE IN ACCORDANCE WITH CC-SPW-00500 SECTION 5.1.
4. THE CONCRETE BED OR SURROUND MAY EXTEND TO THE SIDES OF THE TRENCH OR BE OF MINIMUM WIDTH. MATERIAL IN ACCORDANCE WITH CC-SPW-00500 SECTION 3.2(iii) IS TO BE USED TO FILL ANY VOIDS SO FORMED.
5. FOR TYPE 2 TRENCH THE CONCRETE COVER MAY BE FORMED TO A RADIUS, BATTER OR HORIZONTAL SURFACE. MINIMUM COVER OF CONCRETE SHALL BE 150.

LEGEND

- APPLICATION BOUNDARY
- PERMANENT INFRASTRUCTURE
- MINOR WATERCOURSE & BUFFER
- ROADSIDE DITCH
- CLEAN WATER DRAINAGE PIPE
- SWALE
- ATTENUATION BASIN
- INFILTRATION BASIN
- OUTFALL
- DRAINAGE GRIP
- INSPECTION CHAMBER
- SURFACE WATER DRAINAGE PIPE
- FILTER DRAIN

ISSUE	ORN	APP	DATE	NOTES / DESCRIPTION
1	DL	DKS	15/07/25	FOR PLANNING

STATUS: FOR PLANNING

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Carnmoney Road North
Newtownabbey
Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WINDFARM, CO. LOUTH

CLIENT: JENNINGS O'DONOVAN & PARTNERS

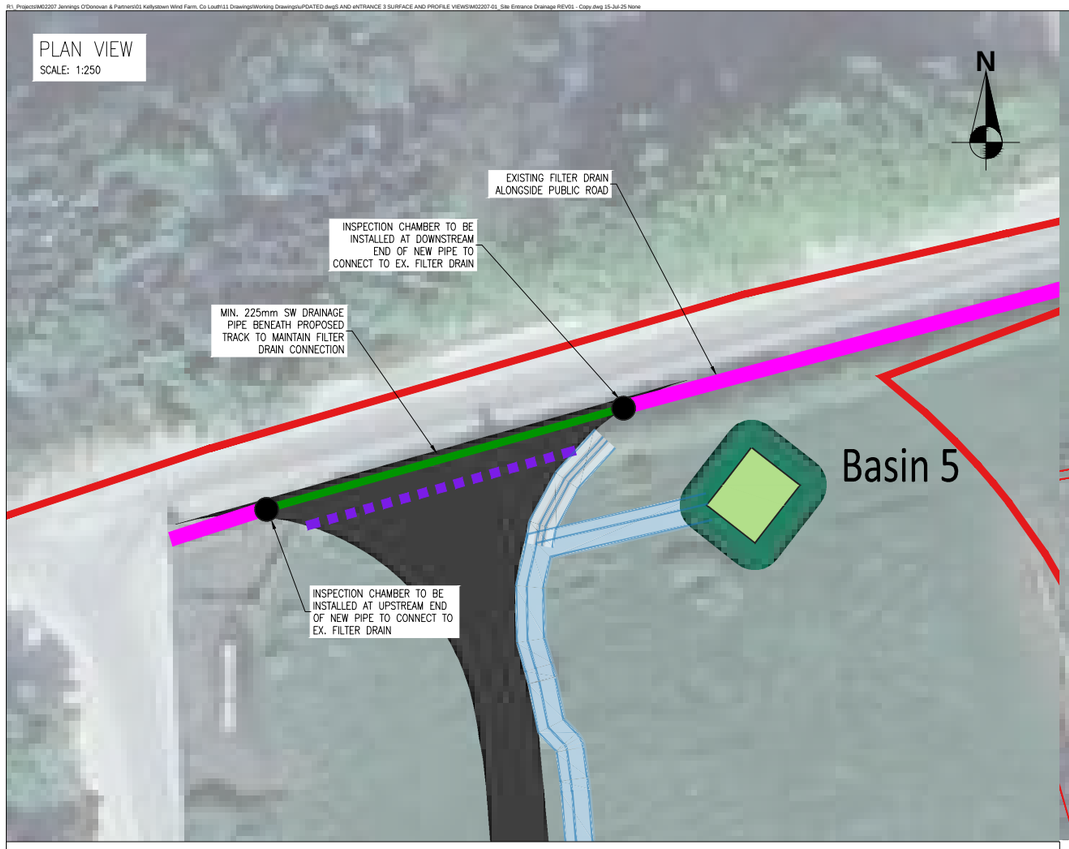
DRAWING TITLE: SITE ENTRANCE 1 PROPOSED SURFACE WATER DRAINAGE LAYOUT & DETAILS

SCALE	ORIGINAL SIZE
AS SHOWN	A1

DRAWN	CHECKED	DATE
DL	DKS	15/07/2025

PROJECT No.	DRAWING No.	ISSUE NO.
M02207-01	DWG_61	1

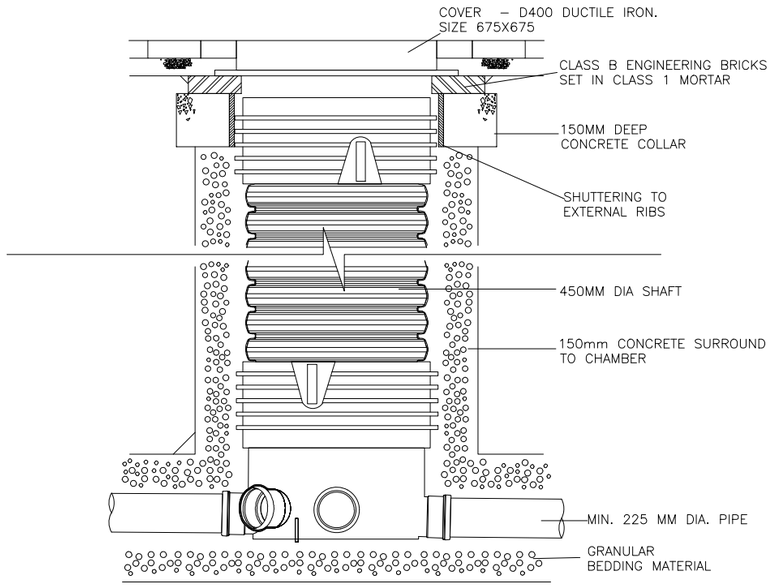
PLAN VIEW
SCALE: 1:250



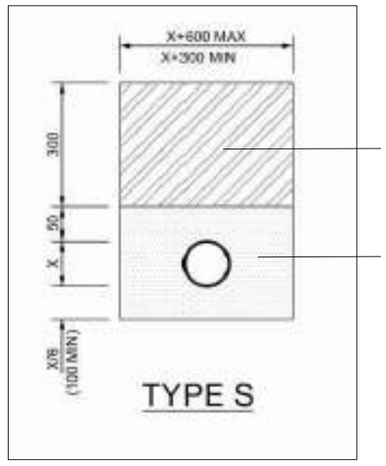
SITE CONTEXT MAP
SCALE 1:2000

LEGEND

- APPLICATION BOUNDARY
- PERMANENT INFRASTRUCTURE
- MINOR WATERCOURSE & BUFFER
- ROADSIDE DITCH
- CLEAN WATER DRAINAGE PIPE
- SWALE
- ATTENUATION BASIN
- INFILTRATION BASIN
- OUTFALL
- DRAINAGE GRIP
- INSPECTION CHAMBER
- SURFACE WATER DRAINAGE PIPE
- FILTER DRAIN



POLYPROPYLENE INSPECTION CHAMBER DETAIL
SCALE: NTS



SURFACE WATER DRAIN TRENCH AND BEDDING DETAIL
SCALE: NTS

NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. DIMENSION X IS THE EXTERNAL DIAMETER OF THE PIPE.
3. THE MINIMUM AND MAXIMUM WIDTH OF THE TRENCH APPLIES ON AND BELOW A LINE 300mm ABOVE THE OUTSIDE TOP OF THE PIPE. ABOVE THE 300mm LINE THE TRENCH BACKFILL MATERIAL SHALL BE IN ACCORDANCE WITH CC-SPW-00500 SECTION 5.1.
4. THE CONCRETE BED OR SURROUND MAY EXTEND TO THE SIDES OF THE TRENCH OR BE OF MINIMUM WIDTH. MATERIAL IN ACCORDANCE WITH CC-SPW-00500 SECTION 3.2(iii) IS TO BE USED TO FILL ANY VOIDS SO FORMED.
5. FOR TYPE 2 TRENCH THE CONCRETE COVER MAY BE FORMED TO A RADIUS, BATTER, OR HORIZONTAL SURFACE. MINIMUM COVER OF CONCRETE SHALL BE 150.

ISSUE	ORN	APP	DATE	NOTES / DESCRIPTION
1	DL	DKS	15/07/2025	FOR PLANNING

STATUS: FOR PLANNING

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Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WINDFARM, CO. LOUTH

CLIENT: JENNINGS O'DONOVAN & PARTNERS

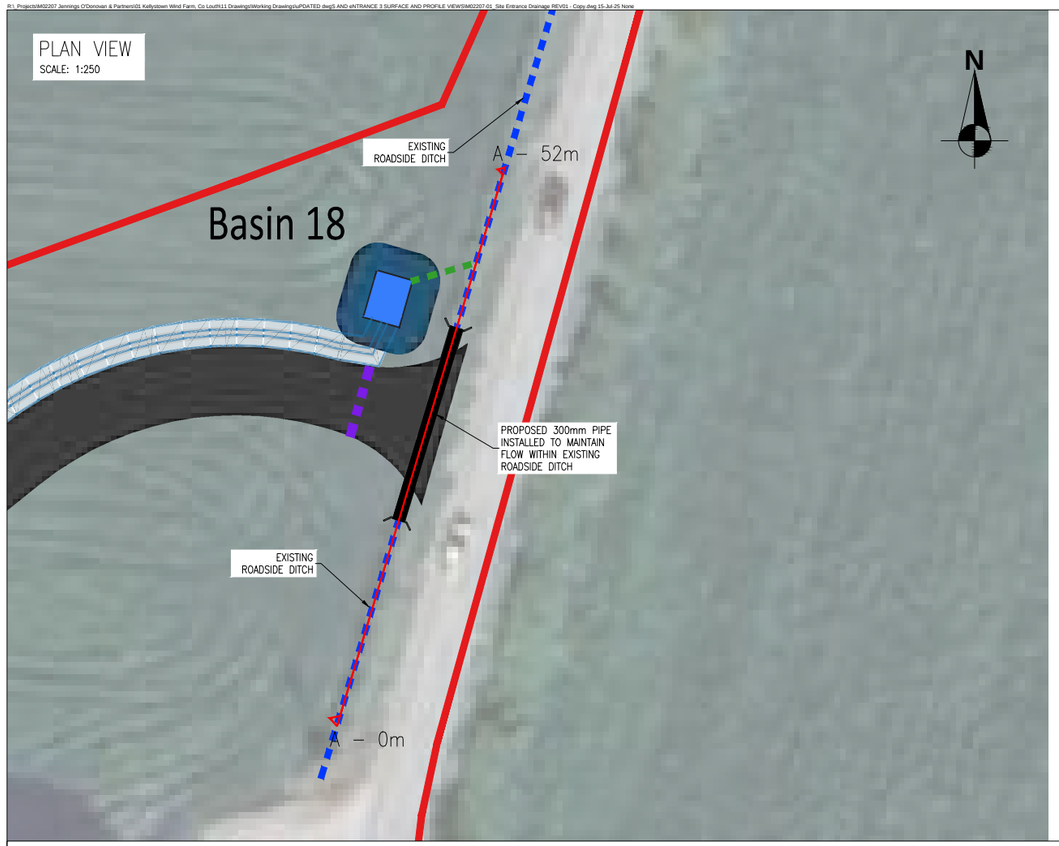
DRAWING TITLE: SITE ENTRANCE 2 PROPOSED SURFACE WATER DRAINAGE LAYOUT & DETAILS

SCALE	ORIGINAL SIZE
AS SHOWN	A1

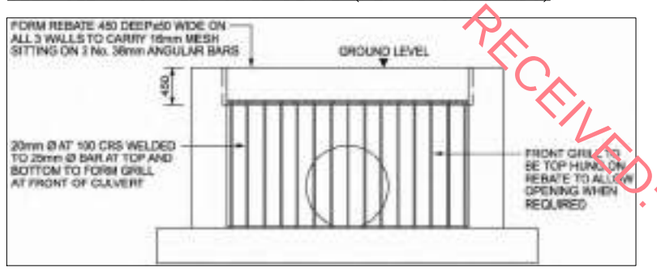
DRAWN	CHECKED	DATE
DL	DKS	15/07/2025

PROJECT No.	DRAWING No.	ISSUE NO.
M02207-01	DWG_62	1

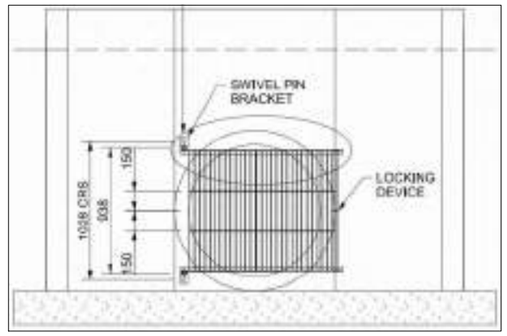
PLAN VIEW
SCALE: 1:250



SELF CLEARING INLET GRILL DETAIL (PER TII STANDARDS):

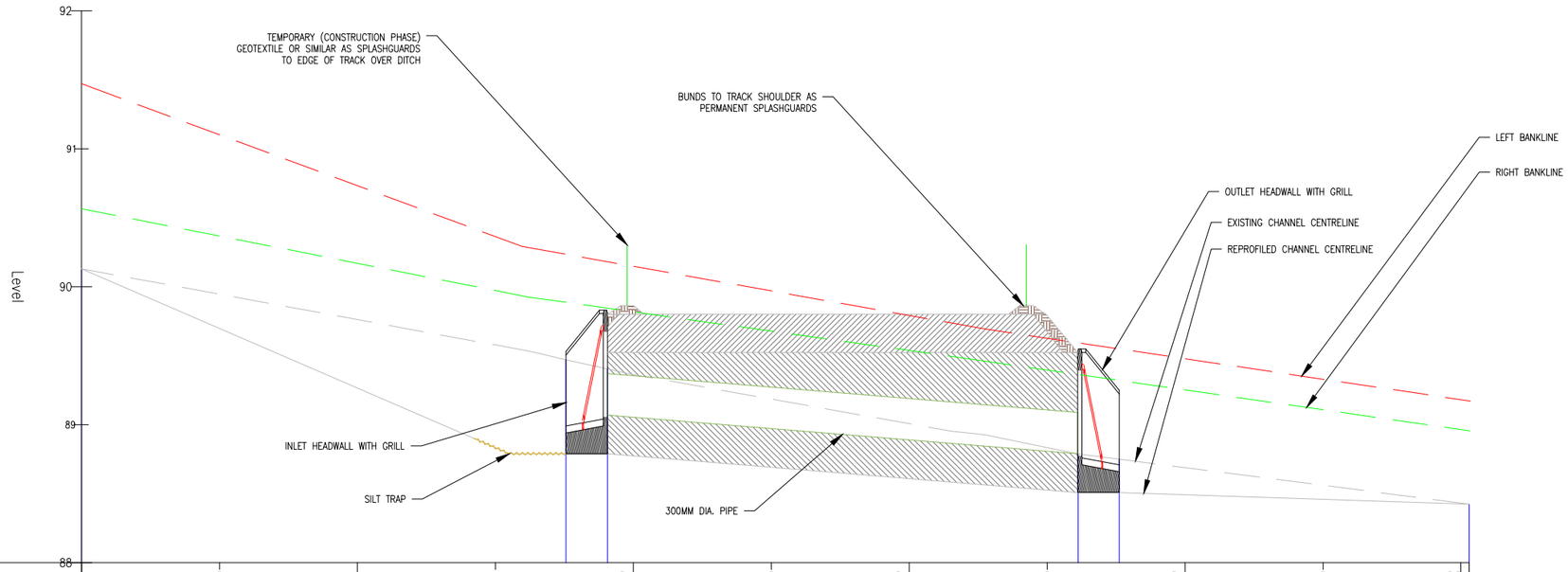


OUTLET GRILL DETAIL (PER TII STANDARDS):



LEGEND

- APPLICATION BOUNDARY
- PERMANENT INFRASTRUCTURE
- MINOR WATERCOURSE & BUFFER
- ROADSIDE DITCH
- CLEAN WATER DRAINAGE PIPE
- SWALE
- ATTENUATION BASIN
- INFILTRATION BASIN
- OUTFALL
- DRAINAGE GRIP
- INSPECTION CHAMBER
- SURFACE WATER DRAINAGE PIPE
- FILTER DRAIN



Chainage	0.00	05.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	50.30
Existing Levels	90.13	89.95	89.76	89.58	89.36	89.19	89.01	88.83	88.69	88.56	88.43	88.42
Proposed Levels	90.13	89.75	89.37	88.99	88.77	88.69	88.61	88.53	88.49	88.46	88.43	88.42

CHANNEL CENTRELINE – LONGSECTION DATUM: 88.000

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	DKS	15/07/2025	FOR PLANNING

STATUS: FOR PLANNING

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Co. Antrim, BT36 5QA

PROJECT: KELLYSTOWN WINDFARM, CO. LOUTH

CLIENT: JENNINGS O'DONOVAN & PARTNERS

DRAWING TITLE: SITE ENTRANCE 3 PROPOSED SURFACE WATER DRAINAGE LAYOUT & DETAILS

SCALE	ORIGINAL SIZE
AS SHOWN	A1

DRAWN	CHECKED	DATE
DL	DKS	15/07/2025

PROJECT No.	DRAWING No.	ISSUE NO.
M02207-01	DWG_63	1

Annex H

Site Entrance 3;

Flow Estimation & Pipe Sizing Calculations

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	Entrance 3 Crossing
Date	02/07/2025

Purpose: To estimate a design flow for a catchment in the Irish hydrological region by the Institute of Hydrology Report 124 (IoH 124) "Flood Estimation on Small Catchments" method.

This spreadsheet is suitable for estimating design flows on small rural catchments (less than 25 km^2) using the IH Report 124 equation for QBAR plus the FSR regional growth curves. Rural can be taken as meaning URBAN less than 0.05, or equivalently URBEX. This sheet does not adopt the <5 sq km alternative method (for plot scale equations) in order to ensure a conservative approach to flood estimation.

AREA	*Max from FSU / Height Data*	0.014	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.005	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor (from FSSR 14 and FSU research)	Design flow (m^3/s)	Specific runoff (l/s/ha)
2	0.920	0.004	3.064
30	2.113	0.010	7.038
50	2.330	0.011	7.761
100	2.610	0.012	8.693
500	3.326	0.016	11.077
1000	3.625	0.017	12.072

Climate Change:
100-year + 20% **0.015 m3/s**

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	Entrance 3 Crossing
Date	02/07/2025

Purpose: To estimate design flows for an Irish catchment by the FSSR No. 6 3-Variable Eqn method

This spreadsheet is suitable for estimating design flows on small catchments (less than 20 km^2) using the FSSR no. 6 3-Variable equation for QBAR plus the FSR (FSSR14) regional growth curves.

AREA	*Max from FSU / Height Data*	0.014	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.004	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor	Design flow (m^3/s)	Specific runoff (l/s/ha)
2	0.920	0.004	2.830
30	0.000	0.000	0.000
50	2.330	0.010	7.169
100	2.610	0.011	8.030
500	3.326	0.014	10.232
1000	3.625	0.016	11.151

Climate Change:
100-year + 20% **0.013 m3/s**

Project M02207-01 Kellystown Wind Farm, Co. Louth
Ref Entrance 3 Crossing
Date 02/07/2025

Purpose

To determine the adequacy of hydraulic capacity for a drainage pipe in accordance with the requirements of CIRIAC689

1.0 *Input Data:*

Culvert Ref:		Entrance 3		
Watercourse Name		Road Verge		
Design Discharge Q		***0.015***	***m3/sec***	As per Hydrological Analysis
Design Return Period		*100+CC*	*Yrs*	As per LA requirement
Elevation of Stream Bed @ Pipe Inlet		89.515	m AOD	From Survey
Elevation of Stream Bed @ Pipe Outlet		88.875	m AOD	From Survey
Culvert Length		8	m	From Survey
Elevation of Stream bed upstream of Pipe		90.13	m AOD	From Survey
Distance upstream of Pipe		16.05	m	From Survey
Elevation of Stream bed downstream of Pipe		88.17	m AOD	From Survey
Distance downstream of Pipe		42.2	m	From Survey
Elevation of Proposed Embankment Crest		90.5	m AOD	From Survey
Average channel invert width		0.25	m	From Survey
Average channel top of bank width		2.3	m	From Survey
Average Channel Depth to Bank		0.5	m	From Survey
Left Over-Bank Ground Level (Floodplain) (Pipe Inlet)		89.756	m AOD	From Survey
Distance from bank		7.4	m	From Survey
Right Over-Bank Ground Level (Floodplain) (Pipe Inlet)		89.73	m AOD	From Survey
Distance from bank		1.2	m	From Survey
Mannings n - Channel		0.035		From C689 Table A1.1
Mannings n - Overbanks		0.035		From C689 Table A1.1
Bedslope upstream of pipe 1 in S1	S1	26.10	-	Calculated
Bedslope downstream of pipe 1 in S2	S2	59.86	-	Calculated
Bedslope across pipe 1 in S3	S3	12.50	-	Calculated
Bedslope across whole reach considered 1 in S4	S4	33.80	-	Calculated
Channel Side Slopes 1 in X	X =	2.05	-	Calculated
Upstream Left Over- Bank Slope	Y =	-28.57	-	Calculated
Upstream Right Over- Bank Slope	Z =	-4.21	-	Calculated

2.0 *Calculate Tailwater Depth and Level:*

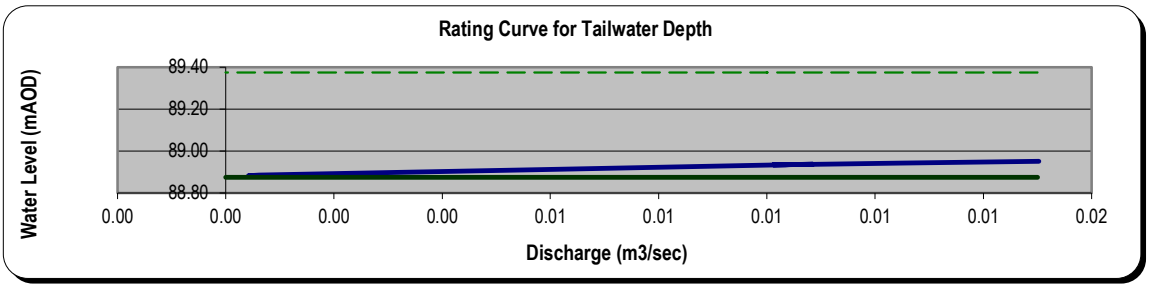
Mannings Equation:

$$Q = VA = \left(\frac{1.00}{n}\right) A R^{\frac{2}{3}} \sqrt{S} \quad [SI] \qquad R_h = \frac{A}{P}$$

Discharge Contained in Channel, Depth of Normal Flow Considered

Depth of water in channel is	y_{dc}	0.08	m	Calculated
Therefore water level at downstream extent of pipe is:	WL_t	88.95	mAOD	Calculated
	V_{dc}	0.69	m/s	Calculated

2.1 Rating Curve for Tailwater Channel Discharge



3.0 *Calculate Tailwater Elevation (Total Head) Ht:*

$$H_t = Z_{bo} + y_{dc} + \frac{V_{dc}^2}{2g}$$

Where: Z_{bo} Elevation @ Pipe Outlet
y_{dc} Water depth in downstream channel
V_{dc} Velocity in downstream channel

Tailwater Elevation:	H_t	88.98	mAOD	Calculated

4.0 *Calculate Froude No.*

Cross Sectional Area (A)		0.02	m2
Top Width (B)		0.32	m
Hydraulic mean depth (A per unit B)	d_m	0.07	m
Froude Number	Fr	0.84	*Subcritical*
Critical depth in channel	h_c	0.05	m
Critical Velocity	v_c	0.81	m/s

5.0 *Initial Design*

Initial Estimate of required pipe cross sectional area required. Analysis is based on new pipe, therefore design should allow for freeflow conditions. Applicable method is Flow Area Method

5.1 *Flow Area Method - refer to C689 Section 6.7.1*

Depth; Min. Tailwater depth	D	0.08	m	Calculated
Assume 20% Initial loss of pipe height due to Freeboard / Silt (		0.10	m	Calculated
where freeboard depth is:	F	0.01	m	Calculated
Area required as per tailwater fllow calculation:	A_t	0.02	m2	Calculated
Nominal width (Area / Depth (not inc. freeboard):		0.29	m	Calculated
Therefore prelim pipe dimensions (incl freeboard + silt)	D_i	*0.10*	*m*	Calculated
	B_i	*0.29*	*m*	Calculated

6.0 *Detailed Design*

6.1 *Try pipe dimensions...*

Based on previous Initial Design

Height / Diameter	D	0.30	m
Breadth (BLANK IF CIRCULAR)	B		m
Number of Pipes	nr	1	n/a
Shape		CIRCULAR	
Freeboard		0.00	m
Siltation / Depth lowered below ex. stream invert		0.00	m

Therefore:

Upstream Pipe Invert		*89.52*	*mAOD*
Upstream Pipe Base (w/Silt)Elevation	Z_i	*89.52*	*mAOD*
Upstream Soffit Elevation		*89.82*	*mAOD*
Downstream Pipe Invert Elevation		*88.88*	*mAOD*
Downstream Pipe Base (w/ Silt) Elevation	Z_o	*88.88*	*mAOD*
Downstream Soffit Elevation		*89.18*	*mAOD*

6.2 *Calculation of Discharge Intensity*

$$q_i = \frac{1.811Q}{A_b D^{0.5}}$$

Where

Discharge	Q	0.015	m3/s
Depth / Diameter of barrell	D	0.30	m
Culvert cross section area excl. freeboard + siltation	Ab	0.07	m2
Discharge Coefficient	qi	0.70	n/a
Discharge intensity classification is:		Free Flow Inlet Control	

6.3 *Calculation of headwater depth for free flow inlet control*

Based on Table A1.3, Pipe type is Nr 2 n/a
i.e, Circular pipe; headwall, socket end of pipe

$$\frac{E_{sh}}{D} = \frac{E_{sc}}{D} + k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M - 0.5S_o$$ Eqn 6.23

$$\frac{E_{sc}}{D} = k\left[\frac{1.811Q}{A_b D^{0.5}}\right]^M$$ Eqn 6.25

Therefore applicable CIRIA C689 equation reference: Equation 6.23

Where Discharge	Q	0.015	m3/s	
Depth / Diameter of barrell	D	0.3	m	
Unsubmerged analysis constant	k	0.0078		Table A1.3
Unsubmerged analysis constant	M	2		Table A1.3
Pipe cross section area excl. freeboard + siltation	Ab	0.07	m2	
Pipe Slope	So	0.08	m/m	1 in 12.5
Critical depth calculated as:	y_c	0.092	m	
Specific Energy at Critical Depth	E_{sc}	0.14	m	
Therefore Specific Energy of Headwater	E_{sh}	0.13	m	

$$\frac{Q^2 W}{gA^3} = 1$$

$$E_{sc} = \frac{3}{2} y_c$$

6.4 *Calculation of headwater elevation for inlet control*

Headwater Elevation H_{hic} determined by:

$$H_{hic} = Z_i + E_{sh} + h_s$$

Where

Headloss due to inlet screen	h_s	N/A	(No Screen Proposed)
Stream Elevation at Inlet	Z_i	89.52	mAOD
Specific Energy of Headwater	E_{sh}	0.13	m
Therefore Headwater Elevation:	H_{hic}	89.64	mAOD

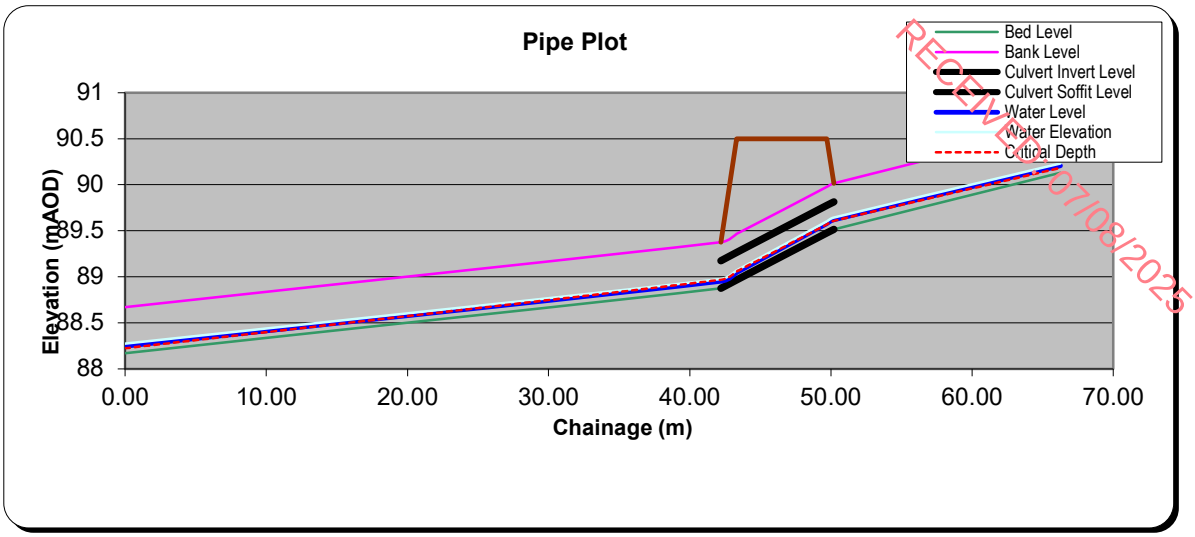
Water Level at the headwater for inlet control WL_{hic} determined by:

$$WL_{hic} = H_{hic} - \frac{V_{uc}^2}{2g}$$

Where

Headwater Elevation:	H_{hic}	89.64	mAOD
Velocity in Upstream Channel	V_{uc}	0.69	m/s
Therefore Water Level at Inlet:	WL_{hic}	89.62	mAOD

6.5 *Pipe Profile*



7.0 *Summary*

	Complies	Fails	Comment
Pipe Inlet Soffit Elevation > Headwater Elevation for Inlet Contr	X		
Adequate Freeboard provided to water level?	X		

Therefore proposed pipe dimensions: **1 nr** **Diameter** **0.30 m**

By	Checked	Revision	Date
DH	KS	Original	02/07/2025

Annex I

Clean Water Drainage Pipes;

Flow Estimation & Pipe Sizing

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	Clear Water Drainage Pipes
Date	02/07/2025

Purpose: To estimate a design flow for a catchment in the Irish hydrological region by the Institute of Hydrology Report 124 (IoH 124) "Flood Estimation on Small Catchments" method.

This spreadsheet is suitable for estimating design flows on small rural catchments (less than 25 km^2) using the IH Report 124 equation for QBAR plus the FSR regional growth curves. Rural can be taken as meaning URBAN less than 0.05, or equivalently URBEX. This sheet does not adopt the <5 sq km alternative method (for plot scale equations) in order to ensure a conservative approach to flood estimation.

AREA	*Max from FSU / Height Data*	0.147	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.04	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor (from FSSR 14 and FSU research)	Design flow (m^3/s)	Specific runoff (l/s/ha)
2	0.92	0.03	2.37
30	2.11	0.08	5.43
50	2.33	0.09	5.99
100	2.61	0.10	6.71
500	3.33	0.13	8.55
1000	3.62	0.14	9.32

Climate Change:

100-year + 20% **0.12 m3/s**

Project	Kellystown Wind Farm, Co. Louth
Ref	M02207-01
Crossing Ref	Clear Water Drainage Pipes
Date	02/07/2025

Purpose: To estimate design flows for an Irish catchment by the FSSR No. 6 3-Variable Eqn method

This spreadsheet is suitable for estimating design flows on small catchments (less than 20 km^2) using the FSSR no. 6 3-Variable equation for QBAR plus the FSR (FSSR14) regional growth curves.

AREA	*Max from FSU / Height Data*	0.147	km2
SAAR4170	*From FSU*	837.4	mm
WRAP class:	*From WRAP maps / FSU BFISOIL*	2	
SOIL		0.3	

QBAR	0.04	m3/s

Map Region	Ireland (GDSDS)

Return period (years)	Growth Curve Factor	Design flow (m^3/s)	Specific runoff (l/s/ha)
2	0.92	0.03	2.35
30	0.00	0.00	0.00
50	2.33	0.09	5.94
100	2.61	0.10	6.65
500	3.33	0.12	8.48
1000	3.62	0.14	9.24

Climate Change:
100-year + 20% **0.12 m3/s**

Project:	*Kellystown Wind Farm, Co. Louth*
Ref:	*M02207-01*
Culvert Ref:	*Clear Water Drainage Pipes*
Date:	*02/07/2025*

Purpose: *To assess the hydraulic capacity of the minimum pipe size required for clean water drainage pipes for maintaining natural hydrology using the Colebrooke White Equation*

Inputs:

Ks	0.6	*mm*	
Diameter	300	*mm*	
Gradient	0.02	*1 in 50*	*(Minimum gradient)*
Peak Inflow	0.12	m^3/s	*(From flow assessment)*

Results:

Pipe Capacity	0.189	m^3/s
Velocity	2.673	*m/s*

Checks:

Inflow as % of capacity	63.52%	
Capacity > Inflow?	*Ok*	

By	*Checked*	*Revision*	*Reason for Change*	*Date*
DH	*JAM*	*Original*	*(-)*	*#######*