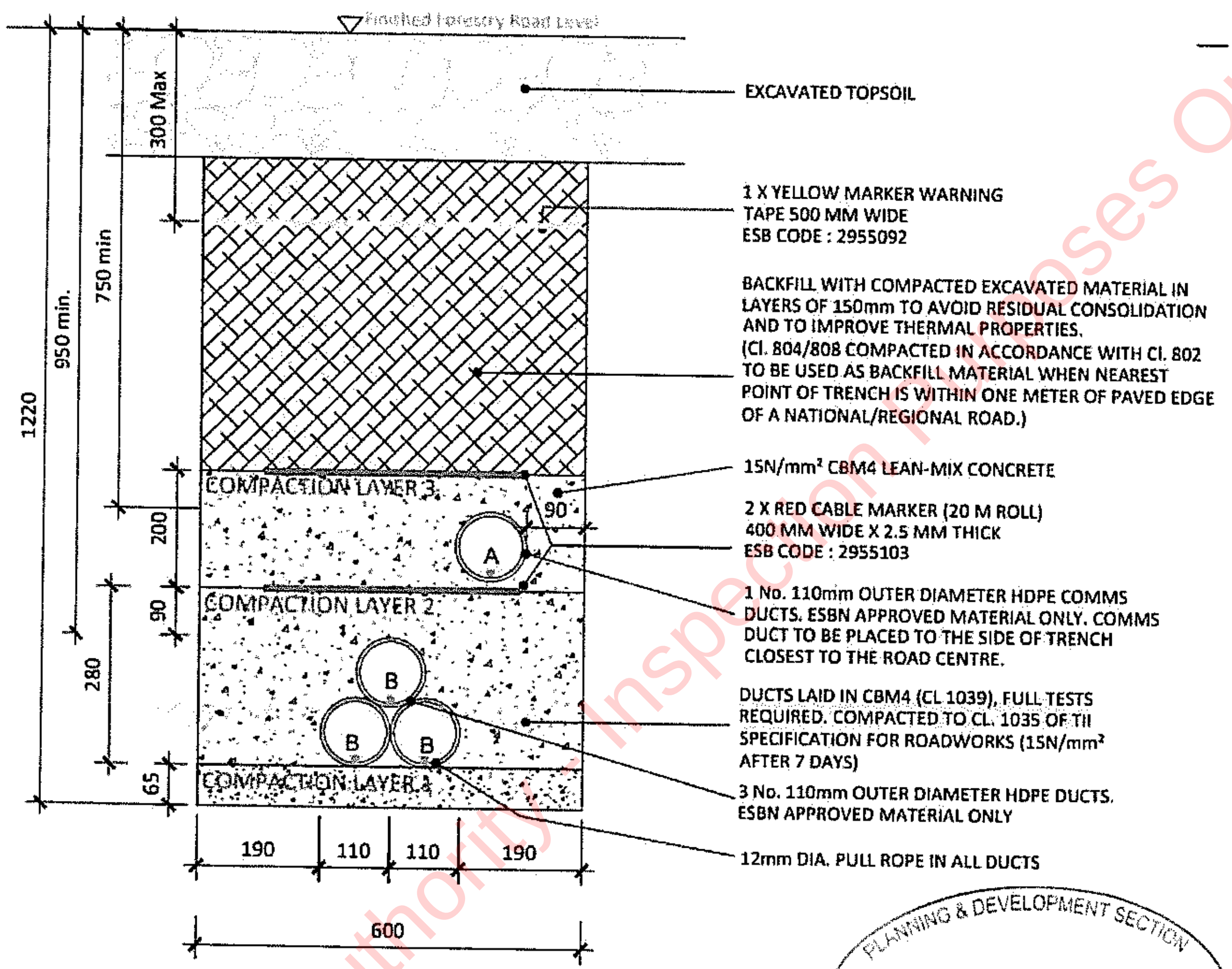
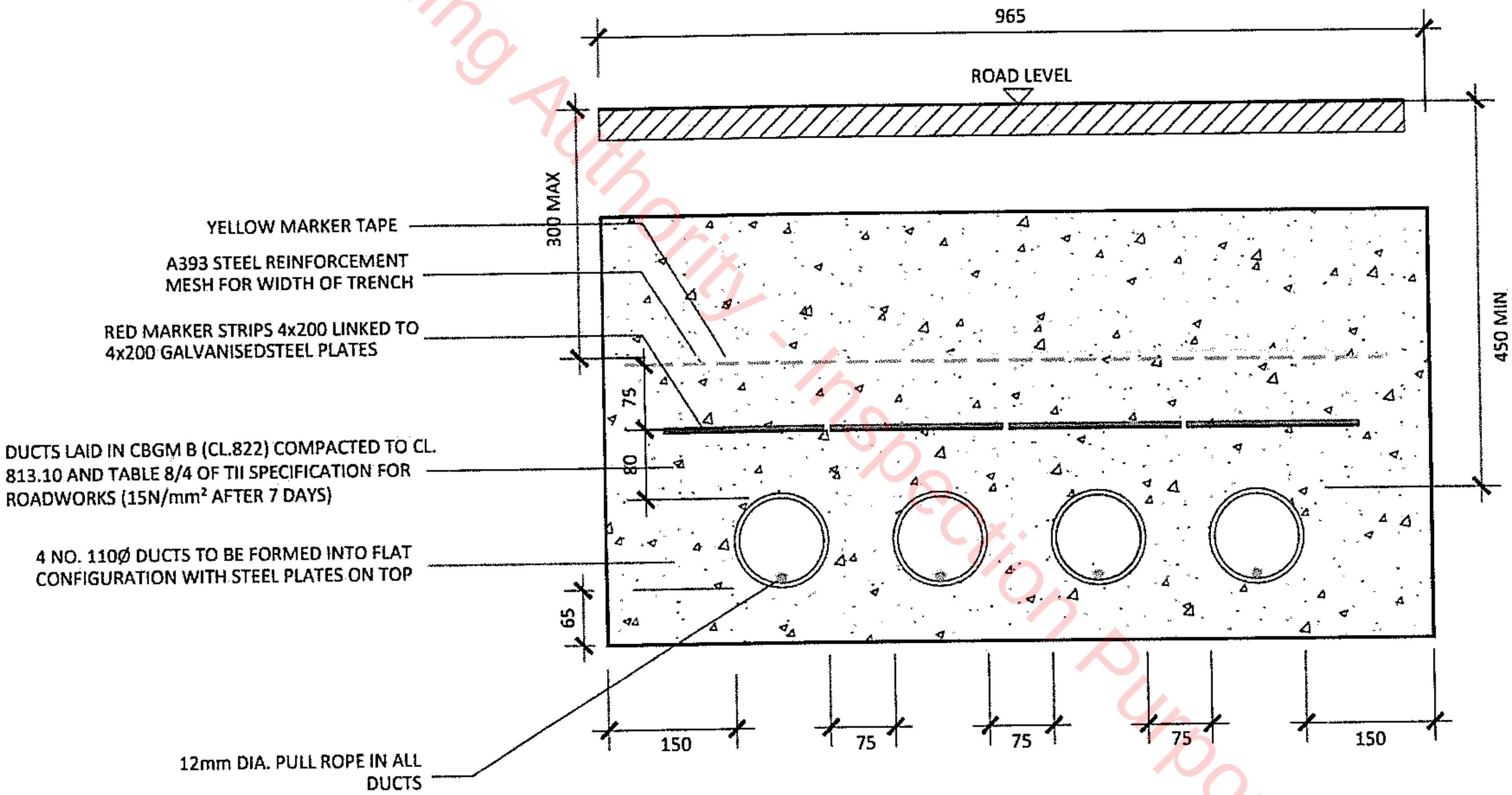
Appendix A – Standard 38kV Trench Trefoil Design (110mm Ducts)



Appendix B – Flat Formation 38kV Trench Design (110mm Ducts – 450mm Depth)



MANAGEMENT PLAN 3 –
SURFACE WATER MANAGEMENT PLAN

INCHAMORE WIND DAC

INCHAMORE WIND FARM
CO. CORK

CONSTUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 3
SURFACE WATER MANAGEMENT PLAN

MAY 2023

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DOCUMENT APPROVAL

PROJECT	Inchamore Wind Farm	
CLIENT / JOB NO	Inchamore Wind DAC	6226
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Surface Water Management Plan	

	Prepared by	**Reviewed/Approved by**
Document Final	Name Shirley Bradley	Name Sean Molloy
Date May 2023	Signature *Shirley Bradley*	Signature *Sean Molloy*

CONTENTS

APPENDICES

1 INTRODUCTION

This Surface Water Management Plan (SWMP) describes the management of surface water during construction of Inchamore Wind Farm, Co. Cork (the Project).

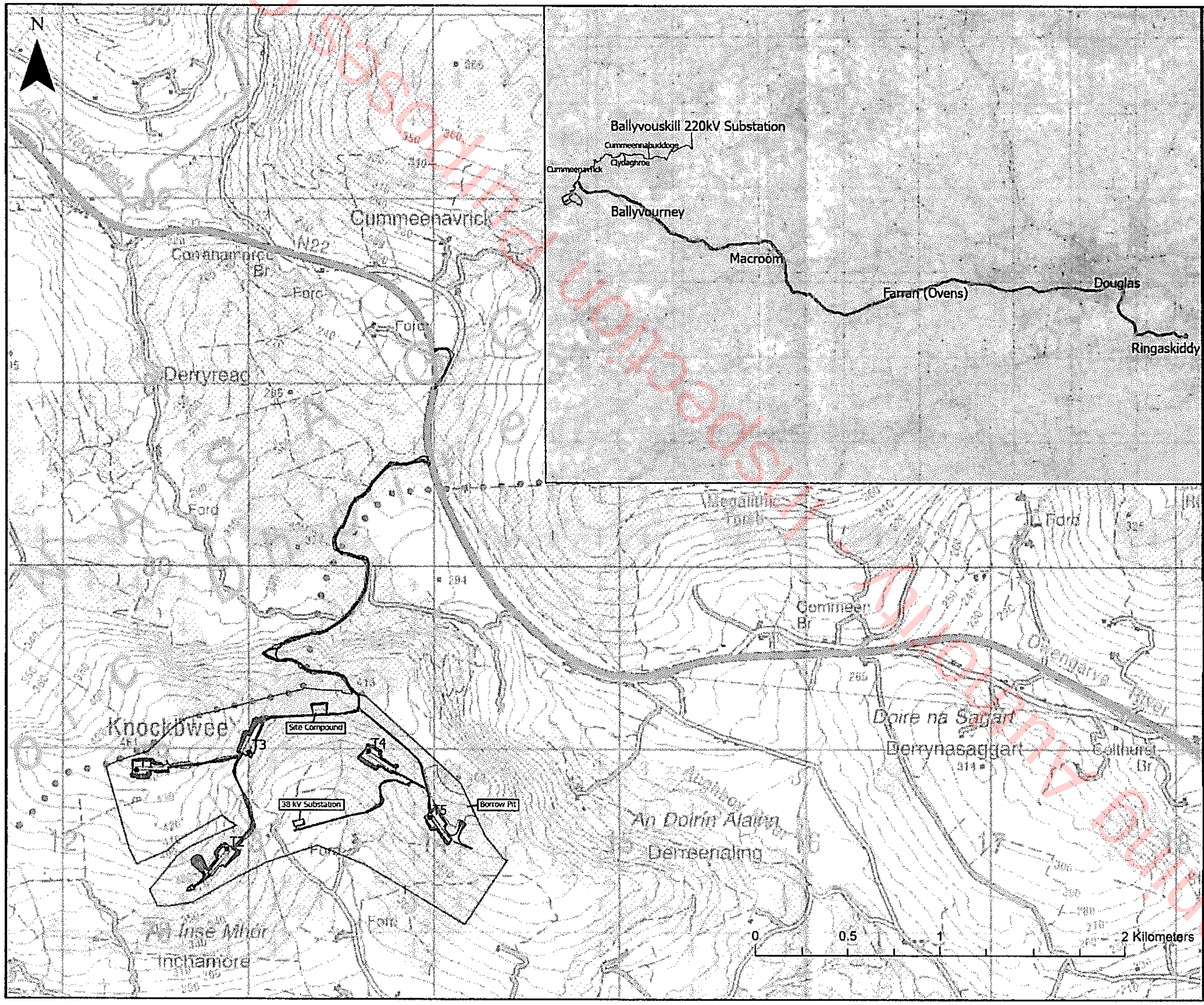
The Surface Water Management Plan aims to:

- Describe the baseline environment of the Project
- Describe how the system will operate to minimise modification and disruption to the existing hydrology
- Outline the proposed maintenance regime
- Outline the proposed drainage management post-construction

2 BASELINE ENVIRONMENT

2.1 Site Description

The Site is shown in **Figure 2.1**.



Legend

- Red Line 23
- 230213 Site Layout
- Redline-250 Haul Road - 256-Polyline
- Met_Mast_Location
- Turbine Locations
- Turbine Delivery Route (TDR)
- Inchamore Grid Connection Route
- Ballyvouskill 220kV Substation

Rev	Date	By	Comment

Client

Inchamore Wind DAC

Client Representative

JENNINGS O'DONOVAN CONSULTING ENGINEERS

Project

Proposed Wind Farm at Inchamore, Coolea, Co. Cork.

Title

Project Elements

Drg. By	SB	Drg No	-
Checked By	SM	Rev	2
Stage	SWMP	Date	07/03/23
Scale	1:20,000 (A3)	Figure	2.1

Figure 2.1: Project Elements

2.2 Topography

Landform within the Site is notably upland and sloping, with considerable variance in elevation, although most of the site rests above the 300 m AOD mark. The Site elevations range from 460 m AOD in the northwestern side of the Site to 350 m AOD towards the eastern side of the Site.

2.3 Hydrology and Geology

The geology and hydrology of the Site are detailed in **EIAR Chapter 8: Soils and Geology** and **EIAR Chapter 9: Hydrology and Hydrogeology**, respectively. Surface water networks draining the site are mapped and presented in **Figure 2.2**.

The Project is situated within the Lee, Cork Harbour and Youghal Bay catchment (ID: 19, Area: 2182km^2).

Surface water runoff associated with the Site drains into the Sullane sub catchment and/or Sullane_010 river sub basins.

All surface water drainage from the Site eventually combine in Carrigadrohid Reservoir, from which waters eventually flow to Cork Harbour.

The Sullane_010 flows into the Sullane_020, _030, _040 and _050 until reaching the Sullane_060 approximately 23.5 km southeast of the Site. From here waters flow into the Lee (Cork)_060 which continues east and flows into Carrigdrohid Reservoir and Inniscarra Reservoir which are not designated drinking water, however the reservoir discharges to the downstream section of the Lee (Cork) river (090) which is designated for drinking water.

Details of watercourse crossings can be found in **Management Plan 2: Water Quality Management Plan**.

Figure 2.2: Surface Water Networks

The mapped (GSI, Bedrock 100k[1]) geological formation underlying the site is classified as the Gun Point Formation (DUGNPT) – which is comprised of Green-grey sandstone & Purple siltstone.

3 ENVIRONMENTAL CONSTRAINTS AND MITIGATION MEASURES

This is a live document and where there is a requirement for variation to the proposed management of surface water during construction the SWMP will be updated to reflect any such changes. The SWMP will be updated by the Environmental Manager (EM) and, where it is relevant to ecology, with input from the Ecological Clerk of Works (ECoW) before any changes are made to the proposed management of surface water during construction of Inchamore Wind Farm.

4 DRAINAGE SYSTEM OVERVIEW

The drainage system has been designed for this Development. It aims to ensure the Development does not change the baseline water quality within or downstream of the Site.

The drainage system includes the following:

- A 65 m buffer from watercourses except at water crossings. These will be marked out prior to works beginning on site.
- Drainage will be installed in parallel with road construction.
- Check dams will be mainly used for road drainage. All road sections will drain to settlement-attenuation ponds.
- Silt fencing will be utilised during water crossings and around stockpiles
- Settlement-attenuation ponds will be used at every major excavation

4.1 SuDS Drainage Design

There is increased potential for water pollution, in particular sedimentation to local surface water features due to the excavation and generation of spoil and emplacement of stone materials during the construction stage of the project.

The design criteria for the SuDS design are as follows:

- To select and install ecologically sensitive drainage.
- To minimise alterations to the ambient site hydrology and hydrogeology.
- To provide settlement and treatment controls as close to the site footprint as possible and to replicate the existing hydrological environment of the site.
- To minimise sediment loads resulting from the development run-off during the

[1] Geological Survey of Ireland (GSI) Spatial Resources. Online: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228. Accessed: May 2021

construction phase.

- To preserve greenfield runoff rates and volumes.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.
- To reduce stormwater runoff velocities throughout the site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.
- To control water within the site and allow for the discharge of runoff from the site within the limits prescribed in the Salmonid Regulations.

The purpose of incorporating a SuDS design is:

- To provide sufficient detail to ensure that water pollution will not occur as a result of construction activities at the site and to minimise the risk of any such occurrence.
- To regulate the rate of surface water run-off downslope to prevent scouring and to encourage settlement of sediment locally.
- To minimise the quantity of sediment laden stormwater and resulting settlement pond sizes by separating "clean" water from the "dirty" development runoff. This can be seen in **Drawing No. 6226-PL-100 to 6226-PL-108.**
- To provide appropriate retention times such that no flooding will occur.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.

4.2 Design Philosophy

The SuDS design must be managed and monitored (see Section 6) and particularly after Met Éireann Status Yellow, Orange or Red weather warnings for wind, rain or snow and during construction phase environmental auditing. The design rationale is that of an integrated approach where each element is assessed for its potential contribution to sediment suspension and the appropriate mitigation measures integrated into the layout design. The design principles are as follows:

Minimise → Intercept → Treat → Disperse → Dilute

4.2.1 Minimise

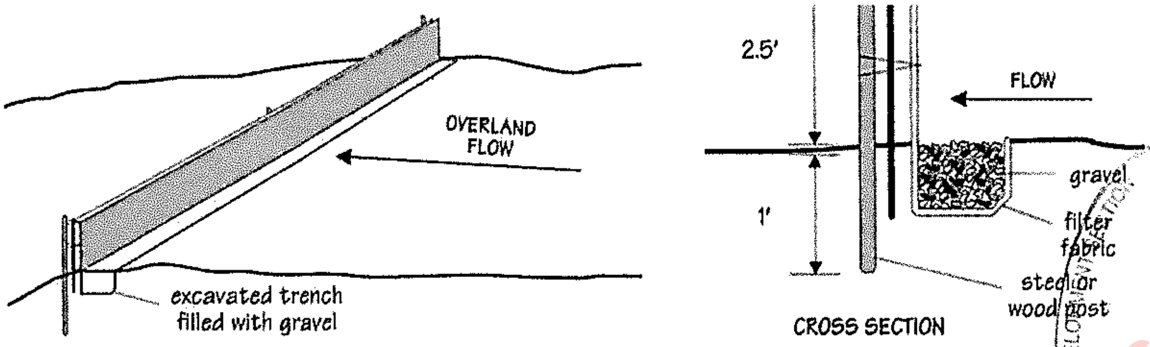


Figure 4.1: Diagram of silt fence[2]

The main principle of this SuDS design is to minimise the volume of 'dirty' water requiring treatment through means of informed, integrated and sustainable drainage design. It achieves this by keeping 'clean' water clean by interception and separation, and by collecting the 'dirty' water and treating it by removing the suspended sediments. The resultant outflow is dispersed across vegetation and will become diluted through contact with the clean water runoff in the buffer areas before entering site/ roadside drains.

[2] Norman, David & Wampler, Peter & Throop, Allen & Schnitzer, E. & Roloff, Jaretta. (1997). Best management practices for reclaiming surface mines in Washington and Oregon.

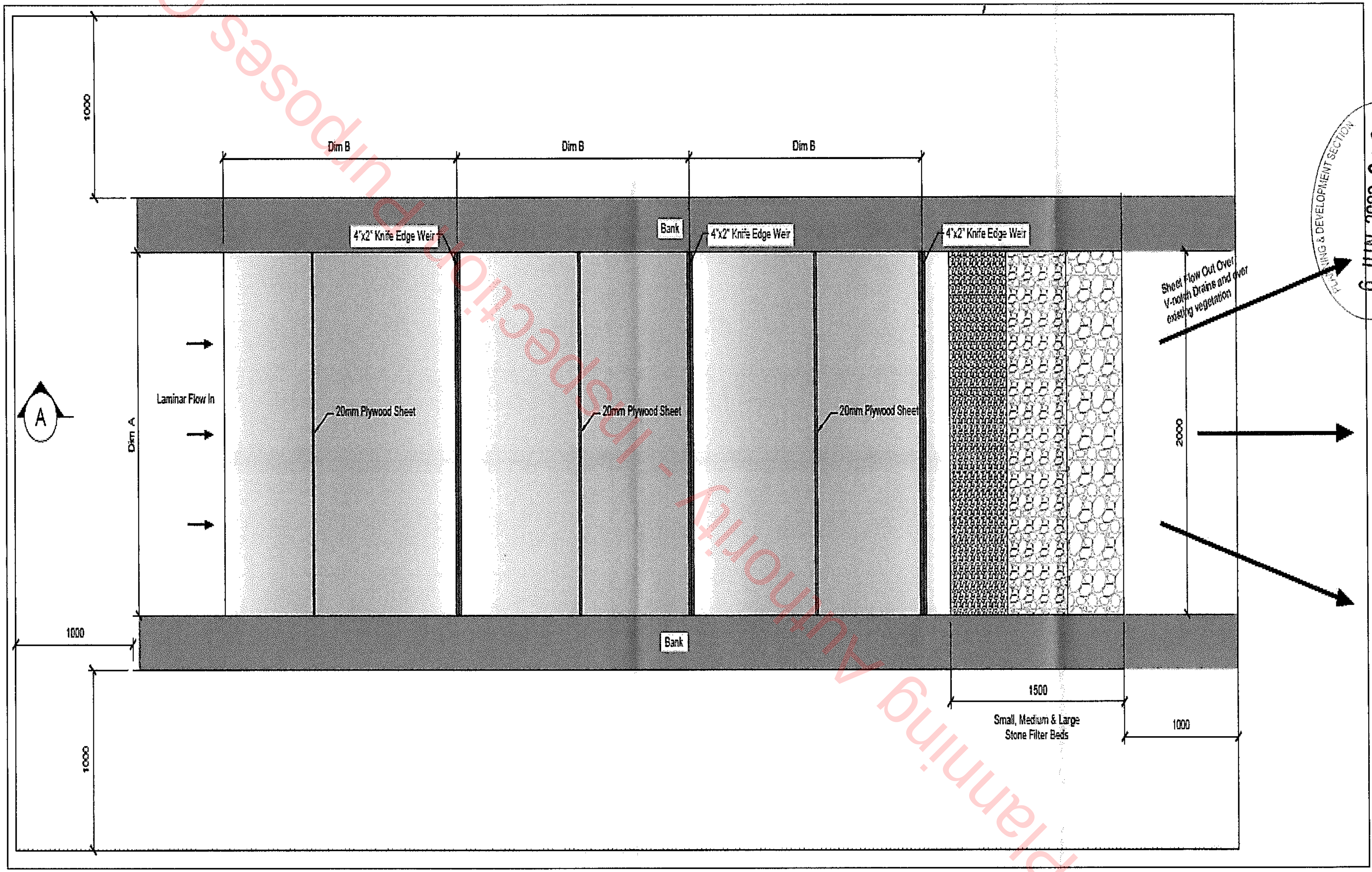


Figure 4.2: Diagram of settlement ponds outlet where outflow is dispersed across vegetated area

4.2.2 Intercept

The key sediment control measure is the separation of construction runoff from the clean water runoff that arises in the undisturbed areas of the site and surrounding lands. This significantly reduces the volume and velocity of dirty water that the sediment and erosion control measures need to deal with. To achieve separation, clean water infiltration collector drains or silt fences are positioned on the upslope and dirty water v-drains positioned along the verge, with site surfaces sloped towards dirty water v-drains. The remainder of this clean water will be regularly piped under the site roads and dirty water v-drains to avoid contamination. Piping the clean water regularly under the site roads allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water sheet flow pattern of the site.

Diagrammatic cross section of Interception Infiltration Drain is as shown in **Figure 4.3**

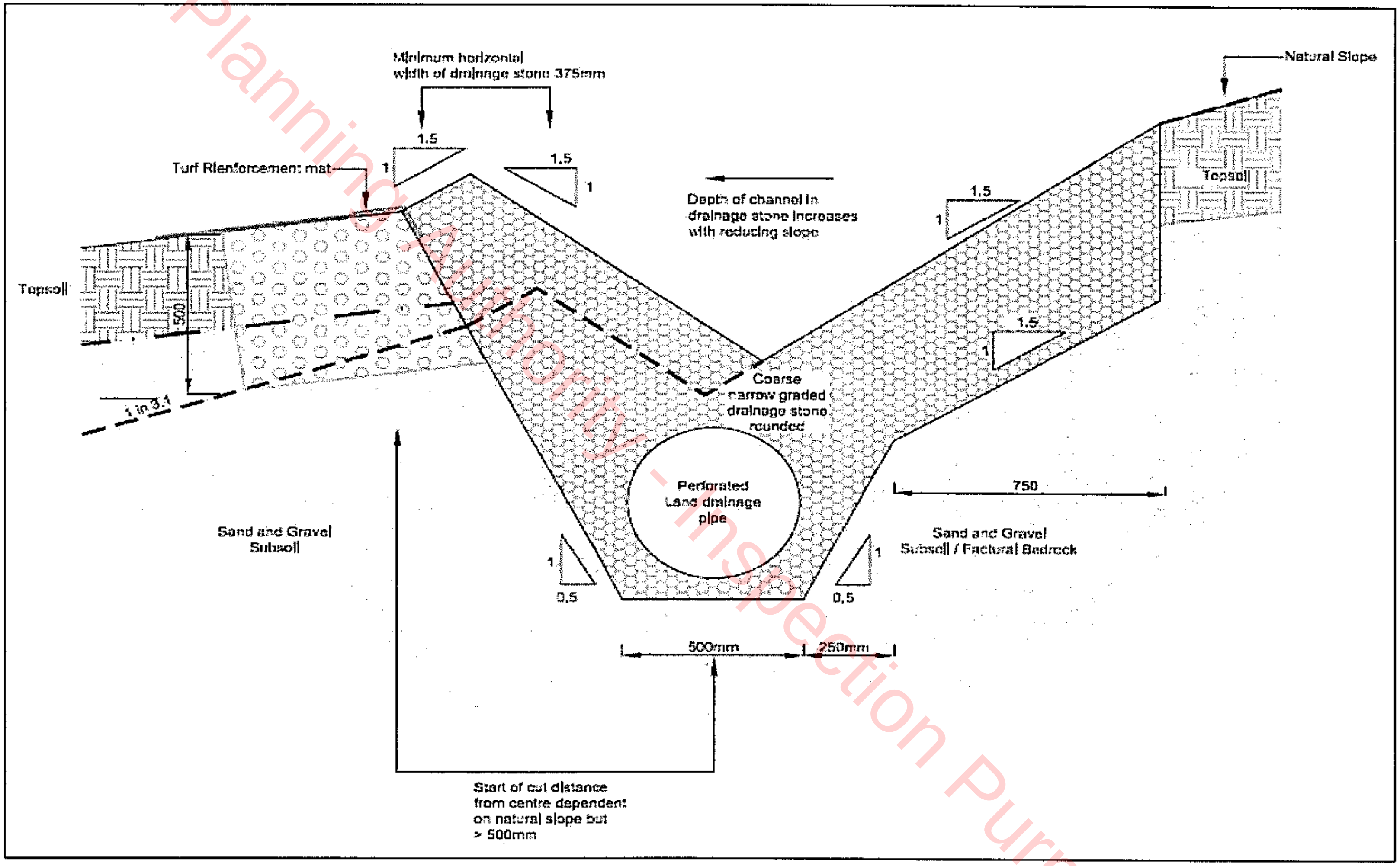


Figure 4.3: Diagrammatic cross section of Interception Infiltration Drains

4.2.3 Treat, Disperse and Dilute

The clean water infiltration interceptor drains are positioned upslope of the development footprint, to prevent any mixing of the clean and 'dirty' water. The infiltration interceptor drains redirect the clean water away from the site infrastructure, as best suits the natural topography of each sector. The clean water outflow is then discharged into either, an existing drainage network or dispersed through an area of vegetation where it can percolate into the ground naturally.

In the drawings, 'dirty water' drains, indicated in orange, collect all incident rainwater that falls on the development infrastructure. These then drain into Settlement-Attenuation ponds. The treated effluent from the Settlement-Attenuation ponds is then dispersed across vegetation (through buffered outfalls) to further filter the discharge. Dispersal in this manner has the effect of allowing the smaller particle sizes to be taken up by the vegetation. Please see **Drawing No. 6226-PL-301 to 304** and **6226-PL-100 to 108**.

5 DETAILED DESIGN CONSIDERATIONS

5.1 Overview

The following elements in series are proposed:

- Open Constructed Drains for development run-off collection and treatment;
- Collection Drains for upslope "clean" water collection and dispersion;
- Filtration Check Dams to reduce velocities along sections of road which run perpendicular to contours;
- Settlement-Attenuation Ponds and Buffered Outfalls to control and store development runoff to achieve settlement and attenuation prior to discharge at Greenfield runoff rates.

These measures provide a surface water management train that will mitigate any adverse impact on the hydrology of the site and surrounds during the construction phase of the project.

5.2 SuDS Design Principles

The approach to treatment and attenuation of storm water is as follows:

- The dimensions of drainage features will avoid intercepting large volumes of water because this could lead to an overloading of the system and a failure to treat and attenuate storm water. Any changes to the Surface Water Management Plan must be agreed with the Project Hydrologist and the Ecological Clerk of Works.
- Surface water runoff from the proposed Site Access Tracks will be managed with crossfall downslope to mimic the natural drainage patterns of the Site.
- Trackside drains (dirty water) are open gently sloping drainage channels to convey dirty water, trap sediment, enhance filtration and slow down the rate and magnitude of runoff that could enter the local watercourses. The drains will be a maximum of 350 mm – 500 mm in depth and the turf will be taken as a single piece and placed on the downslope side of the drain. Therefore, once construction works are complete the turves can be put back in place with minimal ecological damage.
- Drainage vegetation (vegetation including grasses established within a drainage channel can filter runoff water. Living and decomposing plants and roots and associated microorganisms trap sediments and take up excess nutrients) used will be similar in species to the local area and will be approved by the Ecological Clerk of Works.
- Temporary erosion protection together with silt fences may be required until the vegetation becomes established (coir matting or similar) as shown in **Plate 5.1**.
- Roads will be constructed from aggregate and will not be surfaced with bitumen materials, thus allowing for permeation and helping to reduce runoff volumes. Therefore,