Issue	Date	Revision Details
1235411A	19/02/2021	Released

Appendix 8.1

Watercourse Crossing Assessment

Contents

A glossary and list of abbreviations can be located in Chapter 8 Hydrology, Geology and Hydrogeology of the EIAR.

8.1. INTRODUCTION

This document details the requirements for a Watercourse Crossings Assessment at Daer Wind Farm (the proposed development) as part of Chapter 8 of the Environmental Impact Assessment Report (EIAR). The purpose of this document is to provide the relevant information associated with the watercourse crossings required as part of the proposed development and to assist in the identification of regulatory licensing requirements. It is recommended that all the watercourse crossings are designed to maintain hydrology as well as, where necessary, allowing the free passage of mammals and aquatic species.

Regulatory Legislation

The Water Framework Directive (2000/60/EC) (WFD) represents a significant piece of environmental legislation which has implications for the proposed development. The WFD has been transposed into Scottish legislation as the Water Environment and Water Services (Scotland) Act 2003 (or WEWS) and has given Scottish Ministers powers to introduce regulatory controls over activities in order to protect and improve Scotland's water environment. The water environment includes wetlands, rivers, lochs, transitional waters (estuaries), coastal waters and groundwater. These regulatory controls, known as The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) came into force on the 31st of March 2011.

With respect to watercourse crossings required for the proposed development, CAR requires that all 'engineering works in inland waters and wetlands' are subject to authorisation and allow for proportionate risk-based regulation. The authorisation process operates at three levels:

- General Binding Rules (GBR);
- Registration; and
- Licence (Simple or Complex).

GBR represent a set of mandatory rules which cover low risk activities. Activities complying with the rules do not require an application to be made to the Scottish Environment Protection Agency (SEPA), however it is mandatory for activities that fall under GBR to comply with the standard rules.

The three authorisation process levels cover activities with increasing levels of potential impact upon the hydrological environment. SEPA will be required to provide authorisation for watercourse crossings shown on the 1:50,000 scale Ordnance Survey maps (Landranger series). All watercourses, minor or major, are regulated under CAR if works include culverting for land gain, realignment or diversion of watercourses and in these instances, authorisations are always required. Where appropriate, likely authorisations required for the surveyed crossings are described in this report.

The information presented in this document is only intended to act as a guide. The actual design, construction and/or improvements to the crossings during construction will be the responsibility of the appointed contractor.

Following an update to CAR in 2018, all large construction projects, which exceed a certain aerial extent also require a Construction Site Licence (CSL), which must be obtained from SEPA prior to the initiation of construction. Whilst the design of watercourse crossings is in part related to the site's drainage and associated impacts (which is an integral element of the CSL), this document is associated with identifying the licensing requirement for engineering works within the water environment only.

Limitations of Report

This report should be considered live and as such changes will be made should new information come to light. Natural Power has endeavoured to identify the watercourse crossings required as part of the construction associated with the proposed development. However, it is possible additional watercourse crossings, which do not feature on either the Ordnance Survey (OS) mapping or were not encountered during the site visit will be identified within the proposed development area. Should the construction process identify additional crossings then these should be surveyed, and due consideration given to the legislation above to ensure compliance.

8.2. METHODOLOGY

Desk Study

The desk study consisted of a review of the information regarding the proposed development, principally involving an examination of the track layout and the identification of watercourses which will require crossings, including those marked on the 1:10,000 and 1:50,000 scale OS maps.

Site Visit

Following the desk study, a survey of the identified crossings was undertaken to obtain information specific to each watercourse. Photographs and detailed field notes were taken, reporting the dimensions of the watercourse channel and flood channel (where apparent), the type of substrate and the crossing type.

Watercourse surveys were undertaken in August and September 2020. The weather conditions during the surveying were dry with occasional showers.

A plan indicating the site boundary and survey points is illustrated in Figure 8.1 of the EIAR – Hydrology Overview.

Water Crossing Selection Criteria

Information collected during the site visit has been used to inform crossing selection. Construction of the proposed development will include laying access roads, which will require the crossing of natural watercourses and other features such as flush zones and artificial drainage channels. Historically, the usual approach to cross minor watercourses was to place one or more circular culverts in the stream bed and build the track on an embankment above the culvert. This approach and the associated good practice are outlined in UK Forestry Standard Guidelines and has been used for decades for the construction of forestry access roads. However, although this approach has been employed for years and wind farm developments are often located in similar terrain to forestry the acceptable design for watercourse crossings have changed. It is now ecological status rather than purely river volume and the conveyance of flows that is of importance when choosing and designing watercourse crossings.

All of the designated watercourses that drain from the proposed development range in overall status under SEPA's River Basin Management Plans (RBMP) from "good" to "poor" status.

The watercourses within the catchment area for Daer Reservoir are situated within a Drinking Water Protected Area (Surface Water).

Reference should still also be made to the UK Forestry Standard Guidelines, the CIRIA Culvert Design and Operation Guide which focuses on engineering features; SEPA guidance documents for the construction considerations and Scottish Government guidance for best practice and ecology .

8.3. WATERCOURSE CROSSING ASSESSMENT SUMMARY

Twenty seven watercourse crossings were identified for the access tracks constructed as part of the proposed development and a summary of the proposed CAR authorisations is summarised in Table 8.1.1.

Table 8.1.1: Summary of Watercourse Crossings

CAR Authorisation	Number of Crossings
General Binding Rules	11
Registration	16
Simple License	0
Total	**27**

Source: Natural Power

Table 8.1.2 provides a summary of the surveyed natural watercourses, including proposed crossing type and proposed CAR authorisation.

Table 8.1.2: Summary of Watercourse Crossing Types

ID	Easting	Northing	Type	Proposed Crossing Type	CAR Authorisation
WCX1	299838	608087	New	Circular Culvert	Registration
WCX2	299281	606287	New	Circular Culvert	Registration
WCX3	298409	603671	New	Arch Culvert	Registration
WCX4	298934	605118	New	Circular Culvert	Registration
WCX5	300008	605769	New	Circular Culvert	GBR
WCX6	300024	605774	New	Circular Culvert	Registration
WCX7	300934	605513	Existing	Circular Culvert	GBR
WCX8	302264	605497	Existing	Circular Culvert	Registration*
WCX9	302031	605227	Existing	Circular Culvert	GBR
WCX10	302474	604611	New	Circular Culvert	Registration
WCX11	302734	604543	Existing	Bridge	GBR*
WCX12	303790	603715	Existing	Circular Culvert	Registration*
WCX13	303866	602554	Existing	Circular Culvert	Registration*
WCX14	303780	602422	Existing	Circular Culvert	Registration*
WCX15	304039	601249	Existing	Bridge	GBR*
WCX16	303386	600803	Existing	Circular Culvert	Registration*
WCX17	302990	600314	Existing	Bridge	GBR*
WCX18	303673	598424	Existing	Circular Culvert	Registration*
WCX19	304669	597349	Existing	Circular Culvert	Registration*
WCX20	305026	597369	Existing	Circular Culvert	Registration*
WCX21	305465	597696	Existing	Circular Culvert	Registration*
WCX22	306268	597916	Existing	Circular Culvert	Registration*
WCX23	306514	597865	Existing*	Circular Culvert	GBR
WCX24	306911	598063	Existing*	Circular Culvert	GBR
WCX25**	307078	598094	n/a**	n/a**	n/a**
WCX26	307183	598136	Existing*	Circular Culvert	GBR
WCX27	307256	598168	Existing*	Bridge	GBR*

Note; CAR Authorisations classified as a "registration" are identified as a watercourse or water body on an Ordnance Survey Landranger 1:50,000 scale series

**For existing crossings on the Primary Proposed Access, it is assumed that apart from bridge structures, all other crossings will require modifying to accommodate for track widening. In the event that no widening is required and where applicable, these will be subject to GBR under GBR9.*

***Minor watercourse mapped on Ordnance Survey 1:10,000 scale series could not be identified in the field during the survey*

Source: Natural Power

The location of the watercourse crossings in relation to the proposed infrastructure is provided in Figure 8.1 Hydrology Overview of the EIAR. More detailed information on the watercourse crossings is provided in Section 8.5 and takes into account the preceding information, as well as photographs and hydromorphological information associated with each crossing.

8.4. RATIONALE AND DESIGN

The design of the consented track layout has been optimised as far as possible to make use of an existing track, to reduce the total area of land-take and minimise the number of watercourse crossings whilst accommodating other environmental or engineering related constraints. At each watercourse crossing location, consideration has been given to the nature and size of the crossing, fluvial scour and environmental requirements.

Following the completion of micro siting and detailed site investigation, a revised version of this assessment should be produced to estimate peak flows in the watercourses for which flows need to be accommodated to ensure that any potential risk to flooding is minimised. Due to the small size of the catchments, and it being unlikely that local flow data will exist, in line with SEPA guidance , a number of techniques should be presented in the estimation of peak flows. These estimated peak flows will help inform the detailed design considerations required for each of the identified crossing locations. An indication of the required sizing for crossing dimensions would also be provided.

In designing the watercourse crossings, industry good practice will be applied, ensuring that various conditions will be considered during the works, and which are summarised below:

- All watercourses, over which the access road crosses, will be routed through circular culverts, bottomless arch culverts or under bridges appropriately sized and designed not to impede the flow of water. Safe passage for wildlife, such as fish, water voles, otters etc. will also be considered in the design through increased capacity of culvert or separate mammal crossing (pipe);
- When constructing culverts, the appointed contractor takes care to ensure that the construction does not pose a permanent obstruction to migrating species of fish, or riparian mammals;

- Culvert design will be engineered to ensure that the invert can be sunk into the bed of the watercourse allowing riverine substrate to stabilise on the floor of the culvert;
- Designed to convey a minimum of 1 in 200 year plus climate change return period flood events, and individually sized and designed to suit the specific requirements and constraints of its location; and
- All watercourse crossings to include splash boards and run-off diversion measures to prevent any direct siltation of watercourses.

Erosion protection will be implemented at the outfall of all culverts. Where required, the type of erosion protection would depend on a number of factors including:

- Flow;
- Velocity;
- Channel bed material;
- Vegetation;
- The effects/consequences of erosion; and
- Types of erosion protection including:
  - Geotextile bank reinforcement;
  - Vegetation solution;
  - Dumped stone;
  - Laid stone (Rip-rap or equivalent); and
  - Concrete block systems.

The appointed construction contractor will adhere to the following principles for culvert design and construction:

- Where appropriate, the natural low flow depths are maintained through culvert base;
- The culvert base should be buried below the natural bed level to allow for a naturalised culvert bed to be maintained during scour associated with high flow events;
- The culvert should be at least the same width as the natural active channel width, with consideration to low flows and channel migration;
- Culvert alignment should match alignment of the watercourse i.e. in a parallel direction to flow;
- The slope of the culvert base should be similar to that of the bed of the watercourse;
- The culvert must not present a barrier by creating a step or hydraulic drop at the culvert inlet or outlet;
- The culvert must be designed not to exacerbate or create flooding;
- A natural stone headwall should be provided upstream and downstream to protect the road embankment where necessary;
- Culverts should not be constructed under high flow conditions; and
- A mammal tunnel should be provided where considered appropriate by the Environmental Clerk of Works (ECoW), so that no restriction is related to established animal movement routes.

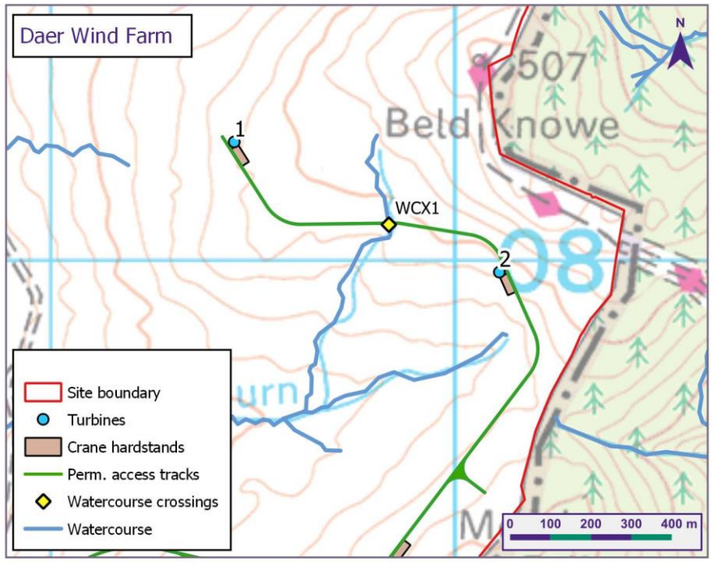
8.5. DETAILED CROSSING ASSESSMENT

Tables 8.1.3 to Table 8.1.29 provide information on the new and existing watercourse crossings outlined in Table 8.1.2.

For existing crossings on the Primary Proposed Access, it is assumed that apart from bridge structures, all other crossings will require modifying to accommodate for track widening. In the event that no widening is required and where applicable, these will be subject to GBR under GBR9.

Table 8.1.3: Crossing WCX1

WCX1 (299838, 608087)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel: Meandering
Gradient: Moderate
Valley form: Shallow vee
Bank condition: Stable
Bed material: Boulders, Coarse gravel, Fine sand/silt
Riparian corridor: Agricultural grazing
Flow condition: Moderate

Water width: 0.2-0.3 m
Water depth: 0.05-0.1 m
Bankfull width: 0.3 m
Bankfull height: 0.3 m

Notes: None.

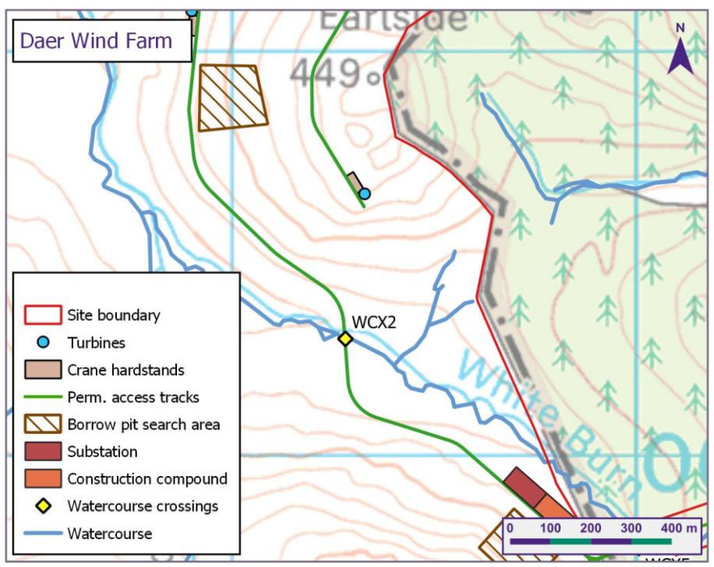
CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.4: Crossing WCX2

WCX2 (299281,606287)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel: Meandering
Gradient: Gentle
Valley form: U-shape valley
Bank condition: Undercut (no evidence of recent collapse)
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Agricultural Grazing
Flow condition: Moderate

Water width: 1-1.2 m
Water depth: 0.15-0.2 m
Bankfull width: 1.2 m
Bankfull height: 0.4-0.5 m

Notes: None.

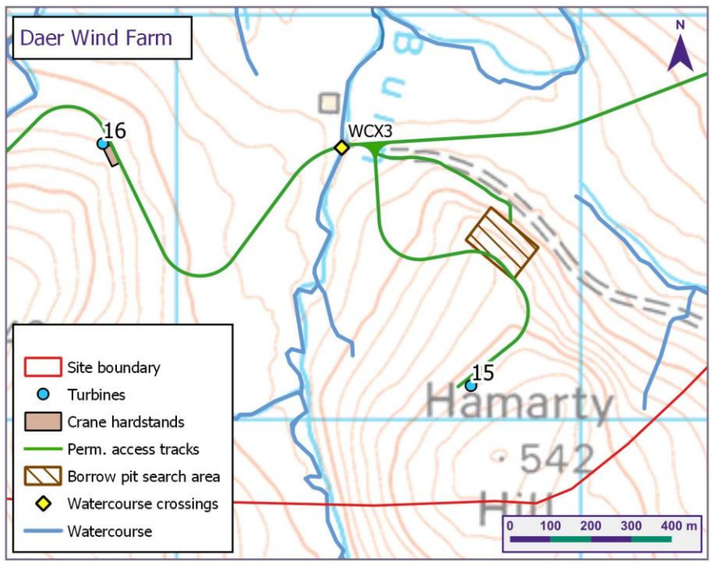
CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream

Table 8.1.5: Crossing WCX3

WCX3 (298409,603671)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel Type: Meandering
Gradient: Gentle
Valley form: U-shape valley
Bank condition: Stable, Undercut (no evidence of recent collapse)
Bed material: Rounded pebbles, Fine sand/silt, Boulders, Coarse gravel
Riparian corridor: Agricultural Grazing, Moorland
Flow condition: Moderate

Water width: 4-5 m
Water depth: 0.1-0.15 m
Bankfull width: 5-6 m
Bankfull height: 0.4-0.6 m

Notes: Evidence of previous bank slip and erosion, however not recent as now grassed over.

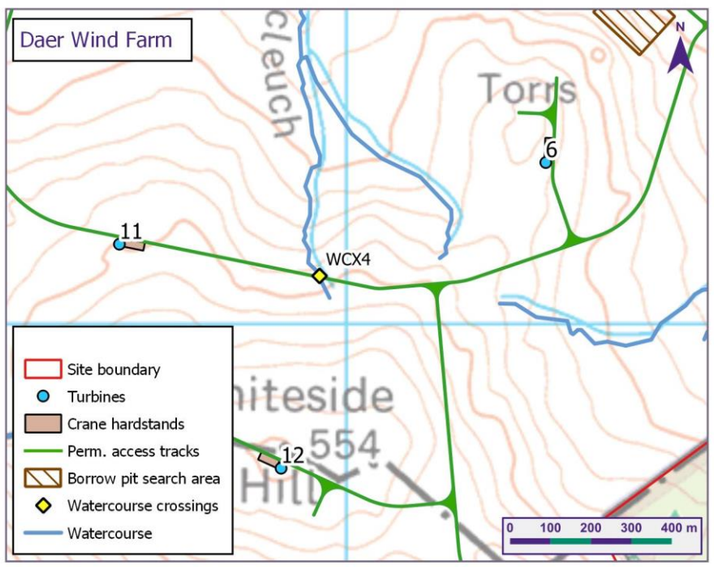
CAR Auth Level: Registration
Proposed Crossing Type: Arch Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.6: Crossing WCX4

WCX4 (298934,605118)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel Type: Meandering, Incised, Poorly defined
Gradient: Moderate
Valley form: Shallow vee
Bank condition: Stable
Bed material: Vegetation
Riparian corridor: Moorland
Flow condition: Moderate

Water width: 0.2m
Water depth: 0.2m
Bankfull width: 0.3m
Bankfull height: 0.2 m
Flooded Bankfull width: 1.6 m
Flooded Bankfull height: 0.5 m

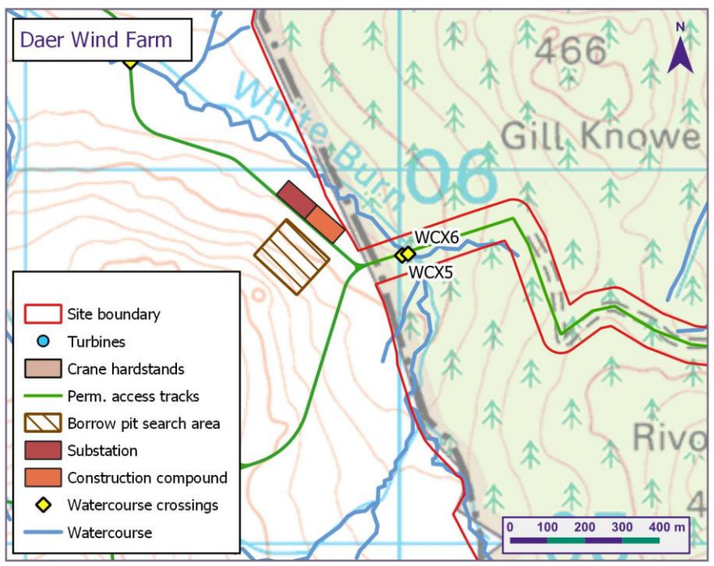
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**
		

Table 8.1.7: Crossing WCX5

WCX5 (300008,605769)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel Type: Poorly defined, Incised
Gradient: Moderate
Valley form: No obvious valley sides, Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Coarse gravel, Boulders
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Water width: 1 m
Water depth: 0.3 m
Bankfull width: 1.3 m
Bankfull height: 0.4 m

Notes: None.

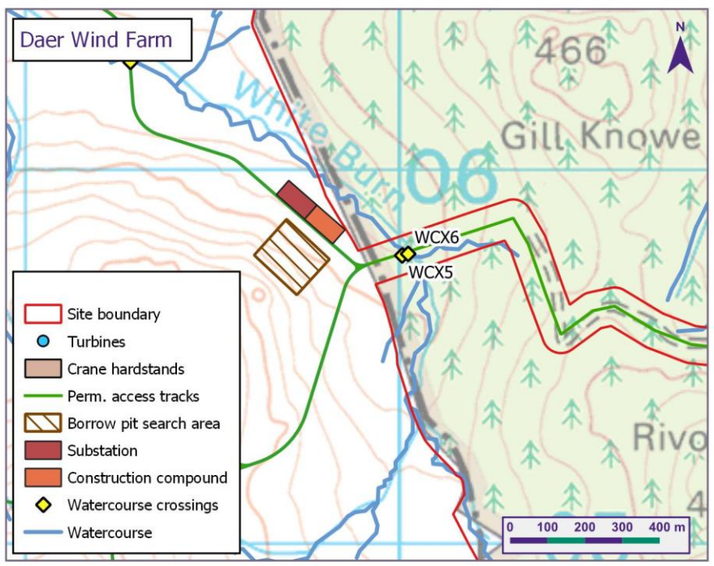
CAR Auth Level: GBR
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.8: Crossing WCX6

WCX6 (300024,605774)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel Type: Meandering
Gradient: Gentle
Valley form: No obvious valley sides, Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Commercial Forestry
Flow condition: Moderate

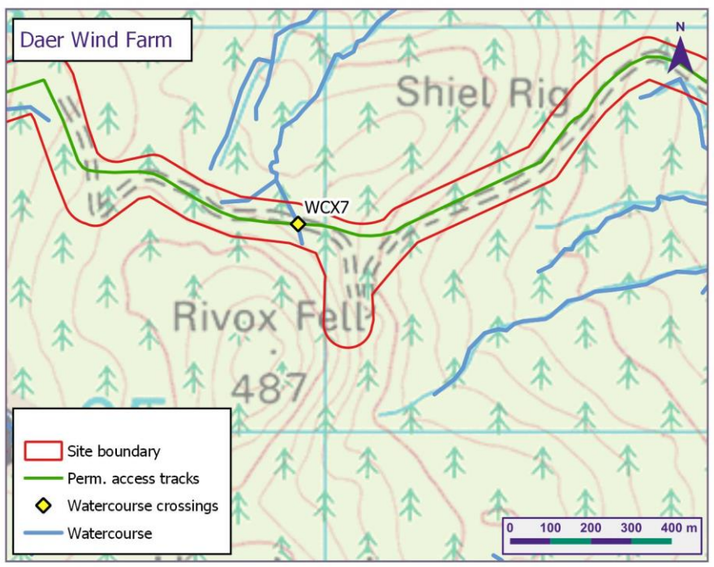
Water width: 2.5 m
Water depth: 0.3 m
Bankfull width: 3 m
Bankfull height: 0.4 m

Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

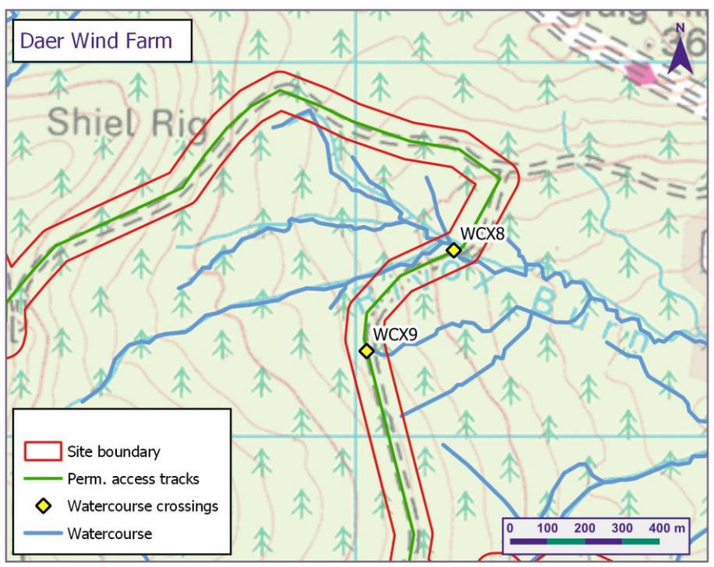
Table 8.1.9: Crossing WCX7

WCX7 (300934,605513)		
Crossing Location	**Crossing Description**	
	**Existing Crossing:** Yes **Crossing Type (existing):** Circular Culvert **Crossing Material (existing):** Plastic **Crossing Condition (existing):** Good **Channel Type:** Incised, Poorly defined **Gradient:** Moderate **Valley form:** Shallow vee **Bank condition:** Stable **Bed material:** Coarse gravel, Boulders, Vegetation **Riparian corridor:** Commercial Forestry **Flow condition:** Slow	**Culvert Dimensions:** 0.4 m **Water width:** 0.3 m **Water depth:** 0.1 m **Bankfull width:** 0.4 m **Bankfull height:** 0.2 m **Banktop height:** 0.7 m **Flooded Bankfull width:** 0.9 m **Flooded Bankfull height:** 0.4 m **Notes:** Measurements taken above culvert. Downstream photo taken below culvert. **CAR Auth Level: GBR** **Proposed Crossing Type: Circular Culvert**

Crossing Photographs		
Upstream	**Across**	**Downstream**
		

Table 8.1.10: Crossing WCX8

WCX8 (302264,605497)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Corrugated sheet metal
Crossing Condition (existing): Good
Channel Type: Incised, Meandering
Gradient: Moderate
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 1.6 m
Water width: 1.4 m
Water depth: 0.32 m
Bankfull width: 1.8 m
Bankfull height: 0.4 m
Flooded Bankfull width: 0.3 m
Flooded Bankfull height: 0.65 m

Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

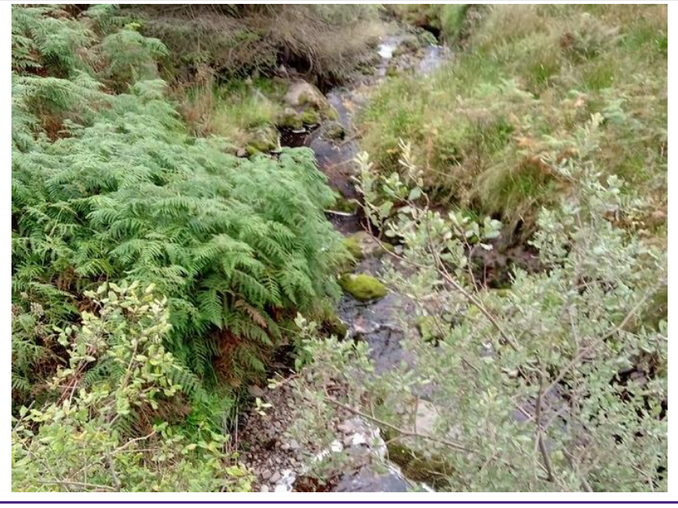
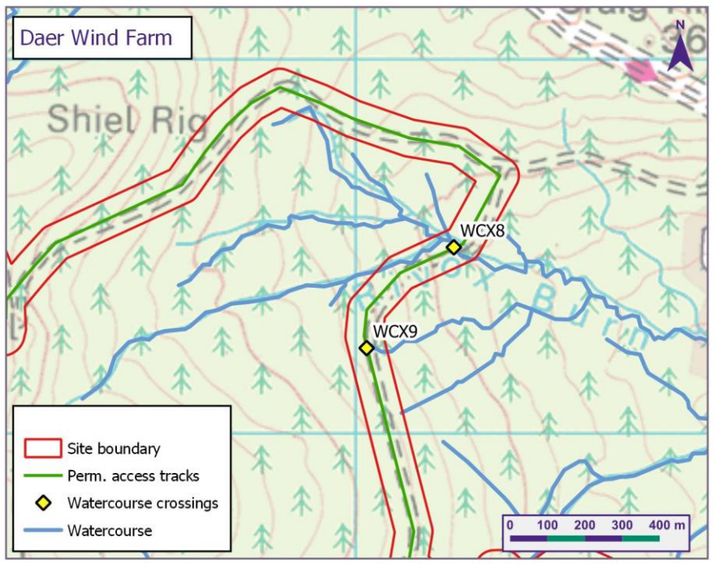
Crossing Photographs		
Upstream	**Across**	**Downstream**
No picture.		

Table 8.1.71: Crossing WCX9

WCX9 (302031,605227)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Concrete
Crossing Condition (existing): Good
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Coarse gravel, Vegetation
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 0.4 m
Water width: 0.3 m
Water depth: 0.1 m
Bankfull width: 0.45 m
Bankfull height: 0.20 m
Flooded Bankfull width: 0.9 m
Flooded Bankfull height: 0.4 m

Notes: None.

CAR Auth Level: GBR
Proposed Crossing Type: Circular Culvert

Crossing Photographs

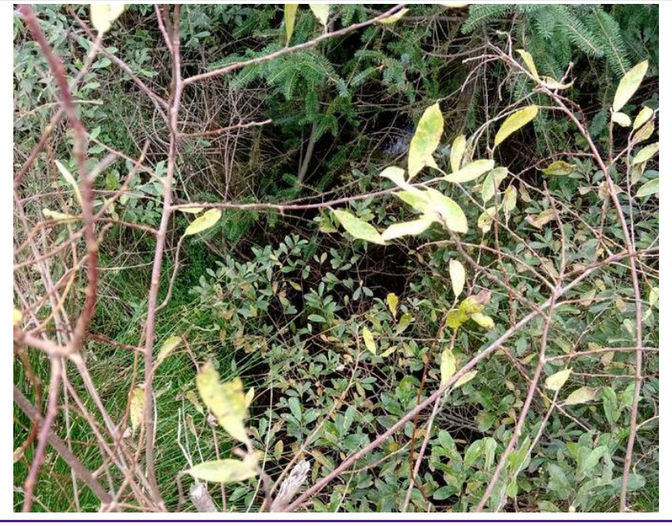
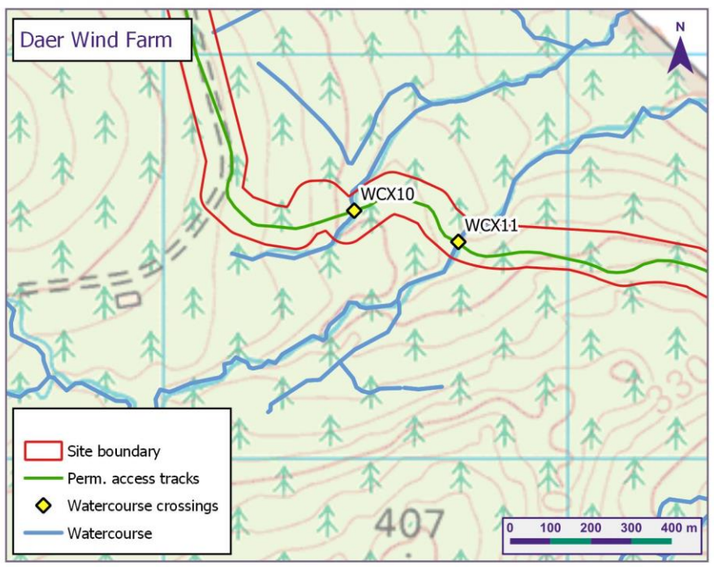
Upstream	Across	Downstream
		

Table 8.1.82: Crossing WCX10

WCX10 (302474,604611)	
Crossing Location	**Crossing Description**



Existing Crossing: No
Channel Type: Poorly defined
Gradient: Gentle
Valley form: No obvious valley sides
Bank condition: Stable
Bed material: Vegetation, Rounded pebbles
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Water width: 0.25 m
Water depth: 0.3 m
Bankfull width: 0.5 m
Bankfull height: 0.4 m
Flooded Bankfull width: 1.8 m
Flooded Bankfull height: 0.5 m

Notes: None.

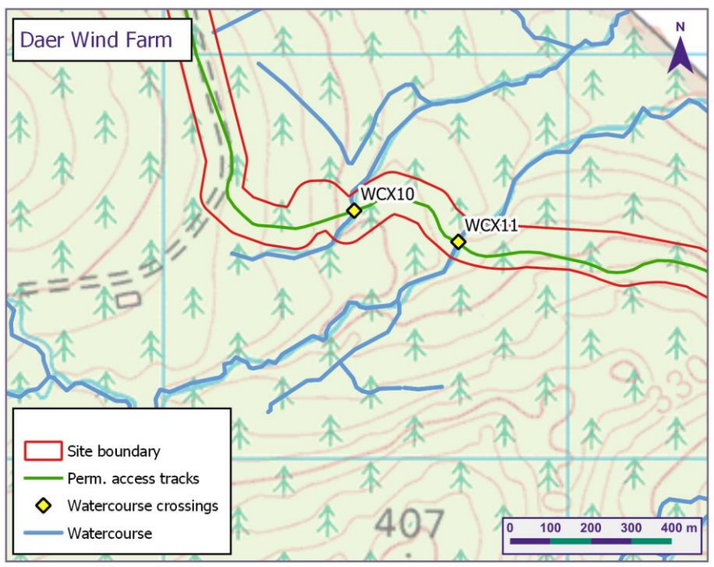
CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.13: Crossing WCX11

WCX11 (302734,604543)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Bridge (no in channel support)
Crossing Material (existing): Concrete, metal, timber
Crossing Condition (existing): Excellent
Channel Type: Incised
Gradient: Moderate
Valley form: Deep vee
Bank condition: Stable
Bed material: Rounded pebbles, Coarse gravel, Boulders, Bedrock
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Water width: 2.2 m
Water depth: 0.3 m
Bankfull width: 3.3 m
Bankfull height: 0.30 m
Banktop height: 2.4 m
Flooded Bankfull width: 4.3 m
Flooded Bankfull height: 0.65 m

Notes: No in-stream abutments. Concrete abutments set back ~1 m from banks

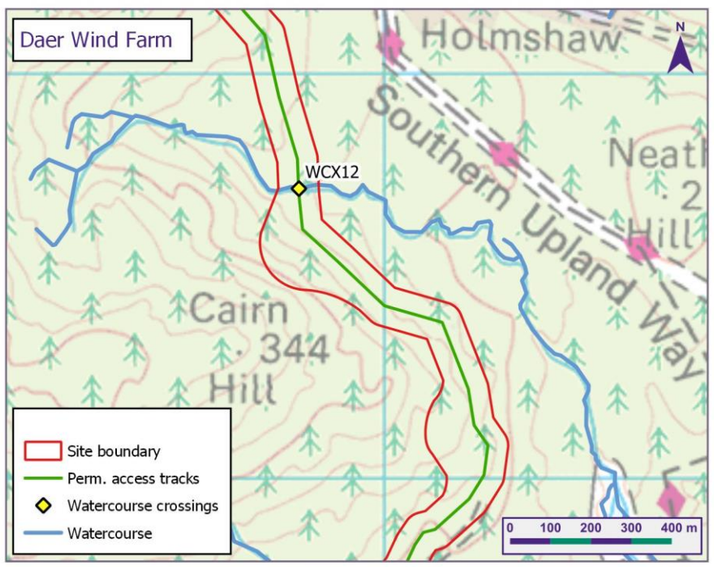
CAR Auth Level: No upgrade anticipated. Any minor works compliant with GBR9.

Proposed Crossing Type: Existing Bridge

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.14: Crossing WCX12

WCX12 (303790,603715)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Incised
Gradient: Moderate
Valley form: Deep vee
Bank condition: Stable
Bed material: Coarse gravel, Boulders
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 1.2 m
Water width: 1.3 m
Water depth: 0.35 m
Bankfull width: 1.3 m
Bankfull height: 1.15 m
Flooded Bankfull width: 2.3 m
Flooded Bankfull height: 1.4 m

Notes: None.

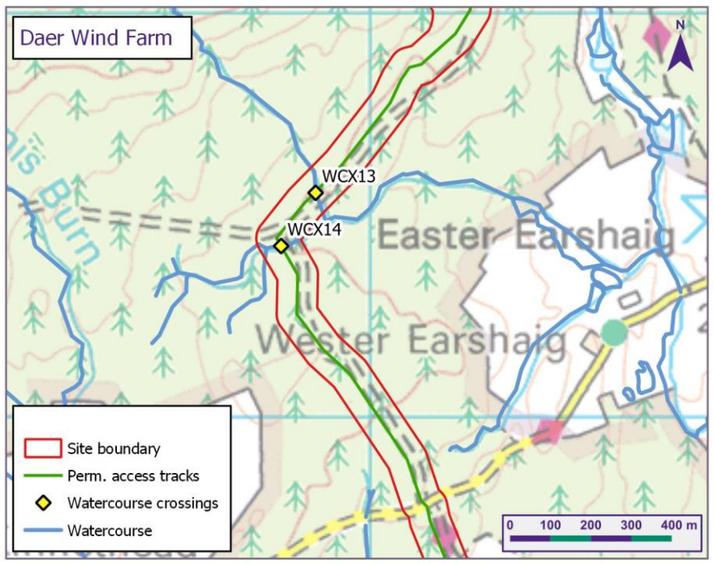
CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.15: Crossing WCX13

WCX13 (303866,602554)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Poorly defined, Incised
Gradient: Moderate
Valley form: No obvious valley sides, Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders, Vegetation
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 0.5 m
Water width: 0.6 m
Water depth: 0.1 m
Bankfull width: 1 m
Bankfull height: 0.4 m
Flooded Bankfull width: 1.3 m
Flooded Bankfull height: 0.7 m

Notes: None.

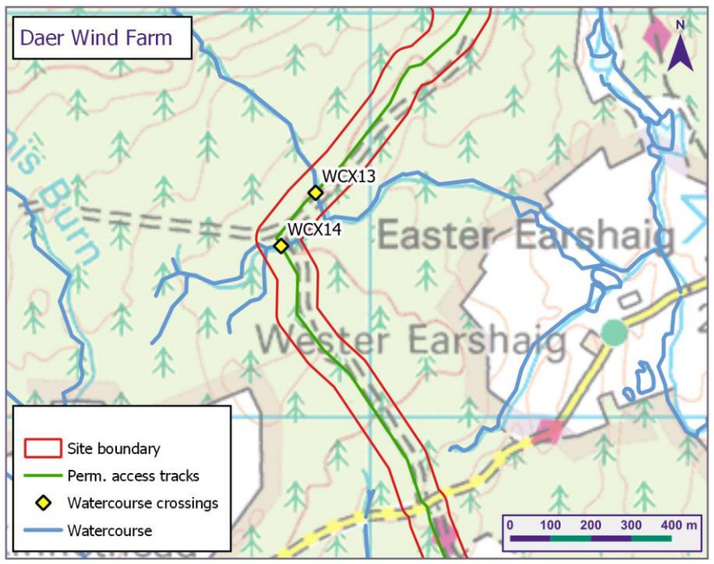
CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.9: Crossing WCX14

WCX14 (303780,602422)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Incised
Gradient: Moderate
Valley form: Shallow vee
Bank condition: Stable
Bed material: Coarse gravel, Boulders, Vegetation
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 0.8 m
Water width: 0.55 m
Water depth: 0.12 m
Bankfull width: 0.55 m
Bankfull height: 0.46 m
Flooded Bankfull width: 3.8 m
Flooded Bankfull height: 0.7 m

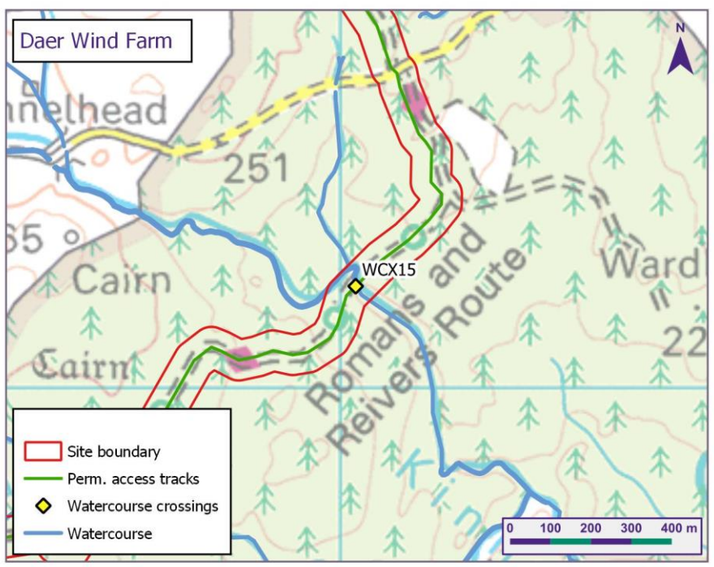
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream

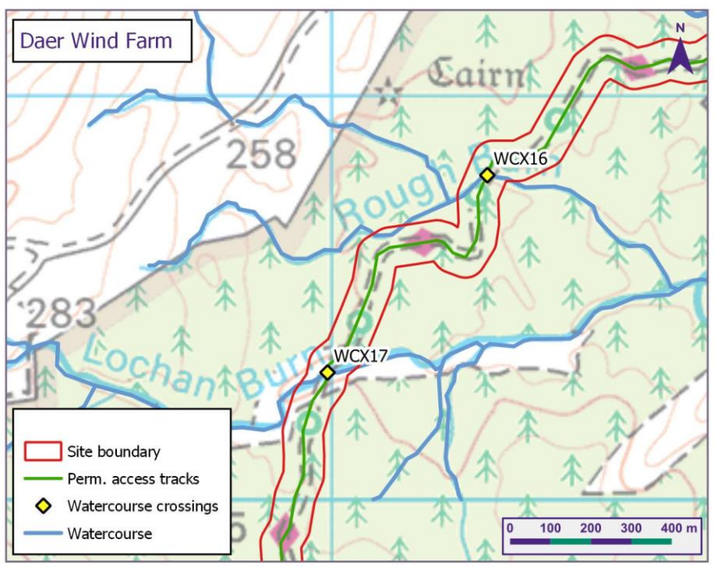
Table 8.1.10: Crossing WCX15

WCX15 (304039,601249)		
Crossing Location	**Crossing Description**	
	**Existing Crossing:** Yes **Crossing Type (existing):** Bridge (no in channel support) **Crossing Material (existing):** Concrete, metal, timber **Crossing Condition (existing):** Good **Channel Type:** Incised, Meandering, Broad **Gradient:** Gentle **Valley form:** Shallow vee **Bank condition:** Stable **Bed material:** Fine sand/silt, Coarse gravel, Boulders, Bedrock **Riparian corridor:** Commercial Forestry, Natural Woodland **Flow condition:** Moderate	**Water width:** 2.5 m **Water depth:** 0.4 m **Bankfull width:** 4 m **Bankfull height:** 0.5 m **Banktop height:** 2 m **Flooded Bankfull width:** 5 m **Flooded Bankfull height:** 0.7 m **Notes:** None. **CAR Auth Level: No upgrade anticipated. Any minor works compliant with GBR9.** **Proposed Crossing Type: Existing Bridge**

Crossing Photographs		
Upstream	**Across**	**Downstream**
		

Table 8.1.11: Crossing WCX16

WCX16 (303386,600803)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Coarse gravel, Boulders, Rounded pebbles, Fine sand/silt
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 2 m
Water width: 1.4 m
Water depth: 0.25 m
Bankfull width: 1.4 m
Bankfull height: 0.8 m
Flooded Bankfull width: 2.4 m
Flooded Bankfull height: 0.9 m

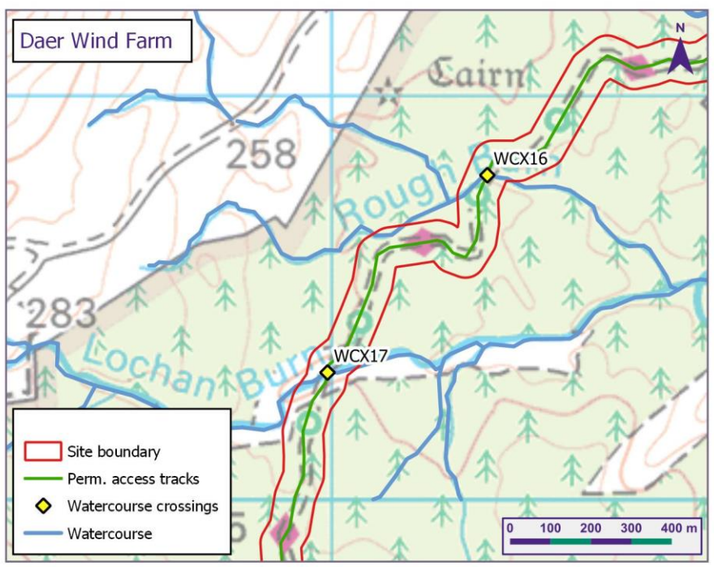
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.129: Crossing WCX17

WCX17 (302990,600314)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Bridge (no in channel support)
Crossing Material (existing): Metal, concrete and timber
Crossing Condition (existing): Good
Channel Type: Incised, Meandering
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Coarse gravel, Bedrock & Boulders
Riparian corridor: Commercial Forestry
Flow condition: Moderate

Water width: 3 m
Water depth: 0.35 m
Bankfull width: 3.5 m
Bankfull height: 0.4 m
Flooded Bankfull width: 4.8 m
Flooded Bankfull height: 0.8 m

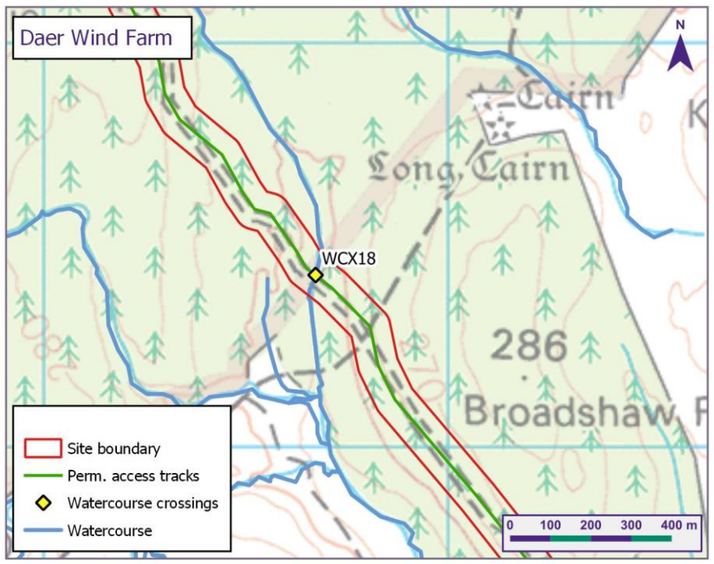
Notes: None.

CAR Auth Level: No upgrade anticipated. Any minor works compliant with GBR9.
Proposed Crossing Type: Existing Bridge

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.20: Crossing WCX18

WCX18 (303673,598424)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: None evident, Poorly defined
Gradient: Gentle
Valley form: No obvious valley sides
Bank condition: Stable
Bed material: Vegetation
Riparian corridor: Heavily Vegetated, Commercial Forestry
Flow condition: Slow

Culvert Dimensions: 1.1 m
Water width: 0.65 m
Water depth: 0.33 m
Bankfull width: 2.65 m
Bankfull height: 0.4 m
Flooded Bankfull width: 4-6 m
Flooded Bankfull height: 0.5-0.75 m

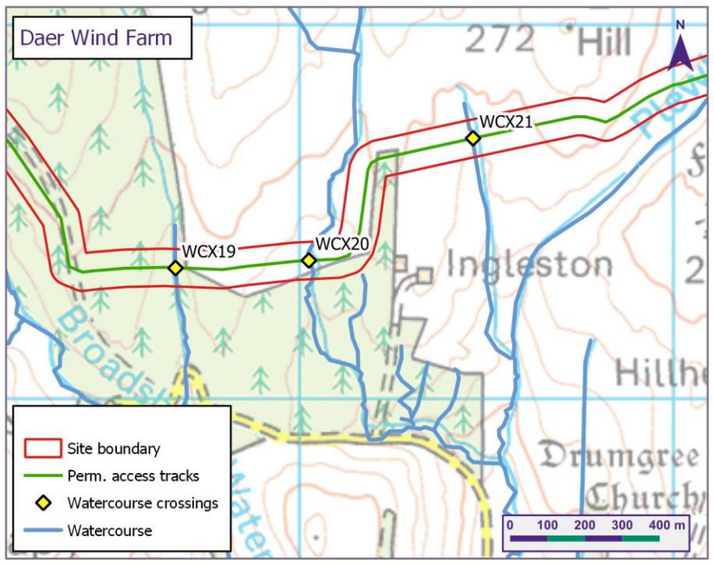
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.13: Crossing WCX19

WCX19 (304669,597349)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: No obvious valley sides, Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders, Vegetation
Riparian corridor: Moorland, Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 0.9 m
Water width: 1 m
Water depth: 0.1 m
Bankfull width: 1 m
Bankfull height: 0.35 m
Flooded Bankfull width: 1.5 m
Flooded Bankfull height: 0.45 m

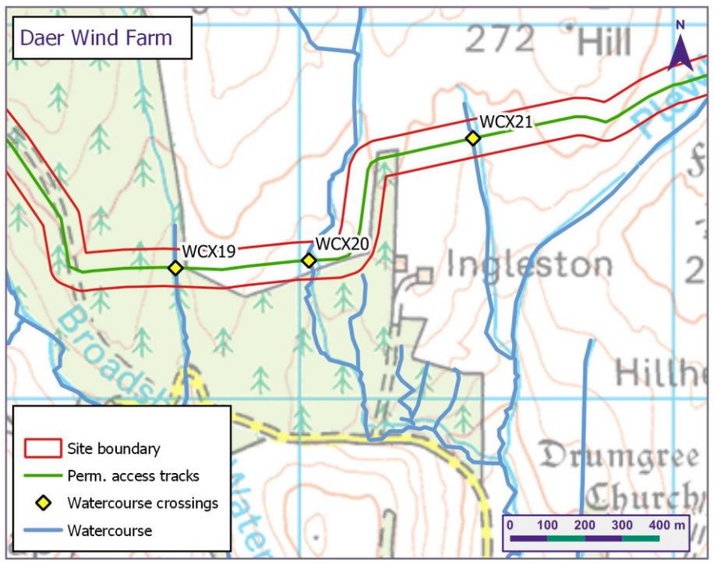
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.14: Crossing WCX20

WCX20 (305026,597369)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Incised, Poorly defined
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Moorland, Commercial Forestry
Flow condition: Moderate

Culvert Dimensions: 0.95 m
Water width: 0.9 m
Water depth: 0.1 m
Bankfull width: 1.5 m
Bankfull height: 0.25 m
Flooded Bankfull width: 2.5 m
Flooded Bankfull height: 0.35 m

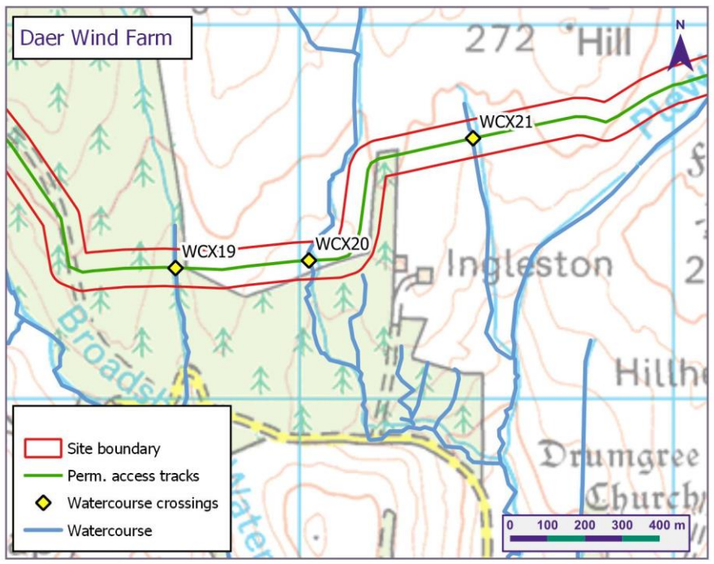
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.15: Crossing WCX21

WCX21 (305465,597696)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Average
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Moorland
Flow condition: Moderate

Culvert Dimensions: 0.9 m
Water width: 0.46 m
Water depth: 0.08 m
Bankfull width: 0.5 m
Bankfull height: 0.23 m
Flooded Bankfull width: 1.5 m
Flooded Bankfull height: 0.4 m

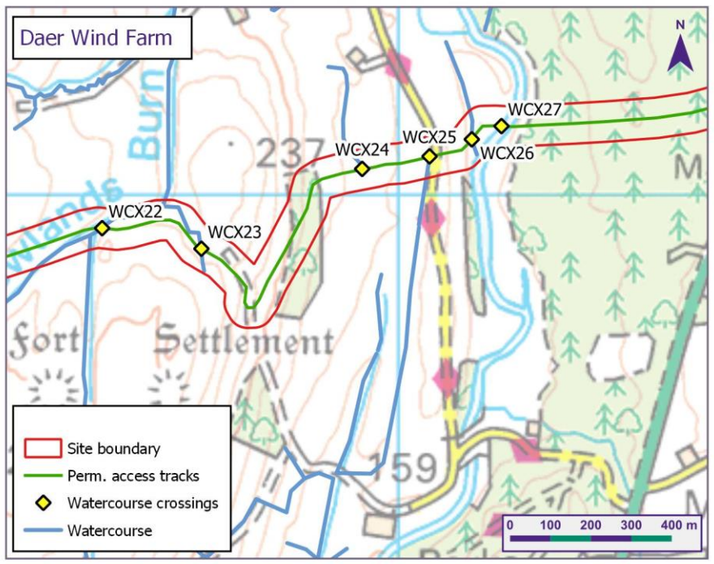
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**
		

Table 8.1.16: Crossing WCX22

WCX22 (306268,597916)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Average
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Coarse gravel, Boulders, Rounded pebbles
Riparian corridor: Moorland
Flow condition: Moderate

Culvert Dimensions: 0.45 m
Water width: 0.45 m
Water depth: 0.09 m
Bankfull width: 0.45 m
Bankfull height: 0.2 m
Flooded Bankfull width: 1 m
Flooded Bankfull height: 0.5 m

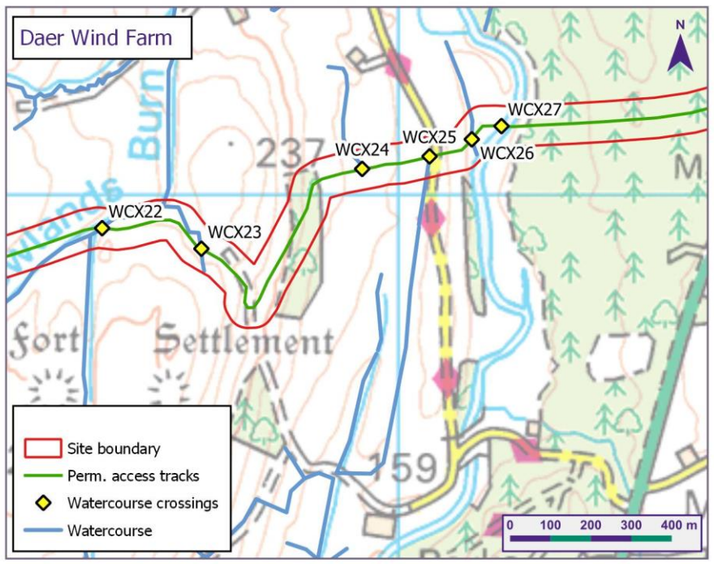
Notes: None.

CAR Auth Level: Registration
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.17: Crossing WCX23

WCX23 (306514,597865)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Average
Channel Type: Poorly defined, Incised
Gradient: Moderate
Valley form: No obvious valley sides
Bank condition: Stable
Bed material: Vegetation
Riparian corridor: Moorland
Flow condition: Slow

Culvert Dimensions: 0.45 m
Water width: 0.25 m
Water depth: 0.05 m
Bankfull width: 0.7 m
Bankfull height: 0.15 m
Flooded Bankfull width: 2 m
Flooded Bankfull height: 0.3 m

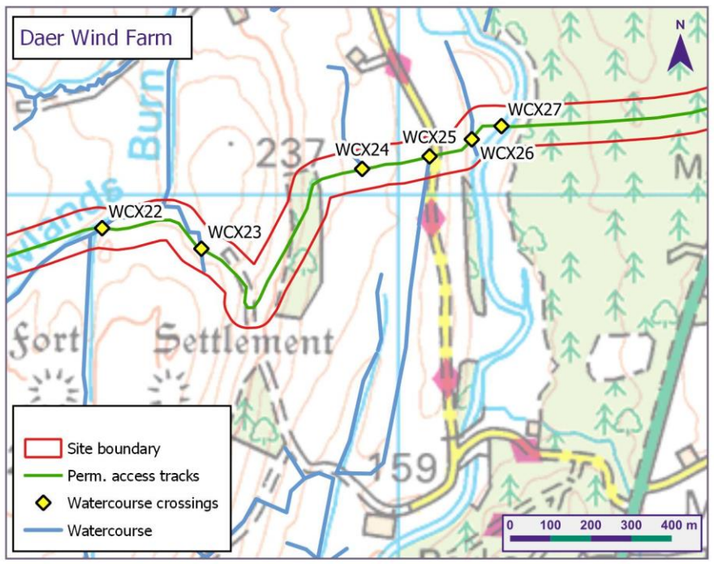
Notes: None.

CAR Auth Level: GBR
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

Table 8.1.186: Crossing WCX24

WCX24 (306911,598063)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Average
Channel Type: None evident, Poorly defined
Gradient: Gentle
Valley form: No obvious valley sides
Bank condition: Stable
Bed material: Vegetation
Riparian corridor: Heavily Vegetated (e.g. gorse, bramble)
Flow condition: Stagnant

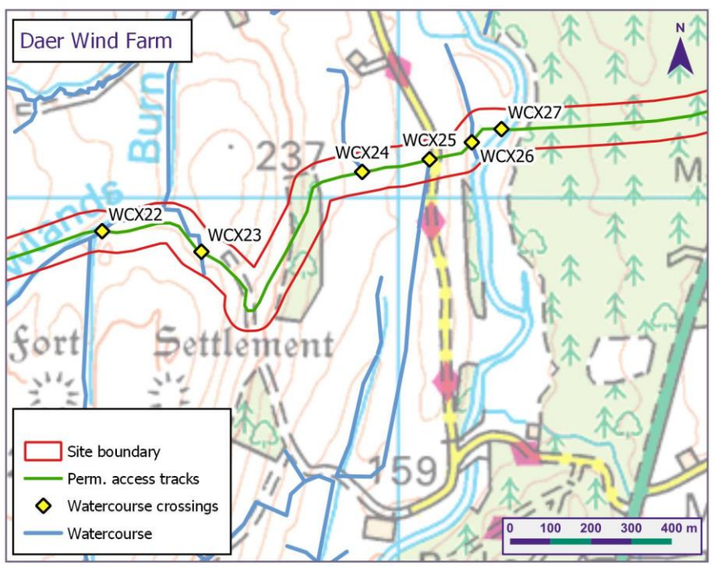
Culvert Dimensions: 0.45 m
Water width: 0.3 m
Water depth: Dry
Bankfull width: 0.5 m
Bankfull height: n/a
Banktop height: n/a
Flooded Bankfull width: 1 m

Notes: very overgrown, no water flow present.

CAR Auth Level: GBR
Proposed Crossing Type: Circular Culvert

Crossing Photographs		
Upstream	**Across**	**Downstream**

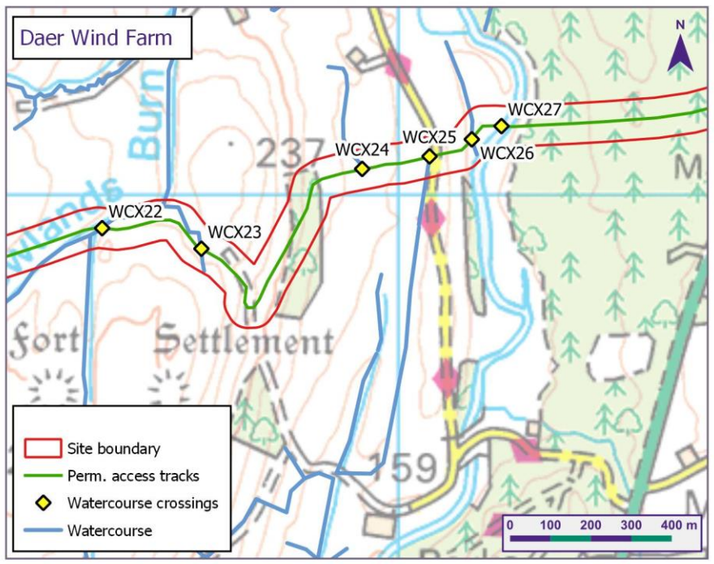
Table 8.1.19: Crossing WCX25

WCX25 (307078,598094)		
Crossing Location	**Crossing Description**	
	**Existing Crossing:** Unknown **Crossing Type (existing):** n/a **Crossing Material (existing):** n/a **Crossing Condition (existing):** n/a **Channel Type:** None evident **Gradient:** Gentle **Valley form**: No obvious valley sides **Bank condition:** n/a **Bed material:** n/a **Riparian corridor:** Heavily Vegetated (e.g. gorse, bramble) **Flow condition:** n/a	**Culvert Dimensions:** None **Water width:** None **Water depth:** None **Bankfull width:** None **Bankfull height:** None **Banktop height:** None **Flooded Bankfull width:** None **Notes:** Whilst mapped, no channel present. **CAR Auth Level: Not applicable** **Proposed Crossing Type: Not applicable**

Crossing Photographs		
Upstream	**Across**	**Downstream**
	n/a	

Table 8.1.20: Crossing WCX26

WCX26 (307183,598136)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Circular Culvert
Crossing Material (existing): Plastic
Crossing Condition (existing): Good
Channel Type: Poorly defined, Incised
Gradient: Gentle
Valley form: No obvious valley sides, Shallow vee
Bank condition: Stable
Bed material: Vegetation
Riparian corridor: Agricultural Grazing
Flow condition: Very slow

Culvert Dimensions: 1.3 m
Water width: 0.3-1 m
Water depth: 0.05 m
Bankfull width: 1-2 m
Bankfull height: 0.05-0.15 m
Flooded Bankfull width: 2-4 m
Flooded Bankfull height: 0.15-0.5 m

Notes: fen-like watercourse, dense vegetation.

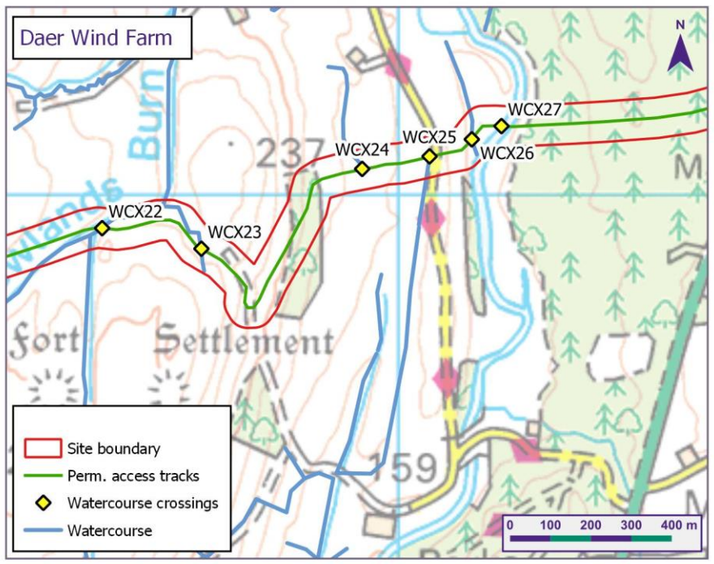
CAR Auth Level: GBR
Proposed Crossing Type: Circular Culvert

Crossing Photographs

Upstream	Across	Downstream
		

Table 8.1.21: Crossing WCX27

WCX27 (307256,598168)	
Crossing Location	**Crossing Description**



Existing Crossing: Yes
Crossing Type (existing): Bridge (no in channel support)
Crossing Material (existing): Concrete and metal
Crossing Condition (existing): Good
Channel Type: Incised, Broad
Gradient: Gentle
Valley form: Shallow vee
Bank condition: Stable
Bed material: Fine sand/silt, Rounded pebbles, Coarse gravel, Boulders
Riparian corridor: Commercial Forestry, Agricultural Grazing
Flow condition: Moderate

Water width: 8 m
Water depth: 0.25 m
Bankfull width: 8 m
Bankfull height: 0.5 m
Flooded Bankfull width: 8-12 m
Flooded Bankfull height: 0.5-1 m

Notes: Single span bridge.

CAR Auth Level: No upgrade anticipated. Any minor works compliant with GBR9.
Proposed Crossing Type: Existing Bridge

Crossing Photographs

Upstream	Across	Downstream