

## Appendix 9.3 Watercourse Crossing Schedule

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# Appendix 9.3 Watercourse Crossing Schedule

## Introduction

This Watercourse Crossing Schedule has been produced to highlight the presence of watercourses which are required to be intersected by the proposed windfarm access tracks and to provide relevant information on the nature of the crossings, likely crossing type required and design recommendations.

The number of watercourse crossings required has been minimised as far as practicable possibly as part of the design evolution of the site, through focussed liaison within the project team.

The basis of the Watercourse Crossing Schedule and recommendations is around the following design guidance:

- The Construction Industry Research and Information Association (CIRIA) Culvert, Screen and Operation Manual (CIRIA,2019);
- Scottish Environment Protection Agency (SEPA) Good Practice Guide, River Crossings, 2<sup>nd</sup> Edition
- Scottish Environment Protection Agency (SEPA) Good Practice Guide, Bank Protection Rivers and Lochs, 1<sup>st</sup> Edition

A hydrological site survey was conducted on 16<sup>th</sup> July 2020 by an experienced Chartered Hydrologist and coordinated with the engineering design team. Through this coordination the resulting design evolution was able to 'design out' an additional likely significant crossing of the Feith Osdail watercourse which flows Northeast-Southwest through the site, the watercourse is a major tributary to the River Tirry.

The local hydrology of the site is governed by relatively gentle gradients with the majority of the site draining inwards to the Feith Osdail. There are no other notable (or named) watercourses within the site boundary other than the Feith Osdail.

As outlined in the Watercourse Crossing Schedule below, all but Watercourse Crossing (WX) 7 are likely to be in the form of Closed Culverts in accordance with SEPA's River Crossing Guidance. These crossings are all <2 m wide and situated on localised land drainage features, which are likely to have ephemeral flow regimes, some are possibly spring sources.

WX7 is a significant (but unavoidable) crossing on the Feith Osdail which is likely to be a single span structure due to the crossing width and likely design flood envelope at the crossing location (refer to Figure 3.5c).

Out of the eleven WX's identified, seven of these are 'confirmed' crossings as observed during the hydrological site walkover and the other four are 'unconfirmed but probable' crossings based on adjacent site observations and review of available mapping. These crossing locations were unable to be surveyed due to the presence of dense forestry and a result of the site design evolution subsequent to the site inspection on 16<sup>th</sup> July. The locations of the identified WX's are shown on Figure 9.6.

Owing to the timing of the survey with peak vegetation growth and a notable portion of the proposed access track being located within dense commercial forestry (and thus inhibiting survey access / visibility), it is likely that there will be numerous other 'land drainage' crossings required which have not been detected by the site survey. The frequency and location of these land drainage crossings will become apparent at the construction stage as vegetation is stripped and upgradient land / track drainage is introduced. Standard closed culverts beneath the track will be appropriate for these land drainage features, spacing will be an important consideration to ensure hydrological continuity with the downgradient land / habitats.

## Watercourse Crossing Schedule

<b>Watercourse Crossing 1 (WX1) - Confirmed</b>			
Location Description	<i>Approximately 200m along the proposed temporary southern access track from the site entrance</i>	 <p style="text-align: center;">View Northwest towards Feith Osdail meander</p>	 <p style="text-align: center;">View Northeast showing bowl-like local land drainage area</p>
Grid Co-ordinates	<i>257671, 913975</i>		
Watercourse Name	<i>Unnamed minor land drainage feature</i>		
Watercourse Description	<i>Braided Land drainage feature issuing from the land Southeast and discharging to the adjacent meander on the Feith Osdail. Catchment is a localised bowl on the Northwest side of the existing adjacent track</i>		
Principal Watercourse Catchment	<i>Land drainage to Feith Osdail</i>		
Proposed Crossing Type(s)	<i>Closed piped culvert</i>		
<b>Watercourse Crossing 2 (WX2) - Confirmed</b>			
Location Description	<i>Approximately 385m along the proposed temporary access track from the site entrance</i>	 <p style="text-align: center;">View of watercourse discharging to Feith Osdail (photo location some 30 m Northwest downstream of crossing location)</p>	 <p style="text-align: center;">View of watercourse looking upstream and Southeast towards location of watercourse crossing located some 20 m away)</p>
Grid Co-ordinates	<i>257764, 914121</i>		
Watercourse Name	<i>Unnamed Spring</i>		
Watercourse Description	<i>Watercourse is likely to be a spring source based on mineral rich colour of water and the local saturation of the ground at this area. Likely to be other braided channels not visible due to vegetation growth</i>		
Principal Watercourse Catchment	<i>Minor tributary to Feith Osdail</i>		
Proposed Crossing Type(s)	<i>Closed piped culvert but preferable to have a bottomless arched culvert due to likely permanent flow of the spring and braided nature of watercourse</i>		

<b>Watercourse Crossing 3 (WX3) - Confirmed</b>			
Location Description	<i>Approximately 410m along the proposed temporary access track from the site entrance</i>	 <p>View looking Southwest of likely braided channel marked by clear topographic depression and vegetation difference – very saturated underfoot. Photo is some 20 m Northwest of crossing location</p>	 <p>View looking South of likely braided channel marked by clear topographic depression and vegetation difference – very saturated underfoot. Photo is some 20 m Northwest of crossing location</p>
Grid Co-ordinates	<i>257787, 914125</i>		
Watercourse Name	<i>Unnamed minor land drainage feature / spring</i>		
Watercourse Description	Likely to be a combination of local land drainage and possible spring source. Channel is braided and widespread over a width of 20m and very saturated underfoot		
Principal Watercourse Catchment	<i>Land drainage / spring to Feith Osdail</i>		
Proposed Crossing Type(s)	<i>Closed piped culvert – likely multiple pipes required</i>		
<b>Watercourse Crossing 4 (WX4) - Confirmed</b>			
Location Description	<i>Approximately 10m from Northwest edge of proposed Construction Compound</i>	 <p>View looking Northeast at spring / land drainage discharge into the Feith Osdail</p>	 <p>Detailed view of spring / land drainage discharge into the Feith Osdail</p>
Grid Co-ordinates	<i>257949, 914221</i>		
Watercourse Name	<i>Unnamed minor land drainage feature / spring</i>		
Watercourse Description	Likely to be a combination of local land drainage and spring source. Photographs taken some 40m downstream of crossing location. Channel at WX4 is likely to be singular, more incised and less braided		
Principal Watercourse Catchment	<i>Land drainage / spring to Feith Osdail</i>		
Proposed Crossing Type(s)	<i>Closed piped culvert</i>		

<b>Watercourse Crossing 5 (WX5) – Unconfirmed but probable</b>		
Location Description	<i>Approximately 60m east along access track from Energy Storage &amp; Switching Station towards T4, located in dense forestry</i>	No photographs available due to dense forestry cover and design evolution subsequent to site survey
Grid Co-ordinates	<i>258078, 914274</i>	
Watercourse Name	<i>Unnamed minor land drainage feature</i>	
Watercourse Description	<i>Local land drainage channel originating some 350m to the Southeast of the crossing location. Channel is located in dense forestry, but likely to be small and incised &lt;2m width</i>	
Principal Watercourse Catchment	<i>Land drainage to Feith Osdail</i>	
Proposed Crossing Type(s)	<i>Closed piped culvert</i>	
<b>Watercourse Crossing 6 (WX6) - Unconfirmed but probable</b>		
Location Description	<i>Located around T4 hardstanding extent</i>	No photographs available due to dense forestry cover and design evolution subsequent to site survey
Grid Co-ordinates	<i>258169, 914309</i>	
Watercourse Name	<i>Unnamed minor land drainage feature</i>	
Watercourse Description	<i>Local land drainage channel originating some 300m to the Southeast of the crossing location. Channel is located in dense forestry, but likely to be small and incised &lt;2m width</i>	
Principal Watercourse Catchment	<i>Land drainage to Feith Osdail</i>	
Proposed Crossing Type(s)	<i>Closed piped culvert, although crossing may not be required, may be more appropriate to divert the land drainage feature around the proposed turbine hardstanding extents</i>	

<b>Watercourse Crossing 7 (WX7) - Confirmed</b>		
Location Description	<i>Approximately 160m Northwest from T4</i>	 <p>View Southwest looking downstream at approximate crossing location</p>  <p>View Northeast looking upstream at approximate crossing location</p>
Grid Co-ordinates	<i>258048, 914407</i>	
Watercourse Name	<i>Feith Osdail</i>	
Watercourse Description	<i>2-stage channel, moderately incised, stable banks and bed. Catchment originates from the hills to the Northeast and has a watershed area of c.20km<sup>2</sup>. likely to be high energy flashy catchment response</i>	
Principal Watercourse Catchment	<i>Major tributary to River Tirry</i>	
Proposed Crossing Type(s)	<i>Single span structure to minimise floodplain restriction and ensure no adverse impacts on river morphology and geomorphology</i>	
<b>Watercourse Crossing 8 (WX8) - Unconfirmed</b>		
Location Description	<i>Located around T3 hardstanding extent</i>	<p>No photographs available due to design evolution subsequent to site survey</p>
Grid Co-ordinates	<i>257820, 914394</i>	
Watercourse Name	<i>Unnamed minor land drainage feature</i>	
Watercourse Description	<i>Local land drainage to the North of T3, channel likely to be shallow and incised. Catchment is local to the upgradient terrain North of T3 which predominately comprises dense forestry. Likely to be ephemeral</i>	
Principal Watercourse Catchment	<i>Land drainage to Feith Osdail</i>	
Proposed Crossing Type(s)	<i>Closed piped culvert, although crossing may not be required, may be more appropriate to divert the land drainage feature around the proposed turbine hardstanding extents</i>	

<b>Watercourse Crossing 9 (WX9) - Confirmed</b>	
Location Description	<i>Approximately 115m East of T2 hardstanding extent</i>
Grid Co-ordinates	<i>257821, 914602</i>
Watercourse Name	<i>Unnamed minor land drainage feature</i>
Watercourse Description	<i>Artificial land drainage channel from adjacent forestry to the immediate North. Likely to be ephemeral. Drainage feature flows Southwards across the forest ride</i>
Principal Watercourse Catchment	<i>Land drainage to River Tirry</i>
Proposed Crossing Type(s)	<i>Closed piped culvert</i>



View West along forest ride (towards T2 location) showing land drainage channel issuing from forestry plantation to the North



View Southeast along forest ride (towards forest ride junction) from location of land drainage feature

<b>Watercourse Crossing 10 (WX10) - Confirmed</b>	
Location Description	<i>Approximately 15m East of T2 hardstanding extent</i>
Grid Co-ordinates	<i>257750, 914657</i>
Watercourse Name	<i>Unnamed minor land drainage feature</i>
Watercourse Description	<i>Artificial land drainage channel from adjacent forestry to the immediate North. Likely to be ephemeral. Drainage feature flows Southwards across the forest ride</i>
Principal Watercourse Catchment	<i>Land drainage to River Tirry</i>
Proposed Crossing Type(s)	<i>Closed piped culvert</i>



View North of discreet land drainage channel (moss cladded) issuing from forestry plantation



View South of discreet land drainage channel (moss cladded) flowing across forest ride

<b>Watercourse Crossing 11 (WX11) - Unconfirmed</b>	
Location Description	<i>Approximately 100m West of T1 hardstanding extent</i>
Grid Co-ordinates	<i>257949, 914836</i>
Watercourse Name	<i>Unnamed minor land drainage feature</i>
Watercourse Description	<i>Artificial land drainage channel from adjacent forestry to the immediate North. Likely to be ephemeral. Drainage feature flows Southwards</i>
Principal Watercourse Catchment	<i>Land drainage to Feith Osdail</i>
Proposed Crossing Type(s)	<i>Closed piped culvert</i>

No photographs available due to dense forestry cover

## Conclusions and Recommendations

This Watercourse Crossing Schedule has been produced to highlight the presence of watercourses which are required to be intersected by the proposed windfarm tracks and to provide relevant information on the nature of the crossings, likely crossing type required and design recommendations.

Aside 7 (WX7), 'closed culvert' type structures are likely to be the most suitable crossing type for all others, however potentially (WX2) will require a bottomless arched culvert type structure.

Ultimately the recommendations set out in the Watercourse Crossing Schedule are compliant with best practice design guidance and proportionate to the hydrological regimes encountered during the site survey.

Following planning permission, the Watercourse Crossings will be subject to authorisation from SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (SEPA,2011). It is envisaged that most Crossings will fall under the category of 'General Binding Rules' or 'Registration' Activities. Watercourse Crossing 2 may be considered a 'Simple Licence' Activity and Watercourse Crossing 7 will require either a 'Simple Licence' or 'Complex Licence' depending on the final proposed configuration.

## References

Construction Industry Research and Information Association (2019). Culvert, screen and outfall manual (C786). Available at: <https://www.thenbs.com/PublicationIndex/documents/details?Pub=CIRIA&DocID=328474>

Scottish Environment Protection Agency (2010a). Good Practice Guide, River Crossings, 2<sup>nd</sup> Edition. Available at: <https://www.sepa.org.uk/media/151036/wat-sg-25.pdf>

Scottish Environment Protection Agency (2010b). Good Practice Guide, Bank Protection Rivers and Lochs, 1<sup>st</sup> Edition. Available at: [https://www.sepa.org.uk/media/150971/wat\\_sg\\_23.pdf](https://www.sepa.org.uk/media/150971/wat_sg_23.pdf)

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