Appendix 9.5 Watercourse Crossing Inventory

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Appendix 9.5 Watercourse Crossing Inventory

Introduction

An inventory of the new and existing watercourse crossings required for the Proposed Development are detailed within the tables below:

- Table 1 New watercourse crossings for the main body of the main development area;
- Table 2 New watercourse crossings for the western forestry track link;
- Table 3 New watercourse crossings for the northern forestry track link;
- Table 4 Existing watercourse crossings for the existing western forestry track that may require replacing or extending; and
- Table 5 Existing watercourse crossings for the existing northern forestry track that may require replacing or extending.

The watercourse crossing locations are shown on Figures 9.6a to c, water features with 1:50,000 scale watercourses shown as dark blue lines with a 50m buffer.

It is noted that only one of the two access route options to the main development site (i.e. the western route or the northern route) will be selected, constructed and used. However, the decision has not yet been made, therefore this report provides information on water crossings for both access route options.

New Watercourse Crossings

Up to nine new watercourse crossings will be constructed for the wind farm development. Three of these new watercourse crossings are required for the main development area access track; six are required for the extension of the existing western forestry track (if selected and constructed) and five are required for the extension of the existing northern existing forestry track (if selected and constructed) to the main development area.

The three new watercourse crossings on the main development area are of main watercourses shown on 1:50,000 OS mapping. These three main watercourse crossings will be of a design so as to maintain hydraulic connectivity and allow the free passage of fish and other wildlife beneath.

Of the six new watercourse crossings required for the extension of the existing western forestry track, two are main watercourses shown on 1:50,000 OS mapping and four are minor watercourse crossings shown on 1:25,000 OS mapping or not shown on mapping. The two main watercourse crossings will be of a design so as to maintain hydraulic connectivity and allow the free passage of fish and other wildlife beneath.

Of the five new watercourse crossings required for the extension of the existing northern forestry track, five are shown on 1:50,000 scale OS mapping and therefore should be considered to be main watercourse crossings. However, on examination in the field, one crossing crosses an existing culverted wet area and another crosses a wet area that has been drained by grips and has no defined channel. It is therefore concluded that there are just three main watercourse crossings which will be of a design so as to maintain hydraulic connectivity and allow the free passage of fish and other wildlife beneath.

Additional crossings of small ephemeral or diffuse drainage lines may require culverts.

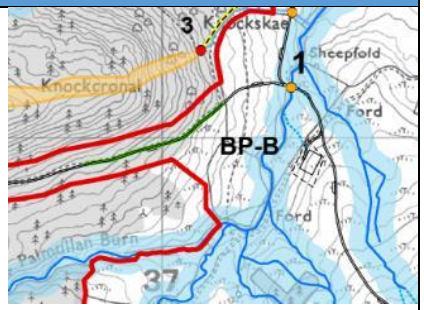
Existing Watercourse Crossings

The existing western forestry track has 6 existing watercourse crossings all of plastic culvert pipe construction. There are also numerous track drainage ditches and small culverts along the existing track.

The existing recently constructed northern forestry track has 7 existing watercourse crossings all of recent culvert pipe construction and all with the exception of one are crossing the Cawlin Burn or its tributaries.

Culverts will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary. Improvements could be made by replacing piped culvert crossings of the Cawin Burn with bottomless arches or single span crossing if they require to be replaced.

Table 1 – New Watercourse Crossings for Main Development Area

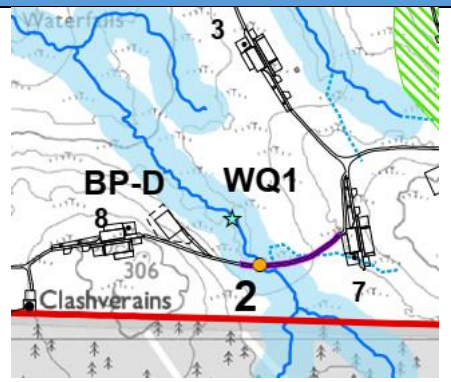
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
1	*Palmullan Burn* *Main watercourse 1:50,000 OS scale map*	*New access into main body of the site*	*NS 37380, 01150*	*New* *Single span* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath.*	*~5m wide incised water channel into bed rock gorge, up to 8m deep within a steep bedrock gorge valley approximately 10m wide. Wider valley approximately 2m on left side and 4m on right side.* *Water depth ~0.5m to 1.2m* *Flood plain: None, constrained within gorge.* *Substrate: Bedrock.*	

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	

Crossing Location

Upstream

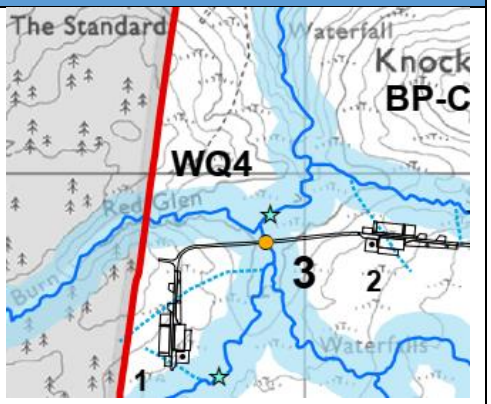
Approach

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
2	*Un-named tributary of Knockoner Burn* *Main watercourse* *1:50,000 OS scale map*	*New access track between T7 and T8*	*NX 599150, 237535*	*New* *Half moon arch crossing or bottomless box culvert* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath.*	*Approximately 0.65m wide water channel, 0.5m to 1.2m wide incised main valley up to 1.1m deep within a steep bank on left hand side. Overall valley up to 2.2m wide.* *Notes: water depth 0.1m to 0.2m, some pond weed and lumpy edges.WQ2.* *Substrate: Peat, gravel, soft.*	

Crossing Location

Upstream

Downstream

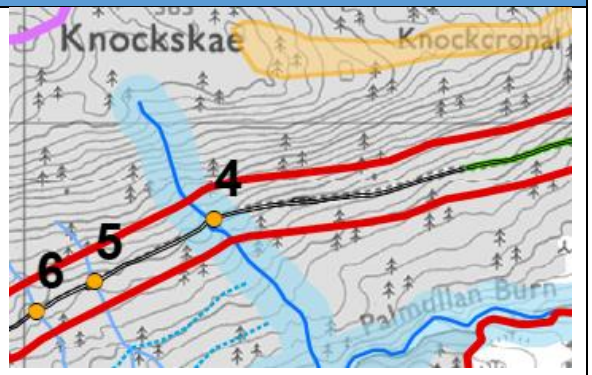
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
3	*Un-named tributary of Knockoner Burn* *Main watercourse* *1:50,000 OS scale map*	*New access track between T1 and T2*	*NX 36930 99870*	*New* *Single span, half moon arch or bottomless box culvert crossing* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath*	*Approximately 1.1 to 2.0m wide water channel, 0.65m deep channel. Main valley up 8m to 13m wide, up to 3.1 deep valley sides. Steeper upgradient, less down gradient.* *Notes: microsite depending on approach angle and slope. WQ4.* *Substrate: Boulders and gravel.*	

Crossing Location

Upstream

Downstream

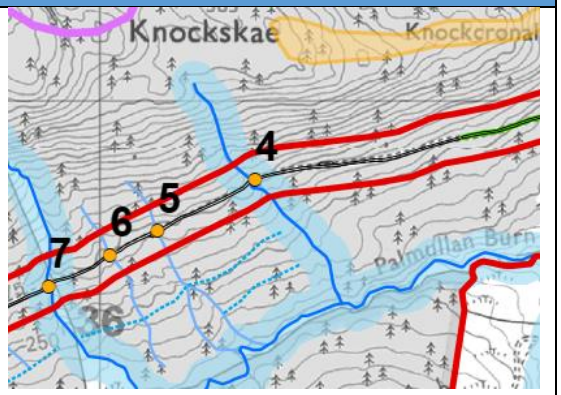
Table 2 – New Watercourse Crossings for Western Forestry Access Track Option

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
4	*Un-named tributary to the Palmullan burn* *Minor crossing* *1:25,000 scale OS mapping*	*New western forestry access track along existing quad track*	*NS 36335 00835*	*New* *1m culvert, arch or box culvert*	*Approximately 0.15 to 0.60m wide water channel, 4.0m wide gently incised valley up to 0.5m deep.* *Notes: water depth 0.2m* *Substrate: Soil and vegetation*	

Crossing Location

Downstream

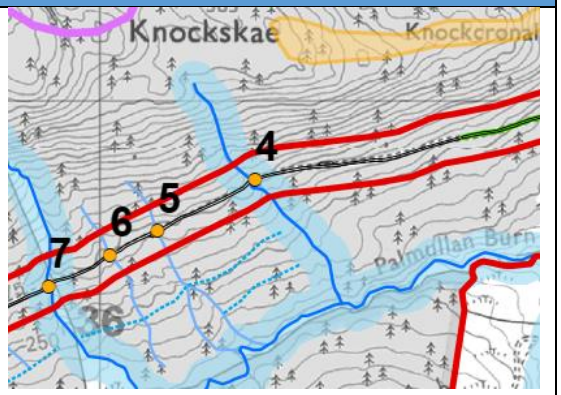
Upstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
5	*Un-named tributary to the Palmullan Burn* *Minor crossing* *1:25,000scale OS mapping*	*New western forestry access track along existing quad track*	*NS 36123 07720*	*New* *>0.3cm culvert*	*Approximately 0.15 wide water channel. Not within a significant valley.* *Substrate: soil and vegetation.*	

Crossing Location

Upstream

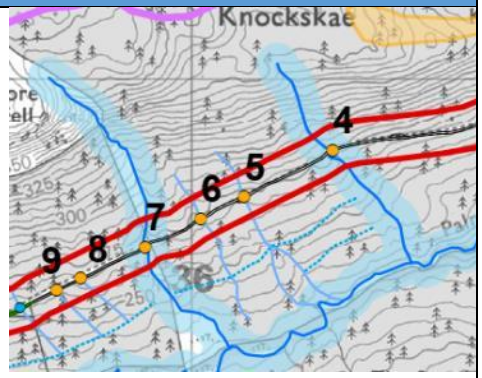
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
6	*Un-named tributary to the Palmullan Burn* *Minor crossing* *1:25,000 scale OS mapping*	*New western forestry access track along existing quad track*	*NS 36020 00675*	*New* *>1m culvert or half moon arch*	*Approximately 0.6m wide water channel, 2.4m wide incised valley up to 1.6m deep.* *Notes: water depth 0.2m to 0.4m, spate depth around 0.6m* *Substrate: soil, gravel and vegetation*	

Crossing Location

Channel

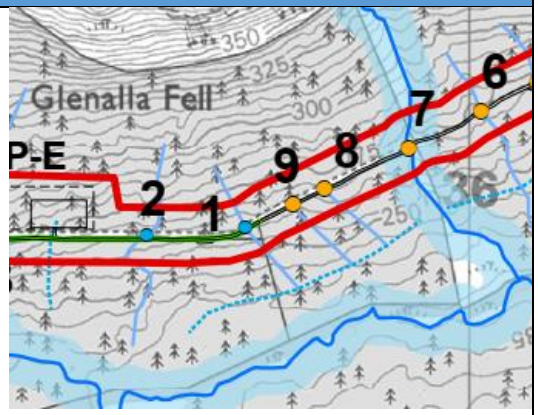
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
7	*Un-named tributary to the Palmullan Burn* *Main watercourse* *1:50,000 OS scale map*	*New western forestry access track along existing quad track*	*NS 35899 00658*	*New* *Half moon arch or bottomless box culvert crossing* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath*	*Approximately 0.9m wide water channel altered by forestry quad track.* *Notes: water flows over log raft quad track and has a drop fall* *Substrate: Boulders, soil, gravel and wood.*	

Crossing Location

Upstream

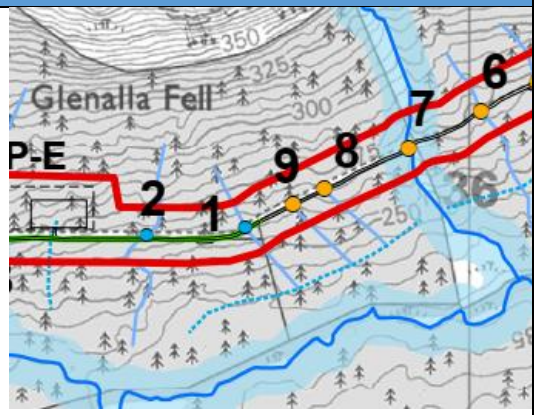
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
8	*Un-named tributary to the Palmullan Burn* *Minor crossing* *1:25,000scale OS mapping*	*New western forestry access track along existing quad track*	*NS 35819 00563*	*New* *0.6m culvert or half moon arch*	*Approximately 0.15 to 0.3m wide water channel altered by forestry quad track.* *Notes: Existing basic wood raft crossing* *Substrate: Boulders, soil, gravel and wood.*	

Crossing Location

Upstream

Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
9	*Un-named tributary to the Palmullan Burn* *Minor crossing* *1:25,000 scale OS mapping*	*New western forestry access track along existing quad track*	*NS 35680 00510*	*New* *>0.6m culvert or half moon arch*	*Approximately 0.45m wide water channel altered by forestry quad track.* *Notes: Existing basic wood raft crossing.* *Substrate: Soil and vegetation.*	

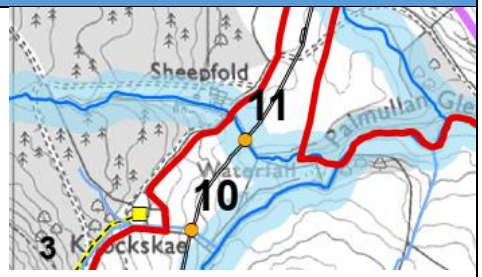
Crossing Location

Upstream

Downstream

Table 3 – New Watercourse Crossings for the Extension of the Northern Forestry Access Track Option

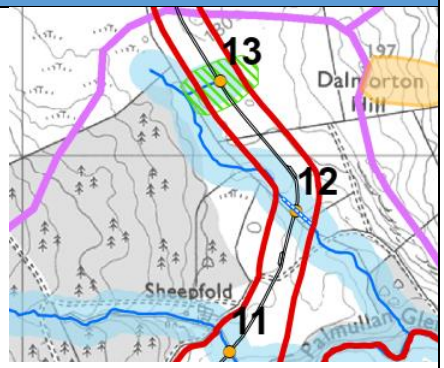
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
10	*Un-named tributary to the Palmullan Burn* *Minor crossing* *1:25,000 scale OS mapping*	*New Northern forestry access link. Downhill of Knockskae*	*NS 37370 01360*	*New* *1m to 2m single span, half moon arch or bottomless box culvert crossing* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath*	*Approximately 0.2m to 0.6m wide water channel. Valley approximately 3m wide by 0.5 to 0.7m deep, slightly stepped. Water approximately 0.15m depth.* *Notes: Altered and linearised along field boundary. Large tree nearby, micro-siting allowance. Flow ~ 3l/s* *Substrate: Boulders, gravel and sand.*	
						
	Crossing Location	*Upstream*	*Downstream*			

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
11	*Un-named tributary to the Palmullan Burn* *Main watercourse* *1:50,000 OS scale map*	*New Northern forestry access link. Downhill of Knockskae barn*	*NS 37482 01561*	*New* *>2m diameter single span, half moon arch or bottomless box culvert crossing* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath*	*Approximately 1.0m to 1.8m wide water channel. Valley approximately 8m to 9m wide by 1.4m to 1.7m deep, slightly stepped valley. Water approximately 0.1m to 0.3m depth.* *Notes: Altered and linearised along field boundary. Large tree nearby and some bank erosion and sections wider or split water channels, micro-siting allowance. Flow ~ 7l/s* *Substrate: Boulders, gravel and sand.*	

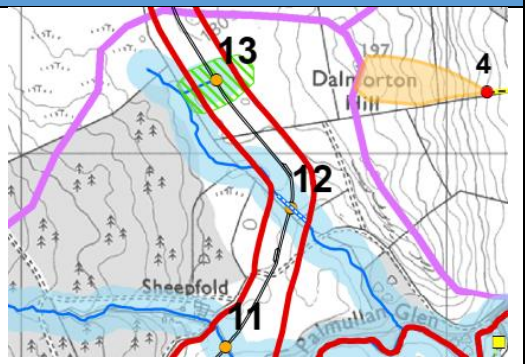
Crossing Location

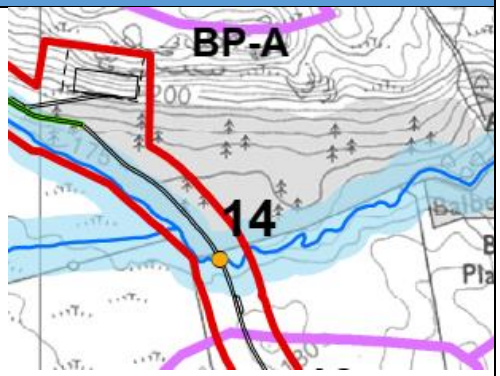
Upstream

Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
12	*Un-named tributary to the Palmullan Burn* *Main watercourse* *1:50,000 OS scale map*	*New Northern forestry access link*	*NS 37670 01838*	*New* *Underground culvert crossing*	*Approximately 3.5m wide wet area that is heavily poached. No distinct channel, possibly culverted below as part of field drainage.* *Notes: Heavy poached by cattle wet area. Watercourse partially culverted. Linearised along field boundary.* *Substrate: Down gradient, poached watercourse with soil, vegetation and rounded boulder substrate.* *No channel identified at this location but an area of marshy ground. Possibly not present due to dry summer conditions. Should a channel be identified it is expected to be small. Recommend review during wetter period and appropriate treatment designed.*	

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
						

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
13	*Un-named tributary to the Palmullan Burn* *1:50,000 OS scale map*	*New Northern forestry access link,*	*NS 37441 02193*	*New* *Series of culverts*	*Approximately 4m wide diffuse flow. No distinct channel.* *Notes: approximately 50m wide fenced off wet area with some overgrown herringbone drainage.* *Substrate: Vegetated.* *No channel identified at this location but an area of marshy ground. Possibly not present due to dry summer conditions. Should a channel be identified it is expected to be small. Recommend review during wetter period and appropriate treatment designed.*	
						

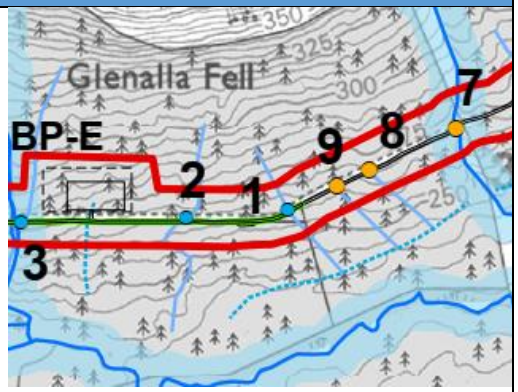
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
14	*Balbeg Burn* *Main watercourse* *1:50,000 OS scale map*	*New Northern access track*	*NS 37287 02460*	*New* *>2m single span, half moon arch or bottomless box culvert crossing, potentially with culverts for flood plain.* *1 in 200year flood event plus climate change* *Allowing passage of fish and other wildlife beneath*	*Approximately 1.8m to 2.8m wide water channel. Valley approximately 10m wide by 2.5m deep on righthand side, slightly stepped valley with 5m flood plain on left hand / north side, dry. Water approximately 0.15m to 0.35m depth.* *Notes: Down gradient of confluence. Microsite to avoid meanders. Flow ~ 8l/s* *Substrate: Boulders, gravel and sand.*	

Crossing Location

Downstream

Approach

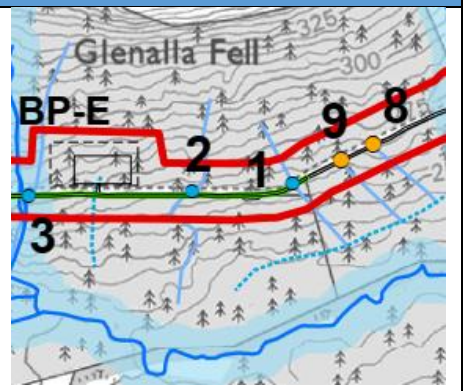
Table 4 – Existing Watercourse Crossings for Western Forestry Track Option

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
1	*Un-named tributary to the Palmullan Burn* *Minor crossing*	*Existing western forestry access track*	*NS 35590 00460*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Small natural drain, 0.65cm wide. Flow ~3l/s* *Track width approximately 4m.* *Substrate: vegetation and gravel* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Upstream

Downstream

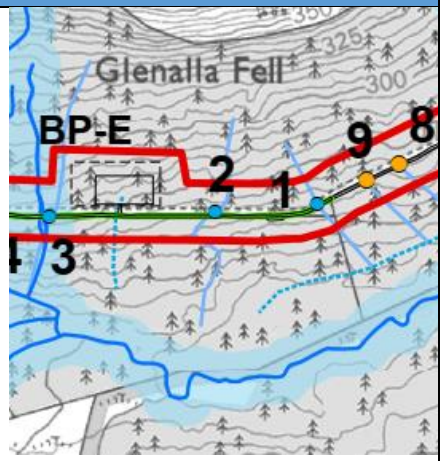
Track

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
2	*Un-named tributary to the Palmullan Burn* *Un-named tributary to the Palmullan Burn* *Minor crossing*	*Existing western forestry access track*	*NS 35400 00445*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Approximately 0.4m wide diverted water channel into track drainage.* *Notes: Flow ~ 2l/s* *Substrate: Gravel and soil* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

Downstream

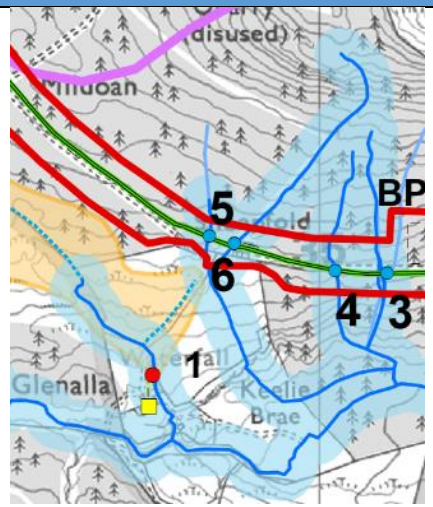
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
3	*Un-named tributary to the Palmullan Burn* *Minor crossing*	*Existing western forestry access track*	*NS 35400 00445*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Approximately 0.4m wide water channel.* *Notes: Flow ~ 2l/s* *Substrate: boulders, gravel and vegetation* *Approximately 0.5m wide water channel.* *Notes: Flow ~ 2l/s* *Substrate: Soil, gravel and boulders* *Existing 0.6m diameter plastic pipe culvert* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	

Crossing Location

Upstream

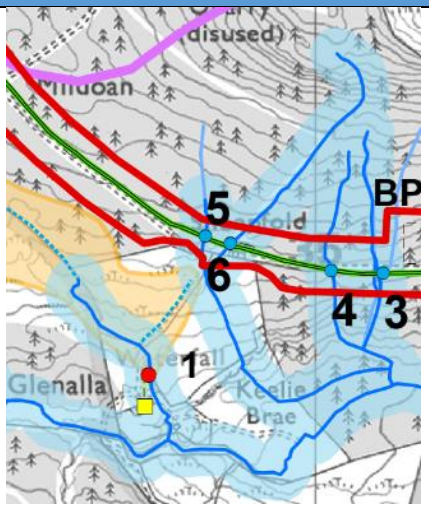
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
4	*Un-named tributary to the Palmullan Burn* *1:50,000 OS scale map*	*Existing western forestry access track*	*NS 35020 00450*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Approximately 0.5m wide water channel.* *Notes: Flow ~ 2l/s* *Substrate: Soil, gravel and boulders* *Existing 0.6m diameter plastic pipe culvert* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

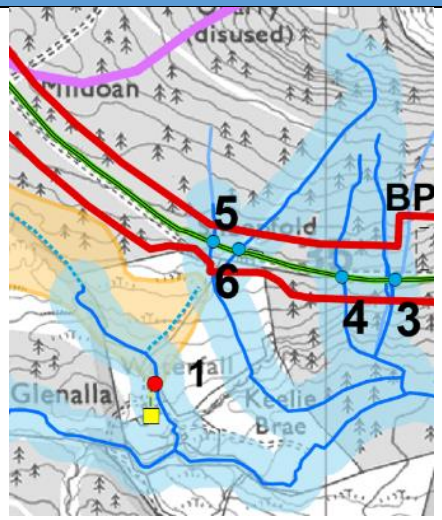
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
5	*Un-named tributary to the Palmullan Burn* *Main watercourse* *1:50,000 OS scale map*	*Existing western forestry access track*	*NS 35400 00445*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Approximately 1.1m wide water channel. 0.3m drop fall and drop pool.* *Notes: Flow ~ 2l/s. Flows by Glenalla fence line* *Substrate: Gravel, sand and soil* *Existing 0.6m diameter plastic pipe culvert* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

Downstream

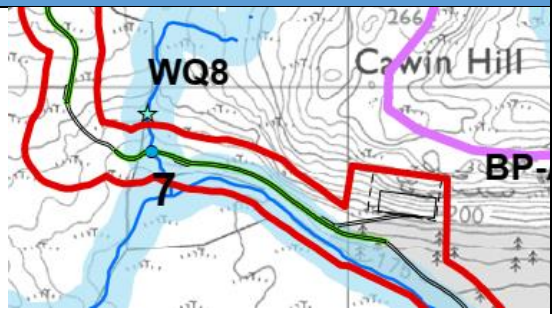
ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
6	*Un-named tributary to the Palmullan Burn* *Main watercourse* *1:50,000 OS scale map*	*Existing western forestry access track*	*NS 34800 00510*	*Existing 0.6m diameter plastic pipe culvert to remain, be replaced or extended*	*Approximately 0.65m wide water channel.* *Notes: Flow ~ 2l/s* *Substrate: Gravel, sand and soil* *Existing 0.6m diameter plastic pipe culvert* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

Downstream

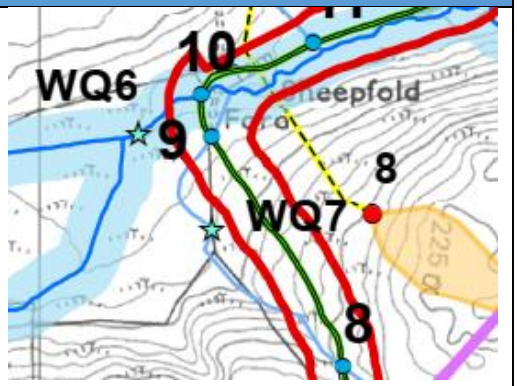
Table 5 – Existing Watercourse Crossings for Northern Forestry Track Option

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
7	*Un-named tributary to the Balbeg Burn* *1:50,000 OS scale map*	*Existing northern forestry access track*	*NS* *36617* *02876*	*Existing plastic pipe culvert to remain, be replaced or extended*	*Small channel to diffuse down gradient* *Recently constructed HDPE twinwall pipe, estimated 0.45m diameter.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

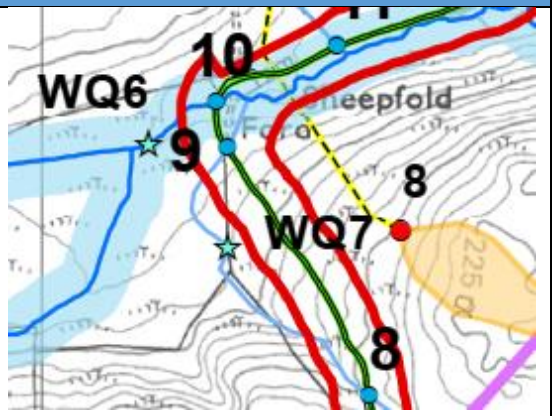
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
8	*Un-named tributary to the Cawin Burn* *Minor* *Not shown on mapping*	*Existing Northern forestry access track*	*NS 36470 03305*	*Existing plastic pipe culvert to remain, be replaced or extended*	*Recently constructed HDPE 0.45m diameter pipe.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
9	*Un-named tributary to the Cawin Burn* *Main* *1:50,000 OS scale map*	*Existing Northern forestry access track*	*NS 36270 03660*	*Existing plastic pipe culvert to remain, be replaced or extended*	*Recently constructed HDPE 0.45m diameter pipe.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

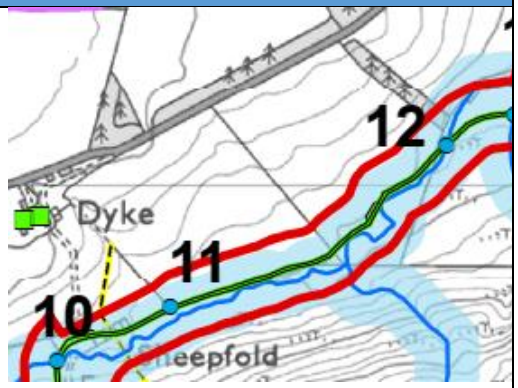
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
10	*Cawin Burn* *Main* *1:50,000 OS scale map*	*Existing Northern forestry access track*	*NS 36255 03730*	*Existing plastic pipe culvert to remain, be replaced or extended*	*Watercourse channel 0.35m to 1.1 m wide, relatively confined.* *Water depth 0.1m to 0.8m in spate. Flow ~5l/s.* *Recently consstructed HDPE twinwall pipe, estimated 1.2m diameter, with 2 No. 0.45m diameter overflow pipes.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

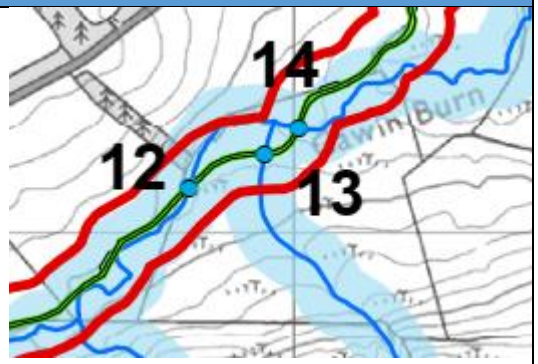
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
11	*Tributary of Cawin Burn from Dyke Farm* *Minor* *Not shown on mapping*	*Existing Northern forestry access track*	*NS 36428 03812*	*Existing plastic pipe culvert to remain, be replaced or extended*	*0.6m diameter plastic pipe culvert* *Recently constructed HDPE pipe, estimated 0.45m diameter.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

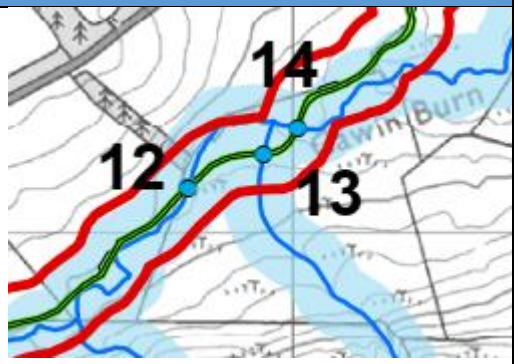
Downstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
12	*Cawin Burn* *Main* *1:50,000 OS scale map*	*Existing Northern forestry access track*	*NS 34800 00510*	*Existing plastic pipe culvert to remain, be replaced or extended*	*1.2m diameter culvert and 2x 0.5m diameter culverts raised.* *Recently constructed HDPE twinwall pipe, estimated 1.2m diameter, with 2 No. 0.45m diameter overflow pipes.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain be replaced or extended as necessary.*	

Crossing Location

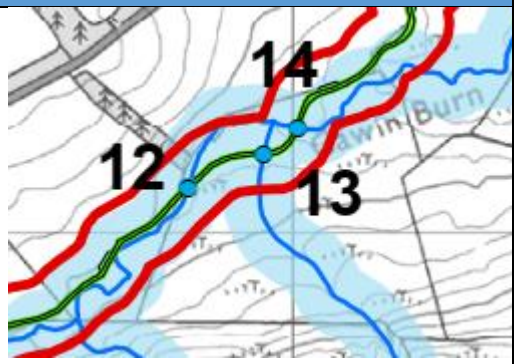
Downstream

Upstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
13	*Cawin Burn* *Unnamed tributary* *1:50,000 OS scale map*	*Existing Northern forestry access track*	*NS 36963* *04113*	*Existing plastic pipe culvert to remain, be replaced or extended*	*Recently constructed HDPE twinwall pipe, estimated 0.45m diameter.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

ID	Watercourse	Location	Grid Ref	Type of Crossing	Description	
14	*Cawin Burn* *Main* *1:50,000 OS scale map*	*Existing Northern forestry access track*	*NS 37010* *01435*	*Existing plastic pipe culverts to remain, be replaced or extended*	*Recently constructed HDPE twinwall pipe, estimated 1.2m diameter, with 2 No. 0.45m diameter overflow pipes.* *Culvert will require a check for compliance with the WTG supplier specification and width to be reviewed as part of track design. Culvert to remain, be replaced or extended as necessary.*	

Crossing Location

Upstream

Downstream