A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010059

Annex A - Culvert Mitigation Strategy

AFPF Regulation Rule 8(1)(c)

Planning Act 2008

Infrastructure Planning (Prescribed Forms and Procedure) Regulations 2009

January 2021

Infrastructure Planning

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Development Consent Order 20[xx]

Annex A - Culvert Mitigation Strategy

Regulation Reference:	APFP Regulation Rule 8(1)(c)
Planning Inspectorate Scheme Reference	TR010059
Application Document Reference	TR010059/ 7.9.1.1
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Version	Date	Status of Version
Rev 0	January 2021	Deadline 1

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Part A																
Cotting Burn (Section 4 in WFD Assessment Part A [APP-255])	Wansbeck from Font to Bothal Burn	Y	0.75	0.001	0.51	- Ordinary watercourse. - River bed comprises clay and silt material. - Aquatic ecology survey identified watercourse as unsuitable habitat for fish. - No evidence of otter was identified during baseline mammal surveys. - Septic tank outfalling into watercourse.	Circular culvert	28	0.3	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	28	0.3	Unchanged	No changes to baseline.	✓ Total length of culverts are reduced by 0.6m. ✓ Gravel bed introduced in all culvert replacements. ✓ Approx. 10m length of new wet woodland will be planted along Cotting Burn. Highly unlikely that Cotting Burn would be a suitable habitat for fish so no baffles or low flow channel provided. No changes proposed to existing culverts beneath A1. Mammal passage has not been provided in the replacement culverts beneath the private access road due to the likely low risk of mammal casualty and with low road usage.
							Circular culvert	41	0.9	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	41	0.9	Unchanged	No changes to baseline.	
							Circular culvert	7	0.35	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert (Ref 1.4)	12.8	H - 1.25 W - 2.7	Replacement culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
							Circular culvert	4	0.35	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert (Ref 1.5)	12.8	H - 1.2 W - 3.0	Replacement culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
							Circular culvert	15	0.45	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N Culvert blocked and assessed to be in poor condition during site visit.						
Shieldhill Burn (Section 5 in WFD Assessment Part A [APP-255])		N	0.94	0.001	0.24	- Ordinary watercourse. - Aquatic ecology survey identified watercourse as unsuitable habitat for fish. - No evidence of otter was identified during baseline mammal surveys. - Heavily modified with various piped and culverted sections. - Realigned along field boundaries in straight and trapezoidal channel. - Flow directed to 300mm dia pipe immediately downstream of culvert and conveyed below ground for c.210m.	Arch culvert	30	H - 1.0 W - 1.2	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 1A)	43.4	1.2	Replacement culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	✓ Gravel bed introduced in replacement culvert. ✖ Total length of culvert is increased by 13.4m. Highly unlikely that Shieldhill Burn would be a suitable habitat for fish so no baffles or low flow channel provided. Wildlife culvert provides free passage to mammals except when in times of flood.
											Wildlife culvert (Ref 1B)	48.5	0.6	New wildlife culvert	Provision of a separate 600mm diameter wildlife culvert.	
															Wansbeck from Font to Bothal Burn - WFD Waterbody Summary:	**✖ Total length of culvert within the WFD waterbody is increased by 12.5m.** **✓ Gravel bed introduced in all replacement culverts.** **✓ Approximately 0.5 hectares of new wet woodland will be planted within the catchment, with c.10m along Cotting Burn.**

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Floodgate Burn (Section 6 in WFD Assessment Part A [APP-255])	Lyne from Source to Tidal Limit	N	2	0.00113	1.25	- Ordinary watercourse. - River bed comprises clay and silt material. - Aquatic ecology survey identified 3-spined stickleback. - No evidence of otter was identified during baseline mammal surveys. - Realigned along field boundaries in predominantly straightened trapezoidal channel, although evidence of natural adjustment.	Arch culvert	26	H - 1.0 W - 1.9	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 3)	32.7	1.8	Replacement culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - Y	✓ Gravel bed introduced in replacement culvert. ✓ Mammal ledge introduced in replacement culvert. ✓ Approx. 50m length of new wet woodland planted along Floodgate Burn. ✗ Total length of culverts is increased by 6.7m. Low flow channel and baffles not feasible due to design constraints for the culvert.
							Circular culvert	7	0.9	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	7	0.9	Unchanged	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	
River Lyne (Section 7 in WFD Assessment Part A [APP-255])		Y	8.27	0.00608	4.72	- Ordinary watercourse. - River bed comprises gravels and sands. - Aquatic ecology survey identified 3-spined stickleback and bullhead species. - No evidence of otter was identified during baseline mammal surveys.					Box culvert (Ref 4)	53	H - 3.75 W - 4.0	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - Y Mammal ledge - Y	✓ Gravel bed, low flow channel and mammal ledge included in new culvert. ✓ Improvement to fish passage through existing culvert by inclusion of baffles. ✓ Approx. 30m length of new wet woodland planted along River Lyne. ✗ Total length of culverts is increased by 53m.
							Circular culvert inlet and arch culvert outlet	34	H - 2.66 W - 1.95	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert inlet and arch culvert outlet	34	H - 2.66 W - 1.95	Unchanged, but with addition of baffles	Natural gravel bed - N Baffles - Y Low flow channel - N Mammal ledge - N	
Fenrother Burn (Section 8 in WFD Assessment Part A [APP-255])		N	3	0.001	2.06	- Ordinary watercourse. - River bed comprises clay. - Aquatic ecology survey identified watercourse as unsuitable habitat for fish. - No evidence of otter was identified during baseline mammal surveys. - Realigned along field boundaries, with long, straight, over deepened sections and trapezoidal channel.	Circular culvert	120	0.5	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Culvert to be infilled					✓ Total length of culverts is reduced by 34.2m. ✓ 429m of new improved watercourse channel being created to avoid further culverting. ✓ Gravel bed introduced in all culverts. Low flow channel and baffles not feasible due to design constraints for the culverts. Wildlife culvert provides free passage to mammals.
											Twin box culvert (Ref 5.2)	33.1	H - 1.25 W - 2x1.5	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
											Box culvert (Ref 5.3)	52.7	H - 1.75 W - 3.0	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
											Realigned watercourse channel	429	Similar channel width to existing	Realignment of watercourse	Design of new channel would maintain similar channel width to existing to mimic baseline conditions, but with boulders placed in new channel to provide improved varied substrate features and flow dynamics and assist movement of aquatic species. Channel planted with aquatic vegetation consistent with existing floral community of the watercourse/catchment.	
											Wildlife culvert (Ref 5.4)	55	0.6	New wildlife culvert	Provision of a separate 600mm diameter wildlife culvert.	

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Earsdon Burn (Section 9 in WFD Assessment Part A [APP-255])	Lyne from Source to Tidal Limit	N	4.2	0.00335	2.87	- Ordinary watercourse. - River bed comprises gravels. - Aquatic ecology survey identified watercourse as unsuitable for fish. - Mammal survey identified the presence of otters. - Upstream sections have more natural planform although downstream in vicinity of A1 has reduced sinuosity and straightened channel.	Triple circular pipes	10	3x 0.45, 0.65, 0.65	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Triple circular pipes	10	3x 0.45, 0.65, 0.65	Unchanged	No changes to baseline.	✓ Gravel bed included in new culverts. ✓ Mammal ledge included in new culverts. ✖ Total length of culverts is increased by 47.2m. Highly unlikely that Earsdon Burn would be a suitable habitat for fish so no baffles or low flow channel provided.
							Bridge	29	W - 5.8	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	Bridge	29	W - 5.8	Unchanged	No changes to baseline.	
							Box culvert	32	W - 3.0	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert	32	W - 3.0 H - 2.1	Unchanged	No changes to baseline.	
											Box culvert (Ref 6.2)	36.2	H - 2.1 W - 3.0	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - Y	
											Box culvert (Ref 6.3)	11	H - 2.1 W - 3.0	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - Y	
Tributary of Earsdon Burn (Section 9 in WFD Assessment Part A [APP-255])		N	Not calculated	Not calculated	Not calculated	- Minor ordinary watercourse. - Catchment <0.5km². Likely to be ephemeral. - Aquatic ecology survey identified watercourse as unsuitable habitat for fish. - Realigned along field boundaries.					Circular culvert (Ref 7.1)	148	1.6	New culvert	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	✓ Realignment and improvement of 240m of the unnamed tributary to avoid further culverting. ✖ Total length of culverts is increased by 157m. Insufficient baseflow to support fish so no gravel bed, baffles or low flow channel provided. Culvert does not pass beneath A1 and only passes beneath private access track. Risk of casualty low so no mammal ledge provided.
											Circular culvert (Ref 7.2)	9	1.6	New culvert	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	
											Realigned watercourse channel	240	Similar channel profile to existing	Realignment of watercourse	Design of new channel would maintain similar channel dimensions to mimic baseline conditions, but with boulders placed in new channel to provide improved varied substrate features and flow dynamics. Channel planted with aquatic vegetation consistent with existing floral community of the watercourse/catchment.	
															Lyne from Source to Tidal Limit - WFD Waterbody Summary:	**✖ Total length of culvert within the WFD waterbody is increased by 231.5m.** **✓ Gravel bed introduced in all replacement and new culverts (with exception of minor tributary).** **✓ Mammal ledge provided in new Earsdon Burn culverts (only watercourse identified to support otter).** **✓ Approximately 670m of watercourse created to avoid excessive culverting, and design of watercourse will offer improvement to the baseline flow dynamics and planting.** **✓ Approximately 11 hectares of new wet woodland will be planted within the catchment, with approx. 30m along River Lyne and 50m along Floodgate Burn.** **✓ Approximately 1.5 hectares of new wetland marginal planting within the catchment.**

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Wildlife passage (Measure EM027, Table 9-23 of Chapter 9: Biodiversity Part A [APP-048])	Longdike Burn Catchment (trib of Coquet)	N	n/a	n/a	n/a	No watercourse					Wildlife culvert (Ref 8A)	51	1.5	New wildlife culvert	Mammal and bat passage.	✓ Wildlife culvert to provide free mammal passage beneath A1.
Longdike Burn (Section 10 in WFD Assessment Part A [APP-255])		Y	23.4	0.014	11.36	- Main river. - River bed comprises silts and gravels. - Brown trout, lamprey and European eel were identified during the fish surveys. - Mammal survey identified the presence of otter along Longdike Burn. - Predominantly sinuous planform. - Outlet of Burgham culvert (Ref 10.1) perched above bed level.	Arch culvert	30	H - 4.8 W - 3.4	Natural gravel bed - N Baffles - Y Low flow channel - N Mammal ledge - N	Arch culvert (Ref 10.1)	30	H - 4.8 W - 3.4	Unchanged	Natural gravel bed - N Baffles - Y (Existing timber baffles replaced) Low flow channel - N Mammal ledge - Y	✓ Improvements to existing baffles to facilitate fish passage and provide a longer term solution / more robust arrangement. ✓ Improvements to mammal passage. ✓ Approx. 50m length of new wet woodland planted along Longdike Burn. ✖ Total length of bridge is increased by 3.8m. Existing (unchanged) culvert outlet cannot be lowered to align with channel bed due to extent of engineering works that would be required.
							Bridge	30.6	H - 2.4 W - 6.6	Natural river bed through bridge.	Bridge (Ref 12)	34.4	H - 2.4 W - 6.6	Bridge extension	Natural river bed maintained. New mammal ledge added.	
Unnamed ditch of Longdike Burn (Section 10 in WFD Assessment Part A [APP-255])		N	Not calculated	Not calculated	Not calculated	- Minor ordinary watercourse. - Catchment <0.5km². Likely to be ephemeral. - Watercourse unsuitable habitat for fish. - Aligned along field boundaries.					Triple circular culvert (Ref 13.1)	56	3 x 0.45	New culvert	Culvert conveys small ephemeral ditch that discharges into the Longdike Burn. No mitigation proposed.	✖ Total length of culvert along unnamed ditch of Longdike Burn is increased by 56m although this is a small ephemeral watercourse.
Tributary of Thirston Burn (Section 11 in WFD Assessment Part A [APP-255])		N	0.7	0.00159	0.021	- Ordinary watercourse. - Aquatic ecology survey identified watercourse as unsuitable habitat for fish. - No evidence of otter was identified during baseline mammal surveys. - Modified channel in straight, over deepened and trapezoidal channel.	Circular culvert	24.3	1.2	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 14)	47.6	1.35	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	✖ Total length of culvert is increased by 23.2m. Low flow channel and natural bed not feasible due to the existing culvert constraints.
															Longdike Burn Catchment (trib of Coquet) - WFD Waterbody Summary:	✖ **Total length of culvert within the WFD waterbody is increased by 79.2m.** ✖ **Total length of bridge within the WFD waterbody is increased by 3.8m.** ✓ **Improvements to existing baffles on Longdike Burn to facilitate fish passage.** ✓ **Mammal ledge provided in Longdike Burn culverts (only watercourse identified to support otter).** ✓ **Approximately 850m length of Longdike Burn will be improved to include nutrient management measures, aquatic planting and bankside stabilisation.** ✓ **Approximately 7 hectares of new wet woodland will be planted within the catchment, with approx. 50m planted along Longdike Burn.** ✓ **Approximately 2.5 hectares of new wetland marginal planting within the catchment.**
Bradley Brook (Section 13 in WFD Assessment Part A [APP-255])	Coquet from Forest Burn to Tidal Limit	N	0.5	0.0014	0.038	- Ordinary watercourse. - River bed comprises silt gravels. - No fish identified during aquatic ecology survey. - No evidence of otter was identified during baseline mammal surveys.	Circular culvert	125	1.2 to 0.9	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 16)	145	0.9	Culvert extension	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	✓ Gravel bed included in new culvert extension. ✖ Total length of culvert is increased by 20m. Highly unlikely that Bradley Brook would be a suitable habitat for fish so no baffles or low flow channel provided.

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m^3/s)	1 in 2 Year Flow (m^3/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
															Coquet from Forest Burn to Tidal Limit - WFD Waterbody Summary:	✖ Total length of culvert within the WFD waterbody is increased by 20m. ✓ Gravel bed included in new culvert extension. ✓ Approximately 8 hectares of new wet woodland will be planted within the catchment. ✓ Approximately 0.5 hectares of new wetland marginal planting within the catchment.

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Part B																
Denwick Burn (Section 4 in WFD Assessment Part B [APP-312])	Aln from Edlingham Burn to Tidal Limit	N	3.8	0.00349	2.08	- Ordinary watercourse. - River bed comprises silts and gravels. - Fish surveys not undertaken as watercourses not considered to have potential to support any notable aquatic species. - No evidence of otter was identified during mammal surveys. - Partially realigned along field boundaries.	Circular culvert	36	0.3	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 22.1)	43.75	0.3	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	✓ Approx. 350m length of new wet woodland planted along Denwick Burn. ✗ Total length of culvert is increased by 45.75m. Low flow channel, natural bed and baffles not feasible due to existing culvert constraints. Mammal ledges unable to be included/retrofitted due to culvert size.
							Circular culvert	72.3	1.2	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 21.1)	110.3	1.2	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	
							Bridge	4.5	H - 0.895 W - 0.7	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	Bridge	4.5	H - 0.895 W - 0.7	Unchanged	No changes to baseline.	
							Circular culvert	10	0.6	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	10	0.6	Unchanged	No changes to baseline.	
							Circular culvert	61.17	0.6	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	61.17	0.6	Unchanged	No changes to baseline.	
Tributaries of Denwick Burn (Section 4 in WFD Assessment Part B [APP-312])		N	Not calculated	Not calculated	Not calculated	- Minor ordinary watercourses. - Catchments <0.5km². Likely to be ephemeral. - Watercourses unsuitable habitat for fish. - Aligned along field boundaries.	Circular culvert	21.25	0.6	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 19.1)	37.75	0.6	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	✗ Total length of culvert is increased by 16.5m although this is a small ephemeral watercourse. Culvert extension provides free passage to mammals except when in times of flood.
							Twin circular pipes	20	2 x 0.15	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Twin circular pipes	20	2 x 0.15	Unchanged	No changes to baseline.	
							Circular culvert (trib)	89	0.3	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 18.1)	89	0.3	Unchanged	No changes to baseline.	
							Circular culvert	49.95	0.5	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 17.1)	49.95	0.5	Unchanged	No changes to baseline.	
White House Burn (Section 5 in WFD Assessment Part B [APP-312])		N	1.22	0.00242	1.73	- Ordinary watercourse. - River bed comprises silts and gravels. - Fish surveys not undertaken as watercourses not considered to have potential to support any notable aquatic species. - No evidence of otter was identified during mammal surveys. - Realigned along field boundaries.	Box culvert	21.7	H - 3.44 W - 3.23	Natural gravel bed - Y Baffles - N Low flow channel - N Cattle creep within culvert. Mammal ledge - N	Box culvert (Ref 23.1)	37.3	H - 3.44 W - 3.23	Culvert extension	Natural gravel bed - Y Baffles - N Low flow channel - N Cattle creep within culvert. Mammal ledge - N	✓ Gravel bed continued through culvert extension. ✓ Approx. 120m length of new wet woodland planted along White House Burn. ✗ Total length of culvert is increased by 15.6m. Low flow channel and baffles not feasible due to the existing culvert constraints. Mammal ledge not required as cattle creep present.
							Circular culvert	5.3	1.5	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert	5.3	1.5	Unchanged	No changes to baseline.	
							Box culvert	Unknown		Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert	Unknown		Unchanged	No changes to baseline.	

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
															Aln from Edlingham Burn to Tidal Limit - WFD Waterbody Summary:	✖ **Total length of culvert within the WFD waterbody is increased by 77.85 m.** ✓ **Approximately 9 hectares of new wet woodland will be planted within the catchment, with 350m along Denwick Burn and 120m along White House Burn.** ✓ **Approximately 6.5 hectares of new wetland marginal planting within the catchment.**
Tributaries of Kittycarter Burn (Section 6 in WFD Assessment Part B [APP-312])	Embleton Burn from Source to North Sea	Y	3.98	0.00322 (combined down-stream)	1.35 (combined down-stream)	- Ordinary watercourses. - River beds comprise silt and gravels. - Fish surveys not undertaken as watercourses not considered to have potential to support any notable aquatic species. - No evidence of otter identified during the mammal surveys. - Realigned along field boundaries.	Circular culvert (southern trib)	21.2	0.45	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (southern trib)	21.2	0.45	Unchanged	No changes to baseline.	✓ Gravel bed introduced in new culvert and maintained through box culvert extension. ✓ Southern tributary of Kittycarter Burn realigned to avoid further culverting. ✓ Approx 100m length of new wet woodland planted along the tributaries of Kittycarter Burn. ✖ Total length of culvert is increased by 75.3m. Low flow channel and baffles not feasible due to design constraints. Mammal ledges unable to be included/retrofitted due to culvert size.
							Circular culvert (southern trib)	25.5	0.6	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 24.2)	50	0.6	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	
							Circular culvert (southern trib)	17	0.6	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Circular culvert (Ref 25.1)	17	0.6	Replacement culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
							Box culvert (western trib)	20.1	H - 2.25 W - 1.88	Natural gravel bed - Y Baffles - N Low flow channel - N Cattle creep within culvert. Mammal ledge - N	Box culvert (Ref 26.1)	70.9	H - 2.25 W - 1.88	Culvert extension	Natural gravel bed - Y Baffles - N Low flow channel - N Cattle creep within culvert. Mammal ledge - N	
											Realigned watercourse channel	165	Similar channel profile to existing	Realignment of watercourse	Design of new channel would maintain similar channel dimensions to mimic baseline conditions, but with boulders placed in new channel to provide improved varied substrate features and flow dynamics. Channel planted with aquatic vegetation consistent with existing floral community of the watercourse/catchment.	
Tributary of Embleton Burn (Section 7 in WFD Assessment Part B [APP-312])		N	0.58	Not calculated	0.44	- Ordinary watercourse. - Fish surveys not undertaken as watercourses not considered to have potential to support any notable aquatic species. - No evidence of otter was identified during the mammal surveys. - Realigned along field boundaries.	Box culvert	5.7	H - 0.31 W - 0.45	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert	5.7	H - 0.31 W - 0.45	Unchanged	No changes to baseline.	✓ Gravel bed included in new culvert. ✖ Total length of culvert is increased by 17m. Low flow channel and baffles not feasible due to design constraints. Mammal ledges unable to be included/retrofitted due to culvert size.
											Circular culvert (Ref 28.1)	17	1.2	New culvert	Natural gravel bed - Y Baffles - N Low flow channel - N Mammal ledge - N	
															Embleton Burn from Source to North Sea - WFD Waterbody Summary:	✖ **Total length of culvert within the WFD waterbody is increased by 92.3m.** ✓ **Approximately 165m of watercourse realigned to avoid excessive culverting, and design of watercourse will offer improvement to the baseline flow dynamics and planting.** ✓ **Approximately 2 hectares of new wet woodland will be planted within the catchment, with 100m planted along the tributaries of Kittycarter Burn.** ✓ **Approximately 1 hectares of new wetland marginal planting within the catchment.**

Watercourse	Watercourse Characteristics						Existing Structures				Proposed Structures					Commentary
	WFD Waterbody	WFD Monitored Waterbody	Upstream Catchment Size (km²)	Low Flow Q95 (m³/s)	1 in 2 Year Flow (m³/s)	Watercourse Description	Structure	Length (m)	Dia. (m)	Features	Structure (Ref no.)	Length (m)	Dia. (m)	New culvert or extension	Features	
Shipperton Burn (Section 8 in WFD Assessment Part B [APP-312])	Brunton Burn from Source to North Sea	N	3.09	Not calculated	1.54	- Ordinary watercourse. - Brown trout were identified during fish surveys. - No evidence of otter was identified during the mammal surveys. - Existing step-weir located immediately downstream of each culvert. - Realigned along field boundaries.	Box culvert	19.1	H - 1.28 W - 2.05	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Rectangular culvert (Ref 27.1)	46.75	H - 1.25 W - 2.0	Culvert extension	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	✓ Existing step-weir located at outlet of culvert extension will be removed. ✓ Gravel bed included in culvert extension. ✖ Total length of culvert is increased by 27.65m. Low flow channel and baffles not feasible due to the existing culvert constraints. Mammal ledges unable to be included/retrofitted due to culvert size.
							Box culvert	21	H - 1.1 W - 1.9	Natural gravel bed - N Baffles - N Low flow channel - N Mammal ledge - N	Box culvert	21	H - 1.1 W - 1.9	Unchanged	No changes to baseline.	
															Brunton Burn from Source to North Sea - WFD Waterbody Summary:	**✖ Total length of culvert within the WFD waterbody is increased by 27.65m.** **✓ Existing step-weir located at outlet of culvert extension will be removed.** **✓ Gravel bed included in culvert extension.** **✓ Approximately 0.5 hectares of new wet woodland will be planted within the catchment.**

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