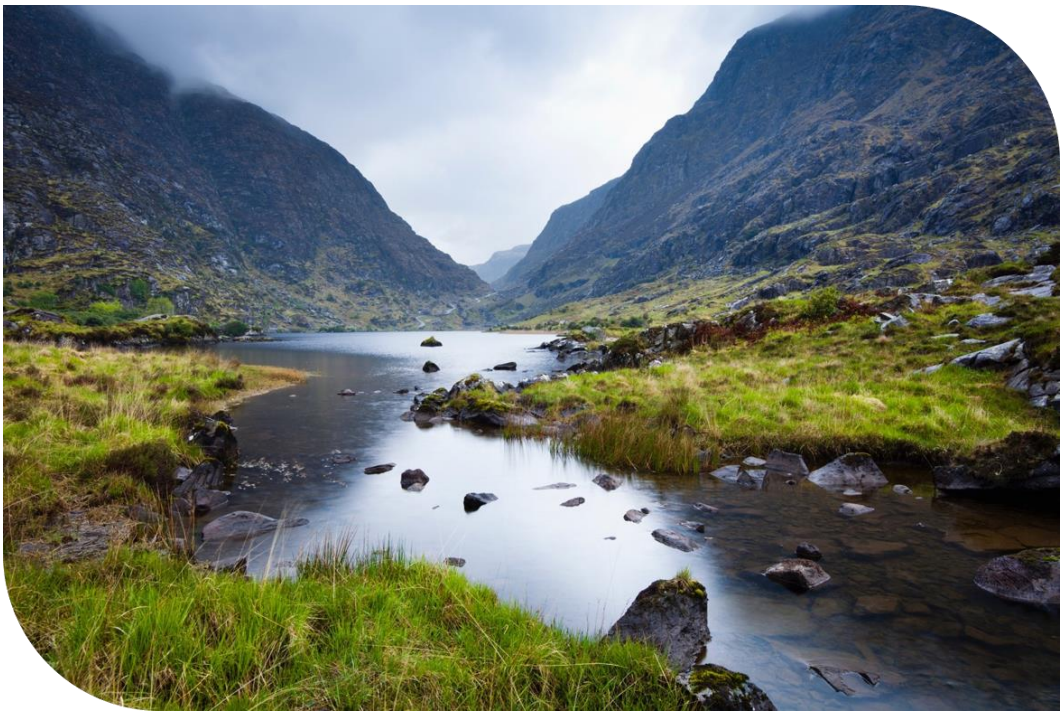
Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Natura Impact Statement

Appendix D



Tionscadal Éireann
Project Ireland
2040

Data disclaimer: This document uses best available data at time of writing. Some sources may have been updated in the interim period. As data relating to population forecasts and trends are based on information gathered before the Covid 19 Pandemic, monitoring and feedback will be used to capture any updates. The National Water Resources Plan will also align to relevant updates in applicable policy documentation.

Baseline data included in the RWRP-EM has been incorporated from numerous sources including but not limited to; National Planning Framework, Central Statistics Office, Regional Spatial and Economic Strategies, Local Authority data sets, Regional Assembly data sets and Irish Water data sets. Data sources will be detailed in the relevant sections of the RWRP-EM. 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

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Appendix D

Adverse Effects on Site Integrity Tables

Preferred Approach options SA1-66, SA1-27 and SA1-42 are not listed below as no LSEs were identified for these options.

Table D1.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA1-Group 3 (17c, 57c, 23c, 53c, 51c, 52c, 87) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Deputy's Pass Nature Reserve SAC (000717)	0km	**Annex I Habitats** Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	Option study area is hydrologically linked to this European site. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are adjacent to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Wicklow Mountains SAC (002122)	< 1km	**Annex I Habitats** Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Disturbance -** There is potential for disturbance to otter. The new pipeline runs adjacent to the Avonmore river which flows from the SAC which may provide supporting habitat for otter.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
The Murrough Wetlands SAC (002249)	ca. 2.8km	**Annex I Habitats** Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Magherabeg Dunes SAC (001766)	ca.4.5km	**Annex I Habitats** Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • With the implementation of mitigation as noted above there is no potential for AESI	**N**
Buckroney-Brittas Dunes and Fen SAC (000729)	ca.4.5km	**Annex I Habitats** Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Alkaline fens [7230]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D1.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA1-Group 3 (17c, 57c, 23c, 53c, 51c, 52c, 87) and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
The Murrough SPA (004186)	ca. 1.7km	Red-throated Diver (*Gavia stellata*) [A001] Greylag Goose (*Anser anser*) [A043] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Herring Gull (*Larus argentatus*) [A184] Little Tern (*Sterna albifrons*) [A195]	non-b non-b non-b non-b non-b non-b non-b breed	**Disturbance -** There is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Wetland and Waterbirds [A999]					

Table D1.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA1-71 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	800m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Preferred Approach options SA2-Group 2 (7b & 11b), SA2-17 and SA2-20a not listed below as no LSEs were identified for these options.

Table D2.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-13 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Wicklow Mountains SAC (002122)	<600m	**Annex I Habitats** Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Disturbance -** There is potential for disturbance to otter. The works for this option lie adjacent to a stream which flows from the SAC and may provide supporting habitat for otter.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** • Yield assessment as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D2.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA2-13 and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Poulaphouca Reservoir SPA (004063)	<1km	Greylag Goose (*Anser anser*) [A043] Lesser Black-backed Gull (*Larus fuscus*) [A183]	non-b non-b	**Disturbance-** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D2.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-35 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Wicklow Mountains SAC (002122)	1.5km	**Annex I Habitats** Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II species** *Lutra lutra* (Otter) [1355]	**Disturbance -** There is potential for disturbance to otter. The works for this option lie adjacent to a stream which flows from the SAC and may provide supporting habitat for otter.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Slaney River Valley SAC (000781)	2.2km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance -** There is potential for disturbance to otter. The new pipeline runs adjacent to a watercourse which flows into the SAC and may provide supporting habitat for otter.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lampetra planeri (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]				

Table D2.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-38 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	ca. 3.6km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D2.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-24 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	15.4km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • Yield assessment as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D2.6: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-40 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	1.8km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D2.7: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-30d and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	0km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Option pipeline crosses this European site three times. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage)	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.4.3.2** In addition to general mitigation measures outlined above options specific measures have been identified for **SA2-30d** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	could impact fish, restrict access to spawning habitat and smother freshwater pearl mussel. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.		derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI	

Table D2.8: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-01 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	0km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species**	Option pipeline crosses this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish, restrict access to spawning habitat and smother freshwater pearl mussel. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the	No operational impacts are predicted. Although there is a groundwater abstraction, the SAC is not within the zone of contribution (ZOC). Therefore, given the distance from the site and the QI features it supports there is no impacts predicted.	• General Mitigation Measures are outlined in **Section 6.4.3.2** • Yield assessment as in **Section 6.3.5** In addition to general mitigation measures outlined above options specific measures have been identified for **SA2-01** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI).	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	spread of invasive species given that the works are within the SAC boundary.		*Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI	

Table D2.9: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA2-28 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measures Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slaney River Valley SAC (000781)	ca. 280m	**<u>Annex I Habitats</u>** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	**Habitat degradation – water quality** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted. Although there is a groundwater abstraction, the SAC is not within the zone of contribution (ZOC). Therefore, given the distance from the site and the QI features it supports there is no impact predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** • Yield assessment as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Preferred Approach option SA3-89 is not listed below as no LSEs were identified for this option.

Table D3.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA3 – 523 (96, 100, 97, 98, 102, 99, 101) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Boyne and River Blackwater SAC (002299)	0km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is directly adjacent to this European site. Option pipeline crosses this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation –** water quality potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** In addition to general mitigation measures outlined above options specific measures have been identified for **SA3-523** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lough Bane and Lough Glass SAC (002120)	0km	**Annex I Habitats** Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140] **Annex II species** *Austropotamobius pallipes* (White-clawed Crayfish) [1092]	Option study area is directly adjacent to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during demolition works given that the works are adjacent to the SAC. **Mortality risk –** pollution during demolition works could pose an impact to white-clawed crayfish **Habitat degradation –** pollution during demolition could cause degradation of QI habitat. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are adjacent to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D3.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA3 – 523 (96, 100, 97, 98, 102, 99, 101) and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Boyne and River Blackwater SPA (004232)	0km	Kingfisher (*Alcedo atthis*) [A229]	breed	Option study area is directly adjacent to this European site. Option pipeline crosses this European site. **Mortality –** there is potential for mortality to kingfisher during the breeding season given that the works are within the SPA boundary. **Disturbance –** there is potential for disturbance to kingfisher given that the works are within the SPA boundary. **Habitat degradation -** changes in water quality because of pollution (associated with sediment runoff, or accidental spillage) could impact fish populations, having potential indirect impacts on kingfisher through reduced prey availability.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D3.3: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA3-77 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Boyne and River Blackwater SAC (002299)	5.7km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation - changes in water quality.** Potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance -** there is potential for disturbance to otter traveling to supporting habitats outside of the SAC from construction works. There is also potential for the spread of invasive species via the hydrological link to the SAC.	This option includes a new abstraction from upstream of this European site. Option study area is hydrologically linked to this European site. **Water table/availability** There is likely a high association between surface water and groundwater flows; a high Baseflow Index (BFI). Therefore, the potential for impacts on QI habitats or aquatic QI species utilising this European site through a reduction in flows/water levels. **Habitat degradation – changes in water quality (hydrological changes).** Option involves abstraction from nearby surface water bodies which are all upstream	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** • Yield assessment as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				of the River Boyne, which could lead to hydrological changes that could impact QI species.		

Table D3.4: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA3-77 and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Boyne and River Blackwater SPA (004232)	5.7km	Kingfisher (*Alcedo atthis*) [A229]	Breed	Option study area is hydrologically linked to this European site. **Habitat degradation -** changes in water quality because of pollution (associated with sediment runoff, or accidental spillage) could impact fish populations, having potential indirect impacts on kingfisher through reduced prey availability.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D3.5: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA3-88 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Boyne and River Blackwater SAC (002299)	5.5km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation -** changes in water quality. Potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance -** there is potential for disturbance to otter traveling to supporting habitats outside of the SAC from construction works. There is also potential for the spread of invasive species via the hydrological link to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D3.6: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA3-88 and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Boyne and River Blackwater SPA (004232)	5.5km	Kingfisher (*Alcedo atthis*) [A229]	breed	Option study area is hydrologically linked to this European site. **Habitat degradation -** changes in water quality because of pollution (associated with sediment runoff, or accidental spillage) could impact fish populations, having potential indirect impacts on kingfisher through reduced prey availability.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D3.7: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA3-47 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Boyne and River Blackwater SAC (002299)	0km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is directly adjacent to this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation –** water quality potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	This option involves an increase in existing ground water abstraction from this European site. **Water table/ availability** There is likely a high association between surface water and groundwater flows; a high Baseflow Index (BFI). Therefore, the potential for impacts on QI habitats or aquatic QI species utilising this European site through a reduction in flows/water levels. **Habitat degradation – changes in water quality (hydrological changes).** An increase in abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact aquatic QI species or habitats. Therefore, there is potential for impacts on aquatic QI species utilising this European site through a	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				reduction in flows/water levels.		

Table D3.8: Source-Pathway-Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA3-47 and Mitigation. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Boyne and River Blackwater SPA (004232)	0km	Kingfisher (*Alcedo atthis*) [A229]	breed	Option study area is directly adjacent to this European site. Option study area is hydrologically linked to this European site. **Mortality –** there is potential for mortality to kingfisher during the breeding season given that the works are within the SPA boundary. **Disturbance –** there is potential for disturbance to kingfisher given that the works are within the SPA boundary. **Habitat degradation -** changes in water quality because of pollution (associated with sediment runoff, or accidental spillage) could impact fish populations, having potential indirect impacts on kingfisher through reduced prey availability.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D4.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA4-99 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Boyne and River Blackwater SAC (002299)	5km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D4.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA4-98 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 11.5km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Annex II species *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D4.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with grouped option SA4-501 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Ennell SAC (000685)	3m	**Annex I Habitats** Alkaline fens [7230]	Option study area is directly adjacent and hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are directly adjacent to the SAC boundary. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are directly adjacent to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lough Lene SAC (002121)	25m	**Annex I Habitats** Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140] **Annex II species**	Option study area is adjacent to this European site. **Habitat degradation – changes in water quality (pollution) -** potential	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3**	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Austropotamobius pallipes (White-clawed Crayfish) [1092]	pollution of waterbody during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are in close proximity to the SAC boundary.		With the implementation of mitigation as noted above there is no potential for AESI.	
River Boyne and River Blackwater SAC (002299)	200m	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lough Owel SAC (000688)	670m	**Annex I Habitats** Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp.* [3140] Transition mires and quaking bogs [7140] Alkaline fens [7230] **Annex II species** *Austropotamobius pallipes* (White-clawed Crayfish) [1092]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Barrow and River Nore SAC (002162)	7.4km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				
Garriskil Bog SAC (000679)	9km	**Annex I Habitats** Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Charleville Wood SAC (000571)	9.5km	**Annex I Habitats** Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slieve Bloom Mountains SAC (000412)	12.1km	**Annex I Habitats** Northern Atlantic wet heaths with *Erica tetralix* [4010] Blanket bogs (* if active bog) [7130] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lough Ree SAC (000440)	13.2km	**Annex I Habitats** Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Alkaline fens [7230] Limestone pavements [8240] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Bog woodland [91D0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D4.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with grouped option SA4-501 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Iron SPA (004046)	0m	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Shoveler (*Anas clypeata*) [A056] Coot (*Fulica atra*) [A125] Golden Plover (*Pluvialis apricaria*) [A140] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	Non-b Non-b Non-b Non-b Non-b Non-b Non-b	Option study area is hydrologically linked to this European site. **Physical loss of habitats/supporting habitat –** there is potential for some loss of/damage to supporting habitats (e.g. foraging habitats) to QI species during construction works given that the works are within the SPA boundary. **Mortality -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact food resource relied on by QI.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
				Habitat degradation – changes in water quality (pollution) - there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by QI bird species. Potential pollution of watercourses during construction could have indirect effects on QI bird species through impacts upon prey species. **Disturbance (including biological disturbance) -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland), as well as within the SPA given the study area is within the SPA.			
River Boyne and River Blackwater SPA (004232)	225m	Kingfisher (*Alcedo atthis*) [A229]	Breed	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by kingfisher. Potential pollution of watercourses during construction could have indirect effects on kingfisher through impacts upon prey species. **Disturbance (including biological disturbance) -** there is potential for disturbance to kingfisher using habitats situated within the immediate hinterland of the SPA, or in areas outside of the SPA but ecologically connected to it, given the study area is in close proximity to the SPA which is a breeding site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lough Ennell SPA (004044)	250m	Pochard (*Aythya ferina*) [A059] Tufted Duck (*Aythya fuligula*) [A061] Coot (*Fulica atra*) [A125] Wetland and Waterbirds [A999]	Non-b Non-b Non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by QI bird species. Potential pollution of watercourses during construction could have indirect effects on QI bird species through impacts upon prey species. **Disturbance (including biological disturbance) -** there is potential for disturbance to QI birds using supporting	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
				habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).			
Lough Derravarragh SPA (004043)	270m	Whooper Swan (*Cygnus cygnus*) [A038] Pochard (*Aythya ferina*) [A059] Tufted Duck (*Aythya fuligula*) [A061] Coot (*Fulica atra*) [A125] Wetland and Waterbirds [A999]	Non-b Non-b Non-b Non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by QI bird species. Potential pollution of watercourses during construction could have indirect effects on QI bird species through impacts upon prey species. **Disturbance (including biological disturbance) -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lough Owel SPA (004047)	670m	Shoveler (*Anas clypeata*) [A056] Coot (*Fulica atra*) [A125] Wetland and Waterbirds [A999]	Non-b Non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by QI bird species. Potential pollution of watercourses during construction could have indirect effects on QI bird species through impacts upon prey species. **Disturbance (including biological disturbance) -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Garriskil Bog SPA (004102)	9km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	Non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by Greenland white-fronted goose. Potential pollution of watercourses during construction could have indirect effects on Greenland white-fronted	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
				goose through impacts upon prey species.			
Lough Ree SPA (004064)	13.2km	Little Grebe (*Tachybaptus ruficollis*) [A004] Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Shoveler (*Anas clypeata*) [A056] Tufted Duck (*Aythya fuligula*) [A061] Common Scoter (*Melanitta nigra*) [A065] Goldeneye (*Bucephala clangula*) [A067] Coot (*Fulica atra*) [A125] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	Non-b Non-b Non-b Non-b Non-b Non-b Non-b Breed Non-b Non-b Non-b Non-b Non-b Breed	Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (pollution) -** there is potential for pollution of waterbodies during construction that could impact on the wetland habitat used by QI bird species. Potential pollution of watercourses during construction could have indirect effects on QI bird species through impacts upon food resources.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Preferred Approach options SA5-33 and SA5-86 are not listed below as no LSEs identified for these options.

Table D5.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-02 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Suck Callows SPA (004097)	ca. 4.6km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option includes an increase in GW abstraction. Option study area overlies a karst aquifer. **Water table/availability** There is a risk to the wetland used by migratory waterbirds due to the underlying Karst/gravel aquifer at the abstraction point. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-09a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Ree SAC (000440)	<600m	**Annex I Habitats** Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Alkaline fens [7230] Limestone pavements [8240] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Bog woodland [91D0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Disturbance –** there is potential for disturbance to otter from construction works due to their proximity to the SAC.	This option includes an increase in abstraction downstream of this European site. Option study area is hydrologically linked to this European site. **Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential impacts to groundwater dependent habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
River Shannon Callows	1.1km	**Annex I Habitats** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	This option includes an increase in abstraction from the River Shannon. Option study area is hydrologically linked to this European site.	This option includes an increase in SW abstraction from the River Shannon.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5**	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
SAC (000216)		Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **<u>Annex II species</u>** *Lutra lutra* (Otter) [1355]	**Habitat loss –** there is potential for some loss of/damage to supporting habitat during construction works given that the works are within River Shannon, upstream of the SAC. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the River Shannon.	**Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/availability** There is potential for impacts on otter utilising watercourse hydrologically linked to this European site through a reduction in flows/water levels.	• With the implementation of mitigation as noted above there is no potential for AESI	

Table D5.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-09a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Ree SPA (004064)	<600m	Little Grebe (*Tachybaptus ruficollis*) [A004] Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Shoveler (*Anas clypeata*) [A056] Tufted Duck (*Aythya fuligula*) [A061] Common Scoter (*Melanitta nigra*) [A065] Goldeneye (*Bucephala clangula*) [A067] Coot (*Fulica atra*) [A125] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b breed non-b non-b non-b non-b non-b breed	**Disturbance -** there is potential for disturbance to QI birds within the SPA, using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Middle Shannon Callows SPA (004096)	1.1km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Corncrake (*Crex crex*) [A122] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156]	non-b non-b breed non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]					

Table D5.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-17a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Suck Callows SPA (004097)	0km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** there is potential for pollution of wetland habitat that could pose a risk to migratory waterbirds. **Disturbance -** there is potential for disturbance to QI birds within the SPA, using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option includes a SW abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species. **Water table/availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). A potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-80 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Shannon Callows SAC (000216)	<550m	**<u>Annex I Habitats</u>** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510]	Option study area is hydrologically linked to this European site. **Habitat loss** – there is potential for some loss of/damage to supporting habitat during	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **<u>Annex II species</u>** *Lutra lutra* (Otter) [1355]	construction works given the distance from the SAC. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.			

Table D5.6: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-80 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Middle Shannon Callows SPA (004096)	ca. 550m	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Corncrake (*Crex crex*) [A122] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	non-b non-b breed non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
All Saints Bog SPA (004103)	3.7km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.7: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-81 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Shannon Callows SAC (000216)	2.5km	**Annex I Habitats** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.8: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-81 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Middle Shannon Callows SPA (004096)	2.5km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Corncrake (*Crex crex*) [A122] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	non-b non-b breed non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
All Saints Bog SPA (004103)	2.5km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
River Little Brosna Callows SPA (004086)	4.5km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156]	non-b non-b non-b non-b non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b				

Table D5.9: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-517 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Dovegrove Callows SPA (004137)	3.7km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	non-b	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option includes a SW abstraction. Option study area overlies a karst aquifer. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species. **Water table/availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). A potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.10: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-84 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Shannon Callows SAC (000216)	ca. 7km	**<u>Annex I Habitats</u>** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Limestone pavements [8240]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species** *Lutra lutra* (Otter) [1355]				

Table D5.11: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-37b and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Four Roads Turlough SAC (001637)	1.2km	**Annex I Habitats** Turloughs [3180]	No potential impact pathway given distance from site, lack of hydrological connection and the QI feature it supports.	Option includes an increase in GW abstraction. Option study area overlies a karst aquifer. **Water table/ availability** abstraction point is within a karstic aquifer which connects the site to the SAC within 5km. This SAC contains a groundwater dependent QI habitat that could be impacted by abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lisduff Turlough SAC (000609)	3.4km	**Annex I Habitats** Turloughs [3180]	No potential impact pathway given distance from site, lack of hydrological connection and the QI feature it supports.	Option includes an increase in GW abstraction. Option study area overlies a karst aquifer. **Water table/ availability** abstraction point is within a karstic aquifer which connects the site to the SAC within 5km. This SAC contains a groundwater dependent QI habitat that could be impacted by abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lough Croan Turlough SAC (000610)	5km	**Annex I Habitats** Turloughs [3180]	No potential impact pathway given distance from site, lack of hydrological connection and the QI feature it supports.	Option includes an increase in GW abstraction. Option study area overlies a karst aquifer. **Water table/ availability** abstraction point is within a karstic aquifer which connects the site to the SAC within 5km. This SAC contains a groundwater dependent QI	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				habitat that could be impacted by abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.		

Table D5.12: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-37b and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Suck Callows SPA (004097)	0km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b	Option study area is directly adjacent to this European site. **Disturbance -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option includes an increase in ground water abstraction. Option study area overlies a karst aquifer. **Water table/ availability** a potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Four Roads Turlough SPA (004140)	1.2km	Golden Plover (*Pluvialis apricaria*) [A140] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option includes an increase in ground water abstraction. Option study area overlies a karst aquifer. **Water table/ availability** a potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.13: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA5-518 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Ballynamona Bog and Corkip Lough SAC (002339)	ca. 1.3km	Annex I Habitats Turloughs [3180] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150] Bog woodland [91D0]	Study area is located downstream of this site. Therefore, impacts are unlikely given distance from site and the QI features it supports.	Option includes an increase in ground water abstraction. Option study area overlies a karst aquifer. **Water table/ availability** abstraction point is within a karstic aquifer which connects the site to the SAC within 5km. This SAC contains a groundwater dependent QI habitat that could be impacted by abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Castlesampson Esker SAC (001625)	ca. 3.5km	**Annex I Habitats** Turloughs [3180] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]	Study area is located downstream of this site. Therefore, impacts are unlikely given distance from site and the QI features it supports.	Option includes an increase in ground water abstraction. Option study area overlies a karst aquifer. **Water table/ availability** abstraction point is within a karstic aquifer which connects the site to the SAC within 5km. This SAC contains a groundwater dependent QI habitat that could be impacted by abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lough Ree SAC (000440)	ca. 4km	**Annex I Habitats** Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Alkaline fens [7230] Limestone pavements [8240] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Bog woodland [91D0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	Option study area overlies a karst aquifer. **Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ Availability** There is potential for impacts on otter utilising watercourse hydrologically linked to this European site through a reduction in flows/water levels.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Shannon Callows SAC (000216)	ca. 8.5km	**Annex I Habitats** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	Although there is a groundwater abstraction and the site overlies a karst aquifer, this is over 5km from this site so no operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D5.14: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA5-518 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Ree SPA (004064)	ca. 4km	Little Grebe (*Tachybaptus ruficollis*) [A004] Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Shoveler (*Anas clypeata*) [A056] Tufted Duck (*Aythya fuligula*) [A061] Common Scoter (*Melanitta nigra*) [A065] Goldeneye (*Bucephala clangula*) [A067] Coot (*Fulica atra*) [A125] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b breed non-b non-b non-b non-b non-b breed	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland). **Habitat degradation – water quality** there is potential for pollution of wetland habitat that could pose a risk to migratory waterbirds.	Option study area overlies a karst aquifer. **Water table/ availability** a potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI bird species.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**
River Suck Callows SPA (004097)	ca. 4km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using supporting habitats in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	Option study area overlies a karst aquifer. **Water table/ availability** a potential lowering in groundwater level could impact QI birds indirectly through degradation of supporting groundwater dependent habitat within the SPA. **Habitat degradation – changes in water quality (hydrological**	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
				Habitat degradation – water quality there is potential for pollution of wetland habitat that could pose a risk to migratory waterbirds.	**changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI bird species.		

Table D6.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-193 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	0km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option pipeline crosses this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Slaney River Valley SAC (000781)	ca. 40m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Option study area is adjacent to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	spread of invasive species given that the works are adjacent to the SAC boundary.			

Table D6.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-197 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	<200m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Option study area is adjacent to this European site. Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are adjacent to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Annex II species *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-19 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	<100m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] *Hydrophilous* tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is adjacent to this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are adjacent to the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are adjacent to the SAC boundary.	Option includes refurbishment of existing ground water abstraction. Option study area is within a karst aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-24 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 4.4km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	No potential impact pathway. Although there is a groundwater abstraction, the SAC is not within the zone of contribution (ZOC). No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Austropotamobius pallipes (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-191 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	<400m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lampetra planeri (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.6: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-33 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	1.3km	**<u>Annex I Habitats</u>** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **<u>Annex II species</u>** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	Study area is within a gravel aquifer overlying a karstic aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a gravel aquifer likely overlying a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alosa fallax fallax (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				
Slaney River Valley SAC (000781)	3.6km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.7: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-38 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
The Loughans SAC (000407)	720m	**Annex I Habitats** Turloughs [3180]	Option study area is hydrologically linked to this European site. However, given that the study area is downstream of this site there is no potential for impacts.	Option includes a new GW abstraction within a karstic aquifer. **Water table/availability:** The new GW abstraction is within a karst bedrock as is the Loughans SAC which is 720m away and is designated for turlough habitat; a sensitive GWDTE. Further studies	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				are required on the current conservation status of this SAC and ZOC of the abstraction relative to the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.		
River Barrow and River Nore SAC (002162)	ca. 11.5km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	No potential impact pathway. Although this option comprises a groundwater abstraction, the SAC is not within the zone of contribution (ZOC). No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.8: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-45a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	0km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option study area is within this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk –** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option includes a ground water abstraction within 1.3km of this European site within a productive fissured aquifer. **Water table/availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. There is a potential groundwater link via the fissured bedrock aquifer to this European site. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.9: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-53a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Galmoy Fen SAC (001858)	ca. 2.5km	**Annex I Habitats** Alkaline fens [7230]	Impacts are unlikely given distance from site, lack of hydrological link and the QI features it supports.	Option includes an increase in ground water abstraction. **Water table/availability** Galmoy Fen SAC at 2.5km, while outside the same karst bedrock is still potentially within ZOI as this SAC has highly sensitive alkaline fen FOI. Further studies are required on ZOI of the abstraction and current conservation status of alkaline fen in Galmoy Fen SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitat.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Barrow and River Nore SAC (002162)	ca. 8.3km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alosa fallax fallax (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.10: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-57a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	8.8km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106]	Option study area is hydrologically linked to this European site. Option study area is within a karstic aquifer. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species due to the hydrological link to the SAC.	Option includes a new GW abstraction. Option study area is within a karstic aquifer **Water table/ availability** Although this European site is not within the zone of contribution (ZOC), there is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilizing watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lutra lutra (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.11: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-64 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 3km	**<u>Annex I Habitats</u>** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **<u>Annex II species</u>** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.12: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-69a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 2.3km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	Option includes an increase in ground water abstraction. **Water table/ availability** Although this European site is not within the zone of contribution (ZOC), there is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilising watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.13: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-77 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 1km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex and Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099 *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Impacts are unlikely given distance from site, lack of hydrological link and the QI features it supports.	Option includes an increase in ground water abstraction. Option study area is within a karst aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.14: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-86a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	2.4km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** • Yield assessment as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.15: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-90 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 800m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. **Water table/ availability** Although this European site is not within the zone of contribution (ZOC), there is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilising watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alosa fallax fallax (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.16: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-94 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	2.4km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. Study area is within a karst aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lutra lutra (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.17: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-99 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	7.7km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.18: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-104 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	0.17km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. Study area is within a productive fissured bedrock aquifer. **Water table/ availability** There is potential for impacts via groundwater abstraction via the productive fissured bedrock aquifer. The SAC is 170m from the site of Option abstraction increase point, well within the 3km range at which impacts should be considered. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Margaritifera durrovensis (Nore Pearl Mussel) [1990]				

Table D6.19: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA6-104 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Nore SPA (004233)	3.1km	Kingfisher (*Alcedo atthis*) [A229]	breed	Option study area is hydrologically linked to this European site. **Habitat degradation - water quality (pollution)** Potential pollution of watercourses during construction could have indirect effects on through impacts upon prey species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.20: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-105 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	4.2km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. Study area is within a gravel aquifer overlying a karstic aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a gravel aquifer likely overlying a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Petrifying springs with tufa formation (Cratoneurion) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] Margaritifera durrovensis (Nore Pearl Mussel) [1990]		hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.		

Table D6.21: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-113a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 2km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. **Water table/ availability** Although this European site is not within the zone of contribution (ZOC), there is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilizing watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality**	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]		**(hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species and habitats.		

Table D6.22: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-122 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Slieve Bloom Mountains SAC (000412)	ca. 500m	**Annex I Habitats** Northern Atlantic wet heaths with *Erica tetralix* [4010] Blanket bogs (* if active bog) [7130] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Option study area is hydrologically linked to this European site. However, given that the SAC is upstream of the option study area, the distance from site and the QI feature it supports, there is no potential for impacts.	Option includes an increase in ground water abstraction. Option study area is within a productive fissured aquifer. **Water table/ availability** abstraction point is within a productive fissured aquifer which connects the option study area to the SAC within 500m. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Barrow and River Nore SAC (002162)	ca. 4.5km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during	No operational impacts are predicted	• General Mitigation Measures are outlined in **Section 6.3.3**	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	construction could affect hydrologically connected habitats.		With the implementation of mitigation as noted above there is no potential for AESI.	

Table D6.23: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA6-122 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Bloom Mountains SPA (004160)	<100m	Hen Harrier (*Circus cyaneus*) [A082]	breed	**Disturbance –** there is potential for disturbance to QI birds given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.24: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-553 (139, 144e) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lisbigney Bog SAC (000869)	ca. 180m	**Annex I Habitats** Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	No potential impact pathway given the lack of a hydrological link and the QI features it supports.	Option includes an increase in ground water abstraction. Option study area is within a karst aquifer. **Water table/ availability** There is a risk this increase in groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** An increase in abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Barrow and River Nore SAC (002162)	500m	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the options study area is hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. Option study area is within a karst aquifer. **Water table/ availability** There is a risk this increase in groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a karstic aquifer, less than 5km from the SAC. **Habitat degradation – changes in water quality (hydrological changes).** An increase in abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lampetra fluviatilis (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				

Table D6.25: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA6-553 (139, 144e) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Nore SPA (004233)	560m	Kingfisher (*Alcedo atthis*) [A229]	breed	**Disturbance –** there is potential for disturbance to QI birds given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.26: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-126 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	3.5km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Option study area is within a gravel aquifer. Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option includes an increase in ground water abstraction. Option study area is within a gravel aquifer. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilising watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** An increase in abstraction could lead to hydrological changes (reduced	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]		flows – impacting on water quality) that could impact QI species or habitats.		
Lisbigney Bog SAC (000869)	4.5km	**Annex I Habitats** Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	No potential impact pathway given distance from site and the QI feature it supports.	Option includes an increase in ground water abstraction. Option study area is within a gravel aquifer adjacent to a karst aquifer. **Water table/ Availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a gravel aquifer adjacent to a karst aquifer which underlies this SAC. This has the potential to impact on groundwater dependent habitats and species. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.27: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-156 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	ca. 7km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works hydrologically linked to the SAC.	Option includes an increase in ground water abstraction. **Water table/availability** Although this European site is not within the zone of contribution (ZOC), there is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilizing watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling are outlined in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.28: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-552 (180c, 184) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Clonaslee Eskers and Derry Bog SAC (000859)	1.2km	**Annex I Habitats** Alkaline fens [7230] **Annex II Species** *Vertigo geyeri* (Geyer's Whorl Snail) [1013]	New pumps, storage and mains, WTP upgrades. Option study area is hydrologically linked to this European site **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –**There is potential for the spread of invasive species given that the works are close to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Charleville Wood SAC (000571)	1.6km	**Annex I Habitats** Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is hydrologically linked to this European site **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –**There is potential for the spread of invasive species given that the works are close to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.29: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA6-552 (180c, 184) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Bloom Mountains SPA (004160)	2m	Hen Harrier (*Circus cyaneus*) [A082]	Breed	**Disturbance –** there is potential for disturbance to QI birds given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D6.30: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA6-149 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
River Barrow and River Nore SAC (002162)	3.1km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]	Option study area is within a gravel aquifer. Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option includes an increase in ground water abstraction. Option study area is within a gravel aquifer. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to QI species utilising watercourse hydrologically linked to this European site and further study required on ground water and surface water links required. **Habitat degradation – changes in water quality (hydrological changes).** An increase in abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lisbigney Bog SAC (000869)	4.9km	**Annex I Habitats** Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] **Annex II Species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	No potential impact pathway given distance from site and the QI feature it supports.	Option includes an increase in ground water abstraction. Option study area is within a gravel aquifer adjacent to a karst aquifer. **Water table/ Availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer. This groundwater abstraction is within a gravel aquifer adjacent to a karst aquifer which underlies this SAC.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				This has the potential to impact on groundwater dependent habitats and species. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.		

Preferred Approach options SA7-44 and SA7-60 not listed below as no LSEs identified for these options.

Table D7.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-55 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Derg, North-east Shore SAC (002241)	0km	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Taxus *baccata* woods of the British Isles [91J0]	Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex I habitat during construction works given that the works are within the SAC boundary. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are within the SAC boundary. **Habitat degradation –** water quality. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and otter directly or indirectly via impacts to prey species.	**Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential impacts to groundwater dependent habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Shannon Callows SAC (000216)	0.53km	**Annex I Habitats** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II Species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation –** water quality. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and otter directly or indirectly via impacts to prey species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are adjacent to the SAC boundary.	**Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential impacts to groundwater dependent habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA7-55 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Derg (Shannon) SPA (004058)	0km	Cormorant (*Phalacrocorax carbo*) [A017] Tufted Duck (*Aythya fuligula*) [A061] Goldeneye (*Bucephala clangula*) [A067] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999	breed non-b non-b breed	**Disturbance -** the site is directly adjacent to the SPA therefore there is potential for disturbance to QI birds using SPA designated habitats in the vicinity of Portumna WTP.	**Habitat degradation – changes in water quality (hydrological changes)** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential impacts to groundwater dependent habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-504 (36b, 43a, 54b) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Derg, North-east Shore SAC (002241)	10.9km	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] *Taxus baccata* woods of the British Isles [91J0]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality**. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats.	No operational effects are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-63 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Sharavogue Bog SAC (000585)	ca.8.9km	**Annex I Habitats** Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality**. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact hydrologically connected habitats. Although there is a WTP within 1km proximity of Sharavogue Bog SAC, this was deemed as having no potential impact as there was no pathway between the closest WTP and the SAC.	No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-23 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Derg, North-east Shore SAC (002241)	1.6km	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] Taxus *baccata* woods of the British Isles [91J0]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality**. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Shannon Callows SAC (000216)	ca. 3.5km	**Annex I Habitats** Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species**	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality**. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact QI species and hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Lutra lutra (Otter) [1355]				

Table D7.6: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA7-23 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Middle Shannon Callows SPA (004096)	2.7km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Corncrake (*Crex crex*) [A122] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	non-b non-b breed non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Little Brosna Callows SPA (004086)	ca. 3.2km	Whooper Swan (*Cygnus cygnus*) [A038] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Golden Plover (*Pluvialis apricaria*) [A140] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Dovegrove Callows SPA (004137)	3.4km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	non-b	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.7: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-61 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Derg, North-east Shore SAC (002241)	<100m	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] *Taxus baccata* woods of the British Isles [91J0]	Option study area is adjacent to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex I habitat during construction works given that the works are adjacent to the SAC boundary. **Habitat degradation –** water quality. Pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given that the works are adjacent to the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.8: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA7-61 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Derg (Shannon) SPA (004058)	<100m	Cormorant (*Phalacrocorax carbo*) [A017] Tufted Duck (*Aythya fuligula*) [A061] Goldeneye (*Bucephala clangula*) [A067] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	breed non-b non-b breed	Option study area is adjacent to this European site. **Disturbance -** the site is directly adjacent to the SPA therefore there is potential for disturbance to QI birds in the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D7.9: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA7-14 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lough Derg, North-east Shore SAC (002241)	ca.600m	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]	Option study area is hydrologically linked to this European site. **Habitat degradation –** water quality potential pollution of watercourses during construction could affect hydrologically connected habitats.	Option includes an increase in GW abstraction. **Water table/availability** The Option abstraction occurs over a region of karstified bedrock directly linked to the European	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0]	**Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to the SAC.	site. There is existing pressure from the current abstraction and this option poses a risk due to the abstraction being a potential permanent effect. Further detailed assessment required at site level. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI habitats.		

Table D7.10: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA7-14 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Lough Derg (Shannon) SPA (004058)	ca.600m	Cormorant (*Phalacrocorax carbo*) [A017] Tufted Duck (*Aythya fuligula*) [A061] Goldeneye (*Bucephala clangula*) [A067] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	breed non-b non-b breed	Option study area is hydrologically linked to this European site. **Disturbance -** there is potential for disturbance to QI birds within the SPA given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-09 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Ratty River Cave SAC (002316)	ca. 100m	**Annex I Habitats** Caves not open to the public [8310] **Annex II species** *Rhinolophus hipposideros* (Lesser Horseshoe [LHS] Bat) [1303]	Option study area within core LHS foraging and commuting range **Habitat loss –** within 120m of lesser horseshoe (LHS) SAC. Works within the 2.5km core foraging range from SAC. Vegetation, hedgerow or tree clearance associated with the works could sever important commuting routes for LHS bats commuting between their roost site in the SAC and foraging areas outside the confines of the SAC. This would require further assessment to ensure impacts are avoided.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lower River Shannon SAC (002165)	ca. 7km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Tursiops truncatus (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-09 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Shannon and River Fergus Estuaries SPA (004077)	ca. 8km	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	breed non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of waterbodies during construction could impact on the wetland habitat used by QI bird species. **Disturbance-** there is potential for disturbance to QI birds within the SPA and using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-01 (in conjunction within option SA8-172) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 200m	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option includes an increase in GW abstraction. Option study area overlies a karstic aquifer. **Water table/availability** There is likely a high association between surface water and groundwater flows at the abstraction point; a high Baseflow Index (BFI). Therefore, there is potential for impacts to this European site and further detailed study required. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-01 (in conjunction with SA8-172) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Shannon and River Fergus Estuaries SPA (004077)	ca. 5km	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	breed non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of waterbodies during construction could impact on the wetland habitat used by QI bird species. **Disturbance-** there is potential for disturbance to QI birds within the SPA and using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-20a and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Aughty Mountains SPA (004168)	ca. 20m	Hen Harrier (*Circus cyaneus*) [A082] Merlin (*Falco columbarius*) [A098]	breed breed	**Disturbance –** there is potential for disturbance to QI birds given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.6: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-504 (31a) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	0km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option pipeline crosses this European site. Option includes an increase in SW abstraction. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact QI species. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option pipeline crosses this European site. Option includes an increase in SW abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** Option includes abstraction adjacent to this European site. Therefore, there is potential for impacts on aquatic QI species utilising watercourses hydrologically linked to this European site through a reduction in flows/water levels.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** In addition to general mitigation measures outlined above options specific measures have been identified for **SA8-504** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI, 2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.7: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-504 (31a) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Shannon and River Fergus Estuaries SPA (004077)	2.6km	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	breed non-b	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of waterbodies during construction could impact on the wetland habitat used by QI bird species. **Disturbance-** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.8: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-22 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 15km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** There is potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.9: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-22 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Aughty Mountains SPA (004168)	ca. 250m	Hen Harrier (*Circus cyaneus*) [A082] Merlin (*Falco columbarius*) [A098]	breed breed	**Disturbance –** there is potential for disturbance to QI birds given the proximity of the study area to the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.10: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-24 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 14.5km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) – T**here is potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.11: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-24 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Aughty Mountains SPA (004168)	0km	Hen Harrier (*Circus cyaneus*) [A082] Merlin (*Falco columbarius*) [A098]	breed breed	Option pipeline is within or adjacent to this European site. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.12: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-179 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 15km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** There is potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Salmo salar (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.13: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-21 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	20km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.14: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-21 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Aughty Mountains SPA (004168)	0km	Hen Harrier (*Circus cyaneus*) [A082] Merlin (*Falco columbarius*) [A098]	breed breed	Options study area is within this European site **Disturbance –** there is potential for disturbance to QI birds given the study area is within this European site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.15: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-120 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slieve Aughty Mountains SPA (004168)	0km	Hen Harrier (*Circus cyaneus*) [A082] Merlin (*Falco columbarius*) [A098]	breed breed	Option pipeline is within or adjacent to this European site. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lough Derg (Shannon) SPA (004058)	ca. 5.2km	Cormorant (*Phalacrocorax carbo*) [A017] Tufted Duck (*Aythya fuligula*) [A061] Goldeneye (*Bucephala clangula*) [A067] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]	breed non-b non-b breed	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution) -** potential pollution of waterbodies during construction could impact on the wetland habitat used by QI bird species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.16: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-510 (17f, 84, 105, 192) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	0km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170]	This option includes an increase in abstraction from this European site. Option pipeline crosses this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary.	Option includes an increase in abstraction from this European site. **Habitat degradation – changes in water quality (hydrological changes)** Option includes direct abstraction from this European site which could lead to hydrological changes that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** In addition, construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	**Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact QI species. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	**Water table/ availability** Option includes abstraction from this European site. Therefore, there is potential for impacts on aquatic QI species utilising watercourses hydrologically linked to this European site through a reduction in flows/water levels.	environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI, 2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI.	

Table D8.17: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-510 (17f, 84, 105, 192) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Shannon and River Fergus Estuaries SPA (004077)	0km	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141]	breed non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	Option pipeline runs adjacent to this European site. **Habitat degradation – water quality (pollution)** potential pollution of waterbodies during construction could impact on the wetland habitat used by QI bird species. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b non-b non-b				

Table D8.18: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-508 (199, 40, 138, 49) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	0km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Option pipeline crosses this European site. Option includes an increase in SW abstraction. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact QI species. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option pipeline crosses this European site. Option includes an increase in SW abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** Option includes abstraction adjacent to this European site. Therefore, there is potential for impacts on aquatic QI species utilising watercourses hydrologically linked to this European site through a reduction in flows/water levels.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** In addition to general mitigation measures outlined above options specific measures have been identified for **SA8-508** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI, 2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Annex II species *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.19: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-508 (199, 40, 138, 49) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slievefelim to Silvermines Mountains SPA (004165)	0km	Hen Harrier (*Circus cyaneus*) [A082]	Breed	Option study area is within this European site. **Physical loss of habitats/supporting habitat –** There is potential for some loss of/damage to supporting habitats (e.g. foraging habitats) to QI species during construction works given that the works are within the SPA boundary. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.20: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-51 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Tory Hill SAC (000439)	ca. 5km	**Annex I Habitats** Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	No potential impact pathway. Given distance from site and the QI features it supports.	Option study area overlies a karst aquifer. **Water table/ availability** There is a risk this groundwater abstraction will reduce water flow in the underground aquifer and impact QI habitats. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrogeological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
				– impacting on water quality) that could impact QI habitats.		

Table D8.21: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-52 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 20km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted. Although there is a groundwater abstraction this European site is not within the zone of contribution (ZOC).	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Salmo salar (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.22: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-59 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 27km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitanti*s and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted. Although there is a groundwater abstraction this European site is not within the zone of contribution (ZOC).	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Petromyzon marinus (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.23: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-516 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Blackwater River (Cork/Waterford) SAC (002170)	ca. 7.2km	**Annex I Habitats** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D8.24: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-68 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 18km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.25: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-98 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	0km	Hen Harrier (*Circus cyaneus*) [A082]	breed	Option study area is within this European site. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.26: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-100 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 1.5km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts are predicted. Although there is a groundwater abstraction this European site is not within the zone of contribution (ZOC).	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Petromyzon marinus (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]				

Table D8.27: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-100 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
River Shannon and River Fergus Estuaries SPA (004077)	ca. 1.5km	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	breed non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	**Disturbance-** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.28: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-177 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 170m	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II Species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is adjacent to this European site and includes an increase in SW abstraction. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are adjacent to this European site.	Option study area is adjacent to this European site and includes an increase in SW abstraction. **Habitat degradation – changes in water quality (hydrological changes).** Abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact QI species or habitats. **Water table/ availability** Option includes abstraction adjacent to this European site. Therefore, there is potential for impacts on aquatic QI species utilising watercourses hydrologically linked to this European site through a reduction in flows/water levels.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.29: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-149 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 11km	**<u>Annex I Habitats</u>** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.30: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-145 and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	ca. 15km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect QI species and hydrologically connected habitats.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.31: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-523 (163 & 166) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	1.4km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Increase GW abstraction, upgrade WTP and pump, new mains. Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats.	No operational impacts are predicted. Although there is a groundwater abstraction this European site is not within the zone of contribution (ZOC).	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**
Lower River Suir SAC (002137)	940m	**Annex I habitats** Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to aquatic species including otter from construction works. There is also potential for the spread of invasive species given that the works are hydrologically linked to this European site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Annex II species *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]				

Table D8.32: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA8-523 (163 & 166) and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Slievefelim to Silvermines Mountains SPA (004165)	0km	Hen Harrier (*Circus cyaneus*) [A082]	breed	Option study area is within this European site. **Habitat loss –** There is potential for some loss of/damage to hen harrier habitat during construction works given that the works are within the SPA boundary. **Disturbance –** there is potential for disturbance to QI birds given the study area is within the SPA.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI	**N**

Table D8.33: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA8-512 (27 & 118) and Mitigation Measures.

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	0km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170]	New WTP, pumps and mains. Option pipeline crosses this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact QI species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** In addition to general mitigation measures outlined above options specific measures have been identified for **SA8-512** (see **Section 6.3.4**) as follows: Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-	**N**

European Sites	Distance from Option Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **<u>Annex II species</u>** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	**Habitat degradation – water quality (pollution)** potential pollution of watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.		derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI, 2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.* With the implementation of mitigation as noted above there is no potential for AESI	

Table D9.1: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with options SA9-84 and Mitigation Measures.

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Lower River Shannon SAC (002165)	0km	**Annex I habitats** Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] Degraded raised bogs still capable of natural regeneration [7120] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Alkaline fens [7230] **Annex II species** *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	Option includes a new surface water abstraction from this European site. Option study area is within this European site. Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are within the SAC boundary. **Mortality risk -** pollution of water courses during construction (associated with sediment runoff, or accidental spillage) could impact migratory fish, restrict access to spawning habitat and smother freshwater pearl mussel. **Habitat degradation –water quality** potential pollution of nearby watercourses during construction could affect hydrologically connected habitats. **Disturbance (including biological disturbance) –** there is potential for disturbance to otter from construction works. There is also potential for the spread of invasive species given that the works are within the SAC boundary.	Option includes a new surface water abstraction from this European site. Option study area is hydrologically linked to this European site. **Water table/availability** -Option includes abstraction from this European site. Therefore, there is potential for impacts on aquatic QI species utilizing watercourses hydrologically linked to this European site through a reduction in flows/water levels. **Habitat degradation – changes in water quality (hydrological changes)** Option involves direct abstraction from this European site which could lead to hydrological changes that could impact QI species and habitats.	• General Mitigation Measures are outlined in **Section 6.3.3** • Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Lisduff Fen SAC (002147)	500m	**Annex I Habitats** Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Option study area is hydrologically linked to this European site. **Habitat loss –** There is potential for some loss of/damage to	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3**	**N**

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Alkaline fens [7230] **<u>Annex II species</u>** *Vertigo geyeri* (Geyer's Whorl Snail) [1013]	QI/Annex 1 supporting habitats during construction works given that the works are within 500m of the SAC boundary. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.		With the implementation of mitigation as noted above there is no potential for AESI.	
Sharavogue Bog SAC (000585)	1.4km	**<u>Annex I Habitats</u>** Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Barrow and River Nore SAC (002162)	2.6km	**<u>Annex I Habitats</u>** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
		Petrifying springs with tufa formation (*Cratoneurion*) [7220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]				
Lough Derg North-East Shore SAC (002241)	3.6km	**Annex I Habitats** *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Charleville Wood SAC (000571)	5.1km	**Annex I Habitats** Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] **Annex II species** *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
			Disturbance (including biological disturbance) – there is potential for the spread of invasive species given the hydrological link to this site.			
Rye Water Valley/Carton SAC (001398)	ca. 8km	**Annex I Habitats** Petrifying springs with tufa formation (*Cratoneurion*) [7220] **Annex II species** *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Boyne and River Blackwater SAC (002299)	13km	**Annex I Habitats** Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species** *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
River Shannon Callows SAC (000216)	14.8km	**Annex I Habitats** *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Limestone pavements [8240] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] **Annex II species** *Lutra lutra* (Otter) [1355]	Option study area is hydrologically linked to this European site. **Habitat degradation – water quality** pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D9.2: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with option SA9-87 and Mitigation Measures.

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Baldoyle Bay SAC (000199)	65m	Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Option study area is hydrologically linked to this European site. **Habitat degradation –** water quality pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Malahide Estuary SAC (000205)	380m	Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	Option study area is hydrologically linked to this European site. **Habitat degradation –** water quality pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species. **Disturbance (including biological disturbance) –** there is potential for the spread of invasive species given the hydrological link to this site.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
The Murrough Wetlands SAC (002249)	5km	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	Option study area is hydrologically linked to this European site. **Habitat degradation –** water quality pollution of water courses during construction (associated with sediment runoff and/or accidental spillage) has the potential to impact any hydrologically connected habitats and associated species.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D9.3: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with option SA9-87 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
North Bull Island SPA (004006)	5m	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A13] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Turnstone (*Arenaria interpres*) [A169] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
South Dublin Bay and River Tolka Estuary SPA (004024)	30m	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162]	non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b passage breed passage	**Disturbance -** there is potential for disturbance to QI birds.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Wetland and Waterbirds [A999]					
Baldoyle Bay SPA (004016)	340m	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Bar-tailed Godwit (*Limosa lapponica*) [A157] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
Malahide Estuary SPA (004025)	380m	Great Crested Grebe (*Podiceps cristatus*) [A005] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Pintail (*Anas acuta*) [A054] Goldeneye (*Bucephala clangula*) [A067] Red-breasted Merganser (*Mergus serrator*) [A069] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162]	non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds.	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
		Wetland and Waterbirds [A999]					
Rogerstown Estuary SPA (004015)	700m	Greylag Goose (*Anser anser*) [A043] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Redshank (*Tringa totanus*) [A162] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b non-b non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**
The Murrough SPA (004186)	700m	Red-throated Diver (Gavia stellata) [A001] Greylag Goose (Anser anser) [A043] Light-bellied Brent Goose (Branta bernicla hrota) [A046] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Black-headed Gull (Chroicocephalus ridibundus) [A179] Herring Gull (Larus argentatus) [A184] Little Tern (Sterna albifrons) [A195] Wetland and Waterbirds [A999]	non-b non-b non-b non-b non-b non-b non-b breed	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D9.4: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SACs) with options SA9-28 and SA9-46 and Mitigation Measures.

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
			Construction	Operation		
Rye Water Valley/Carton SAC (001398)	ca. 200m	**Annex I Habitats** Petrifying springs with tufa formation (*Cratoneurion*) [7220] **Annex II species** *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	Option study area is hydrologically linked to this European site. However, impacts are unlikely given that the SAC is upstream of the site and the QI features it supports.	Option study area is hydrologically linked to this European site. Although this European site is upstream and not within the zone of contribution (ZOC) more information on abstraction regime required. Therefore, there is the potential for impacts as described below. **Water table/ availability** -Option includes abstraction downstream of this European site. Therefore, there is potential for impacts on aquatic QI species through a reduction in flows/water levels. **Habitat degradation – changes in water quality (hydrological changes)** Option involves direct abstraction downstream of this European site which could lead to hydrological changes that could impact QI species and habitats.	• Hydrological modelling as in **Section 6.3.5** With the implementation of mitigation as noted above there is no potential for AESI.	**N**

Table D9.5: Source-Pathway- Receptor Analysis – potential impact pathways connecting European Sites (SPAs) with options SA9-28 and SA9-46 and Mitigation Measures. Unless otherwise stated impacts are considered direct impacts.

European Sites	Distance from Proposed Study Area (Km)	Qualifying Interests	Breeding (Breed)/ Non-breeding (Non-b)	Potential Impact Pathway		Mitigation Measure Conclusion	Adverse Effects on Site Integrity (Y/N)
				Construction	Operation		
Poulaphouca Reservoir SPA (004063)	ca. 1.3km	Greylag Goose (*Anser anser*) [A043] Lesser Black-backed Gull (*Larus fuscus*) [A183]	non-b non-b	**Disturbance -** there is potential for disturbance to QI birds using habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).	No operational impacts are predicted.	• General Mitigation Measures are outlined in **Section 6.3.3** With the implementation of mitigation as noted above there is no potential for AESI.	**N**