11. AQUATIC ECOLOGY – CABLE

Additional information relevant to Section 11 is presented in Appendix G in Volume 2 of 3 of the EIS.

11.1 RECEIVING ENVIRONMENT

11.1.1 Methodology

Consultation

Details of the proposed works were discussed on site with Mr Michael McPartland and Ms Patricia O'Connor (IFI). Dr Dennis Doherty (ESB) was consulted regarding salmon movements past the dams at Carrigadrohid and Iniscarra and the ESB's restocking programme in the River Lee and its tributaries, and Mr Tom Sweeney, (Macroom Anglers) was contacted regarding trout angling on the Sullane and its tributaries. In addition, a field visit to a broad range of watercourse crossings was undertaken to discuss the crossing methods likely to be employed at watercourses. Dr Eugene Ross (Tralee IT) and Dr William O'Connor (Ecofact) supplied details of freshwater pearl mussel records for the Roughty River

Fieldwork

A series of detailed field investigations was undertaken during November and December 2014 at all the main river and stream crossings along the route of the underground cable to assess their water quality and fisheries habitats. The route was visited on several dates and each of the watercourses crossed, including the smallest diameter piped drain crossing roads, along the route was mapped and was photographed where relevant. This was undertaken during a period of wet weather, which facilitated identification of the smaller drains. At each of the 147 crossings encountered, an assessment was made about the likelihood that fish were utilising the habitat present. These details were mapped using an appropriate colour code for each crossing indicating its assessed fish use status.

A representative number of the main streams and rivers along the route were also assessed for their current baseline water quality using the EPA Q-rating method. Q-value scores and the corresponding WFD Status, the corresponding degree of pollution associated with each are listed in Table 11.1.

Table 11.1: EPA Q-ratings and Corresponding Pollution Status and Water Framework Directive Status

Q-rating	EPA Pollution Status	WDF Status
Q5	Unpolluted	High
Q4-5	Unpolluted	High
Q4	Unpolluted	Good
Q3-4	Slightly Polluted	Moderate
Q3	Moderately Polluted	Poor
<Q3	Moderately-Seriously Polluted	Bad

At each site (refer to Table 11.2) a two-minute moving kick-sample and one minute stone washing was taken in riffle-type habitat with a long-handled pond net (1 mm mesh). The material collected was sieved through a 500 µm sieve to remove fines and examined on the bankside in a white tray. Abundance categories were assigned using the EPA method and Q-ratings were calculated.

11.1.2 River Drainage Areas

The route of the UCG from Ballyvouskill to Coomataggart traverses two main river catchments, namely the River Roughty to the west containing about 25% of the route and the Sullane to the east containing the remaining 75%. The Sullane catchment portion of the route can be sub-divided into three sections, namely the main Sullane running east as far as Ballyvourney, a second section travelling through the Bohill River catchment to the north east and finally at the eastern end of the route in the upper Foherish catchment including the Garrane River sub-catchment.

The locations of the river crossings are indicated in Figures 11.1-11.3**.**

The Roughty Catchment

Although the western part of the underground cable route is within the Roughty River catchment, it doesn't cross the main channel of the river at any point. The most significant crossing in terms of width of channel is at the bridge at Sillahertane (S116) toward the downstream end of this medium sized stream flowing from the east (herein referred to as the Sillahertane Stream). The crossing is approximately 400 m upstream of the main channel of the Roughty. Elsewhere within the Roughty catchment, the cable crosses mostly very small drains or streams and a few more sizeable streams that eventually drain to the main channel.

Main Channel of the Sullane to the Bohill Confluence in Ballyvourney

The underground cable route runs along the road parallel to the main channel of the River Sullane from the Roughty watershed at Coomnaneage near ING 11150, 73500 downstream as far Ballyvourney Bridge at ING 119570 77586, a distance of over 10 km. Along the way it crosses the main channel of the Sullane at three locations including at two bridges (S75 and S67) and just upstream of Ballyvourney village (S49), as well as at least 37 side streams and drains, the majority of which are very small.

Bohill River and Cappagh West Stream

Starting from just after Ballyvourney Bridge this part of the route follows a series of byroads north and north east as far as the watershed between the peaks of Carrigrathduff and Knockullane just below Mullaghanish at ING:122400 80400. Within this portion of the route the underground cable traverses two small rivers, the Bohill River about 50 m below Cappagh Bridge (S44) and a tributary stream flowing east through Cappagh West (S43) (herein referred to as the Cappagh West stream). In addition, there are 19 other small stream and drain crossings along this portion of the route.

Foherish River Catchment

Travelling east from the Bohill River catchment the eastern section of the underground cable route enters the upper catchment of the Foherish River crossing approximately 24 small streams and one small river, the Garrane (S13), toward the eastern end of the route. Several of the small streams in this and the previous section flow over very steep terrain and are very torrential in nature

11.1.3 Water Quality

Water quality for the watercourses traversed by the cable route was compiled from online data from the EPA, as well as through field surveys at 10 sites (Table 11.2).

Table 11.2: Summarised Water Quality Results

Site Name	Catchment	Q Rating	Status
S13 Garrane Bridge	Foherish	Q4	Good
S15 Small trib. of Garrane	Foherish	Q4 (Q4-5)	Good
S43 Cappagh West stream (Slievereagh Stream)	Bohill	Q4 (Q4-5)	High
S44 Bohill River	Bohill	Q4-5	Good
S49 Sullane d/s Ballyvourney Bridge	Sullane	Q4 (Q4-5)	High
S55 Trib. Of Sullane near Murnaghbeg	Sullane	Q4-5 (Q4)	High
Sullane at Milleeny Bridge, Coolea	Sullane	Q4-5 (Q4)	High
S67 Sullane at bridge near Lumnaghmore	Sullane	Q4-5	High
S116 Sillahertane Stream at Bridge	Roughty	Q4-5 (Q4)	High
Roughty Main Channel – Upper Catchment	Roughty	Q4-5	High

The Roughty River

The Roughty River drains large areas of upland in the south western peaks of the Derrynasaggart Mountains. The biological water quality along all of its main channel from source to sea is ranked as High, i.e. Q4-5, in recent EPA surveys (2012) and most of the sites on its tributary streams (the Owbeg, Slaheny and Cleady) are also ranked as High, with the exception of one site on the lower Slaheny which was classed as Good, i.e. Q4. One of the EPA sites on the upper Roughty at the Bridge near Knockanruddig was sampled for macroinvertebrates (at ING 108773 70901) and a Q4-5 rating was also obtained indicating a High status water. In addition, a small tributary which joins the Roughty from the east (Sillahertane Stream, S116) was sampled at the bridge near Sillahertane about 400 m upstream of its confluence with the main Roughty at ING 109154 73230, where a Q4-5 High status was also obtained. In the latter case the quality wasn't quite as high as in the main channel veering toward Q4 (Good status) but nevertheless was very suitable for salmonid fish.

The likely reason for the overall High status water in the Roughty is the great expanse of blanket bog and a general lack of intensive farming in the catchment, where sheep grazing is the most widely practiced form of livestock rearing. The High status classification also explains the suitability of the river for salmon and why there is a known small population of freshwater pearl mussels (*Margaritifera margaritifera*) recorded there.

River Sullane

The EPA's most upstream monitoring point on the Sullane is at Milleeny Bridge (at Coolea) and from that downstream as far as Linnamilla Bridge about 2 km upstream of Macroom the river was classified as of High ecological status, i.e. Q4-5 or Q5, during the last published EPA monitoring run (for 2011). This clearly indicates that the water quality is suitable for salmon and trout. As part of the current study, macroinvertebrates were sampled at three sites, one in the upper reaches just upstream of the bridge between Lumnagh More and Lumnagh Beg (ING: 114034 74497), at Milleeny Bridge (ING: 116158 75905) and downstream of Ballyvourney Bridge at ING: 119648 77580. These were ranked at Q4-5, Q4-5 and Q4 (bordering on Q4-5) respectively i.e. High, High and Good to High. This confirms that the water quality in the stretch is suitable for salmonids. A tributary stream joining the main channel between Coolea and Ballyvourney at Mournaghbeg (S55) also returned a Q4-5 High status rating.

Despite the classification of the main channel of the Sullane as generally High status in the most recently online published EPA monitoring data for their 2011 surveys (which were mainly confirmed in the present survey), Moorkens (2007) sampling for pearl mussels along the main channel in September (2007) observed several localised stretches where there was strong evidence of eutrophication in the form of dense filamentous algal growths and high percentage cover rates of Ranunculus. In addition, siltation was also evident on the bed in places.

Bohill River and Cappagh West Stream

None of the streams in this section of the route is sampled by the EPA as part of its monitoring programme. For the current study the Bohill River was sampled at ING: 119822 79175, (upstream from S44) where Q4-5 was recorded i.e. High ecological status. The other main stream flowing from the east by Cappagh West (S43) was sampled just upstream of the bridge at ING: 120071 178856 and the water quality was found to be Good (Q4) bordering on High (Q4-5). Again, these streams would be suitable for salmonids. Pearl mussels have not been recorded in either water course (RPS, 2014).

Foherish Catchment

The most easterly section of the underground cable route drains to the Foherish River and to a tributary of the Foherish, the Garrane River. The EPA includes sites on both these rivers for its monitoring programme. The upper Foherish is monitored at two sites, the more upstream at ‘Br N of Cumnaleigh’ (ING: 126403 80969) and at Foherish Bridge (ING: 127983 81444). In both cases a High ecological status was assigned (Q4-5) in 2011. The Garrane is sampled in its lower reaches just upstream from its confluence with the upper Foherish at ING: 127036 81257 (‘Br u/s Foherish River’) which was classified as Good status (Q4) in 2011. The underground cable route traverses the same channel about 3 km upstream at Garrane Bridge S1 (ING: 124679 83384) and the water quality measured at this site for the current assessment was also Q4, i.e. Good ecological status. The water quality in one of the 12 smaller streams (S15) crossed along this section of the route was also sampled as part of this study and was classed as High Status with a Q-rating of Q4-5 and it is likely that most if not all of the other small streams are also High status or at least Good status, given that the bulk of the agriculture appears to be low intensity and large tracts of ground sustain no agriculture. These small channels flow into the upper Foherish River.

11.1.4 Fisheries Habitats

A detailed survey of the drainage along the cable route revealed a 147 individual watercourses (Figures 11.1-11.3), which are mainly tiny drains and streams diverted under the roads along which the underground cable is routed. The majority of these (92) are thought likely to have no fish life. A smaller number (31) which are all small or very small streams, are thought very unlikely to have fish present by virtue of either their size, very steep gradients, unsuitable habitats etc. However, the presence of some fish (mainly trout) cannot be entirely ruled out in all cases, particularly in the lower reaches of some of the larger ones where the channel gradient becomes less steep. Then there is a smaller number (16) of small to moderately sized streams where the chances of fish being present is considered higher i.e. probably greater than 50%, although none of these would be important in themselves for their fisheries habitats; these are indicated with purple dots on the map. Finally there are eight larger streams and river sections that will definitely have fish present and contain moderate to good fisheries habitat downstream of each crossing point. Only in the case of one of these, in the Roughty catchment (S116) where the channel is wide enough is it possible that salmon might be present. However, they can only be present some distance downstream of the crossing because an impassable fall at that point prevents them from migrating into most of the stream channel which is situated above that point. All of the other channels traversed by the cable will have trout as their main species either because they are in the Sullane catchment or if they are in the Roughty catchment they are too small or the gradient is too steep. It is known from some recent data and previous electrofishing surveys that there are some juvenile salmon in the Sullane catchment but it seems as if their numbers are generally very low, with trout being the dominant and very widespread species in the system. It is important to note that it is likely that some tiny streams and drains could have been missed in the survey, but it is very unlikely that a channel larger than those recorded will have been overlooked.

Table 11.3: Watercourse Details

Description of Watercourse	Likelihood of Fish Present	No. of Watercourses
Tiny drains and streams diverted under the roads	No fish life	92
Small or very small streams	Fish Very Unlikely	31
Small to moderately sized streams	Fish Possible	16
Larger Streams	Fish Certain	8
Total		147

11.1.5 European Conservation Sites

There are no Natura 2000 sites present with a hydrological connection to the underground cable route within 15 km of any part of the site. The nearest sites are the Kenmare River SAC (Site Code 00215) toward the western side of the study area and to the east Great Island Channel SAC (Site Code 004030) in Cork Harbour. Neither of these sites will be adversely impacted by the development and are not discussed further herein.

11.1.6 Conservation Species

Two Annex II aquatic species are present within the Roughty and Sullane catchments, namely the Freshwater Pearl Mussel (*Margaritifera margaritifera*) and the Atlantic salmon (*Salmo salar*).

Freshwater Pearl Mussels

The freshwater pearl mussel (*Margaritifera margaritifera)* which is protected under Irish and European legislation is an Annex II species under the EU Habitats Directive. The species is extinct across much of its European range or represented there by very small and declining residual populations. The Irish populations are some of the most important in Europe and are largely protected by the designation of SACs in which the species is a listed conservation objective. A total of 19 designated populations exist around the country. In addition, several rivers that are not designated contain smaller populations of the species and these include the Roughty River and the main channel of the Sullane and its tributaries the Foherish and the Laney. No mussels have been recorded in the Bohill River (RPS, 2014)

An extensive survey of the species was undertaken on the Sullane, the Foherish and the Laney in 2007 (Moorkens, 2007) and this is the benchmark study of the species in that catchment. A more recent study (RPS, 2014) concentrating on a shorter stretch around Ballyvourney, confirmed that the population was stable in the intervening 7 years since the Moorkens study. There does not seem to have been a systematic study of the River Roughty populations, although recent surveys in and around Kilgarvan have confirmed the presence of a small mussel population in that stretch (Ecofact, 2013).

Moorkens (2007) examined 15 sections of the main channel of the Sullane from O'Mahony's Bridge upstream of Coolea downstream to the River Laney confluence just downstream from Macroom. In the first three sections surveyed covering the stretch from O'Mahony's Bridge downstream to ING: 112598 75977, just downstream of Coolea, no mussels were encountered, the first being recorded in Section 4 about 1.2 km m downstream of Coolea starting at ING:117200 76353 where the highest density within the 15 study sections was noted (i.e. 300 mussels per 1 km). The next three stretches were all concentrated around Ballyvourney Bridge, from just below the confluence of the Owengarve River to immediately upstream of the confluence of the Bohill Stream. Within those three sections only 5 mussels were recorded (in Section 5) where the density estimate was 10 mussels per 1 km. The next three sections surveyed were located just downstream from the Bohill Stream confluence (Section 8), upstream and downstream of Ballymakeery Bridge (Section 9) and upstream of Poulnabro Bridge (Section 10). The estimated per km densities of mussels in each of these stretches were 278, 6 and 26 respectively, i.e. with the highest densities just downstream of the Bohill Stream confluence (Section 8). The remaining five survey sections (Sections 11-15) located from Sullane Bridge to below Macroom revealed per km densities of 20, 0, 4, 40 and 0 mussels respectively. The age profile of all of the mussels examined in the Sullane indicated that there had been no new mussels recruited to the population for at least 20 years. The survey report would suggest that suitable pearl mussel habitat on the Sullane is fairly localised and that in many places a combination of filamentous algae, heavy macrophyte cover and silt are all contributing to reducing its suitability. The overall estimated numbers for the surveyed stretches came to 684 and the Moorkens (2007) report concluded that the total population for the main channel of the Sullane was unlikely to exceed 2,000.

Moorkens (2007) also surveyed six sections on the Foherish River from upstream of Carriganimmy Bridge to the confluence with the Sullane. The survey found no mussels in the two most upstream sections with the first mussel recorded in Section 3 at Clondrohid, where just one individual was observed and the per km density estimated at 2 individuals. A total of 82 mussels were estimated to have been present in the six sections surveyed and the report concluded that the Foherish population was unlikely to exceed 200 individuals overall. Again, as in the case of several points within the Sullane, the 2007 survey pointed to significant evidence of eutrophication on the Foherish which is inimical to the survival and reproduction of *Margaritifera*.

Salmon

None of the watercourses within the Roughty catchment crossed by the underground cable route is likely to be used by salmon, but all watercourses that are crossed drain directly or indirectly to the main river, which does contain salmon. The Roughty River has a good stock of salmon which are present in numbers above the conservation limits set for the river and therefore angling and commercial fishing is permitted. Annually, on average around 225 fish are caught commercially in the estuary and about 200 on rod and line in the river. The rod caught fish are mainly grilse taken in June to September, especially August and September, with about 10% of the catch multi-sea winter fish. Small numbers of seatrout are also caught. The High status water quality throughout most of the system combined with extensive riverine habitats suitable for salmonids clearly contribute to the health of the fishery. Spawning is likely to occur in many parts of the main channel as well as in tributaries. Salmon are likely to be present throughout the system except on the Sillahertane above an impassable falls located just below the underground cable crossing point, and in part of the upper reaches of the main channel i.e. farther upstream from the confluence of the Sillahertane Stream and closer to Grousemount.

The Sullane River and its main tributaries the Foherish and Laney Rivers discharge into the upper Lee Reservoir (Carrigadrohid reservoir) downstream of Macroom. The presence of the Carrigadrohid and Iniscarra hydroelectric dams on the River Lee downstream, means that the Sullane and its tributaries have no natural migration run of the species, despite extensive areas of suitable habitat. A salmon restocking programme by the ESB releases thousands of juveniles into the catchment above Carrigadrohid annually and some juveniles have been recorded from time to time in the river during electrofishing surveys. It is known from a recent IFI survey that there are juvenile salmon in the Sullane, with 46 individuals recorded at Sullane Bridge upstream of Macroom in 2014 and it is possible that small numbers of salmon occur more widely within the system. However, the population is not believed to be self-sustaining, is currently below its conservation limits and no salmon angling is permitted within this part of the River Lee system.

Other Species

The Sullane system has a healthy trout population with extensive areas of suitable habitat throughout the main channel and in the tributaries. The Sullane has only been surveyed once under the WFD monitoring programme (in 2014) at Sullane Bridge near Lissacresig approximately 6 km upstream of Macroom. The survey recorded 180 brown trout, 46 salmon, 5 minnow, 4 stickleback, and 4 stone loach. The river also contains roach and possibly roach hybrids which according to local anglers have become increasingly apparent in the past two years and are extending as far upstream as Ballyvourney. There's an active angling club in Macroom with angling mainly concentrated in the lower reaches upstream and downstream of Macroom, as well as on the Foherish and Laney Rivers which also hold good stocks of trout.

Along the underground cable route the Bohill Stream and the Cappagh West stream both contain habitat suitable for trout and they are is likely to be common in both waters. In addition, a number of the smaller streams contain suitable habitat for trout and the species is also likely to be present in some of these.

The main channel of the Roughty River and the main tributary crossed by the cable at Sillahertane will also contain trout.

11.2 IMPACT OF THE DEVELOPMENT

11.2.1 Overview

Relevant Characteristics of the Proposal.

The relevant aspects of the underground cable development are as follows:

- Excavation of the cable trench.
- Construction of joint bays
- Watercourse crossing methods including open-cut and trenchless (HDD).

Each of these activities and particularly watercourse crossings could lead to washout of soil and other construction associated particulates from the site, which could enter the drainage system along the route.

Only the aspects of the underground cable construction with the potential to cause impacts in watercourses traversed by the cable or to which these watercourses drain are considered.

It is important to note that these activities will generally only have the potential for adverse impacts when it is being undertaken close to a watercourse or to a drain leading to a watercourse. Moreover, not all impacts are equally likely in all situations; it will depend among other things on ground conditions, slope and weather conditions before during and after the activity etc.

IFI Requirements

Consultation with the IFI stated the following general principles should apply from a fisheries perspective:

- The preferred option from a fisheries perspective is that the cable be embedded in the road surface and not involve in-stream works.
- Directional drilling would be the second least intrusive option with any form of open channel in-stream cut being the last resort.
- If any culverts are being replaced as part of the works provision in terms of design and construction detail must be made to ensure these permit fish passage.
- Any in-stream works or works liable to lead to an increase in suspended solids levels above ambient should be limited to the May-September period inclusive.

These requirements will be adhered to, where feasible.

11.2.2 Construction Activities

Trench Construction

Aspects of trenching which may be a source of solids are as follows:

- Soil management: Wash-off of solids from temporarily stored excavated soil during heavy rainfall could give rise to solids contamination of watercourses if not correctly managed.
- Trench dewatering: Solids-contaminated water pumped from trench excavations could negatively impact receiving waters, should it be discharged untreated to watercourses if they were nearby.
- Adding CBGM B: Although the CBGM B is a semi-dry granular material it may be vulnerable to erosion during heavy rainfall in areas where it is temporarily stockpiled along the route. As it contains cement, the run-off, should it reach surface waters, could be detrimental to aquatic life due to high pH and suspended solids.
- Bentonite injection: Bentonite grout is used to improve insulation of the cable within the ducts and it is injected at bentoniting pits every 100-200 m along the underground cable route. Bentonite grout is high in suspended solids also contains cement and should it reach surface waters would have a detrimental impact on aquatic life. While its method of use makes this very unlikely, nevertheless precautions will be taken to eliminate this risk.

Joint Bay Construction

Construction of a joint bay has the potential to give rise to adverse impacts, if it is situated near a watercourse or a drain leading directly to a watercourse. However, none of the joint bays on the underground cable route is situated near a stream and so the risk is considered low. Nevertheless, the aspects of the joint bay construction and installation that could potentially give rise to solids escapement are considered here, and taken account of in the Construction Methodology (Appendix C.1 in Volume 2 of 3 of the EIS):

- Site access and ground preparation: Access by vehicles to joint bays locations close to watercourses, especially on sloping ground, could lead to significant soil damage and potential for solids wash out to drains and watercourses during heavy rain.
- Soil excavation: Temporary stockpiles of excavated soil arising from joint bay construction could be a source of solids wash-out to streams depending on their proximity to watercourses.
- Dewatering: The excavated joint bay may require dewatering prior to the concrete base being laid. If the water contains high levels of suspended solids, these could reach nearby watercourses, if the local arrangements for their management are inadequate, especially on sloping ground or if the operation is too close to surface water drainage channels.
- Concreting: Pouring of concrete could lead to spills, if not properly managed. Should this occur near a watercourse, the consequences could be very severe. However, the likelihood is considered remote, as joint bays are built within an excavated pit.
- Backfilling with cement bound sand: Cement-contaminated run-off during heavy rainfall from temporary storage areas for cement bound sand used to backfill joint bays, would be a potential threat to watercourses if situated nearby, even though the cement content in the material is very low (i.e. 1 part cement : 40 parts sand).

Watercourse Crossings – Open Cut

Subject to agreement with IFI and using a range of best practice construction methods, it is proposed to undertake open-cut crossings of all drains and small streams along the route and of some of the larger streams. It is important to note however, that open-cut is only proposed for the period May to September for streams likely to contain fish i.e. outside of the salmonid spawning and early fry development period. One of two open-cut crossing methods will be used i.e. damming with pump-over, and damming with flume. The choice of method will depend mainly on the flow in the channel being crossed, with lower flow channels being crossed using the damming and pump-over method, and the damming and fluming method being used for channels with higher flow volumes.

- Site access and ground preparation: Heavy vehicle activity at and approaching the crossing point could give rise to localised soil and bank damage which would result in solids washing into the watercourse during heavy rainfall, especially in sites sloping toward the watercourse or where the soil is erodible.
- In-stream habitat damage: Digging the cable trench and damming the watercourse will result in the potential removal and/or silting of coarse bed material (boulders, cobbles, and gravel), which are important habitat elements required both for fish and invertebrates in watercourses.
- Watercourse damming: Damming of the watercourse may result in the release of solids to the watercourse depending on the materials being used, and the sequencing and approach taken. Where unsuitable clay or soil are used to make

the dam, the likelihood of solids escape will be higher.

- Dewatering of watercourse crossing excavation: Dewatering of excavations at the crossing may give rise to increased in-stream solids, if returned to the stream without treatment.
- Pumping over: Water discharged downstream from the pumping-over operation could cause erosion of the riverbed at the discharge point below the downstream dam, giving rise to habitat damage to the stream bed and solids erosion.
- Site reinstatement: Inadequately managed crossing site decommissioning and reinstatement could lead to solids wash-out reaching the crossed watercourse.

Watercourse Crossings – Trenchless

Horizontal Directional Drilling (HDD) will be employed at six river crossings, all of which are significant watercourses and all of which contain fish, e.g. the crossing of the Sullane at Ballyvourney Bridge (S49). In addition, HDD will be used at crossings S13, S21, S43, S44 and S67 if feasible. Aspects of this crossing method which could give rise to potential impacts include the following:

- Site access and ground preparation: Vehicular access to and at the launch and reception pits for HDD could act as sources of silt wash-out depending on ground conditions, slope and weather.
- Bentonite preparation, injection and recycling: Spills of bentonite or bentonite contaminated with drill arisings from any aspect of the bentonite handling process could be washed off the site and enter a watercourse with potential adverse impacts on aquatic life.
- Bentonite blow-out: If the drilling process encounters fractured rock there is a possibility that bentonite could be forced up through these fissures to the surface in the watercourse channel above, with potentially serious adverse consequences for aquatic life.
- Site reinstatement: Inadequately managed HDD site de-commissioning and re-instatement could lead to solids washout-out to the nearby watercourse.

11.2.3 Potential Impact on Annex II Species

Pearl Mussels

Pearl mussels require a very high standard of water quality to maintain sustainable populations. Currently the populations in the Sullane and Foherish are not self-sustaining, as no juveniles have been recruited to them in the past 20 years and the population of an estimated 2,000 mussels on the Sullane and 200 on the Foherish (Moorkens, 2007) is likely to gradually decline and become extinct unless the water quality improves. A significant threat to the species is sedimentation of their habitats with fine particulates. This has both direct and indirect impacts on the species.

Direct impact is caused by the silt smothering the mussels or causing them to close their shells preventing them from breathing thereby causing their death. Indirectly sedimentation of their gravels can prevent sufficient water flow through the gravels thereby starving the juveniles of oxygen. Siltier conditions in gravel beds also facilitates the rooting of macrophytes which once established trap additional silt leading to more macrophyte colonisation thereby gradually degrading the habitat for mussels which become excluded.

Salmon

Salmon spawn during the winter laying their eggs in redds constructed in suitable clean gravels. The fertilised eggs require adequate clean water flowing through the redds to allow them to hatch and develop into yolk-sac fry while still in the river bed. It is at this stage and the early weeks of their swim-up from the gravels that they are particularly susceptible to silt. Large amounts of silt deposited in spawning beds smother the redds and prevent or reduce oxygenated water flow getting to the eggs and larvae which then fail to develop or experience increased mortalities. Early swim-up fry exposed to elevated suspended solids levels would also be very susceptible to increased mortalities in the spring as their gills would be very delicate.

Other Species

Brown trout spawn in very similar habitats to salmon and would similarly be susceptible to increased siltation caused by the escape of excessive amounts of soil or other inert particulates from the construction route.

11.2.4 Site-Specific Risk Assessments – Watercourse Crossings

It would be expected that the sites most likely to result in the highest potential for solids escapement would be the eight larger stream or river crossings. However three of these have sufficient overburden above the bridge or culvert to allow the cable be laid over the structure without a need for in-stream works. The other five watercourses will be crossed using the HDD trenchless method. In addition, a number of smaller stream crossings may also have the potential to release solids by virtue of their size or more challenging topography or access. These include one in the Foherish catchment (where HDD will also be used), one in the Bohill River and Cappagh West Stream catchment, one in the Sullane catchment and one in the Roughty catchment.

These sites along with their general characteristics are presented in Table 11.4, with a risk level that takes account of the distance of the sites to the nearest freshwater pearl mussel record on the Foherish, Sullane and Roughty Rivers, as well as the size of the watercourse to be crossed. The risk analysis assumes that all of these crossings will be by an open-cut method, i.e. HDD will not be used or will prove not to be suitable. It also assumes that Good Construction Practice, following the detailed site-specific methodology presented the Construction Methodology (Appendix C.1 in Volume 2 of 3 of the EIS), will be used at all times.

The assessment, although specifically aimed at pearl mussels, also takes into account salmon on the Roughty catchment and mainly trout in the Sullane, Bohill and Foherish catchments, and that open trench crossings will only be undertaken during the May-September period, i.e. when spawning and fry swim-up are complete. In addition, all crossings, including all those of minor streams and drains will be undertaken following the same strict construction methods as for the crossings listed in Table 11.4. Furthermore, no in-stream works in fish bearing watercourses will be undertaken without permission from and consultation with IFI in advance.

Table 11.4: Assessment of the Potential for Adverse Impacts on Freshwater Pearl Mussels (FPM)

Ref.	Catchment	Fisheries Status	Distance to Nearest FPM Record	Risk Level with GCP*
S13	Garrane Foherish	Fish Certain	13 km +	Extremely low
S21	Foherish	Fish Unlikely	13 km +	Extremely low
S38	Bohill River / Cappagh West Stream	Fish Possible	2.8 km	Very Low
S59	Sullane	Possible Downstream	2 km	Very Low
S67	Sullane	Fish Certain	4.6 km	Very Low
S97	Roughty	Fish Possible	7.9 km	Very Low

The above assessment assumes open-cut crossings

Significance of Impacts from River Crossings

Based on the assessment presented in Table 11.3, the watercourse details in relation to habitats, water quality and the presence of pearl mussels and salmon in downstream areas, it is concluded that there will be no significant adverse impacts caused to the Annex II aquatic species freshwater pearl mussels or salmon downstream of any of the crossings.

A possible exception is crossing S44 at the Bohill River.

These assumptions are contingent on the construction throughout the route being undertaken in strict compliance with the detailed site specific methods listed in the Construction Methodology (Appendix C.1) which specifically addresses all aspects of the operation that have the potential to give rise to washout of solids and cement or cement containing aggregate from the works and associated areas.

If the Bohill River crossing (S44) can be achieved using HDD then no adverse impact is likely to arise. However, if an open trench method is employed, there is a possibility that suspended solids generated during the works could adversely impact the pearl mussels in the main channel of the Sullane below the confluence with the Bohill River about 1km downstream. At this point in the Sullane, Moorkens (2007) reported the second highest per kilometre density of pearl mussels. The Sullane is not a Natura 2000 site and is therefore not designated for freshwater pearl mussels. However, it can be described as a nationally important site for the species, given the current poor state of non-designated populations nationally and their small number. In this context, were mussels to be lost as a result of the construction of this crossing it would constitute a significant adverse impact, long-term or permanent in duration.

Minor temporary and localised impacts on trout and salmon habitat can be expected in the channels immediately downstream of crossings of fish bearing watercourses (other than to be crossed with HDD) where finer material (mainly sand) may be deposited within the first few meters of the works. This may reduce bottom feeding for fish on a temporary basis but should be reversed within one or two seasons following winter floods. It would be considered a minor temporary adverse impact. The latter presupposes that all gravels removed and set aside during the construction process would have been fully reinstated in affected channels where open cut trench crossings were undertaken, in line with the Construction Methodology.

11.2.5 Site-Specific Risk Assessments – Joint Bays

The joint bays are located in areas away from streams and drains and for that reason present a low risk of impacting aquatic habitats. Furthermore, all will be installed following the detailed Good Construction Practice outlined in the Construction Methodology (Appendix C in Volume 2 of 3 of the EIS). This is specifically designed to prevent or minimise any polluting matter entering surface waters from the works area. Considering all of the above, it is not expected that the construction of joint bays will have any adverse impacts on the receiving waters along the route or have any adverse impact on freshwater pearl mussels or salmon.

11.2.6 Cumulative Impacts Associated with Grousemount Wind Farm

The potential impacts on aquatic ecology in development of the wind farm presented in Section 10 herein. The residual impacts of the wind farm, following implementation of mitigation measures, were considered to be not significant.

In that context, no cumulative impacts will arise

Further to the above, whereas the overall area of the wind farm development is approximately 1,465 ha, the footprint of the underground cable within that area is indiscernible.

11.3 MITIGATION

No in-stream works in fish bearing watercourses will be undertaken without advance permission from and consultation with IFI.

Where it is undertaken, open-cut crossing of drains and small streams will only take place in the period May to September, i.e. outside of the salmonid spawning and early fry development period, for streams likely to contain fish.

The choice of method of open-cut crossing to be used, i.e. damming with pump-over or damming with flume, will depend principally on the flow in the channel being crossed, with lower flow channels being crossed using the damming and pump-over method, and the damming and fluming method being used for channels with higher flow volumes

11.4 CONCLUSION

Fish bearing watercourses crossed by the open trench method will exhibit localised temporary reductions in habitat quality due to residual sedimentation below the crossing points. However, these impacts will be minor and temporary in nature in the context of each of the river systems affected. The significance levels assigned to these impact predictions are contingent on strict adherence by the contractor(s) to the details contained in the Construction Methodology (Appendix C in Volume 2 of 3 of the EIS), which are designed to prevent or minimise the escape of inert solids and cement into watercourses from every aspect of the work and that the contractor(s) will be adequately supervised by a suitably experienced person or persons to ensure full compliance in this regard.

Having regard to the use of HDD at particular locations as a construction method, the impacts of the proposal on the receiving aquatic environment will be minor, adverse and temporary.

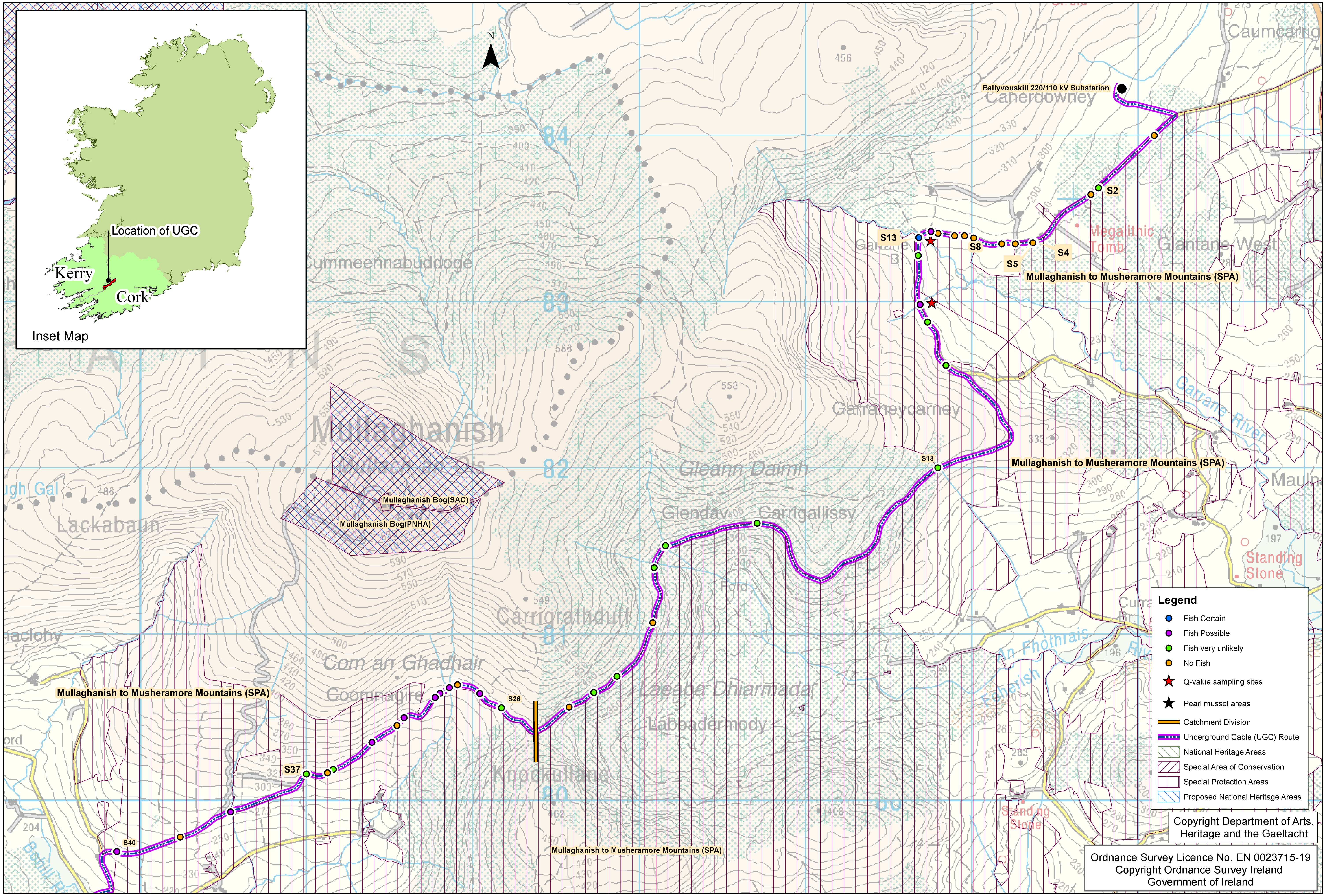

Figure 11.1 - Aquatic Ecology - Cable Route (1)

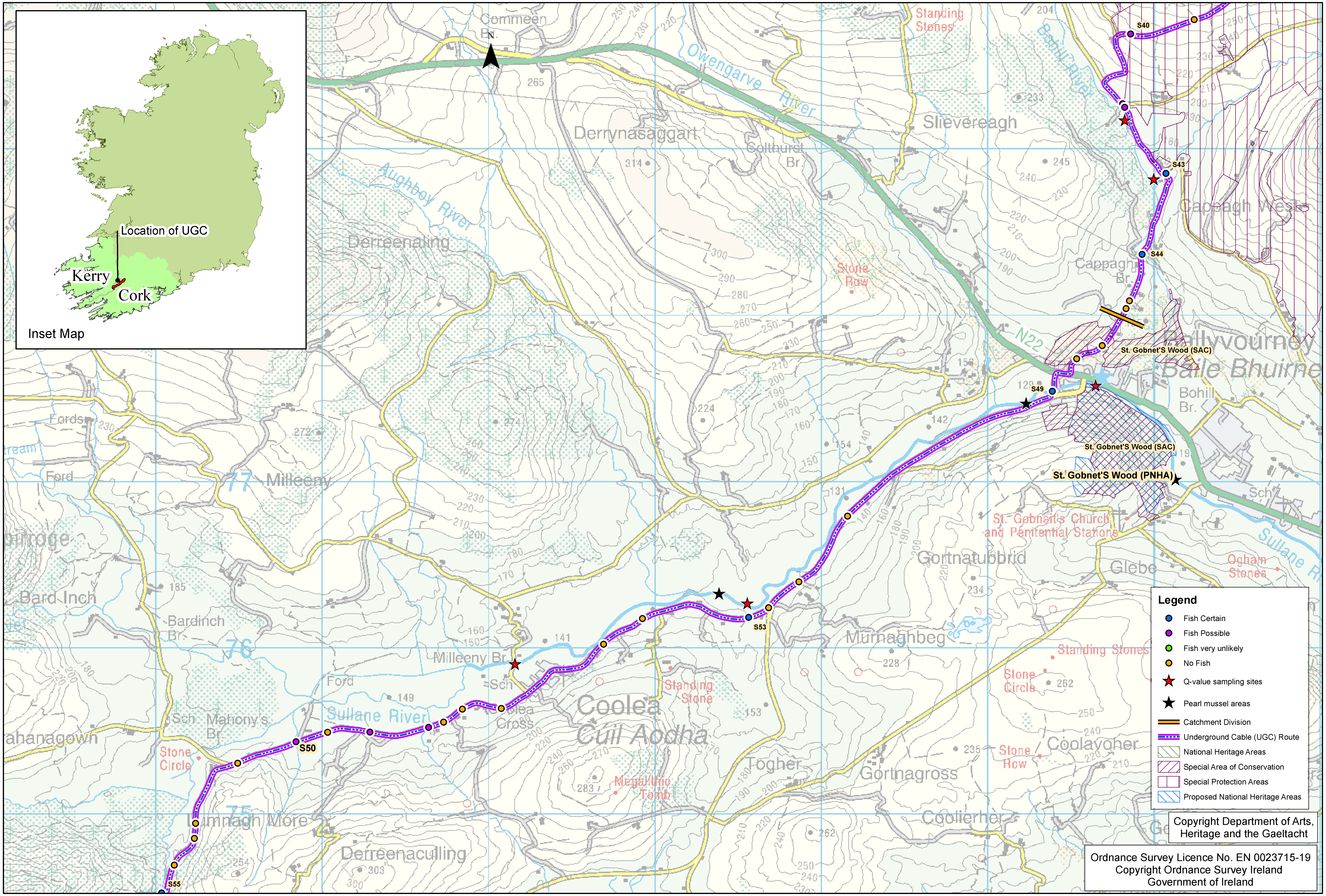

Figure 11.2 - Aquatic Ecology - Cable Route (2)

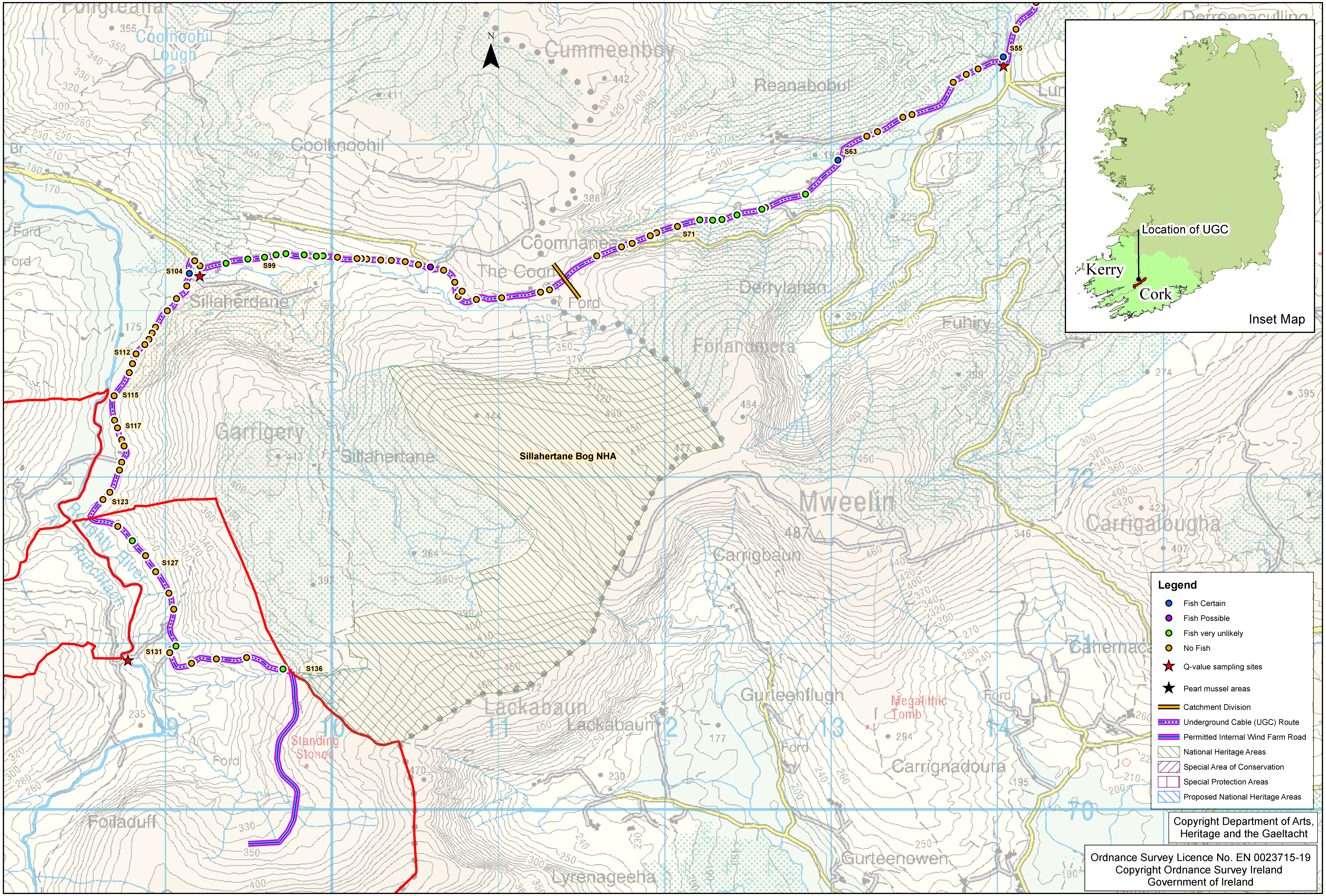

Figure 11.3 - Aquatic Ecology - Cable Route (3)