

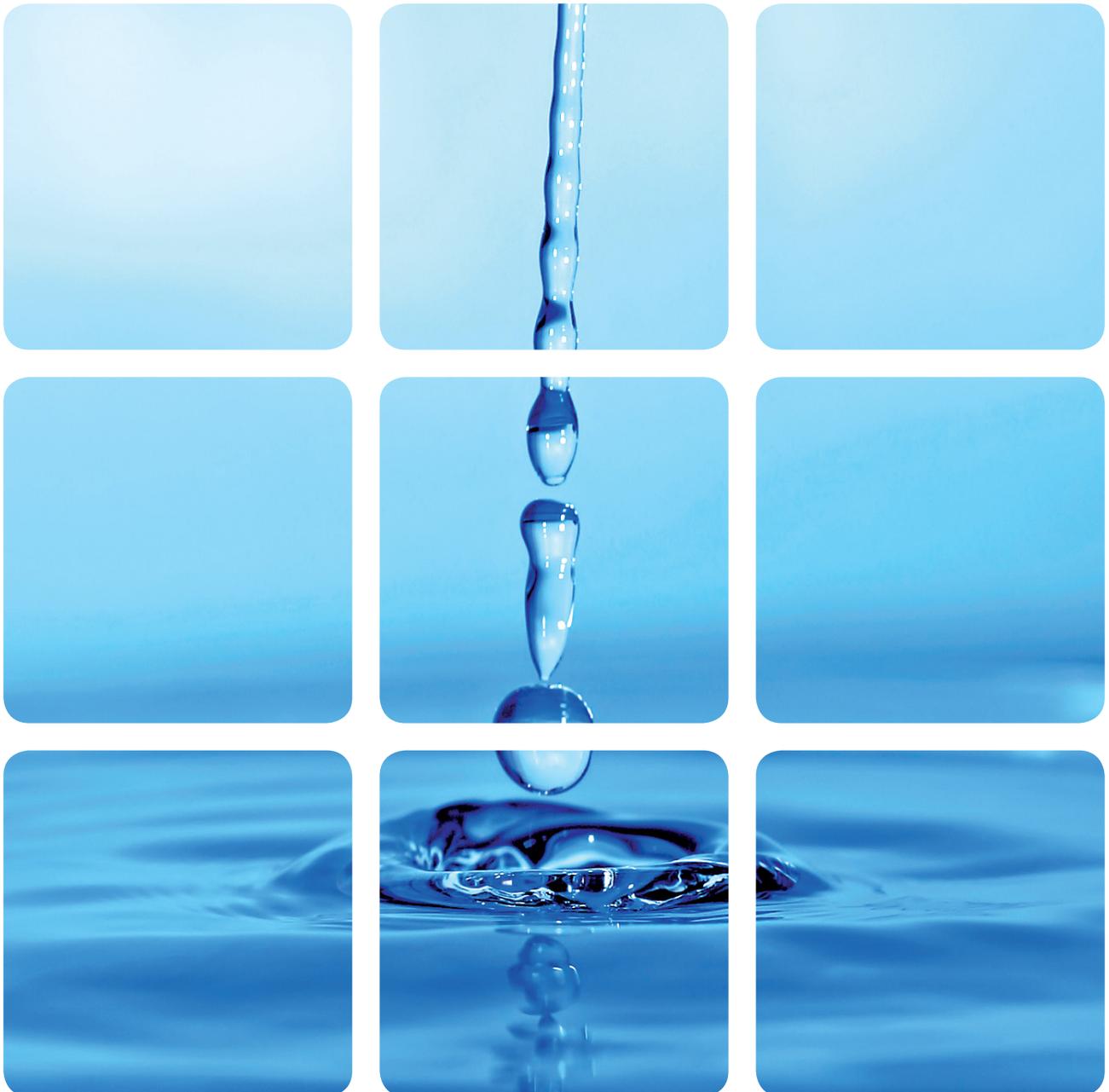


Lough Talt Regional Water Supply Scheme

Article 6(4) Assessment of Alternative Solutions & Imperative Reasons of Overriding Public Interest

Volume 2

May 2018





Lough Talt Regional Water Supply Scheme

Article 6(4) Assessment of Alternative Solutions and Imperative Reasons of Overriding Public Interest

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1 STAGE 3 AA - ASSESSMENT OF ALTERNATIVE SOLUTIONS

The assessment of alternative solutions is a process by which an examination is made of alternative ways of achieving the objectives of the plan/project, which would avoid or have less of an adverse effect on the integrity of the Natura 2000 network of sites. These alternative solutions could incorporate alternative locations, different scales or designs for the development, or the provision of alternative production processes. The 'zero-option' or 'do-nothing' scenario must also be considered as part of the exercise. It should be noted that the assessment of alternative solutions is required when the competent authority, at the AA stage, has concluded that adverse effect is likely, or cannot be ruled out. It is therefore also necessary to consider the relative impacts of the other alternative solutions upon the Natura 2000 network.

The objective of the proposed development is to provide, a safe and wholesome supply of drinking water to a population of approximately 13,663 people including reduction of the risk or formation of Trihalomethanes (THM's) and effective treatment barrier against cryptosporidium.

This report provides a detailed assessment of alternative water supply options for the Lough Talt RWSS and includes an assessment of replacement options to the current proposal to upgrade Lough Talt WTP which provides drinking water to 13,663 people, and use it temporarily for a period of 7 – 10 years. Irish Water has carried out an assessment of replacement sources, and it is clear that owing to the complexities, size and scale, and distance involved, as well as the complex regulatory and environmental compliance factors such a source will not be available for approximately 10 years.

The following options have been considered:

- **Option A:** Do Nothing – Zero Option;
- **Option B:** Do nothing until a replacement source in place;
- **Option C:** Cease abstraction until a replacement source in place;
- **Option D:** Upgrade WTP and use temporarily until a replacement source in place;
- **Option E:** Upgrade WTP and supplement Lough Talt supply with bulk import to WTP via tankering until a replacement source in place;
- **Option F:** Upgrade WTP and progressively reduce Lough Talt supply as replacement sources became available; and
- **Option G:** Upgrade WTP and supplement Lough Talt supply with groundwater source during drought periods.

An assessment of replacement source supply to inform **Options B to F** is provided in **Appendix A** and includes an assessment of likely significant effects of the replacement options.

1.1 EVALUATION OF ALTERNATIVES

1.1.1 Option A: Do Nothing – Zero Option

The zero option of 'Do Nothing' which is to maintain the existing treatment facility is not an acceptable option as the existing Lough Talt water supply scheme is currently on a boil notice due to

the detection of *Cryptosporidium* in the treated water supply. In addition the scheme is also on the EPA's Remedial action List and the EPA has issued legal directions to Irish Water in August and December of 2014 to upgrade the level of treatment to protect public health. The do nothing option will not address the short term (*Cryptosporidium*) or long term (THMs) health impacts of the deficient supply.

In addition the zero option does not resolve the adverse effects on the qualifying interests of Lough Hoe Bog SAC, until such time as the replacement source is in place.

1.1.2 Option B: Do nothing until a replacement source in place

Option B of 'Do Nothing' and develop a replacement source is not an acceptable option as it will take between 7 and 10 years to develop a replacement source based on an assessment of replacement sources carried out by Irish Water. It is clear that owing to the complexities, size and scale, and distance involved, as well as the complex regulatory and environmental compliance factors such a source will not be available for up to 10 years. A breakdown of the timeframes involved is set out below.

- Appointment of an Engineering Service Provider in accordance with all procurement requirements (involving scope definition, consultant tendering and evaluation, budget approvals and consultant appointment) (6 months to 1 year);
- Once a contract has been awarded, the Provider must carry out an Assessment of Source Capability, Data Collection and Environmental Studies. This will involve substantial data gathering and analysis to ensure a thorough assessment of the environmental effects of the proposed replacement source (2- 3 years);
- Preparation and submission of documents for water abstraction authorisation and Planning and consideration by competent authorities and obtaining valid consents (2 years);
- Design, Site Investigation Works and Land Acquisition (1-2years);
- Procurement and Contractor Appointment (1 year); and
- Construction of WTP plant and approx. 35 km of pipe (2-3 years).

The public health issues will not be resolved in the interim and this option will also not resolve the adverse effects on the qualifying interests of Lough Hoe Bog SAC until such times as the replacement source is in place.

1.1.3 Option C: Cease abstraction until a replacement source in place

If IW could not properly treat the abstracted water from Lough Talt, current drinking water regulation non-compliance issues with regard to Trihalomethane (THM) exceedances and cryptosporidium risk remain. There is no replacement potable water supply available to the RWSS and it will take between 7 and 10 years before a replacement source is in place. The lack of a safe and reliable drinking water supply would clearly have serious impacts on homes, businesses, schools and healthcare facilities. Only limited volumes of water could be brought into the area by tankers and therefore water rationing such as the use of standpipes and rota cuts to homes would be inevitable. In addition this tankered water would still be required to be boiled. This would present an unacceptable risk to human health in that basic and proper sanitary requirements could no longer be met. There would also be significant economic and social disruption as many businesses would be unable to operate. Furthermore, no replacement supply sources exist that can be developed within

the required timescales as each of the sustainable options identified require a minimum 7-10 years to develop and implement.

Although this option would resolve the adverse effects on the qualifying interests of Lough Hoe Bog SAC, it would not meet the objectives of the project.

1.1.4 Option D: Upgrade WTP and use temporarily until a replacement source in place

The upgrade to the WTP will resolve the public health issues through improvements to the treatment barrier against cryptosporidium and provide secondary disinfection by means of chloramination to reduce the THMs within the distribution network. This will allow for the boil water notice to be permanently lifted and for the scheme to be removed for the RAL. It is envisioned that this upgrade will be completed within a 2 year timeframe from the date of planning submission (subject to statutory approvals). This timeframe is much shorter than that estimated for the replacement source as no further detailed design is required, assessments have already been carried out and no additional pipeline is needed, and will provide water that is safe to drink to the local population for approximately 7-10 years while a long-term sustainable solution is developed and implemented.

Robust and effective mitigation measures have been proposed during the construction and operation of the WTP upgrade for the avoidance of impacts to Lough Hoe Bog SAC. The hydrological and hydrogeological mitigation measures will mitigate for potential adverse effects to the fen habitat which provides suitability *Vertigo geyeri*. However, the proposed measures will not mitigate for historical loss of the species due to abstraction pressures.

1.1.5 Option E: Upgrade WTP and supplement Lough Talt supply with bulk import to WTP via tankering until replacement source in place

The upgrade to the WTP will resolve the public health issues through improvements to the treatment barrier against cryptosporidium and provide secondary disinfection by means of chloramination to reduce the THMs within the distribution network. It is envisioned this upgrade will provide water that is safe to drink to the local population for approximately 7-10 years while a long-term sustainable solution is developed and implemented.

During drought periods the Lough Talt supply would need to be supplemented with 4MLD. Given a typical tanker volume of 33 m³ (maximum tanker capacity available), this would require approximately 121 tanker fills per day (approximately one every 12 minutes, 24 hours/day) to maintain the water supply to the network resulting in 242 truck movements within the site on a daily basis. It typically takes at least 35 minutes to empty a tanker of this size which would require a minimum of 3 tankers emptying simultaneously 24 hours/days. This filling exercise and the number of trucks movements within a constrained site would result in unacceptable Health & Safety risks. It is not logistically or physically possible to supply water to Lough Talt WTP under this option and the requirement to fill, deliver and empty 121 tankers with water within a 24 hour period cannot be achieved.

The impossibility of providing water in this manner would result in water shortages for the RWSS and therefore water rationing such as the use of standpipes and rota cuts to homes would be required. This would present an unacceptable risk to human health in that basic and proper sanitary

requirements could no longer be met. There would also be significant economic and social disruption as many businesses would be unable to operate.

1.1.6 Option F: Upgrade WTP and progressively reduce Lough Talt supply as replacement sources became available

The upgrade to the WTP will resolve the public health issues through improvements to the treatment barrier against cryptosporidium and provide secondary disinfection by means of chloramination to reduce the THMs within the distribution network. It is envisioned this upgrade will provide water that is safe to drink to the local population for approximately 7-10 years, as outlined in Section 1.1.4 above, while a sustainable solution is developed and implemented.

No replacement supply sources for the area exist that can be developed within a shorter timeframe than the required timescales (7-10 years) for the implementation of a long term solution that could supplement the supply by the 4 MLD deficit during drought conditions.

The Lough Talt Water Conservation Stage 3 – Phase 2 works project was recently completed and involved the rehabilitation and replacement of 17kms of water mains in Curry, Quarryfield, Killavel and Oldrock, primarily located through private lands, with 24kms of new polyethylene water mains located primarily on public roads. In addition Irish Water repair leaks in the distribution network on an ongoing basis to reduce leakage insofar as possible with approximately 75 leaks repaired in 2018. While these measures have reduced the abstraction amount slightly it is not possible to reduce the Lough Talt abstraction by any significant amount until such time as the long term solution is in place.

Therefore, this option offers no advantage over option D in terms of ecological impact. It is preferable from a technical viewpoint to progress just one replacement source and so Option D would be preferred.

1.1.7 Option G: Upgrade WTP and supplement Lough Talt supply with groundwater source during drought periods

The upgrade to the WTP will resolve the public health issues through improvements to the treatment barrier against cryptosporidium and provide secondary disinfection by means of chloramination to reduce the THMs within the distribution network.

The provision of a groundwater source to supply the WTP during drought conditions would mitigate for potential adverse effects to the fen habitat which provides suitability *Vertigo geyeri*. However, the proposed measures will not mitigate for historical loss of the species due to abstraction pressures.

A Hydrogeological Desktop Study was undertaken to assess the viability of supplementing Lough Talt (during drought conditions) with a minimum of 4 MLD of groundwater. There are no established sources in the area with available capacity. The desktop study reviewed all current holdings by Sligo County Council and Irish Water and identified three sites Muckelty, Castleoye and Chaffpool reservoirs are located within a regionally important karst (bedrock) aquifer that could possibly provide adequate capacity to support abstraction rates of up to 4 MLD. However, Turloughmore SAC is located within the same regionally important karst (bedrock) aquifer.

A desktop assessment of the potential impact of the groundwater abstraction on the turlough during drought periods was undertaken and showed that the abstraction of 4MLD would result in a reduction in the watertable of between 0.9m and 2.4m over a period of 95 days.

The conservation objectives for Turloughmore SAC is to maintain or restore the favourable conservation condition of the Annex I habitat Turloughs for which the SAC has been selected. Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions. The targets for Turloughs are set out in the Conservation *objectives supporting document for Turloughs and Rivers with muddy banks with *Chenopodium rubri* p.p. and *Bidention* p.p. vegetation* (NPWS, 2017). The target for *Hydrological regime: groundwater contribution* is to maintain appropriate groundwater contribution necessary for the natural functioning of the habitat. Groundwater abstraction from the aquifer supporting the Turloughmore SAC will result in a reduction in the watertable of between 0.9m and 2.4m over a period of 95 days and may result in significant adverse effects to the SAC in view of the site's conservation objectives. Furthermore, Article 6(2) of the Habitats Directive requires the following:

(2) Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.

Therefore, considerable environmental investigations would be required to inform AA of this option, which could not be undertaken in the short term. Therefore, groundwater abstraction to supply the WTP during drought conditions, is not a sustainable option.

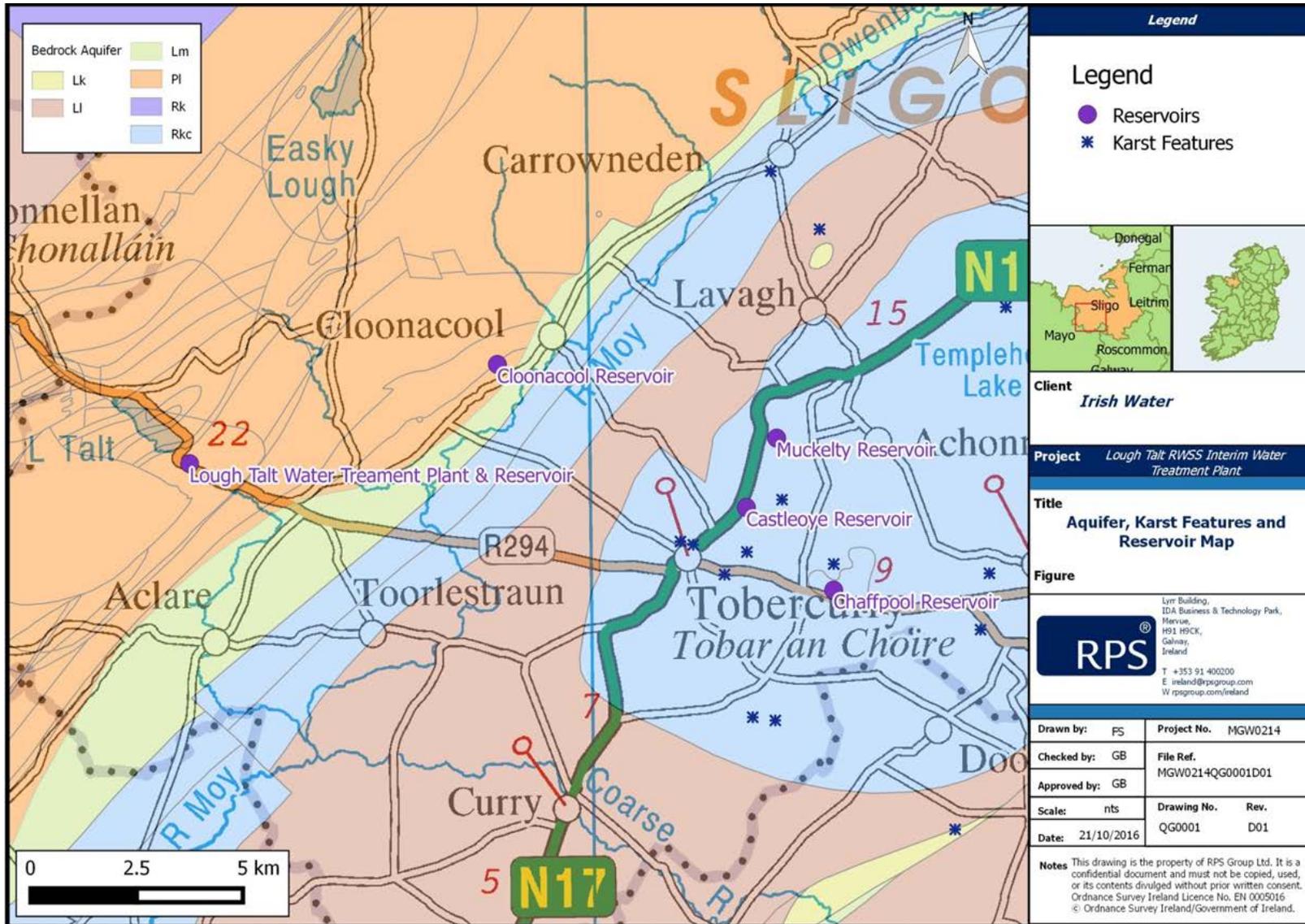


Figure 1-1: Potential Groundwater Abstraction Sites

1.2 CONCLUSION OF ASSESSMENT OF ALTERNATIVE SOLUTIONS

In the event that the competent authority Sligo County Council determines that the proposed development could adversely affect the integrity of European sites, alternatives to the current proposed development have been investigated.

There is no available solution that meets Irish Water's objective (as informed by national policy & EPA direction and drinking water compliance) to ensure a safe and treated water supply to the local population in the short to medium term (1-2 to 7-10 years) which does not have a potential impact on the conservation objectives of Lough Hoe Bog SAC or Turloughmore SAC. No replacement supply sources for the area exist that can be developed within the required timescales as each sustainable option identified requires a minimum 7-10 years to develop and implement.

It is not acceptable that the affected population be left at risk of THM and Cryptosporidium for a period of 7 to 10 years. Therefore, Options A and B are not a feasible alternative. If abstraction ceases immediately (Option C) the population will be left without drinking water. Option E is technically impossible. Option G is likely to have greater ecological impact than Option D and cannot in any event be developed within the required timeframe. Option F would have no greater ecological benefit to simply replacing the Lough Talt supply as soon as the replacement source has been developed. The provision of safe drinking water and removal of Lough Talt from the EPA Remedial Action List within a 2 year timeframe requires the continued abstraction from Lough Talt at the current rate of approximately 8 MLD per day and an upgrade to the existing water treatment facility.

The only available option in the immediate short term is to proceed with Option D and provide upgraded treatment at the existing Lough Talt WTP site to improve the treatment barrier against cryptosporidium and provide secondary disinfection by means of chloroamination to reduce the THMs within the distribution network. It is envisioned this upgrade will provide water that is safe to drink to the local population for approximately 7-10 years while a long-term sustainable solution is developed and implemented.

Therefore, Irish Water requests that Sligo County Council proceed to Stage 4 of the appropriate assessment procedure provided for in articles 6(4) of the Habitats Directive.

The IROPI that are being relied upon to indicate that the plan or project should proceed notwithstanding that it may adversely affect the integrity of a European site are presented in **Chapter 2** of this report.

2 STAGE 4 - IMPERATIVE REASONS FOR OVER-RIDING PUBLIC INTEREST

The Lough Talt RWSS is of strategic importance as a public water supply in County Sligo, serving a population of 13,663, however it is currently not achieving the water quality standards to provide safe and reliable drinking water supply and there is no immediately available replacement source.

The current basic water treatment facilities consists of chlorination and fluoridation, which do not address the water quality deficiencies present and is inadequate to provide drinking water which is in compliance with the Drinking Water Regulations.

The Lough Talt water supply scheme has drinking water regulation non-compliance issues with regard to Trihalomethane (THM) exceedances and the current level of treatment provides no barrier against cryptosporidium. 140 water samples taken from the supply have been non-compliant with the drinking water regulations over the past 14 years (2004-2018).

The Lough Talt RWSS is on the EPA's Remedial Action List (RAL) due to "Inadequate treatment for Cryptosporidium". The EPA issued a Direction to Irish Water on the 15th August 2014 in relation to inadequate disinfection. On the 3rd December 2014 a further Direction was issued by the EPA in relation to exceedances in Trihalomethanes.

Directions issued under Regulation 10(4) refer to failures to meet a quality standard or indicator parameter. Under the legislation, the agreed action plan must be implemented, within one year of the approval date where there is a risk to human health or two years where a risk to human health does not exist.

Furthermore, the European Commission advised the Irish government that it is monitoring the remedial measures being taken in relation to water supplies where there are Trihalomethane (THM) exceedances (EU Pilot 7544/2015/ENVI). THM risk is also a precautionary public health issue, though its impact is thought to be associated with long term exposure rather than immediate impact.

The current level of treatment provides no barrier against cryptosporidium. A Boil Water Notice was put in place on Monday 5th February for the Lough Talt Regional Water Supply Scheme following the detection of cryptosporidium in the treated water coming from the plant after a routine test.

Both the cryptosporidium and the exceedances in Trihalomethanes issues are important public health risks, with cryptosporidium giving rise to severe gastroenteritis in patients affected and in extreme situations can endanger vulnerable people, where their health is poor in any case. Irish Water has committed to addressing these public health risks in its drinking water supplies as its top priority. The current water treatment facilities at Lough Talt RWSS do not provide a barrier for cryptosporidium nor are they effective to address THM exceedances. Should the water treatment facilities for the RWSS remain unchanged, there is an ongoing serious Human Health risk to the population served by the RWSS.

If IW could not properly treat the water abstracted from Lough Talt, the current drinking water regulation non-compliance issues with regard to Trihalomethane (THM) exceedances and cryptosporidium risk remain. The findings of the Assessment of Alternative Solutions confirmed that there is no available solution that can be implemented in the short-term (1-2 years) that does not

have a potential impact on the conservation objectives of Lough Hoe Bog SAC or Turloughmore SAC. Furthermore, no replacement supply sources exist that can be developed within the required timescales as each of the sustainable options identified require a minimum 7-10 years to develop and implement. The lack of a safe and reliable drinking water supply would clearly have serious impacts on homes, businesses, schools and healthcare facilities..

Therefore, the following is proposed:

1. Proceed with an IROPI application to upgrade the existing water treatment plant at Lough Talt as per the 2014 EPA Direction to provide an acceptable barrier against cryptosporidium and assess feasibility of providing in-situ reduction of THMs by chloramination in distribution reservoirs.
2. Irish Water commission a yield assessment for the replacement supply options as outlined in **Appendix A** to fully assess the impact of the additional abstraction on Lough Conn and Lough Gill.
3. Irish Water to proceed with the long term option to replace the water treatment plant at Lough Talt with a new supply within the 7 to 10 year timescale which will remove the impact on the qualifying features of Lough Hoe Bog SAC.
4. When the long term option has been implemented, the IROPI for abstraction impacting on Lough Hoe SAC will no longer be required.

Compensatory measures that are being proposed to ensure that the overall coherence of the Natura 2000 network is protected for the duration of the IROPI. The compensatory measures proposed are outlined in **Volume 3**.

2.1 CONCLUSION

This assessment has been completed to inform Article 6(3) and Article 6(4) of the EU 'Habitats' Directive 92/43/EEC and provides a professional scientific examination of the project.

The conclusion of this assessment is that the likelihood of adverse effects on the integrity of the Lough Hoe Bog SAC conservation objections cannot be excluded. However, there is no feasible alternative to the proposed development for providing a safe, compliant supply of water to the local population, and there are imperative human health reasons of overriding public importance justifying the granting of consent.

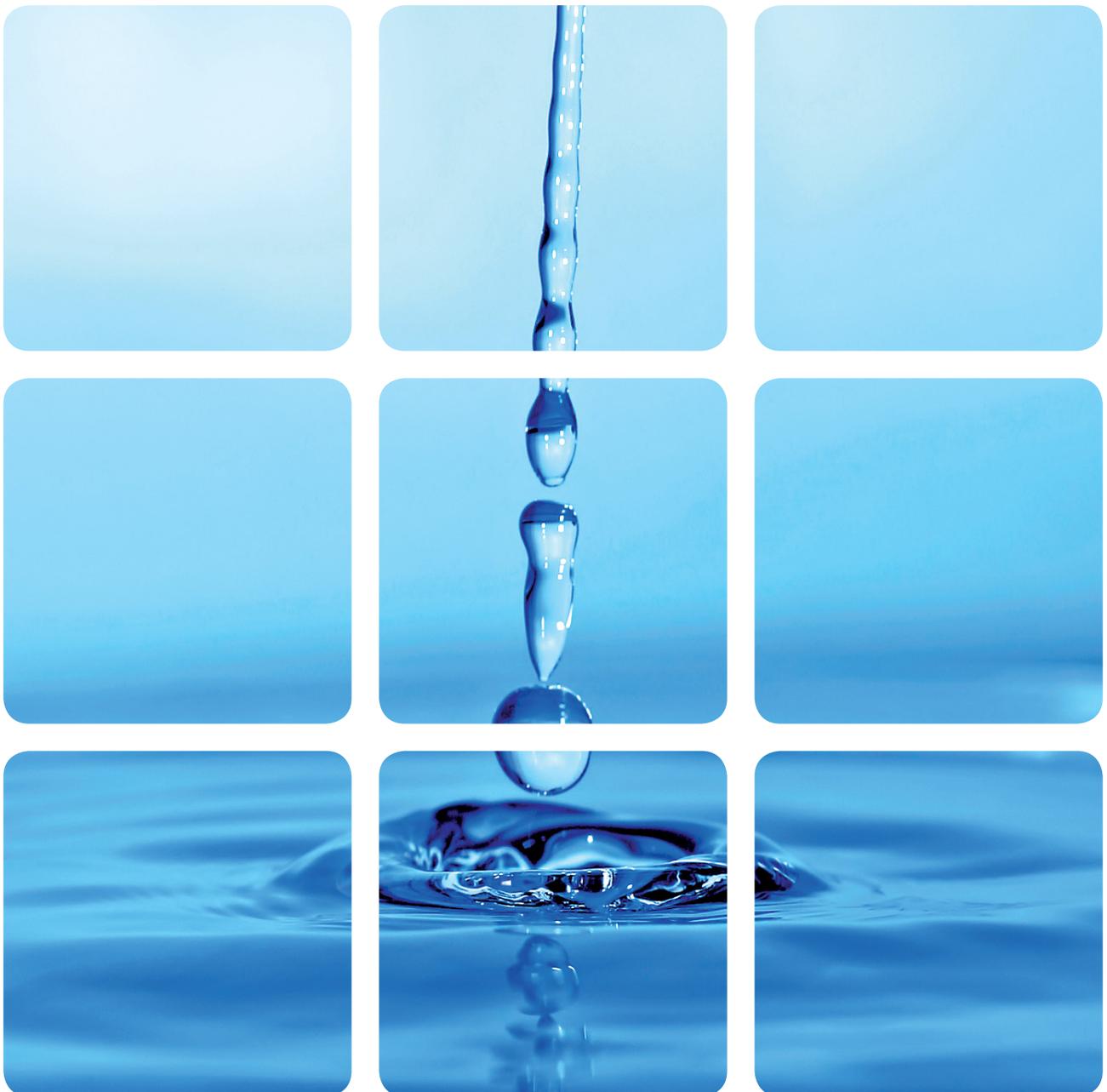
In the event that the competent authority agrees and determines both that there are no feasible alternatives and IROPI apply, compensatory measures are required to compensate for potential impacts to *V. geyeri* populations at Lough Talt.

APPENDIX A – REPLACEMENT SUPPLY OPTIONS REPORT



Lough Talt Regional Water Supply Scheme Replacement Supply Options Report

May 2018



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Lough Talt Regional Water Supply Scheme Water Treatment Plant

Replacement Supply Options Report

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1 INTRODUCTION

This report provides an assessment of the potential replacement water supply options that might exist in order to replace the current supply from Lough Talt Water Treatment Plant (WTP) which provides drinking water to approximately 13,663 people. Before proceeding with the preferred option, further detailed design, surveys and assessments will be required.

The Lough Talt Regional Water Supply Scheme (RWSS) is an isolated water supply network where the nearest large scale water resources are Lough Conn, 30 kilometres to the west of the existing Water Treatment Plant and Lough Gill, 40 kilometres to the north of the treatment plant.

It is likely to take up to 10 years to establish a new water source to supply the RWSS with treated drinking water. Identifying and developing an alternative source will involve major abstractions, treatment systems and long distance pipelines, with all of the statutory processes, technical, procurement and budget challenges that such major projects entail. The reduction of the abstraction to this level is therefore not possible as there is no other nearby source to supply the deficit in the short term.

1.1 CURRENT SUPPLY

Lough Talt Public Water Supply serves a population of 13,663 via a single treatment plant situated 500m to the east of Lough Talt, on the R294. The supply feeds the town of Tobercurry and a large rural supply area including the villages Annagh, Aclare, Curry, Lavagh, Ballanacarrow, Carroweden, Kilmacteige, Coolaney, Bellaghy and Ballymote. The catchment for the lake is steeply sloped with ground elevations ranging from 300-136m OD (malin head datum) and classified as a high risk groundwater body, due to the groundwater discharges in the vicinity of the lake, and agricultural practices.

The water from Lough Talt receives only minimum treatment (chlorination) for disinfection purposes before being distributed as drinking water. While the source is relatively high quality, the natural organic content means that it fails the trihalomethane (THMs) standard as per the European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) and the WTP is included in the EPA Remedial Action List for treatment upgrade. The plant offers no protection against cryptosporidium. A Boil Water Notice was put in place on Monday 5th February 2018 for the Lough Talt Regional Water Supply Scheme following the detection of cryptosporidium in the treated water coming from the plant after a routine test. Both issues are important public health risks, with cryptosporidium giving rise to severe gastroenteritis in patients affected and in extreme situations can endanger vulnerable people, where their health is poor in any case. THMs meanwhile are classified as 'possibly carcinogenic' to humans. A 8MLD WTP will sustain the existing water supply to the existing communities for the Lough Talt Water Supply.

1.2 OPTIONS FOR A REPLACEMENT WATER SUPPLY

The objectives of the long term sustainable solution are as follows:

- To provide a long-term safe supply of drinking water to a population of 13,663 people including reduction of the risk of formation of THMs and an effective treatment barrier against cryptosporidium, and
- To eliminate the environmental impact on Lough Talt and any other water courses associated with the final solution.

In order to compare and evaluate the replacement water supply options, each option has been assessed in terms of the risk associated with the particular option. From this assessment an overall risk score has been determined for each option. The risks include the following;

- Security of supply,
- Raw water quality,
- Planning,
- Water Abstraction Licence/Order,
- Environmental,
- Technical delivery, and
- Programme.

The risks are scored quantitatively using the criteria presented in **Table 1.1**.

Table 1.1: Risk Scoring

Risk Rating	Scoring Range
Low	1-3
Medium	4-6
High	7-10

In addition to risk, each option has been assessed in terms of its capital, operational and lifecycle cost, including the Net Present Cost per m³ of treated water produced.

- **The capital costs** for each option have been calculated using the Irish Water project costing template.
- **The operational costs** of the pumping stations have been calculated using a unit cost per kWh of €0.015 and an allowance for maintenance.
- **The operational cost** of the water treatment plants (WTP) is based on actual operational costs of WTP with similar output.
- **The net present value** of the combined construction and operational costs over 25 years at an annual inflation rate of 3.5% has been calculated

In total seven options have been analysed for the replacement water supply for Lough Talt as follows:

- **Options 1-3:** Development of additional water treatment capacity and associated network infrastructure to supply Lough Talt RWSS from Lough Conn RWSS

- **Option 1:** Upgrade Existing Wherrew WTP and Supply Lough Talt RWSS via Ballina and Bonniconlon
- **Option 2:** Upgrade Existing Wherrew WTP and Supply Lough Talt RWSS via Foxford and Aclare
- **Option 3:** New WTP at southern end of Lough Conn and Supply Lough Talt RWSS via Foxford and Aclare
- **Options 4-5:** Supply The Lough Talt RWSS fully from either or both of the Sligo Town and Environs RWSS (SEWSS) and Lough Easkey RWSS
 - **Option 4:** Supply Lough Talt WSS using source water from Lough Gill (SEWSS)
 - **Option 5:** Supply Lough Talt WSS using source water from a combination of Lough Easkey and Lough Gill
- **Options 6-7:** Supply The Lough Talt RWSS partially from Sligo Town and Environs RWSS (SEWSS) and/or South Sligo RWSS (SSWSS) and provide a new water treatment plant at Lough Talt (capacity 4 MLD)
 - **Option 6:** Provide a new treatment facility at Lough Talt to treat 4 MLD and transfer 4 MLD of demand to the SEWSS
 - **Option 7:** Provide a new treatment facility at Lough Talt to provide 4 MLD and transfer 2.8 MLD of demand to the SEWSS and 1.2 MLD of demand to the SSWSS

1.3 SUPPLY FROM LOUGH CONN (OPTIONS 1-3)

The source of water for the nearby Ballina Regional Water Supply Scheme (RWSS) scheme is Lough Conn located a few kilometres south west of Ballina town. The scheme is supplied from two water treatment plants; the Wherrew plant located at the intake on the north shore of the lake and Lisglennon located approximately ten kilometres north of the Wherrew WTP. The scheme supplies Ballina, Killala, Crossmolina and a large rural area of North East Mayo.

Irish Water has, under the Water Supplies Act 1942, following a proposal to acquire water rights on the 22nd January 1975 for the Ballina Regional Water Supply Scheme, Stage 2, the lawful right to use 20,000,000gals/day (90,909m³/d) from Lough Conn. This figure is further broken down to 18,500,000gals/day (84,090m³/d) from a point at Wherrew and 1,500,000gals/day (6,818m³/d) from the same or additional points. The Ballina RWSS is currently abstracting an average of 9,834m³/d at Wherrew. A number of potential options exist for the supply of the Lough Talt RWSS from Lough Conn as outlined below as options 1, 2 and 3.

1.3.1 Option 1 – Wherrew WTP via Ballina & Bonniconlon

This option includes supply from the Wherrew WTP via Ballina and Bonniconlon. It would require a significant upgrade (8 MLD minimum) to the existing intake and WTP at Wherrew and approximately 38.50km of a 450mm diameter main and associated pumping stations and storage to extend the supply to Lough Talt. Details of the option and route are outlined in **Table 1.2**.

A route option is shown in **Figure 1-1**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings.

Table 1.2: Option 1, Rising Main Route

Route - Option 1	
Route Start	Wherrew WTP
Route Finish	Lough Talt
Length	38.5 km
Pipe Diameter	450 mm
Private Property	0
River Crossings	1
Rail Crossings	0
Other Significant Crossings	0
Maximum static lift	188 m
Approximate Dynamic Headloss	50 m
Booster pumping station	3 No.

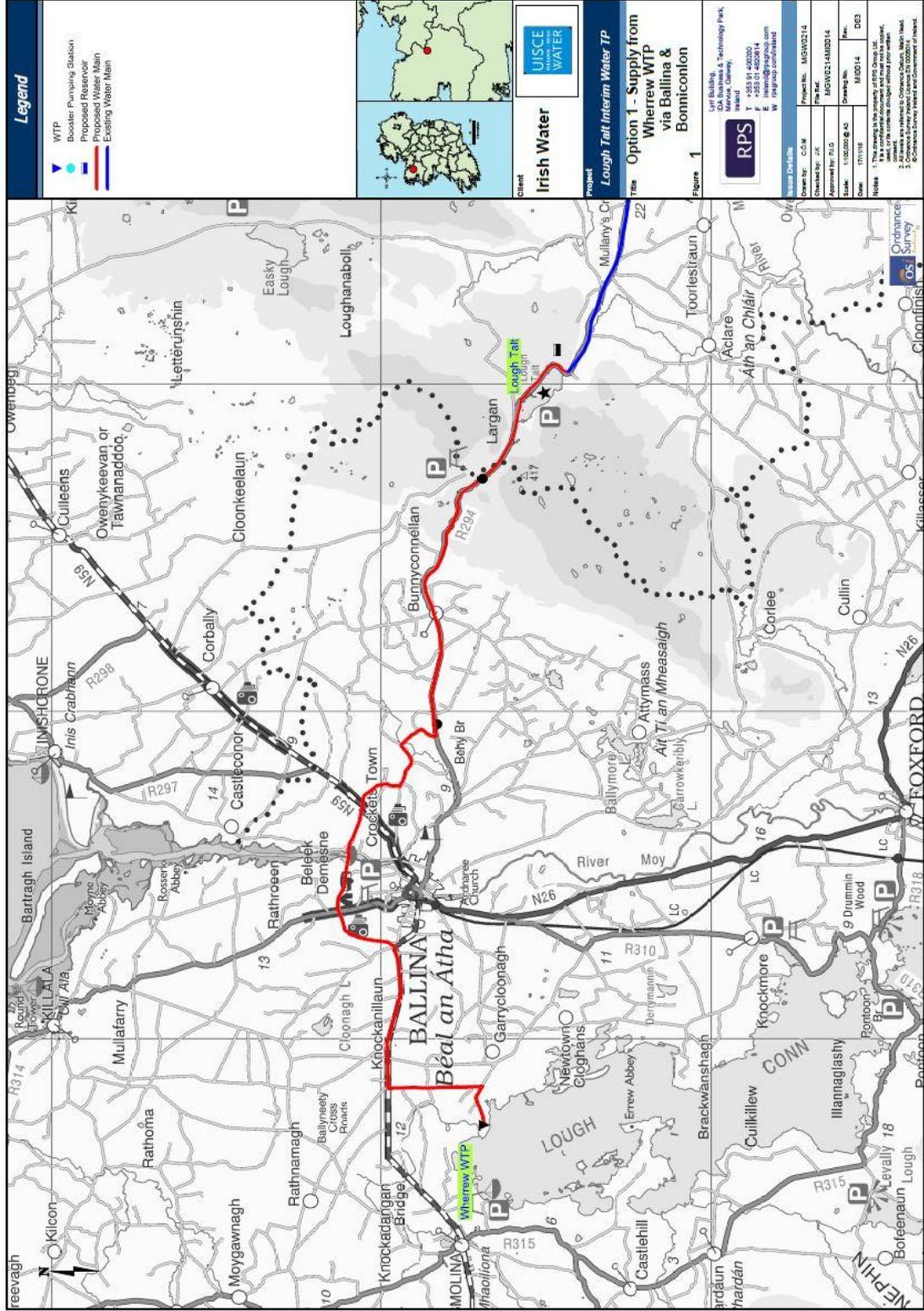


Figure 1-1: Option 1 Rising Main Route

1.3.2 Assessment of Option 1

The following sections present the results of the assessment associated with option 1.

1.3.2.1 Risk Assessment

Security of Supply

Mayo County Council / Irish Water currently have the legal right to abstract 91 MLD from Lough Conn including (84,090m³/d) from a point at Wherrew. The current abstraction rate is approximately 9.834 MLD. Therefore there is significant scope for an increase in the abstraction. A yield assessment will be required to fully define the security of the supply from Lough Conn.

Raw Water Quality

Lough Conn is currently rated as having 'Good' status water quality by the EPA. The Water Framework Directive (WFD) currently categorises Lough Conn as being 'not at risk'. Wherrew WTP does not currently have issues with raw water quality.

Planning

This option will include the expansion of the existing Wherrew WTP. Planning permission will be required for the expansion of the existing WTP as well as the booster pumping stations. Due to the existing treatment plant at the location planning issues are less likely to occur when compared to the construction of new WTP.

Water Abstraction Order

It is not anticipated that a water abstraction order or licence would be required for this option as the existing abstraction point will be maintained. However, this will require review when the details of the new abstraction licencing regime are in force.

Existing Environment

Lough Conn is designated under the following European sites; Lough Conn and Lough Cullin Special Protection Area (SPA) and River Moy SAC. Lough Conn and Lough Cullin SPA is designated for the following species; Tufted Duck (*Aythya fuligula*) [A061], Common Scoter (*Melanitta nigra*) [A065], Common Gull (*Larus canus*) [A182] and Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]. The River Moy SAC supports the Annex I habitats including active raised bog [7110], Alkaline fens [7230] and alluvial forest [91E0], while also supporting a population of white-clawed crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*) [1106] and Otter (*Lutra lutra*).

From Wherrew, the pipeline route heads north to the N59 via the townlands of Knockfree and Brackloonagh. It follows the N59 immediately east towards Ballina before diverting north at Gorteen to join the R314 for approximately 3.5km. The existing environment primarily consists of improved agricultural land. The route follows the R314 north of Ballina town environs, before deviating east, spanning the Killala Bay/Moy Estuary SAC/SPA. As it traverses through the Corbally townland towards Bonnicolon the landscape begins to change with cut over blanket bog and elements of conifer plantation becoming more prominent. East of Bonnicolon the route becomes dominated by blanket bog as the R294 traverses through Lough Hoe Bog SAC, finally concluding at Lough Talt.

Lough Talt WTP is located downstream of Lough Hoe Bog SAC and is drained by the Eighnagh River which is designated under the River Moy SAC.

Lough Conn is fed by the River Deel and is assigned a “High” status (Q4-5/ Q5) as per the current EPA water quality monitoring data. The water quality is monitored at the bridge adjacent to Castle Gore. Lough Conn is assigned a “Good” lake waterbody status as per the Water Framework Directive (WFD) 2010-2015 dataset. The lake is regarded as having oligotrophic/mesotrophic surface water quality status as per the EPA monitoring results. The route option crosses the Killala Bay/Moy Estuary SAC/SPA, north of Ballina where the River Moy flows into the Moy Estuary, and further into Killala Bay. The River Moy is assigned a “Good” quality status prior to flowing into Killala Bay. Killala Bay is classified as having a “Good” status under the Coastal Water Quality Status 2010-2015.

Potential Impacts on European sites

Increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in impacts to habitats sensitive to hydrological changes within Lough Conn which is designated under the River Moy SAC and Lough Conn and Lough Cullin SPA. This includes the priority habitat [91E0] Alluvial forests, which is found on the western shores of Lough Conn, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. Potential changes in the hydrogeological regime may impact groundwater dependent terrestrial ecosystems (GWDTE) such as Active raised bog (7110), Alkaline fens [7230] and Alluvial forests (91E0), habitats which may be found within the zone of influence of the abstraction. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish (which is widespread in the SAC including the rivers which feed Loughs Conn and Cullin), lamprey species, Salmon and Otter. Increased abstraction may reduce the availability of wetland habitats on the shores of Lough Conn and Lough Cullin SPA on which waterbirds rely.

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however this will require further assessment under Stage 2 Appropriate Assessment. See **Figure 1-2, Table 1.3** for proximity of European sites.

Table 1.3: Option 1, Designated Sites

Option	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance from SPA
1	River Moy SAC	Abstraction within Lough Conn, WTP 0.13km from site	Lough Conn & Lough Cullin SPA	0.14km
	Killala Bay/Moy Estuary SAC	Within (pipeline crosses the site)		
	Lough Hoe Bog SAC	Pipeline within 0.15km	Killala Bay/Moy Estuary SPA	Within (Crossing)
	Lough Nabrickkeagh Bog SAC	Pipeline within 0.12km		

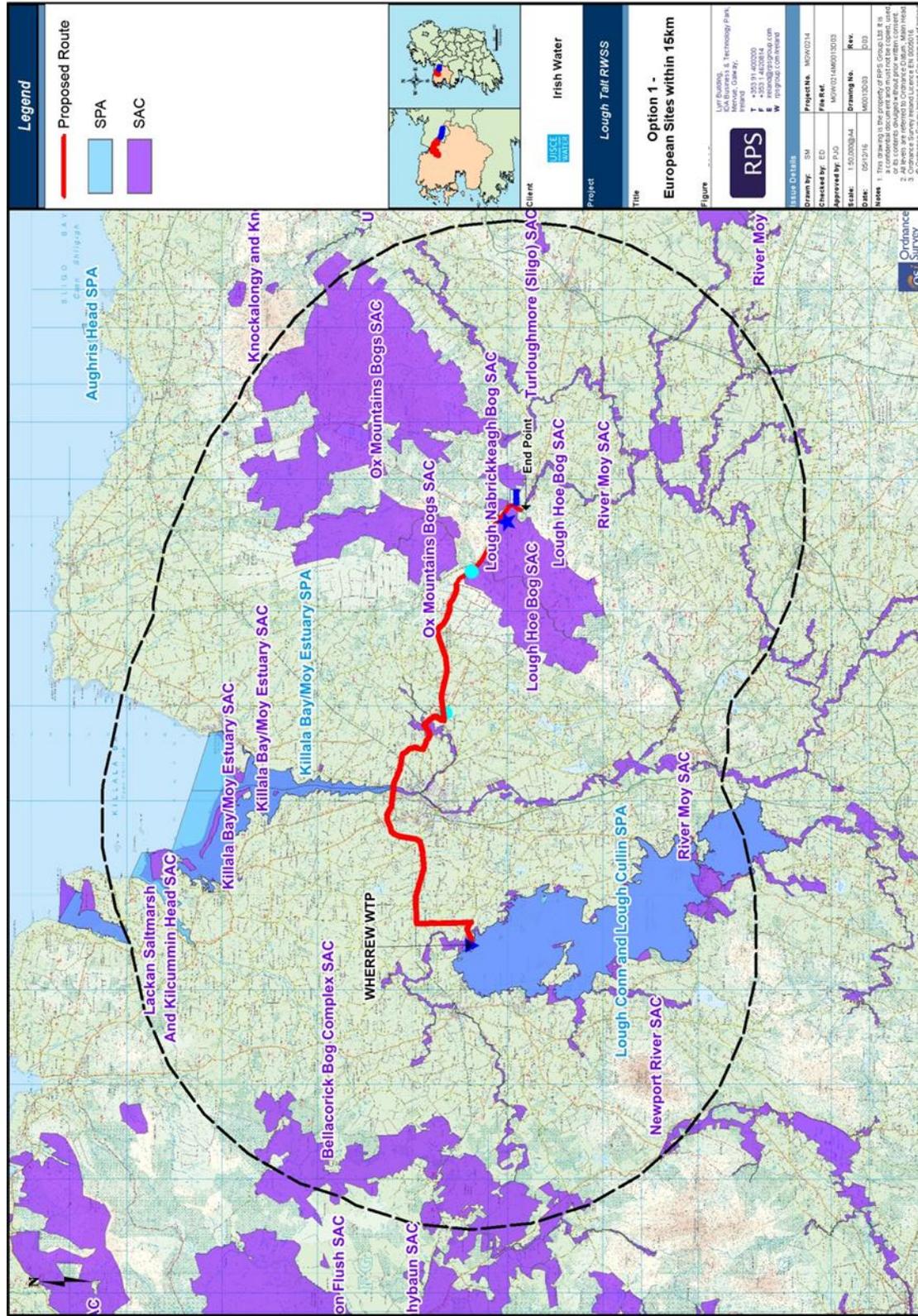


Figure 1-2: European Sites within Zol of Replacement Option 1

Technical Delivery

This option is technically viable. However, given the significant static lift along the route modelling will be required to accurately assess the performance of the pipeline including the locations of the booster pumping stations.

Programme

Programme delays may occur during the execution of Option 1 due to the following;

- Land acquisition for the expansion of the existing WTP site at Wherrew booster pumping station sites and wayleaves required for 38.5km of pipeline – delays may occur during discussions with landowners for the WTP expansion and pipelines etc.
- The rising main route includes a crossing of the River Moy estuary SAC. The project programme may require flexibility in order to ensure avoidance and mitigation measures to protected SAC are implemented.

1.3.2.2 Risk Score

A risk matrix was developed based on the above risk assessment. Risk scores were based on **Table 1.1** and the findings for Option 1 are summarised in **Table 1.4**.

Table 1.4: Option 1, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 1										
Security of supply										
Raw water quality										
Planning										
Abstraction Order										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										25

1.3.3 Option 2 - Supply from Wherrew WTP via Foxford and Aclare

This option includes for the supply of treated water from Wherrew WTP via Foxford and Aclare. It would require a significant upgrade of the existing intake and WTP at Wherrew and approximately 28km of a 500mm diameter, 17.3km of a 450mm diameter main and associated pumping stations to extend the supply to the existing Lough Talt trunk main. Details of this option and route are outlined in **Table 1.5**. A route option is shown in **Figure 1-3**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings.

Table 1.5: Option 2, Rising Main Route

Route - Option 2	Section 1	Section 2
Route Start	Wherrew WTP	Foxford
Route Finish	Foxford	R294
Total Length	28 km	17.3km
Pipe Diameter	500 mm	450 mm
Private Property	0	
River Crossings	2	
Rail Crossings	1	
Other Significant Crossings	0	
Maximum static lift	63 m	
Approximate Dynamic Headloss	68 m	
Booster pumping station	2 No.	

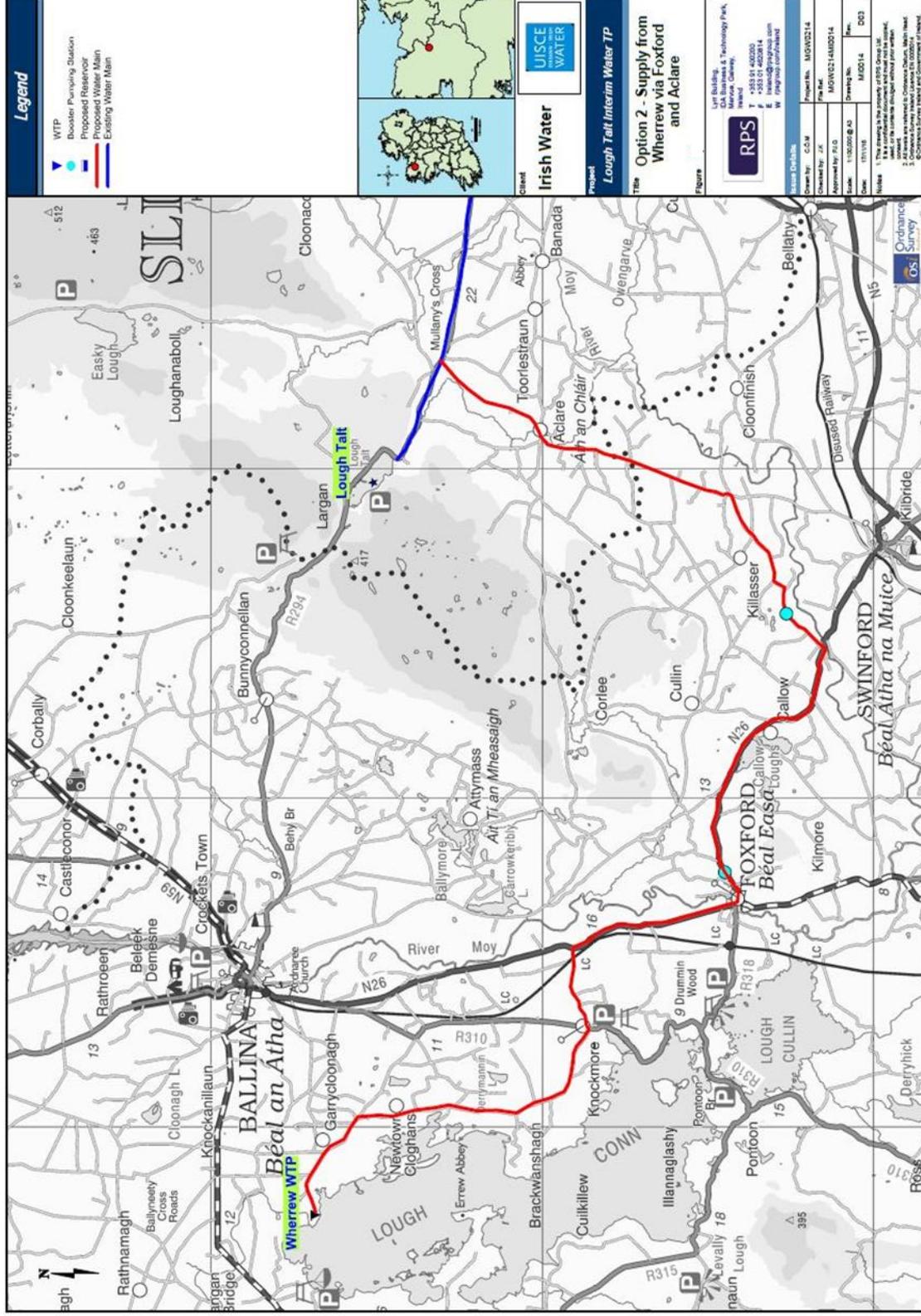


Figure 1-3: Option 2 Rising Main Route

1.3.4 Assessment of Option 2

The following sections of the report present the results of the risk and cost assessments of option 2.

1.3.4.1 Risk Assessment

Security of Supply

Mayo County Council / Irish Water currently have the legal right to abstract 91 MLD from Lough Conn including (84,090m³/d) from a point at Wherrew. The current abstraction rate is approximately 9.8MLD. Therefore there is significant scope for an increase in the abstraction. A yield assessment will be required to fully define the security of the supply from Lough Conn.

Raw Water Quality

Lough Conn is currently rated as having 'Good' status water quality by the EPA. The Water Framework Directive (WFD) currently categorises Lough Conn as being 'not at risk'. Wherrew WTP does not currently have issues with raw water quality.

Planning

This option will include the expansion of the existing Wherrew WTP. Planning permission will be required for the expansion of the existing WTP as well as the booster pumping stations. Due to the existing treatment plant at the location planning issues are less likely to occur when compared to the construction of a new WTP.

Water Abstraction Licence/Order

It is not anticipated that a water abstraction order or licence would be required for this option as the existing abstraction point will be maintained. However, this will require review when the details of the new abstraction licencing regime are in force.

Existing Environment

From Wherrew towards Knockmore the surrounding land is dominated by pastoral agricultural land east of Lough Conn and the route supports a combination of hedgerows and treelines.

South of Knockmore the landscape becomes less dominated by agricultural grassland, however blanket bog and conifer plantation become more evident. This is also apparent west of the N26, where blanket bog can be found, with improved agricultural land on the eastern side adjacent to the River Moy. Callow Lough Lower and Upper are located directly south of the N26. As the proposed route continues north to Aclare the surrounding landscape encompasses blanket bog and wet grassland in particular adjacent to the Eighnagh River. North-east of Aclare, the proposed 450mm diameter main joins the existing 450m watermain on the R294 linking and serving Lough Talt WTP. The route concludes at Lough Talt, which is located within Lough Hoe Bog SAC.

The proposed route crosses the River Moy SAC at Foxford and again at Aclare. The River Moy supports Annex I priority habitats; active raised bog [7110] and alluvial forest [91E0], while also supporting a population of white-clawed crayfish (*Austropotamobius pallipes*). At both River Moy

SAC intersections the river is classified as having “Good” water quality as per the EPA dataset 2010 to 2015. The Eighnagh River flows from Lough Talt in a southerly direction and it is designated as “Good” in terms of its river quality.

Potential Impacts on European sites

Increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in impacts to habitats sensitive to hydrological changes within the River Moy SAC. This includes the priority habitat [91E0] Alluvial forests, which is found on the western shores of Lough Conn, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. Potential changes in the hydrogeological regime may impact groundwater dependent terrestrial ecosystems (GWDTE) such as Active raised bog (7110), Alkaline fens [7230] and Alluvial forests (91E0), habitats which may be found within the zone of influence of the abstraction. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish which is widespread in the SAC including the rivers which feed Loughs Conn and Cullin, lamprey species, Salmon and Otter. Increased abstraction may reduce the availability of wetland habitats on the shores of Lough Conn and Lough Cullin SPA on which waterbirds rely.

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however this will require further assessment under Stage 2 Appropriate Assessment. See **Figure 1-4** and **Table 1.6** for proximity of European sites.

Table 1.6: Option 2, Designated Sites

Option	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance from SPA
2	River Moy SAC	Abstraction within European site, WTP 0.13km from site and pipeline crosses the SAC at two locations	Lough Conn & Lough Cullin SPA	0.03km

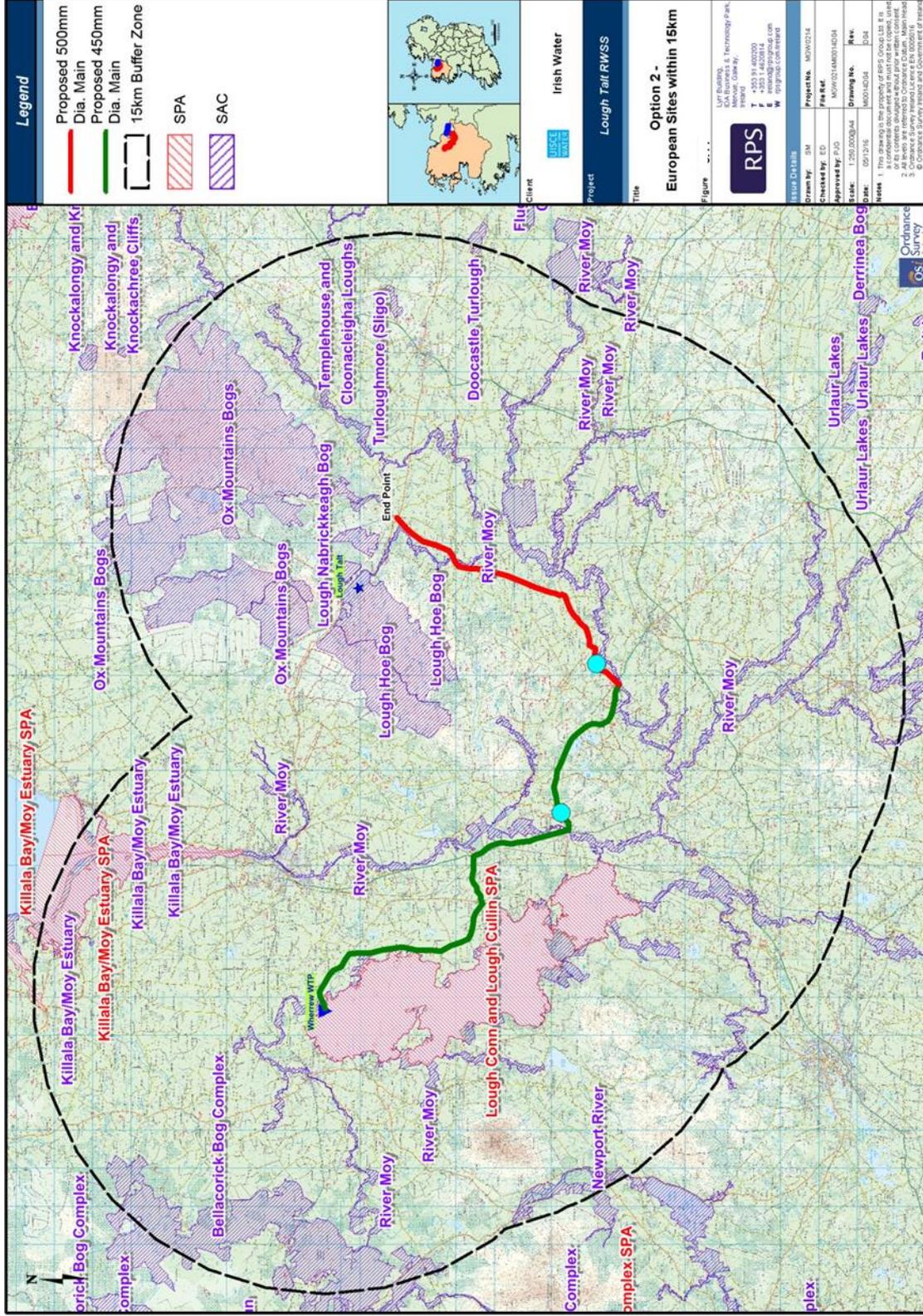


Figure 1-4: European Sites within the Zol of Option 2

Technical Delivery

This option is technically viable and the delivery of this option should not present any technical issues.

Programme

Programme delays may occur during the execution of Option 2 due to the following;

- Land acquisition for the expansion of the existing WTP site at Wherrew and for the booster pumping station sites – delays may occur during discussions with landowners for the WTP expansion and pipelines etc.
- This option will include the installation of a rising main through the town of Foxford and Aclare. Delays therefore may occur due to traffic management issues and possible constraints on working hours.

1.3.4.2 Risk Score

Table 1.7: Option 2, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 2										
Security of supply										
Raw water quality										
Planning										
Abstraction Order										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										26

1.4 OPTION 3 - SUPPLY FROM A NEW WATER TREATMENT PLANT AT THE SOUTHERN END OF LOUGH CONN VIA FOXFORD AND ACLARE

This option includes for the supply of treated water from a new Water Treatment Plant at the southern end of Lough Conn via Foxford and Aclare. This option would require a new water treatment plant to be constructed with a capacity of 8 MLD and connecting to Lough Talt as per Option 2 above resulting in approximately 12.4km of a 500mm diameter, 17.3km of a 450mm diameter main and associated pumping stations to extend the supply to the existing Lough Talt trunk main. A Water Abstraction Order would likely be required for this option due to the new abstraction location. Details of this option and route are outlined in **Table 1.8**. A route option is shown in **Figure 1-5**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings.

Table 1.8: Option 3, Rising Main Route

Route - Option 2		
	Section 1	Section 2
Route Start	South Lough Conn	Foxford
Route Finish	Foxford	Lough Talt
Total Length	12.4 km	17.3km
Pipe Diameter	500 mm	450 mm
River Crossings	2	
Rail Crossings	1	
Other Significant Crossings	0	
Maximum static lift	63 m	
Approximate Dynamic Headloss	43 m	
Booster pumping station	2 No.	

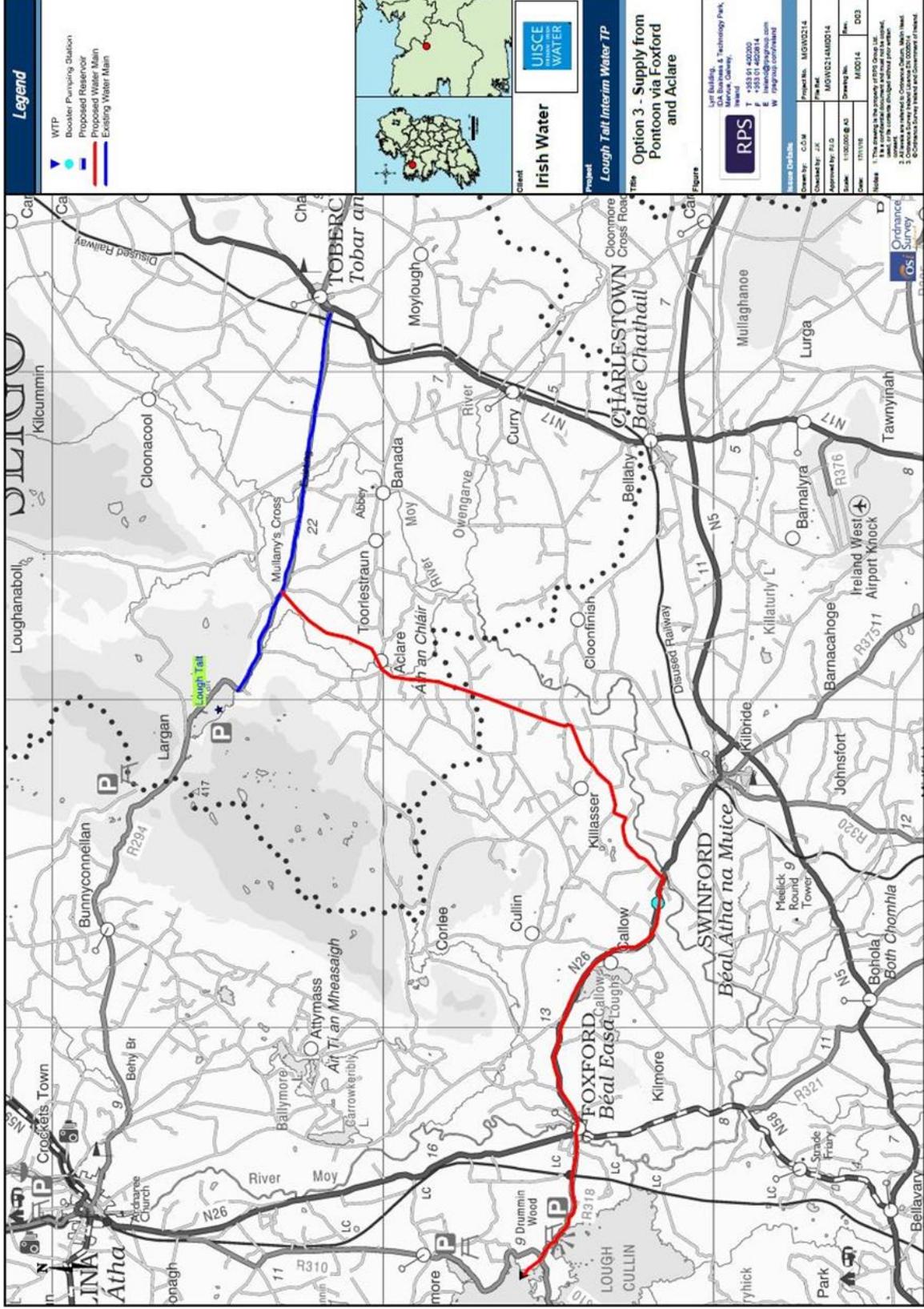


Figure 1-5: Option 3 Rising Main Route

1.4.1 Assessment of Option 3

The following sections present the results of the assessment associated with Option 3.

1.4.1.1 Risk Assessment

Security of Supply

Mayo County Council / Irish Water currently have the legal right to abstract 91 MLD from Lough Conn. The current abstraction rate is approximately 9.8 MLD. Therefore there is significant scope for an increase in the abstraction. A yield assessment will be required to fully define the security of the supply from Lough Conn.

Raw Water Quality

Lough Conn is currently rated as having 'Good' status water quality by the EPA. The Water Framework Directive (WFD) currently categorises Lough Conn as being 'not at risk'. Wherrew WTP does not currently have issues with raw water quality.

Planning

This option will include the construction of a new WTP at the southern end of Lough Conn. Issues could arise during the land acquisition and planning process which may lead to delays.

Abstraction License/Order

It is anticipated that a new water abstraction licence/order is likely to be required for this option due to the new abstraction location. While the WAO will be for an abstraction significantly less than the existing WAO it could still result in delays to the delivery of the project.

Existing Environment

Option 3 begins at a proposed new intake and treatment plant located at the southern end of Lough Conn. The proposed route travels along the R318 to Foxford, from which it continues along the same route as Option 2 to the Lough Talt main, intersecting the River Moy SAC at Foxford and again at Aclare. It terminates at the R294 Mullany's cross area, joining the existing 400m watermain. This route also crosses the Eighnagh River at Aclare where it is designated as "Good" in terms of its river quality.

Potential Impacts on European sites

Increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in impacts to habitats sensitive to hydrological changes within the River Moy SAC. This includes the priority habitat [91E0] Alluvial forests, which is found on the western shores of Lough Conn, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. Potential changes in the hydrogeological regime may impact groundwater dependent terrestrial ecosystems (GWDTE) such as Active raised bog (7110), Alkaline fens [7230] and Alluvial forests (91E0), habitats which may be found within the zone of influence of the abstraction. Should the pipeline installation be completed in the absence of best practice, proposed works may result in

localised impacts to water quality and to water dependent species such as White-clawed crayfish which is widespread in the SAC including the rivers which feed Loughs Conn and Cullin, lamprey species, Salmon and Otter.

Option 3 comprises a new WTP and abstraction point at the southern end of Lough Conn. There is potential for landtake within the SAC and potential for disturbance and pollution due to the construction of a new WTP at the shores of Lough Conn which may result in impacts to the River Moy SAC.

Increased abstraction may reduce the availability of wetland habitats on the shores of Lough Conn and Lough Cullin SPA on which waterbirds rely.

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network and construction of the WTP. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however this will require further assessment under Stage 2 Appropriate Assessment. See **Figure 1-6** and **Table 1.9** for proximity of European sites.

Table 1.9: Option 3, Designated Sites

Option	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance from SPA
3	River Moy SAC	Abstraction within European site, and pipeline crosses the SAC at two locations	Lough Conn & Lough Cullin SPA	Within

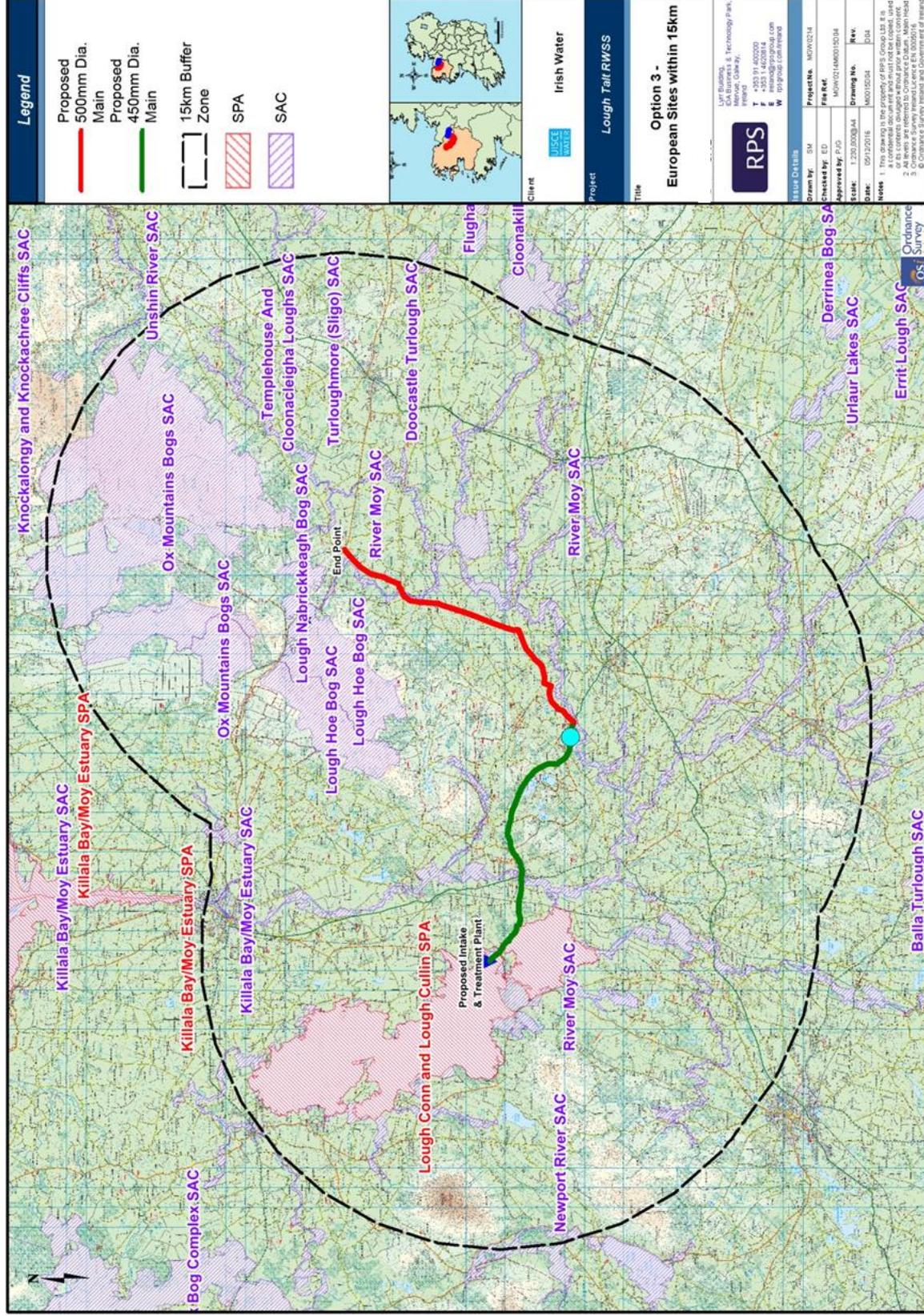


Figure 1-6: European Sites within the ZoI of Option 3

Technical Delivery

This option is technically viable and the delivery of this option should not present any technical issues.

Programme

Programme delays may occur during the execution of Option 3 due to the following;

- Land acquisition for the new WTP and pipeline route – delays may occur during discussions with landowners etc.
- Wayleaves will be required through approximately 500m of private lands. This may cause delays to the programme.

1.4.1.2 Risk Score

Table 1.10: Option 3, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 3										
Security of supply										
Raw water quality										
Planning										
Abstraction order										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										27

1.5 OPTIONS 4-5 - SUPPLY FROM LOUGH GILL AND/OR LOUGH EASKEY

Sligo Town and Environs Water Supply Scheme (SEWSS) is currently supplied from 2 water treatment plants as follows:

Table 1.11: SEWSS Abstractions

Plant	Foxes Den	Killsellagh
Source	Lough Gill	Impounding Reservoir
Water Abstraction Order	16.5 MLD	
Working Capacity	11 MLD	5.8 MLD
2016 Average Production	10 MLD	5.12 MLD
Surplus Available Existing Asset	1 MLD	0.68 MLD
Water Abstraction Surplus	5.5 MLD	

Foxes Den WTPs abstract from Lough Gill whereas Kilsellagh abstracts from an impounding reservoir north of Sligo. Both distribution networks are independent and supplementing from Kilsellagh is not feasible. A Water Abstraction Order is in place for a maximum abstraction of 16.5 MLD from Lough Gill which suggests that there is approximately 5.5 MLD available.

1.5.1 Overview of Option 4

This option includes for the supply of the Lough Talt RWSS from the SEWSS and Lough Gill. It would require a significant upgrade to the recently refurbished Foxes Den WTP or a new WTP (8 MLD) and approximately 31km of a 450mm diameter main and associated pumping stations to extend the supply to the Lough Talt RWSS at Castleoye Reservoir outside Tubbercurry. An increase in the water abstraction order amount from Lough Gill would also be required.

A route option is shown in **Figure 1-7**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings. Details of the route are provided in **Table 1.12**.

Table 1.12: Option 4, Rising Main Route

Route - Option 4	
Start	Cairns Hill Reservoir
Finish	Lough Talt
Length	31 km
Diameter of Pipeline	450 mm
River Crossings	3
Rail Crossings	1

Route - Option 4	
Other Significant Crossings	0
Maximum static lift	32 m
Approximate Dynamic Headloss	39 m
Booster pumping station	1 No.

1.5.2 Assessment of Option 4

The following sections present the results of the assessment associated with Option 4.

1.5.2.1 Risk Assessment

Security of Supply

A water abstraction order is in place at Lough Gill. The abstraction order entitles Irish Water to abstract 16.5MLD per day from Lough Gill. If this option were to proceed, an increase to the abstraction order will be required. A yield assessment will be required to fully define the security of the supply from Lough Gill.

Raw Water Quality

Lough Gill is currently rated as having 'Moderate' status water quality by the EPA. The Water Framework Directive (WFD) currently categorises Lough Gill as being 'at risk'.

Planning

This option will include the expansion of the existing Foxes Den WTP or the construction of a new WTP to treat the additional demand of 8ML/day. Planning permission will be required for the expansion of the existing WTP as well as the booster pumping stations. Planning issues may arise during this process which may lead to programme delays.

Abstraction Order/Licence

As stated, a water abstraction order is in place at Lough Gill. However, there is insufficient capacity within the order to cater for the additional demand. Therefore, an increase in the abstraction order will be required and an abstraction licence is likely to be required.

Existing Environment

Option 4 commences at Foxes Den WTP, 0.6km west of Lough Gill SAC. Lough Gill SAC is assigned "Moderate" lake waterbody status as per the WFD 2010-2015 dataset and is classified as oligotrophic/mesotrophic by the EPA surface water quality. South of the WTP is dominated by scrub and woodland. The proposed option heads south through Ballysadare from the southern outskirts of Sligo town. It crosses the Owenmore River, designated as part of Unshin River SAC, which flows through Ballysadare village and into Ballysadare Bay SAC. The Ballysadare River is located east of the route, bordered by conifer plantation, woodland and scrub. The Ballysadare River has "Good" water quality as assigned by the EPA water monitoring scheme, it flows into Ballysadare Bay SAC and further onto Sligo Bay SAC. Sligo Bay is classified as having a "Good" coastal water quality as per the EPA 2010-2015 dataset. From Colloney village, the route continues south along regional and national roads for 21km primarily traversing through improved agricultural grassland before joining the existing Lough Talt scheme north of Tobercurry adjacent to Castleoye Reservoir. Turloughmore (Sligo) SAC is situated 0.8km north of the reservoir.

Potential Impacts on European sites

Option 4 requires an increase in the current abstraction at Lough Gill by another 8 MLD (maximum abstraction of 19 MLD). Increasing the current rate of abstraction from Lough Gill may impact to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the mouth of the Bonnet River on the southern shores of Lough Gill, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish, lamprey species, Salmon and Otter.

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network and construction of the WTP. It is unclear as to whether the Lough Gill is of a sufficient size to support increased abstraction. This option will require further assessment under Stage 2 Appropriate Assessment. See **Figure 1-8** and **Table 1.13** for proximity of European sites.

Table 1.13: Option 4, Designated Sites

Option	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance from SPA
4	Lough Gill SAC	Within SAC	Ballysadare Bay SPA	0.14km
	Turloughmore (Sligo) SAC	Reservoir 0.8km from sites Pipeline 0.28km from site		
	Templehouse & Cloonacleigha Loughs SAC	0.39km		
	Unshin River SAC	Within (Crossing)		
	Union Wood SAC	0.22km		
	Ballysadare Bay SAC	0.14km		

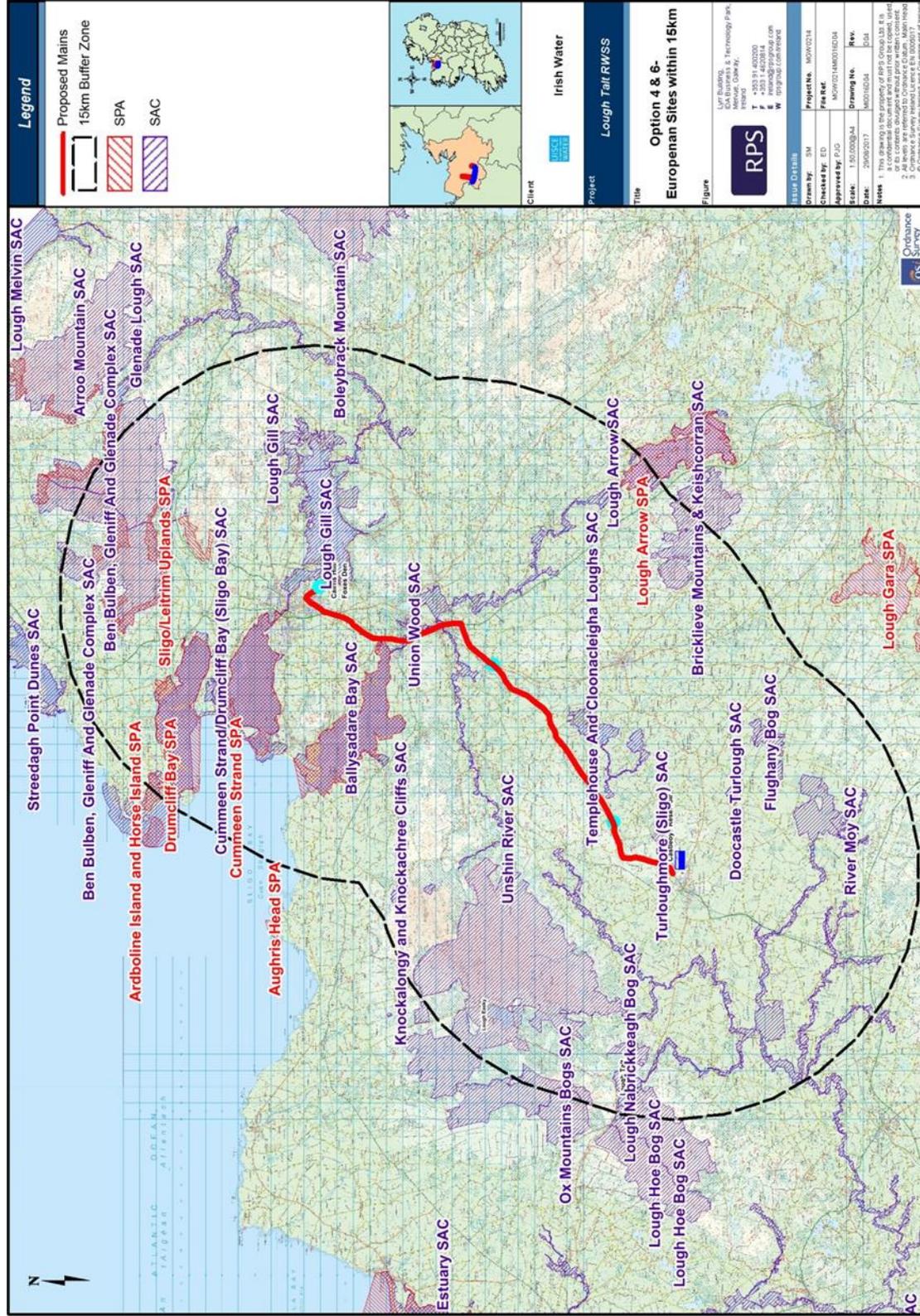


Figure 1-8: European Sites within the Zol of Option 4 and 6

Technical Delivery

This option is technically viable and the delivery of this option should not present any technical issues.

Programme

Programme delays may occur during the execution of Option 4 due to the following;

- Land acquisition for the expansion of the existing WTP site and for the booster pumping station sites – delays may occur during discussions with landowners etc.
- An increase in the abstraction order is required. This may lead to delays due to the time taken to prepare the licence application and supporting documents.

1.5.2.2 Risk Score

Table 1.14: Option 4, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 4										
Security of supply										
Raw water quality										
Planning										
Abstraction licence										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										35

1.5.3 Assessment of Option 5: Supply from Lough Easkey and Lough Gill

The average daily output from the Lough Easkey Water Treatment Plant is in the region of 2.65 MLD. The WTP abstracts water from Lough Easkey and has a capacity of 4.4 MLD. A Water abstraction order of 9.09 MLD exists for Lough Easkey.

This option includes for the supply of the Lough Talt RWSS with 4 MLD from Lough Easkey and 4 MLD from the SEWSS. It would require;

- An upgrade to the WTP at Lough Easkey (4 MLD) and approximately 12 km of a 300mm diameter gravity main.
- An upgrade to the Foxes Den WTP or a new WTP (4 MLD) and approximately 31km of a 300mm diameter main and associated pumping station and storage to extend the supply to the Lough Talt RWSS at Castleoye Reservoir.

A water abstraction order would not be required.

A route option is shown in **Figure 1-9**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings. Details of the route are provided in **Table 1.15**.

Table 1.15: Option 5, Rising Main Routes

Route - Option 5	SEWSS	Lough Easkey
Start	Cairns Hill Reservoir	Lough Easkey
Finish	Lough Talt	Lough Talt
Total Length	31 km	12 km
Pipeline Diameter	350 mm	300 mm
River Crossings	3	2
Rail Crossings	0	0
Other Significant Crossings	0	0
Maximum static lift	32 m	20 m
Approximate Dynamic Headloss	37 m	30 m
Booster pumping station	1 No.	1 No.

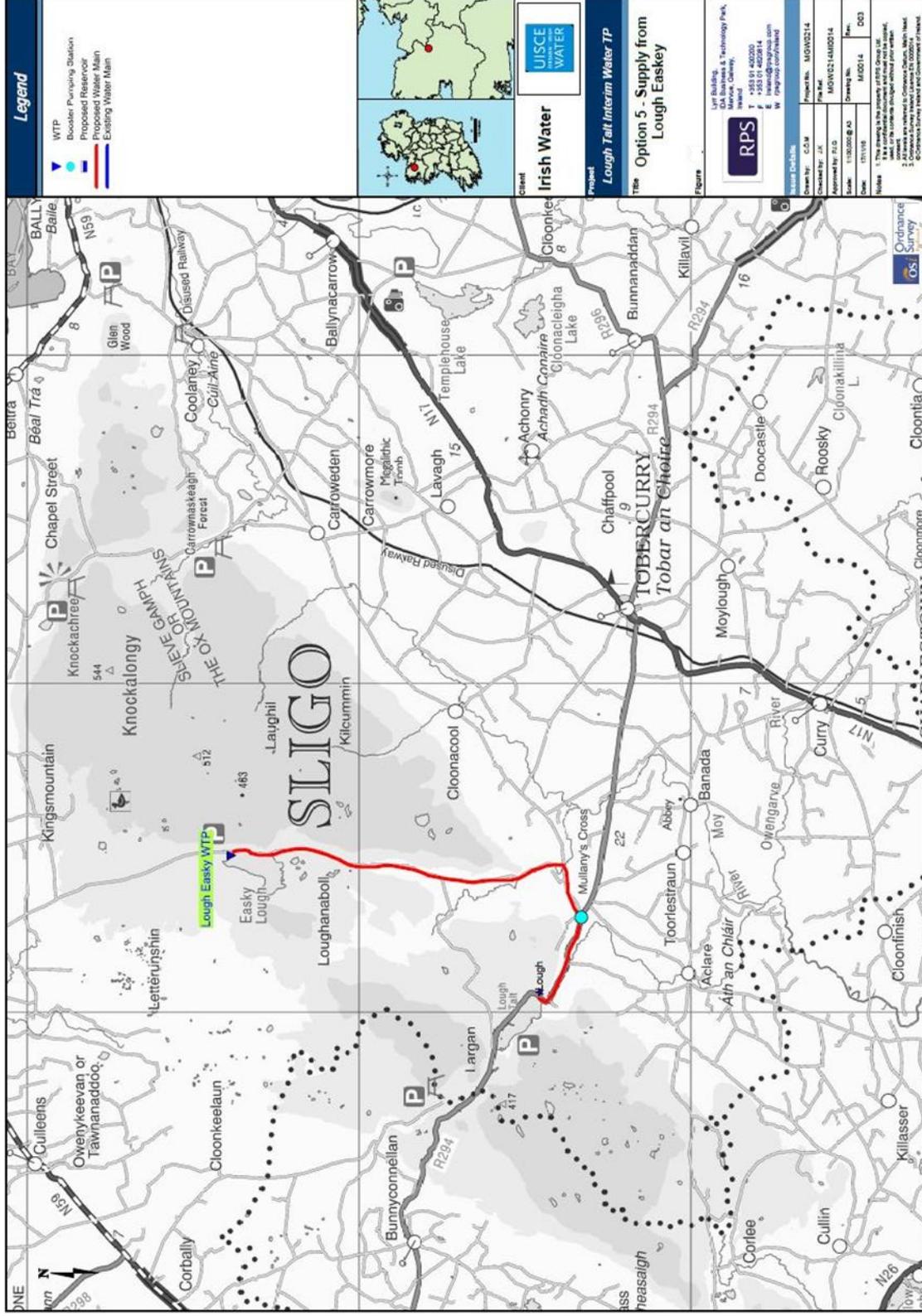


Figure 1-9: Option 5 Rising Main Route

1.5.4 Assessment of Option 5

The following sections present the results of the assessment associated with Option 5.

1.5.4.1 Risk Assessment

Security of Supply

A new water abstraction order would not be required at Lough Easkey or Lough Gill as part of this option as there is sufficient capacity within the existing orders to provide 4MLD from each to the Lough Talt WSS. Yield assessments will be required to fully define the security of supply from both Lough Easkey and Lough Gill.

Raw Water Quality

Lough Easkey is currently rated as having 'Good' status water quality by the EPA. The Water Framework Directive (WFD) currently categorises Lough Easkey as being 'not at risk'. Lough Easkey WTP does not currently have issues with raw water quality. Lough Gill is currently rated as having 'Moderate' status water quality by the EPA as noted under the assessment of Option 4.

Planning

This option will include the expansion of the both the Lough Easkey WTP and the Foxes Den WTP or the construction of new WTPs at those sites as well as the pumping station sites. Separate planning permissions will be required and this may increase the risk of incurring planning issues and subsequent delays.

Abstraction Order/Licence

It is not anticipated that a water abstraction licence would not be required for this option. However, an assessment of the effect of abstracting a significantly higher volume of water from Lough Gill and Lough Easkey may be required.

Existing Environment

Option 5 comprises of two sections; section one is approximately a distance of 11.2km watermains south of Lough Easkey to the existing water main east of Lough Talt. Lough Easkey is located in the Ox Mountains Bogs SAC. The Ox Mountains Bogs are an extensive area, comprising of several upland blanket bogs of which are regarded as priority habitat (if active) [7130] and are a qualifying interest of the SAC. Lough Easkey has a waterbody WFD status of "Good" as per the 2010-2015 dataset. The EPA surface water quality status classifies the lake as having an Oligotrophic/Mesotrophic status. The route crosses the Owenaher River prior to connecting to the existing mains at R294. This river is assigned a "Good" river quality status as per the EPA dataset.

Potential Impacts on European sites

Geyer's Whorl snail (*Vertigo geyeri*), a qualifying feature of the Ox Mountains Bogs SAC, is present around Lough Easkey and the slopes downstream adjacent to Lough Easkey River (*per coms.* Evelyn Moorkens). An increase in the water abstraction may potentially have a significant negative impact upon the surrounding populations, particularly during drought conditions. Although not a qualifying interest of the Ox Mountains Bogs SAC, a population of Fresh Water Pearl Mussel (*Margaritifera margaritifera*) are present downstream of the lake and are potentially located within the lake (*per coms.* Evelyn Moorkens). The freshwater pearl mussel is a bivalve mollusc found in clean, fast-flowing rivers, and occasionally in lakes. It is a highly threatened animal, categorised as critically endangered in Ireland.¹ Abstraction of Lough Easkey during drought conditions has potential to significantly negatively impact upon the local population. See **Figure 1-10** and **Table 1.16** for proximity of European sites.

A significant period of monitoring would likely be required if an increase in abstraction was to be considered at Lough Easkey with a probable negative outcome with regards to the Habitats Directive. This option will therefore not be considered further at this stage.

Table 1.16: Option 5, European Sites

Option	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance from SPA
5	Lough Gill SAC (Site Code: 001976)	Abstraction at Lough Gill is within SAC boundary	Ballysadare Bay SPA	0.14km
	Ox Mountains Bogs SAC (Site Code: 002006)	Abstraction at Lough Easkey and pipeline is within Ox Mountains Bogs SAC boundary		
	Unshin River SAC (Site Code: 000636)	Crosses the Unshin River SAC	Cummeen Strand SPA (Site Code: 004035)	2.9km north
	Union Wood SAC (Site Code: 000638)	0.22km east of pipeline		
	Ballysadare Bay SAC (Site Code: 000622)	0.14km west of pipeline		
	Turloughmore (Sligo) SAC (Site Code: 000637)	0.14km west of pipeline		
	River Moy SAC (Site Code: 002298)	2.9km north		

¹ <https://www.npws.ie/research-projects/animal-species/invertebrates/freshwater-pearl-mussel>

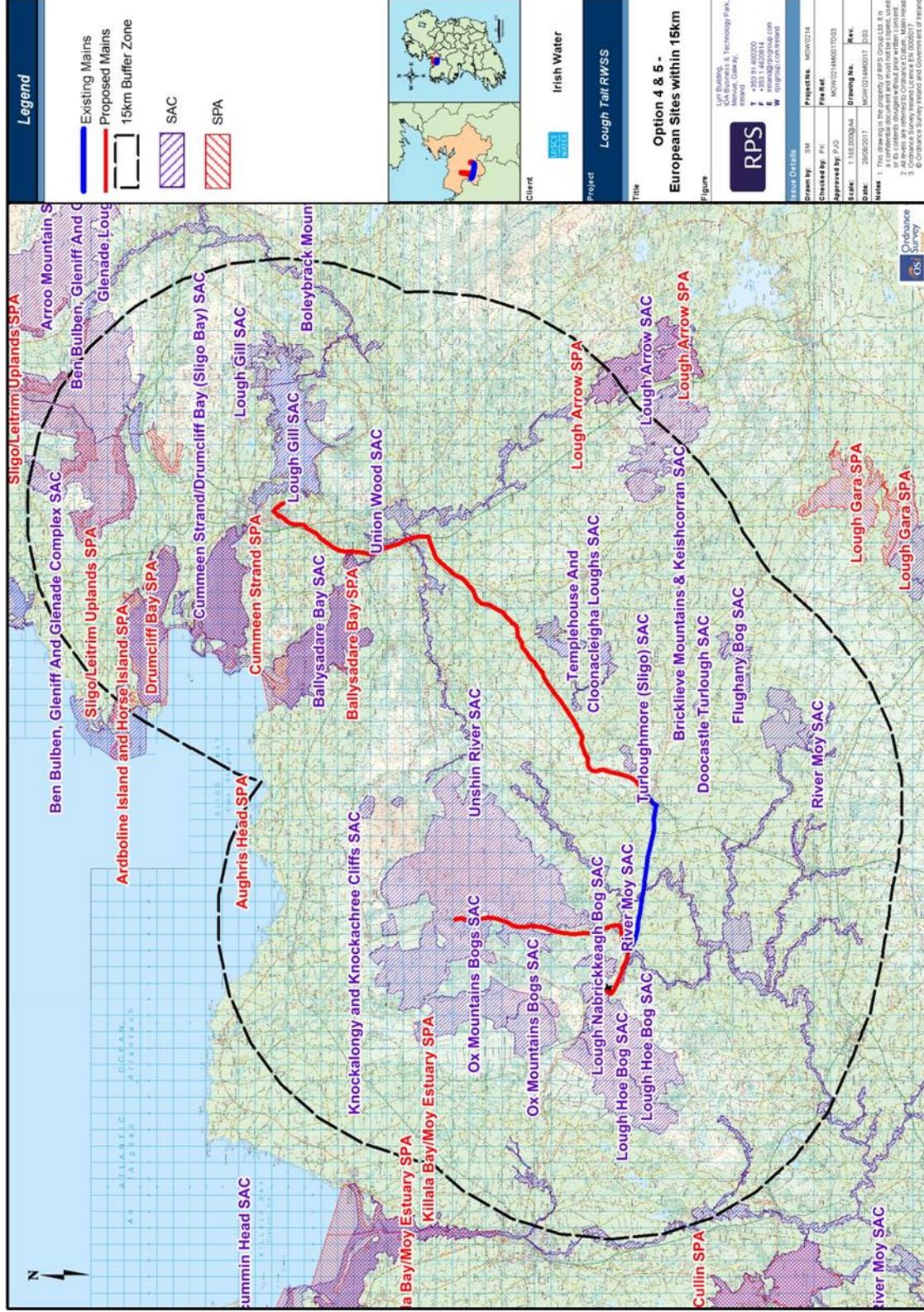


Figure 1-10: European sites within the Zol of Option 5

1.6 SUPPLY FROM NEW WATER TREATMENT PLANT AT LOUGH TALT OF REDUCED CAPACITY WITH SUPPLEMENT FROM OTHER WATER SUPPLY SYSTEMS (OPTION 6 AND 7)

The hydrogeological impact assessment report prepared by RPS indicates that if abstraction remains below 4 MLD there is likely to be no impact to the *Vertigo geyeri* population and habitat within Lough Bog SAC. Options 6 and 7 involve the provision of a new 4 MLD treatment facility at Lough Talt and assess options for providing an additional 4 MLD from adjacent regional water supply systems.

1.6.1 Option 6: Lough Talt WTP Supplemented from Sligo Town & Environs WSS (SEWSS)

This option involves increasing the output from the Sligo Town & Environs Regional Water Supply System (SEWSS). Under this option the Castleoye area of the existing Lough Talt WSS will be transferred to SEWSS. This requires:

- A new water treatment plant at Lough Talt with capacity of 4 MLD
- New pumping station at Cairns Hill Reservoir, and a minimum of 31 km of distribution mains to supply 4 MLD to Castleoye Reservoir
- A new or upgraded WTP at Foxes Den to provide an additional 4 MLD treatment capacity. (It is assumed that the current headroom (1 MLD) available at the Foxes Den WTP will be required to address short/medium term growth in Sligo Town).

The route option is the same as Option 4 and is shown in **Figure 1-8**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings. Details of the route are provided in **Table 1.17**.

Table 1.17: Option 6, Rising Main Route

Route - Option 6	Cairns Hill Reservoir to Castleoye Reservoir
Total Distance	31.0 km
Pipe Diameter	350 mm
River Crossings	3
Rail Crossings	1
Other Significant Crossings	1
Maximum static lift	32 m
Approximate Dynamic Headloss	38 m
Booster pumping station	1 No.

1.6.2 Assessment of Option 6

The following sections present the results of the assessment associated with Option 6.

1.6.2.1 Risk Assessment

Security of Supply

An abstraction order is required for Lough Talt, however a new treatment facility with a capacity of less than 4 MLD is below the minimum threshold recommended to minimise the impact of water abstraction on lake levels and maintaining the required habitat for *Vertigo geyeri*. It is likely that additional study would be required before a licence is authorised. There is sufficient capacity within the existing Lough Gill WAO however a yield assessment may be required.

Raw Water Quality

Lough Gill is currently rated as having 'Moderate' status water quality by the EPA as noted under the assessment of Options 4 and 6. Lough Talt is currently rated as having "Good" status. Both lakes have existing water treatment facilities and with sufficient treatment will produce good quality drinking water.

Planning

This option will include a new water treatment facility on Lough Talt and the construction of a new water main and pumping station sites and upgrade to Foxes Den WTP. Separate planning permission will be required and this may increase the risk of planning issues and subsequent delays.

Abstraction Order

There is no water abstraction order in place for Lough Talt. An existing order of 16.5 MLD for Lough Gill is in place, currently 11 MLD is abstracted. The required additional 4 MLD is well within the 5.5 MLD spare capacity.

Existing Environment

Option 6 comprises of two sections; section one is approximately a distance of 31 km of watermains south of Lough Gill to the existing service water reservoir. This was discussed as part of Option 4 in **Section 6.5.2**. Please refer to **Table 1.13** and **Figure 1-8** for the European sites within the zone of influence of this option.

Potential Impacts on European sites

Option 4 requires an increase in the current abstraction at Lough Gill by another 4 MLD. Increasing the current rate of abstraction from Lough Gill may impact to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the mouth of the Bonnet River on the southern shores of Lough Gill, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish, lamprey species, Salmon and Otter.

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the construction of the new water treatment plant at Lough Talt and during the installation of the pipeline network. However, it is unclear as to whether the Lough Gill is of a sufficient size to support increased abstraction. Preliminary hydrological reports indicate that there

will be no impact on *Vertigo geyeri* if abstraction at Lough Talt is maintained below 4 MLD and the reduction in abstraction would may have a positive impact on the other qualifying interests such as Oligotrophic waters [3110] and White clawed crayfish [1092]. However, a long-term study on the impact of abstraction on the qualifying interests of Lough Hoe Bog and Lough Gill is required. This option will require further assessment under Stage 2 Appropriate Assessment. See **Figure 1-8** and **Table 1.13** for proximity of European sites.

Technical Delivery

This option is technically viable and the delivery of this option should not present any technical issues.

Programme

Programme delays may occur during the execution of Option 6 due to the following;

- Land acquisition for the expansion of the existing WTP site and for the booster pumping station sites – delays may occur during discussions with landowners etc.
- Delay to obtain planning permission for the new water treatment facility at Lough Talt and the upgraded treatment at Foxes Den.
- An abstraction licence would be required for the permanent use of Lough Talt. This may lead to delays due to the time taken to prepare the licence application and supporting documents.

1.6.2.2 Risk Score

Table 1.18: Option 6, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 6										
Security of supply										
Raw water quality										
Planning										
Abstraction licence										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										36

1.7 OPTION 7: LOUGH TALT WTP SUPPLEMENTED FROM SLIGO T&E SOUTH SLIGO WSS

This option involves increasing the output from the Sligo Town & Environs Regional Water Supply System (SEWSS) and the South Sligo Regional Water Supply System (SSWSS). Under this option the Castleoye area of the existing Lough Talt WSS will be transferred to SEWSS and the Bunnanadden Area will be transferred to the SSWSS. This requires:

- A new water treatment plant at Lough Talt with capacity of 4 MLD
- New pumping station at Cairns Hill Reservoir, and a minimum of 31 km of distribution mains to supply 2.8 MLD to Castleoye Reservoir
- Provide a minimum of an additional 2.8 MLD treatment capacity from Foxes Den WTP
- New pumping station at a minimum distance of 17.7 km from Monasteraden Pumping station to supply 1.2 MLD to Bunnanadden Reservoir

The additional 1.2 MLD provided to Bunnanadden will be provided from the South Sligo WSS which has spare capacity from imports from the nearby North Roscommon WSS. The Lough Gara WTP supplies the South Sligo RWSS has a capacity of 10 MLD and average production is less than 7.3 MLD.

A route option is shown in **Figure 1-11**. The route of the pipeline has been chosen to minimise river, rail and other significant crossings. Details of the route are provided in **Table 1.19**.

Table 1.19: Option 7, Rising Main Route

	Cairns Hill Reservoir to Castleoye Reservoir	Monasteraden Pumping Station to Bunnanadden Reservoir
Total Distance	31.0 km	17.7 km
Pipe Diameter	300 mm	250 mm
River Crossings	3	1
Rail Crossings	1	0
Other Significant Crossings	1	0
Maximum static lift	32 m	63 m
Approximate Dynamic Headloss	42 m	12 m
Booster pumping station	1 No.	1 No.

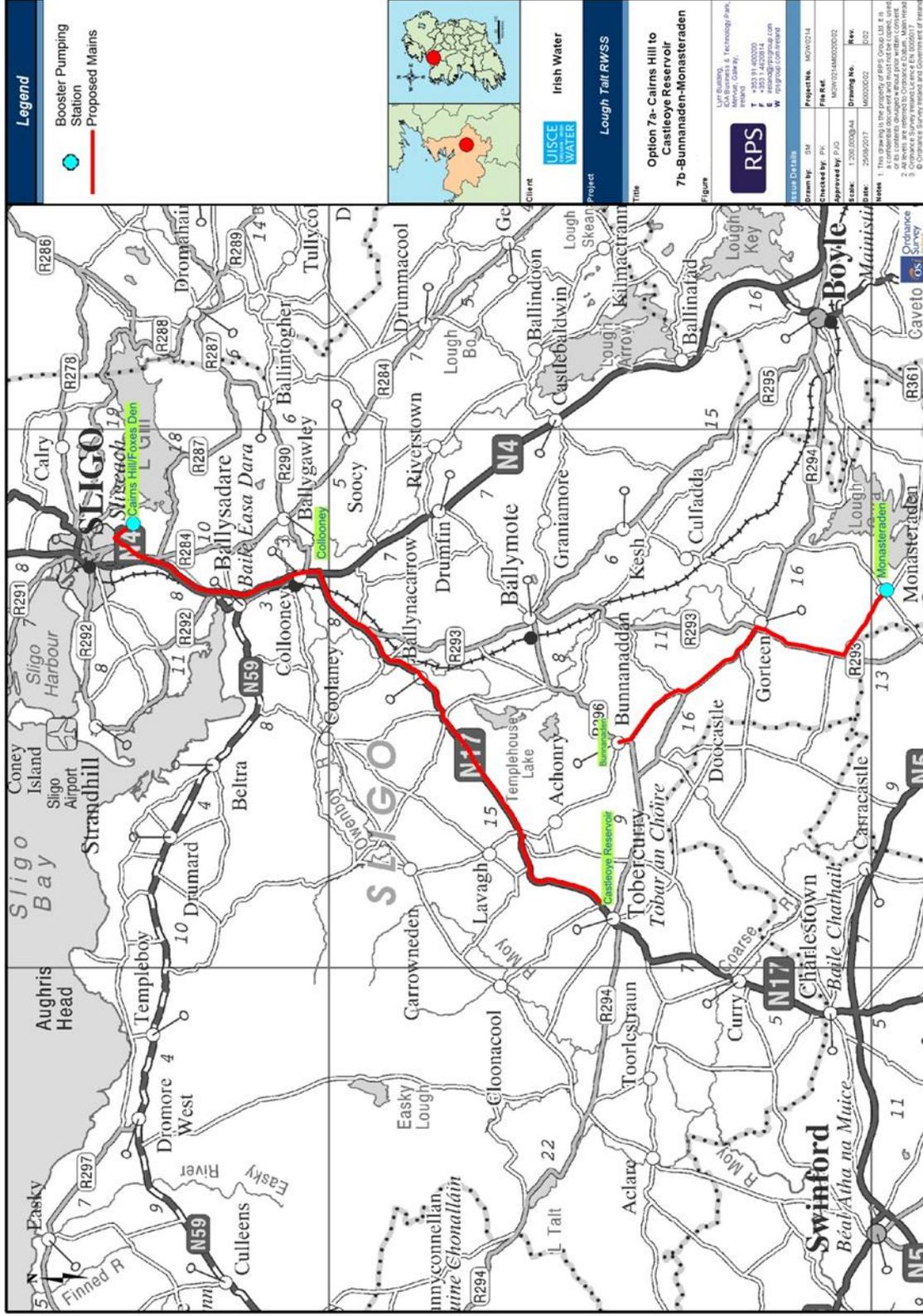


Figure 1-11: Option 7 Rising Main Route

1.7.1 Assessment of Option 7

The following sections present the results of the assessment associated with Option 7. For costing purposes a required upgrade of 3 MLD at Foxes Den WTP has been assumed.

1.7.1.1 Risk Assessment

Security of Supply

An abstraction order is required for Lough Talt, however a new treatment facility with a capacity of less than 4 MLD is below the threshold recommended to minimise the impact of water abstraction on lake levels and maintaining the required habitat for *Vertigo geyeri*. It is likely that additional study would be required before a licence is authorised. There is sufficient capacity within the existing Lough Gill WAO however a yield assessment may be required.

Raw Water Quality

Lough Gill is currently rated as having 'Moderate' status water quality by the EPA as noted under the assessment of Options 4 and 6. Lough Talt is currently rated as having "Good" status. Both lakes have existing water treatment facilities and with sufficient treatment will produce good quality drinking water.

Planning

This option will include a new water treatment facility on Lough Talt and the construction of a new water main and pumping station sites and upgrade to Foxes Den WTP. There is spare capacity within the SSWSS to provide an additional 1.2 MLD, however new waters mains are required to import the water to the Lough Talt network. Separate planning permission will be required and this may increase the risk of planning issues and subsequent delays. The initial application for an 8MLD water treatment facility was rejected by both Sligo County Council and An Bord Pleanála and there is a risk the reduced capacity facility could be rejected on the same grounds.

Abstraction Order

There is no water abstraction order in place for Lough Talt and it is anticipated that a licence would be required for long-term use. An existing order of 16.5 MLD for Lough Gill is in place, currently 11 MLD is abstracted. The required additional 2.8 MLD is within the 5.5 MLD spare capacity.

Existing Environment

Option 7 comprises of two sections; section one is approximately a distance of 31 km of watermains south of Lough Gill to the existing service water reservoir at Castleoye (same as Option 4), and 17.7 km of watermains from Monasteraden to Bunnandden. The route begins at Monasteraden, located approximately 1.2km west of Lough Gara, a designated SPA site. Monasteraden to Gorteen is dominated by wet grassland bog prior. Gorteen is the most significant settlement on the route. Gorteen to Bunnandden route is located in a rural landscape with agricultural fields and occasional patches of wet grassland being the most common habitat type; it follows the R294 terminating at Bunnandden. The existing environment of these routes is described in detail in **Section 6.5.2**.

Potential Impacts on European sites

Robust and effective best practice measures can be developed for the avoidance of any impacts to European sites during the construction of the new water treatment plant at Lough Talt and during the installation of the pipeline network. However, it is unclear as to whether the Lough Gill is of a sufficient size to support increased abstraction. Preliminary hydrological reports indicate that there will be no impact on *Vertigo geyeri* if abstraction at Lough Talt is maintained below 4 MLD and the reduction in abstraction would may have a positive impact on the other qualifying interests such as Oligotrophic waters [3110] and White clawed crayfish [1092]. However, a long-term study on the impact of abstraction on the qualifying interests of Lough Hoe Bog and Lough Gill is required. This option will require further assessment under Stage 2 Appropriate Assessment. Refer to **Table 1.20** and **Figure 1-12** for the European sites within the zone of influence of this option.

Table 1.20: Option 7, Designated Sites

Route	Special Areas of Conservation (SAC)	Distance from SAC	Special Protected Areas (SPA)	Distance for SPA
Option 7	Lough Gill SAC	Abstraction within SAC	Ballysadare Bay SPA	0.14km
	Turloughmore (Sligo) SAC	Reservoir 0.8km from site Pipeline 0.28km from site		
	Templehouse & Cloonacleigha Loughs SAC	0.39km		
	Unshin River SAC	Within (Crossing)		
	Union Wood SAC	0.22km	Lough Gara SPA	1km
	Ballysadare Bay SAC	0.14km		
	Flughany Bog SAC	0.9km		

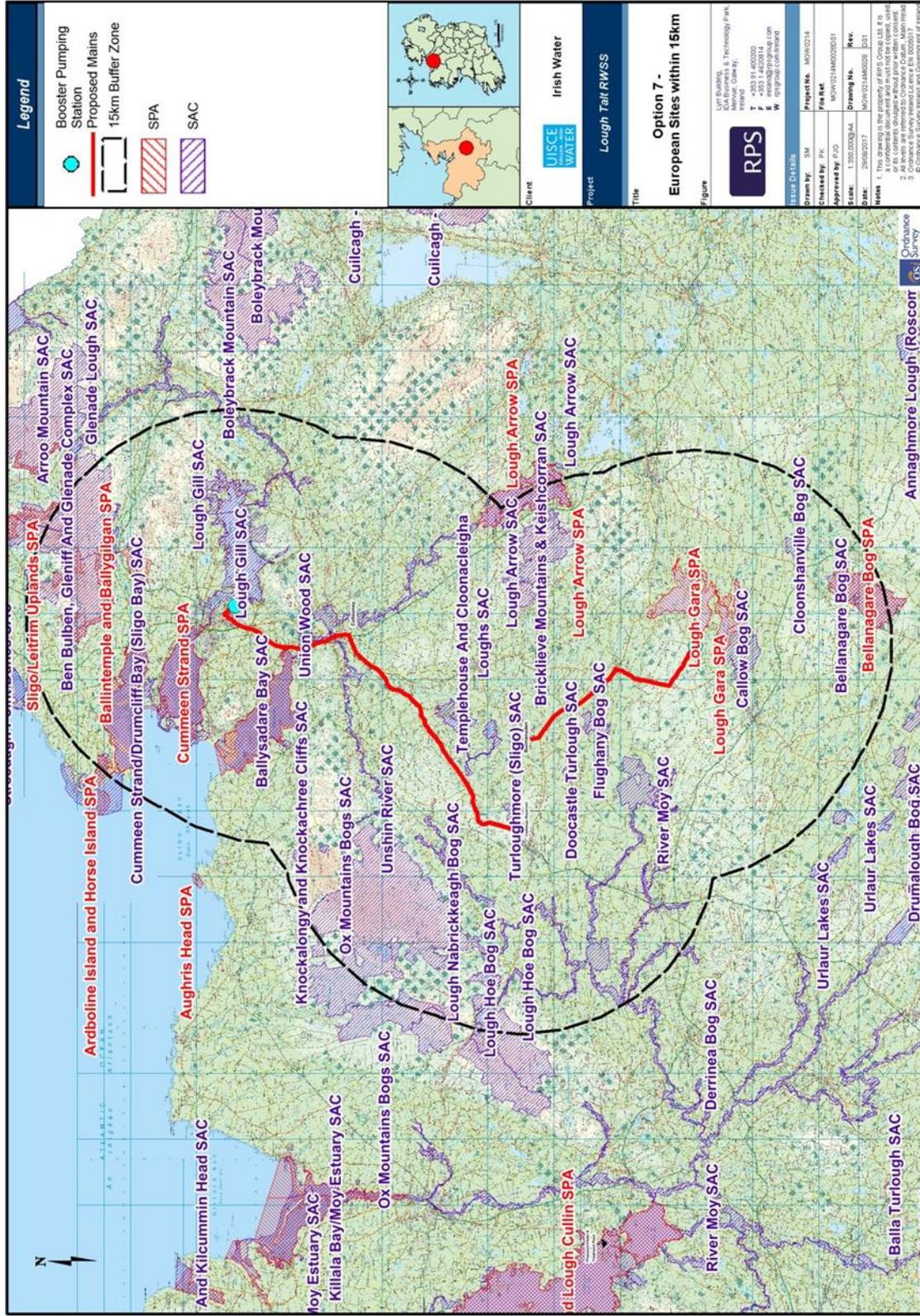


Figure 1-12: European Sites within the Zol of Option 7

Technical Delivery

This option is technically viable and the delivery of this option should not present any technical issues.

Programme

Programme delays may occur during the execution of Option 7 due to the following;

- Land acquisition for the expansion of the existing WTP site and for the booster pumping station sites – delays may occur during discussions with landowners etc.
- Delay to obtained planning permission for the new water treatment facility at Lough Talt and the upgraded treatment plant at Foxes Den
- A new abstraction order is required. This may lead to delays due to the time taken to prepare the licence application and supporting documents.

1.7.1.2 Risk Score

Table 1.21: Option 7, Risk Score

Risk	Score									
	1	2	3	4	5	6	7	8	9	10
OPTION 7										
Security of supply										
Raw water quality										
Planning										
Abstraction licence										
Environment										
Technical delivery										
Programme										
TOTAL RISK SCORE										36

2 CONCLUSIONS

The existing WTP at Lough Talt does not provide an adequate barrier for cryptosporidium and treated water samples within the network regularly breach the regulatory standard for THMs. There is no short-term solution available that does not have a potential environmental impact on Lough Talt but Irish Water and the EPA consider it unacceptable that the public health risks associated with the current treated water supply are allowed to continue until such time as a long-term sustainable solution is in place. To address these current public health risks it is proposed to upgrade the existing treatment facility with a view to abandoning the facility within a 7-10 year timeframe.

2.1 PREFERRED REPLACEMENT WATER SUPPLY

The preferred replacement supply for the Lough Talt RWSS is to proceed with detailed feasibility to develop source capability at Lough Conn either by:

- Construction of a new water treatment facility at south of Lough Conn to treat required 8MLD, or
- Significant Expansion at the existing Wherrew WTP

This would provide a sustainable 8 MLD supply to Lough Talt RWSS and therefore would allow the abstraction from Lough Talt to cease.

A Water Abstraction Licence may be required for this option due to the potential for a new abstraction.

**APPENDIX A – ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS OF
REPLACEMENT OPTIONS**

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
000633	Lough Hoe Bog SAC	(3110) Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (7130) Blanket bogs (*if active only)	(1013) <i>Vertigo geyeri</i> (1092) White clawed crayfish (<i>Austropotamobius pallipes</i>)	<p>Option A: Do Nothing – Zero Option: Direct connectivity. This option maintains the continued abstraction of 8MLD from Lough Talt.</p> <p>Replacement Supply Option 1: Indirect connectivity. Route Option 1 adjoins this European site at Lough Talt and its immediate environs.</p> <p>Replacement Supply Option 2: Direct connectivity. The route crosses the Eighnagh River (Lough Talt River) located 4.5km south of the Lough Hoe Bog SAC.</p> <p>Replacement Supply Option 3: Indirect connectivity. The route</p>	<p>Continued abstraction from Lough Talt at the current rate of 8MLD will continue to impact the Annex II species Geyer's Whorl Snail (<i>Vertigo geyeri</i>) [1013] and White-clawed Crayfish (<i>Austropotamobius pallipes</i>) [1092], particularly during drought conditions.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors such as White-clawed Crayfish [1092] during the construction stage. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Lough Hoe Bog SAC is located upstream and therefore there should be no impacts to water dependent qualifying habitats. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and White-clawed Crayfish [1092] which is also found in the Eighnagh River. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Lough Hoe Bog SAC is located upstream and therefore there should be no</p>

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
				crosses the Eighnagh River (Lough Talt River) located 4.5km south of the Lough Hoe Bog SAC.	impacts water dependent qualifying habitats. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and White-clawed Crayfish [1092] which is also found in the Eighnagh River. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.
				<p>Replacement Supply Option 6: Direct connectivity. Option 6 requires continued abstraction from Lough Talt the construction of a new water plant at Lough Talt with capacity of 4 MLD.</p> <p>Replacement Supply Option 7: Direct connectivity. Option 7 requires continued abstraction from Lough Talt and the construction of a new water plant at Lough Talt with capacity of 4 MLD.</p>	<p>A reduced abstraction of 4MLD may meet the conservation objectives of <i>Vertigo geyeri</i>, which is to restore the favourable conservation condition for this species. Favourable conservation condition would be reached through suitable hydrological and hydrogeological interactions occur at Lough Talt to provide optimal habitat for this species. However, further assessment is required.</p> <p>The construction of the new water plant at Lough Talt may result in localised impacts to water quality of Lough Talt and the Eighnagh River. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the construction stage.</p>
002298	River Moy SAC	(7110) *Active raised bogs	(1092) White clawed crayfish (<i>Austropotamobius</i>)	Replacement Supply Option 1: Direct connectivity due to water abstraction from Lough Conn via Wherrew WTP.	For all options, increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
		<p>(7120) Degraded raised bogs still capable of natural regeneration</p> <p>(7150) Depressions on peat substrates of the Rhynchosporion</p> <p>(7230) Alkaline fens</p> <p>(91A0) Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</p> <p>(91E0) *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, <i>Salicion albae</i>)</p>	<p><i>pallipes</i></p> <p>(1095) Sea lamprey (<i>Petromyzon marinus</i>)</p> <p>(1096) Brook lamprey (<i>Lampetra planeri</i>)</p> <p>(1106) Atlantic salmon (<i>Salmo salar</i>) (only in fresh water)</p> <p>(1355) Otter (<i>Lutra lutra</i>)</p>	<p>Direct connectivity to the River Moy SAC also occurs at the crossing of the Brusna and Glenree River; both crossings are located in the River Moy SAC, east of Ballina. There is potential for indirect connectivity to the River Moy SAC at the route termination point at Lough Talt where the connection to existing pipeline occurs. There is also indirect connectivity to the River Moy SAC via a river crossing of the Sruffaunbrogue River west of Ballina and at the estuary crossing north of Ballina where a significant route crossing occurs.</p>	<p>8MLD may result in impacts to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the western shores of Lough Conn, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores.</p> <p>Potential changes in the hydrogeological regime may impact groundwater dependent terrestrial ecosystems (GWDTE) such as Active raised bog (7110), Alkaline fens [7230] and Alluvial forests (91E0), habitats which may be found within the zone of influence of the abstraction. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however further assessment is required.</p> <p>Should the pipeline installation be completed in the absence of best practice measures, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish which is widespread in the SAC including the rivers which feed Loughs Conn and Cullin, lamprey species, Salmon and Otter. However, robust and effective construction measures can be developed for the avoidance of any</p>

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
				<p>Replacement Supply Option 2: Direct connectivity due to water abstraction from Lough Conn via Wherrew WTP. Direct connectivity occurs via the River Moy at the route crossing in Foxford. Indirect connectivity to the River Moy SAC also occurs in the townland of Pollsharvoige where the route is adjacent to the SAC along the road. Further potential indirect connectivity to the River Moy SAC occurs at the following river crossings:</p> <ul style="list-style-type: none"> ▪ Via a tributary of the River Moy (WE_MoyTRIB_Carrownedan) located in the townland of Carrowmoremoy. ▪ Via the Bellanamean River south of Aclare. <p>There is potential for direct connectivity to the River Moy SAC at</p>	<p>impacts to European sites during the installation of the pipeline network.</p> <p>Option 3 comprises a new WTP and abstraction point near southern end of Lough Conn. There is potential for landtake, disturbance and pollution due to the construction of a new WTP at the shores of Lough Conn which may result in impacts to the River Moy SAC. Robust and effective construction measures can be developed for the avoidance of any impacts to European sites during the construction of the WTP.</p> <p>For all options, increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in impacts to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the western shores of Lough Conn, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores.</p> <p>Potential changes in the hydrogeological regime may impact groundwater dependent terrestrial ecosystems (GWDTE) such as Active raised bog (7110), Alkaline fens [7230] and Alluvial forests (91E0), habitats which may be found within the zone of influence of the abstraction. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current</p>

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
				<p>the river crossing of the Eighnagh River (Lough Talt River) providing direct connectivity to the River Moy SAC.</p> <p>Replacement Supply Option 3: Direct connectivity due to water abstraction from Lough Conn via a proposed new WTP at southern end of Lough Conn. Direct connectivity occurs via the River Moy at the route crossing in Foxford. Indirect connectivity also occurs in the townland of Pollsharvoige where the route is adjacent to the SAC along the road. Further indirect connectivity occurs at the following river crossings;</p> <ul style="list-style-type: none"> ▪ Via a tributary of the River Moy (WE_MoyTRIB_Carrownedden) located in the townland of Carrowmoremoy. ▪ Via the Bellanamean River south of Aclare. <p>There is potential for direct connectivity to the River Moy SAC at the river crossing of the Eighnagh River (Lough Talt River), within Aclare village, providing direct connectivity to the River Moy SAC.</p> <p>Replacement Supply Option 1: Direct connectivity due to water abstraction from Lough Conn via Wherrew WTP.</p>	<p>abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however further assessment is required.</p> <p>Should the pipeline installation be completed in the absence of best practice measures, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish which is widespread in the SAC including the rivers which feed Loughs Conn and Cullin, lamprey species, Salmon and Otter. However, robust and effective construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Option 3 comprises a new WTP and abstraction point near southern end of Lough Conn. There is potential for landtake, disturbance and pollution due to the construction of a new WTP at the shores of Lough Conn which may result in impacts to the River Moy SAC. Robust and effective construction measures can be developed for the avoidance of any impacts to European sites during the construction of the WTP.</p> <p>For all options, increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in the reduction of</p>

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					wetland habitats on the shores of Lough Conn on which waterbirds rely. Diffuse and point source pollution of freshwaters during the construction stage of pipeline installation and the construction of the new WTP for Option 3 is likely to have indirect effect on bird species through impacts on prey abundance. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however further assessment is required. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.
004228	Lough Conn & Lough Cullin SPA	N/A	Tufted Duck (<i>Aythya fuligula</i>) [A061] Common Scoter (<i>Melanitta nigra</i>) [A065] Common Gull (<i>Larus canus</i>) [A182] Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395] Wetland and Waterbirds [A999]	Replacement Supply Option 2: Direct connectivity due to water abstraction from Lough Conn via Wherrew WTP. Replacement Supply Option 3: Direct connectivity due to water abstraction from Lough Conn via a proposed new WTP and abstraction near the southern end of Lough Conn. Replacement Supply Option 4: Direct connectivity. Increase in the current abstraction at Lough Gill.	For all options, increasing the current rate of abstraction from Lough Conn from approximately 10MLD by another 8MLD may result in the reduction of wetland habitats on the shores of Lough Conn on which waterbirds rely. Diffuse and point source pollution of freshwaters during the construction stage of pipeline installation and the construction of the new WTP for Option 3 is likely to have indirect effect on bird species through impacts on prey abundance. Based on the size and storage capacity of Lough Conn, it is unlikely that increasing the current

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
					<p>abstraction will have a significant effect on the hydrological regime of the River Moy SAC; however further assessment is required.</p> <p>However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>All options require an increase in the current abstraction at Lough Gill by another 8 MLD for options 4 and 5 and an increase of 4MLD for options 6 and 7. Increasing the current rate of abstraction from Lough Gill may impact to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the mouth of the Bonnet River on the southern shores of Lough Gill, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. It is unclear as to whether the Lough Gill is of a sufficient size to support increased abstraction. This option will require further assessment.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish, lamprey species, Salmon and Otter. However, robust and effective best practice construction</p>

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
001976	Lough Gill SAC	<p>Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation [3150]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0]</p>	<p>(1092) White clawed crayfish (<i>Austropotamobius pallipes</i>)</p> <p>(1095) Sea lamprey (<i>Petromyzon marinus</i>)</p> <p>(1096) Brook lamprey (<i>Lampetra planeri</i>)</p> <p>(1106) Atlantic salmon (<i>Salmo salar</i>) (only in fresh water)</p> <p>(1355) Otter (<i>Lutra lutra</i>)</p>	<p>Replacement Supply Option 5: Direct connectivity. Increase in the current abstraction at Lough Gill.</p> <p>Replacement Supply Option 6: Direct connectivity. Increase in the current abstraction at Lough Gill.</p> <p>Replacement Supply Option 7: Direct connectivity. Increase in the current abstraction at Lough Gill.</p> <p>Replacement Supply Option 5: Direct connectivity. Option 5 includes for the increase in abstraction from Lough Easkey by 4 MLD.</p>	<p>measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>All options require an increase in the current abstraction at Lough Gill by another 8 MLD for options 4 and 5 and an increase of 4MLD for options 6 and 7. Increasing the current rate of abstraction from Lough Gill may impact to habitats sensitive to hydrological changes such as the priority habitat [91E0] Alluvial forests, which is found on the mouth of the Bonnet River on the southern shores of Lough Gill, which requires periodic flooding to maintain the habitat along river floodplains and lakeshores. It is unclear as to whether the Lough Gill is of a sufficient size to support increased abstraction. This option will require further assessment.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to water dependent species such as White-clawed crayfish, lamprey species, Salmon and Otter. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>An increase in abstraction from Lough</p>

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					<p>Easkey is likely to result in significant effects to the qualifying interests of the Ox Mountains SAC including the Annex I habitat Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110] and the Annex II species Geyer's Whorl Snail (<i>Vertigo geyeri</i>) which is present around Lough Easkey and in the slopes downstream by the Easkey River. Any increase in abstraction of the lake especially in drought conditions is likely to have an impact on the habitat of the <i>Vertigo geyeri</i>. The Easkey River immediately downstream of the lake (and possibly the lake itself) is also home to a population of pearl mussel and any increase in the abstraction at Lough Easkey is likely to have a negative impact on the pearl mussel.</p>
002006	Ox Mountains SAC	<p>(3110) Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (3160) Natural dystrophic lakes and ponds (4010) Northern Atlantic wet heaths with <i>Erica tetralix</i> (7130) Blanket bogs (*if active only) (7150) Depressions on</p>	<p>(1013) <i>Vertigo geyeri</i></p>	<p>Replacement Supply Option 1 – Direct connectivity to the SAC occurs at the route crossing north of Ballina town. There is indirect connectivity to the River Moy SAC via a river crossing of the Sruffaunbrogue River, a tributary of Killala Bay, located west of Ballina.</p>	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised disturbance to bird species and pollution may reduce prey abundance. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p>

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		peat substrates of the <i>Rhynchosporion</i>			
004036	Killala Bay/Moy Estuary SPA	N/A	<p>Ringed Plover (<i>Charadrius hiaticula</i>) [A137]</p> <p>Golden Plover (<i>Pluvialis apricaria</i>) [A140]</p> <p>Grey Plover (<i>Pluvialis squatarola</i>) [A141]</p> <p>Sanderling (<i>Calidris alba</i>) [A144]</p> <p>Dunlin (<i>Calidris alpina</i>) [A149]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Curllew (<i>Numenius arquata</i>) [A160]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Wetland and Waterbirds [A999]</p>	<p>Replacement Supply Option 2 – There is tenuous indirect connectivity to the SAC via the route crossing of the River Moy in Foxford, located approximately 15km south of the SAC.</p> <p>Replacement Supply Option 3 - There is tenuous indirect connectivity to the SAC via the route crossing of the River Moy in Foxford, located approximately 15km south of the SAC.</p> <p>Replacement Supply Option 1 – Indirect connectivity to the SPA via the estuary crossing north of Ballina. The SPA is located 190m north of the proposed crossing. There is indirect connectivity to the River Moy SAC via a river crossing of the Sruffaunbrogue River west of Ballina. The River Moy SAC is a tributary of the Killala Bay / Moy Estuary SPA.</p>	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised disturbance to bird species and pollution may reduce prey abundance. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors such as Sea Lamprey [1095]. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p>
000458	Killala Bay/Moy Estuary SAC	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Annual vegetation of drift lines [1210]</p> <p>Salicornia and other</p>	<p>Narrow-mouthed Whorl Snail (<i>Vertigo angustior</i>) [1014]</p> <p>Sea Lamprey (<i>Petromyzon marinus</i>) [1095]</p> <p>Harbour Seal (<i>Phoca vitulina</i>) [1365]</p>	<p>Replacement Supply Option 2 – Indirect Connectivity. There is tenuous indirect connectivity to this SPA via the route crossing of the River Moy in Foxford, located approximately 17.2km south of Killala Bay/Moy Estuary SPA.</p>	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors such as Sea Lamprey [1095]. However, robust and effective best practice construction measures can be developed for the</p>

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		<p>annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]</p> <p>Embryonic shifting dunes [2110]</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]</p> <p>Humid dune slacks [2190]</p>		<p>Replacement Supply Option 3 – Indirect Connectivity. There is tenuous indirect connectivity to the SAC via the route crossing of the River Moy in Foxford, located approximately 17.2km south of Killala Bay/Moy Estuary SPA.</p> <p>Replacement Supply Option 1: Indirect Connectivity. Proposed pipeline lies within 0.12km of SAC</p>	<p>avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.</p>
000634	Lough Nabrickkeagh Bog SAC	(7130) Blanket bogs (*if active only)	n/a	Replacement Supply Option 4: Indirect Connectivity. Lies 0.39km east of pipeline route.	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p>
000636	Templehouse & Cloonacleigha Loughs SAC	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. [3140] Water courses of plain to montane levels with the	n/a	<p>Replacement Supply Option 6: Indirect Connectivity. Lies 0.39km east of pipeline route.</p> <p>Replacement Supply Option 7: Indirect Connectivity. Lies 0.39km east of pipeline route.</p>	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best</p>

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		Ranuncullion fluitantis and Callitricho-Batrachion vegetation [3260]		Replacement Supply Option 4: Direct Connectivity. This option crosses the Owenmore River, designated as part of Unshin River SAC	practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network. Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.
000636	Unshin River SAC	Water courses of plain to montane levels with the <i>Ranuncullion fluitantis</i> and Callitricho-Batrachion vegetation [3260] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (A/Ino-	<i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355]	Replacement Supply Option 5: Direct Connectivity. This option crosses the Owenmore River, designated as part of Unshin River SAC Replacement Supply Option 6: Direct Connectivity. This option crosses the Owenmore River, designated as part of Unshin River SAC. Replacement Supply Option 7: Direct Connectivity. This option crosses the Owenmore River, designated as part of Unshin River SAC. Replacement Supply Option 4: Indirect Connectivity. Lies 0.22km east of pipeline	Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network. Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.

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000638	Union Wood SAC	<i>Padion, Alnion incanae, Salicion albae</i> [91E0] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]		<p>Replacement Supply Option 5: Indirect Connectivity. Lies 0.22km east of pipeline</p> <p>Replacement Supply Option 6: Indirect Connectivity. Lies 0.22km east of pipeline</p> <p>Replacement Supply Option 7: Indirect Connectivity. Lies 0.22km east of pipeline</p> <p>Replacement Supply Option 4: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SAC</p>	<p>Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p>
000622	Ballysadare Bay SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation	<i>Vertigo angustior</i> (Narrow-mouthed Whorl Snail) [1014] <i>Phoca vitulina</i> (Harbour Seal) [1365]	<p>Replacement Supply Option 5: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SAC</p> <p>Replacement Supply Option 6: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SAC</p> <p>Replacement Supply Option 7: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SAC</p>	<p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p> <p>Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.</p>

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		(grey dunes) [2130] Humid dune slacks [2190]		Replacement Supply Option 4: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SPA.	localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network.
004129	Ballysadare Bay SPA		Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Dunlin (<i>Calidris alpina</i>) [A149] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Redshank (<i>Tringa totanus</i>) [A162] Wetland and Waterbirds [A999]	Replacement Supply Option 5: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SPA Replacement Supply Option 6: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SPA Replacement Supply Option 7: Indirect Connectivity. Crosses the Ballysadare River which flows into Ballysadare Bay SPA	Should the pipeline installation be completed in the absence of best practice, proposed works may result in localised impacts to water quality and to downstream sensitive receptors. However, robust and effective best practice construction measures can be developed for the avoidance of any impacts to European sites during the installation of the pipeline network. Turloughmore SAC is located 2km northeast of Tobercurry town in Co. Sligo. A desktop assessment of the potential impact of the groundwater abstraction on the turlough during drought periods was undertaken and showed that the abstraction of 4MLD would result in a reduction of between 0.9m and 2.4m in the watertable over a period of 95 days. It is therefore it is deemed that a groundwater abstraction to supplement the Lough Talt abstraction will result in likely significant effects to Turloughmore (Sligo) SAC
000637	Turloughmore (Sligo) SAC	(3180) *Turloughs	n/a	Replacement Supply Option 4: Indirect Connectivity. Turloughmore (Sligo) SAC is situated 0.8km north of	Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Impact Pathway	Likely Significant Effects
				the Castletoye reservoir and the pipeline runs 0.28km from SAC.	European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.
				<p>Replacement Supply Option 5: Indirect Connectivity. Turloughmore (Sligo) SAC is situated 0.8km north of the Castletoye reservoir and the pipeline runs 0.28km from SAC.</p> <p>Replacement Supply Option 6: Indirect Connectivity. Turloughmore (Sligo) SAC is situated 0.8km north of the Castletoye reservoir and the pipeline runs 0.28km from SAC.</p> <p>Replacement Supply Option 7: Indirect Connectivity. Turloughmore (Sligo) SAC is situated 0.8km north of the Castletoye reservoir and the pipeline runs 0.28km from SAC.</p> <p>Replacement Supply Option 7: Indirect Connectivity. Lies 1.2 km from pipeline route</p>	<p>Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.</p> <p>Given the characteristics of the proposed pipeline works, the distance and tenuous connectivity to the European site, there will be no potential adverse impacts on the conservation interests of this European site. No likely significant effects.</p>
004048	Lough Gara SPA	n/a	Whooper Swan (<i>Cygnus cygnus</i>) [A038] Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395]		