An Bord Pleanála **64 Marlborough Street,** **Dublin 1,** **D01V902** **14.01.2025**	**Coolatober, Ballyforan** **Ballinasloe** **Co. Galway** **H53 KD66**

Re: Planning application for a 110 kilovolt electricity substation, approximately 7.5 kilometres of underground electricity line and all associated works at Moyvannan, Feamore, Lisbaun, Carrownolan, Carrowncloghan, Carrowkeeny, Ardmullan, Curraghboy, Gortnasythe, Derryglad, Eskerbaun, and Brideswell, County Roscommon

Ref. No. 321328

Dear Sir/Madam,

I attach my observations on the above application for your consideration. I also wish to request an Oral Hearing.

The fee of €50 is included

Yours faithfully

Rose Burke

Rose Burke BScEng CEng

Observations on planning application

ABP-321238-24

Planning application for a 110 kilovolt electricity substation, approximately 7.5 kilometres of underground electricity line and all associated works at Moyvannan, Feamore, Lisbaun, Carrownolan, Carrowncloghan, Carrowkeeny, Ardmullan, Curraghboy, Gortnasythe, Derryglad, Eskerbaun, and Brideswell, County Roscommon

Rose Burke

This observation should be read in conjunction with 'Observations on Lough Funshinagh Interim Flood Relief Scheme' as submitted to An Bord Pleanála on 04.11.2024 – Appendix A

14.01.2025

Foreword

1.0 ABP Ref: 313750 Planning history 2009 - 2024

The planning process in relation to the Seven Hills Wind Farm Development is unique in many ways not least because of its longevity. On the 16th of September 2009 the then developer, Galetech Engineering Development Ltd., had their first pre-application consultation with An Bord Pleanála (the Board) to discuss the proposed wind farm developments.

Fourteen years later on the 23rd of November 2023 the Board issued an order ABP-313750 -22

> *Application for ten-year planning permission under section 37E of the Planning and Development Act 2000, as amended, in accordance with plans and particulars, including an Environmental Impact Assessment Report and Natura Impact Statement, lodged with An Bord Pleanála on the 7th day of June 2022 by Energia Renewables ROI Ltd care of MKO, Planning and Environmental Consultants, Tuam Road, Galway, Co. Galway as amended by the further information received by An Bord Pleanála on the 10th day of July 2023.*
>
> *Grant permission under section 37G of the Planning and Development Act 2000, as amended, for the above proposed development in accordance with the said plans and particulars based on the reasons and considerations under and subject to the conditions set out below.*

The grant of permission included a 110kV connection of the wind farm to the existing substation in Monksland Athlone via an underground 110kV cable.

Between 2009 and 2024 the planning process has produced

- Five Inspectors' reports
- Two refusals of permission
- One grant of permission
- Two Judicial Reviews
- One Oral Hearing
- Two expert reports commissioned by the Board
- Four separate site investigations on the subject sites carried out by the applicant.

Over this timespan it became apparent that

- Neither the Board nor the Inspectors had the professional qualifications which would have enabled them to properly carry out a lawful Appropriate Assessment.
- Neither the Board nor the Inspectors had any expertise in lowland karst – the unique landform underlying the subject sites.
- Neither the Board nor the Inspectors or the perceived experts had any knowledge of the peculiarities of the South Roscommon karst.
- Significant information in regard to the subject site was either unknown or disregarded
- Climate change is real, and Ireland's climate is warmer and wetter over the most recent 30-year period. (Met Eireann 22 Mar 2024)
- Wetter weather has impacted already flood prone areas in South Roscommon.

On the one occasion, in 2017, when the Board engaged expert opinion to advise on 'the *likely impacts of the proposed development from the hydrogeology/hydrology perspectives'*[1]the application was refused.

[1] Inspector's ReportsABP-244346A and 244347A Report by Mr. Jerome Keohane consultant Hydrogeologist/Hydrologist c2016

2.0 ABP Ref: 321238-24

2.1 ABP 321238 -Pre-application consultation with the Board

On the 8th of April 2024 the current developer, Energia Ltd, held the first pre-application consultation with the Board to discuss an application for a proposed substation in Moyvannan under Section 182 of the Act. The permitted windfarm and grid connection were determined under Section 37 of the Act. Extracts from The Board's record of the meeting are as follows

Record of 1st Meeting ABP-319042-24

Date **8th of April 2024**

Representing the Prospective Applicant
Simon Carleton, Senior Planner, Galetech Energy Services
Tony Gallagher, Project Manager, Energia Renewables
Sara Tinsley, Planning & Environmental Consents Manager, Energia Renewables

The Board referred to the letter received from the prospective applicant on the ***13th of February 2024****, requesting pre-application consultations under section 182E of the Planning and Development Act 2000, as amended, and advised the prospective applicant that the instant meeting essentially constituted an information-gathering exercise for the Board.*

The prospective applicant stated that the proposed development would provide an alternative connection point to the national electricity network for the permitted Seven Hills Wind Farm (ABP-313750-22), which was granted permission by the Board in November 2023. *The prospective applicant stated that due to the recent changes in the available capacity at Monksland substation in Athlone, connection at that point is no longer guaranteed to be feasible and hence why an alternative grid connection option is being pursued.*

The Board's representatives queried the justification for the change in the development necessitating the revised connection to Monksland substation. ***The prospective applicant stated that when the Seven Hills Windfarm was originally submitted in 2022 there was capacity for the Windfarm to connect to the Monksland substation.*** *However, in the intervening period, two solar developments have submitted connection applications to EirGrid and, in the event that these developments also connect to the Monksland substation, there would not be sufficient capacity to accommodate the permitted windfarm development.*

The prospective applicant stated that given the uncertainty of the grid connection they have been forced to seek permission for an alternative stand- alone connection under Section 182, ***however it is recognised that this would mean that the entirety of the permitted Seven Hills windfarm (i.e. the balance of the permitted grid connection route to Monksland substation) would not be constructed****. The prospective applicant stated that in the event that connection to the Monksland substation is not feasible they intend to submit a146B application to amend the original windfarm and grid connection application to remove the section of grid connection from Brideswell (where the*

proposed grid connection route connects with the currently permitted grid connection) to Monksland Substation and implement the current proposal in its place.

The Board's representatives noted the approach proposed and the fact that the prospective applicant was not proposing to use the 146B process to amend the existing s.37E permission for the Seven Hills Windfarm and grid connection to provide for the alternative grid connection route. *The Board's representatives advised the prospective applicant to provide clarity in the public notices and application documentation of what is proposed and the need for such an approach given the circumstances outlined by the prospective applicant. (emphasis added throughout).*

2.2 Connections to the grid

EirGrid plc is the state owned electric power Transmission System Operator (TSO). EirGrid develops, manages and operates the high to medium voltage power grid in Ireland. The terms grid, electricity transmission network and transmission system are used interchangeably.

The Electricity Supply Board (ESB) is the licensed Transmission System Owner for Ireland and is the person with sufficient legal interest in the Monksland, Athlone substation.

An independent power producer (IPP) is an entity that is not a public utility but owns facilities to generate electric power e.g. Energia Ltd.

There are two primary elements to any new or upgraded grid connection, these are known as 'contestable works' and 'non-contestable works':

Board Order 313750-22 page 2 lists the elements of the granted permission which includes inter alia

6. *All works associated with the connection of the proposed wind farm to the national electricity grid via underground 110kV cabling from the site to the existing Athlone 110kV substation located in the townland of Monksland.*

This element is contestable and can be caried out by the IPP to ESB Networks specification (MV) and Eirgrid specification (HV).

> 7. *Upgrade works to the existing 110kV Athlone substation consisting of the construction of an additional dedicated bay to facilitate connection of the cable.*

This element is non-contestable and must be carried out by Eirgrid with the consent of the ESB.

2.3 Permitted Seven Hills Wind Farm ABP-313750 - EIAR Chapter 4.0

Chapter 4 - Description of Proposed Development - Paragraph 4.3.8 of the EIAR submitted in support of grant of permission ABP -313750 -22 states

> *To facilitate the HV cable connection from the Proposed Development to the transmission network, a new 110 kV Air Insulated Switchgear (AIS) bay will be required at the existing Athlone 110 kV substation in Monksland operated by EirGrid. The new AIS bay would be constructed in an area of the substation reserved for future bays and be located under the existing 110 kV busbar. It would comprise of the following equipment mounted on steel structures: busbar disconnects, circuit breaker, current transformers, voltage transformers, cable/earth disconnects, surge arrestors, and a cable sealing end. The proposed layout of the new bay is shown in Figure 14-16.*

There are three notes on Figure 14-16. Note 3 on Figure 14-16 states

Drawing represents an indicative 110 kV line bay, has been produced without any detailed information on Athlone 110kV station, as such a detailed space providing exercise has not been carried out.

To be clear the ESB is the legal owner of all the components that make up the transmission system and that ownership includes the substation at Monksland, Athlone. Energia's application under ABP 313750-22 did not include confirmation of consent from the ESB to carry out any works at the ESB owned asset in Monksland, Athlone.

The Board is, or should be, aware that the ESB is the owner of the Monksland, Athlone substation and that their permission is required for element No. 7 of the works.

The Inspector's report ABP 313750-22 dated the 9th of September 2023 Page 40 notes

> ***Grid connection***: The applicant has submitted sufficient information with the planning application, EIAR and NIS to enable the Board to undertake a cumulative impact assessment of any impacts on the environment, and likely significant effects on European sites, of the overall windfarm development in-combination with the grid connection, other windfarms, and plans or projects in the vicinity.

The applicant had *submitted sufficient information with the planning application* to make the Board aware that *a new 110 kV Air Insulated Switchgear (AIS) bay will be required at the existing Athlone 110 kV substation in Monksland operated by EirGrid*. Operated by Eirgrid but owned by the ESB.

The Board has granted planning permission for a wind farm development and a connection to the grid ***from the site to the existing Athlone 110kV substation***, *a connection* which is dependent on alterations to an ESB asset, i.e. the existing Athlone substation, without the consent of the person with sufficient legal interest in the existing Athlone substation. Under these circumstances the grant of permission for such a development is not just irrational and illogical it is invalid.

Regardless of whether or not '*in 2022 there was capacity for the Windfarm to connect to the Monksland substation'* Energia did not have confirmation of consent from the ESB to undertake the required works necessary for the grid connection.

3.0 Anomalies of Board Order ABP-313750-22

Page 153 of the Inspectors report states

> *Having regard to the nature and scale of the work required to erect the windfarm (which would involve substantial excavations and the installation of tall structures), and the results of the extensive bird survey results that were submitted by the applicant as part of the original application, and* ***as unsolicited and solicited FI,*** *it is possible that the proposed development could have an adverse effect on the these SPAs, their SCI species and/or their Conservation Objectives.*

Page 1 of the Board Order ABP-313750-22 states

> *Application for ten-year planning permission under section 37E of the Planning and Development Act 2000, as amended, in accordance with plans and particulars, including an Environmental Impact Assessment Report and Natura Impact Statement, lodged with An Bord Pleanála on the 7th day of June 2022 by Energia Renewables ROI Ltd care of MKO,*

Planning and Environmental Consultants, Tuam Road, Galway, Co. Galway ***as amended by the further information received by An Bord Pleanála on the 10th day of July 2023.***

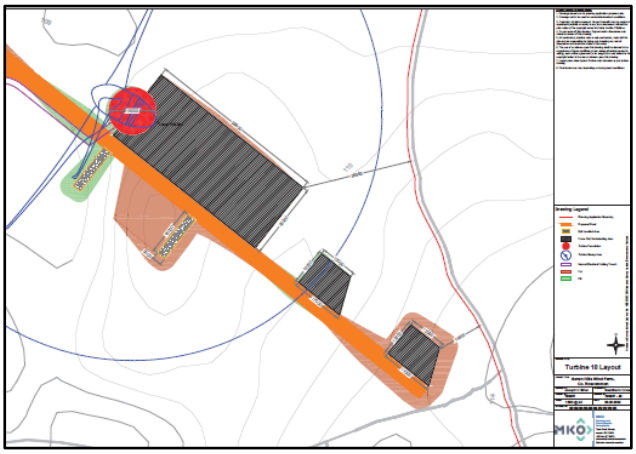
The Order lists the elements of the permitted development including inter alia

> 2. *15 number spoil storage areas at hardstands of turbines number 1, 2, 3, 4, 5, 6 and 7 (in the townlands of Turrock, Gortaphuill, Cronin, and Tullyneeny) and turbines number 8, 10, 11, 13, 14, 17, 19 and 20 (in the townlands of Milltown, Cuilleenoolagh, Cloonacaltry, Feacle and Tawnagh).*

Condition No. 1 of the order states

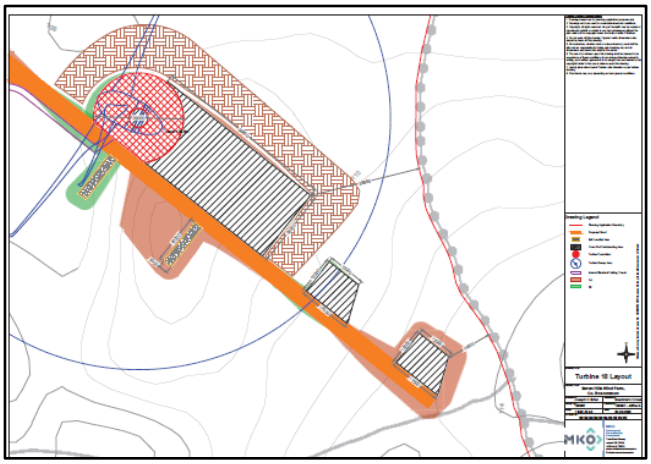
> 1. *The development shall be carried out and completed in accordance with the plans and particulars lodged with the application,* ***including the further information received by the Board on the 31st day of March 2023 and on the 10th day of July 2023,*** *except as may otherwise be required in order to comply with the following conditions.* (emphasis added throughout)

In the interests of clarity it must be noted that the plans and particulars lodged with the application on the 7th of June 2022 vary significantly from the plans and particulars lodged as part of the further information (FI) received by the Board on the 31st day of March 2023 (the 31st of March submission). The plans lodged with the application on the 7th of June 2022 describe a turbine base of 15.0m diameter, Figure 1. The plans lodged on the 31st day of March 2023 describe a 29.0m diameter turbine base, Figure 2.



The title on this drawing is *Turbine18 layout* it shows a 15.0m base to T18 and the associated infrastructure works. The drawing is dated 03.06.2022

Figure 1: Drawing No. 190907 -46. Lodged with the application on the 7th of June 2022



The title on this drawing is *Turbine 18 layout* it shows a 29.0m base to T18 and the associated infrastructure works for a 15.0m base. The drawing is dated 30.03.2023. A spoil storage area is now included which is not listed in Board Order 313750-22.

Figure 2: Drawing No. 190907 -46 Rev A. Lodged as part of the FI of the 31st of March 2023

It is clear the two drawings describe two completely different developments. Assessing the potential cumulative impacts of the proposed development (ABP-321238-24) and the permitted Seven Hills Wind Farm (ABP-313750-22) begs the question which permitted Seven Hills Wind Farm development is to be included in the assessment. How many overburden storage areas are to be included? Which set of drawings will be valid for compliance and enforcement purposes? Can Energia pick and choose from the two options?

An email dated 9th Dec 2024 to the Board requested '*In the interest of clarity could you please confirm to which plans the grant of permission applies*.' The Board replied on the 11th of Dec 2024.

> *The application as amended by the FI is probably the correct one, but I will have to check the other conditions to make sure. I will get back to you later this week to confirm*

A second email from the Board dated 13th Dec 2024 states

> *I have been asked by An Bord Pleanála to refer to your email received on 9th December 2024*.
>
> *Please be advised that the response to the submissions and the further information received from the applicant by the Board, supersedes the documentation submitted in the planning application, or part thereof, and the grant of permission is based on this documentation as received by the Board*.
>
> *The inspector's report notes the changes referred to in applicant's submissions and these changes formed part of the Board's decision*.

Where in the Board Order is the '*response to submissions'* included? Which FI does the email refer to? Condition No.1stands as is and is not superseded by anything. Condition No. 1 includes two FIs received by the Board, one nine months and a second thirteen months after the application date. Two FIs and the timing of same is in itself questionable.

The reality is the Board has granted Energia two distinct options for a development including a connection to the grid which, without confirmation of consent from the ESB,is impossible.

In addition the two distinct options include different site boundaries. Figure 3 shows an extract from drawing No. 190907-18 as lodged with the application on the 7th of June 2022. Figure 4 shows an extract from drawing No. 19099-18 Rev A lodged as part of the FI of the 31st of March 2023.

Figure 3: Drg. No. 190907-18 (07.06.22)

Figure 4: Drg. No. 190907-18 Rev A (31.03.23)

The plans lodged as part of the FI of the 31st of March 2023 show an altered red line boundary. The red line now excludes an area which '*does not form part of the application*.'

By way of explanation the ABP-313750-22 Inspector notes

> *The submitted drawings are bespoke for the project and the site. However, a drafting error was noted in some of the drawings in relation to the turbine foundation diameter and this has been amended from 15m to 29m (amended drawings attached). The original EIAR impact assessments were mainly undertaken for the 29m diameter and the applicant's assessment of any additional potential adverse environmental impacts, are summarised below.*
>
> *The information submitted did not give rise to any material changes to the proposed development and the EIAR and NIS conclusions were also not materially altered by the response submission.*[2]

To add to this unprecedented and bizarre situation the plans lodged by Energia to the Board on the 31st of March 2023 are not available in the Roscommon Co. Co. planning offices as they should be. The only official copies of these drawings are located in the off-site Board archive storage. In order to view these drawings an email must first be sent to publicaccess@pleanala.ie requesting to view the case file. The Board will then arrange to have the file retrieved from storage, when the file has arrived at the Board's office an email will be sent to the requester letting them know the file is available. The requester will then travel to the Board's office in Dublin to view the file. If perchance some other matter needs to be viewed on the drawings the whole process starts again.

This bizarre and questionable legal precedent is as a result of what Mr. Justice Humphreys described as '*involved*'

> *84. This issue / ground is involved and cannot easily be reduced to a short explanation save at a high of abstraction. Put simply, the Applicant asserts that the Board failed to consult or adequately consult on a post consultation submission/further information that it received from the Notice Party – 'the 31 March 2023 Submission'.*[3]

The Board constructed a situation which was so '*involved*' that the Court itself made two errors while attempting to decipher it. The matter is '*involved*' as a direct result of questionable procedural actions on the part of the Board in relation to Articles 33 and 34 and Section 37F (2) of the Act. The Board must now deal with the consequences of those actions.

4.0 ESB Confirmation of consent for works associated with ABP-321238-24

EIAR Annex 3.4: Planning-Stage Construction & Environmental Management Plan Page 7

> *At the location of the interface masts, the existing overhead transmission line will be broken, and the proposed underground electricity line (c. 270m) will connect the existing overhead line to the electricity substation*.

Confirmation of consent from the ESB to '*break'* the ESB owned existing overhead transmission line and connect to their asset does not seem to be included in the documents submitted to the Board in support of application ABP-321238-24. As such the application for permission is invalid.

5.0 Alternative connection to the grid

ABP-313750-22 did not have a viable connection to the grid, in that case the current application is not an alternative connection.

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[2] ABP-313750-22 Inspectors Report Page 32

[3] Judgement of Humphreys J. delivered on Monday the 7th day of October 2024 [2024] IEHC 570

Alternative presupposes one or more options available as another possibility or choice.

The current application is a 146B application: to amend the existing s.37E permission for the Seven Hills Windfarm and grid connection at the existing Athlone substation. However, the said s.37E permission is invalid unless Energia can submit confirmation of consent from the ESB for the required works at the Monksland Athlone substation.

6.0 Public notices

> *The Board's representatives advised the prospective applicant to provide clarity in the public notices and application documentation of what is proposed and the need for such an approach given the circumstances outlined by the prospective applicant.*[4]

The newspaper notice and the site notices are standard wording and do not convey any of the information as advised by the Board.

An email sent to the Board on the 2nd of Dec 2024 requested the Board to instruct the applicant to relocate the site notices erected by the applicant because the current locations were inappropriate and as such presented a danger to anyone attempting to read same i.e. the notices were not " *easily visible and legible by persons using the road*".

In addition the Board were asked ' *Does the Inspector visit the site during this five week period? If not, who inspects the site notice to confirm it complies with regulations?'*

The Board replied on the 3rd of Dec 2024 at 9.58 am

> *Section 182A does not require the applicant to erect site notices. In this regard the Board is not in a position to request the applicant to readvertise the application and relocate the notices.*

and again at 10.07 am

> *Please see my previous email about the site notice. They are not obligated to have one up. Inspectors work on their own times. They visit the sites at different times, which we are no aware of, depending on the project etc. So hard to put a timeline on it. But in this case, the site notice location is irrelevant.*

The cable route may or may not be a Section 182A application, but the substation and ancillary works are not. Therefore a site notice is required for these works which is why presumably the applicant put the site notices in place in the first instance.

It is unclear whether the Inspector visited the site within the "five week period" and in doing so ascertained if the requirements of the regulations, as far as the site notice is concerned, had been complied with

7.0 Addendum to Observations on Lough Funshinagh Interim Flood Relief Scheme submitted to An Bord Pleanála on the 5th of Nov 2024 .

7.1 Geological Survey Ireland

Groundwater Flooding in County Roscommon**.** GSI Events and News 27 Jan 2021notes

> *Recent heavy rainfall, in combination with already high water levels, has caused water levels at Lough Funshinagh, Co Roscommon to rise towards unprecedented flood levels.*

[4] ABP 321238 -Pre-application consultation with the Board

> *While Lough Funshinagh is designated as a turlough due to its characteristic fluctuating water levels, it is extremely slow to drain and seldomly empties completely. The characteristic slow response of Funshinagh means that, unlike other turloughs in Ireland, it does not get the opportunity to reset it's flood pattern each year. This leaves it particularly vulnerable to weather events as their impacts can carry over from one year to the next.*

Lough Funshinagh was recorded on the 1656-1658 Down survey. In modern times it was extremely slow to drain some years because the annual groundwater inflow exceeded the outflow. This imbalance was as a result of mid-19th century drainage works which discharged additional groundwater directly into the turlough. Prior to these works it can be assumed that Lough Funshinagh behaved in exactly the same manner as all turloughs. There are no records to suggest otherwise.

After the drainage works it did not get the opportunity to reset it's flood pattern each year but accounts going back to *c*1900 record it had found a novel way to compensate for the additional inflow. The resetting was sudden and compared to a plug being pulled.

J.C. Coleman (1965) remarks

> *In November 1955, the tenth time in the last fifty years, the waters of the lake vanished down a swallow hole, leaving hundreds of fish stranded on its muddy bottom. In July 1964 I visited the site, and grass was growing over most of the lake bed. Like Lough Nasool in south Co. Sligo, it appears that collapse of the plugged material in swallow holes causes these sudden disappearances.*[5]

The slow response of Lough Funshinagh did leave *it particularly vulnerable to weather events as their impacts can carry over from one year to the next.*

Flooding need not arise solely from a single adverse weather event; it may also result from the accumulation of unresolved impacts over a number of years. Of course if a single adverse weather event does occur the flooding will manifest itself much sooner.

The plug analogy is appropriate, a partially filled sink with an inadequate outlet and a dripping tap will eventually overflow, however if the tap is turned on full bore the sink will overflow in a much shorter time period unless the blockage is removed.

7.2 The Lough Funshinagh Technical Subgroup

> *Figure 47 shows significant dates and groundwater events superimposed on Figure 3. Without full knowledge of the construction of the model it is not clear if 63.0m OD is the actual bottom level of the turlough. For the purpose of this exercise that isn't significant, the recorded years which the turlough reset (emptied) are shown with green arrows. There is a distinct pattern in the graph.*[6]

The model referred to is *Figure 3*: *Long-term modelled water level hydrograph for Lough Funshinagh, Co. Roscommon. For the period 1941 to 2024*.[7] The Observations on Lough Funshinagh Interim Flood Relief Scheme document used Figure 3 to illustrate a corelation

[5] The GSI Groundwater Newsletter, No.30 Nov 1996. David Drew and Morgan Burke, Department of Geography, TCD.

[6] Submission re Planning Application ABP-320869 Observations on Lough Funshinagh Interim Flood Relief Scheme. R Burke Nov 2024

[7] Lough Funshinagh Technical Subgroup: Modelling and analysis of Lough Funshinagh Flood Levels 13th June 2024

between high water levels in Lough Funshinagh and its novel reset technique. The reset years were indicated by a green arrow at a level of 63.0m O.D. However using the model in this manner showed a water level of 63.0m OD in years where there was no record of a reset.

This was not overlooked in positing the theory that accumulating high water levels triggered the resets. Rather it was overlooked because as stated it wasn't significant for the purpose of the exercise. Analysing the model per se was not the object of the observation, the model served what is an invaluable scientific purpose, it raised questions - is there a pattern and if so, what is it and why? If for no other reason than that it can be repeated that *The Technical Subgroup's report is the single most important engineering document in the entire contents of the application to the Board*.

7.3 The Reset

The turlough reset of 2003 indicated by a green arrow on the model was queried by a number of local sources. The initial information was taken from the OPW Flood Maps, Past Flood Events Flood Summary (ID 1096), Report No. 1 *Project Title: OPW Flood Hazard Mapping – Phase 1: Minutes of meeting identifying areas subject to flooding. Roscommon - Athlone Area Engineer. Compiled by: Search Manager ESBI Status Draft*.

> 10. Lough Funshinagh – This lake disappears in dry years. Last disappeared in 2003. Flood Id = 1096

Local knowledge disputed the 2003 date and confirmed the 1996 date as cited in the Roscommon - County Geological Site Report – Lough Funshinagh

> **Main Geological or Geomorphological Interest**
> Lough Funshinagh is not a true turlough, but rather it is a disappearing lake. This only happens occasionally, with the last rapid draining taking place in September 1996. It a

Between the 1941 and 1996 resets there are four intervals of 11,9,20 and 12 years. The data set is so small and dependent on rainfall records so any guess at the next reset after 1996 is just that a guess. Averaging the four intervals but allowing less weight for the twenty years would give a value of say 12 years, leading to a predicted reset in 2008.

> *Before 2007 the peak water level in the series occurs in 1948, which is supported by anecdotal evidence of exceptionally high water levels in the Spring of that year (OPW, 2022). A shift towards higher flood levels can then be seen from 2007 onwards. This reflects the increase in long-term rainfall over this period, with records showing a 10% increase in average 5-year and 10-year cumulative rainfall post-2015 compared to the long-term average.*[8]

The increase in long-term rainfall since 2007 is undeniable but the shift towards higher flood levels from 2007 onwards could also reflect the carryover of prior weather events which were no longer being released in the manner they had been prior to 2007.

> *It is interesting to note that between April 2021 and October 2022 the lake volume decreased in volume by approximately 75% (12.4 million cubic metres). For any year prior*

[8] Lough Funshinagh Technical Subgroup: Modelling and analysis of Lough Funshinagh Flood Levels 13th June 2024

to 2021, this volume of water removed from the Lough would have resulted in the Lough draining completely. However, this was not the case in October 2022 due to the very high level of 69 m AOD that was reached in 2021 and that had yet to recede fully.[9]

It is necessary to distinguish between the years when the turlough emptied due to antecedent dry seasons and when it emptied suddenly and unexpectedly. These latter events are referred to as resets.

Firsthand accounts of the resets refer to the wailing/crying sound audible during the reset. A resident near the SE corner of Lough Funshinagh spoke of feeling vibrations through the ground when the turlough was resetting. The resets were sudden and rapid. Moving such a large volume of water in a relatively short time suggests either a large orifice or assisted mobility.

Groundwater flow in karst aquifers is three dimensional. Horizontal conduits can form at multiple levels as illustrated in Photo 1.

Photo 1 also illustrates why boreholes are an unreliably method for determining the water table in a karst aquifer

Could cojoined layers create a siphon in the aquifer?

Could that siphon be activated by the increased head of water caused by the ' *carry over from one year to the next'?*

Photo 1

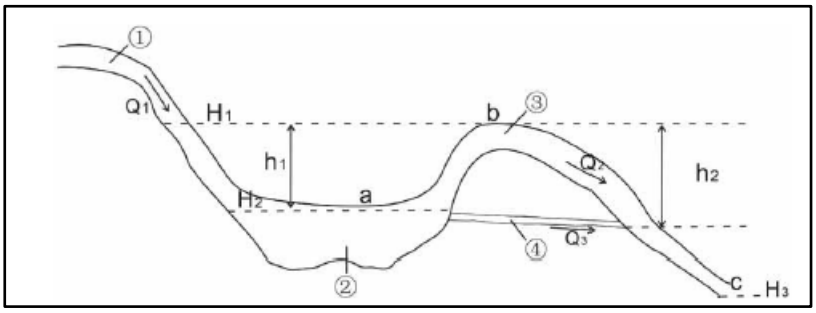

Figure 5: Schematic diagram of the siphon structure (cited from (Zou 1993)).

(1) The water supply pipeline, (2) relatively closed karst reservoir, (3) karst siphon pipeline, and (4) karst fissure lower than the siphon pipeline; H1 is the starting water level of the siphon and H2 is the stopping water level of the siphon; Q1, Q2, Q3, and Q4 are the flow rates during the operation of each pipeline; (a) is the lowest point at the inlet of the siphon, (b) is the highest point of the siphon, and (c) is the dew point of springwater, at the outlet of the siphon; h1 represents the height difference between points (a) and (b); and h2 represents the height difference between points (b) and (c).[10]

[9] OPW Lough Funshinagh 2024 State of Knowledge Draft 07.05.2024

[10] Jie Ma et al Temporal dynamics of water level and water sources analyses of karst tidal springs in Guilin, China January 2024

Despite the rapid discharge of large volumes of water there are no records of associated flooding downstream. Nothing untoward was ever reported at Mullagh spring. The heterogeneity and complexity of the karst aquifer , the fracture development and uneven distribution would enable the discharged water to travel in a multitude of directions between the siphon structure and the ultimate receiving point or points. It is possible that the 'normal' flow discharged in a S/SW direction but the 'reset' flow discharged to the east into Lough Ree. Karst hydrogeology does not obey the rules of 'normal' hydrogeology, a lot is possible.

A siphon would create increased velocity and turbulence and account for the noise referred to by observers. If the resets were a siphon effect, why did they cease? What occurred in the area between the years 1996 and 2007 that would have caused the reset process to cease? Did boreholes allow air into the system, did the natural ongoing karstification, which created the siphon in the first instance act alone in ending the siphon , did the GSI 1970s/1980s programme of boreholes play a part in the siphon's demise?

These are issues way beyond the scope of this observation, but they are included to highlight the complexities of karst and the challenge in understanding its hydrological process.

> *However, karst groundwater systems still present hydrogeologists with particular problems, both scientific and economic. Increased karstification commonly means increased uncertainty in groundwater resource assessment: Often, inadequate data are available as to the character of the karst drainage system in a particular area – the size, location and interconnectedness of fissures and conduits for example – and this limits the quality of the data used in modelling.* [11]

The draft OPW document *Lough Funshinagh 2024 State of Knowledge* is to be welcomed, in particular the conclusion that

> *In order for an efficient engineering solution to be found for Lough Funshinagh, it will be necessary to deepen our knowledge of how the lake fills and drains. This requires establishing the geometry of the lake and its contributing catchment, inflows, groundwater contributions, and the drainage mechanisms.*

Without an understanding of the past the present can never be understood, and effective solutions will prove elusive.

At the current level of uncertainty and the inadequate data regarding the nature of the karst of South Roscommon the consequences of the construction of the permitted Seven Hills Wind Farm and the proposed substation are unknowable.

Likewise the effects of the RCC proposed permanent outfall from the east of Lough Funshinagh towards Lough Ree are beyond current understanding. The site investigation results of application ABP-321238-24, which are discussed later, confirm the risks that this proposal presents.

[11] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland.

The rarity of such disappearing lakes in Ireland means that this site has already been recommended by GSI for designation as a geological Natural Heritage Area by the NPWS.[12]

It is possible that Lough Funshinagh was even more of a rarity than was previously understood, whatever mechanism generated that rarity is now lost forever and with it the chance of the turlough achieving NHA status. The best that can be hoped for now is a permanent solution to the flooding and the securing of Lough Funshinagh's SAC status.

An independent expert technical group such as the Lough Funshinagh Technical Subgroup, led by a single entity – OPW or likewise , is best placed to achieve these aims.

RCC should give serious consideration to funding community research into the lowland karst and to sponsoring academic research projects.

[12] RCC/GSI Roscommon - County Geological Site Report – Lough Funshinagh

1.0 Introduction

1.1 General

On the 12th of November 2024 Galetech Energy Services (GES) on behalf of Energia Renewables ROI Limited (Energia) submitted a Strategic Infrastructure Development (SID) planning application to an Bord Pleanála (the Board) for permission to construct a 110 kV electricity substation and approximately 7.5 km of underground electricity line and all associated works at Moyvannan, Feamore, Lisbaun, Carrownolan, Carrowncloghan, Carrowkeeny, Ardmullan, Curraghboy, Gortnasythe, Derryglad, Eskerbaun, and Brideswell, County Roscommon.

GES is a company within the Galetech Group. *GES is a renewable energy consultancy and services provider and it's mission is to provide development support, technical advisory, project management & engineering services from project feasibility right through to construction and operation.*

Galetech Energy Developments (GED) is also a company within the Galetech Group. In 2009 GED was *established to develop large scale wind projects which will be located throughout Ireland.*

1.2 Background to the proposed development

> *Planning permission was granted by An Bord Pleanála in November 2023 for the development of a 17 no. turbine wind energy development and associated infrastructure (known hereafter as the 'Seven Hills Wind Farm') pursuant to* ***Reference ABP-313750-22****. The permitted Seven Hills Wind Farm includes grid connection infrastructure to export the renewable electricity generated to the national grid network via the existing Athlone 110kV electricity substation at Monksland, County Roscommon ('the Athlone substation'). The permitted grid connection comprises a c. 11km 110kV underground cable* ***within the carriageways of the R362, R363 and L2047 public roads.***[1](emphasis added)

Contrary to the above statement the Inspectors report ABP-313750 -22 is based on '*Laying grid connection cables under the R363 verge (c11km).*

> ***The main infrastructure elements include:***
>
> - Minor road works long the delivery / haul routes.
> - Provision of new site access points off the R363: -
> - Access A - Private access track to N cluster (c.2km).
> - Access B - New access off the L7535 (via R363) to S cluster.
> - Access C - New access directly off the R363 to S cluster.
> - Widen the L7535 local road at its junction with the R363 (5m x 415m).
> - Minor works to the L7602 local road.
> - New and upgraded internal access tracks / service roads.
> - Laying grid connection cables under the R363 verge (c.11km).

Figure1: ABP -313750-22 Inspector's report P53

> The underground grid connection route along the public road verge, would traverse 6 x small watercourses (Eroding / upland rivers), three of which contain support habitat for fish (incl. Atlantic salmon, Lamprey, Brown trout & Stone loach). The proposed development, in the absence of mitigation, has the potential to affect sensitive habitats and species as the excavation and construction work could result in the loss or degradation of habitats, and the loss of or disturbance to species (incl. fatalities).

Figure 2: ABP -313750-22 Inspector's report P103

The permitted grid connection is dealt with in section 2.0. of the foreword to this observation.

[1] ABP-321238-24 Galetech Energy Services cover letter to ABP12.11.2024

1.3 Background to the proposed development with regard to ABP -313750-22.

In the interests of clarity and to properly assess cumulative effects it is necessary to look back further than the Nov. 2023 grant of permission for *the development of a 17 no. turbine wind energy development and associated infrastructure (known hereafter as the 'Seven Hills Wind Farm') pursuant to Reference ABP-313750-22*.

In July 2009 the Board held the first of two preapplication consultations with GED regarding a proposal for the development of three separate wind farms at three locations in the South Roscommon area. The Board's preliminary view was that the proposed developments constituted SID.

In October 2010 GED applied to Roscommon Co. Co. (RCC) for planning permission for one wind farm development to be located north of Dysart village in Roscommon (Ref:10/541.) The proposed development included 16 No. wind turbines and associated infrastructure.

In July 2011 GED made a similar application for a second wind farm located south of Dysart village (Ref:11/273). The proposed development included 19 No. wind turbines and associated infrastructure.

Neither applications included a connection to the grid.

In 2011 and 2012 respectively RCC granted planning permission for both developments.

In 2011 and 2012 respectively both decisions were appealed to an Bord Pleanála (the Board) Refs. ABP 239759 and 241069

In September 2013 the Board granted permission for both developments.

In 2014 a Judicial Review *Kelly v An Bord Pleanála [2014] IEHC 400* quashed both decisions, and the cases were remitted back to the Board. Reactivated case Nos. 244346 and 244347.

In June 2016 the Board held an Oral Hearing, Mr. Jerome Keohane and Mr. Richard Arnold, experts engaged by the Board, attended the Oral Hearing, their subsequent reports were included as additional Inspectors reports on the Board's webpages Ref: 244346B and 244347B.

The Board engaged Mr. Jerome Keohane as a

> *consultant Hydrogeologist/Hydrologist to advise the Inspector/Board on the likely impacts of the proposed development from the hydrogeology/hydrology perspectives, having regard to all aspects of the proposed developments including access tracks, foundations and turbines.*[2]

Mr. Keohane's report concluded

> *With some modification (along the lines outlined by Professor Johnston), the proposed investigation has the potential to generate such findings, however on the basis of my understanding of the requirement that "no reasonable scientific doubt remains as to the absence of the identified potential effects", I am not satisfied the present understanding of the hydrological/hydrogeological environment can eliminate that doubt. The key deficits that I see in the information provided are; The absence of site specific*

[2] Additional Inspectors report Ref:244346B and 244347B

permeability testing, the lack of a comprehensive spatial understanding of the extent of point source and diffuse recharge across the site and the lack of measurement of groundwater and turlough responses to rainfall events.

Professor Johnston's modifications included the advice not to rely on borehole data as part of the hydrogeological investigation because

Karst is a very difficult environment in which to carry out investigations. He submitted that drilling boreholes may miss the conduits in the karst. If, however, one measures the hydraulics or the response of the turlough to rainfall it will give a good indication of the response of the turlough.[3]

Professor Johnston is currently a member of the Lough Funshinagh Technical Subgroup which was initiated by RCC in April 2024 to examine the Lough Funshinagh flood regime in a hydrological and ecohydrological context. The group consists of turlough hydrogeology specialists from South East Technological University, Geological Survey Ireland, National Parks and Wildlife and Trinity College Dublin.[4]

In February 2017 the Board refused permission for both developments. The reasons and considerations included

Ref. No. 244346

In particular, it is considered that the hydrogeological and geotechnical investigations carried out do not demonstrate to a reasonable level of scientific certainty that the excavations and construction works required to carry out the development would not adversely impact on the turloughs which are qualifying interests of the Lough Croan Turlough Special Area of Conservation (site code 000610), the Four Roads Turlough Special Area of Conservation (site code 001637) and the Lisduff Turlough Special Area of Conservation (site code 000609).

Ref. No. 244347

In particular, it is considered that the hydrogeological and geotechnical investigations carried out do not demonstrate to a reasonable level of scientific certainty that the excavations and construction works required to carry out the development would not adversely impact on the turloughs which are qualifying interests of the Ballynamona Bog and Corkip Lough Special Area of Conservation (site code 002339), the Castlesampson Esker Special Area of Conservation (site code 001625), and the Lough Funshinagh Special Area of Conservation (site code 000611). It has also not been demonstrated that development works would not impact on Feacle Turlough to an extent which could impact on the qualifying interest bird species of Special Protection Areas in the vicinity which frequent this turlough.

In June 2022 Energia submitted a Strategic Infrastructure Development (SID) application for planning permission to the Board ABP-313750-22 for a wind farm development.

The proposed development was practically the same as the previously refused developments and was to be located on the same sites. The Planning Report submitted by the applicant in support of the application states at Section 2.2

Of particular note in relation to the Proposed Development is that this application is being lodged subsequent to a previous planning application for ***a broadly similar renewable energy development at this location*** *(Pl.Ref. 10/541 and Pl. Ref: 11/273, ABP PL.20.244346 and PL.20.244347).* (emphasis added).

[3] Additional Inspectors report Ref: 244346A and 244347 A

[4] Lough Funshinagh Interim Flood Relief Scheme Engineering Report September 2024 Roscommon County Council

The turbine locations for the refused developments and the locations for the proposed development are shown in Figure 3. The original ABP PL.20. 244346 and PL.20. 244347 were now known as the Northern Cluster and the Southern Cluster respectively.

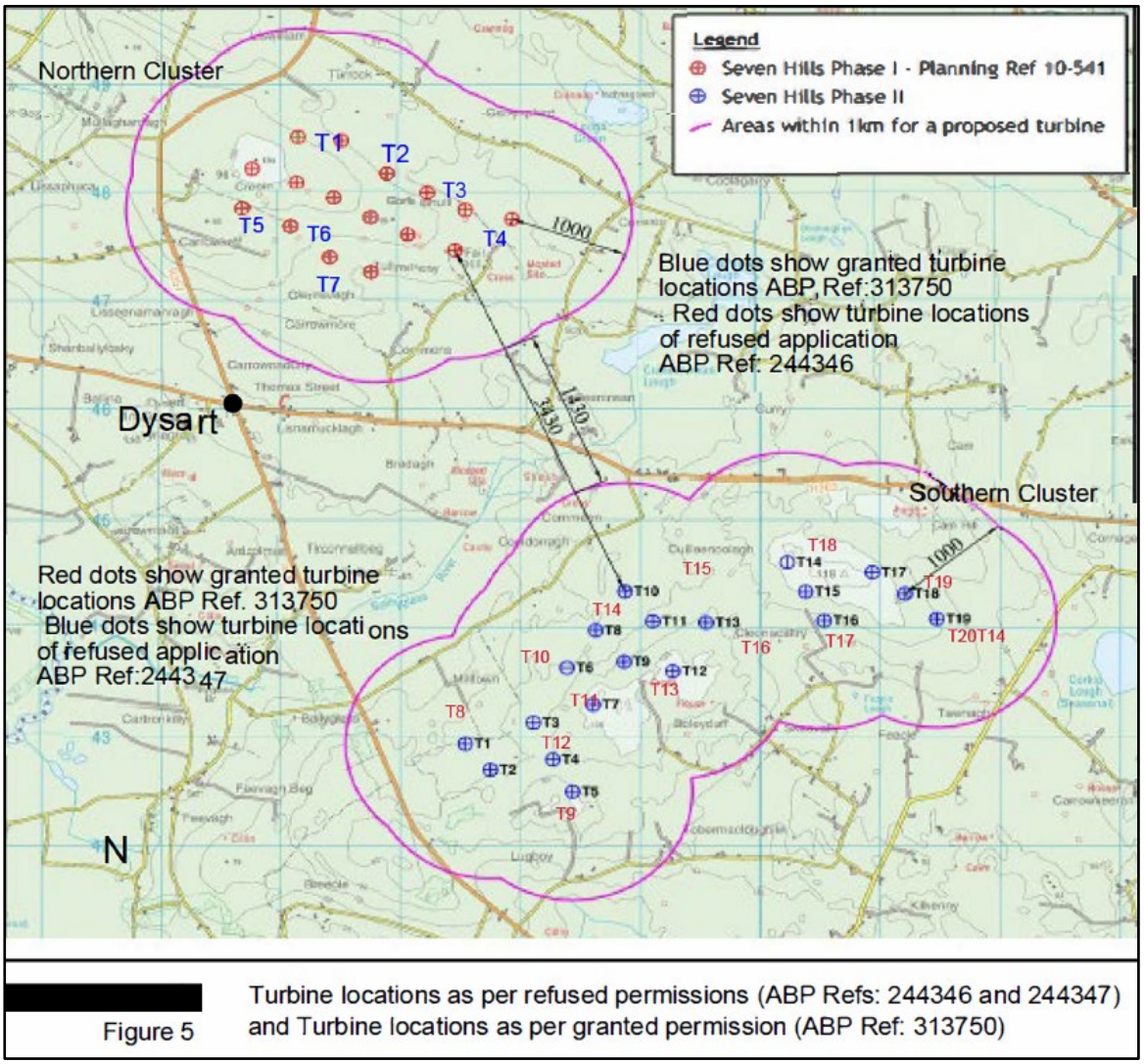

Figure 3: Site layout of 2017 refused permission and 2023 granted permission wind farms

The proposed development was not only '*broadly similar*' to the refused development, but the receiving environment was also exactly the same in 2022 as it was in 2017 when the Board refused permission based on Mr. Keohane's report. Neither the hydrogeology nor the geotechnics of the site had altered in five years and Mr. Keohane's and Professor Johnston's recommendations remained valid.

The documents submitted with the 2022 application did not remedy the deficits identified by Mr. Keohane or place any value on Professor Johnston's advice that '*drilling boreholes may miss the conduits in the karst.'*

The EIAR Chapter 8 Land Soil and Geology noted

> *The site investigation data on subsoil types and depths from the Northern Cluster is consistent across* ***multiple instances of borehole*** *and trial pit works between 2010-2021. A total of 22 no. boreholes haven been drilled within the Northern Cluster.*
>
> *The site investigation data on subsoil types and depths from the Southern Cluster is consistent across* ***multiple instances of borehole*** *and trial pit works between 2010-*

2021. A total of 32 no. boreholes have been drilled within the Southern Cluster. (emphasis added).

Based on the this the applicant concluded

> *No proposed WTG (wind turbine generator) is located over a known or suspected karst anomaly*. [5]

When assessing the 2022 application the Board dispensed with expert advice and instead relied on the Inspector's and the Board members expertise. The Inspector's expertise allowed them to conclude

> ***The consultant hydrogeologist who advised the Board on the previous windfarm applications described the underlying bedrock as extensively karstified (i.e. weathered or fissured)*** *and referenced the inter-relationship between ground and surface waters. Several of the submissions raised concerns in relation to potential adverse impacts on groundwater and the underlying bedrock aquifer (incl. GSI, NPWS, RCC & several observers).* ***On the other hand, the applicant has described the underlying limestone bedrock as not been highly karstified in both the previous and current windfarm applications****. However, unlike the previous cases, the applicant's contention has been supported by an extensive range of site surveys and investigations to support the current application. The site investigations provide a very detailed, localised, and spatially specific description of the topography, sub-soil overburden, bedrock conditions and groundwater levels and flow patterns with the site, which I consider to be thorough and robust following my review of them.* [6] (emphasis added)

In short, the Inspector set aside the combined experience of the GSI, the NPWS, RCC, the Board's consultant hydrogeologist's (Mr. Keohane), Professor Johnston (turlough hydrogeology specialist from TCD) and several observers in favour of the applicants '*extensive range of site surveys and investigations'* i.e. boreholes and trail pits.

In November 2023 the Board granted permission for the development.

In January 2024 the Courts granted Mr. John Joe Kennedy & Anors leave to appeal the Board's decision - Record No. 2024/128 JR. Energia were included in the proceedings as a Notic Party.

The Board's legal submission vigorously defended the Inspector's and the Board's expertise

> *Pursuant to the 2000 Act, the Board is the competent authority for the purposes of carrying out an EIA and AA and is assisted in this regard by its Inspectors and is deemed to have the necessary expertise.*
>
> *The Board is not required to prove it has sufficient expertise to conduct the EIA or the AA that it carried out merely because the Applicants contend by way of non-expert assertion and without any evidence that the Board lacks sufficient expertise.*
>
> *As regards §132 of the Applicants submissions, there is no requirement for the Board to record details as to its expertise in a Board Order or Board Direction and there is no such requirement for Inspectors in the context of Inspector Reports either. Nothing turns on the absence of something which is not required.* [7]

[5] ABP Ref:313750 EIAR and NIS Chapter 8 - Land, Soils and Geology

[6] ABP Ref.: 313750 Inspectors report

[7] Record No. 2024/128 JR Outline Written Legal Submissions Of The First Named Respondent

In July 2024 Mr. Kennedy's legal team brought a motion for discovery/particulars

> *All documents relating to the expertise and/or qualifications and/or professional experience of the Board Members and the Board's Inspector involved in the impugned decision concerning their expertise in relation to: (i) geology (ii) geophysics (iii) hydrology and/or hydrogeology (iv) Karst landscapes, and (v) ornithology, specifically and individually collated under each of the aforesaid (i) to (v)*

The Judgement of Humphreys J. delivered on Monday the 7th day of October 2024 stated

> *39. As regards the applicants' motion for particulars and discovery dated 23rd July 2024, following discussion of the matter when the motion was first listed, the board provided information by letter dated 17th September 2024 regarding the board's expertise on a voluntary basis and not on foot of an order.* [8]

The three Board members who carried out the AA using the *"best available scientific knowledge in the field "* were described in the Board's letter as two qualified planners and a qualified accountant.
The Inspector's qualifications were listed as

(i). *B.Sc. (Hons, 2.1) in Environmental Science from the University of Ulster (1982) – which degree comprised modules on Geology, Hydrology & Hydrogeology.*
(ii). *Master's Degree (MRUP) in regional and urban planning from UCD (1987)*
(iii). *Diploma in EIA / SEA Management from UCD (2007)*
(iv). *Master's Degree (M.Sc.) in Coastal Zone Management from University of Ulster (2014)*
(v). *Diploma in 'Start Your Own Business' from AnCo (SOLAS) (1984).*

The case was heard on the 18th and 19th of Sept 2024, and proceeded on the evidence that the grid connection would be to the Monksland, Athlone substation as granted by Board Order ABP-313750-22. The Board and the Notice party's meeting of the 8th of April 2024 was not referred to.

The judgement was delivered on the 7th of October 2024 *[2024] IEHC 570* and the Court found in the favour of the Board, aside from one point. On the 12th of November 2024 Energia submitted the current application for a new substation ABP-321238-24 at Moyvannan to the Board.

1.4 Anomalies of decision ABP -313750-22

1.4.1. General

There can be no doubt that the subject application must assess the likelihood of significant effects on the environment of the proposed development in combination with the permitted Seven Hills Wind Farm including the permitted section of underground cable route from the Northern Cluster to Brideswell. This however presents some difficulties because it is unclear to what exactly the grant of permission ABP -313750 -22 applies.
In addition the Inspector's stated mitigation measures in ABP -313750 -22 are not included in the applicant's mitigation measures and are not included in the Board Order 313750-22

1.4.2 Board Order Condition 1

> *The development shall be carried out and completed in accordance with the plans and particulars lodged with the application,* ***including*** *the further information received by the Board on the 31st day of March 2023…*

[8] [2024] IEHC 570

As noted in section 3.0 of the foreword to this observation the Board has granted Energia two distinct options for a development which has no realistic connection to the grid.

1.4.3 The Inspector's AA and mitigation measures

The Inspector assessment of all the designated sites concluded

> ***Conclusion: T****he proposed development individually or in-combination with other plans or projects would not adversely affect the integrity of this European site in light of its Conservation Objectives, subject to the implementation of mitigation measures outlined above**, and any recommended conditions.*[9]

The *'mitigation measures outlined above'* included '*Identification and avoidance of karst features*. This conclusion was based on the applicant's statement

> *No proposed WTG (wind turbine generator) is located over a known or suspected karst anomaly. The iterative approach to design has ensured that turbine locations were moved or reconfigured to avoid potential subsurface anomalies identified from drilling and geophysical investigations.*[10]

Therein lies the anomaly because the site investigation commissioned by Energia states *Completely to highly weathered/karstified LIMESTONE is indicated at T11, T13 and the access road to T12. Possible karstified rock is indicated at a number of locations*. IGSL Rotary core No. T11- RC03 records '*POSSIBLE KARST INFILL'* from 12.3 to 14.7m below ground level.[11]

2.0 Bord Pleanála Case reference: VC20.319042 - Pre-Application Consultation

2.1 Record of 1st Meeting ABP-319042-24

> *The prospective applicant stated that the proposed development would provide an alternative connection point to the national electricity network for the permitted Seven Hills Wind Farm (ABP-313750-22), which was granted permission by the Board in November 2023***.**

The granted connection to the grid is dealt with in Section 2.0 of the foreword to this observation.

3.0 ABP-321238-24 EIAR Chapter 6 Land, Soil and Geology

3.1Non-Technical Summary by the Applicant

> *The bedrock encountered during the site investigations was described as predominantly competent (strong) limestones with some dolomite. No significant karst features were recorded at the substation site during the site investigations.*[12]

3.2 Environmental Impact Assessment Report Chapter 6

Page 6:11

> *The geophysical survey identified 2 no. zones of potential karstification within the site of the electricity substation. However, no karst features were noted during the drilling of the 6 no. boreholes. Bedrock is identified at an average depth of 8.6mbgl and no significant karst conduit features have been logged throughout the 129.3m of drilling. The results of the drilling provides confidence in stating that the local limestone bedrock is overlain by*

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[9] ABP-313750-22 Inspectors report
[10] ABP-313750-22: EIAR and NIS Chapter 8 - Land, Soils and Geology
[11] ABP-313750-22: EIAR and NIS Appendix 4.3 IGSL Factual Report
[12] ABP-321238-24 Environmental Impact Assessment Report Non-Technical Summary

thick overburden deposits and bedrock is comprised of strong, fine to medium grained limestone or dolomitic limestone with discreet weathered zones and intermittent clay fractures.

Page 6:13

***As described at Section 6.3.5 above, no significant areas of karst were identified during the site investigations (trial pits and boreholes**). Whilst weathered limestone bedrock and clay infilled fractures were identified, these are typical across all limestone bedrock in Ireland.(*emphasis added*)*

Page 6:18

The site investigation data also outline the absence of any significant karst features below the thick subsoil layers which could impact on ground instability

3.3 Geophysical Investigation report by Apex Geophysics[13]

The seismic velocities and resistivity values indicate the upper 1.5 m of rock is highly weathered in places with some cavities and clay infill also present, as encountered in the boreholes. This material overlies moderately weathered to slightly weathered rock over slightly weathered to fresh rock.

***Two main zones of rock with a potential high degree of karstification with clay infill are interpreted across the site**. One deeply penetrating zone (Z1) is present in the central part of the site. This zone is interpreted as a WSW – ENE feature shown on Drawing AGP23061_04 summary map. Borehole BH05/RC05 targeted this zone and encountered fractures with clay smearing, infilled cavities with sandy gravelly clay within highly weathered to slightly weathered to fresh rock over a depth range of 8.65 to 20.3 m bgl*

A second area of low resistivity values in the bedrock is present as a broader feature at the top of the rock at the NE of profile R4. This feature (Z2) penetrates to 22 m bgl.

Drawing AGP23061_04 is shown in Figure 4. The interpretated karst zones Z1 and Z2 are surrounded by the symbol '?' to indicate that the extent of the zones are unclear.

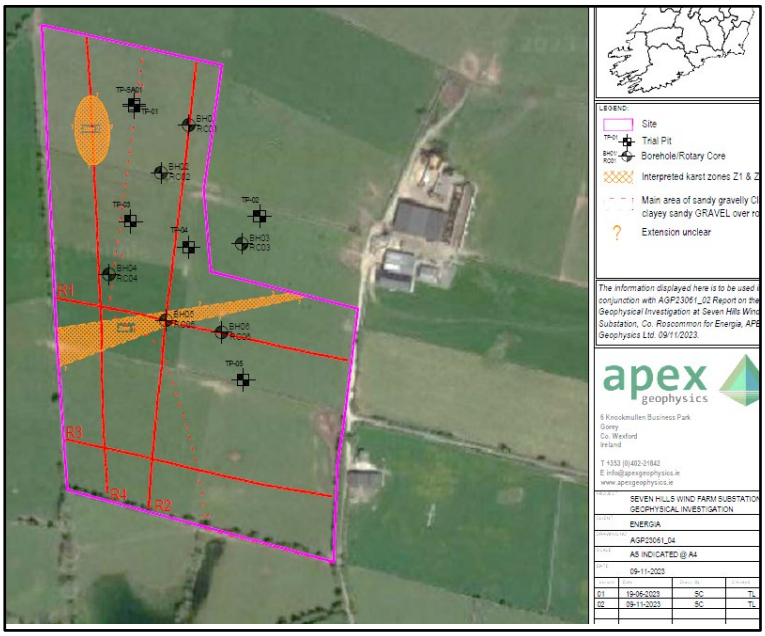

Figure 4: Apex Drawing No. AGP23061_04

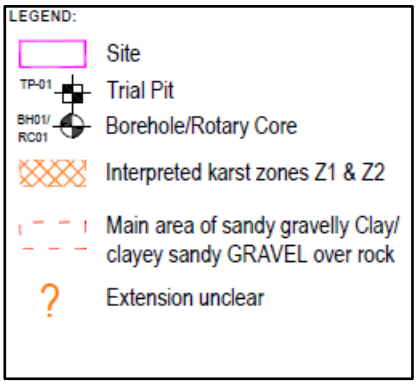

Figure 5: Legend to Fig. 4

[13] ABP-321238-24 Environmental Impact Assessment Report Annex 6.1: Geophysical Investigation Report

3.4 Ground Investigation Report by Ground Investigations Ireland[14]

> *The rotary core boreholes recovered strong to very strong massive light grey fine grained fossiliferous LIMESTONE interstratified with Moderately weak to medium strong massive light brownish grey crystalline medium grained DOLOMITIC LIMESTONE with vugs. Cavities which were infilled with clay or sand were noted in the borehole logs. The depth to rock varies from 4.05m BGL in BH+RC-04 to a maximum of 12.20m BGL in BH+RC-01. The total core recovery is good, typically 100% with some of the runs dropping to 80 or 90% where cavities are noted.*

3.5 Factual site investigation reports v narrative in the EIAR and NIS

In both the granted permission ABP-313750-22 and the subject application ABP-321238-24 the narrative in the EIAR documents before the Board describe the sites Energia wish they had as opposed to the sites they do have. In both cases the factual site data as recorded by the site investigations companies and included in the EIAR Appendices do not align with the narrative in the body of the EIAR or the NIS.

A submission to the Board on the 21st of July 2022 by made this clear.

> Apex Geophysics' (AG) executive summary Section 1 states
> *Completely to highly weathered/karstified LIMESTONE is indicated at T11, T13 and the access road to T12. Possible karstified rock is indicated at a number of locations.*
>
> *It is difficult to see how the design criteria of avoiding weathered rock can be achieved when the entire site is underlain by weathered bedrock and the geophysical investigation confirms that proposed formation level of the turbine bases is underlain by weathered/ possible karstified rock.*

The ABP-313750-22 Inspector based their report entirely on the narrative in the EIAR and the NIS and ignored the factual data and accepted Energia's interpretation of the data as accurate and correct without any expertise which would facilitate such an approach.
The factual site data supports the views of the GSI, the NPWS, the Board's consultant hydrogeologist's (Mr. Keohane), Professor Johnston (turlough hydrogeology specialist from TCD) and several observers. There was no evidence before the Board to support Energia's claim that *No proposed WTG (wind turbine generator) is located over a known or suspected karst anomaly*.

In ABP-313750-22 the Inspector and the Board failed to read and understand the factual site data and instead relied on Energia's invalid interpretation as transcribed into the EIAR. This failure does not align with the Board's claim *Pursuant to the 2000 Act, the Board is the competent authority for the purposes of carrying out an EIA and AA and is assisted in this regard by its Inspectors and is deemed to have the necessary expertise*[15]

Planners and accountants do not have expertise in reading factual site investigation reports regardless of what the Courts may find. Without such expertise the Board's claim that

> *The Inspector... was entitled to accept the content and analysis contained in the documentation submitted by the Notice Party*[15]

Is irrational, illogical and clearly ridiculous. Does the Board expect the proponent of a plan to point out to the Board the deficits in their application?

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[14] ABP Ref 321238 Environmental Impact Assessment Report Annex 6.2: Ground Investigation Report

[15] Record No. 2024/128 JR Outline Written Legal Submissions Of The First Named Respondent

It is the Board's job to examine all the presentations before the Board and not accept without question the partisan interpretations as presented by an applicant.

The factual data in ABP-321238-24 EIAR Annexes 6.1 and 6.2 does not align with Energia's statement to the Board at the Pre-application consultation held on the 8th of April 2024 that the *location was selected due to the absence of complex geologies*.

In the case of ABP- 313750-22 Energia successfully utilised the Board's lack of expertise to achieve a grant of permission for two completely different developments on the same site where '*Possible karstified rock is indicated at a number of locations.'*

Since 2011 the Board had been alerted to the presence of active karst in the general development area.
In May 2011 Dr. Michael Long, Associate Professor in the School of Civil Engineering UCD, visited the site and environs north of Dysart and reviewed relevant chapters of the then referenced EIS. Dr. Long's report was submitted to the Board in Oct 2011 and in August 2012 as part of the appeal documentation for ABP Refs: 239759 and 241069.

In July 2022 a submission to the Board in relation to ABP- 313750-22 again cited Dr. Long's report

> *There is no doubt that the area of the site is one of active karst (i.e. features continuing to develop with time). The presence of enclosed depressions, dolines, turloughs, small caves, the Burren like karren area at the adjoining townlands of Coolatober, Shanballylosky etc. are all clear evidence of this. The rate at which the large Turloughs, e.g. Cuilleenirwan, empty in the spring are evidence that drainage network in the rock comprises relatively large sized openings. My overall conclusion is that, given its active karstic nature, this is a complex site geotechnically*
>
> *On a site such as this with a large network of unsurfaced roads, drainage and trench lines, the risk and implications of reactivation of karstic features needs to be considered carefully before deciding on a solution.*
> *Consideration also needs to be given to the wider problem, e.g., if a karstic feature is reactivated locally what are the implications for the overall underground drainage system, the local ecology etc.* [16]

The recommendations in the May 2022 Apex Geophysics ABP-313750-22[17] report included

> *The normal mitigation measures applying to construction over karstic limestones, such as sealed drainage, and foundations capable of spanning voids that may come to the surface, should therefore be incorporated into any works.*

The Nov 2023 Apex Geophysics ABP-321238-24[18] report included

> *Any changes in surface water drainage or groundwater levels associated with proposed construction activities may re-activate dormant karst features and cause subsidence of the overburden materials.*

[16] Report by Dr. Michael Long, Associate Professor in the School of Civil Engineering UCD, 20.05.2011
[17] ABP-313750-22 Proposed Seven Hills Wind Farm – EIAR and NIS Appendix 4.3
[18] ABP Ref.321238Environmental Impact Assessment Report Annex 6.1: Geophysical Investigation Report

3.6 Record of Dormant Karst Feature adjacent to the granted underground cable route

The concern regarding subsidence and dormant karst features is not hypothetical. In 2011 a dormant karst feature was recorded in the Dysart area. The Board was notified of this in Oct 2011 and in August 2012 as part of the appeal submission documentation submitted to the Board in connection with ABP- 239759 and ABP-241069 respectively It was repeated to the Board again in the 2015 reactivated cases ABP-244346 and 244347.

> *In May 2011, a landowner noticed a new depression in a field adjacent to the R363 adjacent to the location of a nineteenth century drain which had been dug in an unsuccessful attempt to drain Cuilleenirewan turlough.*
>
> *On examination it was found that a much larger void existed just below the topsoil. In order to examine the problem the landowner removed the suspended topsoil, and the collapsed overburden was then visible in the enlarged hole. The landowner dug down through this loose overburden and at a depth of approx. 5m revealed a portion of a horizontal conduit approx.600mm deep by 900mm wide. Photo 26 shows the collapsed subsoil and Photo 27 shows the conduit. The collapse is approx. 2.0km from T12 in Phase 1 and 1.3km from T10 in Phase 2 and approx. 25m from the R363.*

The ABP- 313750-22 corresponding turbines and distances to the redundant conduit are.

T4 in the Northern Cluster - 2.5 km

T15 in the Southern Cluster – 1.4m

Photos 1 and 2 below correspond with Photos 26 and 27 as described above. The location of the conduit is shown in Figure 6.

The ABP-313750-22 Inspectors Report Section 1.5 Planning History notes

> ***ABP PL20.244346****: permission refused for a 16 x turbine windfarm at Cronin and adjoining townlands following a Third Party appeal and subsequent JR of the Board's original decision to grant permission.*
>
> ***ABP PL20.244347****: permission refused for a 19 x turbine windfarm at Skyvalley and adjoining townlands following a Third Party appeal and subsequent JR of the Board's original decision to grant permission.*

The Inspector's familiarity with the planning permission history would suggest that the Inspector was, or should have been, aware of this significant occurrence.

Photo 1: Collapsed subsoil

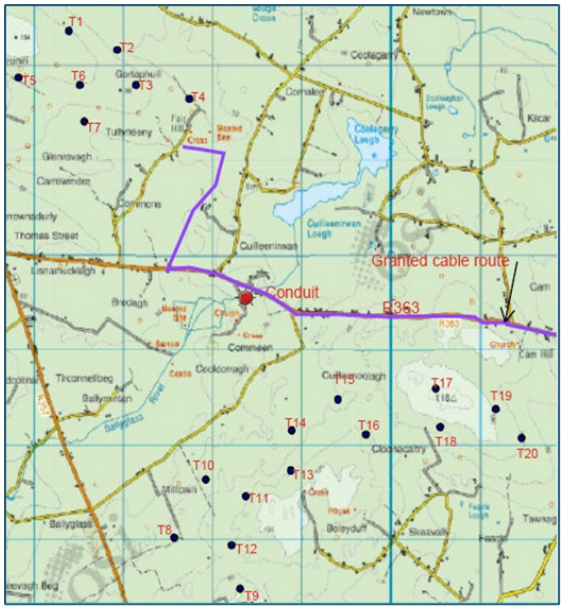

Figure 6: Location of conduit

The minimum flowpath lengths for upland and lowland karsts are similar with flowpath lengths in upland karst ranging from 9.4 m–14 km, averaging 3.3 km and the range for lowland karst is 6.4 m–15.7 km, averaging 4.2 km.[19]

The straight line distance between the interpretated karst zones Z1 and Z2 at the proposed substation and the dormant conduit adjacent to the granted permission cable route is approx. 8.0km, well within the flowpath length range for lowland karsts.

Photo 2: Dormant karst conduit located approx. 25m from R363 carriageway

> *The GSI does not map the presence of any karst features within the immediate vicinity of project site (www.gsi.ie).*[21].

The GSI (www.gsi.ie) does not map the presence of any karst features over or within the immediate vicinity of the dormant karst conduit yet a significant conduit existed there, discovered only after a collapse occurred.

3.7 Known subterranean cavities, conduits and swallow holes on and around the subject site

3.7.1 Overview

GSI expressed concerns to the Board and to Energia regarding geohazards on the granted ABP313750-22 site

> *Damage to the underlying karst bedrock and karst features such as swallow holes, enclosed depressions and turloughs resulting from heavy plant machinery traffic and turbine installation operations. Potential collapse of sinkholes and cavities due to weight and activity of overlying construction.*[22]

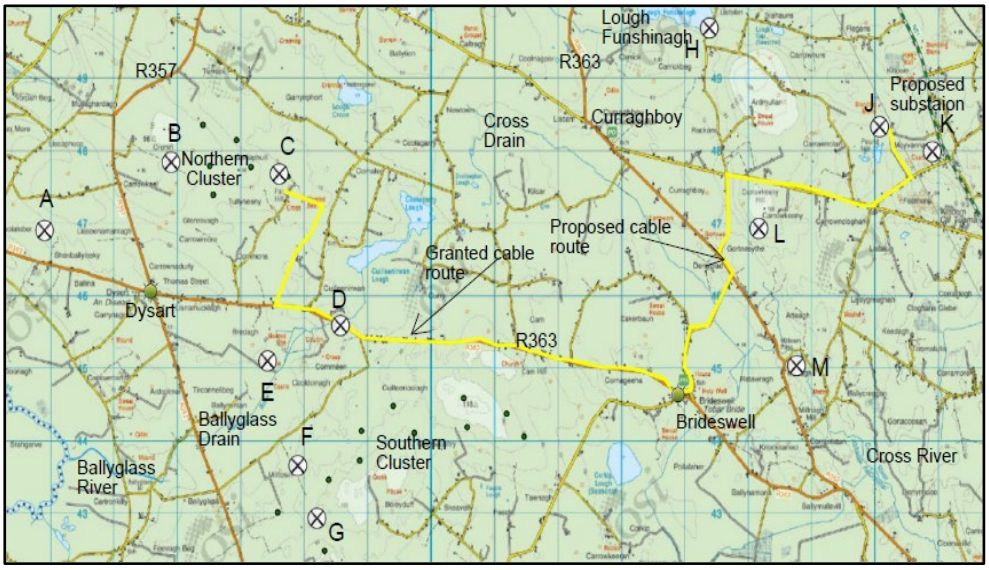

Figure 7 illustrates some of the known potential geohazards in and around the granted development and the proposed development.

Figure 7: Known potential geohazards adjacent to granted and proposed cable route

[19] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland

[20] ABP-321238-24. EIAR Chapter 6 Land and Soil

[21] ABP-321238-24. EIAR Chapter 6 Land and Soil

[22] GSI Additional Response to the Proposed Seven Hills Wind Farm Development in Co. Roscommon 04.11.2020

Location	Type	Source
A	Cave	Sites & Monuments Records -RO047-033
B	Souterrain Cave	Sites & Monuments Records -RO047-067 See Photos 3, 4 and 5
C	Souterrain	Sites & Monuments Records -RO047-084
D	Conduit	See section 3.6
E	Swallow Hole	GSI Groundwater Data Viewer
F	2.4m cavity 12.3m bgl	ABP-313750-22 EIAR Appendix 4.3 IGSL T11- RC03.
G	Karstified limestone @ 1.4m bgl	ABP-313750-22 EIAR Appendix 4.3 Apex Geophysics T13
H	Swallow Hole at Lough Funshinagh	GSI Groundwater Data Viewer
J	Zones of highly karstified rock up to 22m deep. Extent unknown	ABP-321238-24 EIAR Annex 6.1: Geophysical Investigation Report
K	Souterrain	Sites & Monuments Records -RO048 -156
L	Grey, brown, LIMESTONE very weathered with clay bands from 19.0m to 29.5m bgl	RCC Planning application Reg. Ref. 04/2280 TES Consulting Engineers BH No.2
M	Traced outfall from Lough Funshinagh	Drew (1996)

Table 1: Details of known potential geohazards

Souterrain (from French sous terrain, meaning "under ground"). Souterrains may be a man made cave or a natural karst cave.

3.7.2 Geohazards under and around Turbine 5 (Location B in Table No.1)

Figure 8, from MKO Drawing No. 190907-11, shows Turbine No.5 and the associated infrastructure. Borehole T05-RC02 was cored at the location of T5, the log of T5-RC02 records rock at 1.3m and the borehole terminated at 3.8m. The date on the log is 08.12.2020. The approx. locations of geohazards B (souterrain and cave) are also shown in Figure 8.

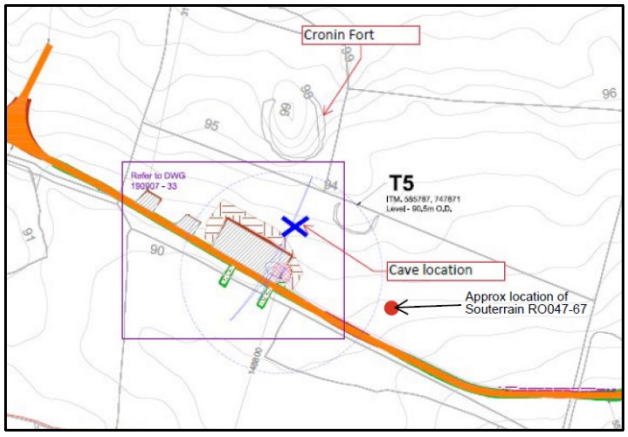

Figure 8: T5 with souterrain and cave locations

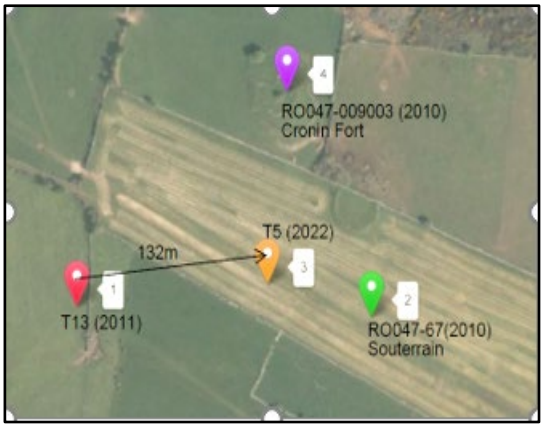

Figure 8a: T13 Phase 1 and T5 N. Cluster

RO047-009003 is located in Cronin Fort

> *There is a local report of an underground chamber discovered when a tractor fell into it, and which was subsequently backfilled. Situated just to W of rath (RO047-009001-). This is probably the same as (RO047-067----)* [23]

RO047-067

> *On a gentle S-facing slope c. 30m S of rath (RO047-010001-). An underground passage was discovered in 1934 (Irish Times 3-1-34; Connaught Tribune 6-1-34) which is*

[23] GSI Historic Monument Viewer. Compiled by: Michael Moore. Date of upload 24 August 2010

described locally as a passage (L c. 4m) leading through a creep to a beehive chamber. It was closed c. 1980.[23]

A possible fault zone or channel feature is interpreted along profile 28 at Turbine 13.[24]

The geophysical data indicates the centre of Turbine T05 is characterised by c. 1.5m of medium dense to dense slightly clayey sandy GRAVEL/BOULDERS over very poor highly weathered/ possible karstified LIMESTONE over moderately weathered/possible karstified LIMESTONE. Depth to slightly weathered to fresh LIMESTONE is 3.0m bgl[25]

Photo 3: Entrance to cave at T5 (1996)

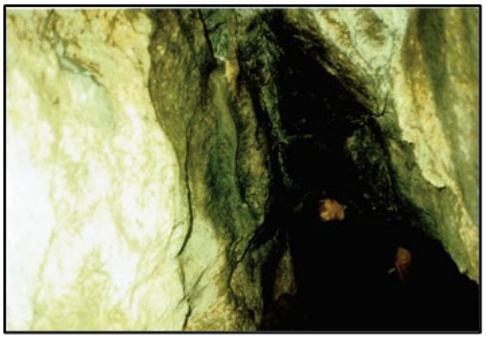

Photo 4: The cave is large enough to accommodate an adult

Photo 5: Inside the cave at T5 (1996)

Since 2011 photographs 3 and 4 and explanation text have been sent to the Board on numerous occasions. They were last submitted in July 2022 as part of a submission regarding ABP-31750-22.

The underground chamber described by Moore, the cave in photos 3 to 5 and the souterrain RO047-67 are all part of the same subterranean karstified limestone rock located directly under Turbine 5 and the associated infrastructure.

A subterrain fault zone which has been confirmed by the applicants 2011 and 2022 site investigations

Figure 8a shows the location of T13 (2011) and T5 (2022). This *fault zone* is similar to the karst zones ZI and Z2 recorded in site investigations for the proposed development. Similar to the Z1 and Z2 zones the extent of these fault zones is unknown.

Trial pit T05-TP02 was dug approx. 20m NW of T5. The trial pit was excavated with a tracked digger which would have a downward reach of about 4.0m. The trial pit ended at 1.2m and '*Refusal due to large boulders*' is recorded in the log. Borehole T05-RC02 met rock at 1.3m and continued coring for a further 2.5m.

The trial pit refusal at 1.2m deep was not due to *large boulders*, there is no evidence of *large boulders* in the trial pit photograph records as shown in Figure 9 and 10. The teeth marks of the tracked machine on the rock can be seen in Figure 10. What can be seen in Figure 10 is more

[24] WaterWise Environmental Geophysical Survey Seven Hills Wind Farm -07.04.2011

[25] ABP-313750-22: EIAR and NIS Appendix 4.3 IGSL Factual Report – Apex geophysics

likely a high point of the *very poor highly weathered/ possible karstified LIMESTONE* as recorded in the geophysics.

Figure 9: T5 TP02 [26]

Figure 10: T5 TP01[25]

Borehole T05-RC01is located in the hardstanding area of Turbine 5. The log records rock at 1.8m bgl and described it as *Apertures are tight to locally open, locally clay-filled contributing to small scale coreloss (at 5.74-5.82m & 6.56-6.66m*).

> *Caves are usually regarded as being underground channels accessible to humans that are of comfortable dimensions. However, in hydrogeological terms, every water-transmitting opening greater than 5–10 mm in diameter within the limestone aquifer has turbulent flow and should be considered a conduit.* [27]

All of the above aligns with the data recorded at the proposed substation and confirms the expert opinions of Mr. Keohan, Professor Johnston, Dr. Long etc. i.e. the presence of Karstified rock throughout the area.

The land around the cave has been reclaimed. The cave is no longer visible, but the hazard remains

It is worth repeating the opinion of the ABP-313750-22 Inspector

> *The consultant hydrogeologist who advised the Board on the previous windfarm applications described the underlying bedrock as extensively karstified (i.e. weathered or fissured) and referenced the inter-relationship between ground and surface waters. On the other hand, the applicant has described the underlying limestone bedrock as not been highly karstified in both the previous and current windfarm applications.* [28]

The Inspector is mistaken if they believe that the applicant has described the underlying bedrock as **not** being highly karstified in previous applications.

Oct 2010 - Northern Cluster

> *Given the risk to the stability of the turbine foundations from buried karst features (such as collapse features) it is proposed to use piled foundations.* [29]

Oct 2011- Northern Cluster

> *Photos 21 and 22 below were included by the applicant in the EIS submitted to RCC as part of the planning documents for Phase 1 of the proposed development.* [30]

Photo 21 is captioned "*Photograph of flooded collapse feature (doline) in SE corner of site.*

---

[26] ABP-313750-22: EIAR and NIS Appendix 4.3 IGSL Factual Report

[27] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland

[28] ABP-313750-22. Inspectors Report

[29] RCC Application 10/541 Proposed Seven Hills Wind Farm Phase I. EIAR Sections 9.8.1 and 9.8.2 (15.10.2010)

[30] Extract from submission to ABP regarding 10/541 appeal – ABP-239759 (28.10.2011)

Photo 22 is captioned " *Photograph of typical (doline) present at the site and within the general area."*

Photo 21 (2011)

Photo 22 (2011)

July 2011- Southern Cluster

Field sizes tend to be small, and the land is well drained with an absence of surface watercourses. The landscape hosts a number of karst features, most commonly dolines (enclosed depressions). This site consists of moderate to high permeability sandy gravelly clay rich deposits.[31]

April 2011 – Northern Cluster

6. A prominent karstified layer as indicated by low resistivity values is modelled to the centre and east of the site. This layer is typically 6-10 m thick and may contain significant fractures, cavities and sediment filled cavities

7. A number of possible small karst features within the intermediate limestone horizon are interpreted within the central band of the site, in particular at Turbines 14 and 16. A possible fault zone or channel feature is interpreted along profile 28 at Turbine 13.[32]

April 2015 – Southern Cluster: Borehole RC-T8-PH2[33]

Depth(m) 5.80 - 20.00 Weathered rock. Probable weathered LIMESTONE rock. Depth (m) 14.80-17. I0 Cavity

May 2020 – Southern Cluster: Borehole log ST2[34]

Weak to strong, light grey, LIMESTONE. Clay infill between 16.1 and 17.8mbgl slight fracture from 20.4 - 20.6m

March 2021 – Northern Cluster: Borehole T05-RC01[35]

Discontinuities are widely to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-filled contributing to small scale coreloss (at 5.74-5.82m & 6.56-6.66m)

March 2021 – Southern Cluster: Borehole T11 RC03[33]

Depth (m)12.30 – 14.70 POSSIBLE KARST INFILL

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[31] RCC Application 11/273 Proposed Seven Hills Wind Farm Phase II – Planning Report (July 2011)

[32] WaterWise Environmental Geophysical Survey Seven Hills Wind Farm -07.04.2011

[33] Proposed Seven Hills Wind Farm, Co. Roscommon Appendix 8-3 2015 Site Investigation – Borehole Logs. Jennings O' Donovan Ireland. Submitted to ABP after Kelly v ABP Supplementary Judgement. ABP Reactivated case 244347

[34] ABP-313750-22: EIAR Appendix 8.2 HES Boreholes

[35] ABP-313750-22: EIAR and NIS Appendix 4.3 IGSL Factual Report

May 2022 – Both clusters[33]

> *Completely to highly weathered/karstified LIMESTONE is indicated at T11, T13 and the access road to T12. Possible karstified rock is indicated at a number of locations.*

From Oct 2010 to May 2022 all the site investigation reports recorded karstified rock on the sites of the granted ABP 313750-22 development. This was never disputed by anyone, including the applicant, that is until June 2022 when the applicant described the site in EIAR Section 8 – Land, Soil and Geology and EIAR Section 9 – Water.

> *The bedrock geology underlying both Wind Farm site clusters is now comprehensively understood with the recognition that karst features are not ubiquitous, and that the bedrock geology is characterised by competent limestone.*[36]

> *No proposed WTG is located over known or suspected karst anomaly. The iterative approach to design has ensured that turbine locations were moved or reconfigured to avoid potential subsurface anomalies identified from drilling and geophysical investigations.*[37]

The narrative in ABP-313750-22 EIAR Chapters 8 and 9 is contradicted by multiple sources, including the applicants own site investigation reports. It is unclear why the applicant assumed that multiple consecutive site investigations would yield different results. The site is karst, it always was, it always will be regardless of the applicant's desire *that the bedrock geology is characterised by competent limestone.*

> *The Board did not request responses to specific submissions made to the planning application; rather they invited the applicant to make a submission on the observations received to the application.*[38]

ABP-313750-22 *Further Information received by the Board on the 31st day of March 2023*[39] did not make any response to the geological details contained in the 21st of July 2022 submission to the Board. Neither did the Board request the applicant to rectify this omission.

Similar to ABP 313750-22, the narrative in the EIAR ABP- 321238-24 Sections 6.0 *Land and Soil* and Section 7 *Water* submitted as part of the current application do not reflect the site data submitted in Annexes 61 and 62 of the application documents.

The Inspector and the Board members were not competent to assess the ABP-313750-22 application. This incompetency and lack of expertise has resulted in a grant of permission for 17 No. 180m wind turbines to be built on a site where two sudden collapse ground events have been recorded and where geohazards have been identified, the extent of which is unknown.

The potential for sudden and catastrophic collapse of the underlying karstified limestone rock immediately or at some future date cannot be dismissed as a theoretical analysis: it is real. It has occurred before and it will happen again.

> *This is a very real, but localised hazard in parts of Roscommon. In the county there is limestone often only a few metres or less beneath the land surface. The number of known caves in the limestone is very few, but in certain areas such as Mewlaghmore near Castlerea, there are hundreds of karstic features called dolines. These are enclosed depressions with no surface water drainage associated with them. Some form by slow*

[36] Proposed Seven Hills Wind Farm, Co. Roscommon – EIAR Ch.8 - Land Soils and Geology

[37] Proposed Seven Hills Wind Farm, Co. Roscommon – EIAR Ch. 9 - Water - F

[38] ABP-313750-22 Further Information 31.03.2023: Response to Observations Received. MKO 31.03.2023

[39] ABP-313750-22 Board Order Nov. 2023 Condition No. 1

dissolution of the underlying limestone rock, but others can be formed as rapid collapse events. When they occur, they are often not reported and just filled in by farmers, so we have little information on the frequency with which they happen.[40]

The environmental impact of the construction of the Seven Hills Wind Farm in conjunction with the subject application is, like the extent of the site karstification, unknown. How much longer is the Board going to continue to support the applicant's claim that *No proposed WTG is located over known or suspected karst anomaly*?

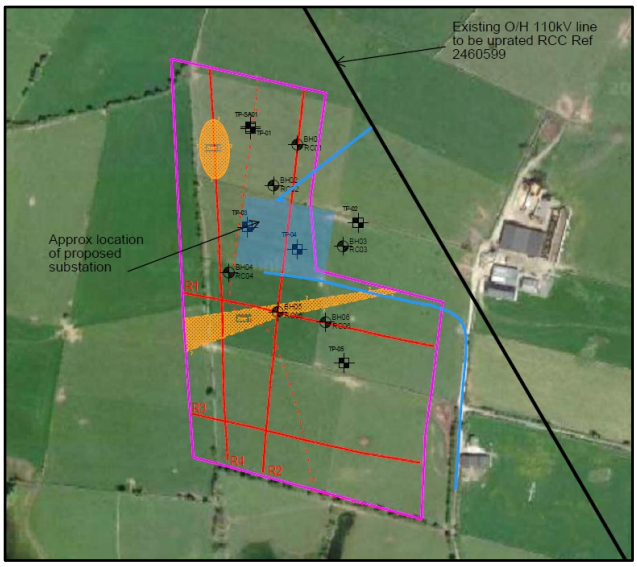
The applicant acknowledges that the granted foundation bases may not be the ultimate foundation method selected

After the foundation level of each turbine has been formed, using piling methods or excavating to competent strata[41]*....*

Where an excavated turbine base cannot be used due to the depth of soil, a piled foundation using reinforced concrete piles will be installed. [42]

The Board has made a serious error in granting ABP-313750-22 planning permission. Should this development proceed the consequences of that error will at best alter the hydrogeology of the area causing negative effects on the eco system and cause flooding of unknown extent at worst– who knows.

4.0 ABP-321238-24 EIAR Chapter 7 Water



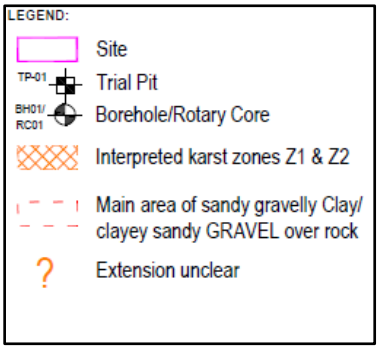


Figure 12: Legend to Figure 11

Figure 11: Proposed substation superimposed on Apex Drg. 23061_4

EIAR Chapter 7 Water: Section 7.3.8.2 Summary of Geological Data

` *A detailed description of the geology at the project site is provided at Chapter 6 of this EIAR. The following is a brief summary of relevant geological information that has a bearing on the hydrogeology of the site: -*

- *A layer of potentially weathered bedrock was encountered in 3 no. rotary core boreholes at depths ranging from 3.8 to 9.8m. This layer, where present, is thin ranging from 1.1 to 3.35m in thickness;*

[40] The Geological Heritage of Roscommon An audit of County Geological Sites in Roscommon 2012 RCC/GSI

[41] ABP-313750-22 EIAR Ch.4 - Description of Proposed Development

[42] ABP-313750-22 EIAR CEMP

- *The underlying competent bedrock is noted to comprise of strong to very strong massive fossiliferous limestone which is interbedded with moderately weak to strong massive dolomitic limestone;*
- *The bedrock is notes to be generally fresh to slightly weathered;*
- *The total core recovery is good, typically 100%, with some of the runs dropping to 80% or 90% recovery where cavities are present; and,*
- *The occasional cavities are filled with clay or sand; however, no significant karst features were recorded.*

As per ABP-313750-22, the geological narrative in EIAR ABP-321238-24 bears scant resemblance to the actual site data. EIAR Chapter 7 Water is fundamentally flawed and is invalid.

5.0 Joint Bays

5.1 Grant of permission ABP-313750-22. EIAR Appendix 4-9 - Construction and Environmental Management Plan

2.3.2.10.6 Joint Bays

Joint bays are pre-cast concrete chambers where lengths of cable ducting will be connected.

For proposed cable route, joint bays are required approximately every 600m to 800m. The joint bay dimensions are approximately 6m long x 2.5m wide and 2m deep.

Joint bay locations will be excavated using conventional mechanical excavators. Joint bay excavations will be advanced to the required depth and width with the excavation floor graded and smoothed. A blinding layer will be placed at the base of the excavation to facilitate the construction of a concrete base and side walls (in-situ or precast).

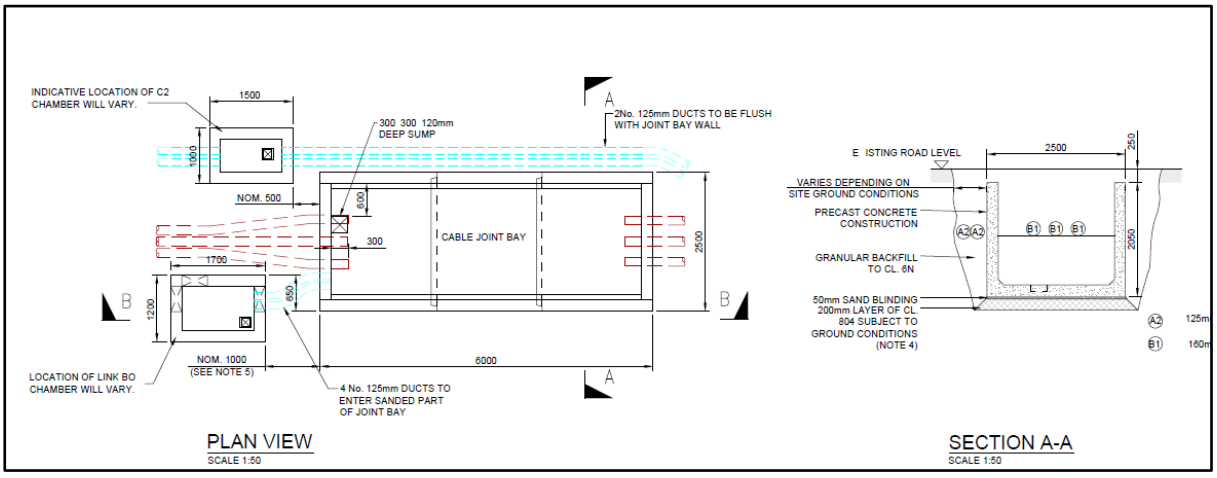


Figure 13: Extract from planning drawing No. 60634578-ACM-DR-CE-037 Typical Joint Box Details.

Although supportive in principle of this Strategic Infrastructure Development, Roscommon County Council roads department would have legitimate concerns about the long term effect that the proposed works will have on the R362, R363...

1. The applicant should note that the preferred position for the cabling shall be In the verge at least 1.2m from the road edge. This will reduce the impact on the road and the overall cost to the applicant in terms of backfill requirements and the cost of the associated road opening licence.

The mapping presented is not satisfactory for RCC to make an accurate appraisal of the impact that the proposed development will have on the public road network.

For clarity the mapping should clearly show the carriageway, the verge and thus extent of the cabling route in a colour coded fashion as follows:

a) Cabling route in road

b) Cabling route in verge but at the road edge i.e. within 1.2m of the road edge.

c) Cabling route in the verge (outside the first 1.2m).

d) Roscommon County Council will require the applicant to carry out full lane reinstatement on all public roads where cabling is within the carriageway.[43]

Of more significance in respect of potential long term impacts or constraints is the proposed 12.3 km grid connection route from the wind turbine site to the existing ESB substation in Monksland.

As detailed in the response from Roscommon County Council's Roads Department, there is concern about the long term effect of the development on the R362 and R363 regional roads in the event that the cabling route is in the carriageway. It is essential that every effort should be made to finalise a cabling position in the verge rather than in the carriageway and it is reasonable that this forms a requirement and a prominent element of this overall recommendation and report to An Bord Pleanála. Roscommon County Council expects that ensuring the integrity of the road network will be a central component of this strategic infrastructure project.

It is recommended to the Elected Members that the principle of the proposed development be endorsed by Roscommon County Council in its consultation response to An Bord Pleanála, subject to matters
set out in (1), (2) and (3) below.

(3) In the event of the granting of planning permission, the inclusion in a schedule of conditions, of specific conditions to address the following matters:

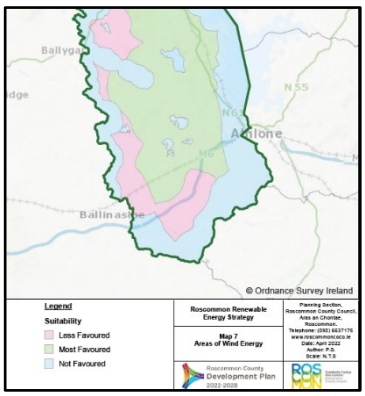
(b) A requirement to locate (to the maximum extent possible) the grid connection cabling in the verge of the public road, at a distance of at least 1.2m from the road edge, in order to preserve the structural integrity of the public road;[44]

It is unclear whether RCC Roads Department or the Chief Executive fully understood that approximately *6m long x 2.5m wide and 2m deep joint bays are required approximately every 600m to 800m* along the public carriageways or that the Board has granted permission for them. In fact, it is unclear whether the Board itself fully understands for what they had granted permission, aside of course from two separate developments. The Inspector's report doesn't refer to joint bays but assumes the underground cable is in the road verge – a verge that is non-existent for long stretches of the R362 and the R363.

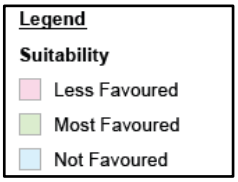
The RCC requirement, which the support of the Elected Members depended on, *to locate (to the maximum extent possible) the grid connection cabling in the verge of the public road, at a distance of at least 1.2m from the road edge, in order to preserve the structural integrity of the public road* and that the applicant be required *to carry out full lane reinstatement on all public roads where cabling is within the carriageway* is not a condition of Board Order ABP-313750-22.

[43] ABP-313750-22: RCC Roads section Planning Report 19.07.2022

[44] ABP-313750-22: RCC- Chief Executive's Report to ABP re SID Proposal - Seven Hills Wind Farm 28.07.2022



The RCC Renewable Energy Strategy 2022-2028 (RES) effective from 19th April 2022 indicates most of south Roscommon as an area "*most favoured*" for wind energy development. This includes the area around Lough Funshinagh which, in 2022, was in its sixth year of an environmental flooding crisis.



Map 7 from RCC's RES 2022-2028 **Legend to Map 7**

5.2 Planning Application ABP-321238-24 EIAR Annex 3.4: Planning-Stage Construction & Environmental Management Plan

Page 7

3.8 Underground Electricity Line

The electricity substation will be connected to the permitted Seven Hills Wind Farm grid connection infrastructure via c. 7.5km of 110kV underground electricity line.

The electricity line will be installed within ducting in an excavated trench of c. 1.3m deep and c. 0.6m wide. Cable (electricity line) lengths will be connected at designated 'joint bays' to be constructed along the route. It is estimated that 11 no. joint bays will be required along the route of the underground electricity line; however, the exact number to be constructed will be confirmed as part of the post-consent detailed design process. Joint bays will, insofar as possible, be located within roadside verge or at agricultural access points to minimise the extent of joint bay infrastructure within the paved carriageway of the public road network.

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- *Where possible, joint bays will be installed within roadside verges or at field entrances*
- *Following the installation of the electricity line ducting, the trench will be backfilled with appropriate material and temporarily reinstated. Following the installation of the underground electricity line, all public roads within which it is proposed to install the underground electricity line will be subject to a full-width carriageway reinstatement (re-surfacing) of the relevant road section*

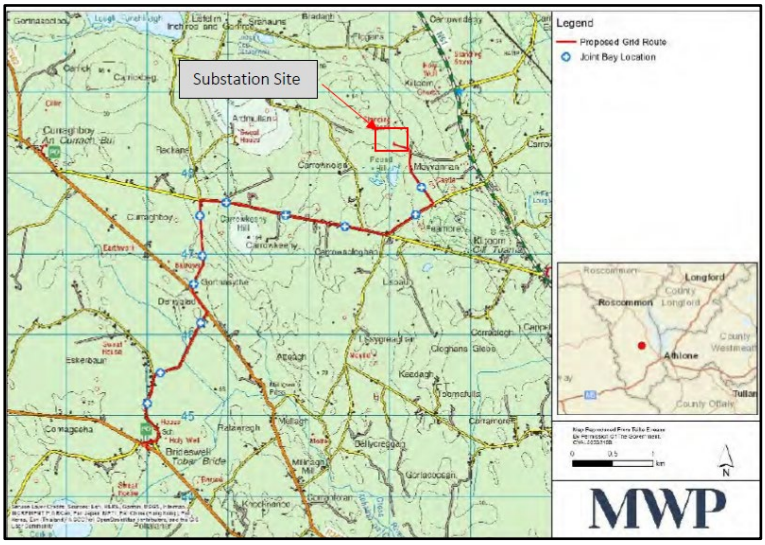


Figure 14: Proposed Joint Bay Locations shown as blue dots.

RCC Roads Dept. require *the applicant to carry out full lane reinstatement on all public roads where cabling is within the carriageway.*
The applicant is proposing *a full-width carriageway reinstatement (re-surfacing) of the relevant road section.*
It is unclear whether these are the same proposal.

The Board and the Inspectors ABP-313750-22 AA failed to consider the joint bays as a significant element of the development. The in combination effects of these and the proposed ABP-321238-24 bays must now be assessed.

Figure 14a: Typical Joint Bay Backfilling Procedure

6.0 Proposed outfall pipe from Lough Funshinagh to Flegans

Roscommon County Council's proposal for an overflow to the east consists of a 2,000 metre length of closed pipe from the southeast corner of Lough Funshinagh at Lisfelim to an existing watercourse at Flegans. This watercourse runs east, under the N61 National road, and outfalls at Carnagh Bay on Lough Ree. The watercourse in the Flegans area runs through several properties and under the gardens of some houses. The additional flow of 0.60 m3/second from the overflow pipe would require an increase in the cross section of the watercourse which may not be practical. It would also incur some level of flood risk to properties where there is currently no apparent risk. Consequently, we would propose to extend the pipe farther east to Kiltoom where the stream appears to have adequate capacity for the increased flow. The closed pipe system would follow the same route as that proposed by RCC but would have a total length of 3,000 metres as shown in Figure 4[45]

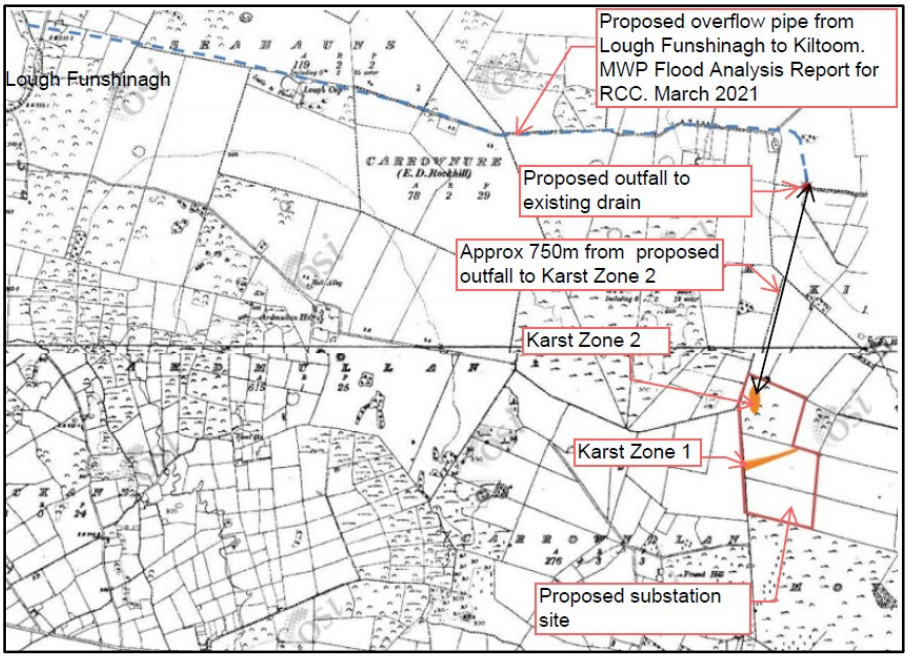


Figure 15 shows the proposed pipe and outfall referred to above on the OSI third edition 6" map (1911-1913).

The proposed substation site and the Karst zones as recorded in ABP-321238-24 EIAR Annex 6.1 Geophysical Investigation Report are also shown.

Figure 15: OSI 6"to a mile third edition (1911-1913)

[45] MWP Flood Analysis Report- Lough Funshinagh March 2021

The RCC proposed outfall described above is approx. 750m north of the 22m deep Karst Zone 2 as shown on the Apex drawing However, Apex state that the extent of the zone is unclear so it may be closer to the outfall. If the zone is closer or if it connects to other conduits then some or all of the outfall discharge would find its way into these conduits and discharge at any location. The zones may extend NW toward the actual pipeline route. The karst zones on the subject site and the flooding SW of the proposed development site could potentially be linked to the persistent flooding which occurs at Ardmullen, adjacent to Lough Cup and perhaps even to Lough Funshinagh.

Figure 16 shows the proposed pipe and outfall on the OSI Imagery 2013-2018.The satellite image shows two areas of flooding immediately south of the proposed substation. Only one area is recorded as '*Liable to flood'* on the OSI 25" 1890 map. The additional flood area is evidence of the active karst nature of the area and the increased propensity to flooding over the last thirty years.

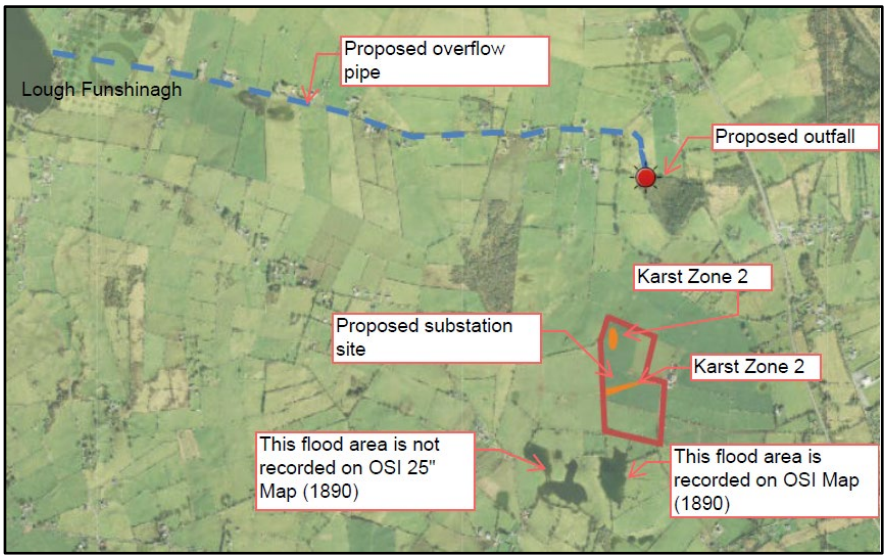


Figure 16: OSI Imagery 2013 -2018

The ABP-321238-24 EIAR site investigations summary of

> *two main zones of rock with a potential high degree of karstification* and *fractures* and *infilled cavities within highly weathered to slightly weathered to fresh rock over a depth range of 8.65 to 20.3m bgl*

calls into question the RCC proposal of a 600mm diameter pipe *for an overflow to the east* at depths of up to 6.0m below ground. This project must be developed in conjunction with hydrogeologists with lowland karst competencies. To date that has not occurred. Without such input the potential for environmental damage, downstream flooding and groundwater contamination is unknowable.

7.0 Cumulative Impact Assessment

There can be no doubt but that the area surrounding the proposed development is busy. Figure 17 shows the matters which need to be considered in the assessment of ABP-321238-24.

Figure 17 does not include the Planning Application for permission for works to uprate the existing Athlone to Lanesborough 110 kV overhead line (OHL) circuit which was received by RCC on the 27th of November 2024, Planning Ref: 2460599

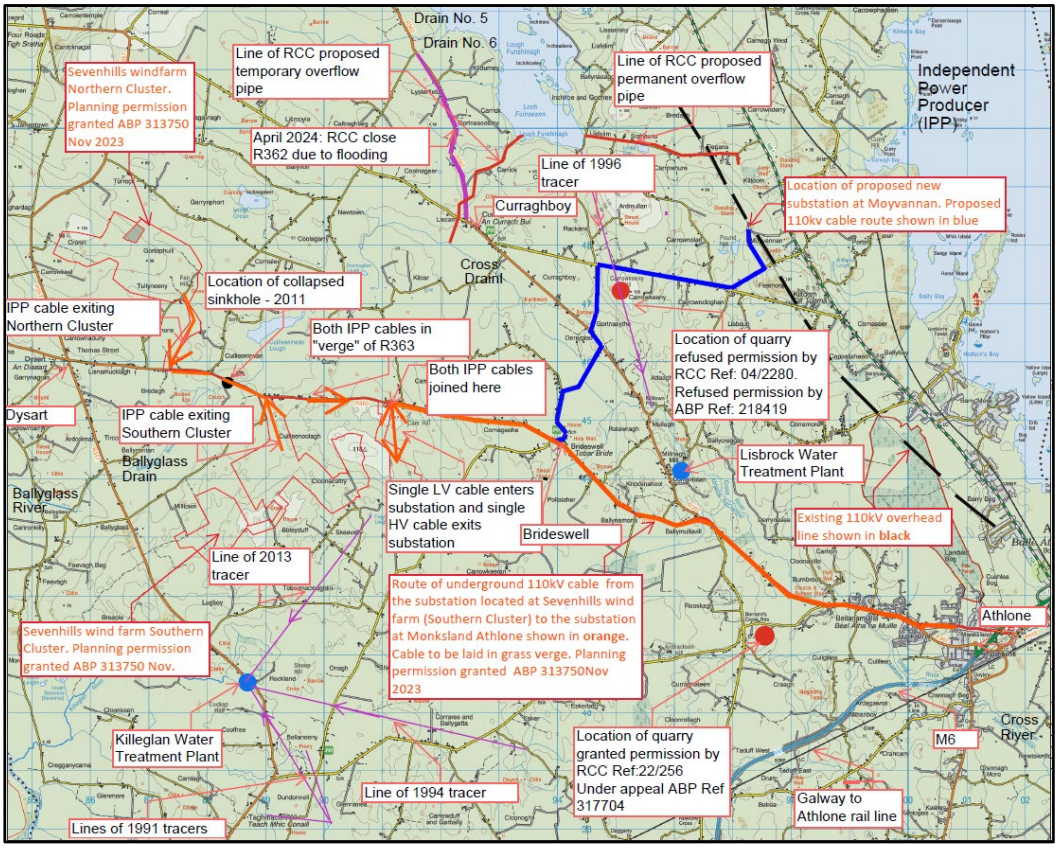


Figure 17: Developments and issues which need to be considered when assessing Planning Application ABP- 321238-24

8.0 General matters to be considered

8.1 Geohazards in Karst

These are explained in detail by GSI. Refer to section 3.7.2 for an example adjacent to the granted permission ABP-313750-22

8.2 Underground 110kV cables

On the 28th of Oct 2011 an appeal was lodged to the Board in relation to the decision by RCC to grant permission for Phase 1 of the Seven Hills Wind Farm development (RCC Ref: 10/541 ABP Ref: 239759). Phase 1 is now known as the Northern Cluster.

The appeal was received by the Board on the 1st of Nov.2011 and by RCC on the 4th of Nov 2011.

Section 3.0 of the appeal submission to the Board *"Connection to the National Grid and implications for the scope of EIS and NIS"* described Eirgrid's policy regarding underground cables. The following are extracts from Section 3.0 of the appeal submission.

The Eirgrid document *'Grid 25 A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and competitive future'* is available on the Eirgrid website and notes the following

- *Overhead lines are the standard form of transmission throughout the world.*
- *Overhead lines cost significantly less to construct than underground cables. They are easier to pinpoint faults on and quicker to repair and so provide a cheaper and more reliable alternative to underground cables.*
- *Only where it is not possible to find a route for overhead lines are high voltage (HV) underground cables used worldwide. Such situations arise, for example, when the area that has to be traversed consists of one or more of the following:*
  - *A built-up urban area where there is no space for support structures;*
  - *An area with a multiplicity of existing overhead power lines;*
  - *A relatively wide expanse of deep water;*
  - *An area of unique natural beauty.*
- *There are two main reasons why underground cables are used so rarely at transmission voltages (110 kV, 220 kV and 400 kV). Firstly the capital cost of installing a cable is many times that of an equivalent overhead line and secondly the operating performance of an underground cable is not as good as that of an overhead line.*
- ***When considering a transmission project in isolation however, neither a technical nor an economic case can be made for installing underground cable, even at 110 kV, unless confronted with a built up area, a vast expanse of water or an area where there is a multiplicity of overhead lines. (emphasis added)***

The Eirgrid policy regarding underground 110KV cables remains unchanged. Appendix A of the Eirgrid strategy 2020-2025 confirms this. Appendix A of the Eirgrid document concludes by saying *When considering a transmission project in isolation however, neither a technical nor an economic case can be made for installing cable, even at 110 kV, unless confronted with a built up area, a vast expanse of water or an area where there is a multiplicity of overhead lines. In some countries lower voltage lines have been placed underground but, for the reasons given above, no country has adopted a policy of undergrounding high voltage lines*.

The Irish Wind Energy Association (IWEA) and an independent study confirms Eirgrid's policy

In its submission to RCC on the draft WES The Irish Wind Energy Association (IWEA) notes

It is currently not the policy of the system operators to offer underground cable options instead of overhead power lines. There are many technical and operational difficulties that apply to underground cables which do not apply to overhead power lines.

- *Overhead power lines can provide a more secure electricity supply than underground cables. Overhead lines are easier and faster to maintain and repair while underground cable faults can take weeks to repair may be difficult to locate and maintenance and repair is thus a much slower process*
- *Trenching associated with underground cables has its own environmental and technical concerns and also from a technical point of view certain land types are not suitable/desirable for undergrounding cables*
- *Underground high voltage cables are considerably more expensive to install than overhead lines. In some cases this extra cost may render a wind energy project economically non-viable*

The above is supported by an independent Study commissioned by Eamon Ryan, T.D., Minister for Communications, Energy and Natural Resources in 2008 on the Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cables.

8.3 Groundwater Source Protection Areas adjacent to the proposed development

Groundwater is an important natural resource which supplies 100% of drinking water in South Roscommon. Groundwater in Ireland is protected under European Community and national legislation. Local authorities and the Environmental Protection Agency (EPA) are responsible for enforcing this legislation.

> *The 'Killeglan PWS Tobermore Spring' Public Supply Source Protection Area is the nearest public water scheme located c. 4km west of the underground electricity line and c. 7km southwest of the electricity substation site. There are no other PWS and GWS within 10km of the project site.*[46]

The Lisbrock Water Treatment Plant (WTP) and associated springs is located c2.0km west of the underground electricity line at the proposed location in Brideswell. This WTP is located c4.3km SW of the proposed electricity substation.

> *Given the unpredictable nature of karst groundwater, particularly the direction of groundwater flow, establishing ZOCs (Zone of Contributions) requires specific techniques, significant resources, suitable antecedent weather conditions and time.*[47]

8.4 Groundwater levels at the subject site

> *The site investigations and baseline monitoring completed to inform the preparation of this chapter are as follows:*
>
> - *Walkover surveys and hydrological mapping of the project site and the surrounding area were undertaken by HES whereby water flow directions and drainage patterns were recorded. These walkover surveys were completed on 22 February 2023, 18 January 2024 and 28 August 2024;*
> - *The installation of 1 no. groundwater monitoring well at the electricity substation site; and,*
> - *Seasonal groundwater level monitoring completed at the substation site in 2 no. wells (Well 1 and Well 2) between October 2023 and August 2024.*
> - *Drilling of 5 no. cable percussion boreholes with follow on rotary core borehole drilling (6 no.)*
>
> *No groundwater strikes were recorded during the drilling of the boreholes. Meanwhile, groundwater monitoring installation was completed at RC02 to facilitate groundwater level monitoring. Manual groundwater level monitoring was completed in the newly installed standpipe at RC02 and in the preexisting farm well in the vicinity of the electricity substation site between October 2023 and August 2024.*
> *Meanwhile continuous water level monitoring was completed in RC02 and the adjacent agricultural farm well from the 18 January to 25 July 2024.*
> *With regards to the site investigations completed at the electricity substation site, no karst features were encountered during the drilling of the 6 no. boreholes.*[48]

Aside from Professor Johnston's advice that *boreholes may miss the conduits in the karst* any attempt to define the groundwater level in a karstic aquifer by reference to water levels in boreholes will be unsuccessful. Refer to Photo 1 in the Foreword.

---

[46] ABP-321238-24 EIAR Section 7 - Water

[47] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland

[48] ABP-321238-24 EIAR Section 7 - Water

There is usually a water table of sorts in karstic aquifers, but it may be a semi-discontinuous surface as evidenced by the considerable variations in standing water levels recorded in adjacent boreholes in many karst areas. The significance of the water table is also less than in conventional groundwater hydrology as so much of the groundwater is in localised conduits rather than being evenly distributed through the aquifer.[49]

The applicant has applied conventional groundwater hydrogeology to define the groundwater level in a karst environment, where clearly such an approach does not apply. An invalid premise will produce invalid conclusions.

....the likelihood of significant effects is negligible for the following conclusive reasons:-

- *The electricity substation is underlain by strong limestones;*
- *No karst features were identified during the site investigations;*
- *There will be no interference with groundwater flowpaths or alteration of groundwater recharge rates and therefore there is no potential to effect local groundwater levels; and*
- *Therefore, based on the hydrogeological assessment of the electricity substation site and the prescribed mitigation measures, it can be robustly determined that the potential to effect local wells/water supplies is negligible.*

Due to the extensive site-specific data on subsoils and bedrock within the electricity substation site obtained from site investigations, coupled with the mitigation measures associated with drainage management and the protection of water quality, the residual effect is assessed to be indirect, negative, imperceptible, short term, unlikely impact to groundwater fed turloughs.

No significant effects are likely to occur on downgradient non-designated turloughs.[50]

The granted ABP-313750-22 EIAR and NIS used an equally invalid premise and arrived at invalid conclusions which were unscientific, irrational and illogical.

The turlough water levels are used in conjunction with other collected water level data to delineate groundwater contours and flow directions within the Hydrogeological Conceptual Site Model[51]

Photos 3 to 8 show the pumphouse in Feacle Turlough between 2014 and 2024 at various times of the year. Photos 3 and 3a are at the same location six years apart.
Photos 4 to 8 are at the same location as evidenced by the stepped dry stone wall in the background.
The combined photos illustrate the inaccuracy of using turlough water levels to develop a Hydrogeological Conceptual Site Model.

[49] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland
[50] ABP-321238-24 EIAR Section 7 - Water
[51] Granted ABP-313750-22 EIAR and NIS Chapter 9 -Water

Photo 3: 3rd March 2014

Photo 3a : Seven Hills EIAR Appendix 8.
(undated see Note 1 below)

Photo 4: 15th Dec 2023

Photo 5: 16th March 2024

Photo 6: 16th April 2024

Photo 7: 25th November 2024

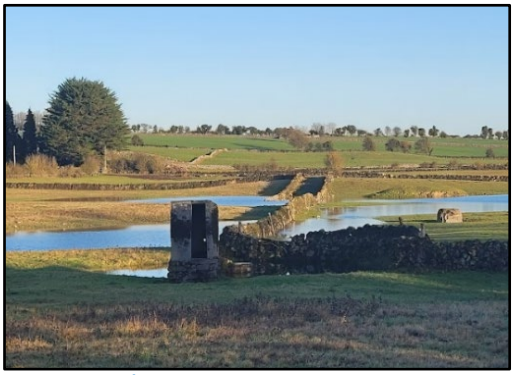


Photo 8: 9thDec. 2024 (after storm Darragh)

Note1

In addition to the above site investigation dataset, the following is a summary of the seasonal hydrological and hydrogeological monitoring that has been undertaken

Feacle Turlough: 21st January – 18th June 2020 and 22nd October 2020 – 13th July 2021.[52]

T17 measures as 670m from Feacle turlough.[52]

Feacle turlough can be measured as 670m from T17 but it is an artificial measurement. In order to maintain the structural integrity and user safety of the road to the north of the turlough RCC built a retaining wall on both sides of the road. The wall artificially constrains the groundwater as shown in Figure 18 but is not always successful. Photos 9 and 9a were taken on the road in Nov. 2024 looking east and west respectively.

[52] ABP-313750-22 EIAR and NIS Chapter 9: Water

Figure 18: Feacle Turlough April 2011 (Google maps)

Photo 9

Retaining wall built by RCC to maintain structural integrity of the road and safety of users.

Photo 9a

Condition 6 of the Board's order ABP-313750-22 states

> *The excavation works for the turbine foundations and on-site spoil depositories should avoid incursion into the underlying bedrock, and where this cannot be locally avoided, excavations work shall not extend below or to within 2 metres of the winter water table level.*
>
> ***Reason:*** *To protect groundwater in the area, public water supplies, and the quality and quantity of water in the surrounding interconnected turloughs.*

The condition "*excavation works shall not extend below or to within two metres of the winter water table"* is an undefinable and unenforceable condition. It does nothing to *protect groundwater in the area, public water supplies, and the quality and quantity of water in the surrounding interconnected turloughs*

It is both illogical and irrational and unscientific. What is the 2.0m cut-off based on? Why not one metre or three metres?

Photo 10: Feacle turlough in Nov 2024

Photo 10 shows Feacle turlough empty on the 25th Nov 2024. The enclosed depressions can be clearly seen. These are surface expressions of subterranean subsidence.

Photo 8 shows these depressions beginning to fill from underground sources after heavy rainfall.

The GSI does not map the presence of any karst features within the immediate vicinity of project site (www.gsi.ie).[53]

For example, in the lowland karst of Ireland there is little surface expression of karst because of the blanket of Quaternary deposits overlying the limestone, but karst processes still operate to varying degrees; the presence of active karst hydrogeological systems does not necessarily mean that surface karst landforms are present.
Although the karst hydrogeology of the western lowlands is not unique in global terms, the sheer complexity and temporal variability of the interactions between the fluvial, lacustrine and groundwater systems make this area one of the world's more remarkable karsts[54]

Lowland karsts are probably the most developed and complex karst regions of Ireland, comprising a mixture of reactivated, pre-glacial and inter-glacial karst and Holocene karst.[55]

8.5 Groundwater flooding in the vicinity of the proposed development

With regards to the underground electricity line, the closest mapped flooding was recorded c. 100m to the east in the townland of Derryglad.
Based on the above, the risk of flooding at the project site is low due to the well-drained nature of the soils and subsoils and the low density of surface water features in the local area. Meanwhile, despite there being several areas of groundwater flooding in the lands surrounding the underground electricity line, no historic or modelled groundwater flood zones encroach the route [56]

Groundwater flooding has not traditionally been recognized as posing a significant risk and so remains relatively less well understood than other forms of flooding (Bonacci et al. 2006; Morris et al. 2007). Consequently, investigations into the contribution of karst hydrology to surface flooding are still in their infancy (Gutiérrez et al. 2014).[57]

An understanding of the interactions between recharge, storage and transport mechanisms during flood conditions is a precursor to effective flood risk assessment. However, the heterogeneity of karstic groundwater systems is such that they can often behave in unpredictable ways during extreme weather events, making the development of such an understanding difficult. The lack of an established theoretical foundation for groundwater flood prediction means that an evidence-based approach is the most appropriate for groundwater flood risk management in the Irish context understanding of groundwater flood hazards in lowland karst.[54]

[53] ABP-321238-24 EIAR Section 6: Land and Soil

[54] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland

[55] Detailed conceptual hydrogeological models for pilot areas and case studies Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe - 2021

[56] ABP-321238-24 EIAR Section 7 - Water

[57] Naughton et al Groundwater flood hazards and mechanisms in lowland karst terrains. Geological Society, London, Special Publications Volume 466. Oct 2017

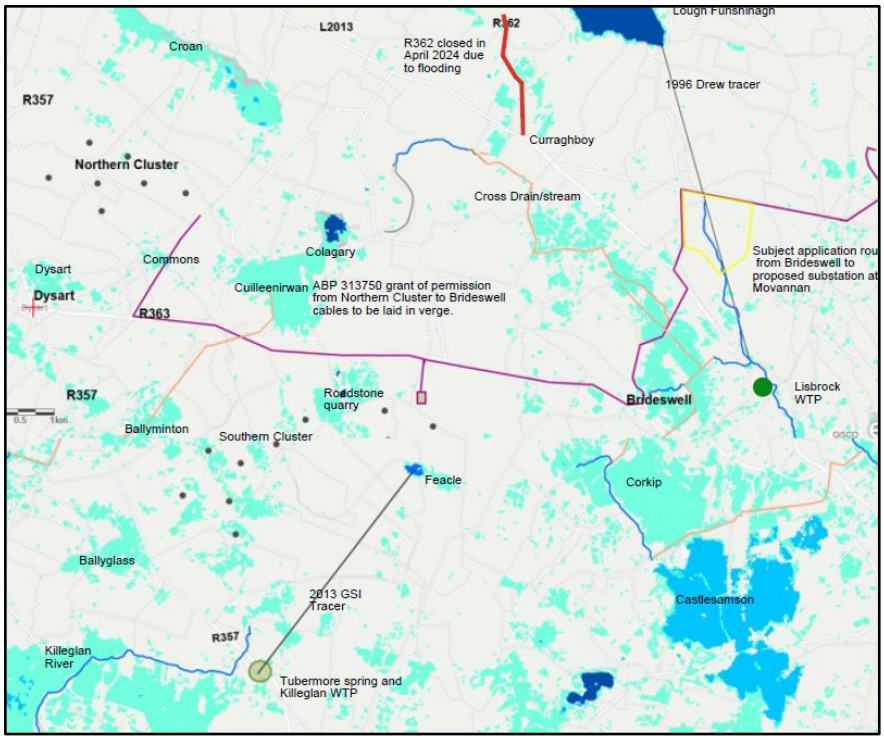
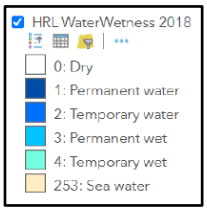


Fig 20 Detail at Brideswell & the L2023



Legend for Fig.19

Figure 19: European Environment Agency HRL Water Wetness 2018

Figure 21 shows the map of known flooding areas which was submitted to the Board in 2015 after the Courts had ordered the original wind farm decision to be remitted back to the Board.
This *evidence-based approach* mapping compares favourably with the European Environment Agency HRL Water Wetness 2018 map in Figure 19.

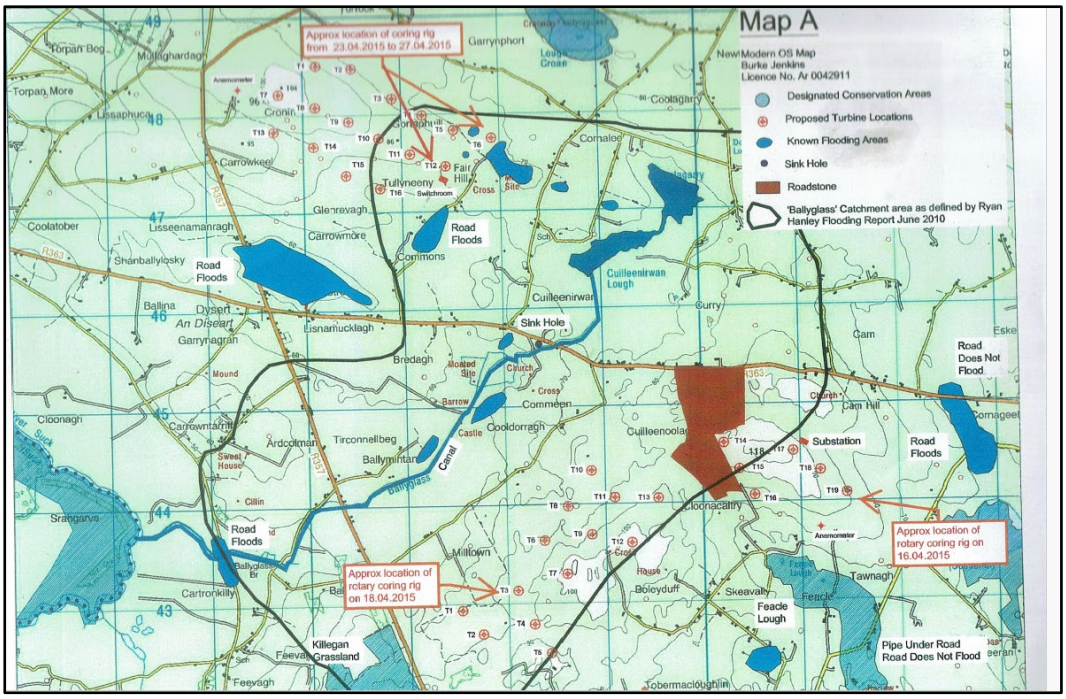


Figure 21: Map A Known flooding areas as submitted to ABP in 2015.

8.6 Groundwater flow direction in the subject area.

According to the GSI's Initial Characterisation Report of the Funshinagh GWB, the highly karstified nature of the bedrock means that, locally, groundwater flow directions can be highly variable, but overall groundwater flow will be towards Lough Ree (GSI, 2003). The

private well assessment assumes that the groundwater flow direction will generally be towards Lough Ree, situated c. 2km east of the substation location.[58]

As noted by the applicant the GSI Funshinagh GWB Description dates from 2003. Knowledge gained since that date regarding karst aquifers suggests that there is a lot to learn.
A recent letter from the Department of the Environment, Climate and Communications (DECC) notes

> *Groundwater flow direction within karst environments such as Lough Funshinagh is subject to significant uncertainty. Thus, while an eastern flow direction cannot be ruled out, the only scientific evidence of groundwater flow direction in the region is a 1996 tracer study carried out by David Drew and Morgan Burke which identifies flow towards Cross River to the South (see here for more information: https://www.gsi.ie/documents/GWNewsletterNo30.pdf#page=9)*[59]

The DECC are of course correct the only scientific evidence of groundwater flow in the environs of Lough Funshinagh is a twenty eight year old tracer study.
However by combining evidence such as subsoil permeability, GSI recorded karst features, rock outcrops, flooding and borehole records etc. it can be safely assumed that the overall groundwater flow direction is SW towards the Suck River as shown in Figure 22 and not east towards Lough Ree.

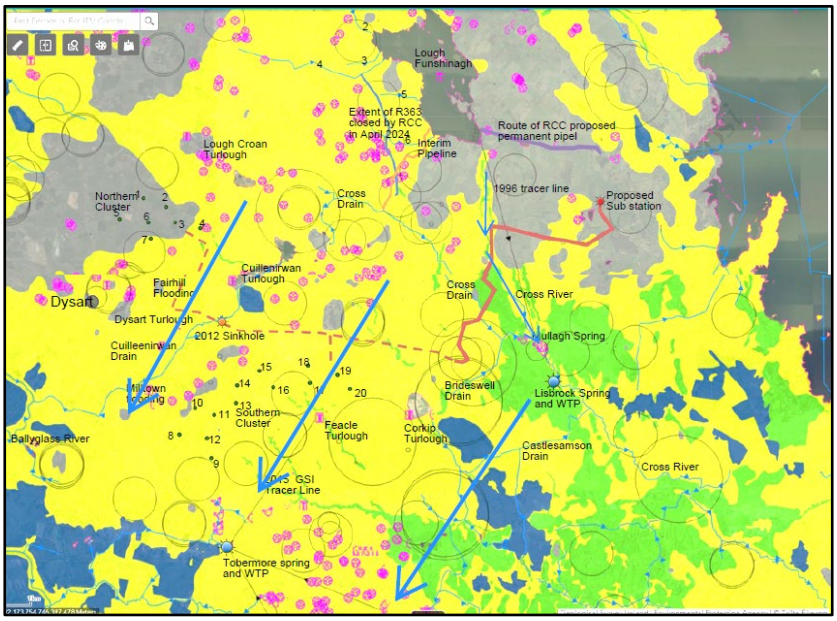


Figure 22: Overall groundwater flow direction in the vicinity of the subject site

[58] ABP-321238-24 EIAR Section7 - Water

[59] Reply letter 19.12.2024 from DECC Re: AIE request AIE202476

9.0 Underground cable route from Northern Cluster to proposed new substation at Moyvannan.

9.1 General

For ease of reference the granted and proposed route of the underground cables is broken down into Area 1 to 6 as shown in Figure 23.

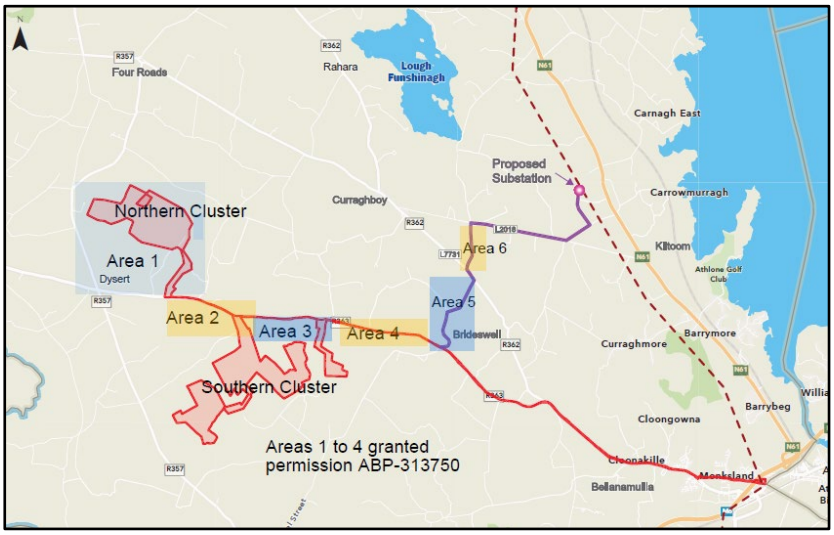
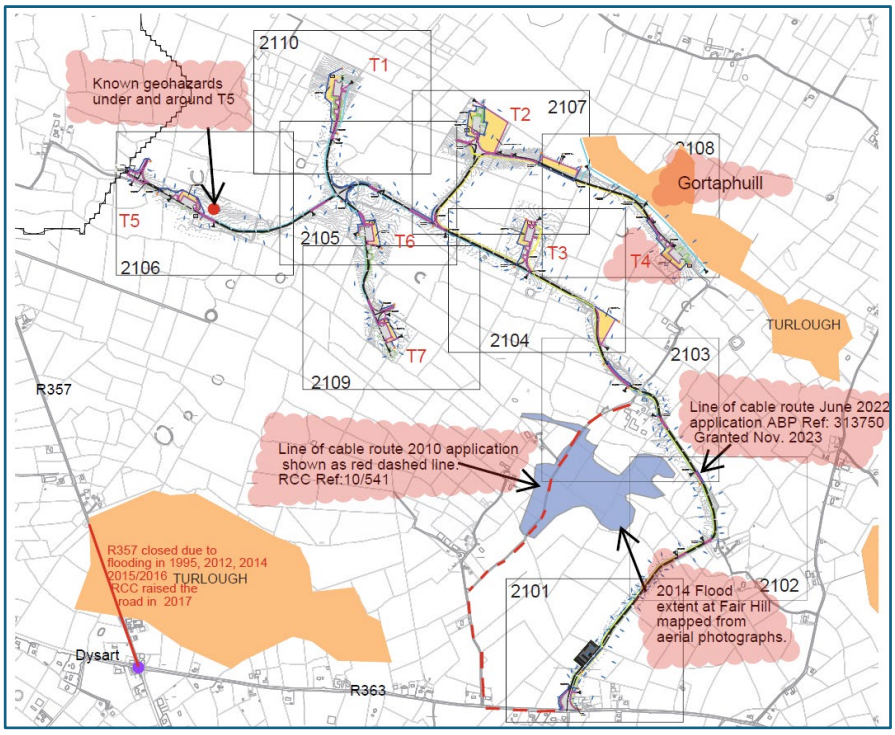


Figure 23: Proposed route of the underground cables

9.2 Area No.1

The geohazards present in this area are described in 3.7.2 of this observation.

The turloughs and the 2015/2016 flooding is shown in Figure 24 along with the location of the caves etc. at T5.



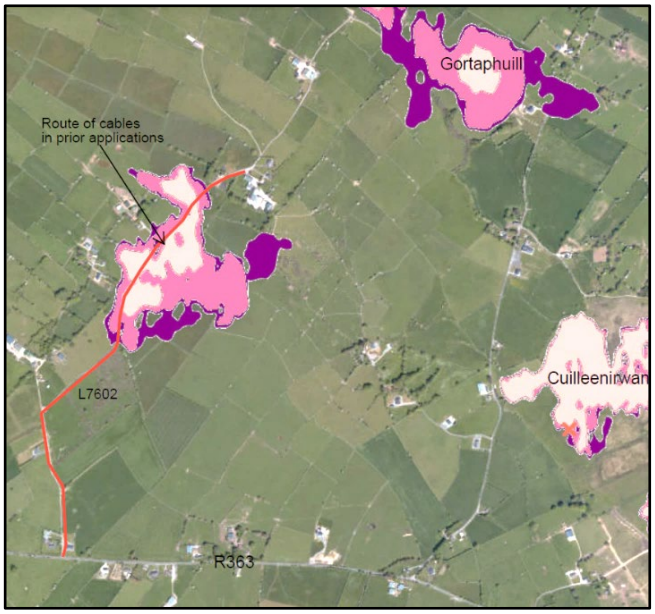
T4 is situated ~50m upgradient of the maximum flood extent of Gortaphuill turlough.[60]

The max flood extent of Gortaphuill turlough is unknown. In the context of a 29m diameter base plus a 5.0m road *~50m* is irrelevant.

Figure 24: Flooding etc. in area No.1 (From MWP Drg. No. 21337-MWP-00-00-DR-C-2125 P020) ABP-313750-22 SID Application drawing June 2022

[60] ABP-313750-22 Granted Seven Hills Wind Farm, Co. Roscommon – EIAR Ch. 9 - Water

The GSI Groundwater flooding probability mapping at Gortaphuill turlough shown in Fig. 25 does not follow the simplistic straight line as shown in Fig. 24. The GSI flood extent exceeds that described in EIAR Chapter 9. It is inevitable that the Gortaphuill turlough will be negatively impacted by the excavation works for T4 and the associated infrastructure.



The ABP-313750-22 application moved the cable route away from the previous location under the L7602 in an attempt to avoid the recorded extensive flooding on the L7602.

Gortaphuill, Cuilleenirwan and the flooded L7602 are all part of the same groundwater rising up in response to rainfall events

The GSI mapping does not show groundwater rising to surface level at the granted cable route but that is no assurance that the groundwater is not at the level of the 1.25m deep cable trenches.

Figure 25: OPW Flood Info Map showing GSI Groundwater Flooding Probability.

The excavated trenches, which will be backfilled with selected excavated material, will create preferential flow paths which will facilitate groundwater to flow from the higher points in the Northern Cluster to the lower point on the R363 carriageway.

The flooding on the L7602 may not be included on the MWP drawing as shown in Figure 25 but there is no doubt that the applicant and the Board were aware of it. Figure 26 is an extract from the appeal documents submitted to the Board on the 1st of November 2011 in connection with the RCC 10/541 grant of permission (Northern Cluster).

The 'L7602' turlough appears most years and was at a max in the winter of 2009/2010 after the extreme weather event of Nov 2009. Regarding that event the Ryan Hanley report notes

The effects of this flooding include flood water restricting access to the residents of the Cornalee Road, restricted access to the local Primary school and inundation of farmland.

The same event caused restricted access to the L7602 and inundation of the surrounding farmland. Photos 8 to 10 partially show the extent of the flooding. More detailed photographs of this area are included in Appendix A. The photographs of the flooding in and around the L7602 do not record the max height or volume of water in the area. The photographs were taken after the flood had receded sufficiently to gain access to the area.

In 2009/2010 the L7602 was impassable to standard vehicular traffic for several weeks despite previous works carried out by RCC in raising the road in an attempt to alleviate the access problem. This is confirmed by Roscommon Co. Co. in the Senior Executive Engineer's report on the 10/541 planning file. This issue is addressed in more detail in Appendix 10.0 of this submission.

Again the extensive flooding in these areas is not recorded on the historic OS but the 6"(1837) records a small body of water closely with a level of 226' (66.2m OD Malin Head).

Figures 27 and 28 are the photos referred to in the text. Figure 29 shows the Senior Executive report referred to in the submission.

Figure 26: Extract from submission to ABP re Northern Cluster (01.11.2011)

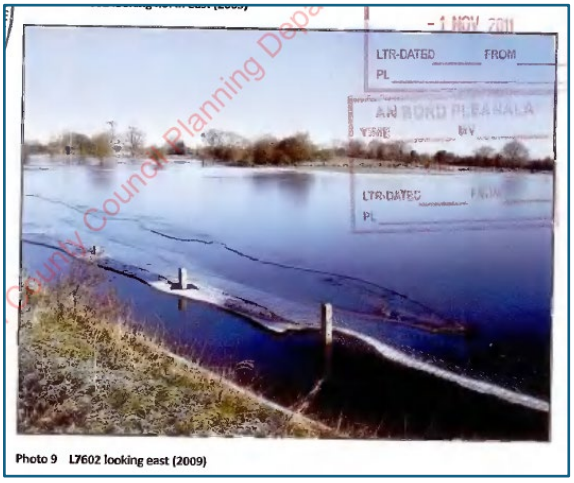
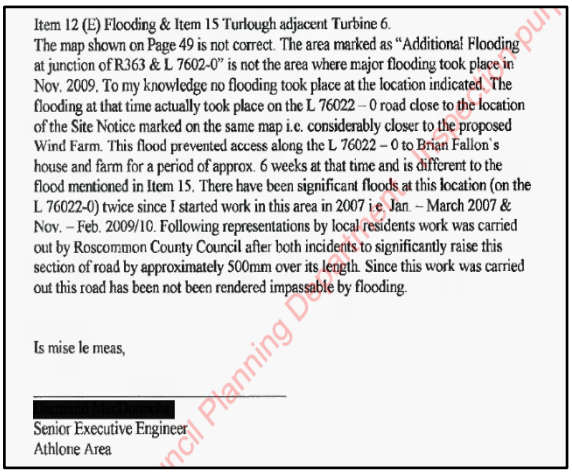


Figure 27: L7602 looking east (2009/2010)

Figure28: L7602 looking NE (2009/2010)



Item 12 (E) Flooding & Item 15 Turlough adjacent Turbine 6.
The map shown on Page 49 is not correct. The area marked as "Additional Flooding at junction of R363 & L 7602-0" is not the area where major flooding took place in Nov. 2009. To my knowledge no flooding took place at the location indicated. The flooding at that time actually took place on the L 76022 – 0 road close to the location of the Site Notice marked on the same map i.e. considerably closer to the proposed Wind Farm. This flood prevented access along the L 76022 – 0 to Brian Fallon's house and farm for a period of approx. 6 weeks at that time and is different to the flood mentioned in Item 15. There have been significant floods at this location (on the L 76022-0) twice since I started work in this area in 2007 i.e. Jan. – March 2007 & Nov. – Feb. 2009/10. Following representations by local residents work was carried out by Roscommon County Council after both incidents to significantly raise this section of road by approximately 500mm over its length. Since this work was carried out this road has been not been rendered impassable by flooding.

Is mise le meas,

[redacted]
Senior Executive Engineer
Athlone Area

Figure 29: RCC Senior Ex. Engineer Report

Photo 10a: The L7602 looking north 2016

The RCC Engineer's report states' *there has been significant flooding at this location i.e. March 2007 & Nov. – Feb 2009/10'* and notes '*RCC raised this section of the road by approx. 500mm'* RCC raised the road again after the 2015/2016 flood event as can be seen in Photo 9a. The raised road acts like a bund to contain and thus extend the flood waters to the east of the road.

9.3 Area No. 2

This area extends from the point where the Independent Power Provider (IPP) i.e. Energia's MV cable exits the Northern Cluster at the R363 to the widened R363/L7535 junction as shown in Figure 30.

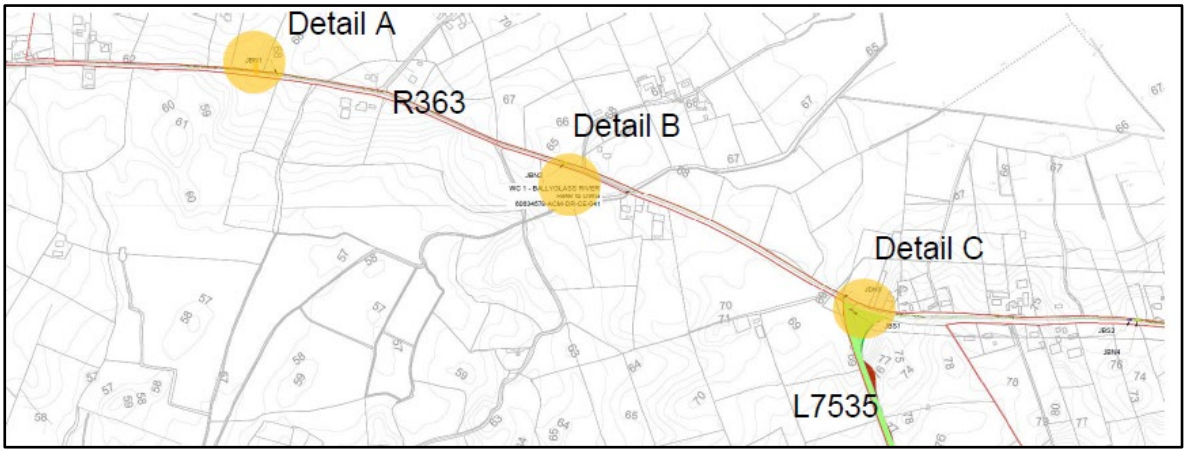
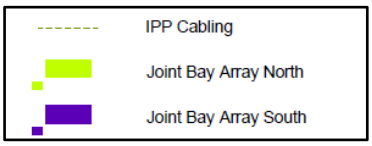


Figure 30: Cable route in area No.2 (From MKO Drg. No. 190907-05)

Detail A shows the proposed location of the first joint bay on the Northern Cluster cable (JBN1).

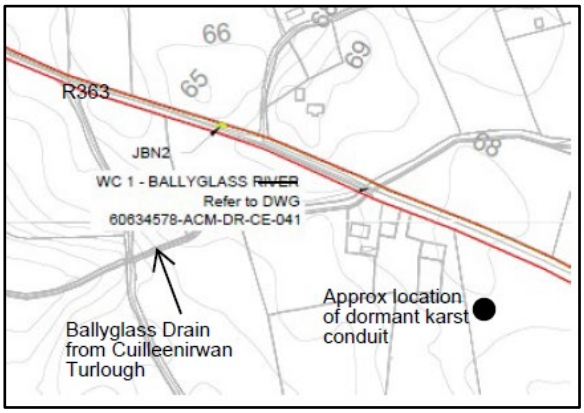


Legend

Detail A

Detail B shows the second joint bay on the Northern Cluster cable (JBN2). The drain from Cuilleenirwan Turlough, which the cables must cross under is also shown. This drain is part of the 19th century drainage works as described in the observation in Appendix A. The drain was unsuccessful in draining Cuilleenirwan; however its excavation most likely created a preferential flow path and diverted some groundwater flow away from this location and instigated the flooding at Dysart approx.3.0km to the west as described in the ABP-313750-22 submission to the Board dated 21.07.2022.

The dormant karst conduit discovered in 2011 may have been part of the Cuilleenirwan conduit system.



Detail B

Detail C shows the third joint bay on the Northern Cluster cable (JBN3) and the first joint bay on the Southern Cluster cable (JBS1).

Detail C

Figure 31 shows the site location of the onsite substation. The land between T17/T18 and the substation and T19/T20 is not included in the 'red line' planning application boundary. As a result the IPP cabling from T8 to T18 does not have direct access to the onsite substation. To overcome this the cabling for these turbines will take a westerly route and exit at the junction of the R363/L7535 as shown in Detail C.

From there it will travel east under the R363 in parallel with the Northern Cluster cables until both sets of cables arrive at the point marked 'x' on Figure 31.

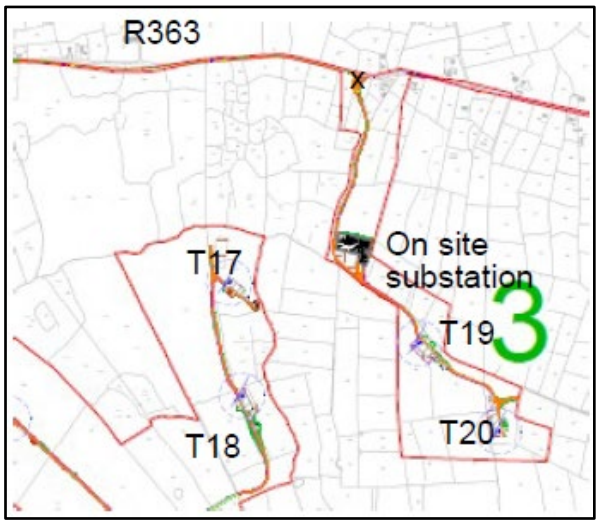


Figure 31: Substation site location plan

9.4 Area No.3

This area extends from beyond the widened R363/L7535 junction to the new site access road off the R363.

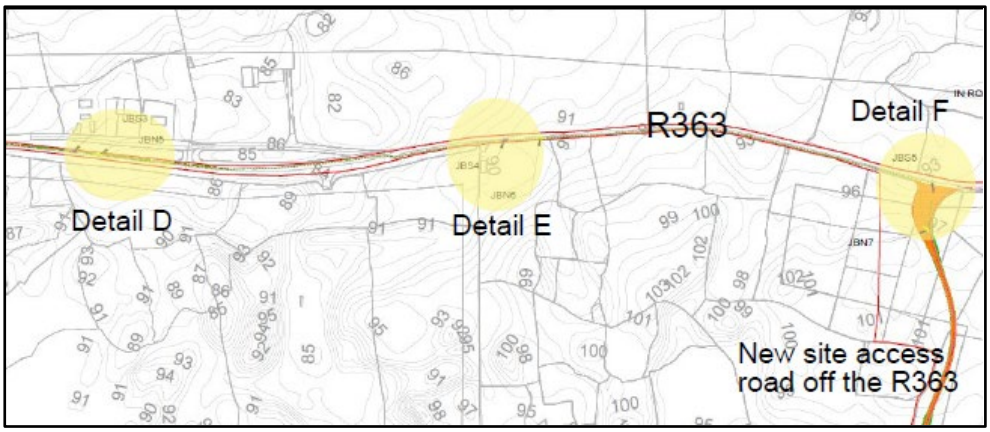
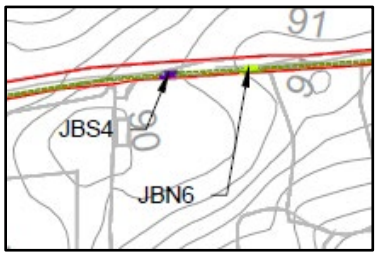


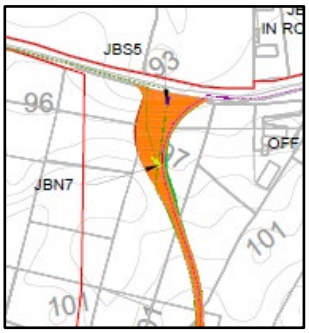
Figure 32: Cable route in area No.3 (From MKO Drg. No. 190907-06)

Detail D



Detail E

Details D and E show both sets of IPP cabling and the respective staggered joint bays located parallel to each other under the R363. The road width at these locations is approx. 5.0m.



Detail F

Detail F shows both sets of cables joining at JBN7 and going towards the onsite substation.

E1: The R363 at Detail E (Google map)

9.5 Cables entering and exiting the onsite substation

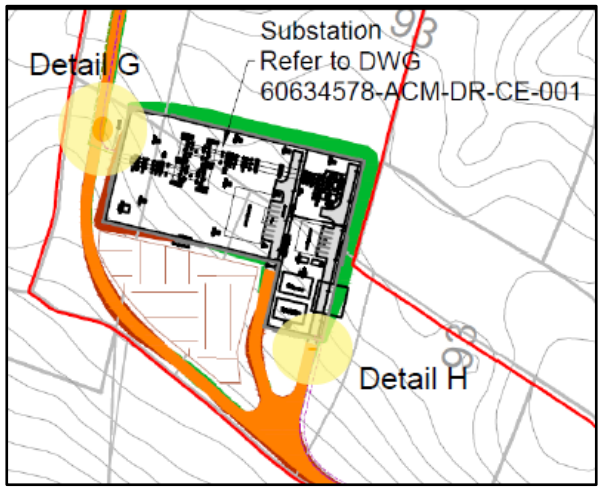
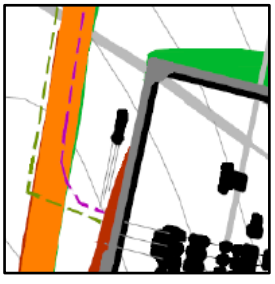


Figure 33: Onsite substation (From MKO Drg. No. 190907-06)

Detail G shows the IPP cable from JBN7 entering the onsite substation and the 110kV stepped up cable exiting the onsite substation.

Detail H shows the IPP cable from T19 and T20 entering the onsite substation.



Detail G

Detail H

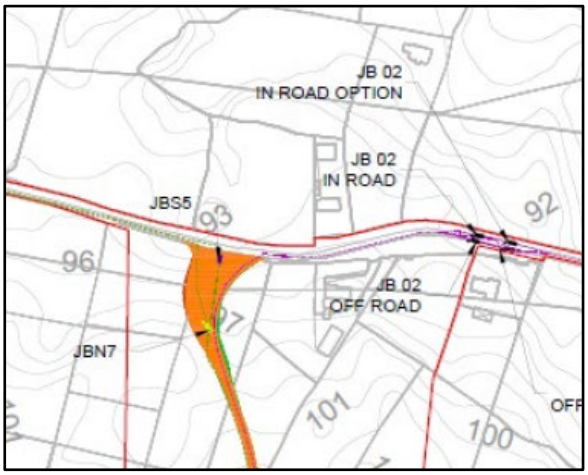


Figure 34: 110kV cable leaving Southern Cluster (From MKO Drg. No. 190907-06)

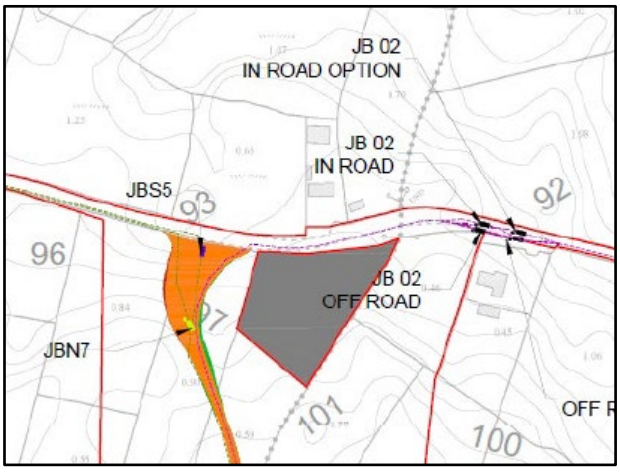


Figure 34A: 110kV cable leaving Southern Cluster (From MKO Drg. No. 190907-06 Rev A)

9.6 Area No.4

This is one of the many sections along the R363 where there is no verge, it is approx. 1.0km west of Brideswell village. At this section the road is not wide enough to accommodate heavy traffic this resulted in damage to adjoining land and dangerous road conditions as shown in Photo 11

Photo 11: R363 West of Brideswell village (Google maps May 2024)

MKO Drawing No 190907 -22 indicates the road width at this location as 4.5m as shown in Figure 35.

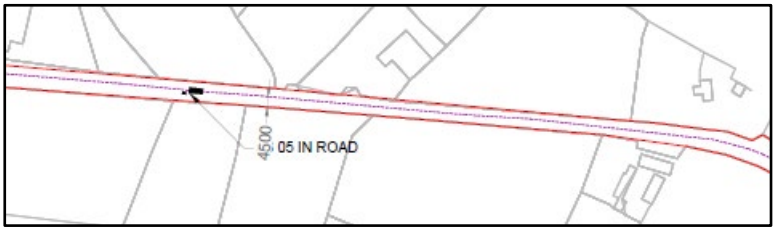


Figure 35: Section of R363 as shown in Photo No. 11 (From MKO Drg. No. 190907-22)

In August 2024 RCC built a reinforced concrete retaining wall along this section of the R363 to preserve the structural integrity of the road and to improve the safety of the road. Photos 12 and 13 show the retaining wall and the finished wall faced with dry stone walling. RCC operated a 'stop go' system during the construction of the wall.

Photo 12: Retaining wall at the R363

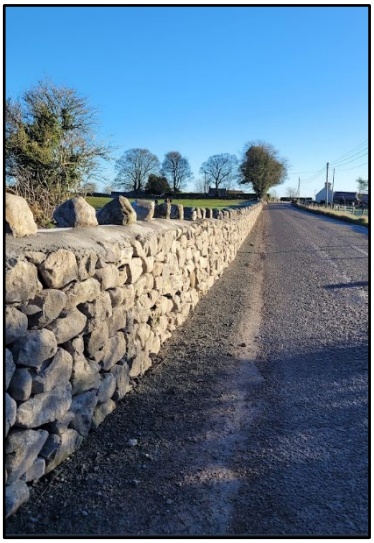


Photo 13: Finished retaining wall.

The above highlights the significant issues associated with the cable route as granted by ABP-31750-22. The following is a non-exhaustive list of issues

- Flooding on the route
- A significant karst feature adjacent to the route.
- The likelihood of creating preferential flowpaths – this is of particular concern at the Ballyglass drain
- Inadequate road width at single and double joint box locations
- Deep excavations along the road to accommodate joint bays that were never addressed in the Inspectors or the Board's AA. The Inspector's AA assumes the cable is in the road verge.
- RCC serious concerns regarding the impact of the proposed cable on the road this concern was expressed without taking the joint bays into account
- Full road closures during the construction of the joint bays and again during the installation of the cables
- Loss of structural integrity of the road

In addition to the above issues the IPP cables under the R363 and the very unorthodox arrangement of the IPP cabling between the L7535 and the new site access road at the R363 must be considered. Double cables and joint boxes do not seem like good practice.

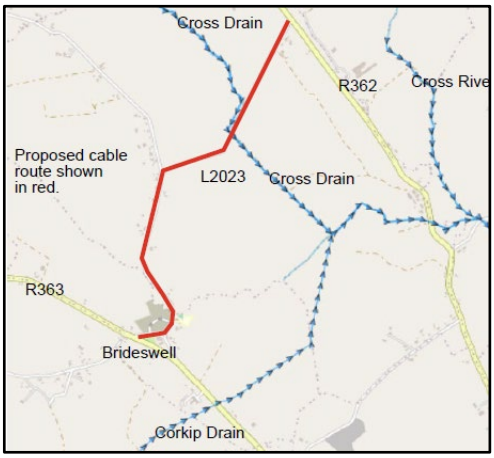
ESB's licensed functions as the owner of the transmission and distribution electricity networks in Ireland (Transmission Asset Owner and Distribution Asset Owner) are carried out by ESB staff assigned to ESB Networks business unit, managed by ESB Networks DAC (an ESB subsidiary company).

ESB Networks build and operate the medium and low voltage electricity infrastructure, including distribution stations, overhead lines, poles and underground cables.

Under normal circumstances the IPP cables in a wind farm will be self-contained within the development site. The onsite substation will step up the power and the exiting 110kV cable will connect to the grid and become an ESB asset managed and operated by Eirgrid.

The IPP cables in the road are medium voltage but they do not connect directly to the grid so it is unlikely that ESB Networks will manage them. A fault on that section of cabling would not affect the grid, as far as the grid was concerned it would simply be the same as if the wind turbines were not operating. What are the long term implications of cables under a public road that are owned by a private operator? What is RCC's opinion on this?

9.7 Area No.5



This is the beginning of the cable route the subject of this application. As noted previously the requirement for junction bays applies to this application also. This area extends from Brideswell to the L2023/R362 junction. The EPA map showing indicative flow network in this area is shown in Figure 36.

For more information on the Corkip and Cross drains see Appendix A

Figure 36: EPA map of indicative flow network

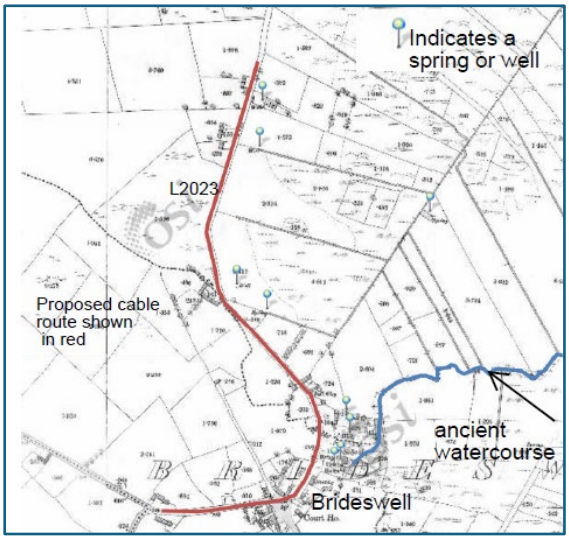


Figure 37 shows the network of 19th century field drains located to the east of the proposed cable route at this location. The drains connected to the ancient watercourse shown in blue. This watercourse travelled in a NE direction for approx. 1.4km until it joined the Cross River at the Atteagh Mill Pond.

The history of the drains and the ancient watercourse is described in Appendix A.

The drains, springs and wells are a source of the groundwater flooding as shown in Figure 19.

Figure 37: OSI 25" Historic map of Brideswell area (First Ed. 1890)

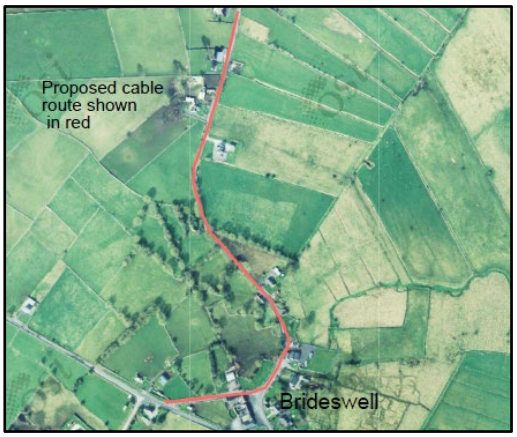


Figure 38 is a modern satellite image of the same area as Figure 37.

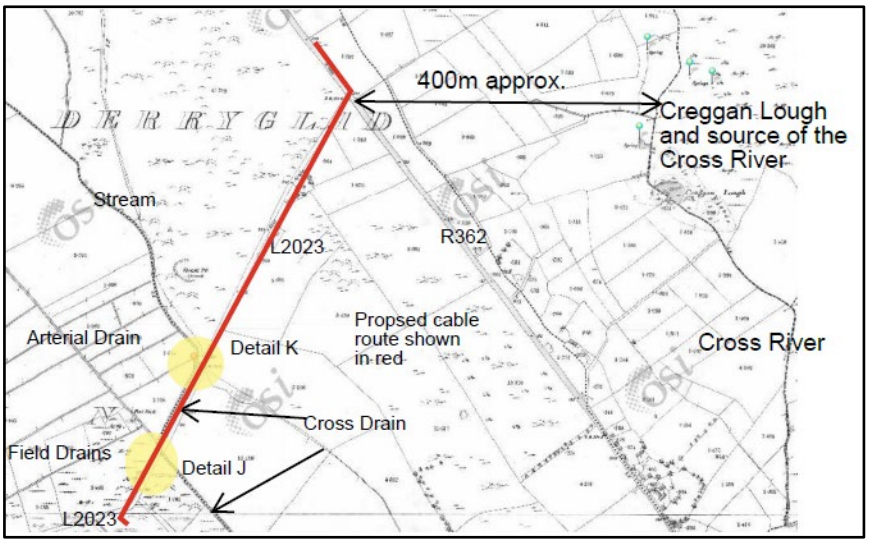
The watercourse, drains, springs etc. are gone but their mark on the landscape remains.

Figure 38: OSI Imagery (2013 – 2018)

The proposed cable route continues along under the narrow L2023 until it arrives at the Cross Drain, not the Cross River. The Cross River is on the eastern side of the R362 as shown in Figure 39.

> *Horizontal Directional Drilling (HDD) will be undertaken at the intersection of the underground electricity line and the Cross (Roscommon) River, and the use of this methodology will avoid any in-stream works or any direct or indirect effect on the existing bridging structure. Launch and receptor pits will be excavated at either side of the river; a*

minimum of 15m away from the river; to accommodate the drilling rig. The bore will be at a minimum depth of 2.5m below the bridging structure to ensure that there are no impacts on the structural integrity and stability of the bridges.[61]



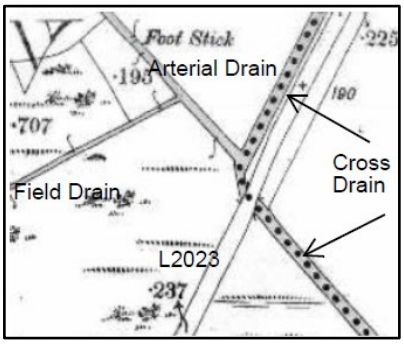
The area referred to above is shown in Figure 39.

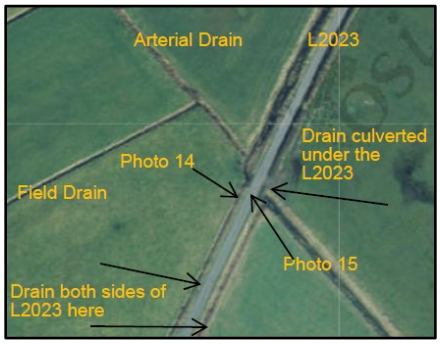
The proposed HDD is at Detail 'J'

Detail 'K' shows the Cross Drain at an access gate off the L2023.

Figure 39: OSI 25" First Edition (1888)

At the R362/L2023 junction the proposed cable route is approx. 400m from the source of the Cross River. To be clear the cable route does not intersect with the Cross River.





Detail J shows the Cross drain along the NW side of the L2023, culverted under the L2023 and then travelling SE towards the Cross River.

Detail J: 25" OSI Map

Detail J: OSI Imagery (2013 – 2018)

Photo 14: Culvert at L2023 Looking SE

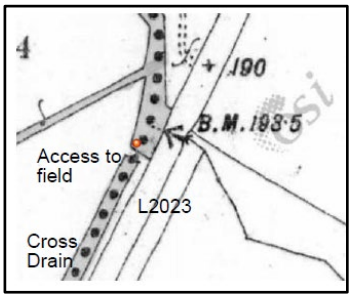
Photo 15: Culvert at L2023 Looking NW

At the culvert location the Cross Drain is joined by a NW arterial drain and additional drains on both sides of the SW section of the L2023.

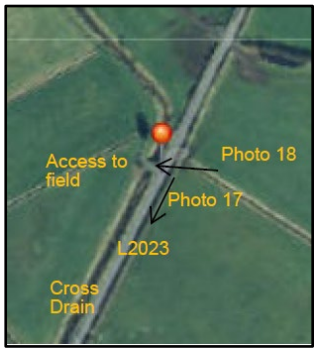
Planning Drg. Figure 13: Directional Drilling Specification does not show these drains.

[61] ABP-321238-24 EIAR Chapter 3 Description of the project

Photo 16: Settlement crack on SE parapet.



Detail K:25" OSI Map (1880)



Detail K: OSI Imagery

Photo 17: At access point looking SW

Photo 18: At access point looking W

Photo 17 shows the L2023 approx. 2.0m above the water level of the Cross Drain in Nov. 2024. Photo 18 shows the culvert at an access point to a field, in the same place it was almost 150 years ago – Detail K. The L2023 along this location is single lane width approx. 3.0m wide.

Planning Drg. Figure 4.5: Site Location Plan 5 of 5 shows the application boundary at this location as 7.9m wide.

GES mistakenly places the Cross River to the west of the R362. The Cross River rises from a spring east of the R362 at an ancient water body named Creggan Lough. Appendix A contains the details of the Cross River and the Cross Drain.

The proposed HDD described in ABP-321238-24 EIAR and the associated planning drawings indicate a cable trench under a single confined watercourse. The actual site conditions are significantly different. The groundwater drainage network along the L2023 is ignored. *A drill bore will be at a minimum depth of 2.5m below the bridging structure to ensure that there are no impacts on the structural integrity and stability of the bridges.*

The bridge at the L2023 is already structurally compromised as evident by the severe settlement crack in the parapet – Photo 16. The surrounding area is reclaimed bog and was already showing flooding by early November 2024 as shown in Photo 19.

Photo 19: Bridge on L2023 looking east (Nov 2024)

The environmental consequences of this proposed crossing are conveniently ignored as is the proximity of the proposed excavations for the cable to the actual Cross River. How everything is to be accommodated in a 3.0m wide road is unclear.

9.8 Area No.6

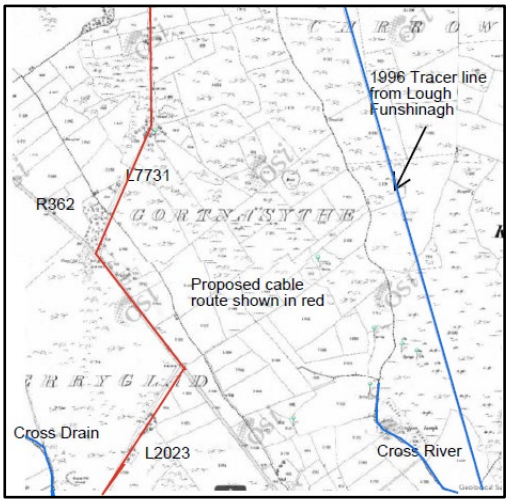


Figure 40: L7731 on OSI 25" Map

The L7731 links the R362 with the L2018, it is a little over 1.2km long and is less than 2.5m wide in places.

Figure 40 shows the road on the OSI 25" historic map, and the adjacent un-reclaimed agricultural fields.

Along the first half of the road either or both sides of the road are enclosed by high banks. The 1996 tracer line from Lough Funshinagh is to the west of the road and the Cross River and associated springs are to the SE .

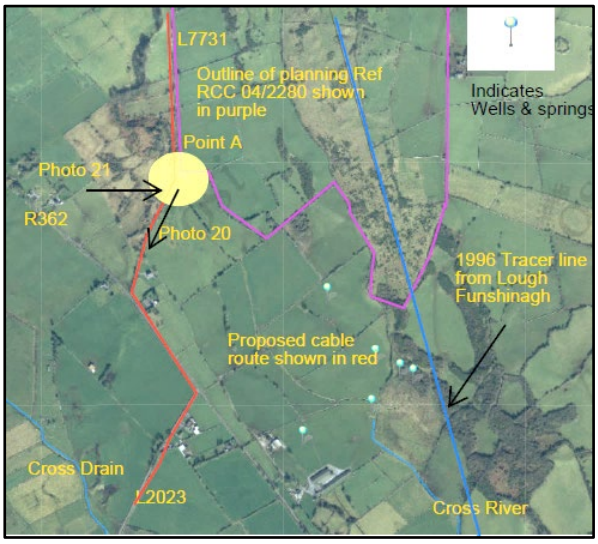


Figure 41: OSI Imagery (2013-2018)

Figure 41 shows the road on the OSI Imagery Map, the fields to the immediate east have been reclaimed but not those to the west. The high ground within the purple outline is also un-reclaimed. Photo 20 shows a section of the road with high banks on either side.

At Point A on Figure 41 the east side bank is cleared and the high ridge, which the 1996 tracer line bisects is visible in the distance– Photo 21. The spring, the source of the River Cross is approx. 850m SE of this point.

Details of planning Ref: RCC 04/2280 are in Appendix A

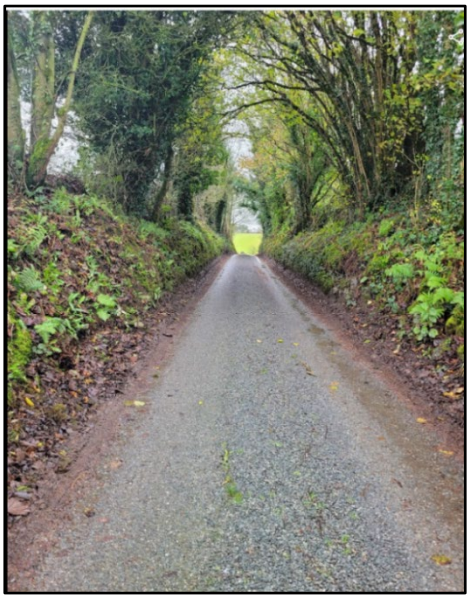
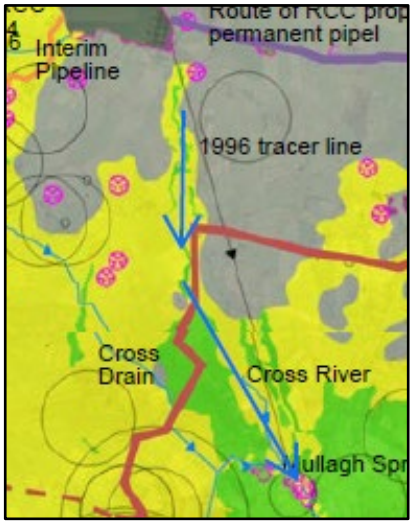


Photo 20

Photo 21



These features combined with the tracer test results, the subsoil permeability and the ground contours all suggest that the flowpaths from Lough Funshinagh are within a "corridor" bounded at the swallow hole by the 80m contour and by the 60m contour at Mullagh spring. [62]

Figure 41a

Viewed on the ground from Point A the "corridor " is better described as a valley. The banks on either side in Photo 20 would appear to show the road cut into the west side of the valley at an elevation above the springs and flood areas below. The 'valley ' effect is visible, though less dramatic, along the full length of the L7731 up to the SW corner of Lough Funshinagh.

Photo 21 shows what could be considered to be the base of the valley, but it does not do the area justice. The vista has to be seen to be appreciated and understood.

Obviously, tracer lines are indicative simply joining two points where dye went in and was observed exiting. The actual path the 1996 tracer test travelled is, most likely, contained in this valley, this area is therefore extremely important in terms of understanding the hydrogeology of Lough Funshinagh and it has potential to assist in a possible long term solution to the flooding crisis. There is no recognition in the applicants EIAR of the importance of this area. The environmental impact of trench and joint bay excavations along this road is unknowable.

Planning Drg. No. Figure 4.4: site location plan 4 of 5 indicates a 6.0m application boundary, as noted the road is less than 2.5m wide in places.

The proposed cable route continues along the L2018 with an assumed application boundary wider than the public road. The L2019 from the L2018 to the site boundary is a single lane roadway where the width is less than 3.0m wide.

The environmental impacts, the structural instability, the potential for sudden and catastrophic collapse of elements of the proposed development have not been addressed in the applicant's submission for grant of planning permission ABP-321238-24.

The environmental impacts, the structural instability, the potential for sudden and catastrophic collapse of elements of the granted development ABP313750-22 were not addressed by the Board.

10.0 The proposed cable route and the area beyond the Southern Cluster

The shaded area of South Roscommon in Figure 42 is bounded roughly by the River Suck to the west, the Ballinasloe/ Athlone railway line to the south and the L2026/N61 to the east.

> *The geological setting of the site is dominated by Limestone, which is extensively karstified.* [63]

[62] ABP-320829-Observations on Lough Funshinagh Interim Flood Relief Scheme Burke 01.11.2024

[63] Inspector's Report ABP-244346B and 244347B: Report by Mr. Jerome Keohane 2015

As such the in combination effects of the proposed cable route may extend beyond the southern boundary of the permitted Southern Cluster.

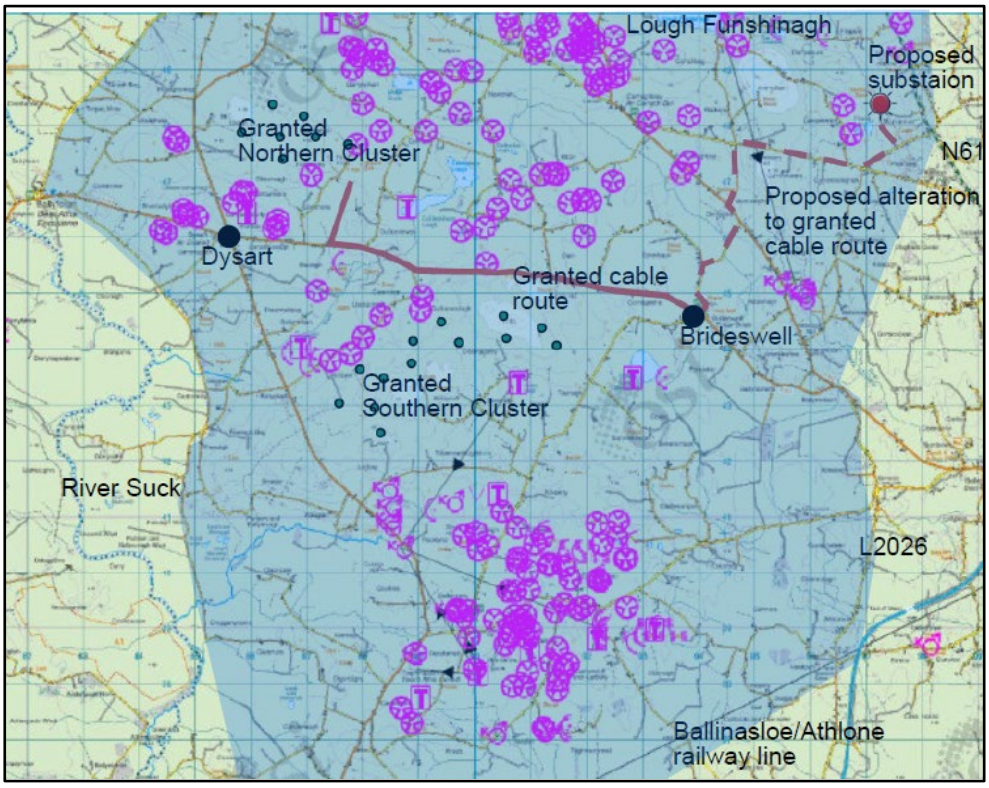


Figure 42: South Roscommon area with GSI Karst Data included

The EPA map of the area south of the Southern Cluster is shown in Figure 43.

T16 is located on elevated ground ~1.1km to the northwest of Feacle Turlough. The topography around from T17 to T18 slopes to the south in the direction of Feacle Turlough. Due to this sloping topography from these turbines towards Feacle Turlough, groundwater flow towards Feacle Turlough cannot be discounted. The depth of subsoils and lack of any groundwater strikes at T16, T17 or T18 indicate that any potential subsurface connection will be minor.

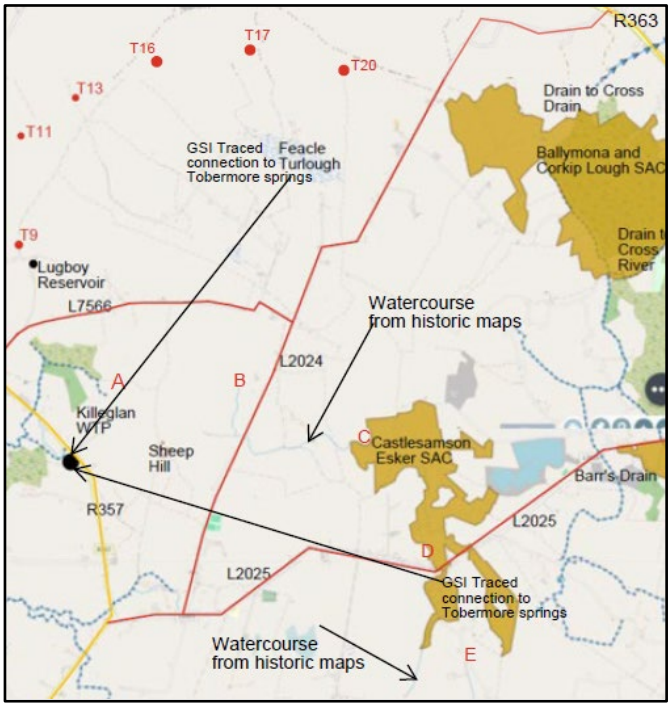
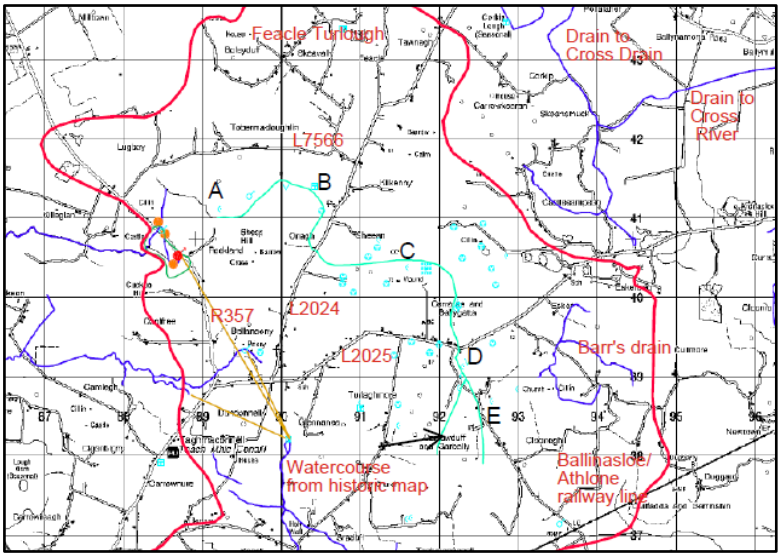


Figure 43: EPA map of area south of Southern Cluster

*Due to the separation distances involved, **the site specific knowledge of the ground conditions (subsoil and bedrock competency)** groundwater levels, gradients and flow directions as well as the mitigation measures provided to ensure the protection of water quality and water quantity (recharge), there will be no residual impacts on Four Roads Turlough SAC/SPA/pNHA and Feacle Turlough pNHA.*[64]

[64] ABP-313750-22 EIAR and NIS Chapter 9 - Water

The separation distance between the *two main zones of rock with a potential high degree of karstification* identified at the proposed substation site and Feacle Turlough is approx. 8.1km. This is well within the range of flowpath lengths in lowland karst as described by Drew *the range for lowland karst is 6.4 m–15.7 km, averaging 4.2 km.*[65]



There are few surface streams in the catchment. These are the stream at Bellaneeny, the seasonal stream that flows through the centre of the catchment, the stream network that flow into the swallow hole at Glennanea, and the stream network to the south of Esker, which also appear to flow into a swallow hole.[66]

Figure 44: Killeglan Water Supply Scheme Figure 1

Figure 44 shows an extract from the GSI/RCC Killeglan Water Supply Scheme Tobermore Spring Groundwater Source Protection Zones report. Points A to E have been added. Points A to C indicate the location of the seasonal stream. Karst features are also indicated along this length.

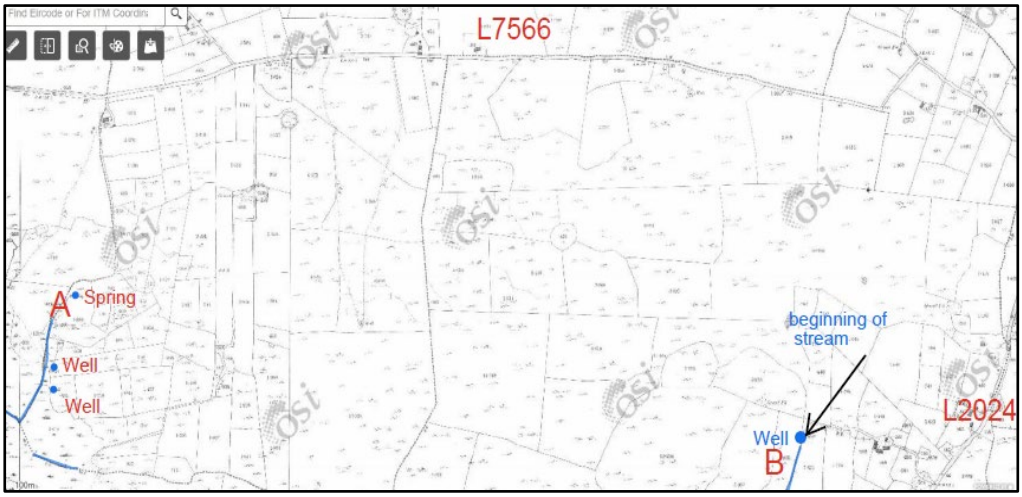


Figure 45: OSI 25" Historical map Point A to Point B

Figure 45 shows a section of the OSI 25" First Ed.(1880) south of the L7566. A stream is not mapped. The beginning of a stream at Point A and at Point B (adjacent to the L2024) is mapped similar to that shown on the EPA map.

[65] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland

[66] Killeglan Water Supply Scheme Tobermore Spring Groundwater Source Protection Zones (April 2003) GSI/RCC

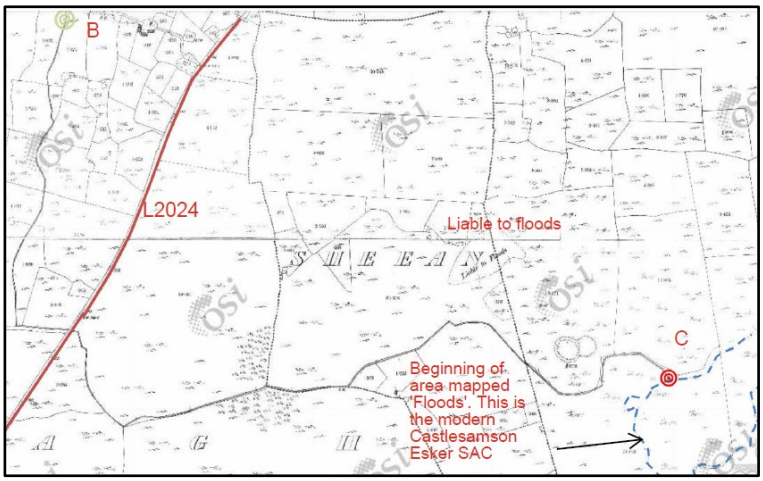
Figure 46 shows the OSI imagery map of the same area. Local knowledge has identified the '*seasonal stream*' as described in the GSI/RC 2003 document as a drain excavated by RCC sometime in the 1970s.

The approx. present day profile from point x to point B is also shown in Figure 46.

Figure 46: OSI 25" OSI map Point A to Point B with present day profile (Profile from the National Library of Scotland)

Local knowledge recalls the works were intended to alleviate the flooding which occurred to the east of the L2024 by draining the flood waters to the west towards the Killeglan/ Suck rivers. The project was abandoned before it was complete for unknown reasons but most likely due to inadequate falls. The flooding to the east of the L2024 which the drain was intended to relief is now known as the western section of the Castlesamson Esker SAC.

> *The western section of the site comprises an undulating area of glacially derived mounds and seasonally flooded basins, Corraree turlough.*[67].



The feature from B to C is shown on the OSI 25" map as a stream. Local knowledge recalls it as a stream which children crossed on their way to the nearby school in the mid-1950s. Widening and deepening the stream was also part of the RCC 1970s drainage works. The stream stopped at point C an area recorded as 'Floods' on the 25" map. This is the NW corner of the modern Castlesamson Esker SAC.

Figure 47: OSI 25" Historical map Point B to Point C

[67] Site Name: Castlesampson Esker SAC Site Code: 001625 Site Synopsis

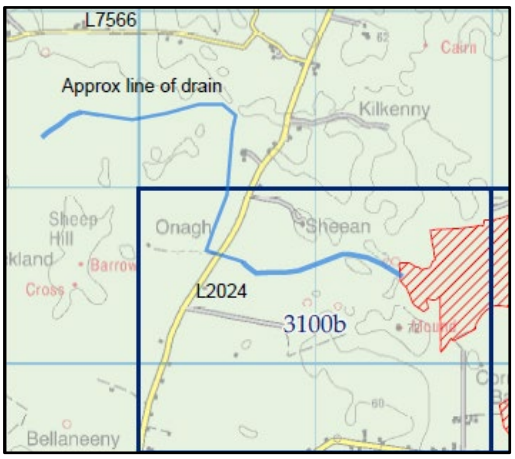


Figure 48: Drain at Castlesamson Esker SAC

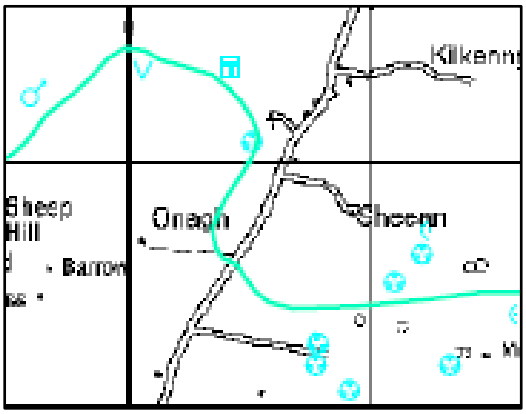


Figure 49: 'Stream' in catchment area of Killeglan water supply

The approx. present day elevation profile from point B to point C is shown in Figure 50, the problem of negative falls is evident. According to local knowledge during periods of intense rain the channel overflows and floods the L2024, this would confirm the backfall shown in the elevation profile. The drain enables contaminated groundwater to flow into the SAC.

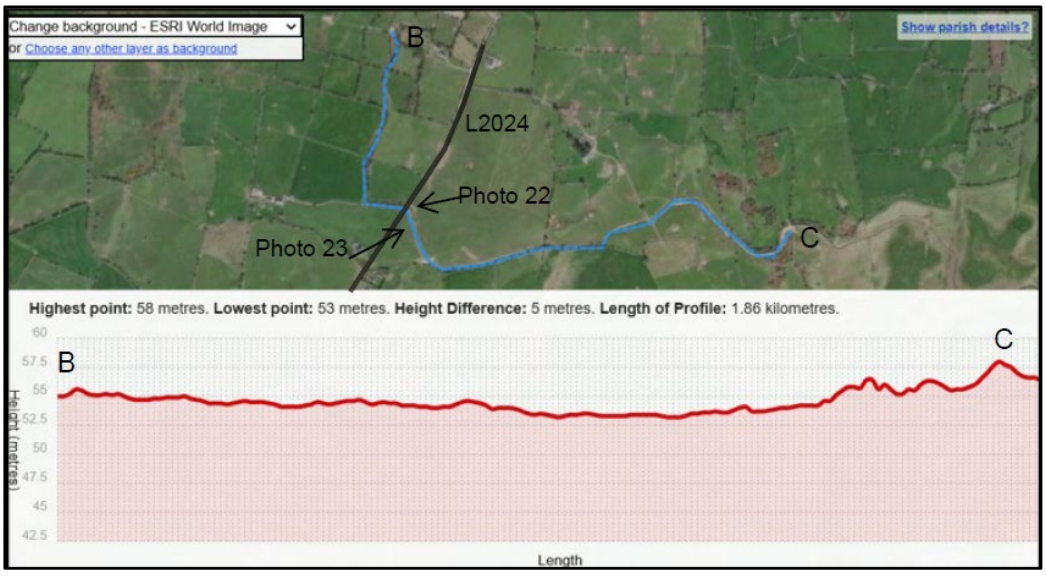


Figure 50: Present day profile from Point B to Point C (National Library of Scotland)

Photos 22a to 22b show the location looking west where the drain crosses under the L2024.

Photo 22: April 2009 (Google maps)

Photo 22a: April 2011 (Google maps)

The 2019 photo shows erosion/ widening of the channel, most likely after the 2015/2016 rainfall event.

Photo 23 is looking NE from the L2024 and shows the excavated material deposited along the bank.

Photo 22b: Aug. 2019 (Google maps)

Photo 23: The excavated material is visible on the bank Aug. 2019 (Google maps)

A seasonal stream does not flow through the catchment area for the Killeglan water supply scheme: a drain does.

The *stream network to the south of the esker* is primarily a series of 19th-century drains. They end as a pair roughly at the lower point of the Castlesamson Esker SAC forks and extend back as far as the Ballinasloe/ Athlone railway line. Along the way they are joined by numerous secondary drains. The network appears to have been constructed in an effort to drain the flooding/turloughs but similar to the later RCC efforts inadequate falls proved a difficulty. The ability of these drains to facilitate pollution of the SAC and the Killeglan water supply should not be overlooked

The GSI/RCC Source Protection Zones document is dated 2003 but the description of the drain as a seasonal stream remains current and has made its way to Europe.

> *There is also a seasonal stream that runs through the catchment (marked by linear strip of extreme vulnerability in Figure 20).*[68]

This adds to the existing substantial misinformation regarding the South Roscommon karst and underlies the urgent need for detailed scientific studies.

11.0 Conclusion

The narrative in ABP-321238-24 EIAR Chapters 6: Land and Soil and Chapter 7: Water do not accurately reflect the findings in Annex 61: Geotechnical Investigation Report and Annex 62:Ground Investigation Report, therefore the assessment and conclusions in both these chapters should be treated with caution

The EIAR of the Southern Cluster of permitted ABP-313750-22 claims that *the depth of subsoils and lack of any groundwater strikes at T16, T17 or T18 indicate that any potential subsurface*

[68] GeoERA RESOURCE Project Deliverable 5.2 Detailed conceptual hydrogeological models for pilot areas and case studies 11.01.2021

connection will be minor. Bedrock competency and separation distances will ensure there will be no residual impacts on Four Roads Turlough SAC/SPA/pNHA and Feacle Turlough pNHA.

Leaving aside that the bedrock is extensively karstified and that groundwater in karst can travel long distances very quickly the applicants reasoning and conclusions are all based on what could be described as conventional hydrogeology and not on karst hydrogeology. The two are significantly different.

The conclusion of the Board's consultant hydrogeologist in 2016 '*...on the basis of my understanding of the requirement that "no reasonable scientific doubt remains as to the absence of the identified potential effects", I am not satisfied the present understanding of the hydrological/hydrogeological environment can eliminate that doubt'* was valid in 2017 when the Board refused ABP-244346 and ABP-244347 permission, was valid in 2023 when the Board granted ABP-313750-22 permission and remains valid today for the ABP-321238 application.

There is no evidence to support the claim the granted development or the proposed substation will not impact Lough Feacle or indeed Lough Funshinagh

The proposed permanent outfall from Lough Funshinagh is 750m from zones *with a potential high degree of karstification (which)penetrates to 22 m bgl,* these zones are 2.2km east of the 1996 tracer line from Lough Funshinagh which in turn is approx. 7.0 km NE of the collapsed conduit adjacent to the R363. The groundwater flow direction is SW so there is a strong possibility that all these elements are connected. Tracer tests confirm Lough Feacle is connected to the catchment area of the Killeglan water supply which in turn is traversed by an open drain which we now know is connected to the Castlesamson Esker SAC ,and so on it goes, unknown connectivity between apparently unrelated entities.

Therein lies the fundamental issue which has been ignored by the applicant, the granted development site and the proposed substation site are not discrete self-contained units they are inextricable linked to the entire surrounding ecosystem via the karstic hydrogeology.

Submissions to the Board over the last thirteen years in relation to the Seven Hills Wind Farm development have identified the following previously unknow/ignored elements

- The effect of the 19th century drainage on the Dysart flooding and their potential for contamination of the groundwater
- The proven existence of serious geohazards throughout and adjoining the subject site
- The misinformation regarding the filling mechanism of Lough Funshinagh
- The probable cause of the Lough Funshinagh flooding disaster.
- The accurate location and source of the Cross River
- The incorrect description of drains as rivers e.g. the Ballyglass and Cross drains
- The presence of a drainage channel through the catchment area of the Killeglan water supply previously described as a seasonal stream.

What else is unknown/ignored?

Regardless of the Board's claim to the contrary none of the relevant issues were given any regard by the Board in arriving at the ABP313750-22 decision. If they had then the decision would be different.

It can only be hoped that the ABP321238-24 decision will reflect a more scientific analysis on the part of the Board. The evidence the permitted development and the subject application pose significant threats to the environment and to the communities is overwhelming. The Board should not be party to these dangers.

Appendix A

Observations

on

Lough Funshinagh Interim Flood Relief Scheme

(Lough Funshinagh)

01.11.2024

Lough Funshinagh

1.0 General

On the 20th of September 2024 Malachy Walsh and Partners (MWP), on behalf of Roscommon County Council (RCC), applied to An Bord Pleanála (the Board) for approval under Section 177AE of the Planning and Development Act 2000 (As Amended) to develop an interim flood relief scheme to pump water from Lough Funshinagh and to discharge the water to the Cross River, within the townland of Carrick, in County Roscommon.

1.1 Hydrogeology

A Natura Impact Statement (NIS) was submitted as part of the application for approval in respect of the proposed development.[1]

3.3 Lough Funshinagh Turlough

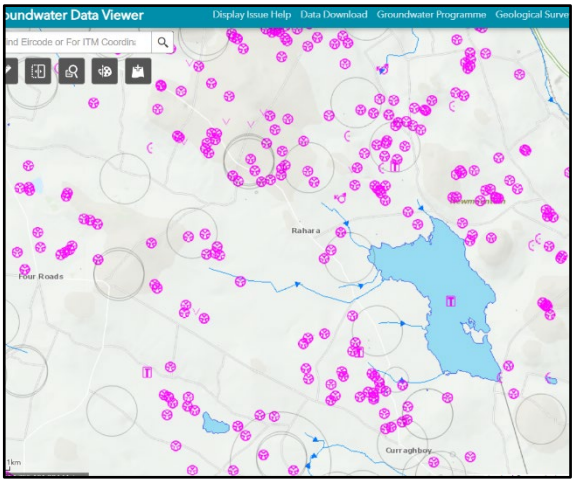
The lake lies upon Carboniferous limestone and is designated as a turlough. In recent years, Lough Funshinagh has experienced prolonged flood periods that typically occur in winter and have lasted through to the summer seasons. As such the turlough is considered to not be operating as a typical turlough. While the lake has apparent karst drainage features (and has been successfully traced to a spring 5km to the south), it is filled predominantly by surface water rather than groundwater. The turlough has five known streams entering at the northern and western shores of the turlough and two swallow holes in the southeastern corner which facilitates as the natural draining feature of the turlough. The EPA operates a gauging station on the largest stream, with data indicating that during filling events the turlough can receive over 40% of its net change in volume from this stream alone. This suggests that the lake is predominantly surface water fed, and groundwater drained. As such, the turlough essentially behaves more as a backed-up swallow hole than a typical groundwater fed turlough.

3.6.1 Regional Hydrogeology

The Funshinagh GWB predominately comprises Dinantian Pure Bedded Limestones which are a Regionally Important karstified bedrock aquifer dominated by conduit flow (Rkc). The GSI36 GWB description notes that within this type of highly permeable aquifer the groundwater flows through enlarged conduits and fractures which are well connected and widespread. The bedrock is devoid of intergranular flow as the groundwater flows within the fractures and conduits resulting in highly variable aquifer permeability and transmissivity. Groundwater velocities are relatively rapid indicating sizable conduits are present within the aquifer. High yielding springs in the region further indicate the significant capacity for the groundwater network to transmit high volumes of water and the regional scale of the groundwater flow network. Flow paths can be several kilometres in length. This groundwater dominated system is evident on the ground surface as there are relatively few surface water features such as rivers and streams. The karstified bedrock is evidenced by numerous karst landforms including springs, swallow holes, turloughs and enclosed depressions. These features indicate places where significant karstification of the

[1] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited

bedrock has occurred and where there is likely to be significant water bearing conduits or fractures.[2]



The GSI Groundwater Data Viewer as shown in Figure 1 confirms that the area surrounding Lough Funshinagh conforms to the description in paragraph 3.6.1. aside from the apparent surface water features.

Numerous karst landforms and springs are shown along with the zone of contribution of these springs. These features indicate places where significant karstification of the bedrock has occurred.

Figure 1: GSI Groundwater Data Viewer

3.6.2 Lough Funshinagh Hydrogeology

Lough Funshinagh is a local topographical low where the surrounding streams combine to form the lake as there is no surface outflow and the subsurface outflow is restricted. This results in the water backing up within the topographical low and forming the lake. Two swallow holes have been identified within in the southeastern part of Lough Funshinagh and provide drainage to the aquifer.

Surface inflows to the lake include 6 surface water streams located on the northern and the western shores of the lake. The EPA operates a gauging station on the largest stream and during rainfall events over 40% of the net volume is contributed to Lough Funshinagh by this stream. This indicates the lake is predominantly surface water fed and, as there are no outflowing rivers or streams, discharges to ground.[2]

From the above it appears that the Lough Funshinagh hydrogeology does not align with the regional hydrogeology. The surrounding area has all the necessary karst landforms and springs, yet the report describes Lough Funshinagh as not operating as a typical turlough and behaving more as a backed-up swallow hole than a typical groundwater fed turlough.

Lough Funshinagh is a designated SAC, qualifying interests Turlough[3]. Groundwater is the driver of the hydrology of turloughs and the conservation objectives for which the turloughs had been designated.[4] The view that Lough Funshinagh is not a true turlough appears to stem from the supposition that inflows to the turlough include five/six surface water streams located on the northern and the western shores of the turlough. The RCC Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) references the EPA GIS platform as a source for this information.

[2] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited
[3] NPWS Lough Funshinagh SAC Qualifying Interests Turloughs [3180]
[4] ABP Inspectors Report 244346A and 244347A

1.2 Present day evidence of the six surface water streams.

The screening for AA and NIS states the EPA operates a gauging station on the largest stream but does not give a reference for the gauge. Figure 2 below shows the streams and gauges as mapped on the EPA website. The numbers shown have been added, starting at the most northerly tip the streams are numbered one to six in an anticlockwise direction.

The EPA describes the gauges as Water level and flow gauges. Figure 2a shows gauge No. 26243 located on an unnamed water body. Figure 2b shows gauge No 26245 apparently located remote from a water body.

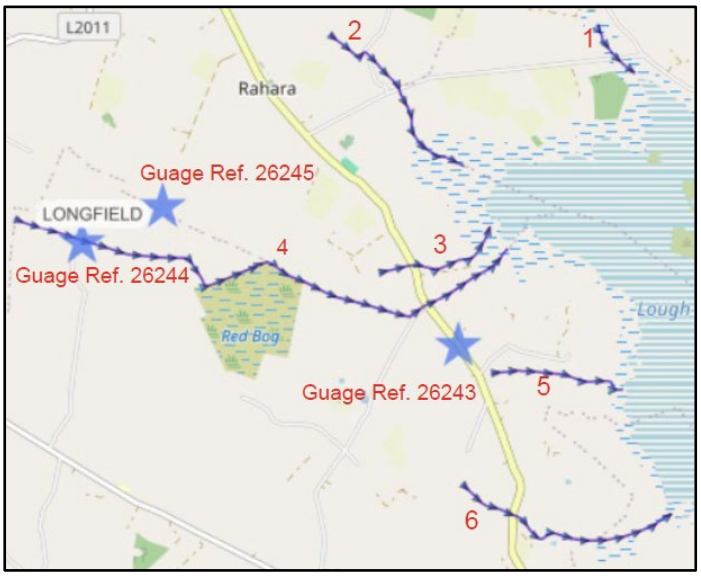


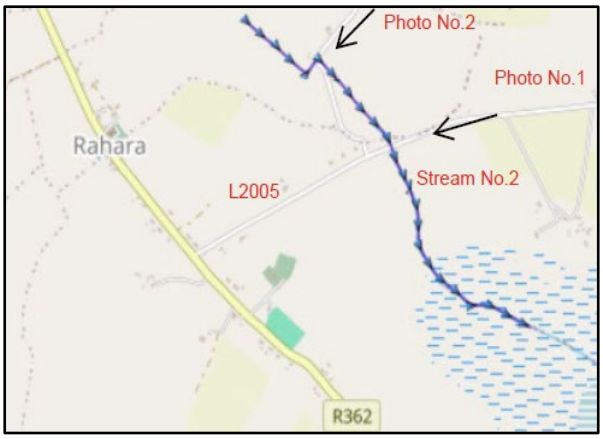
Figure 2: Streams and gauges as per the EPA website.

Figure 2a: Gauge No 26243

Figure2b: Gauge No 26245

1.2.1 Streams No. 1 and 2

The area around stream No.1 is inaccessible due to flood waters from Lough Funshinagh.



Stream No.2 is shown originating northwest of Lough Funshinagh and flowing southeast joining the turlough at the NW corner as shown in Figure 3. The stream is shown crossing the L2005 and a minor road off the L2005. The stream is on private lands but should be visible from the L2005 and from the minor road off the L2005.

Figure 3: Stream No.2

Photo No.1 is a Nov. 2022 view (Google maps) from the L2005. A drain is visible in the field on the northern side of the road. It crosses the L2005 but is not culverted. There is a roadside drain on the southern side of the road. Photo No.2 is a May 2009 view (Google maps) at the bend in the minor road of the L2005. An open channel can be seen here but it doesn't cross

the road as shown, instead the channel is coming from the NE and is draining the Toberlargan spring

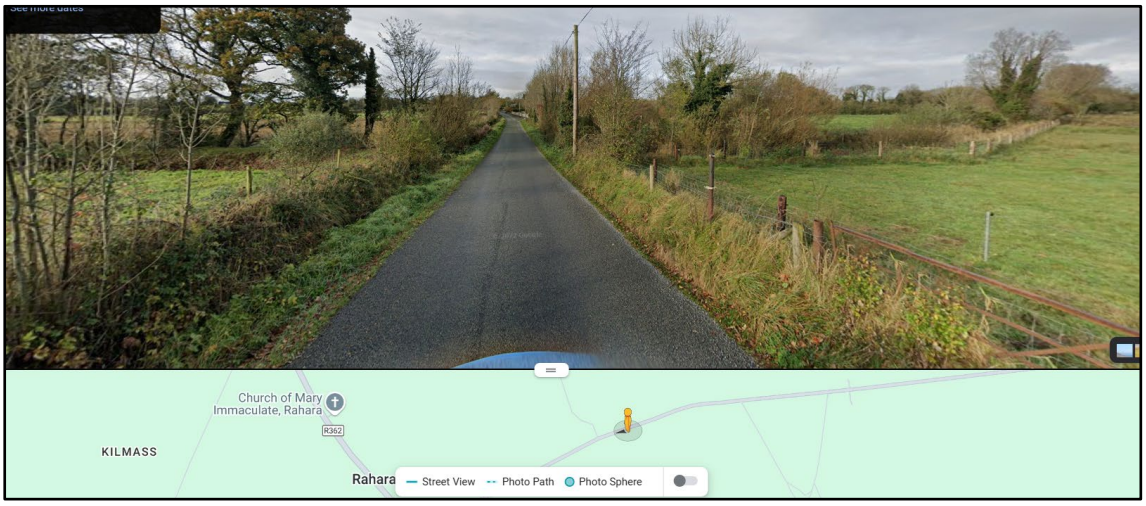


Photo No. 1 L2005 looking SW - Nov. 2022

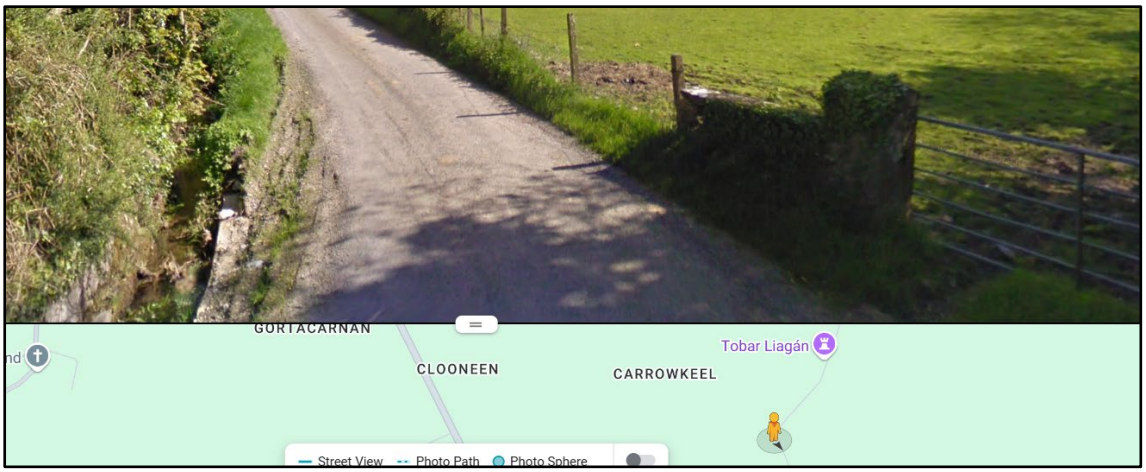
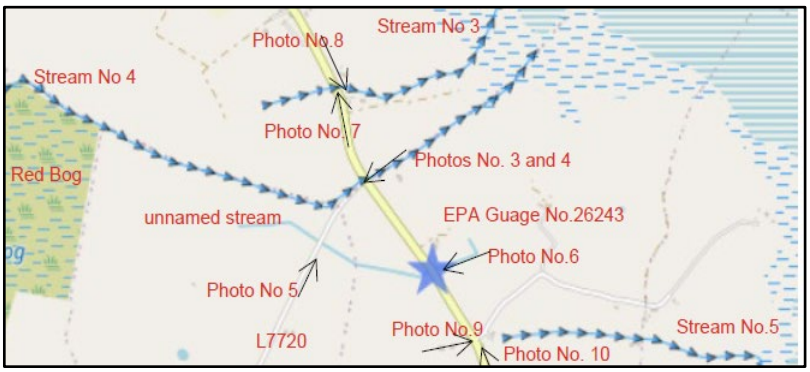


Photo No. 2 Minor road of the L2005 looking SW – open channel at bottom left

1.2.2 Streams No. 3,4 and 5

Stream No. 3 and 4 originate west of Lough Funshinagh and flow NE to join the turlough as shown in Figure 4. Stream No. 4 is shown parallel to the northern side of the L7720 and then crossing the R362. Stream No. 5 is shown east of the R362 and flowing east. All streams are shown in Figure 4.



The EPA maps a short water feature south of Stream No.4 it is shown crossing the L7720 and the R362. EPA Guage No. 26243 is located on this water feature. The three streams and the water body are on private lands but should be visible from the R362 and the L7720.

Figure 4: Stream No. 3, No. 4 and No.5

Stream No. 4 – Photo No. 3 is a May 2009 view (Google maps) at the junction of the R363 and the L7720. A drainage ditch is located along the righthand side of the L7720, stops at the farm gate and then continues along the lefthand side of the R362 but it is not culverted under the R362.

Photo No.3: The junction of the L7720 and the R362 – May 2009

Photo No.4 is a Nov 2022 view (Google maps) at the same junction. The corner field at the junction is flooded, the groundwater has reached the centre of the L7720 and is moving towards the roadside drain.

Photo No.4: The junction of the L7720 and the R362 – Nov. 2022

Short water feature south of stream No.4 - Photos No.5 and 6 are Aug.2019 views (Google Maps) on the L7720 and the R362 respectively. Both show a drain culverted under the road.

Photo No.5 drain culverted under L7720

Photo No.6 drain culverted under the R362

Stream No. 3 –

Photo 7 is a Nov 2022 view (Google maps) on the R362 looking north. A drain from the NW direction is culverted under the R362.
Photo No. 8 is a Nov 2022 view (Google maps) on the R362 looking south showing the drain turning in a SE direction.

Photo No. 7 Looking north on the R362 - Nov 2022

Photo No. 8 Looking south on the R362 Nov 2022

Stream No. 5 – Photo No. 9 is a Nov.2024 view (Google maps) of a drainage ditch off the R362 Road at the same location as the EPA map. Photo No. 10 is a view (Google maps) looking north on the R362. The drain can be seen in the background adjacent to the vehicle on the road. There is a roadside drain on the left hand side of the R362, the orange sign says Road Flooded.

Photo No. 9: Drainage ditch off the R362

Photo No. 10: Looking North on the R362

1.2.3 Summary

The streams labelled Nos 2,3,4 and 5 in Figure 2 are drains. Those named Nos. 1 and 6 could not be located.

1.3 Historical evidence of six surface water streams

The following historical maps were accessed from the GSI Groundwater Data Ireland ITM Viewer and the National Library of Scotland Georeferenced Map Finder

- OSI 6 inches to a mile first edition colour.[5] 1838
- OSI 25 inches to a mile first edition.[5] 1890
- OSI 6 inches to a mile third edition.[5] 1911 -1913

The 6 inches to a mile OSI (1829 – 1842) was the first large-scale survey of an entire country in the world. Acclaimed for their accuracy, these maps are regarded as among the finest ever produced. Figure 6 is a small sample from an OSI 6" showing the level of detail recorded. The colour coded boundaries recorded in the maps remain current. A civil parish boundary is not the same as an ecclesiastical parish boundary. The Ballyglass River is little more than a stream but is mapped meticulously. The 6" characteristic sheet is available from OSI or from the Map Library in Trinity College Dublin.

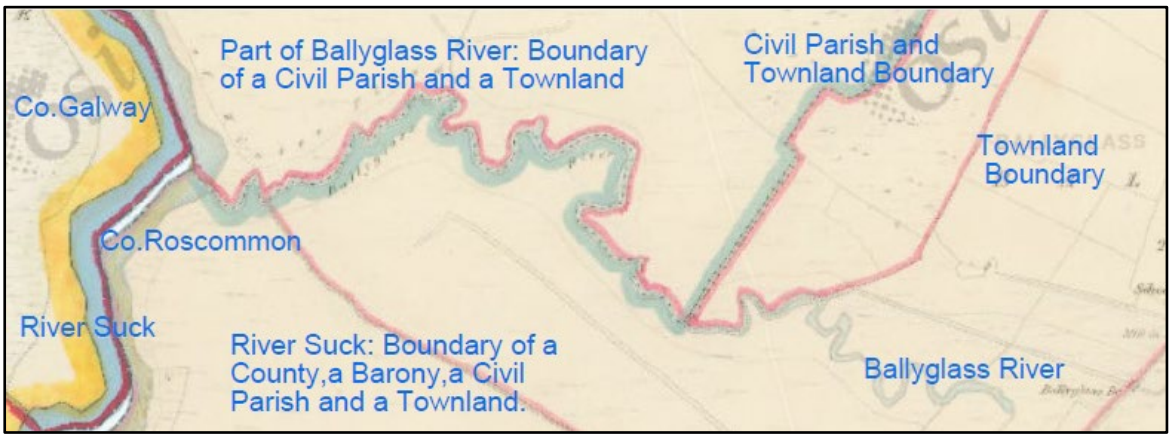


Figure 5: Sample of 6" OSI map showing Townland Boundary and Ballyglass River

[5] Ordnance Survey Ireland (OSI) "19th Century Historical Maps," held by Ordnance Survey Ireland. ©

1.3.1 Drain No 2

Stream No.1 or drain No. 2 are not shown on the OSI 6" First Edition Colour – Figure 6

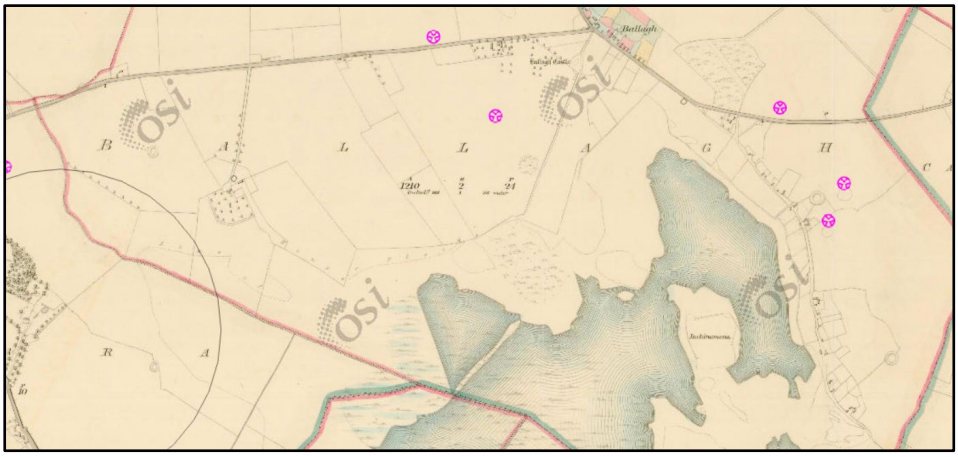


Figure 6: OSI 6" First Edition Colour

The OSI 25" map records a drain along points A to D as shown in Figure 8. A short natural stream is recorded north of the drain, this has been connected, via an artificial channel, to Lough Funshinagh as shown in Figure 9. Thumbnails of points A to D are shown in Figure 10.

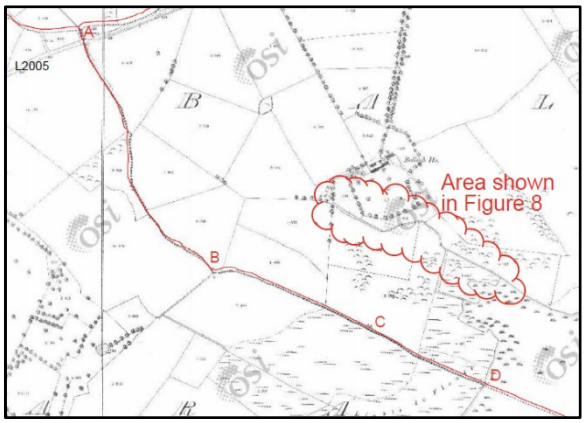


Figure 8: OSI 25" First Edition 1890 map

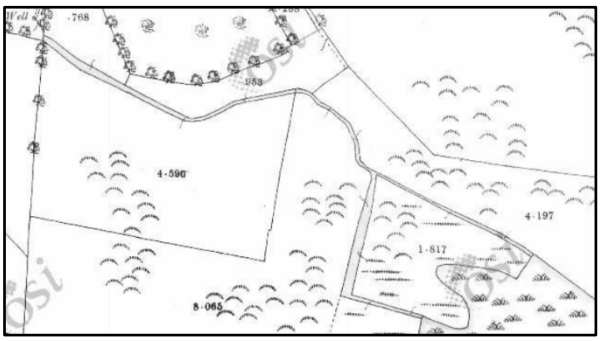
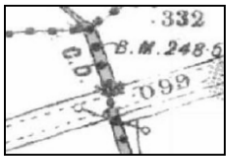
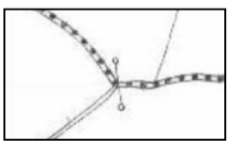


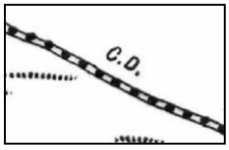
Figure 9: Natural stream drained artificially to Lough Funshinagh



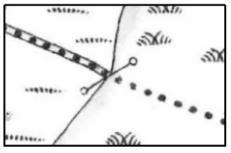
Point A



Point B



Point C



Point D

Point A: CD (centre of drain) and a BM of 248.5' is recorded.

Point B: Drain recorded

Point C: The Ballagh/ Rahara townland boundary is now recorded as a drain anotated CD

Point D: The end of the drain at the intersection of the "*Liable to Floods*" line.

Figure 10: Thumbnails A to D

The main drain and a field drain at Point B is shown in Figure 11.

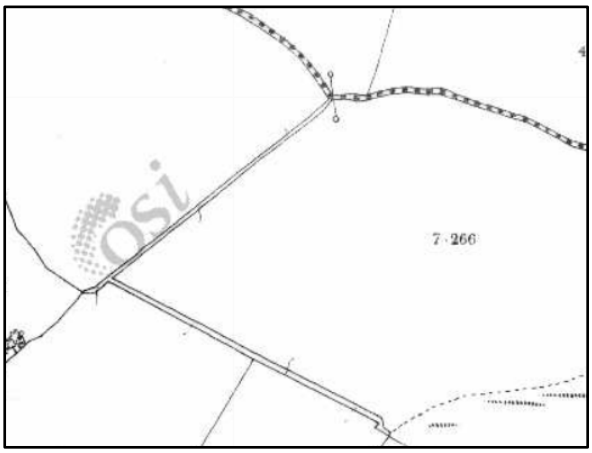


Figure 11

1.3.2 Streams Nos. 3 and 4

There is no evidence of stream Nos. 3 and 4 on the OSI 6" map, see Figure 12. A water body, Lough Anneally, is mapped approx. 4.0km west of Lough Funshinagh. Figure 13 shows a mill race on the line of stream 3 and an old Mill just off the line. No other water bodies are mapped.

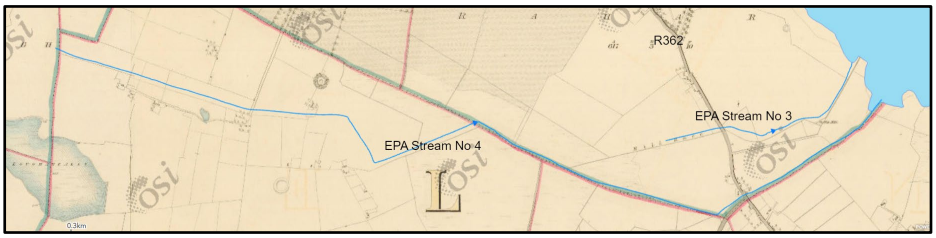


Figure 12: 6" OSI map with streams Nos. 3 and 4

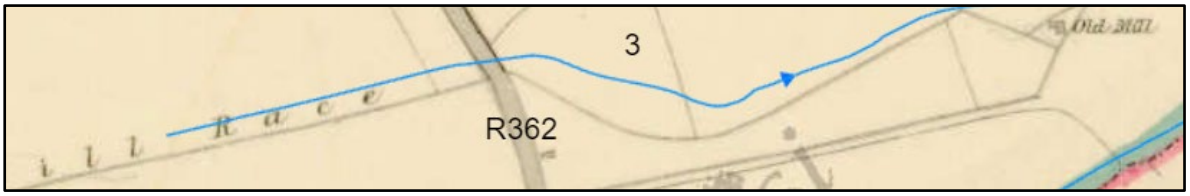


Figure 13: 6" OSI map with old mill race along line of stream No.3

The OSI 25" map records artificial drains mapped along the lines of streams Nos. 3 and 4 and the unnamed stream - Figure 14. The unnamed stream on the EPA maps as described in 1.2.2 (Photos. No. 5 and 6) is a drain, field drains in Corralea discharge into it.

The drain is mapped crossing the L7720 and the R362 as shown in Photos 5 and 6. This drain does not discharge directly into Lough Funshinagh but instead discharges into Drain No. 4. Its extent westward should be checked to understand the statement "*during filling events the turlough can receive over 40% of its net change in volume from this stream alone.*"

The liable to floods line is shown as a light blue line. The 1830 location of Lough Anneally is off the extent of Figure 14, but it is now longer recorded in the 1890 map instead it is annotated "*Liable to flood*".

The 1890 map records the roadside drains, these are shown in purple in Figure 14.

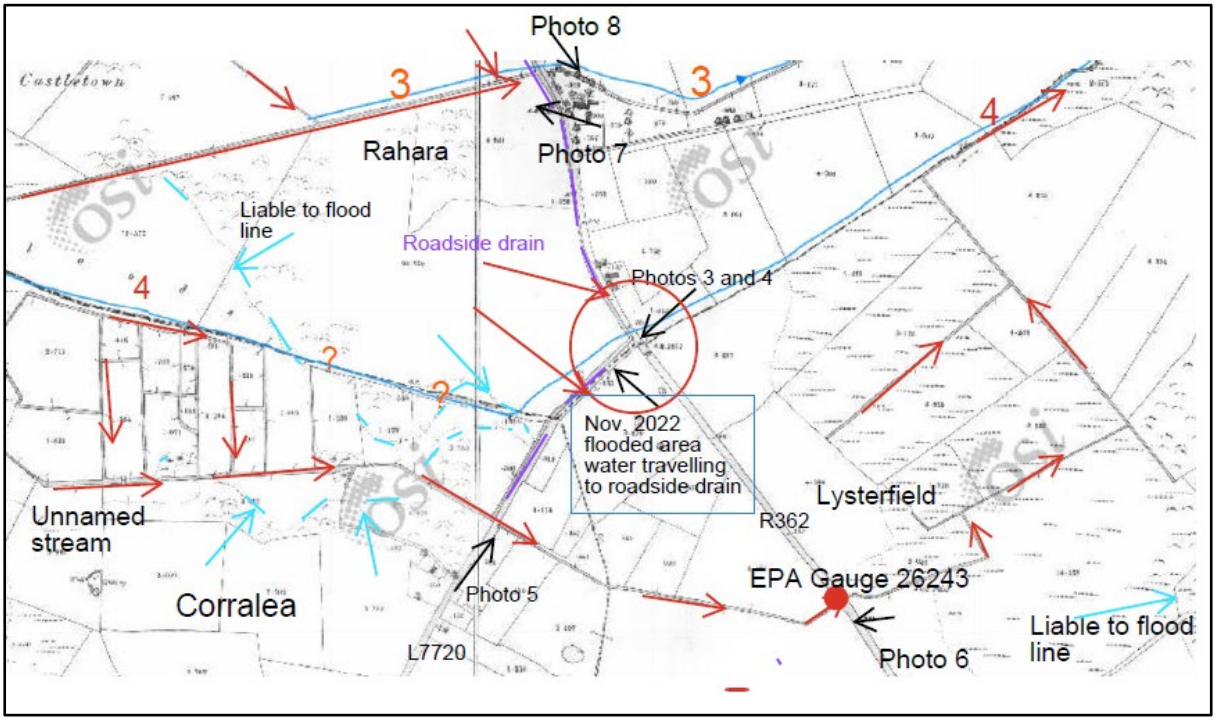


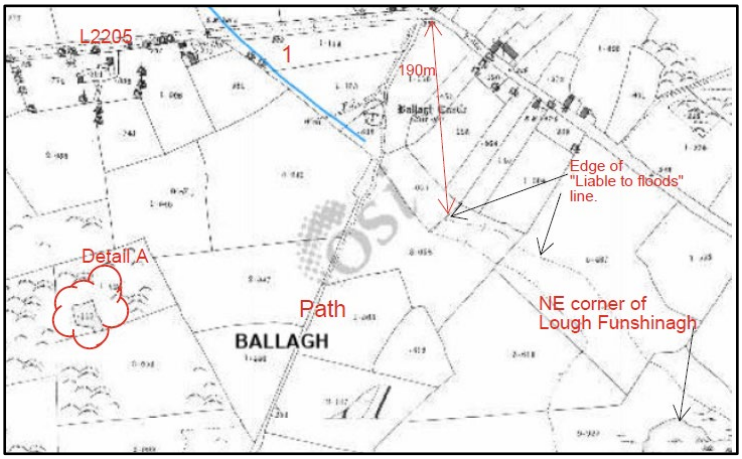
Figure 14: OSI 25" map showing artificial drains on the line of streams 3 and 4 and the unnamed stream

The junction of the L7720 and the R362 is shown in the 2013 – 2018 imagery in Figure 15. Stream No. 4 is not culverted under the R362.

Figure 15: 2013 -2018 imagery

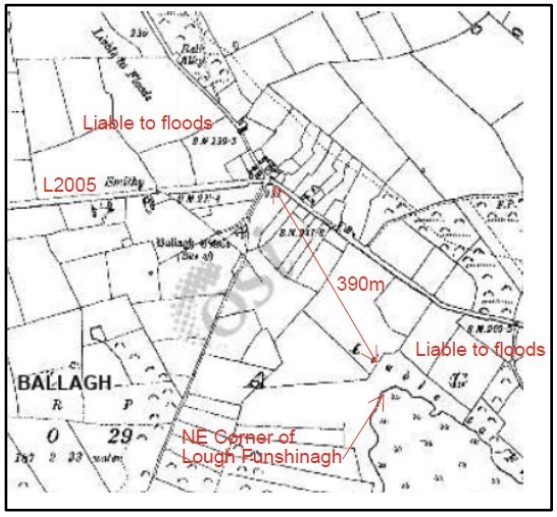
1.3.3. Stream No.1

There is no evidence of stream No.1 on the 6" map or the 25" map.



The OSI 25" first edition (1890) is shown in Figure 16. The NE corner point of Lough Funshinagh is approx. 450m from the L2005 junction. The "*Liable to flood line*" forms a narrow, inverted U shape and its closest point is approx. 190m from the same junction.

Figure 16: OSI 25" map (1890)

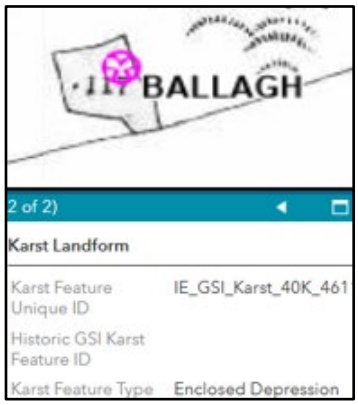


The OSI 6" third edition map (1911 – 1913) is shown in Figure 17. An area to the north of the L2005 junction is annotated "*Liable to Floods"*. The northern most point of Lough Funshinagh is approx. 450m from the L2005 junction. The "*Liable to floods"* line has receded and is now recorded as 390m from the L2005 junction.

An access track extends from the corner junction in a SW direction. According to local knowledge the track still exists today and is in use

The southern section of Ballagh and the eatern section of Lisfelim are recorded as marsh

Figure 17: OSI 6" 3rd Edition (1911 -1913)



Detail A shows a water feature, measured to three decimal places of an acre, on the 25" map overlain with the GSI Karst Landform feature type "Enclosed Depression". Detail B shows the line of a ditch dotted orange which may be a drain added at a later stage in attempt to drain the flood north of the L2005.

Detail A **Detail B**

1.3.4 Stream No.5

There is no evidence of stream No. 5 on the 6" OSI map. The 25" shows a drain along part of the line of stream No.5.

Lough Pollagh, a water body approx.0.1Ha is recorded on the 6" and the 25"

The 25" map records drains as shown in Figure 18a. The drain south of stream No.5 is a mixture of drains and natural features and has the annotation CF and CDF. It is located along a townland boundary which is the usual, but not always, location of these drains. Following the townland boundary gives the drains the apparent random looking route and the giveaway obtuse angles.

These drains are coincidental with drains recorded on the OSI Basemap Premium as shown in Figure 19.

Figure 18:OSI 6" First Edition 1838

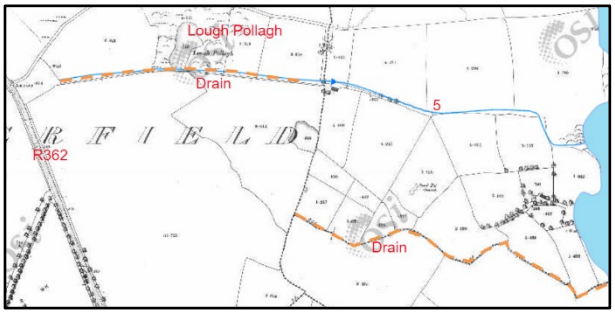


Figure 18a: OSI 25" First Edition 1890

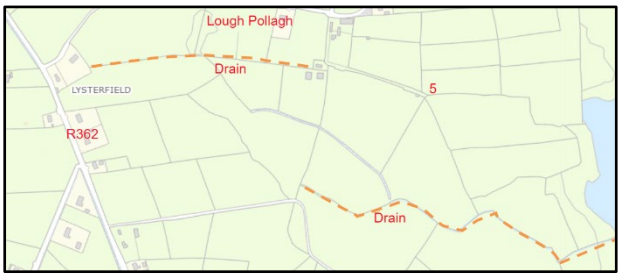


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Figure 19: OSI Basemap Premium

1.3.5 Stream No.6

There is no evidence of stream No.6 on the 6" map.

The 25" map records a mixture of drains and natural features shown as a dotted orange line in Figure 19. Not all the drains have the 25" characterisations used to record drains and the annotation changes along the route of the drain. CD, CF and CDF are all recorded. A large area of "*Liable to Floods*" c3.5ha is mapped west of Lough Funshinagh and a smaller area is mapped south of a drain. These drains are coincidental with drains recorded on the OSI Basemap Premium as shown in Figure 20 below.

The 25" map records a spring in the SW corner of Lough Funshinagh as shown in Figure 21.

The spring location is superimposed on the ESRI World Image in Figure 22.

Spring ITM Co-ordinates: 593215,749943. Approx. elevation 68.5m OD

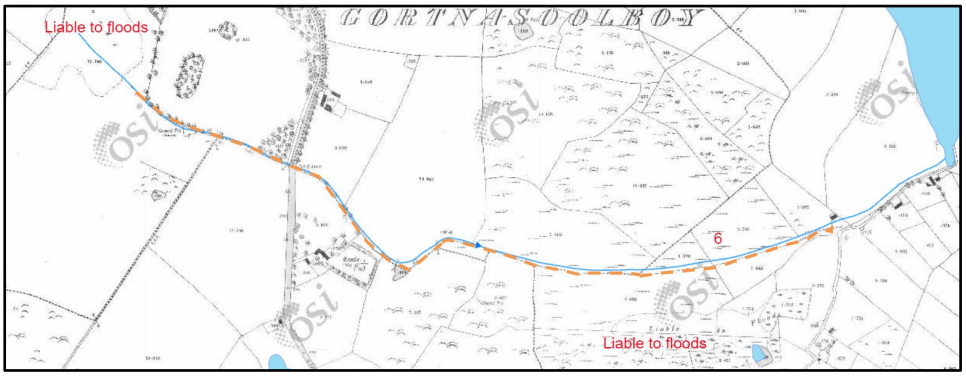


Figure 19: OSI 25" map

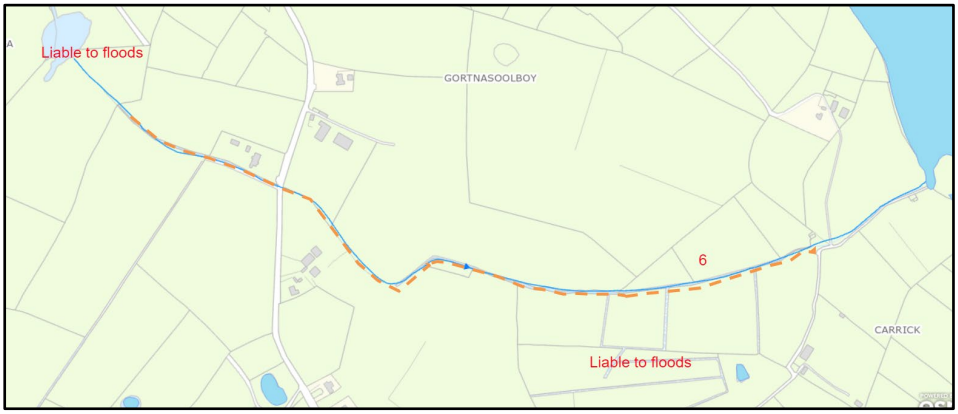


Figure 20: OSI Basemap Premium

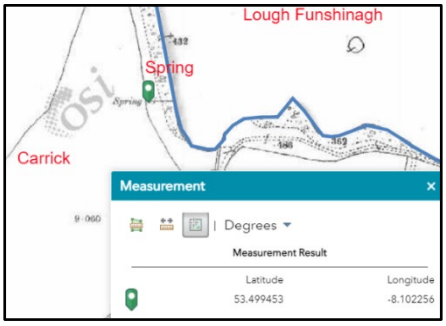


Figure 21: Spring - OSI 25"

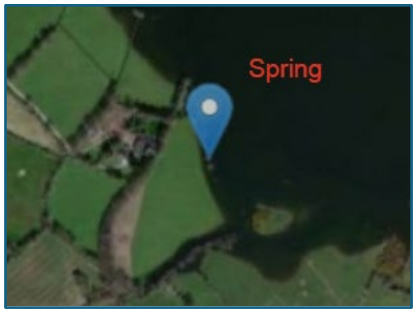


Figure 22: Spring – ESRI World Image

1.3.6 Summary of investigation into 6 No. surface water streams

Neither historical or actual evidence on the ground exists to support the claim that Lough Funshinagh *is filled predominantly by surface water rather than groundwater* or that *surface inflows to the lake include 6 surface water* streams *located on the northern and the western shores of the lake*.

The 6" OSI historical 1837 maps, acclaimed for their accuracy, do not record any such water bodies. Neither are drains recorded on these maps.

The OSI historical 25"1890 map records drains on four of the "stream" routes. These are stream Nos. 2,3,4 and 6. The 25" map records part drains on the route of stream No.5. The 25" map does not record a drain on the route of stream No.1, however there is a ditch along this route it may be that a drain was dug in an attempt to drain the "Liable to flood" area north of the L2005. There is a drain at the location of EPA Gauge No.26243 but it does not discharge directly into Lough Funshinagh, it discharges into drain No. 4.

Streams entering Lough Funshinagh are not recorded on the OSI 6" or 25" maps. The 25" map records some natural sinking streams remote from the turlough which are connected by the artificial drain network.

Streams cannot be identified on the ground. Drains on the routes of streams Nos.2 to 6 inclusive have been identified on the ground. EPA gauge No. 26243 is located on a drain.

In 1996 Lough Funshinagh was described as *The lake is flat floored and shallow (2m maximum depth) and is filled by two small streams, little more than drainage ditches,*

entering from the north-west.[6] And in 2018 as *Funshinagh is fed by two small streams but appears to have no groundwater inflows*.[7]

This description matches the location of drains 2 and 4, these are the only drains that reach Lough Funshinagh - Figure 23. However, these are not the primary filling mechanism for the turlough. For centuries Lough Funshinagh filled without assistance from any artificial drains.

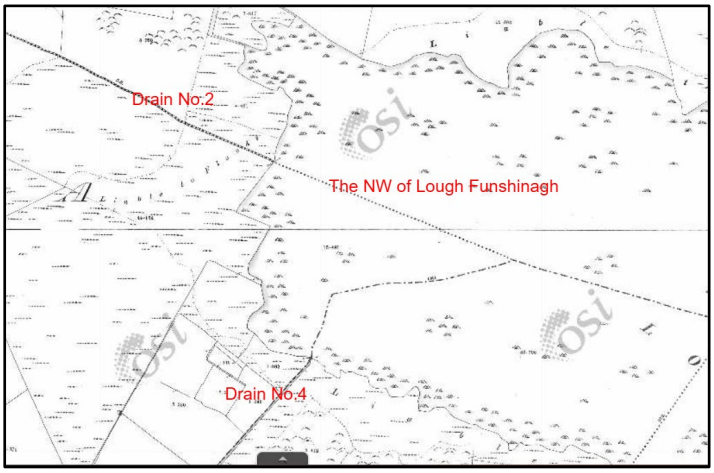


Figure 23: OSI 25" First Edition

Drains 2,3 and 4 are arterial drains, an extensive network of field drains discharge into these drains. The field drains were engineered to drain and improve agricultural land. As well as collecting field drains the drains also collect water from "*Liable to floods*" areas, sinking streams and springs. The purpose of the drainage network was to drain and improve agricultural land.

Even if the arterial drains are open, and that is not certain, the field drains are not. The field drains were open when they were created, this was a time when holdings in the west of Ireland were extremely small but with modern size farms, they definitely are not open. There is also a significant amount of open roadside drains dating back to the same era. The use of these for collecting runoff from modern day roads was never envisaged by the 19th century engineers.

Photo No. 4 shows groundwater from a field draining into the roadside ditch along the L7720, a ditch that is also taking run-off from the road. This will eventually end up in Lough Funshinagh, discharge through the swallow hole and mix with the Mullagh spring, and all other springs along the way, mix with the Cross River and end up in the treatment plant at Lisbrock. There it will have to undergo costly treatment, which if unsuccessful will result in the "*boil notices*" the people of South Roscommon are very familiar with.

> *The assessment of Lough Funshinagh in this Plan indicates that the lough has known threats and pressures for the SAC related to agricultural practices, direct interaction with species and populations through predator control and other direct land use practices.*[8]

[6] The GSI Groundwater Newsletter, No.30 Nov 1996. David Drew and Morgan Burke, Department of Geography, TCD.
[7] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland.
[8] Lough Funshinagh Interim Flood Relief Scheme | Issue | September 2024 | Ove Arup & Partners Ireland Limited Water Framework Directive Compliance Report

This assessment implies that the farming community and other community groups are responsible for the poor water quality of Lough Funshinagh. This is a commonly held belief by many. It is obvious in the case of Lough Funshinagh and the surrounding "streams" that this is not the case.

It is far too simple to blame it on an easy target when the blame should be placed with those charged with protecting the asset. RCC, the EPA, Irish Water, the NPWS and whatever number of other statutory bodies are in charge don't know or understand the hydrology of the turlough. This is an acute failure, and as will be shown later, is only part of the overall failure of these bodies in relation to Lough Funshinagh.

It is a very difficult problem to address but as with all problems it is essential to understand the past in order to understand the present.

Time constraints prevent any further comments on the WFD Compliance Report.

Drains 1 and 5 play a lesser role in draining land and mostly collect water bodies as described above. Drain No 6 originates in a large "*Liable to floods*" area in the townland of Lysterfield but it is difficult to determine where it drains to. Another large area of "*Liable to floods*" is shown in the townland of Carrick.

There is no evidence to support the statement that *the turlough essentially behaves more as a backed-up swallow hole than a typical groundwater fed turlough*. Lough Funshinagh is not a lake nor a vanishing lake. Lough Funshinagh is a turlough dependent on groundwater, as are all turloughs. Lough Funshinagh is filled by groundwater.

If any doubt remains regarding the credentials of Lough Funshinagh, then reference to the Down Survey , Figure 24 and 25, should assuage all concerns.

> *Taken in the years 1656-1658, the Down Survey of Ireland is the first ever detailed land survey on a national scale anywhere in the world. Copies of these maps have survived in dozens of libraries and archives throughout Ireland and Britain, as well as in the National Library of France. This Project has brought together for the first time in over 300 years all the surviving maps, digitised them and made them available as a public online resource.*[9]

[9] Trinity College Dublin

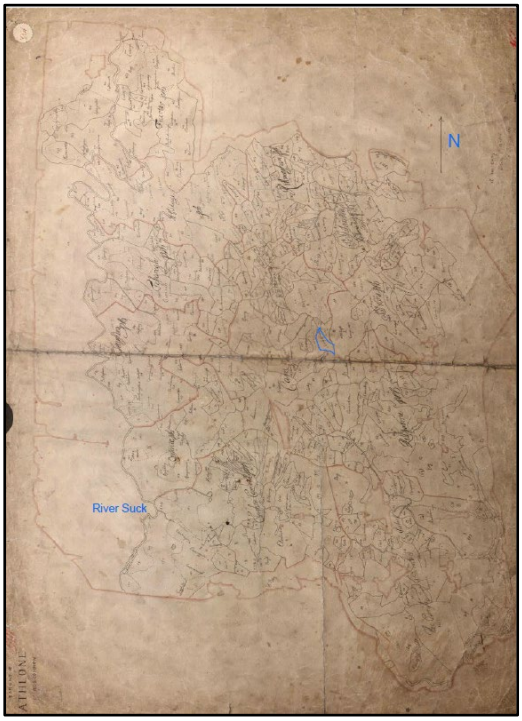


Figure 24: Down Survey
The Barony of Athlone

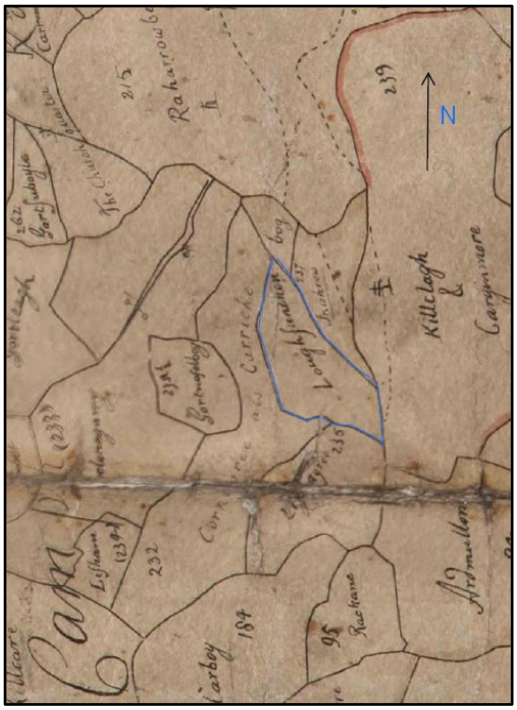


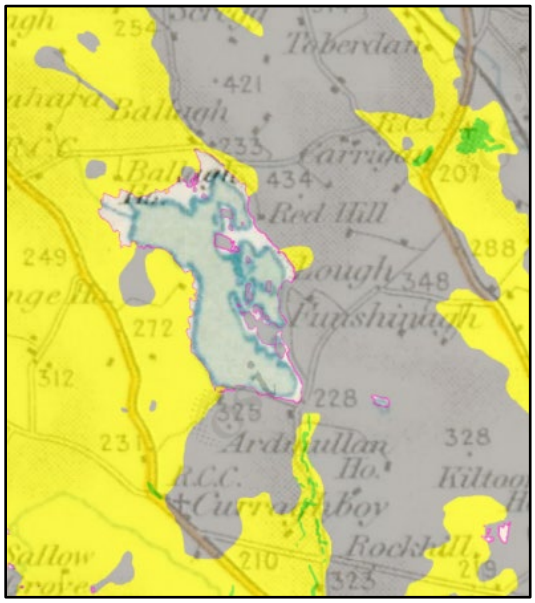
Figure 25: Down Survey
Lough Funshinagh outlined in blue

Pre mid-19th century Lough Funshinagh filled without assistance from the drainage network.

It filled by rising groundwater levels, groundwater conveyed via a karst conduit system and epikarst flow the same as all turloughs.

> *Caves are usually regarded as being underground channels accessible to humans that are of comfortable dimensions. However, in hydrogeological terms, every water-transmitting opening greater than 5–10 mm in diameter within the limestone aquifer has turbulent flow and should be considered a conduit.*
>
> *Caves are like river valleys with a roof except:*
>
> - *they can develop at successive levels in the aquifer over time (because groundwater flow is three-dimensional compared to surface streams)*
>
> *The minimum flowpath lengths for upland and lowland karsts are similar with flowpath lengths in upland karst ranging from 94 m–14 km, averaging 3.3 km and the range for lowland karst is 64 m–15.7 km, averaging 4.2 km.*[10]

[10] Drew, D. 2018. Karst of Ireland: Landscape Hydrogeology Methods. Published by Geological Survey Ireland



Filling from the karstified limestone rock to the east and northeast of the turlough as shown in Figure 26 would be possible. The elevation difference would not be a barrier *because groundwater flow is three-dimensional compared to surface streams*. In the southeast corner there is little elevational difference. Distance isn't a constraint if the average flowpath length for lowland karst is 4.2km.

The moderately permeable subsoil to the west of the turlough would have contributed but not in the manner which it now does.

Figure 26: GSI Subsoil Permeability

The lack of research and studies on the lowland karst of South Roscommon and East Galway is a significant deficit.

2.0 Arterial drainage in Ireland

2.1 General

There are two arterial drainage schemes in Ireland

1. Arterial Drainage Schemes carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Various work was carried out under Part II of the Arterial Drainage Act, 1945. These Arterial Drainage Schemes are schemes the OPW has a statutory duty to maintain.

2 Arterial Drainage Schemes know as Drainage Districts were carried out by the Board of Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. Local Authorities are charged with responsibility to maintain Drainage Districts.

2.2 The Board of Works and Drainage Districts

The Office of Public Works, or Board of Works, was established by an Act of Parliament passed in 1831 entitled An Act for the Extension and Promotion of Public Works in Ireland (1 & 2 Will. IV c.33).

From its early years the Board had certain responsibilities for drainage, but no significant work was accomplished until the Drainage (Ireland) Act, 1842 (5 & 6 Vict. c.89) was passed. The eventual outcome was the setting up of 140 drainage districts, with works being carried out in 121. The number of acres benefiting from the various schemes was over 250,000, with a total expenditure of almost two million pounds, of which over £200,000 was provided from private funds (initial land surveys had to be funded locally).

Under the Landed Property Improvement Act, 1847 (10 Vict. c.32) it was hoped to encourage proprietors in the west of Ireland to drain their lands. Drainage works were then introduced under the provisions of the Poor Employment Act, 1822 (3 Geo IV. c.34). It was believed that useful results followed under this arrangement: over 1,500 baronial drainage presentments in 29 counties, amounting to over £25,000, were granted, approved by the Board, and sanctioned between October 1846 and February 1847.

An acceleration in the rate of progress of drainage works was made necessary by the Great Famine, requiring the government to obtain new Parliamentary powers, and to this end the Drainage (Ireland) Act (9 Vict. c.4) was passed in 1846. The expenditure on a completed scheme was not to exceed three pounds per acre improved, and where it was necessary to exceed this sum further consents would have to be obtained from the owners.

On the basis of this Act, arterial drainage works were put in hand on an almost universal basis. The scope of the works was nation-wide and far more extensive than anything which had preceded them. Arterial drainage projects seemed an ideal choice for labour schemes, given the amount of valuable work required to be done and the labour-intensive nature of the activity.

In 1846 several new Acts of Parliament were passed to deal with the looming famine crisis. The distress caused by the potato blight required the Board to concentrate on providing employment for the destitute poor under Acts passed early in the Parliamentary session of 1846 for the sole purpose of affording relief by employment. In August of that year, when the scale of the crisis became clearer, the government was given additional powers for the employment of the labouring poor by means of Treasury loans.

A major impetus was given to the various schemes on the Shannon by the very severe flooding in 1861 of the lands bordering the river. In an effort to relieve the threat of further severe flooding the Shannon Act, 1874 (37 & 38 Vict. c.60) was passed. This provided for a survey and valuation of the lands by the Board. It proved impossible to get the required number of assents from landowners and a reduced scheme was carried out at public expense during 1880–1884. The other major drainage project carried out in this period was that of the Suck Drainage District, which was certified as complete in 1895 at a cost of over £170,000.

Due to the near famine conditions which again prevailed in the country at the close of 1879, and the prospect of imminent destitution, the Relief of Distress (Ireland) Act was passed in March 1880 (43 Vict. c.4). The passing of this Act followed a memorandum from the Board giving an outline of the type of activity within its power to promote, such as land improvement, loans to sanitary authorities, extraordinary baronial presentment sessions, as well as other miscellaneous relief measures [11]

2.4 Arterial Drainage and Turloughs

The threats posed to turloughs by arterial drainage schemes is well documented.

Arterial drainage schemes conducted on a basin basis, have involved deepening, straightening, embanking and creating a uniform gradient in river channels together with the excavation of tributary drainage channels where necessary. As arterial drainage have been the responsibility solely of civil engineers, awareness of the wider environmental implications of drainage or of the peculiarities of karstic or semi-karstic terrains has been largely absent. The reports of nineteenth century drainage works often refer to problems encountered during channel excavations, for example: "...it was with great difficulty the work was proceeded with in consequence of the cavernous nature of the rock and the difficulty of unwatering it" (Roberts, 1850)

It has been estimated that at least a third of all turloughs have now been drained: of ninety sites with an area of at least 10 hectares, thirty were found to have been drained since the mid-nineteenth century, and several other sites are likely to have been affected to some extent (Coxon, 1987)[12]

Arterial drainage, or drainage of river systems to dry out land within the catchment, of karst lowlands in Ireland since the mid-19th century has resulted in losses of recharge, lowering of water tables, drying up of turloughs, alteration of underground

[11] The archives of the Office of Public Works and their value for local history Rena Lohan, Archivist, National Archives Journal of the Irish Society for Archives, Autumn 1994

[12] THE EFFECTS OF LAND DRAINAGE ON GROUNDWATER RESOURCES IN KARSTIC AREAS OF IRELAND David P. Drew Catherine E. Coxon IAH 21st Congress KARST HYDROGEOLQGY AND KARST ENVIRONMENT PROTECTION 10-15 October 1988 GUÎLIN.CHINA

flow routes, and periodic groundwater contamination (Drew and Coxon, 1988). Though large-scale drainage has ceased, it resulted in the loss of at least 50% of flooded turlough area (Coxon, 1986; Goodwillie, 2001).[13]

Lough Funshinagh would appear to be an outlier regarding the effects of the mid-19th century arterial drainage schemes. Rather than deprived of groundwater Lough Funshinagh was the receptor of groundwater channelled through the drainage network created c1846 – 1884 and which RCC is charged to maintain. This increase in groundwater was not beneficial to the turlough, instead it created a different set of problems

3.0 Historic and Predicted Flooding around Lough Funshinagh

3.1 General

The arterial drainage around Lough Funshinagh is described in section 1.3. The OSI 6" First Edition Maps were published between 1832 and 1846. Co. Roscommon was surveyed in 1838.[14] The arterial works began in 1846 therefore they were not included in the First Edition 6" maps.

The OSI 25" resurvey of Ireland commenced with County Dublin in 1864. Co. Roscommon was surveyed in 1888.[12] By that date the Acts facilitating the arterial drainage and land improvements had been passed and the resultant arterial and field drainage systems were included in the First Edition 25" maps.

Lough Funshinagh continued to fill in the manner it always had pre the drainage works but now land drainage and flood areas, remote from the turlough, springs, sinking streams were collected in the new drains and discharged into the turlough. At the NW corner of Lough Funshinagh, the drainage network extends westward for over 3.5km. Groundwater from the moderately permeable sub soil to the west was now able to flow directly into Lough Funshinagh. Today, the drainage network continues to discharge into the turlough. When the net rate of inflow exceeds the net rate of outflow the turlough expands and floods low lying areas. The extent of the change in the turlough since 1830 can be seen in Figure 27.

Figure 27: OSI 6" (1830 - 1880) outline of Lough Funshinagh overlain on the ESRI World Imagery basemap. (National Library of Scotland)

The drainage works benefitted the lands to the west and east of Lough Funshinagh but at the expense primarily of the lands to the north of the turlough. The islands on the east side of the turlough gradually became submerged. From a simple visual analysis, it would seem that the net loss of land exceeded the net gain, if this were the case then the turlough top of water level would have to rise.

[13] Turloughs – Ireland's unique wetland habitat M. Sheehy Skeffington J. Moran A O Connor E Regan C.E. Coxon N.E. Scott, M. Gormally June 2006

[14] Trinity College Library Dublin The Six-Inch Ordnance Maps of Ireland (1:10,560)

Local knowledge that would have witnessed the turlough in an “empty” state tells that the top half of the turlough is deeper than the bottom half and that it was this section that never drained fully.

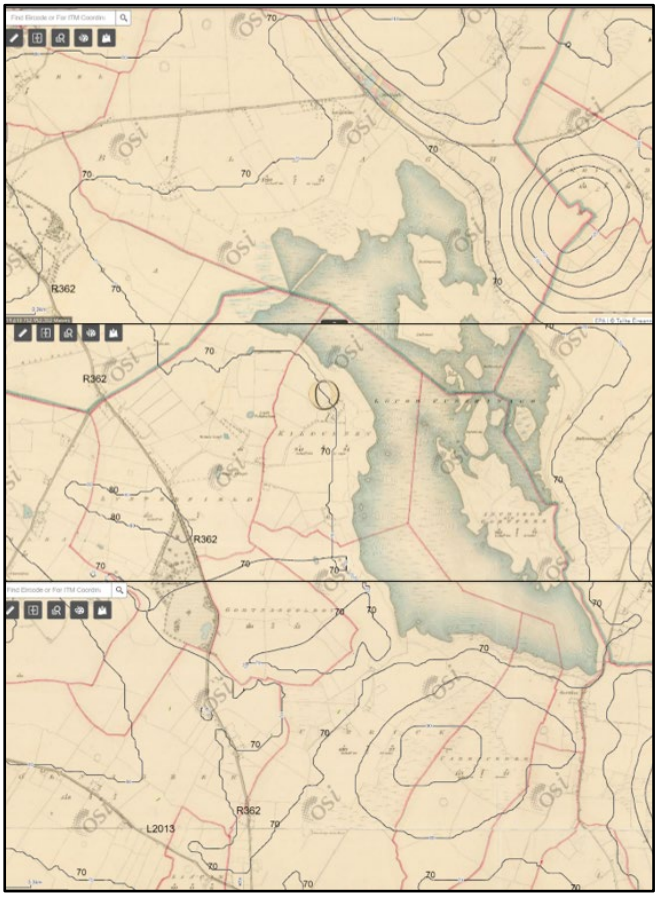
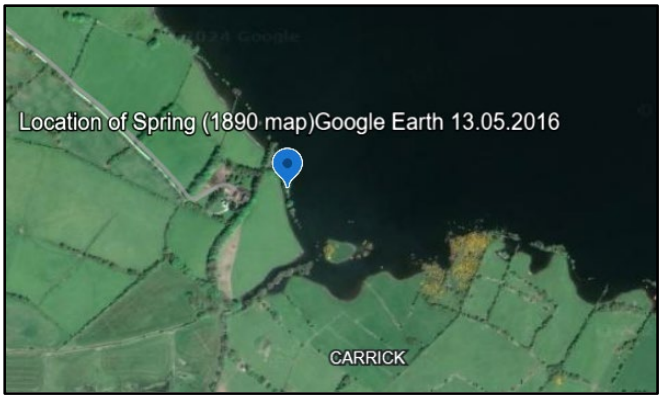


Figure 28 shows the OD contours around the turlough on the OS 6” map. The 6” has been used for clarity. By comparing Figures 27 and 28 it can be seen that the lands affected by the expanding turlough are contained within the 70m OD contour. The OSI 25” 1890 map shown in Figure 16 records the *“liable to floods”* line as an inverted U, contained within the 70m inverted U shaped contour. On the west shore of the turlough, in the townland of Kildorney, the contour line runs south, close to and parallel to the lake. The east and part of the south shores are similarly enclosed. At the SW corner the contour is a bit convuluted. It forms a boot shape towards the R362 and the L2013 but also maks a shape to the west. Closer contour mapping is required here in order to predict flooding. However the 25” does record significant flooding in these areas.

Figure 28: OSI 6” with contours

If the turlough was constrained by elevated land on all sides then an increase in net inflow would cause the top of water level to rise but would not cause flooding. But along the northern shore Lough Funshinagh is not constained in this manner, neither is it constrained at the SW corner. Any increased input will first fill the lower elevation areas within the 70m contour bounds. This is ilustrated in the 1890 map where flooding is recorded in the areas in the NE and NW. If left unconstrained the turlough will continue to fill the NE and NW corners.



As the water level rises it is likely that groundwater will begin to discharge from the spring located at the south western edge of the turlough as shown in Figure 29. When the level increases further it will continue to expand in a NE and NW direction and also seek to travel in a south westerly direction down the 70m contour ”boot” as mapped in Figure 28.

Figure 29: Google Earth Spring Location

Points on the east and west shore lower than the 70m contour will also flood. As the top of water rises the lower areas bound within the 70m will continue to fill. If, for any reason, the flood waters are prevented from filling these lower areas then the water will seek an alternative route within the 70m contour bounds. The area at most risk will be the SW corner. It is vulnerable because of the low area within the "boot", the location of the spring,the presence of drain No.6 formed to drain a large area "*liable to floods*"

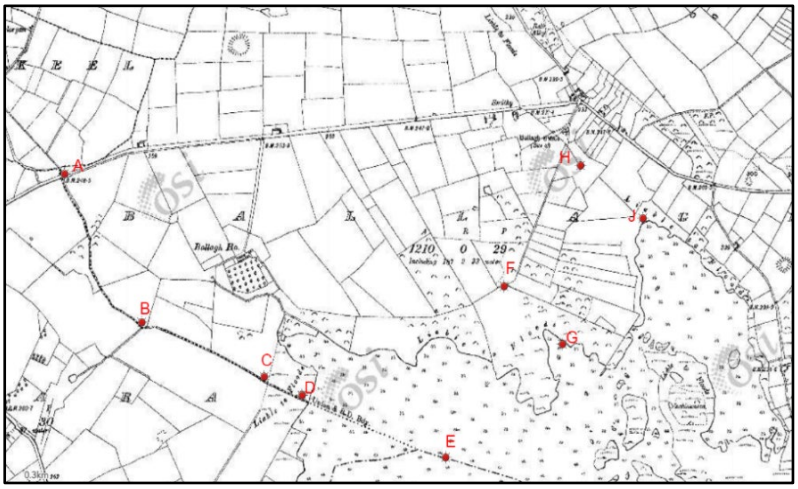
3.2 Flooding in the townland of Ballagh

The northern portion of Lough Funshinagh is located in the townland of Ballagh. Figures 30 to 34 show the OSI maps of this area at points in time between 1838 and 2018. The points A to J have been added.

Pre drainage works the NW corner of the turlough is recorded at point E adjacent to a narrow strip of land.

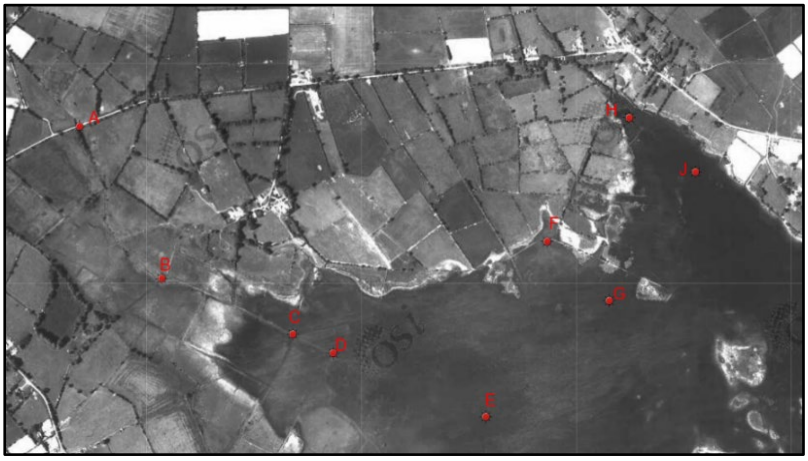
Top of water level: 64.04m OD (219' Poolbeg). Date not recorded.

Figure 30: OSI 6" map (1838 First Ed. Colour - pre drainage)



Post drainage works the NW corner of the turlough is recorded at point D. Point E and the narrow strip of land are now submerged. The area of water to the west of points F and G has altered. An area to the north of the L2006 junction is recorded as "*Liable to Floods*" Top of water level: 64.32m OD (219.9' Poolbeg) 8th June 1912

Figure 31: OSI 6" map (1912 Final Edition – post drainage)



The black and white aerial photography was flown between April and July 1995.[15] With the exception of A and B, all points are recorded as under water.

The water beyond Point H is approx. 135m from the L2006 junction.

Figure 32: OSI Digital Globe imagery 1995

The 2011 – 2013 aerial photograph records that the water has receded along the line B/C, the evidence of previous flood lines is shown by the damaged areas of grassland. The NE corner hasn't receded significantly indicating lower ground in this area.

Figure 33: OSI Digital Globe Imagery 2011 – 2013

The 2013 - 2018 aerial photograph is almost identical to the 1995 aerial photograph.

Top of water level 68.25m OD 2016

Figure 34: OSI Digital Globe Imagery 2013 – 2018

[15] Tailte Eireann

3.3 Flooding around Lough Funshinagh 1995 -2010

The 1995 Imagery is shown in Figure 35. The flood extent is similar to that shown in the 2013-2018 imagery. The Google Historical Imagery 2006 is shown in Figure 36, the damaged grass areas in the NW and NE are evidence of previous flood extents.

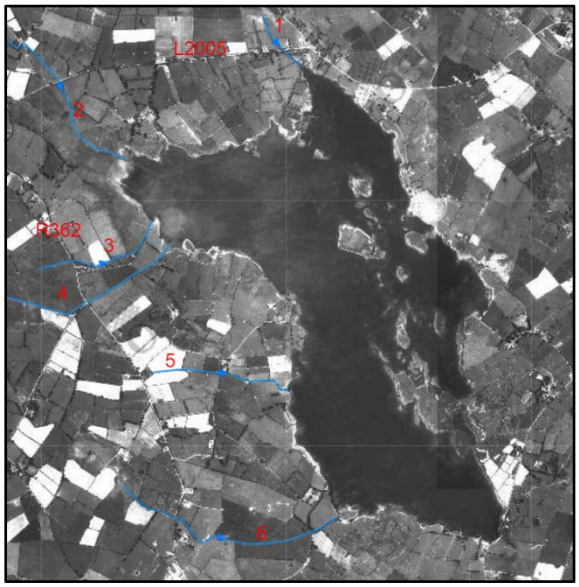


Figure 35: OSI Digital Imagery 1995

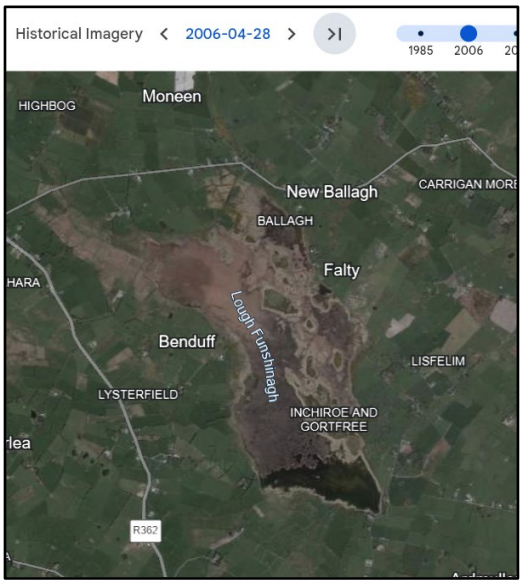


Figure:36 Google Historical Imagery 2006

The Dysart turlough is approx. 7.5km SW of Lough Funshinagh. The flooded turlough in 1995 is shown in photograph No.5. This photograph had been provided to RCC in 2010 and 2011.Met Eireann records for the Lecarrow station are shown in Figure 37.

Photograph No. 5: Dysart Turlough looking north Spring 1995

Lecarrow

Date	Rain (mm)
oct-1994	29.4
nov-1994	71.1
dec-1994	186.9
jan-1995	161.9
feb-1995	124.3
mar-1995	68.2
apr-1995	13.1

Figure 37: Lecarrow rainfall records

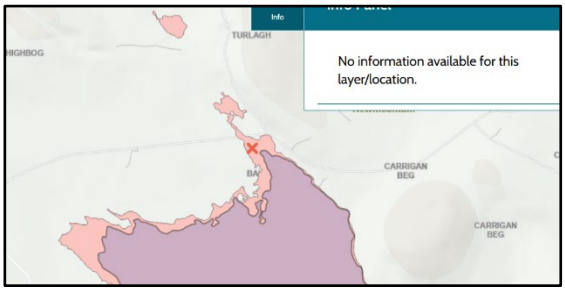
Both the first and last editions of the 6" map record the area of all townlands in acres, roods and perches. The maps also record how much water is included in this area. Omitting the roods and perches the water in the townland of Ballagh is recorded as 161 acres in 1837 and as 187 acres c1912, an increase of 26 acres.

During the period 1912 to 2013 there can be no doubt that the turlough flood line continued to push northwards flooding an increasing acreage of farm land in the townland of Ballagh. This flooding was not recorded in any flood data.

> *In 2009 the water level was 67.00 mOD which was the highest on record at the time, but this did not cause flooding to roads or property.*[16]

The 2009 flooding caused flooding to the agricultural land in Ballagh and a resultant loss of income for the landowners affected.

Between 2016 and 2019 GSI developed Groundwater Flood Maps, the maps can be viewed on the OPW flood info maps site. The map for the portion of the townland of Ballagh adjacent to Lough Funshinagh is shown in Figure 38. The pink area is the "*High Probability*" area as described below. The map records "*No information available for this layer/ location*" for the entire "*High Probability*" area.

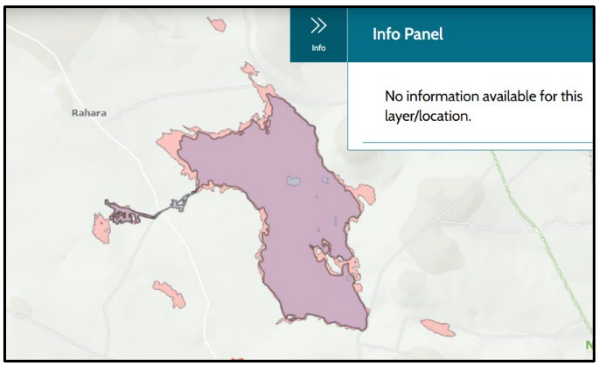


GSI Groundwater Flooding - High Probability

Geological Survey Ireland have developed Groundwater Flood Maps for the Republic of Ireland. The maps were developed in as part of the 2016-2019 GWFlood project in collaboration with Trinity College Dublin and the Institute of Technology Carlow.

Figure 38: OPW Floodinfo map (high probability)
Townland of Ballagh and North section of Lough Funshinagh

The Groundwater Flood Probability Maps shows the probabilistic flood extent of groundwater flooding in limestone regions. These maps are focussed primarily (but not entirely) on flooding at seasonally flooded wetlands known as turloughs. It should be noted that the predictive maps are limited to locations where the flood pattern was detectable and capable of being hydrologically modelled to a sufficient level of confidence.[17].



The OPW Groundwater Flood Map for the Lough Funshinagh area as a whole is shown in Figure 39.

As before the map records "*No information available for this layer/ location*" for the entire "*High Probability*" area.

Figure 39: OPW Floodinfo map- Lough Funshinagh

16

Malachy Walsh and Partners Lough Funshinagh Athlone County Roscommon Flood Analysis Report March 2021

17 OPW Flood Info Maps

The OPW flood info site also records Past Flood Events

A Past Flood Event is defined as the occurrence of recorded flooding at a given location on a given date or on a recurring basis. The event is derived from available flood information documentation including flood event reports, news articles, archive information and photos.

The Flood Point symbol marks the approximate location of a past flood.

. *A Multiple / Recurring Flood Point symbol marks the approximate location of an area that has been affected by more than one Flood Event*

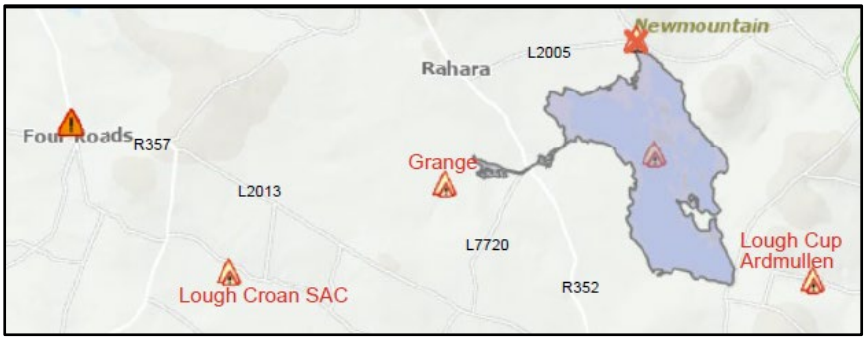


Figure 40: OPW Floodinfo map – Recurring Flood Points near Lough Funshinagh

To get more information, such as flood event reports or photos where available, regarding these events click on the flood point/boundary symbol which will bring up a "Flood Summary" pop-up in which the information available regarding that flood event is summarised and further information can be accessed.[18]

Further information from OPW Floodinfo maps

1.Four Roads

	Report Type	Report Name	Date	Description
VIEW	Report	Flood Mitigation study for Four Roads, Co. Roscommon	07/09/2010	Flood Study report for Four Roads, Co. Roscommon. Report provided by Roscommon Co. Co.

The Flood Mitigation study for Four Roads, Co. Roscommon was prepared by Ryan Hanley for RCC in 2010 following the extreme rainfall events of Winter 2009. The aim of the study was

> The aim of the study is to identify practical measures to prevent or alleviate damage to dwelling houses and businesses and disruption to road users due to flooding in the vicinity of Four Roads, for a flood equal in magnitude to that experienced in November 2009. Local flooding in the vicinity of Four Roads which followed the extreme rainfall events of October and November 2009 caused severe and prolonged hardship to residents and disruption to commuters using the R357.

2.Lough Cup Ardmullen

	Report Type	Report Name	Date	Description
VIEW	Letter	Severe flooding on the Lower Ardmullen Road	29/03/1995	Residents' Report. Photos and description of flooding at a number of locations in the Ardmullen/Rockhill area of Roscommon
VIEW	Source Meeting Minutes	Athlone Area Engineer Meeting - Minutes	03/12/2004	Minutes of meeting identifying areas subject to flooding. Roscommon - Athlone Area Engineer
VIEW	Source Meeting Minutes	Athlone Area Engineer Meeting - Map 1	07/12/2004	Map accompanying minutes of meeting identifying areas subject to flooding - Roscommon Athlone Area

[18] OPW Floodinfo maps

1. Residents Report 1995
   The report to RCC Severe flooding on the Lower Ardmullen Road begins by saying

> I am writing to you on behalf of the Ardmullen (Upper and Lower village) Action group who represent the families of the surrounding area who have suffered severe hardship in 1995 due to the flooding.

The full report is in Appendix A

2. Athlone Area Engineer Meeting -Minutes 03.12.2004 (Appendix B)

Item14. Ardmullan - The small lake level rises, and the road was liable to flooding. The level of the road has been raised. Flood Id 163

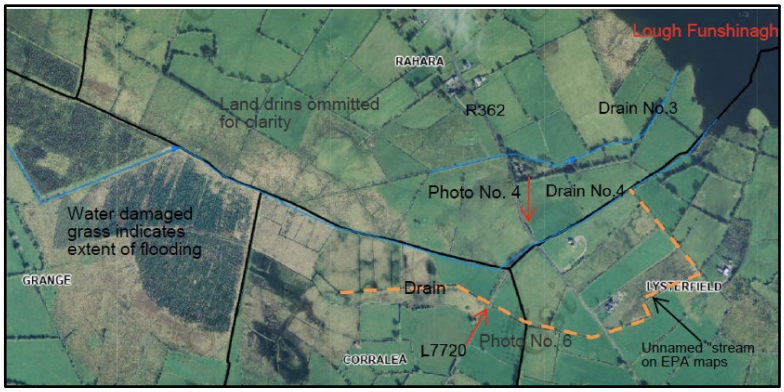
Item 25. Grange – A large low-lying area is prone to flooding. The road is liable to flood in exceptional years. Flood Id = 184 Grange is adjacent

3. Athlone Area Engineer Meeting - Map 107.12.2004 (Appendix B)

Item 3 -Extract from -Map 1

Item 14 refers to a *"small lake"*, this is the waterbody known as Lough Cup and is marked with an X on the map.

Item 25 – Grange is marked with an X on the map. The extent of the area of flooding is shown in Figure 41. The flooded area is identified in the 1890 maps as "*Liable to flooding*"



Grange is to the west of Corralea. The orange dotted line is the "unknown" drain on the EPA maps and the recorded location of EPA Guage No. 26243. Photo No. 4 (Nov.2022) shows water flowing across the L7720 from the flooded corner field. See also Figure 15

Figure 41: Area of flooding recorded in minutes of RCC meeting 03.12.2004

Local knowledge recalls flooding in the Correal townland in 2012 and RCC maintenance staff clearing the culvert to relieve the flooding.

This type of maintenance work is confirmed in the summary of the Area Engineers minutes "*The council does install, unblock and replace culverts to alleviate flooding"*

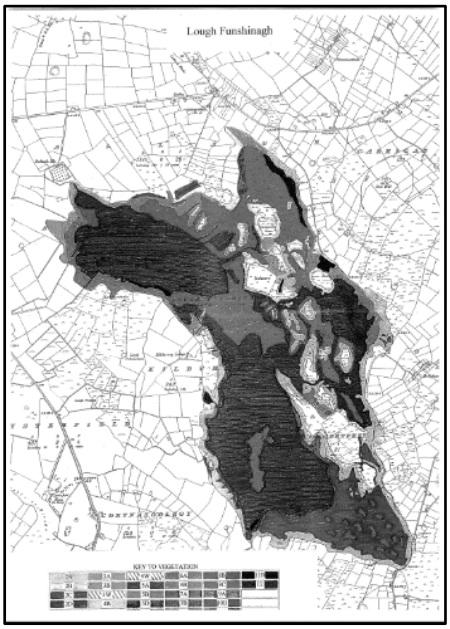
4. Lough Funshinagh

	Report Type	Report Name	Date	Description
VIEW	Source Meeting Minutes	Athlone Area Engineer Meeting - Minutes	03/12/2004	Minutes of meeting identifying areas subject to flooding. Roscommon - Athlone Area Engineer
VIEW	Report	GSI Turlough Data	14/04/2005	List of Turloughs with locations (some townlands and a few coordinates in this report for the turlough locations required modification, these have been corrected in the GIS and flood events in conjunction with the GSI and/or other flood reports)
VIEW	Report	Turlough SACs and NHAs		National Parks and Wildlife Service document. List of Special Areas of Conservation (SACs) and Natural Heritage Areas (NHAs) that are reported to include turloughs. Sites in Roscommon, Clare, Longford, Galway, Kilkenny, Sligo, Mayo, Donegal
VIEW	Report	SAC designated Turlough locations		National Parks and Wildlife Service list of Special Area of Conservation (SAC) designated sites that contain turloughs. Sites in Roscommon, Clare, Longford, Galway, Kilkenny, Sligo, Mayo
VIEW	Map(Paper)	Additional Vegetation Surveys of Turloughs		National Parks and Wildlife Service document. Set of maps. Vegetation Survey for Turloughs in extent and evaluation of their value and sensitivity. Sites in Roscommon, Clare, Donegal, Mayo

1. Athlone Area Engineer Meeting -Minutes 03.12.2004 (Appendix B)
   Item 10. Lough Funshinagh- This lake disappears in dry years. Last disappeared in 2003. Flood Id I096

2. Additional Vegetation Surveys of Turloughs

This item is an undated NPWS document which includes a map of Lough Funshinagh, part of a set of maps entitled "*Vegetation Survey for Turloughs in extent and evaluation of their value and sensitivity" L*ough Funshinagh is shown significantly flooded in the NE and NW corners.



Map (Paper) Additional Vegetation Surveys of Turloughs

3.4 Flooding around Lough Funshinagh 2015 - 2024

The historic maps show the lands in the section of the townland of Ballagh north of Lough Funshinagh have been subjected to flooding since 1890. Property flooding isn't recorded until 2015/2016.

A report in 2021[19] notes *During the 2015/2016 flood event, two houses in Ballagh near the shore of Lough Funshinagh were flooded. These are referred to as House A and House E on the map in Figure 3. Three other houses in Ballagh, Houses B, C & D were at risk of flooding with minimum freeboard above the maximum flood level.* ***A house is Lysterfield, House F, and a section of the R362 regional road were flooded. Two houses, House G and House H and a group of farm buildings at Srahauns at Lough Cup were cut off by severe flooding of the road over an extended period. ...****in the winter of 2015/2016 (when) the water reached a* ***level of 68.25 mOD.*** (emphasis added)

Figure 42: Figure 3 from Malachy Walsh & Partners 2021 report

National Library of Scotland
Leabharlann Nàiseanta na h-Alba

The height data is obtained via the Géoportail Altimetrie Web Map Service, based on elevation information from the N.A.S.A. Shuttle Radar Topography Mission (SRTM3) Global Digital Terrain Model. This height information may give a general idea of heights when looking at maps without surface heights, bench marks, or contours, but it is likely to be less accurate than the heights that are shown on more detailed, larger-scale mapping (e.g. at1:10,000 scale or larger).

Points marked thus are approx. 68m OD

Figure 43: ESRI World Imagery Map with heights (National Library of Scotland)

The OD levels for the points marked in Figure 43 are approx. 68.0m OD. An approximate elevation profile on the L2205 at House B is shown in Figure 44.[20] At a flood level of 68.25m OD it was inevitable that these houses and roads would flood. "*Two houses, House G and House H and a group of farm buildings at Srahauns at Lough Cup were cut off by severe flooding of the road over an extended period.*" This is exactly what the Ardmullen Action Group identified to RCC in 1995.

[19] Lough Funshinagh Athlone County Roscommon Flood Analysis Report on behalf of Roscommon County Council Rev D March 2021 Malachy Walsh and Partners (MWP)
[20] National Library of Scotland – Georeferenced Maps

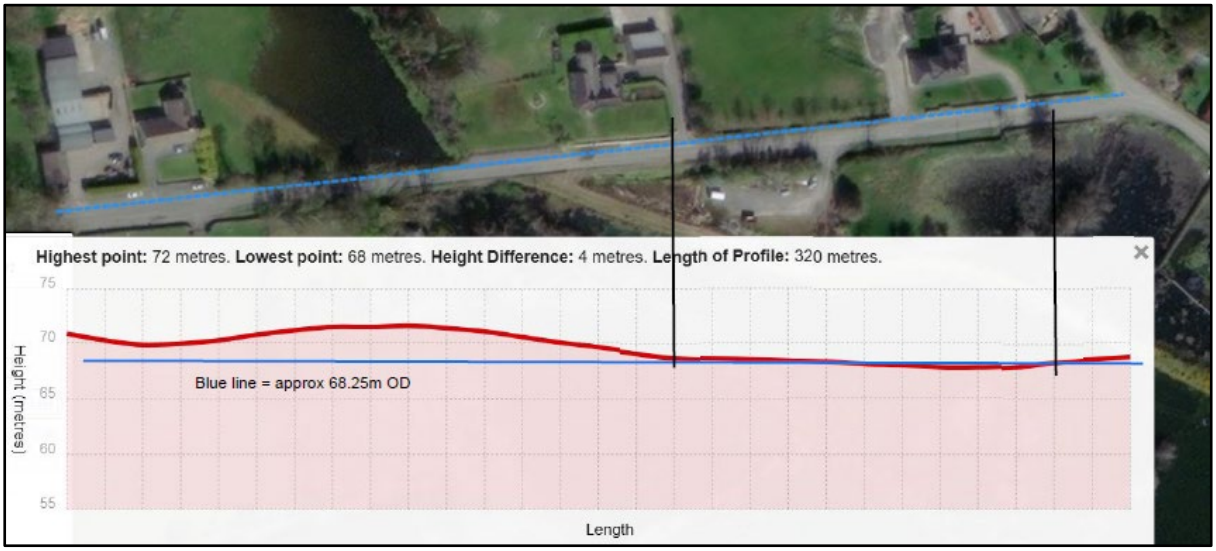


Figure 44: Elevation profile of the L2005 outside houses B, C and D.

A 2024 report by MWP[21] states

> *The lough reached a record peak level of 69.37mOD on the 16th of April 2024. The lough is impounded by the surrounding hills which have their lowest crest level of about 69.30mOD at a location near its southwest corner. As a consequence, the lough overflowed in 2024 and* ***flooded a large area of land at Carrick/Lysterfield*** *and resulted in the temporary evacuation of two houses, one of which has now been permanently vacated.* (emphasis added)

The April 2024 event was reported on by the national and local press. One local newspaper reported as follows[22]

> *A section of a busy County Roscommon road threatened by flooding is to close for an unspecified period of time "in the interest of public safety". This evening Roscommon County Council announced that the R-362 at Coolnageer, Curraghboy, would close from tomorrow for "the minimum period necessary". Emergency Services and local access only will be accommodated.*
>
> *"**Due to ongoing flooding adjacent to Lough Funshinagh in the townland of Coolnageer,** it is necessary to close the R-362 from Lysterfield to Curraghboy," the council said. "Local access shall be in place and diversions will be sign posted between Athleague and Curraghboy."* (emphasis added

RCC issued a public notice advising of the road closure using the EPA map to illustrate the extent of the closure. This is shown in Figure 45. Figure 46 shows the same EPA map with the *water features layer* switched on showing the drains in the area and the location of the EPA "*Water Level and Flow Gauge"*.

All records of floods in the area are displayed. The EPA map records the flooding in Carrick

[21] LOUGH FUNSHINAGH INTERIM FLOOD RELIEF SCHEME Engineering Report

[22] Roscommon Herald 11 April 2024

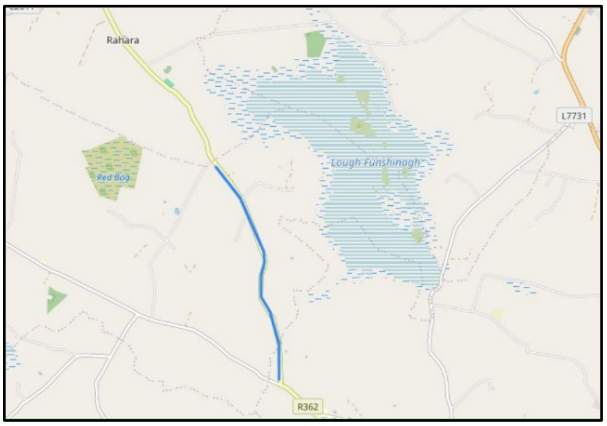


Figure 45: Public notice of R362 closure in April 2024

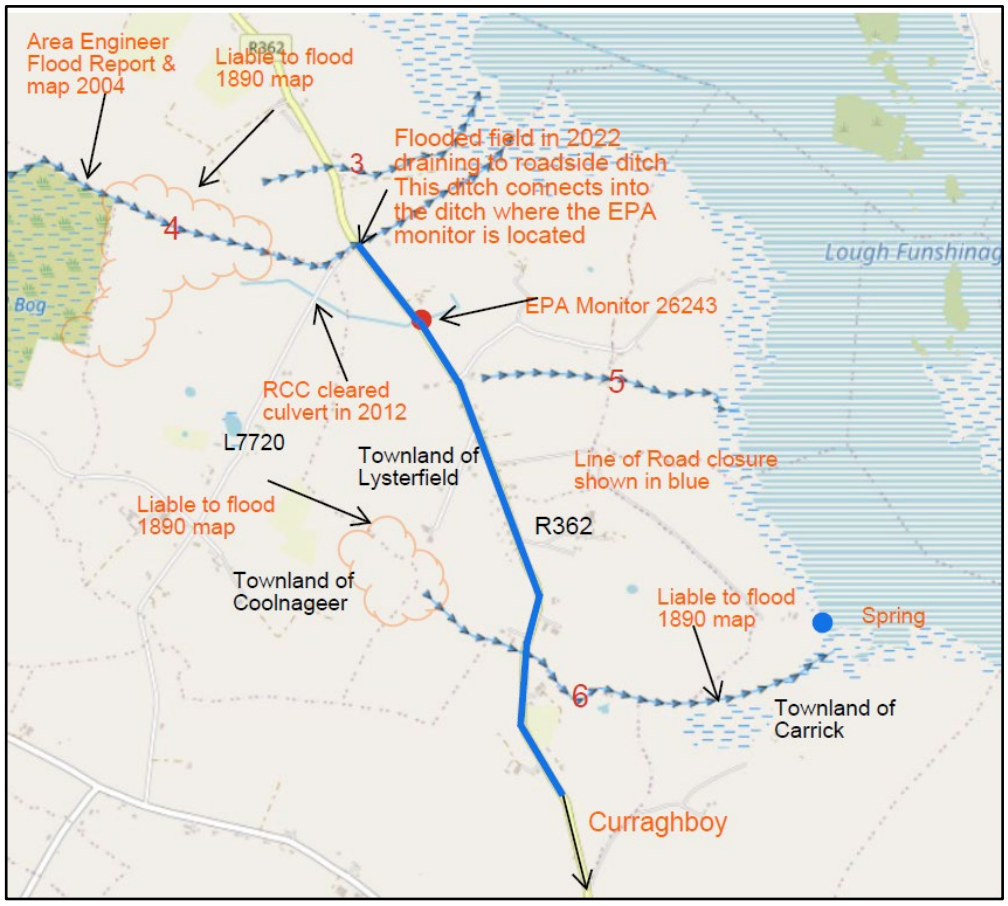


Figure 46: Public notice of R362 closure with drains and flood events added

"flooded a large area of land at Carrick/Lysterfield" because these are low lying areas within the 70m contour and have been identified on the OSI 25" 1870 map as *Liable to floods* and because a drain connecting the flooded area in Lysterfield to the turlough backed up.

The open roadside drains along the R362 adjacent to the old Lysterfield demesne and which were engineered to discharge to drain No.6 probably exacerbated the flooding on the R362.

There may have been flow from the spring in the SW corner but the turlough did not overflow.

Due to ongoing flooding adjacent to Lough Funshinagh in the townland of Coolnageer, which was first identified in 1890.

An area which flooded in 1890 and hadn't undergone any flooding defence work will still flood in 2024.

3.5 Current analysis of the flooding around Lough Funshinagh

1.0 Introduction

The Lough Funshinagh Technical Subgroup was initiated by Roscommon County Council in April 2024 to examine the Lough Funshinagh flood regime in a hydrological and ecohydrological context. The group consists of turlough hydrogeology specialists from South East Technological University, Geological Survey Ireland, National Parks and Wildlife and Trinity College Dublin.

3.2 Lough Funshinagh 1941-2024

The calibrated Lough Funshinagh model was used to reconstruct water levels between 1941 and present using historical rainfall data from Met Eireann (Figure 3). Before 2007 the peak water level in the series occurs in 1948, which is supported by anecdotal evidence of exceptionally high water levels in the Spring of that year (OPW, 2022). A shift towards higher flood levels can then be seen from 2007 onwards[23].

Figure 47 shows significant dates and groundwater events superimposed on Figure 3. Without full knowledge of the construction of the model it is not clear if 63.0m OD is the actual bottom level of the turlough. For the purpose of this exercise that isn't significant, the recorded years which the turlough reset (emptied) are shown with green arrows. There is a distinct pattern in the graph.

The recorded flood years are shown by a blue line and the summers between 2007 and 2015 are shown by a red arrow. The red line across the centre of the graph is the top of water level in the summer of 2015. Available information and dates are also included

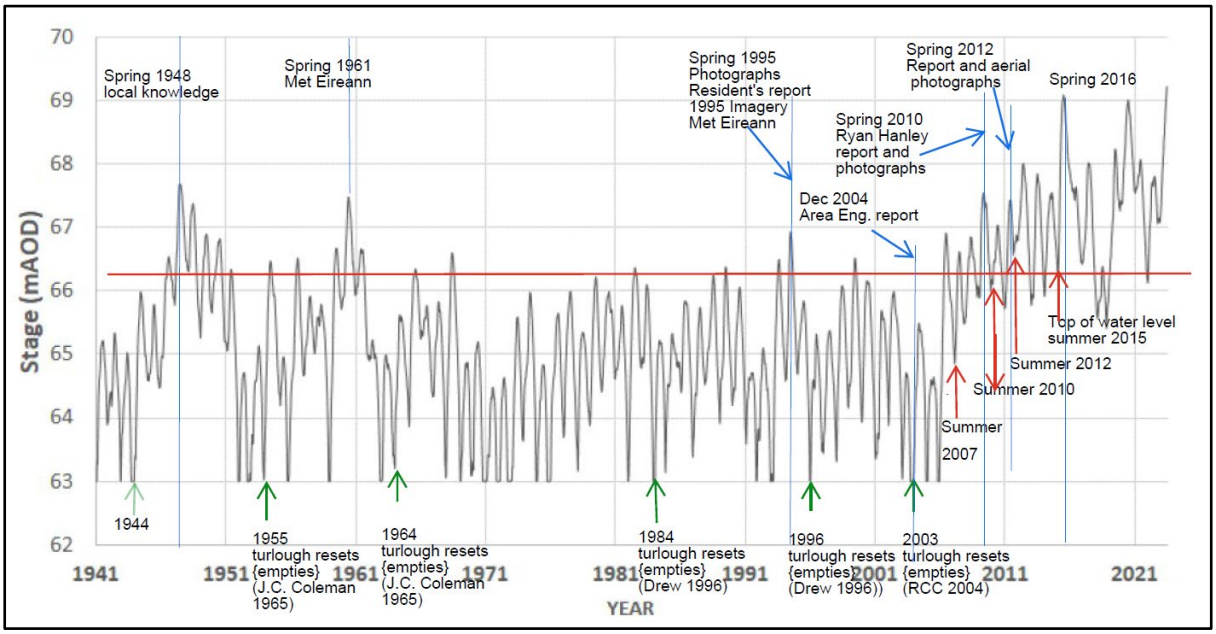


Figure 49: Figure 3: Long-term modelled water level hydrograph for Lough Funshinagh, Co. Roscommon. For the period 1941 to 2024. (dates and notes added).

[23]Modelling and analysis of Lough Funshinagh Flood Levels 13th June 2024 Lough Funshinagh Technical Subgroup Naughton et al

The high-water level of Spring 1948 is followed by three springs of relative high levels with only moderate falls in summer levels. The top of water level in the summer of 1950 is about 600mm lower than that of 2015.

In 1955 the first recorded reset occurs.

> *J.C. Coleman (1965) remarks:* [24]
>
> *"In November 1955, the tenth time in the last fifty years, the waters of the lake vanished down a swallow hole, leaving hundreds of fish stranded on its muddy bottom. In July 1964 I visited the site, and grass was growing over most of the lake bed. Like Lough Nasool in south Co. Sligo, it appears that collapse of the plugged material in swallow holes causes these sudden disappearances.*

The 1944 to 1955 pattern is repeated in a very similar manner in the years 1955 to 1964.

From 1964 initially the pattern appears to be repeating with the first peak in 1969 but no subsequent peaks instead there is steady filling and emptying. No reset event is recorded for these years.

Pre the 1984 reset there are two winters with high water levels.

The pattern returns for the1984 to 1996 period with one peak before and one peak after the peak 1995 spring followed by a reset in summer 1996.

The 1996 to 2003 pattern is similar to the 1984/1996 pattern with a reset in 2003.

Post the 2003 reset the pattern began again, water levels in 2006, 2007 and 2008 are similar to 1949,1950 and 1951.

At this stage RCC and the various bodies tasked with monitoring and maintaining Lough Turlough, those responsible for flood protection and those responsible for the public safety should have been watchful but not overly concerned.

The Met Eireann Lecarrow weather station recorded a monthly rainfall of 250.5 mm for the month of Nov 2009, which represents over 250% of the monthly average. The November rainfall was preceded by a wet summer. The combined events resulted in widespread flooding

> *The extreme rainfall of November 2009 follows flooding in many areas in the summer of 2008. These events have occurred against a backdrop of very poor (i.e. wet) summers in three consecutive years (2007-2009*)[25].

In August 2010 RCC engaged Ryan Hanley to prepare Non Coastal Minor Flood Mitigation Studies for five locations in County Roscommon, namely

- Four Roads (Tisrara)
- Strokestown
- Elphin
- Lissalway, Miltown & Knocklaghta
- Grange

[24] The GSI Groundwater Newsletter, No.30 Nov 1996. David Drew and Morgan Burke, Department of Geography, TCD.
[25] Met Eireann Climatological Report No.12 Report on Rainfall of Nov 2009 Seamus Walsh

The report on Four Roads states "*The aim of this study is to identify practical measures to eliminate flooding from an event similar in magnitude to the November 2009 event.*

LECARROW
rain: Precipitation Amount (mm)

Date	rain
jan-2012	109.7
feb-2012	46.5
mar-2012	25.9
apr-2012	46.7
may-2012	52.7
jun-2012	190.3
jul-2012	120.1
aug-2012	119.3
sep-2012	61.0
oct-2012	124.7
nov-2012	81.1
dec-2012	119.0

Figure 50: Met Eireann Rainfall record for Lecarrow 2012

In the spring of 2010, the top of water level in Lough Funshinagh reached a peak not seen since 1948. A reset was due and was urgently needed.

The months of October, November and December 2011 saw more above average rainfall and subsequent flooding throughout the country including County Roscommon. The summer of 2012 was the wettest on record, and still there was no reset. Met Eireann records for 2012 are shown in Figure 50.

At this point RCC had four separate reports on the flooding in the Lough Funshinagh area. One in the Grange area RCC itself had commissioned and another from their own area engineer complete with a map showing the flood locations.

In addition, RCC had a detailed report regarding flooding in the Dysart and Skeavally areas along with aerial photographs of the flooding. Areas that are within 7.0km of Lough Funshinagh.
The reports and aerial photographs were submitted to RCC as part of an objection by a local community group to proposed windfarm developments in the areas of Dysart and Skyvalley. These areas share the same geological and hydrogeological characteristics as the Lough Funshinagh area, both are underlain by limestone that has been extensively karstified.

Of particular concern to the communities was the effect the development would have on the turloughs in the areas these include Cuilleenirwan, Coolagary, Feacle and Dysart turloughs. The report provided maps of the turloughs and the flooding in Dysart pre and post the drainage works.
The submission highlighted the historical changes to turloughs in the areas due to 19th century drainage works and the consequent serious flooding resulting from such works. The evidence in the report that the flooding in Dysart, as shown in Photograph 5, was as a direct result of the 19th century drainage works carried out in the area was undeniable.

The report was submitted to RCC on at least four occasions. RCC never responded to the report or requested the applicants who sought permission for the windfarm development to respond to the report. The report was submitted to the Boards at each appeal and a summary was included in the submission to the Board in September 2022. The Board took the same action as RCC i.e. they did nothing.

Returning to Figure 49, by the summer of 2012 those tasked with the responsibilities described before should have been seriously concerned about the situation in Lough Funshinagh, concerned enough to take preventative action. There was overwhelming evidence available to RCC that the turlough was in serious trouble. With a few exceptions the top of water level in the summer of 2012 exceeded the spring top of water levels of the past sixty years. There could be no expectation that the rainfall amounts would decrease, it was now widely accepted that climate change was real and with it more rainfall could be expected.

If RCC had heeded the warnings it had been given by the Dysart and Skeavally communities and acted and engaged experts in various aspects of turloughs, karst, hydrogeology, ecology then a predictive study could have been carried out. An effective and sustainable solution could have been arrived at, put in place and the present crisis would have been prevented.

But RCC didn't act responsibly and with foresight. How could they have acted in this manner when they ignored scientific based evidence and the undisputable evidence of aerial photographs. All this coupled with a lack of knowledge of the basic hydrogeological mechanism of Lough Funshinagh made a flooding crisis inevitable.

But neither RCC, the OPW, NPWS, Irish Water, the EPA or any one of the myriads of bodies tasked with looking after flood defences, public safety, water quality and the wellbeing of Lough Funshinagh and more importantly the wellbeing of the communities of Lough Funshinagh took any action to avert the consequences of a totally predictable series of events.

> *Given the first recorded instance of significant flooding around Lough Funshinagh occurred in 2016, this would lend further evidence that there has been a significant shift in hydrological behaviour towards higher flood levels post-2016*[26].

The Technical Subgroup have been misinformed if their understanding is that *the first recorded instance of significant flooding around Lough Funshinagh occurred in 2016*. The following records of significant flooding are held by or available to RCC

1. The OSI 25" 1890 maps record flooding of valuable farmland in the townland of Ballagh as well as flooding in the surrounding townlands

2. The 1995 satellite imagery shows the effects of the 1995 rainfall events.

3. A 1995 report and letter from the Ardmullen (Upper and Lower villages) Action Group

4. A 2004 report and map by a RCC Area Engineer

5. A 2010 report by Ryan Hanley on flooding at Four Roads - 6.7km west of Lough Funshinagh.

[26] Modelling and analysis of Lough Funshinagh Flood Levels 13th June 2024 Lough Funshinagh Technical Subgroup Naughton et al

6. A 2010 report by Ryan Hanley on flooding in the townland of Grange – 1.8km west of Lough Funshinagh. Flooding which a RCC area engineer had previously identified in 2004
7. Feb 2012 aerial photographs of the floods approx. 7.0km from Lough Funshinagh. Lough Croan Turlough SPA located approx. 4.0 km SW of Funshinagh can be seen in the aerial photographs.

8. 2010 and 2011 reports on the disastrous effects of 19th century drainage on flooding and turloughs

The narrative that the flooding was an unforeseen event attributable to

> *the exceptional level of rainfall before and during the 2015/2016 flood event it is reasonable to conclude that the extreme water level in the Lough was due to rainfall only and not necessarily to any external factors affecting the outflow rate.*[27]

was carefully crafted to deflect attention from the reality that the crisis began to unfold as far back as at least the summer of 2010 and neither RCC nor any statutory body did anything to avert it.

> *The levels suggested a change in the subsurface drainage network following the 2015/2016 flood event resulting in a change in the filling and draining dynamics.*[28]

Definitive expert conclusions based on an entirely fictious premise.

Repetition makes a statement seem true, regardless of whether it is or not, it is a very common and effective stratagem. Psychologists refer to it as the "illusion of truth" effect. So, the narrative that the extreme rainfall events of the previous few years was the sole cause of crisis is repeated and eventually it is accepted as fact.

The fact that the turlough was filling from groundwater from a subterranean network of conduits and caves wasn't even considered because "*While the lake has apparent karst drainage features (and has been successfully traced to a spring 5km to the south), it is filled predominantly by surface water rather than groundwater.*"

The fact that the turlough was filling from groundwater from a system of artificial drains wasn't entertained despite RCC and the Board being advised that such a drainage system existed at Cuileenirwan and Coolagary turloughs both located less than 5.0km SW of Lough Funshinagh.

The fact that a report and drawings supporting the evidence of the drainage system and its devasting effects on the Dysart turlough and probably other turloughs had been provided to RCC as early as 2011 and to the Board in 2013.

The fact that RCC and the Board were reminded of this at every available opportunity

[27] Lough Funshinagh Athlone County Roscommon Flood Analysis Report on behalf of Roscommon County Council Rev. D MWP 05.03.2021

[28] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited

The fact that a regularly occurring reset mechanism had evolved to discharge this surplus water was ignored.

The fact that this mechanism had failed to occur when the water levels were steadily rising was ignored.

Most importantly the concerns of three communities were ignored by practically every statutory body. The communities were left to defend their environment and the threats from flooding as best they could.

The *subsurface drainage network* changed long before 2015/2016, it changed when the turlough failed to reset itself. There certainly was a change in the draining dynamics but there was no change in the filling dynamics, not since the 19th century.

But then Lough Funshinagh wasn't a real turlough it was "*a disappearing lake rather than a turlough"* it filled "*predominantly by surface water rather than groundwater"* and "*essentially behaves more as a backed-up swallow hole than a typical groundwater fed turlough*."

The exceptional rainfall of 2015/2016 brought forward a crisis that would have eventually happened even with normal rainfall amounts. The turlough had failed to reset itself and consequently the net inflow was greater than the net outflow. The turlough was moving steadily in a NW and NE direction as it had done on previous occasions, only this time there would be no reprieve for the communities. Unable to reset itself the turlough inevitably flooded all low-lying property and the disaster fully unfolded.

The flooding has caused untold psychological and financial damage to the communities around Lough Funshinagh, psychological damage that they will never fully recover from. And not just the Lough Funshinagh communities, the community of Curraghboy are also impacted waiting and wondering when this flood of water is going to come through their village

> *Curraghboy is a significant location at Lough Funshinagh because it is the lowest potential overland discharge route from the lough. If there is no intervention, then rising water levels in the Lough will be limited by water discharging by gravity and flowing overland in a southerly direction towards Curraghboy village.*[29]

Lough Funshinagh had behaved in a relatively predictable manner since 1905 – over one hundred years

> *In November 1955, the tenth time in the last fifty years, the waters of the lake vanished down a swallow hole, leaving hundreds of fish stranded on its muddy bottom.*[30]

and RCC were proud of its uniqueness

> *The rarity of such disappearing lakes in Ireland means that this site has already been recommended by GSI for designation as a geological Natural Heritage Area by the NPWS.*[31]

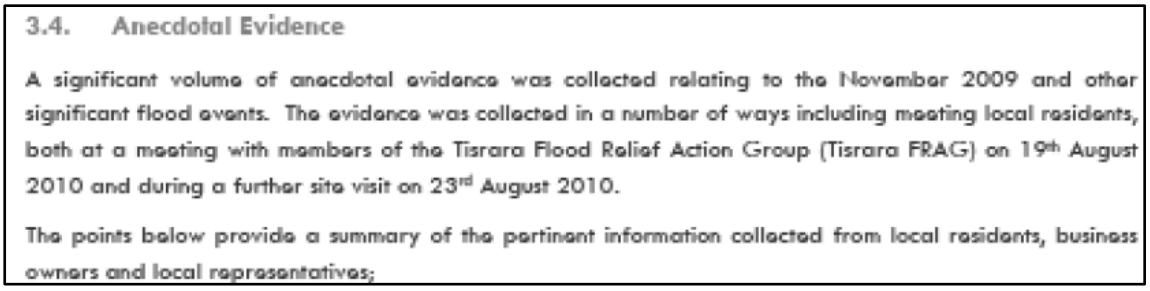
[29]LOUGH FUNSHINAGH INTERIM FLOOD RELIEF SCHEME Engineering Report MWP Sept 2024

[30] JC Coleman 1965

[31] RCC CDP, County Geological Site Report – Lough Funshinagh

Why then did RCC not act when the turlough began to display unusual behaviour? Why did they not examine the various reports and look for answers? Why did they not seek expert advice?
The consequence of their inaction was so profound that something had to be found wanting, the easiest option was to blame it on the weather.

Collecting evidence from first hand witnesses is best practice in compiling any report concerning a disaster
The Ryan Hanley report of 2010 on the Four Roads flooding devotes two and a half pages to anecdotal evidence.



3.4. Anecdotal Evidence

A significant volume of anecdotal evidence was collected relating to the November 2009 and other significant flood events. The evidence was collected in a number of ways including meeting local residents, both at a meeting with members of the Tisrara Flood Relief Action Group (Tisrara FRAG) on 19th August 2010 and during a further site visit on 23rd August 2010.

The points below provide a summary of the pertinent information collected from local residents, business owners and local representatives;

.
In their 2021 report MWP note

> *Malachy Walsh and Partners made several visits to the site and had consultations with Roscommon County Council engineers and public representatives. RCC provided information on the extent of previous floods, water levels records and details of two possible options for controlling the water level in Lough Funshinagh. MWP obtained additional information from GSI and Met Eireann.*
>
> *A local resident (now deceased), who lived close to the Lough, recorded in his diary that in the spring of 1948 the Lough reached a level higher than any achieved in the previous 100 years. Based on his son's interpretation of the description, the water level was at about 68.44 mOD.*

This is the only reference to anecdotal evidence.
Accounts of events by local residents are a very valuable resource in understanding the cause of a problem. The first recorded reset occurred in 1955, that is within living memory. The following resets are all certainly within living memory. There are local families who have lived in the area for three, four generations. Local knowledge says that when the resets occurred the water could be heard rushing through an area close to the tracer line location. What else do local people recall? The absence of first-hand accounts is a notable deficiency in all reports published to date.

The Technical Subgroup's report is the single most important engineering document in the entire contents of the application to the Board. The reverse engineering employed by the group gives an invaluable account of the hydrogeological regime of the turlough since 1941 and reveals the true origins of the disaster.
It is a significant step in achieving an understanding of the past, without an understanding of the past the present cannot be understood, and a future effective solution will prove elusive.

4.0 The origin of the surface streams error

> *The turlough has five known streams entering at the northern and western shores of the turlough[34] and two swallow holes in the southeastern corner which facilitates as the natural draining feature of the turlough. The EPA operates a gauging station on the largest stream, with data indicating that during filling events the turlough can receive over 40% of its net change in volume from this stream alone. This suggests that the lake is predominantly surface water fed, and groundwater drained.* [32]
>
> [34] *River Network Data was accessed from the EPA GIS platform at https://gis.epa.ie/EPAMaps/. Accessed July 2024*

The persistent claim by RCC, and many others, that Lough Funshinagh is fed by surface water streams is difficult to understand. Looking again at Figure 1, the area surrounding Lough Funshinagh is peppered with karst features and landforms. In 1996 Drew visited the site when the water had "disappeared" and stated *The lake is flat floored and shallow (2m maximum depth) and is filled by two small streams, little more than drainage ditches, entering from the north-west.*

Somehow *two small streams, little more than drainage ditches* metamorphosed into "*five known streams"* and became established as fact. The illusion of truth effect is again evident.

The EPAMaps website refers to the drainage channels as rivers and even has names for four of them. Is that the explanation? If the EPA describes the water bodies as such, then they must be surface streams. The documents submitted by RCC refers to the EPAMaps website as a source of information. Reference No. 34.

The EPAMaps *water features* dropdown menu says, "*Flow Network (indicative)*" and an information tab. Clicking on the information tab brings up the message

> *Flow Network (Indicative)*
>
> ***Abstract:*** *This water flow network dataset is a route feature class rather than a simple polyline. The geometry is generated by merging the river lines of individual geometric network datasets. This layer contains an integrated flow network that includes known flow connections through rivers, lakes and groundwater aquifers. In places where the network is depicted flowing through lakes or through underground channels, the flow channels are schematic only, and do not represent the precise location of these flow channels****. The appropriate Geological Survey Ireland data sets should be consulted where underground flows or connections are known or suspected.*** (emphasis added)

As previously noted, the GSI Groundwater Data Ireland ITM Viewer has a dropdown layer list from which various layers can be selected to be displayed on the selected basemap, Figure 49.

[32] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited September 2024

A sub menu of the surface water feature layer allows either or both EPA Rivers or EPA Lakes to be selected, Figure 49a. Selecting the surface water features/EPA Rivers option will display the six "*streams entering at the northern and western shores of the turlough*[34]". [33]

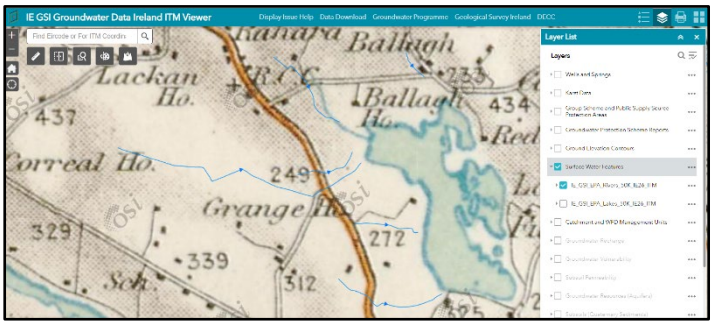


Figure 49: GSI Groundwater Data Viewer

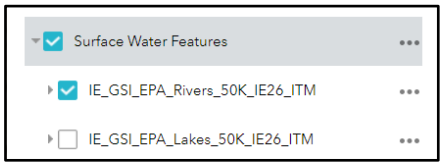


Figure 49a: Sub menu on GSI Groundwater Data Viewer

There is no reliable source for the six streams claim and by now its origins will have been lost. The only reliable source for the entire network of drains in the west of Ireland is the OSI 25" historical map. The only way to differentiate between drains and natural features is the 25" map. For an application of such significance as the current RCC one to the Board looking at historical maps on line is not sufficient. The original of the maps should have been examined and the errors engendered by RCC could have been avoided.

Who is paying for a report the engineering aspect of which is bases on fiction?
Some attempt has been made to illustrate the drains on the OSI Map premium Genie basemap, but they are only visible online by zooming in closely. The overlay may have been extracted from the latest satellite image as illustrated in Figures 50 and 51.

The lack of readily available accurate location and description of the 19th century drainage network is a major gap in the current database.

Figure 50: Google Earth – Drain No.2 and field drains

Figure 51: OSI Map Premium Genie – Drain No. 2 and field drains

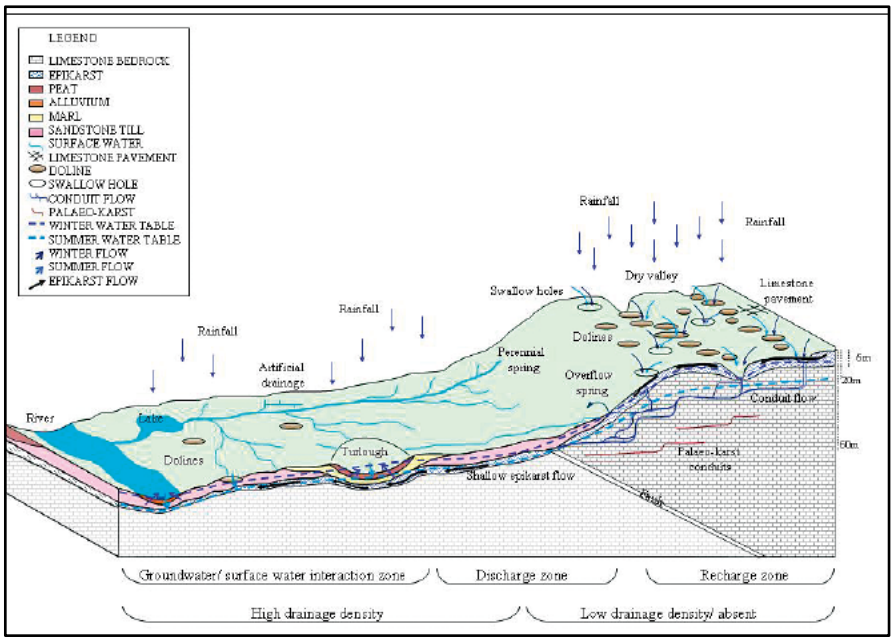
[33] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited

5.0 The outfall

5.1 Conceptual models

A study in 2009 of the Lowland Karst in North Roscommon notes

> *Roscommon is a karstified, western Irish, low-lying county. There is a great paucity of knowledge of the karst of Roscommon. Information from technical reports has shown the karstified nature of the bedrock in certain parts. However, previous to this research no large-scale investigations of the karst hydrology or its associated landforms have been carried out. The only research into the karst of Roscommon, prior to this research, was a study of five karst springs (Doak 1995).*[34]



Hickey's conceptual model illustrates the shallow epikarst flow and the conduit flow in the karstified limestone and the manner in which the turloughs fill. The major karst landforms are included and diffuse and point recharge is well demonstrated. The model also illustrates the artificial drainage common in Roscommon but perhaps underestimates its ubiquity.

Figure 52: Conceptual model of the karst of Roscommon (Hickey 2009)

The Lough Funshinagh conceptual site model submitted as part of the application[35] is shown in Figure 53. The "*Upstream Spring"* is unnamed but judging from the description it is Tobar Liagán, (Stone Well). The name has been anglicised to Toberlargan Spring. The well is remote from drain No. 2 as shown in Figure 54. A small overland flow from the stream adjacent to the well is artificially drained and discharges into drain No.2, the flow is miniscule.

Conduit flow and shallow epikarst flow is omitted from the model as is the contribution from the artificial drainage network. The illustration of a surface water stream infill and an outflow carving its way through the limestone rock is entirely without any supporting evidence. The illustration of the ground water flowing in a straight line through the karstified rock is invalid.

[34] The Use of Multiple Techniques for Conceptualisation of Lowland Karst, a case study from County Roscommon, Ireland. Caoimhe Hickey The Geological Survey of Ireland 9.12.2009

[35] Lough Funshinagh Interim Flood Relief Scheme Screening for AA and NIS Issue | September 2024 | Ove Arup & Partners Limited

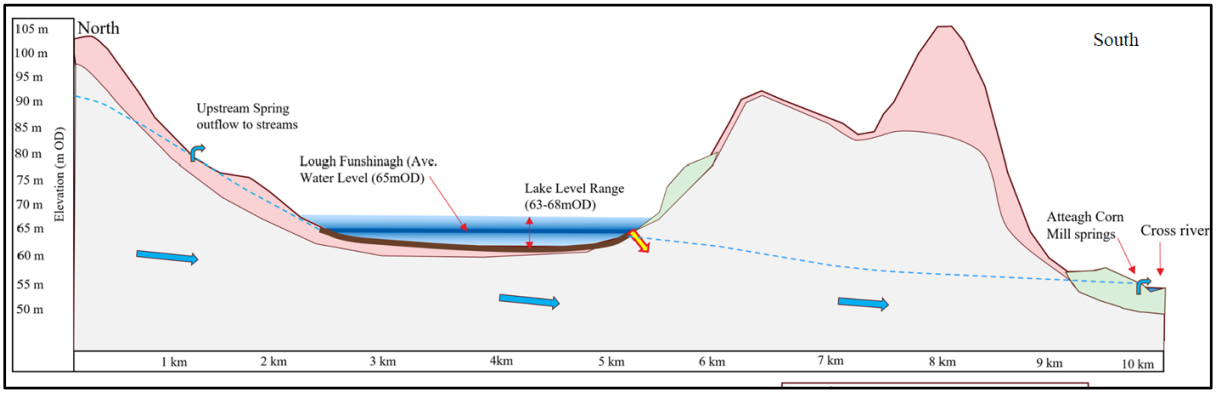


Figure 53: Lough Funshinagh conceptual site model

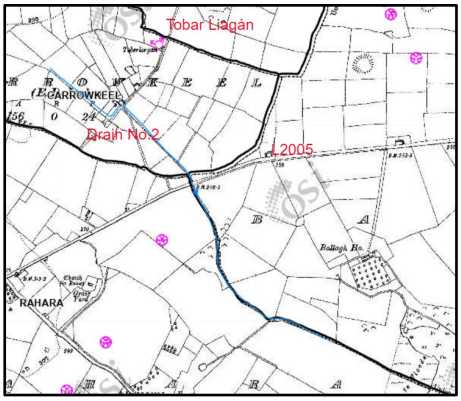


Figure 54: OSI 6" Third Edition – Tobar Liagán and Drain No.2

Figures 55 and 55a show the wells, springs, areas liable to flood and water bodies which are recorded on the OSI 25" map along with GSI identified karst data. These features combined with the tracer test results, the subsoil permeability and the ground contours all suggest that the flowpaths from Lough Funshinagh are within a "corridor" bounded at the swallow hole by the 80m contour and by the 60m contour at Mullagh spring.

The L7731 and the R362 are both recorded on the 25" map, Figures 56 and 57 show a plan and profile respectively along this corridor.[36]

[36] National Library of Scotland

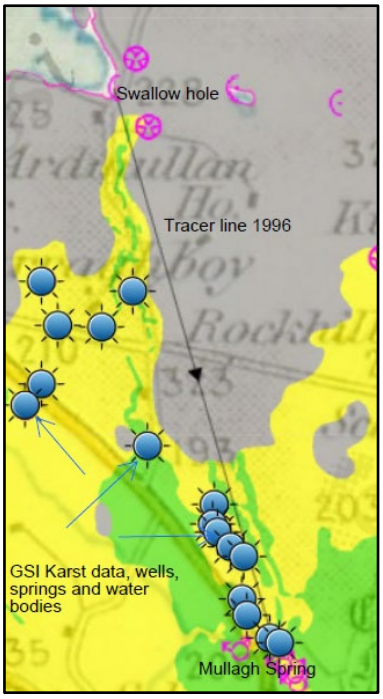


Figure 55

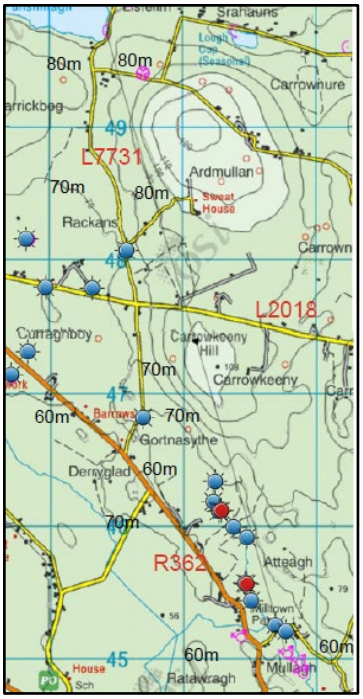


Figure 55a

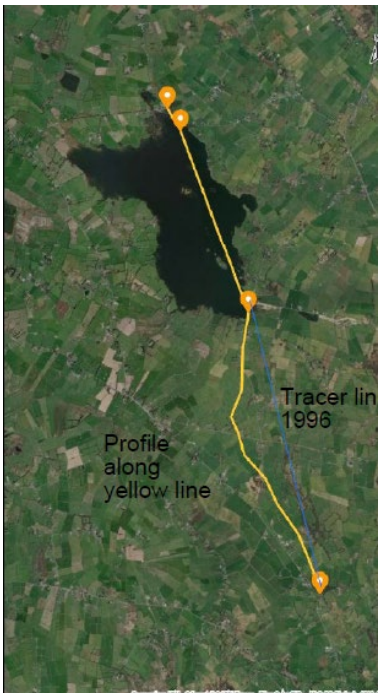


Figure 56

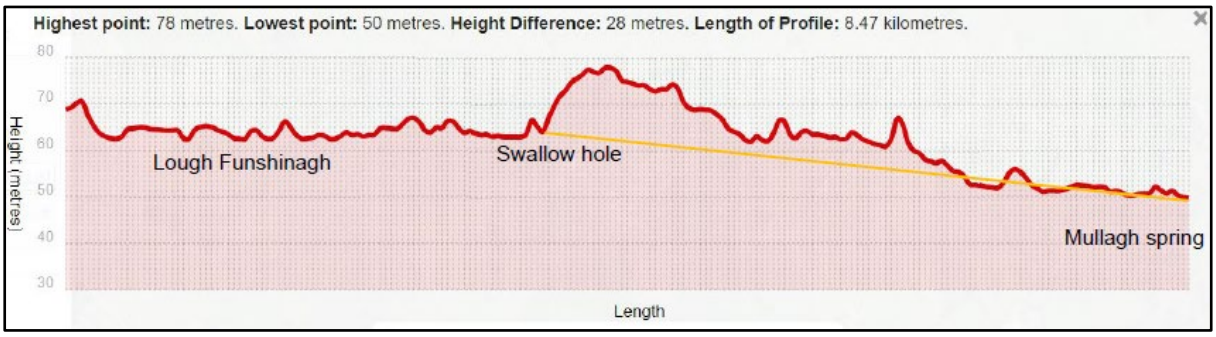
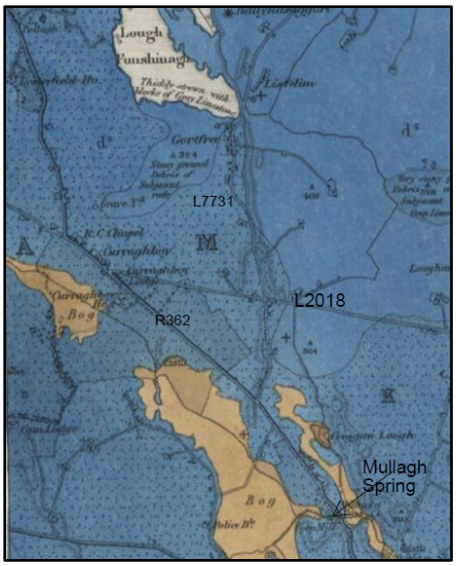


Figure 57: Profile along yellow line as shown in Figure 56



In the mid-19th century, the British Geological Survey (BGS) produced geological maps of Ireland. Figure 58 shows a section from Sheet No. 98. Memoirs were also published along with the maps.

Memoirs contain detailed information on the structure, stratigraphy, and palaeontology, and many have sections on mineral resources, geohazards, groundwater and geophysics of the district. Sheet Descriptions provide a similar level of information to that found in Memoirs, but with a more concise presentation.[37]

Examination of the maps and reading the memoirs would provide some useful information.

Figure 58: BGS Sheet No. 58

[37] British Geological Survey

6.0 Abandoned Boreholes

6.1 General

The EPA was contacted regarding their guidance on decommission abandoned boreholes and received the following reply

> EPA has a guidance for constructing wells DrinkingWaterGuide14ver2.indd but not for decommissioning old ones. However, page 31 of our guidance contains in the References section, a Good Practice Document from the Scottish EPA (SEPA) on decommissioning. Perhaps that might be useful for the caller.
>
> - Decommissioning redundant boreholes and wells
> - contact details for local authorities: gov.ie - Local Authorities
>
> Also, we suggest contacting the water services or planning section of your local authority who may be able to assist you. Trusting that this is helpful to you.

The potential for abandoned boreholes to act as conduits for concentrated waterflow and to create preferential pathways for groundwater movement and contaminant movement is well recognised.

> *Improperly abandoned boreholes and wells may act as preferential pathways for groundwater or contaminant movement. This may result in the contamination of groundwater, the mixing of groundwaters of variable quality from different aquifers or contribute to the loss of aquifer yield and water pressure (potentiometric head) as groundwater flows out of the system. They may also present a physical hazard.*
>
> *Boreholes and wells that no longer need to be made safe and structurally stable should also be backfilled or sealed to prevent groundwater pollution and flow of water between different aquifers.*
>
> *When considering how best to backfill and seal a borehole or well, or whether it can be put to an alternative use – for example as a groundwater monitoring facility – it is necessary to obtain information on the geological strata encountered by the borehole and its completion details. These will include the depth, diameter and construction details and can be obtained from site records, the original driller's log. Only once all available information has been collated and assessed can the most appropriate course of action be determined.* [38]

Decommissioning of boreholes in karst areas is particularly important as noted by Creed [39]

> *"All boreholes should be backfilled with grout in a suspect karst area, so as to ensure that they do not act as conduits for concentrated water flow at some future time."*
>
> Creed's paper was submitted to RCC and to the Board on a number of occasions.

[38] Good practice for decommissioning redundant boreholes and wells Scottish EPA

[39] Remedial measures applied to the engineering solution of Karst problems Michael J. Creed Department of Civil & Environmental Engineering, University College, Cork 1996

6.2 GSI Boreholes c1960 – c2000

This map shows the location of the dug wells, springs and boreholes in Ireland. Data was collected by GSI drilling or submitted to the GSI from Local Authorities and other state bodies, Private Well Grants, Drillers, Consultants, Group Water Schemes and Academia. The location accuracy is visually portrayed on the GSI webmapping viewer by the size of the circle displaying the record. It is NOT a comprehensive database, and many wells and springs are not included in this database.[40] Figure 59 shows the GSI boreholes around Lough Funshinagh.

Figure 59: GSI Boreholes around Lough Funshinagh

The area that experienced flooding in April 2024 is shown in Figure 60. The GSI boreholes are shown numbered 1 to 3 and the details are in Table 1.BH1 appears to have been drilled at the location of an historic well adjacent to an area described as liable to floods. BH2 appears to have been drilled at an historic gravel pit site and adjacent to an historic well. BH3 is located at an enclosed depression. Enclosed depressions in karst are the surface manifestation of subterranean subsidence. Decommissioning of the boreholes is not recorded.

Borehole No.	Depth (m)	Depth to Bedrock (m)	Date	
1	29.6	11.9	14.09.1972	
2	19.5	8.2	29.12.1899	?
3	19.5	11.6	18.11.1969	

Table 1: GSI Borehole summary along route of drain No.6

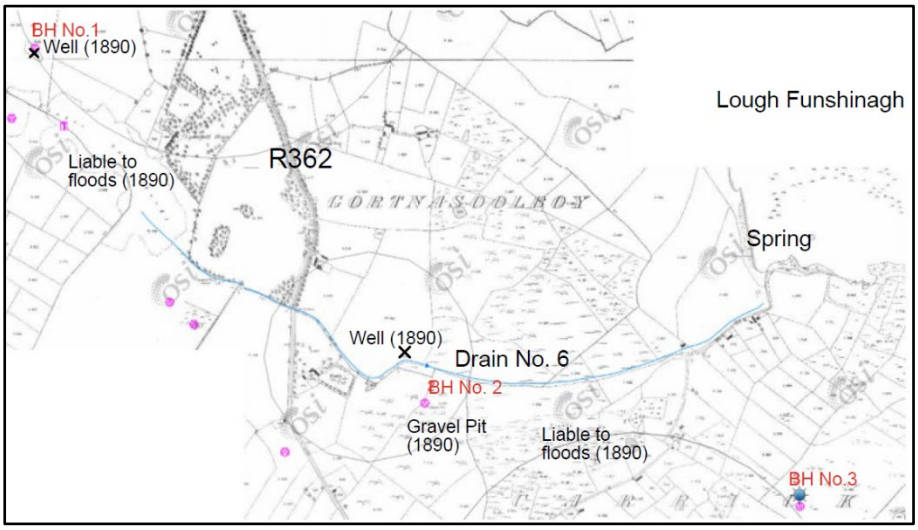


Figure:60 OSI 25" Lysterfield and Carrick with GSI boreholes added

[40] GSI Groundwater wells and springs

6.3 Boreholes 2004

In December 2005 a planning application was submitted to RCC for permission for "*the completion of quarrying works and associated infrastructure comprising approximately 63.4ha of lands" Planning* Reg. Ref. 04/2280.The proposed development was to be located approx. 2.5km south of Lough Funshinagh in the townlands of Carrowkenny and Gortnasythe.

In Nov/ Dec 2002 the applicant drilled four boreholes (BH) on the site. The BH logs do not have a grid reference or an OD elevation and are not numbered on the location plan. The location of the BHs is estimated by their relationship to mapped features, they are approx. 2.7km from the swallow hole in the SE corner of the turlough. The logs are in Appendix D.

The site location in relation to Lough Funshinagh is shown in Figure 61. The 1996 tracer test line is shown as a yellow line. A GSI borehole is approx. 1.2km SE of the swallow hole. The details from the GSI Groundwater data viewer are shown in Figure 62.

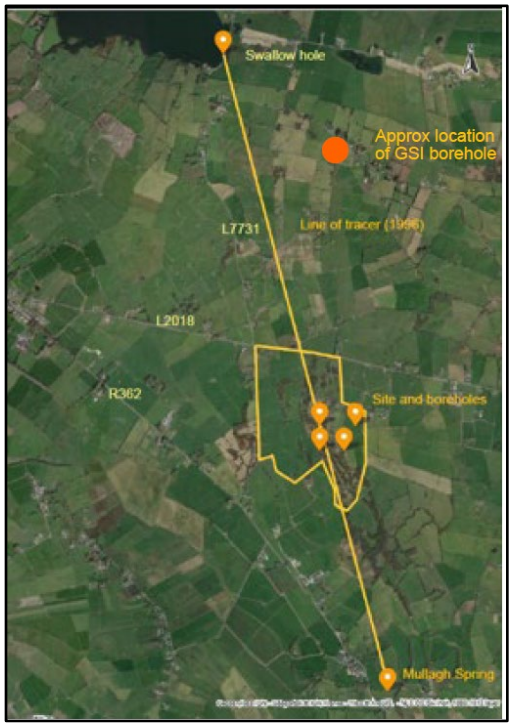


Figure 61: Location Plan of proposed quarry

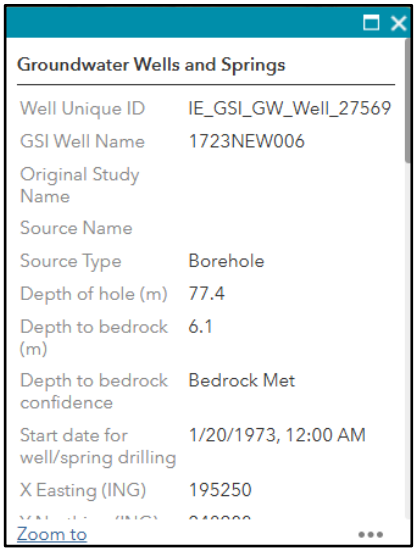


Figure 62: GSI BH Details

The details of the BHs are in Table 2. The borehole logs were submitted to RCC as part of the initial application and to the Board as part of the appeal.

Borehole No	Depth (m)	Depth to rock (m)	Date	Notes
1	26.5	2.0	26.11.2002	14.0 – 26.5 Grey LIMESTONE, very hard
2	29.0	5.5	02- 03.11.2002	**19.0 – 29.5 Grey brown, LIMESTONE very weathered with clay bands**
3	29.5	14.5	09 -11.12.2002	**14.5 – 29.5 Grey LIMESTONE with clay bands from 15m**
4	38.5	5.5	04 – 09.12.2002	5.5 -38.5 Grey LIMESTONE
GSI	**77.4**	6.1	20.01.1973	Log not available

Table 2: Quarry BHs and GSI BH summary

Decommissioning of the BHs is not recorded

In June 2006 RCC refused permission for the development. RCC did not order the applicant to decommission the boreholes.

The applicant appealed the decision to An Bord Pleanála in July 2006 - Ref.281419. In January 2007 the Board refused permission. The Board did not order the applicant to decommission the boreholes.

6.4 Boreholes 2015 -2021

In 2010 and 2011 planning applications for two windfarms were submitted to RCC. The proposed developments were to be located in a number of townlands approx. 6.0km SW and 6.0km south of Lough Funshinagh. For ease of reference the former will be referred to as the Northern cluster and the latter the Southern cluster.

Between 2015 and 2021 a number of factual site investigation reports were commissioned. Six BHs were drilled in 2015 and the logs record that the five of the BHs were backfilled, no information regarding the backfilling is provided so it cannot be known whether it met good practice standards. A 50mm standpipe was installed in one BH in the Northern cluster to allow "*monitoring of groundwater levels over a prolonged period of time*".

Borehole No	Depth (m)	Depth to Rock (m)	Date	Notes
1 North	30	20.10	23.04.2015	20.10 – 22.8 Probable **weathered LIMESTONE** rock
2 South	30	5.80	30.04.2015/ 01.05.2015	5.8 -20.0 Weathered Rock. **14.8 -17.10 Cavity**

Further site work was carried out in 2022 for inclusion in the SID application Ref. 313750. In all twenty-one BHs were drilled on the Northern cluster site and thirty-two on the Southern cluster site, a total of fifty-three BHs. A sample result of BHs drilled at the proposed turbine locations is shown in Table 3.

Borehole No.	Depth (m)	Depth to Rock (m)	Date	Notes
1 North	14.6	9.6	04.12.2020	10 .0 -14.6 LIMESTONE **fresh to locally moderately weathered**
2 North	6.8	1.8	09.12.2020	1.8 – 6.8 **Fresh to locally slightly weathered LIMESTONE**. Apertures are tight to locally open, locally clay filled
3 North	3.5	1.3	08.12.2020	**BH terminated on rock at 3.5m**
1 South	18.3	9.45	01.03.2021	**12.3 – 14.7 POSSIBLE KARST INFILL**
2 South	40.0	2.0	18.05.2020	**2.0 – 9.0 LIMESTONE with weathering/fractures.13.0 – 22.0 Weak to strong LIMESTONE. Clay infill between 16.1 and 17.8mbgl fracture from 20.4 – 20.6**
3 South	5.0	2.7	22.12.2020	0 – 2.7 Gravelly COBBLES and gravelly CLAY **2.7 – 5.0 ROCK**

Table 3: Sample BH results from the Dysart and Skeavally areas.

The site investigation report concluded ***Completely to highly weathered/karstified LIMESTONE is indicated at T11, T13 and the access road to T12. Possible karstified rock is indicated at a number of locations.***[41] (emphasis added throughout)

The applicant's EIAR noted

> ***"No karst features were noted during the drilling of the 16 no. boreholes"*** (Northern cluster) and ***"No karst features were noted during the drilling of the 26 no. boreholes at the Southern Cluster."*** [42]
>
> ***Bedrock is identified at an average depth of 7.32mbgl and no obvious karst features have been logged throughout the total depth of drilling***

The EIAR concluded

> ***"The bedrock geology underlying both Wind Farm site clusters is now comprehensively understood with the recognition that karst features are not ubiquitous, and that the bedrock geology is characterised by competent limestone; No proposed WTG (*wind turbine generator*) is located over a known or suspected karst anomaly".***

In Nov 2023 the Board granted permission for the development. The Board did not order decommissioning of the boreholes

7.0 Hydrology in the Lough Funshinagh area

Figure 63 shows all the GSI boreholes around the Lisbrock and Tobermore Springs. A representative sample of depths of BHs and depth to rock is shown.

All the GSI boreholes are a concern. In the context of the flooding at Lough Funshinagh the GSI borehole SE of Lough Funshinagh drilled in 1973 to a depth of 77.4m in rock and the four boreholes drilled in December 2004 approx. 2.7km south of Lough Funshinagh are a significant cause for concern.

Local knowledge has confirmed the presence of drilling in the 70s and 80s.

[41] Proposed Seven Hills Wind Farm, Co. Roscommon – EIAR Appendices
[42] Proposed Seven Hills Wind Farm, Co. Roscommon - EIAR Ch.8 - Land Soils and Geology -Sections 8.3.4.1 and 8.3.4.2

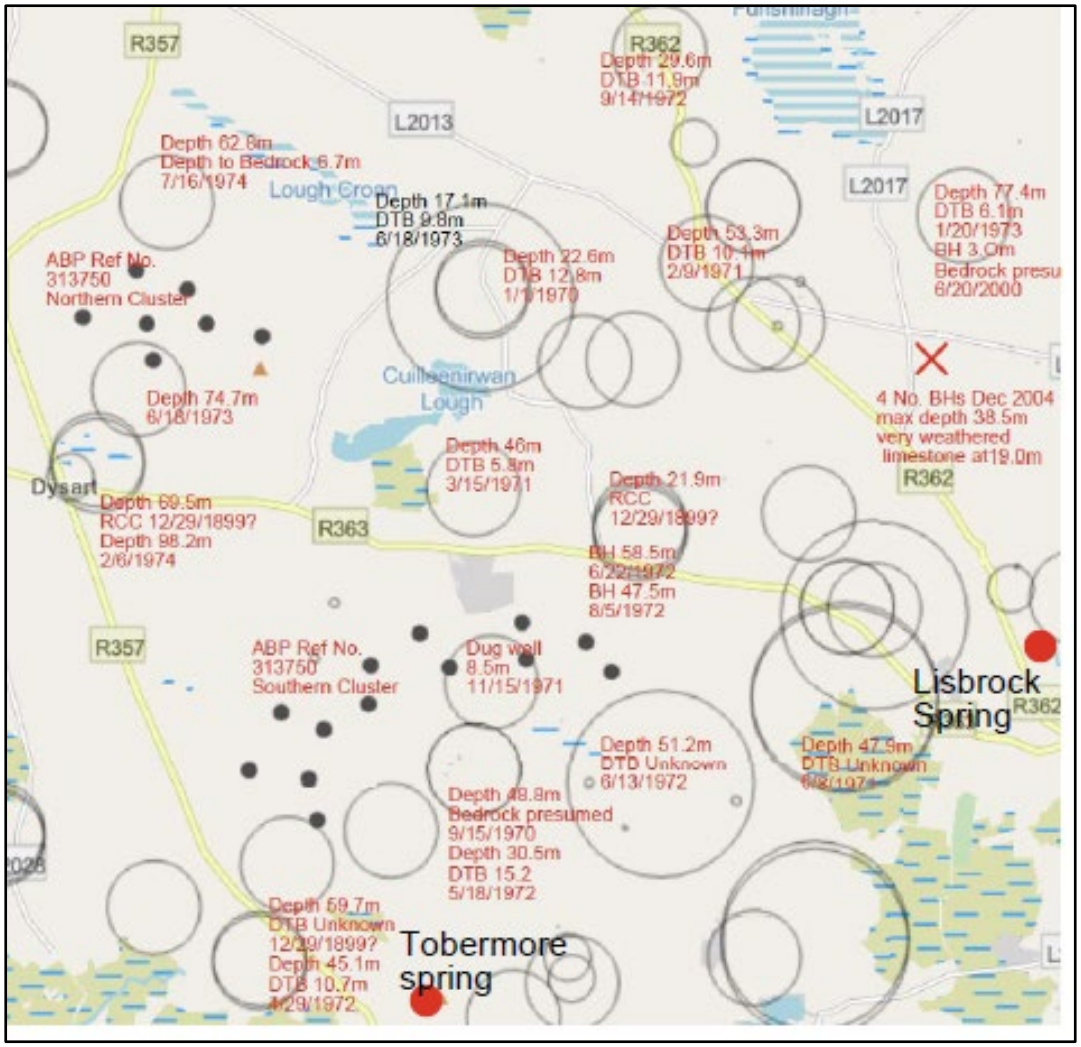


Figure 63: Known Boreholes in around Lough Funshinagh, Lisbrock Spring and Tobermore Spring

In July 2022 RCC made a submission to the Board in relation to the windfarm application. The submission included a response from the RCC Environmental Department as follows

> *The response also notes acknowledgment in the EIAR of the proximity of the development site to the Zone of Contribution (ZOC) for Killeglan Springs public water supply. Contrary to the inference in the EIAR that the ZOC may not expand to the extent delineated by the Geological Survey of Ireland the Environmental Department suggest, based on the conduit nature of the geology in the aquifer, that the ZOC may extend beyond the mapped extent.*

A 2022 Report by Irish Water notes[43]

> *The landscape of County Roscommon reflects the dominant underlying karstic carboniferous limestone and shales, much of it exposed as outcrop. This karst forms a key regionally important aquifer around the towns of Ballinasloe, Athlone and Tullamore. Overall, 12 groundwater sources are managed by Irish Water in the region, abstracting between approximately 30m^3/d to approximately 5,000m^3/d. The*

[43] Irish Water RWRP-EM Study Area 5 Technical Report – Autumn 2022

higher volumes reflect the karstified limestones and their high storage and transmissivity.

The Water section of the NIS prepared by the applicant for the wind farm stated

> ***There should be no Wind Turbine Generator (WTG) proposed over known or suspected karst anomalies.***[44]

Figure 64 shows the ZOC of the Tobermore spring. The spring is the source for the Killeglan Public Water Supply. The Lisbrock Spring, as cited by the Board when refusing planning permission in 2004 for the quarry at Carrowkenny and Gortnasythe, is also shown as well as the Mullagh Spring. The Lisbrock Spring supplies water to the Lisbrock water treatment plant (WTP). The Mullagh Spring is the outfall from Lough Funshinagh as traced by Drew in 1996. The wind turbine Southern Cluster development granted by the Board in Nov 2023 is also shown.

Five turbines are shown on the line of the ZOC, and one turbine is within the ZOC. In karst a ZOC is not readily identifiable, it may extend even more than that illustrated. In such a case an abundance of caution is required

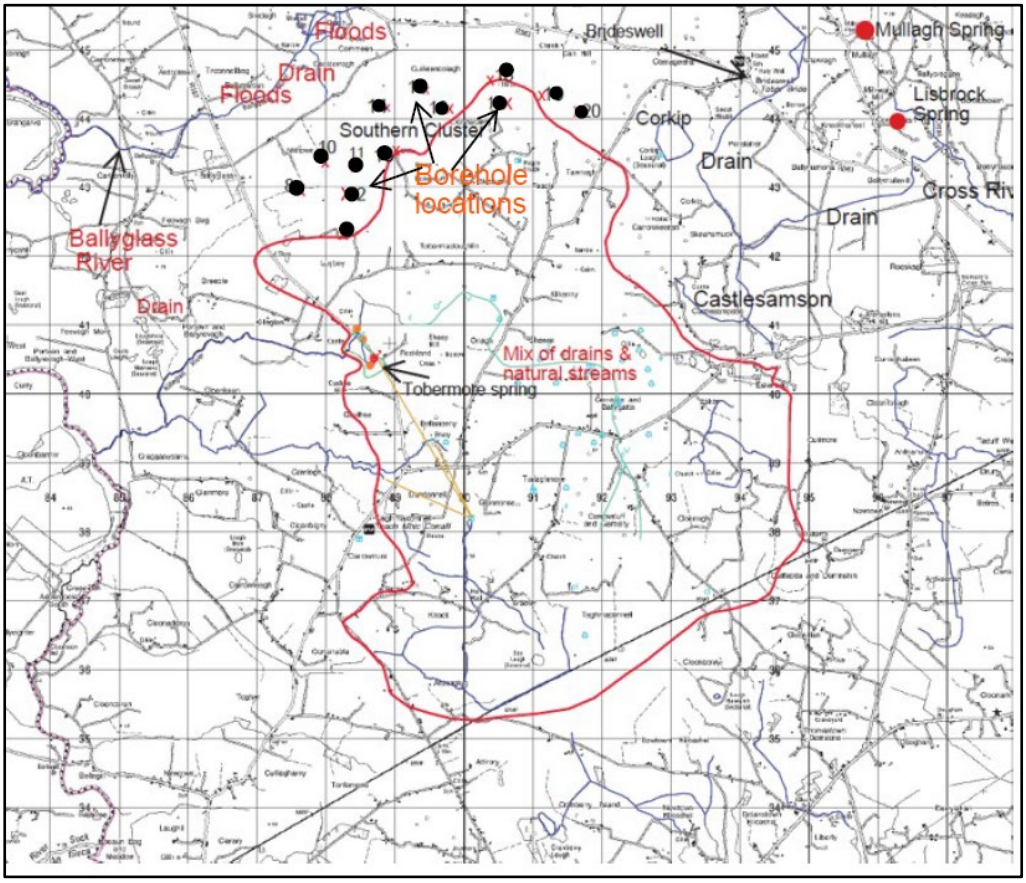


Figure 64: Zone of Contribution for Killeglan Springs public water supply from report by GSI in collaboration with RCC April 2003. Proposed turbines are marked X

The south Roscommon Public Water supply is extremely vulnerable. The regular "Boil notices" are a testament to the this. Looking at Figure 64 the concerns expressed by the RCC

[44] Proposed Seven Hills Wind Farm, Co. Roscommon, Chapter 9 Water, Paragraph 9.13.1

Environmental Department are readily apparent, and this concern was expressed without the knowledge of the presence of the GSI boreholes.

Records indicate the GSI BHs are between 20m to 75m deep. There was at least three boreholes drilled in the area around Dysart village. The boreholes were specifically targeted at the known karst features e.g. historic wells and enclosed depressions.

All the GSI boreholes are a concern. In the context of the flooding at Lough Funshinagh the GSI borehole SE of Lough Funshinagh drilled to a depth of 77.4m in 1973 and the four boreholes drilled in December 2004 approx. 2.7km SE of Lough Funshinagh are a significant cause for concern.

7.1 Irish Water, Roscommon Co. Co. and redundant borehole decommissioning.

Subsequent to the *Kelly v An Bord Pleanála (2014)* judgement the application was remitted back to the Board. By direction of the Court all parties involved were given the opportunity to make one submission to the Board prior to the Board's determination of the remitted application. The six BHs described above were carried out by the applicant in April 2015 and submitted to the Board.

In May 2015 Irish Water were contacted in order to express concern about the coring of boreholes in the north and south cluster and in particular the coring which was being carried out adjacent to the ZOC for the Killeglan Public Water Supply.

A request was made to Irish Water to "*step into the process and bring scientific and objective reasoning to the proceedings".* As a statutory body Irish Water has an automatic right to make representations to the Board on any application that may affect its assets.

Irish Water declined the request stating by email of 15th May 2015 "*After due consideration I confirm that Irish Water are not in a position to make any representation with regard to this process. The information has also been submitted to RCC. It is not possible for Irish Water to give assurances on whether RCC will make a submission with regard to this matter*." The correspondence is in Appendix E. Needless to say there was no submission from RCC.

Photo 11 shows the flooded R363 leading into Dysart in April 2016. The flood was over 600m long on the R363 and too deep to wade through. It took months for the floodwater to recede. Dysart village escaped simply because the R363 and the surrounding land was low enough to accommodate the flood water. RCC's solution was to raise the road as shown in Photo 12

Photo 11: The R363 flooding looking south April 2016.

Photo 12: The R363 looking north May 2017

Building a higher road won't assist those in the community who are unfortunate to have homes in low lying areas when the next excessive rainfall event occurs. RCC was warned about flooding and karst and choose to do nothing for the Lough Funshinagh communities For the Dysart community RCC built a new road and fully endorsed a major civil engineering project without having any facts or knowledge as to how a unique turlough behaved.

We are all in favour of green energy, but some communities will pay a higher price than others.

7.0 Summary and Discussion

> *Roscommon is a karstified, western Irish, low-lying county. There is a great paucity of knowledge of the karst of Roscommon. Information from technical reports has shown the karstified nature of the bedrock in certain parts. However, previous to this research no large-scale investigations of the karst hydrology or its associated landforms have been carried out. The only research into the karst of Roscommon, prior to this research, was a study of five karst springs (Doak 1995).*[45]

Drew's research was focused on North Roscommon. The scarcity which she refers to doesn't apply to South Roscommon simply because no research has been carried out into the karst of South Roscommon. Instead, knowledge has been replaced by fiction, the source of which is unavailable. RCC have engaged a team of stellar consultants to provide an interim solution to a foreseeable crisis which has caused misery, mental and financial distress to the communities of Lough Funshinagh for the past nine years.

The consultants consistently refer to the fiction in all the reports and documents submitted by RCC to An Bord Pleanála as part of an application for permission for an interim flood relief proposal for Lough Funshinagh. An interim proposal after nine years.

> *Working from north to south, the survey began in Antrim and Derry in 1829 and was completed in Kerry in 1842.*[46]

Thirteen years to survey the entire island of Ireland, travelling on foot using, what by today's standards, were basic surveying instruments. Distances were measured using Gunter's chains, which were designed and introduced in 1620 by English clergyman and mathematician Edmund Gunter (1581–1626). The word chainage remains in use to this day on longitudinal sections of roads and drainage, a salute to Rev. Gunter.

Thirteen years to survey Ireland, nine years to come up with an interim flood relief scheme: 200 years of progress.

It would be amusing if it were not such a tragedy for the communities of Lough Funshinagh and such a source of anxiety for the people of Curraghboy.

RCC knew or should have known that Lough Funshinagh was filled partly by groundwater from a network of 19th century drains. They had been told often enough of such a network at Cuilleenirwan and Colagary turlough, turloughs 4.0km SW of Lough Funshinagh. They had been told where to find the information – the OSI 6" and 25" maps. They were told all of this in 2010 and 2011.

RCC could have broken the illusion of truth, but they choose not to. Absent this information their consultants prepared reports based on fiction. A fiction that was so embedded it was available on the EPAMap viewer albeit with a disclaimer. A disclaimer that led to GSI maps

[45] The Use of Multiple Techniques for Conceptualisation of Lowland Karst, a case study from County Roscommon, Ireland. Caoimhe Hickey The Geological Survey of Ireland 9.12.2009

[46] The Six Inch Ordnance Maps of Ireland Trinity College Library Dublin

which contained the exact same information. Which one of these statutory bodies was the chicken and which one was the egg?

The OSI 25" 1890 map records the following townlands as "*liable to floods*" Ballagh, Lysterfield, Corralea, Carrick and Rahara. Ardmullen is mapped as marsh and the road through Ardmullen had yet to be built. Lough Cup is shown as a 0.584 acre waterbody with a further 3.0 acres of "*liable to floods*".

The use of the plural floods suggest that the event was a recurring one. If an area is recorded as liable to floods in 1890 and no flood relief works are undertaken, isn't it logical to assume it will flood in 1995 when adverse weather occurs and again in 2010 and 2012 when rainfall amounts were increasing. Then when the inevitable "never seen in living memory" event does occur isn't it logical that the consequences will be catastrophic?

If a phenomenon occurs on a relatively regular basis, shouldn't it be a cause for concern if it fails to materialise?

The 1995 black and white imagery clearly shows Lough Funshinagh within 100m of the L2005 and a dark streak along the line of drain No. 1 indicating a flooded ditch. Then in 1996 the turlough magically resets. The Technical sub group's model shows the top of water level in the turlough in Spring 1995 was higher than it had been since 1961.

None of this can be said to be hindsight wisdom, RCC were given plenty of warning and notice had it been heeded and acted upon the current crisis would have been avoided.

Where were all the statutory bodies while the crisis was unfolding?

Why was the karst south Roscommon not the focus of academic research and papers? Was it because it wasn't a real turlough, more a disappearing lake. If it was a lake, why was it designated as a priority habitat under Annex 1 of the EU Habitats Directive (94/43/EEC) and also protected under the EU Water Framework Directive (2000/60/EC) as a' Groundwater Dependant Terrestrial Ecosystems'.

Lough Funshinagh and the community have been neglected by RCC and every relevant statutory authority in what can only be described as a public scandal. But they are not alone, the communities of Dysart and Skeavally have been equally neglected, and they can look forward to the same experience of flooding in the years to come.

GSI conducting a program of borehole drilling in the karst of south Roscommon in the 70s,80s and 90s to depths of 80m metres seems extraordinary. Boreholes drilled through enclosed depressions which are the surface manifestation of subterranean subsidence. And in the case of drain No.6 drilled through an historic well adjacent to a liable to floods area.

It is highly unlikely that the boreholes were decommissioned. They have remained in place ready conduits to act as and create preferential pathways for groundwater and contaminant movement. The EPA do not have a good practice guide for the decommissioning of abandoned boreholes instead advising to use the Scottish one or to contact your local authority, the body that neglected its duty in the first instance or contact the water services, the statutory body who are *"not in a position to make any representations regarding the process"*.

The percieved wisdom was that arterial drainage deprived turloughs of groundwater and that is probably correct for the majority of cases. If arterial drainage caused drying up of turloughs then isnt it logically that an expanding turlough must be receiving groundwater from some other source.

With the increased head of water Lough Funshinagh managed to find a release route. A local person living near the swallow hole will tell that the sound of flowing water could be heard when the reset occurred. As long as the turlough had that release valve flooding was not going to occur. By 2010 there had been four Spring water level peaks in a row, but no one noticed or indeed semed to care.

The extensive borehole drilling by GSI in the late 90s cannot be ignored as a factor in the turloughs failure to reset. The drilling in 2004 near or perhaps along the 1996 tracer line and very close to what is probably the actaul route of the output water could very well have been the catalyst for the future flooding.

The origins of the flooding in Lough Funshinagh lie in the mid 19th century. The origins but not the cause. The drainage system was not designed with its current use in mind. The lack of knowledge of the existence of the system is a cause for concern, the determination by RCC, the Board, Irish Water and all the statutory bodies to remain in that state of ignorance is shocking

The Cross River

1.0 Introduction

> *As discussed previously, the temporary solution proposed for the flooding issues in this area involves pumping of water into the Cross River. This is a watercourse with a length of approximately 20 km which rises 2.8 km south-west of Lough Funshinagh and which discharges into the River Shannon 2.5 km south of the town of Athlone*
> *To identify whether there have been any noticeable changes to the area over time, historic mapping data was used. This was sourced from the publicly available Geohive website, with the 6 Inch First Edition (1829 - 1834) maps used and compared to available Google Earth aerial mapping data. The Geohive mapping data at the outfall point is provided in Figure 4.8 below, with an overview of the historic map data for the full reach of the Cross provided in in Figure 4.9These maps show that the area surrounding the site primarily consists of pastural agricultural land and one-off residential developments, in addition to small urban areas such as Curraghboy Village, with no significant change in these areas. A number of mills and associated mill ponds are shown along the length of the Cross River in these maps; however, these ceased to be operational in the 1900s, and the mill ponds were removed. The pond locations how function as pastural agricultural land.*[1]

The Cross River does not rise "*rises 2.8 km south-west of Lough Funshinagh*".

The Cross River rises from a spring in the townland of Gortnasythe, the spring is approx. 3.7km SE of Lough Funshinagh and is one of a cluster of four identified on the OSI 25" First Edition 1890 map - Figure 1. The characteristic for the area east of Creggan Lough is "*Rough Pasture & Cropping Rock"*[2] - Figure 1a

The water body named Creggan Lough is not visible on the OSI Imagery 2013 - 2018 and neither are the springs Figures 2 and 2a. The short water feature to the west of Creggan Lough can be seen as a ditch on the OSI imagery 2013 – 2018. The ditch extends in a NW direction. The "*Surface Water / EPA Rivers"* layer has been selected and this gives the blue line rising from the spring.

The OS 6" First Edition (1830s -1880s) map and the OS 6" Second Edition (1888-1916) map side by side at Creggan Lough is provided in Figure 3.[3] A similar side by side at the outfall is shown in Figure 4(MWP Figure 4.8). An overview of the of the map data 6" First Edition (1830s – 1880s) for the full reach of the Cross provided in Figure 5 (MWP Figure 4.9). Some of the main drains and streams mapped on the 25" First Edition have been added. The EPA map showing these streams and drains is shown in Figure 6.

The detailed survey information from the First Edition OS 25" (1890) map was added to the OS 6" First Edition (1830s -1880s) and published as the OS 6" Second Edition (1888-1916). The drains at the outfall are now clearly annotated as CD – centre of drain.

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[1] LOUGH FUNSHINAGH INTERIM FLOOD RELIEF SCHEME Engineering Report
[2] UCD Library
[3] National Library of Scotland

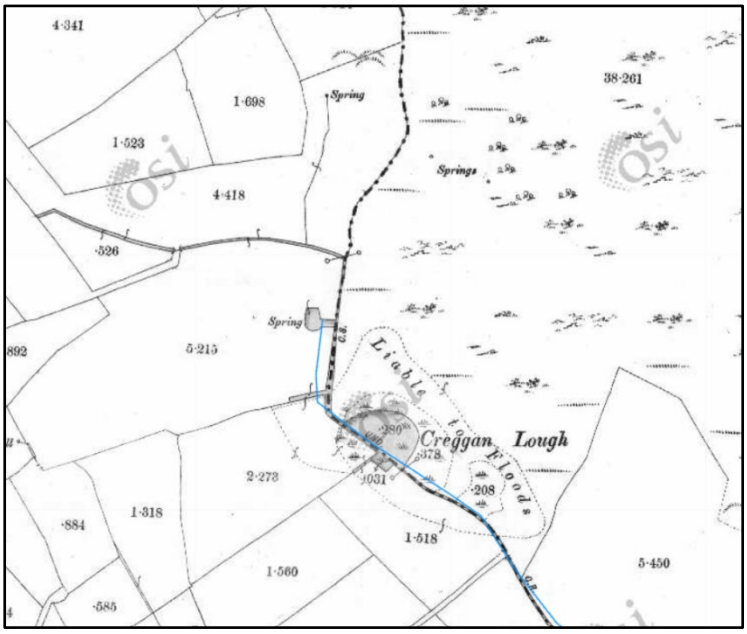


Figure 1: OSI 25" First Edition

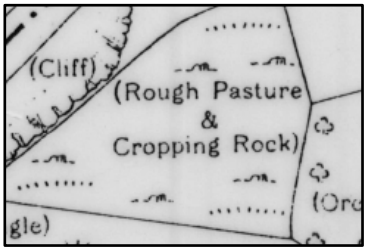


Figure 1a

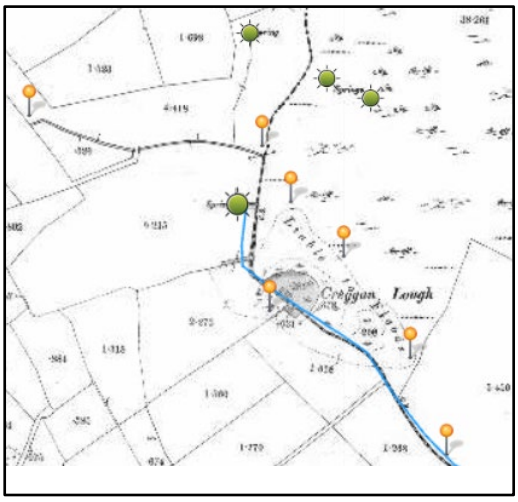


Figure 2

Figure 2a: (springs shown in green)

Figure 3: The OS 6" First Edition (1830s -1880s) map and the OS 6" Second Edition (1888-1916) map side by side at Creggan Lough

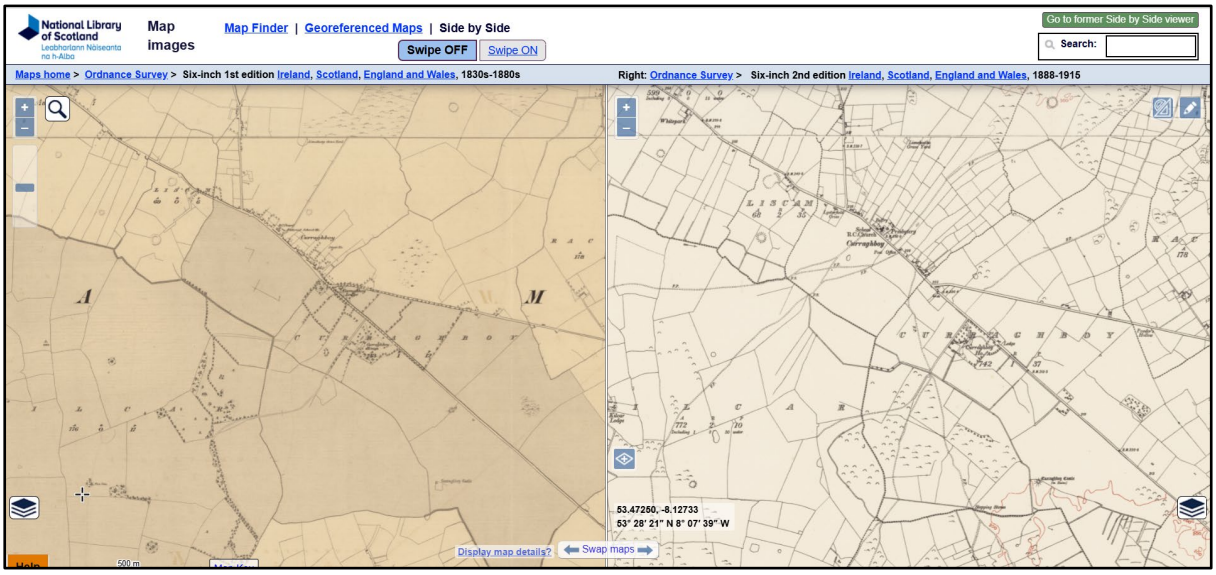


Figure 4: The OS 6" First Edition (1830s -1880s) map and the OS 6" Second Edition (1888-1916) map side by side at the proposed outfall

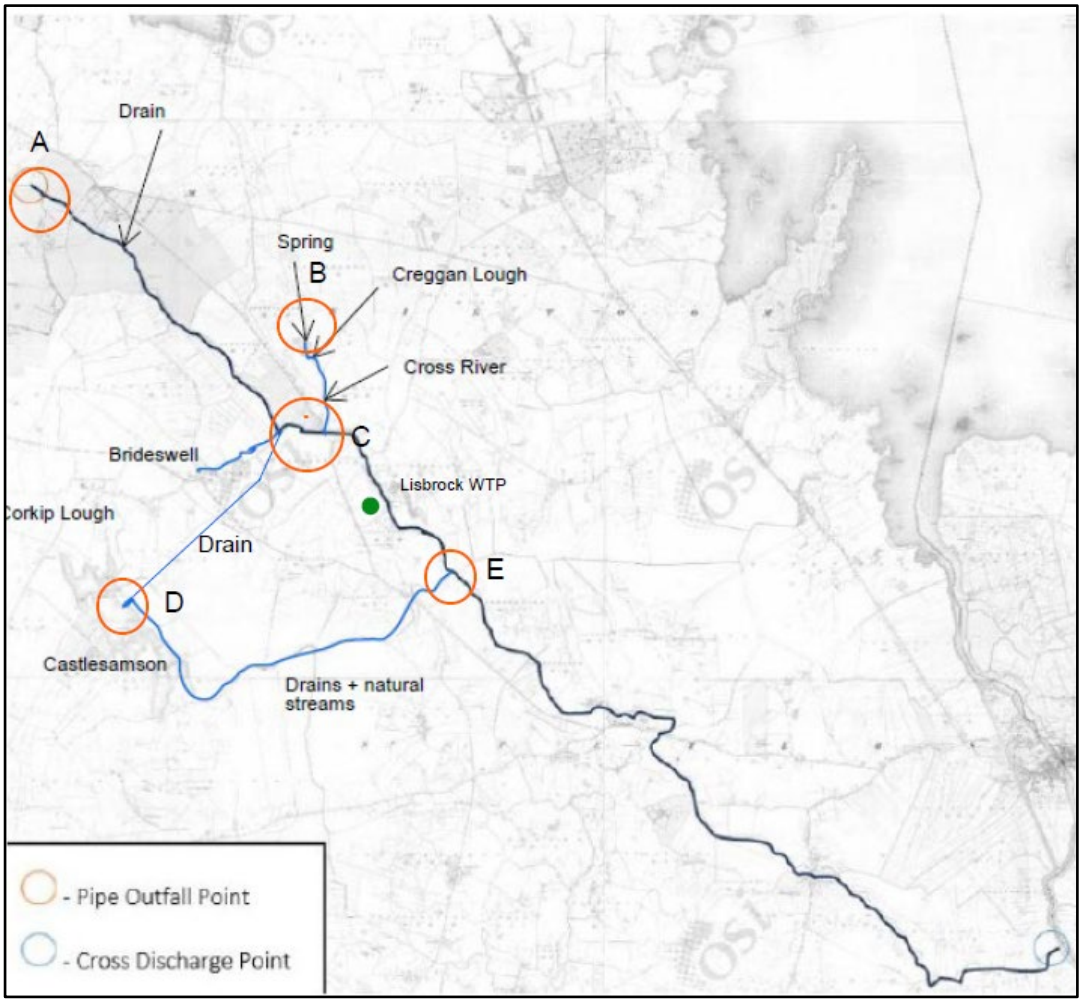


Figure 5: 6" First Edition (1830s – 1880s) for the full reach of the Cross

Note: The 6" First Edition (1830s -1880s) map is a different map from the 6" First Edition. The 6" First Edition (Roscommon 1838) was the first edition published, the First Edition (1830s – 1880s) added additional information to the First Edition (1838) map. (Trinity College Dublin)

Details A from Figure 5 is shown in Figure 7

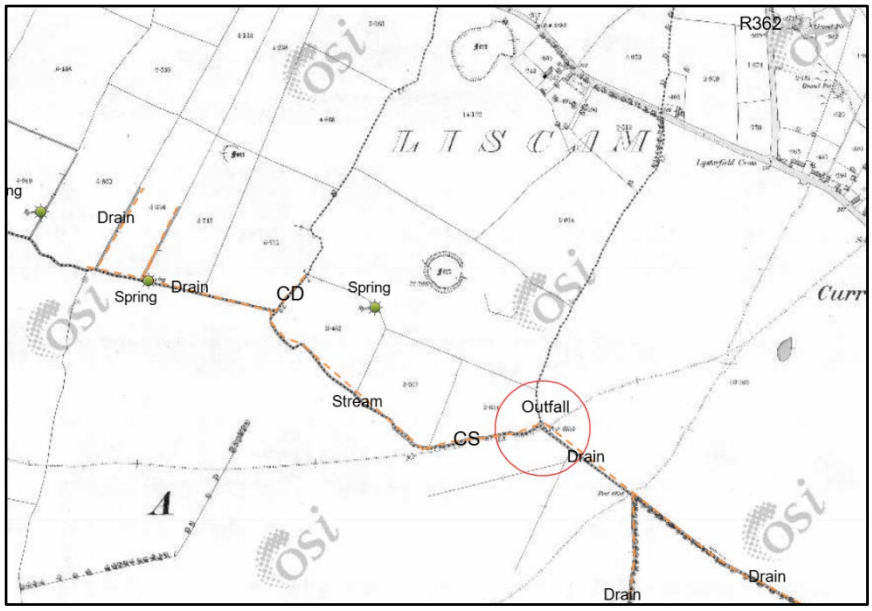
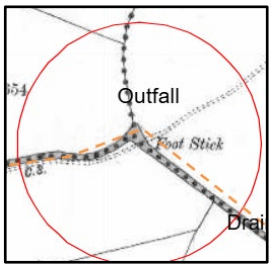


Figure 7: OSI 25" at A



Outfall OSI 25"

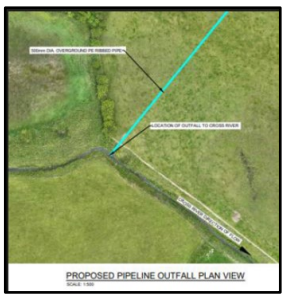


Figure 8:

A Foot Stick was a pedestrian crossing for a drain. It could either be a simple piece of wood or for wider drains posts hammered into the drain functioning much like stepping stones. The presence of a Foot Stick suggests that the drain is deep.

Detail B is shown in Figures 2 and 2a above, Detail C is shown in Figures 9,10 and 10a

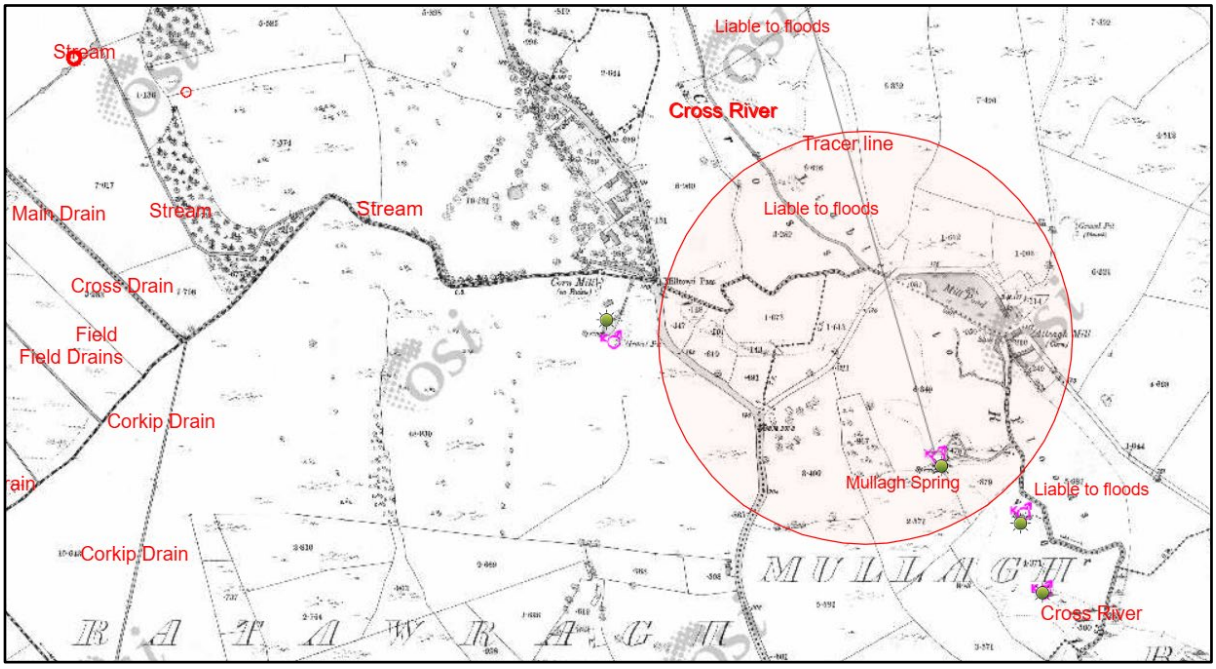


Figure 9

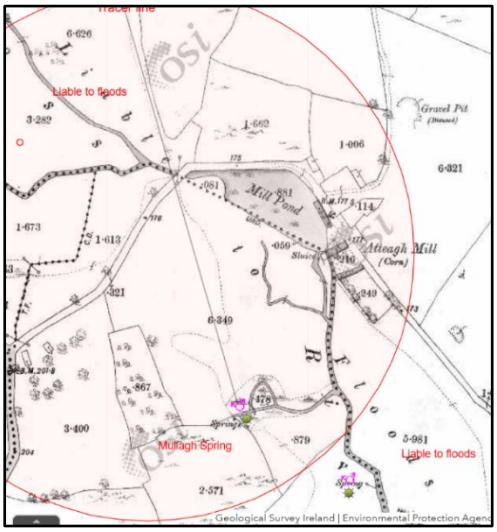


Figure 10: 25" at Mullagh Spring

Figure 10a:2013 – 2018 Imagery at Mullagh Spring

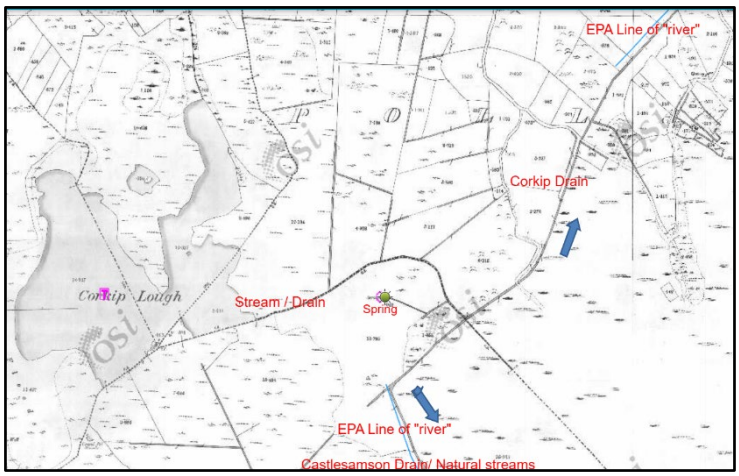


Figure 11: Detail D from OSI 25" – Corkip Drain

Detail D is shown in Figure 11 and Figure 12.

The devasting effects of arterial drainage on turloughs can be seen in Corkip Lough

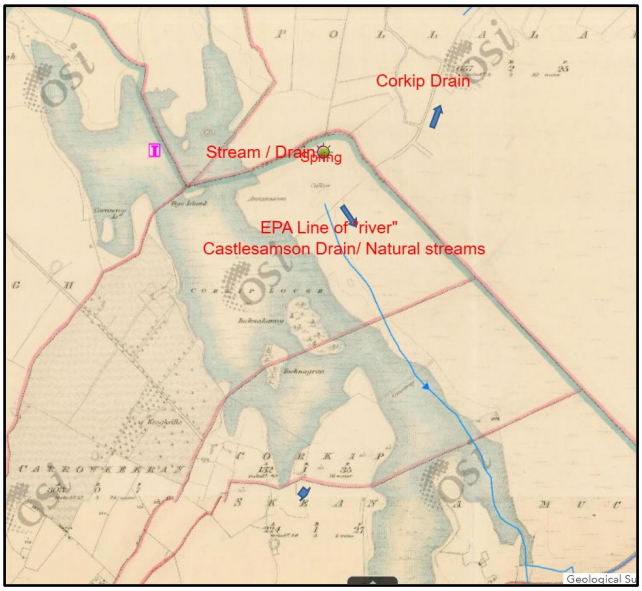


Figure 12: Detail D from OSI 6"

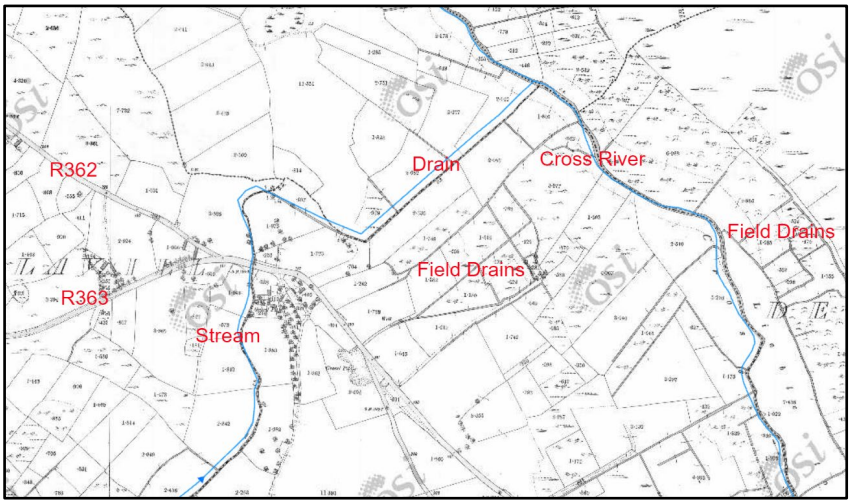


Figure 13: Detail D from OSI 25" Castlesamson Drain

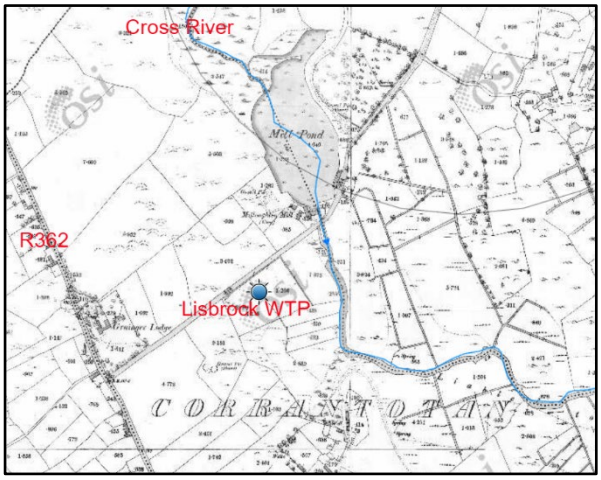


Figure 14: OSI 25" Lisbrock WTP

Figure 15: 2013 – 2018 Imagery Lisbrock

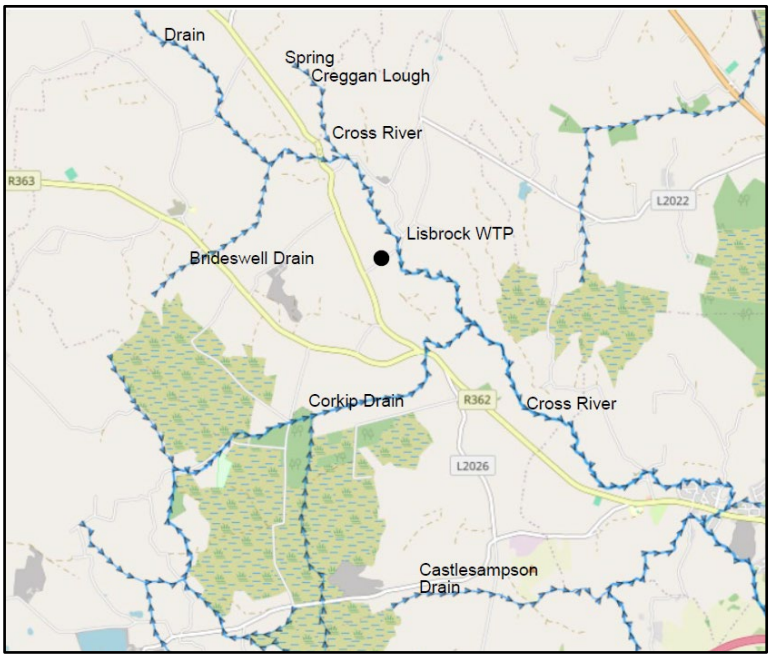


Figure 15: EPA Map of Cross River

2.0 Cross Drain

A site walkover was undertaken by MWP alongside ARUP and Roscommon County Council on Tuesday 16th July, 2024. The intention of this was to walk the area between Lough Funshinagh and the Cross River as well as the Cross River itself to gain a greater understanding of the area and identify any elements which may influence the proposed works. As part of this walkover, photographs were taken at any point of note such as locations where the Cross intersects with the local road network. The locations of these photos are shown in Figure 4.13, and the comments noted during the survey are summarised in Table 4.1 below alongside the related images.

Location	Comment	Image
L2023 Road Crossing	Photograph was taken from the L2023 road south of Curraghboy village. The Cross runs parallel to the road for 160 m at this point before turning 90 degrees and crossing beneath the road. Riverbed is free from growth and straight with high banks which are covered with grass and vegetation. Channel continues to be oversized for flow.	

It is unclear how the entire Cross Drain could be mistaken for a natural watercourse. The straight lines and obtuse angles are not characteristic of a natural watercourse. It is rare to see a river running parallel to a road for 160m before turning 90 degrees.

There is one or two sections which have natural characteristics usually near a spring and the drain stops and starts either side of there features. It is quite difficult to understand how a RCC staff member didn't know the geography of the area.

Photo No 1 was taken from the same place in August 2024. There can be no doubt that the waterbody is a drain. Walking the L2023 where the drain runs parallel to the road the grass on the drain side has the orangey burnt look of grass that is near water. Looking over the bridge where the drain turns under the road another drain can be seen joining.

To capture it fully a Google photograph is used – Photo No.2

Photo No 1. From bridge on L2023 looking SE

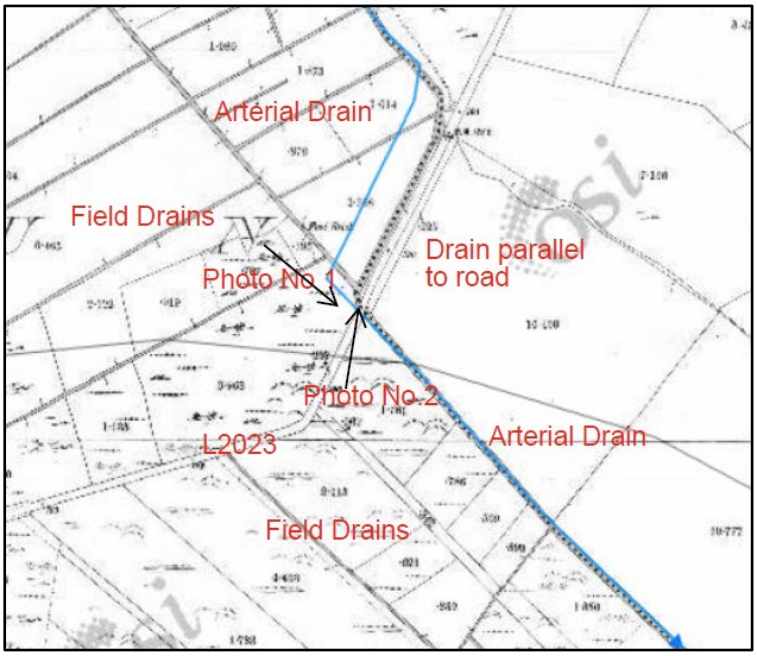


Figure 16: OSI 25" at the L2023

Photo No. 2 From Bridge on L2023 looking NW

There seems little point in making any further observations on the Cross River except to refer to the spring where the Cross rises in relation to the quarry boreholes.

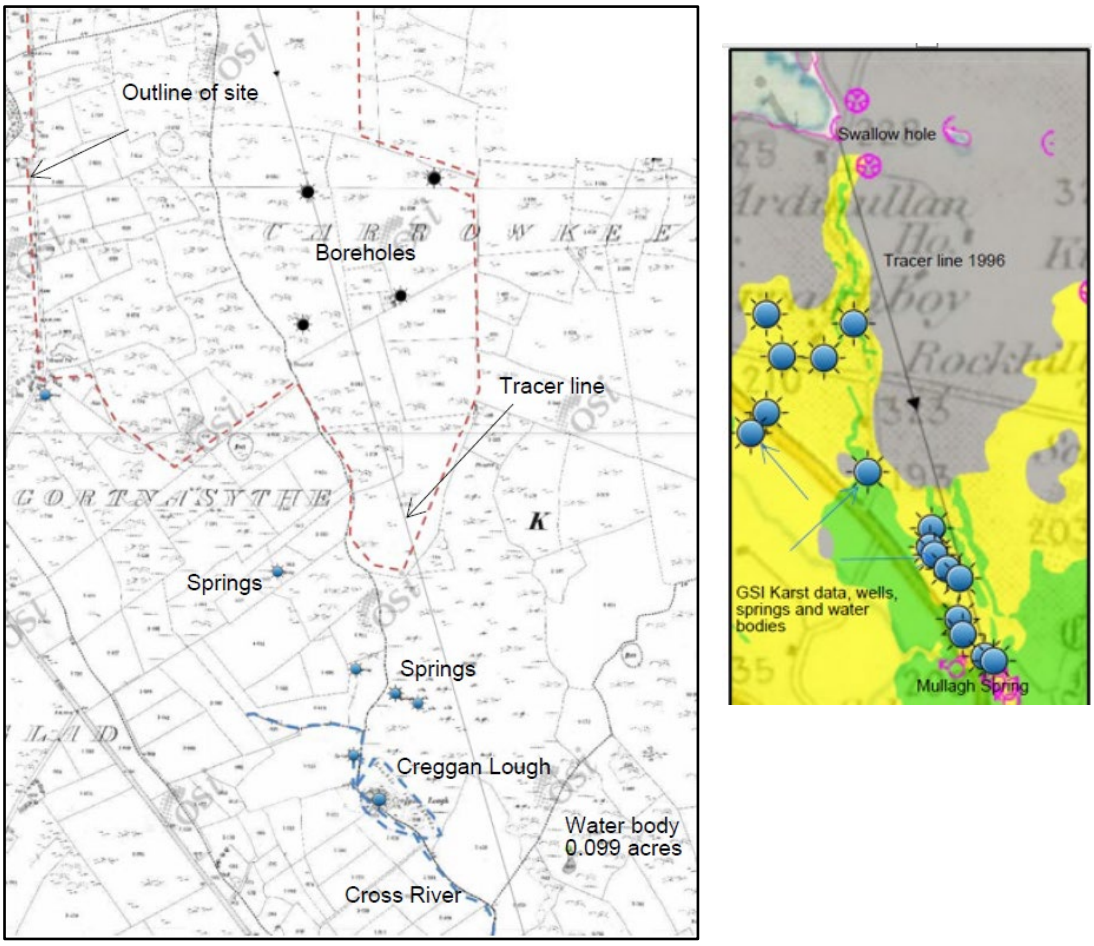


Figure 14: OSI 25" at Creggan Lough

The link between the shift in hydrological behaviour of Lough Funshinagh around 2007/2008 and the multiplicity of the GSI boreholes often cored through karst features and the boreholes cored through weathered limestone in 2002 is difficult to avoid.

The knowledge of the GSI boreholes compromises any assumptions that have ben made about groundwater flow in the area. The additional coring carried out in 2015 and 2021 is an additional cause for concern.
It is probably too late to attempt any decommissioning of the GSI boreholes, but the 2015 and 2021 boreholes should be located and decommissioned as soon as possible.

The boreholes were cored under the planned locations of the turbines therefore a significant amount of the southern cluster must be within or very close to the ZOC of the Tobermore spring.

It is clear from the engineering report submitted as part of this application RCC has absolutely no understanding of the karst of South Roscommon and is not interested in gaining any knowledge or understanding of this very complex landform.

What the communities of Lough Funshinagh have endured for the last nine years is unforgivable. The mess that has been created is of epic proportions. RCC failed in its duty long before the crisis became apparent. When it did manifest itself, they failed to act promptly with a temporary solution, and they have now failed to put forward a solution based on facts.

The engineering report states

> *Since it is not proposed to discharge water from the pipeline during extreme flood events, it is not necessary to estimate flows for higher return periods.*

Have RCC a backup plan in the event of an extreme flood event?

It is not the role of the public to have to wade through technical details and make extensive commentary on planning applications submitted by either public or private bodies. Yet that is what the communities of Dysart and Skeavally have had to do for the last fifteen years in an attempt to avoid the same fate that has befallen the Lough Funshinagh community and to protect the unique environment they are fortunate to enjoy.

The temporary pipeline must be installed as soon as possible with careful monitoring at significantly more locations than proposed in the application. Key areas such as at the confluence of the Corkip drain, the Cross drain and the Cross River need careful attention.

The permanent pipeline proposal should be reviewed by a panel of experts.

Non-invasive ground investigation should be carried out around the area of the quarry boreholes.

These boreholes and the 2015 and 2021 boreholes must be decommissioned in accordance with the Scottish EPA guidelines. The work should be supervised by a suitably qualified person.

The extensive program of GSI boreholes was not considered either during the design phase or during the assessment process of the applications for the windfarm development. In the light of this knowledge the application needs to be reviewed by the Board and its expert