An Coimisiún Pleanála

Specialist Report to Inspector

R322363_App1

Development	Installation of additional underground effluent storage and construction of a new plant and storage building together with all associated site works.
Location	Kippure Lodge & Holiday Village, Kippure Estate, Manor Kilbride, Blessington, Co. Wicklow.
Planning Authority	Wicklow County Council
Planning Authority Reg. Ref.	2560075
Applicant(s)	Seefin Events Unlimited Company, Kippure Estate, Manor Kilbride, Blessington, Co. Wicklow
Type of Application	Normal Planning Appeal
Inspector	Senior Planning Inspector
Scientist	Environmental Scientist
Date of Site Inspection	1st July 2025.

Contents

1.0 Scope of Report

1.1.1. This report to the Inspector and available to the Board is a written record of my review and examination of the submitted information provided by the applicant as it relates to water resources and the aquatic environment around the development. In my capacity of Inspectorate Environmental Scientist, I have the relevant expertise to provide a professional opinion as to the adequacy of the information for the Inspector and the Commission to undertake a decision.

1.1.2. I have been requested to provide an opinion of the acceptability of plans to install a new wastewater treatment plant and soil polishing filter. My comments will be limited to those related to the issue of the proposed volumes and nature of domestic wastewaters arising, the impacts of the proposed disposal option on groundwaters and surface waters and potential impacts on Water Framework Directive compliance.

1.1.3. The operation of the wastewater treatment plant as described in this case requires authorisation via a discharge licence granted under Section 4 of the Local Government (Water Pollution) Act, 1977 and 1990 as amended. The appellant in this case currently holds a discharge licence issued by Wicklow County Council for a discharge of up to 32m^3 of domestic wastewater into groundwaters via a soil polishing filter. The appellant applied for a new discharge licence to discharge 60m^3 of wastewater into groundwaters, which was refused by the licensing authority and is currently under appeal to the Commission. This report does not address the appeal under the Water Pollution Act however, documents and reports pertaining to both appeals are referenced in this report.

1.1.4. In assessing this application, I have reviewed the following documentation and reference material:

- EPA Guidance Document “Treatment systems for small communities, business, leisure centres and hotels.” 1999
- Guidance, Procedures and Training on the Licensing of Discharges to Surface Waters, Groundwater and to Sewer for Local Authorities 2011
- Guidance on the Authorisation of Discharges to Groundwater, EPA 2011
- The Site Characterisation and Tier 3 Hydrogeological Assessment reports prepared by EurGeol.

- The Design Report for the proposed WWTP prepared by Mitchell Environmental Ltd. and O'Reilly Oakstown
- EPA Code of Practice (2021) *Site Characterisation Form submitted by the applicants*
- EPA EDEN site for relevant Water Framework Directive information
- GSI website for relevant soil, bedrock, aquifer, and risk assessment information
- *EPA Code of Practice (Wastewater Treatment and Disposal Systems Serving Single Houses p.e. <10)*, 2021
- EPA *Guidance on the Authorisation of Discharges to Groundwater*, 2011
- EPA Guidance Document *Treatment systems for small communities, business, leisure centres and hotels*, 1999

2.0 **Site Location and Background**

2.1. The site is located at Kippure Lodge, Kippure, Manor Kilbride, Blessington, County Wicklow, W91 VE04. The site is located approximately 6.3km southeast of the village of Kilbride and approximately 6.5km southwest of the village of Glencree, at an elevation of approximately 280 – 295 mAOD and is approached by the Regional R759 road which lies to the north of the site.

2.2. The existing development on the site historically consisted of a holiday resort, which over time, specialised in hosting weddings and events venue as well as having an outdoor activity centre. The site also, which provided the option of both accommodation and meals to guests. This development was served by a wastewater treatment system which discharged treated wastewater to a soil polishing filter and in turn discharged to the in-situ subsoil by gravity. The original soil polishing filter was installed in 2000 and was 880m2 in area. This existing treatment system and polishing filter was located approx. 400m west of the holiday resort and 170m north of the river Liffey.

2.3. In 2017, Wicklow County Council granted a Licence under section 4 of the Local Government (Water Pollution) Act 1977 as amended to the owners of the site which permitted the discharge of 32m^3 per day of treated wastewater into soil polishing filters and in turn to the *in-situ* subsoil. In 2018, a second soil polishing filter was installed covering an area of approximately 720m^2, meaning a total filter area of 1,600m^2 was present on the site. This soil polishing filter was installed to cater for the discharge of 32m^3 per day at a loading rate of 20 litres per m^2 per day. This equates to a population equivalent of 213 (p.e.) in 2018. The treatment system (Stingray Environmental Sewerage Treatment Plant) serving the site is designed to cater for 300 p.e. This second polishing filter was installed adjacent to the original filter approx. 170m north of the river Liffey.

2.4. In 2020 the site was sold and in 2022, the site use changed and since then has been used as an accommodation facility under the International Protection Accommodation Service (IPAS) system. The hydraulic loading to the wastewater treatment system subsequently increased and was measured to be an average of 46.5m^3 per day in April 2023 with peak daily values up to a maximum of 53.9m^3 per day which is significantly more than the permitted loading rates of 32m^3 per day which the current discharge licence permits.

3.0 Assessment

I consider that the significant issues which arise in relation to this appeal are the content and conclusions of the Site Characterisation Report and Tier 3 Hydrogeological Assessment and the consequential impacts of the proposal on groundwater and surface water receptors.

3.1. Existing Wastewater Treatment System

3.1.1. The existing wastewater treatment system is a 300 p.e. Stingray Environmental Sewerage Treatment Plant which was last upgraded in 2020 (Stingray Environmental Engineering Report SEE-E007) and consists of the following components:

- Primary settlement/balancing takes place in a 30m^3 reinforced GRP underground tank. Raw sewage enters this tank by gravity via a 150mm sewer pipe. No screening takes place and partially settled sewage is transferred by lift pumps operated via timers into the aeration zone.

- An anoxic zone is established in a $6m^3$ reinforced GRP underground tank. Nitrified effluent is returned to this chamber via a Mixed Liquor Suspended Solids (MLSS) return pump operated via timer. The oxygen levels in this chamber are maintained between 0-1 mgO_2/L with denitrifying bacteria converting nitrate and nitrite to gaseous forms of nitrogen (mostly N_2).
- Aeration takes place in four $20m^3$ reinforced precast underground concrete tanks. MLSS pumps return nitrified liquor back to the anoxic zone from these tanks for further denitrification.
- Wastewater from the four aeration tanks flows into two $20m^3$ reinforced precast underground concrete tanks where clarification takes place. These tanks also contain suspended solids filters. Settled sludge from these tanks is circulated back to the primary settlement/balancing tank.
- Wastewater from the clarification tanks flows to an $8.5m^3$ effluent pump chamber. From this chamber, the effluent is pumped to the associated polishing filters. This chamber has a flow meter present which records the volume being discharged to the polishing filters.
- An Owner's Manual report for the treatment plant was prepared by Stingray Environmental Engineering (SEE-E007) in July 2023 and stated that the sewage treatment plant was designed to treat the wastewater from 280 p.e. (280 residents * 150L/p/d = 42,000L per day or 280 * 0.06kg = 16.8kg BOD/day). This report stated that the plant was designed to allow for 25% exceedance in the event of periodic overloading. The report noted that the discharge licence limit was $32m^3$/day and advised that a new discharge licence application be made if the "numbers increase".
- Effluent from the wastewater treatment plant is pumped into two soil polishing filters located to the south of the plant. The first soil polishing filter was installed in 2000 and covers an area of $880m^2$ (55m * 16m) which in turn discharges to the in-situ subsoil by gravity. A second pressurised soil polishing filter was installed in 2020 by Mitchell Environmental, covering an area of approximately $720m^2$ meaning a total filter area of $1,600m^2$ is present. This entire polishing filter could cater for the discharge of $32m^3$/day assuming a dosing rate of 20L /m^2/day.

3.1.2. Having regard to the technical information submitted with the appeal I am satisfied that the current loading to the existing wastewater treatment plant and polishing filters is in excess of the design capacity. This design exceedance has led to inefficient treatment processes and overloading of the soil polishing filters which has caused contamination of ground waters, surface waters and in the case of effluent break out, potential impacts on human health.

3.2. Wastewater loading change and issues arising

3.2.1. In 2022, the site use changed and the wastewater loadings to the treatment system increased. Monitoring of the existing treatment plant throughout 2023 and 2024 was carried out by Mitchell Environmental and included the measurement of flow rates to the plant. The maximum daily average was recorded throughout April 2023, when a daily average of 46,489 litres (46.5m^3) was recorded. Flow rates increased from February 2024 onwards and were as high as 53.9m^3 per day in March 2024. The reasons for these increases are not stated but were likely to be linked to higher occupancy rates in the accommodation.

3.2.2. The existing soil polishing filter was designed to accommodate loadings of 32m^3/day and having been exposed to daily loadings >168% of its capacity, the filter could no longer adequately attenuate the volumes and breakout of partially treated effluent occurred near the western side of the original (2000-installed) gravity fed soil polishing filter. This issue was identified in late Spring – early Summer 2024.

3.2.3. Following this incident, the licensing authority instructed the appellant to remove (via tanker) an agreed volume of raw wastewater to be treated off-site in an Uisce Eireann operated WWTP. Thus, since June 2024, 100m^3 of wastewater has been tankered off-site each week via a daily load of approximately 20m^3 over 5 days. The break-out issue ceased due to the reduction in volume going to the polishing filter. Mitchell Environmental also carried out repair works on existing pipework in the soil polishing filter in late Summer and early Autumn 2024 to evenly distribute the treated effluent and minimise the risk of overloading of this part of the filter in future.

3.2.4. In summarising the activities outlined above in his Hydrogeological Modelling Report, Dr. Robbie Meehan suggested that *given the capacity of the existing wastewater treatment plant and the sizing of the existing soil polishing filter, they are therefore* *not fit for purpose currently with an overall discharge from the facility daily of over $50m^3$ per day, despite favourable historical (2017) site characterisation and assessment results*.

3.2.5. Mitchell Environmental prepared a report in November 2024 on the proposal for a new wastewater treatment system to serve the site. In the report they commented on the performance of the existing treatment system and stated that the plant had struggled with effluent quality with poor results for BOD, COD, Ammonia and Suspended Solids. The report stated that the plants biggest issue was the lack of balancing and anoxic elements.

3.2.6. Having regard to the reports prepared by the Licensing Authority, Dr. Meehan and Mitchell Environmental, I am satisfied that the current loading to the existing wastewater treatment plant and polishing filters is in excess of the design capacity. This design exceedance has led to the treatment plant producing an effluent with BOD, COD and Ammonia levels in excess of the emission limit values set by the Licensing Authority. The excessive hydraulic loading to the system has caused effluent to break out from the polishing filter onto the surface of the ground. The existing treatment system is no longer fit for purpose and needs to be upgraded in order to protect the groundwaters and surface waters in the locality.

3.3. Proposed new Wastewater Treatment System

3.3.1. The appellant has proposed to install a new wastewater treatment system which will incorporate and re-purpose some elements of the existing treatment plant and install new elements to improve the treatment efficiency of the system. The proposed treatment system has been designed to have a total hydraulic loading of 90,000L/day (maximum) and total organic loading of 36,000g BOD/day (maximum) and a maximum design population equivalent of 600. The rationale behind the proposal is to allow for the future development of the facility as a tourism venue. The appellant stated that the discharge will be limited to $60m^3$/day or 400 p.e.

3.3.2. The proposed treatment system will contain the following elements:

- Three primary settlement tanks providing a total of $70m^3$ capacity

- Two balancing/buffer tanks (20m^3 each) to balance the flow into the treatment plants
- Four anoxic tanks (20m^3 each) which are fed from the buffer tanks. The Anoxic tanks give sufficient retention time for denitrification, and in-tank mixing generating no more than 0.2 mg/L of Dissolved Oxygen. This environment enhances the uptake of nitrate recycled from the aeration tanks. Mesophilic bacteria, in the absence of Dissolved Oxygen and a presence of contaminated matter, will utilise the oxygen from nitrate (which is released to atmosphere as N_2) to remove BOD/COD. The amount of nitrate removal in this system can be varied by the recirculation rate and the retention time.
- Eight aeration tanks (20m^3 each) with five diffusers on each side of each tank to provide sufficient air to keep the system aerobic to allow aerobic conditions for the removal of BOD/COD and ammonia in the wastewater. By control of the adequate Dissolved Oxygen, and retention times and recirculation rates to the anoxic tanks, the nitrifying bacteria which occur naturally in the sludge will remove ammonia. The remaining COD will be taken out by the normal mesophilic bacteria.
- Three clarification/final effluent tanks settle the sludge and returns the settled sludge to the anoxic tank or primary settlement tank. This is the final step in the biological process and is designed to allow solid-liquid separation of the biological mass from the treated wastewater. The clarified effluent overflows from the final effluent section of the tank into the discharge chamber.

The proposed treatment system will consist of re-purposed elements of the existing treatment system (7 tanks) and new elements (14 tanks) to be provided by O'Reilly Oakstown Environmental. The treatment system has been designed to produce the following minimum percentage pollutant reductions:

Table 3.1 Predicted effluent standards following treatment

Parameters	Incoming Effluent	Design Discharge Standard	Existing Discharge ELVs
Flow Design (m^3/d)	60	60	32
pH	7.0-8.0	6.0-9.0	6.0-9.0

BOD (mg/L)	300	10	25
COD (mg/L)	600	80	125
Total Ammonia (mg/L NH_3-N)	50	2	10
Total P (mg/L P)	15	0.5	No Limit
Ortho-P (mg/L P)	15	0.3	10
Total Kjeldahl N (mg/L N)	100	5	No Limit
FOG's (mg/L)	200	2	No Limit
Suspended Solids (mg/L)	1000	10	35
Nitrates (mg/L)	10	3	15

3.3.3. The suggested design discharge standards of the proposed wastewater treatment system are all lower than the existing discharge emission limit values as imposed by Discharge Licence WPL116.

3.3.4. Having regard to the design of the proposed wastewater treatment system as detailed in the reports prepared by Mitchell Environmental and O'Reilly Oakstown, I am satisfied that this treatment system can treat the projected volumes of wastewater to a high standard. The proposed organic and nutrient levels in the final effluent to be discharged to the soil polishing filters will allow the in-situ soil to safely attenuate the wastewater and not lead to significant impacts in receiving groundwaters or surface waters.

3.4. Proposed new soil polishing filter

3.4.1. The application includes a proposal to install a new soil polishing filter of 1,400m^2 in an area to the west of the current treatment plant location. To assess the suitability of this location to accommodate this new polishing filter a site characterisation assessment was carried out by Dr. Robbie Meehan (EurGeol) in 2023. Due to the scale of the proposed filter, four site characterisation forms were completed and combined in one report.

3.4.2. The soils on the site are described as a mixture of peaty podzols, lithosols and blanket peat and are underlain by a subsoil described as till derived chiefly from granites. The bedrock type is granites and other igneous intrusive rocks, and the accompanying aquifer is poorly productive, and the ground water vulnerability is described by the GSI as being 'High.' The Groundwater Response for the site is therefore noted to be R1 which means it is considered acceptable subject to normal good practice (i.e. system selection, construction, operation, and maintenance best practices).

3.4.3. The site has areas described as being steep (>1:5), shallow (1:5 -1:20) and relatively flat (<1:20) in places. The location of the proposed filter is situated on the southwestern mid-backslope of a low moraine ridge on a shallow slope. The river Liffey flows east to west along the site's southern boundary, approx. 120m south of the existing soil polishing filters and 175m south of the proposed new filter area. A smaller watercourse, the Athdown Brook flows from north to south along the western boundary of the site approx. 115m west-northwest of the proposed new filter and meets the Liffey southwest of the site.

3.4.4. There are no water supply wells within 250m of the existing WWTP and soil polishing filter area, and none within 250m of the proposed new polishing filter. The water supply wells for the site are all over 300m to the northeast (and up-gradient) of the WWTP and soil polishing filters (existing and proposed). Two monitoring wells have been drilled historically, the first approx. 62m north (and upgradient) of the existing WWTP and soil polishing filter, and approx. 35m east-northeast (and upgradient) of the proposed filter and the second approx. 50m southwest (and downgradient) of the existing WWTP and soil polishing filter, and approx. 115m south of the proposed new filter.

3.4.5. As part of the site characterisation assessment, four trial holes were excavated to the north, south, east, and west of the proposed polishing filter area. These trial holes were dug to a depth of between 2.85m and 3.45m and the soil profiles encountered in each were considered quite uniform. An upper 'A' horizon of black, compact to very soft, crumb, organic loam topsoil extended to a depth of between 0.4 - 0.6m below ground level (bgl). This was followed by the 'B' horizon of a yellowish red, soft to firm, subangular and blocky sandy SILT which was noted to a depth of between 0.7 - 1.0m bgl. The subsoil below this consisted of the 'C' horizon which extends to depths > 2.85m bgl and was a pinkish grey, massive yet fissile, very soft, slightly silty SAND with occasional gravels, cobbles, and boulders. This unit was unmottled and therefore unsaturated throughout the year. The trial holes demonstrated that the soils and subsoil units appeared to be permeable with ≥ 2.85m depth of unsaturated soil and subsoil to accept partially treated wastewater making the site potentially suitable.

3.4.6. A total of six subsurface and six surface percolation tests were carried out around the perimeter of the proposed soil polishing filter. These tests provided average subsurface percolation values of 7.69 and 8.19 and average surface percolation values (PV) of 6.78 and 5.81 which confirm the classification of the soils and subsoils undertaken in the trial hole assessments. In particular, the subsurface test rates supported the observations made and the visual assessment with respect to the textural nature and drainage class of the subsoil.

3.4.7. The proposed soil polishing filter will be 1,400m^2 in area (43m x 32.6m) and will accept 28m^3/day of partially treated wastewater at a loading rate of 20l/m^2/day. This represents approx. 47% of the maximum daily loading to be permitted under the requested discharge licence. The recommended design for the polishing filter is that it be installed at 0.7m bgl with 300mm of pea gravel to be firstly placed at 700mm depth, followed by a 35mm pipe manifold distribution system and a covering of 100mm depth of gravel. The gravel will be capped with a geotextile layer (to protect the distribution holes) and 300mm of topsoil to the finished ground level.

3.4.8. Having regard to the site characterisation report prepared by Dr. Meehan, I am satisfied that the location proposed for the new soil polishing filter is suitable for a discharge of wastewater of the nature and volume as described above and will not lead to significant impacts to groundwater or surface water quality.

3.5. Tier 3 Hydrogeological Assessment of the site

3.5.1. The EPA guidance document on the *Authorisation of Discharges to Groundwater* (2011) states that the level of technical assessment to be applied when dealing with discharges to groundwater should be proportionate to the risk posed by the discharge activity. Three tiers of assessment are defined within the guidance and for discharges of domestic wastewater greater than 20m^3/d a Tier 3 assessment is recommended. This assessment should aim to demonstrate that a site:

- Is hydraulically suitable and has sufficient infiltration capacity; and

- Has sufficient attenuation capacity to ensure that the discharge will not result in an unacceptable impact on receptors and non-compliance with groundwater and surface water quality standards and objectives.

A Tier 3 Assessment involves the estimation and/or calculation of :

- Hydraulic loading to groundwater;
- Chemical loading to groundwater; and
- Resulting concentrations of substances of concern that can be expected in groundwater following mixing between the effluent and groundwater; and
- Resulting concentrations of substances of concern that can be expected in a surface water following interaction with groundwater.

3.5.2. A report detailing the findings of a hydrogeological Tier 3 technical assessment was prepared by Dr. Meehan and submitted with the appeal documentation. The report was prepared in accordance with the “Source-Pathway-Receptor “ model for environmental management and with the EPA’s prescribed guidance document referenced above. The aim of the report was to answer the questions posed in 3.6.1 and prepare a conceptual site model to understand the expected interactions between the wastewater, the soils, the bedrock, the groundwater, and nearby surface waters to understand the likelihood of significant impacts on sensitive receptors. The main findings of this report are discussed in the following sections of my report.

Subsoil and Bedrock Assessment

3.5.3. A particle size analysis of the subsoil was undertaken on samples from all four trial pits at depths > 2m bgl which showed percentages of CLAY between 4 – 7% and percentages of fines of between 7 and 24% which places the subsoils within the SAND class. These results placed the subsoils at the higher end of the ‘Moderate’ subsoil permeability class, and the measured PV values of 7.69 and 8.19 confirm this to be the case. An average PV value of 7.95 places this site towards the lower end of the acceptable PV range (3 – 120 as per EPA CoP, 2021) and means the dosing of the proposed soil polishing filter at a rate of 20 litres per square metre per day will not result in groundwater mounding beneath or around the soil polishing filter area.

3.5.4. Groundwater flow direction was found to be generally from northeast to southwest, downslope towards the lower ground and the River Liffey and Athdown Brook and their confluence. This was corroborated by the groundwater levels measured on site in four boreholes (1 upgradient and 3 downgradient of the proposed and existing soil polishing filters). Groundwater was measured at 2.63m bgl in the up-gradient piezometer GW1, and 2.73m, 4.41m and 3.18m bgl in the down-gradient piezometers GW2, GW3 and GW4, respectively. These local groundwater levels suggest flow is in line with topography and the regional flow.

3.5.5. The national aquifer map has classified the bedrock type for the area as poorly productive bedrock aquifers (Pl) – bedrock, which is generally unproductive , except for local zones. In general, in these poor aquifers (Pl), the lack of connection between the limited fissures results in relatively poor aquifer storage and flow paths that may only extend a few hundred metres at a maximum. Due to the low permeability and poor storage capacity, the aquifers will have a low 'recharge acceptance.' Some recharge in the upper, more fractured/weathered zone is likely to flow along the relatively short flow paths and rapidly discharge to streams, small springs, and seeps. The bedrock type under the site is classed as Type 2e equigranular granite rocks and groundwater flow is considered to take place in the upper weathered zone of the aquifer. Flow paths are not considered to extend further than the nearest surface water features and generally not be greater than 250m. This information is important as it limits the potential impacts to the body of groundwater located between the polishing filter and the river Liffey and Athdown Brook. Groundwater outside of this area is unlikely to be impacted by discharges from the polishing filters.

3.5.6. The report highlights that little hydrogeological data is available for this type of groundwater body and specific single figures with respect to permeability, transmissivity and storativity cannot be quoted from existing research. The GSI-EPA Publication on 'Irish Aquifer Properties – a reference manual and guide' suggests that poorly productive aquifers (both Pl and Pu) have transmissivity values in general averaging at maximum around 10m^2/d and the GSI Groundwater Body Summary sheet estimates even lower transmissivities, at 1 – 6 m^2/d. Transmissivity (T) [m^2/d] is defined as the rate at which water can pass through the full aquifer thickness.

3.5.7. Recharge is a term used to describe the amount of water replenishing the groundwater flow system and is assumed to consist of an input (i.e. annual rainfall) less water losses (i.e. annual evapotranspiration and runoff). The National Recharge Map produced by GSI classified the site in question as having a recharge rate of only 100mm, owing more to the limited recharge acceptance in the 'poor' aquifer under the site, rather than the amount of effective rainfall and the permeability of the subsoils in the locality. The annual average effective rainfall for the site was estimated to be 594mm which is calculated by subtracting the actual evapotranspiration value (482mm sourced from the Met Eireann website) from the annual average rainfall value (1,076mm sourced from the Met Eireann website).

3.5.8. Following a walk-over survey of the site, four locations for the installation of monitoring piezometers were selected by the author. The locations and details of these borehole piezometers was provided on pages 24 and 25 of the report. One piezometer (GW1) was located upgradient of the existing and proposed treatment system and infiltration areas and the second, third and fourth locations were down-gradient; one to the west-southwest of the proposed new filter area (GW2), one to the south-west of the existing filter area (GW3) and one to the south of the existing filter area (GW4). Full borehole logs for each of the monitoring piezometers were recorded and are reported in Appendix B of the report. These piezometers were installed outside the influence of infiltrating partially treated effluent, yet as close to the proposed infiltration/treatment area as possible. The report noted that these monitoring boreholes as well as providing information for the purposes of this assessment could be used to monitor the performance of the proposed treatment system and the migration of any contaminants in the future, should the appeal be successful.

3.5.9. The borehole logs demonstrated that the bedrock is 6.7m bgl across the locality of the up-gradient piezometer and between 1.8m and 6.5m bgl beneath the down-gradient piezometers. Bedrock crops out in the bed of the River Liffey also. The water table was encountered 2.63m bgl in the up-gradient piezometer and between 2.73m and 4.41m bgl in the down-gradient piezometers. This demonstrated that the site was well drained with adequate depth of unsaturated subsoils above both the water table and bedrock to attenuate partially treated wastewater.

3.5.10. Having regard to the contents of Dr. Meehan's report and the available GSI data for the site I agree with the findings and am satisfied that the area underlying the proposed soil polishing filter is of such soil type, depth and percolation characteristics to be suitable for the discharge of the proposed volumes of treated effluent.

Wastewater Attenuation

3.5.11. The assessment used the data on nutrient concentrations in the treated effluent provided in Table 6.1 above to predict the concentrations at a depth of 0.9m below the invert level of the proposed soil polishing filter. The fate of nitrogen in the *in-situ* soil/subsoil is dependent on the form in which it is introduced. Under anaerobic conditions, where nitrification is inhibited, ammonium ions are readily adsorbed onto negatively charged soil particles. Under aerobic conditions (which are likely to be present in this instance due to the unsaturated soils present) ammonium undergoes nitrification and nitrate can be readily leached to the groundwater. Therefore, to reduce the potential for elevated nitrate concentrations discharging to surface waters, it is important that the treatment system removes the maximum amount of nitrogen (ammonia and nitrates) as specified in Table 6.1.

3.5.12. Phosphorous attenuation in the subsoil is controlled by adsorption and mineral precipitation reactions and is dependent on soil/subsoil properties. The proposed treatment system includes a coagulant dosing process to assist phosphorous removal and achieve final ortho-phosphate readings below 0.5mg P/L which would represent a highly treated wastewater from a P-removal perspective. The report concluded that the nutrient concentrations in the percolating effluent at 0.9m below the discharge point would be as outlined in Table 6.2 below.

Table 3.2 Estimated concentrations in effluent 0.9m below discharge point

Parameter	O'Reilly Oakstown BAF WWTS Concentration (mg/L) 1m below discharge point
COD (mg/L O_2)	< 15
BOD (mg/L O_2)	< 1
Suspended Solids (mg/L)	< 2 (close to 0)

Total Phosphorous (mg/L P)	< 0.1
Ammonia as NH_3 (mg/L N)	< 0.25

The report concluded that given the above results, the levels of contaminants at 0.9m below the discharge point for the system are likely to be negligible. With dilution in the groundwater body occurring following this, the infiltration area is likely to have little effect on the down-gradient aquifer owing to the well-drained soil and subsoil at the locality, the depth to bedrock and the absence of immediate down-gradient receptors.

3.5.13. Having regard to the proposed nutrient-removal rates for the wastewater treatment system and the suitability of the proposed soil polishing filter, I am satisfied that the contaminant levels of the discharge at a depth of 0.9m below the base of the filter will be so low as to pose no risk to the quality of groundwaters and surface waters.

Assimilative Capacity Assessment

3.5.14. The report detailed the results of an assimilative capacity assessment which was carried out on the groundwater body. To achieve this, background concentrations of various water quality parameters were required. On the 7th of March 2024 water samples were taken from the four piezometer boreholes and from the drinking water well serving the site (GW5). The samples were analysed by an ISO 17025 INAB accredited laboratory and the results presented in Table 8 on page 34 of the report.

3.5.15. The results for the upgradient piezometer GW1 showed that Total Coliforms, Faecal Coliforms and Clostridium Perfringens were found to be present and no explanation for this was presented. There are no known sources of pathogens upgradient of the borehole. GW1 is located up-gradient of the existing polishing filter and the absence of elevated ammonia readings in the sample suggested the existing polishing filter is not linked to the elevated microbial pathogen values noted. Elevated Aluminium, Iron and Manganese were also recorded in this sample and the report concluded that these hydrochemical exceedances were due to the natural geology of the locality and this explanation is acceptable given the presence of muscovite (mineral of aluminium and potassium) in the bedrock and historic iron and manganese mining operations near the site.

3.5.16. The parameters used by the GSI to provide an indication of potential sources of contamination indicate an acceptable quality groundwater at GW1 with a low nitrate concentration (2.04 mg/L NO3 as N) and ammonium concentration (0.029 mg/L NH4 as N). The level of ortho-phosphate is also very low (<0.01 mg/L PO4 as P).

Figure 3.1 Location of groundwater sampling locations and salient features (locations approximate)

3.5.17. The monitoring results for samples taken from the boreholes GW2, GW3 and GW4 showed that elevated Total Coliforms, Faecal Coliforms and Clostridium Perfringens were found to be present. Elevated Aluminium, Iron and Manganese were also recorded in these boreholes, and the report concluded that the natural geology of the locality is responsible for these observed levels. The report suggested that observed exceedances for arsenic and chromium are also due to the local geology.

3.5.18. The nitrate concentrations recorded in GW2, GW3 and GW4 were mostly high (1.25, 6.71 and 4.93 mg/L NO_3 -N respectively) when compared to that noted in the upgradient GW1 site (2.04 mg/L NO_3 -N). The levels of ortho-phosphate in GW2, GW3 and GW4 were found to be low (0.015, <0.01 and 0.017 mg/L PO_4 as P respectively). The readings of ammonia in GW2 and GW4 were low (0.031 and

0.037 mg/L NH_4 as N) however a very high reading was noted in GW3. This elevated reading (8.33 mg/L NH_4 as N) is indicative of significant contamination. Given the location of GW3, downgradient of the breakout of partially treated effluent from the existing soil polishing filter, it is highly likely that the elevated ammonia reading noted was due to ingress of this effluent into the borehole.

3.5.19. The potassium:sodium (K:Na) ratio is often used as an indicator of organic contamination and values of this ratio above 0.3 would suggest contamination from organic wastes. The K:Na ratio was found to be high at GW4 (0.72) indicating that the malfunctioning WWTP and overloaded soil polishing filter was impacting this borehole despite ammonia, nitrate and ortho-phosphate readings being relatively low in the same sample.

3.5.20. A sample of groundwater was also taken from the well supplying drinking water for the site (GW5) and this sample showed elevated values for ortho-phosphates, manganese, arsenic, and uranium. The local geology explained the readings for manganese, arsenic, and uranium but not the ortho-phosphate. The report suggested a nearby forestry plantation may have contributed to this reading (0.053 mg/L mg/L PO_4 as P).

Table 3.3 Summary of background concentrations compared to standards

Parameter	Concentration (mg/L)					
	07/03/2024 GW1	07/03/2024 GW2	07/03/2024 GW3	07/03/2024 GW4	07/03/2024 GW5	Groundwater Regulations /Interim Guideline Value
Nitrate (as NO_3)	9.04	5.54	29.73	21.84	2.42	37.5
Ammonium (as NH_4-N)	0.029	0.031	8.33	0.037	0.011	0.065 – 0.175
Orthophosphate (mg/L P)	<0.01	0.015	<0.01	0.017	0.053	0.03
Potassium:Sodium Ratio	0.27	0.19	0.1	0.72	<0.063	0.3

3.5.21. The assessment quantified the volumetric flow rate of groundwater through the area underlying the soil polishing filters to be 3.01 x 10^{-3} m^3/s. This was calculated by dividing the hydraulic gradient (difference in elevation between the static level in GW1 and GW3) by the perpendicular distance between GW1 and GW3. The figure of 10m^2/d for transmissivity was adopted in the absence of site-specific data for use in applying Darcy's Law to the site.

Darcy's Law for groundwater flow:
$$Q = KiA$$
Where, Q = groundwater flow rate in aquifer (m3/d); K = hydraulic conductivity (m/d); i = hydraulic gradient (m/m);

3.5.22. The assimilation capacity of the groundwater body was assessed by simulating the potential downstream nutrient concentration post discharge. The calculated volumetric flowrate, the background nutrient concentrations in the groundwater along with the proposed maximum hydraulic load and the effluent concentrations were used in a mass balance equation to calculate the resultant nutrient concentration in the groundwater body post discharge. The equation used was not provided in the report but is assumed to be as is provided in the EPA guidance document (see below):

$$C_{gw} = [(C_{in} \times Q_{in}) + (C_{gwu} \times Q_{gw})]/(Q_{in} + Q_{gw})$$
Where, C_{gw} = resulting concentration in groundwater (mass/volume; M/V); C_{in} = concentration in the infiltrating water (M/V); (chemical loading, as concentration) Q_{in} = volumetric rate of infiltrating water (V/t); (hydraulic loading) C_{gwu} = concentration in the aquifer from upgradient areas (M/V); (measured from monitoring wells) Q_{gw} = groundwater flow rate through the aquifer (V/t)

Using this equation, the report suggested the following nutrient concentrations will exist in the aquifer following discharge of the wastewater:

Table 3.4 Simulated resultant nutrient concentrations in aquifer compared to Groundwater Regulations threshold values

Parameter	Resultant Concentration	Groundwater Regulations SI 366 of 2016 Threshold Values
Nitrate (as NO3)	7.72	37.5
Ammonia (as NH4 - N)	0.073	0.065 – 0.175
Orthophosphate (as PO_4 - P)	0.029	0.035

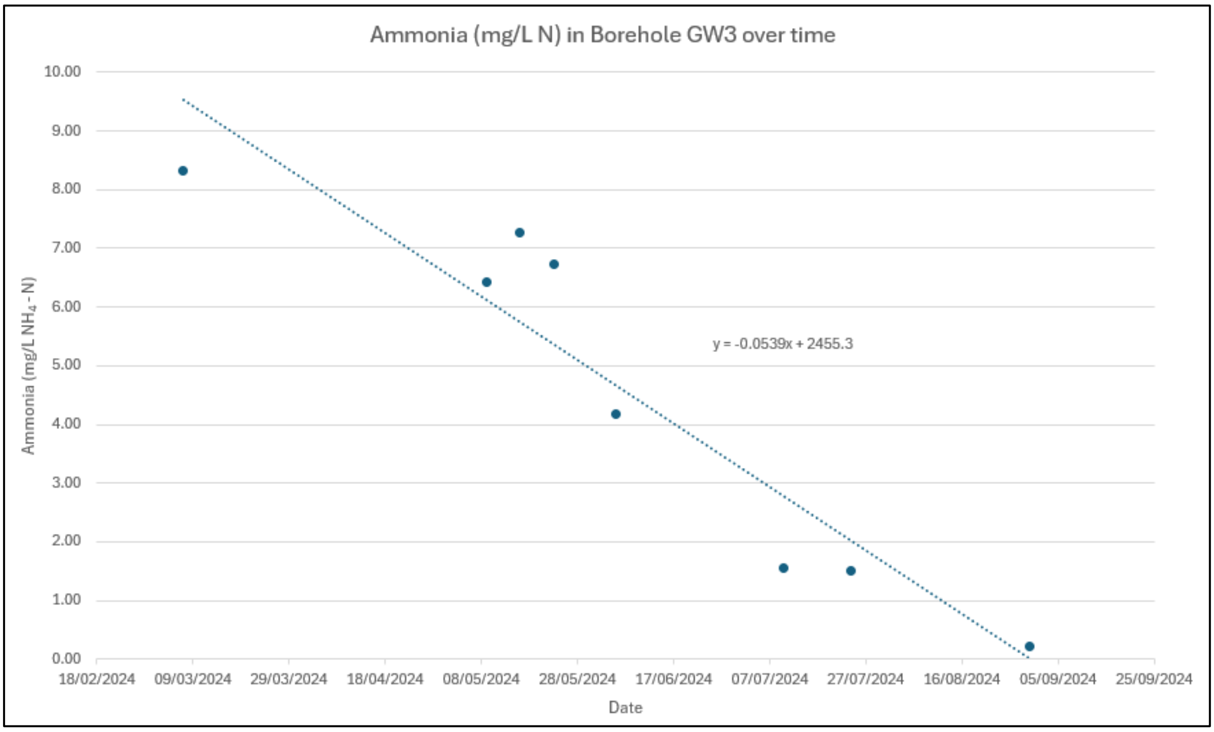
The report also suggests that the effluent would be diluted by a factor of at least 4.33 which will further reduce the concentrations of nutrients in the groundwater.

In calculating these simulated nutrient concentrations, the assessment has excluded the high ammonia reading noted in borehole GW3 and referenced this omission in the report. The rationale for excluding this result was that the overloading of the soil polishing filter and the malfunction of the treatment system led to a failure of the existing system which does not represent the 'normal' operating conditions of the proposed system with loading rates of 20l/m^2/day of a higher quality (lower nutrient level) effluent than is currently the situation.

The assimilation capacity equations include a background concentration of ammonia in the groundwater which used an average of the levels recorded on the 7th March 2024 in GW1, GW2 and GW4, calculated to be 0.032 mg/L NH_4-N. Subsequent sampling of the groundwater quality in all boreholes demonstrated that the levels of ammonia in GW3 have decreased by 97% from an initial value of 8.33 to 0.229 mg/L NH_4-N between March 7th and August 30th 2024. This reduction was due to the impacts of the repair works carried out on the soil polishing filter and the reduction in hydraulic loading to the filter due to the removal of wastewater for treatment off-site. This reduction in hydraulic loading has led to an improved assimilative capacity in the groundwater under the existing polishing filter.

I carried out an investigation of this reduction in ammonia levels in GW3 to assess when the levels would reduce to background concentrations. The monitoring data for GW3 ammonia results for this period was plotted against time and a trendline calculated (see figure 6.2 below). Using the equation of this line, it was estimated that the concentration of ammonia within GW3 could return to background levels (assumed to be 0.032 mg/L NH_4-N) by September 20th, 2024, assuming the same rate of depletion/attenuation within the borehole. The assumption that the attenuation/depletion rate remains constant is dependent on several factors such as the performance of the wwwtp, removal rates of raw wastewater for treatment off-site, rainfall amounts, groundwater flow rates etc. This timeframe is not definitive but can be taken as indicative based on the data provided in the report.

Figure 3.2 Concentration of Ammonia (mg/L NH_4-N) in GW3 over 177 days in 2024



3.5.23. The planning authority in their reasons for refusal suggested there was an inadequate examination of the impact of the ammonia discharge on the assimilative capacity of the groundwater, given the existing ammonia concentrations in the groundwater. Given the evidence that ammonia levels have already decreased by 97% in GW3 it is considered appropriate that the baseline concentration values used in the assimilation capacity calculations were not those resulting from the overloading and malfunction of the treatment system. It is more appropriate that the baseline values applied to the assimilation capacity equations for the proposed system were more typical of the levels noted in other boreholes less impacted by the malfunctioning wwtp and polishing filter.

3.5.24. The proposed new polishing filter will discharge into subsoils and groundwaters which have not previously received effluents from the existing WWTP. The results from the monitoring of GW2, which is located downgradient of the new polishing filter, demonstrated that the groundwater in this area was low in nutrients and more representative of background (upgradient) conditions. Therefore, the new polishing filter will not be discharging partially treated effluent into an already elevated-nutrient environment. The Tier 3 Assessment has demonstrated that this groundwater environment will be capable of attenuating the volume of wastewater the new polishing filter is designed to accept, which is up to 28m^3/day.

3.5.25. In conclusion, I consider that the rationale for excluding the elevated ammonia value recorded in GW3 on March 7th, 2024, from the assimilative capacity calculations used in the Tier 3 Assessment is understood, valid and in accordance with best practice. I believe having undertaken the above analysis of available data and considering the proposed location of the new soil polishing filter, the Tier 3 Assessment uses valid background readings and proves that the installation of the new wastewater treatment system and polishing filter will not have any significant impacts on groundwaters.

3.5.26. The Tier 3 Assessment concluded with a conceptual hydrogeological model of the Kippure site which outlined that:

- Simulations suggested that the levels of contaminants at 1.2m below the discharge point were likely to be negligible.
- With dilution in the groundwater body occurring following this, the infiltration area would have little effect on the down-gradient aquifer owing to the well-drained soil and subsoil, the depth to bedrock, the design and construction of the on-site polishing filter and the absence of down-gradient drinking water receptors.
- Nutrient concentrations in groundwater will comply with Drinking Water and Groundwater Regulations threshold values.
- There will be a dilution factor of 4.33 at a mixing depth of 6m in the saturated granular material therefore, as the proposed discharge volume is low relative to the volumetric flowrate of the groundwater body, it is envisaged that the proposed discharge will not result in a reduction of the quality status of the underlying aquifer.

3.5.27. Having overall regard to the Tier 3 Hydrogeological Assessment, I am satisfied that the investigations and report were prepared in accordance with the guidance provided by the EPA for managing discharges to groundwaters. The report has demonstrated that the installation of the wastewater treatment system and soil polishing filter will not have a significant impact on groundwater quality.

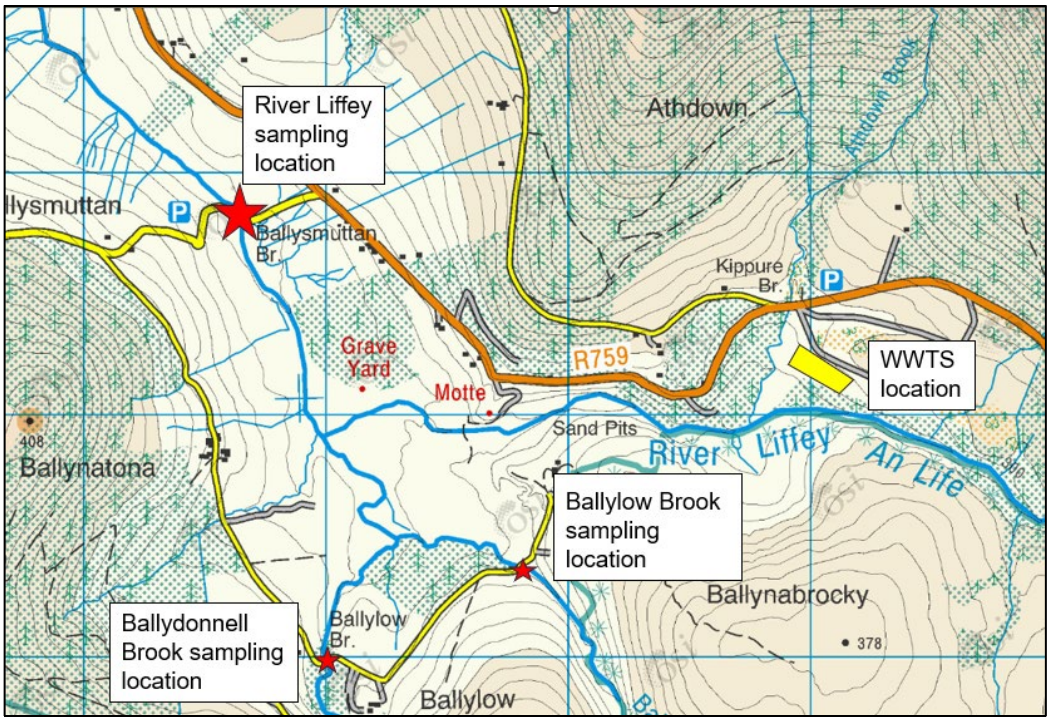
Impacts on River Liffey

3.5.28. The report also discussed the potential for impacts on the adjacent River Liffey. The report outlined that water samples were taken from the river Liffey upgradient and down gradient of the Kippure site on seven occasions between May and November 2024. The results obtained over this period indicated the river Liffey is a 'High Status' water with low concentrations of nutrients and no impact from either the normal operation or malfunction of the existing wastewater treatment system was evident.

3.6. Surface Water Quality Impact Assessment

3.6.1. To verify this conclusion relating to the receiving waters of the river Liffey I carried out an investigation using available data from the EPA's water quality monitoring programme. I identified a sampling location at Ballysmuttan Bridge (Site code IE_EA_09L010200) which is approximately 3km downstream of the Kippure site. This site is routinely sampled as part of the Operational Monitoring programme managed by the EPA. The location of this monitoring station is appropriate to assess any significant changes in water quality observed in the river Liffey in the vicinity of the site in question over the previous 7 years. Two smaller watercourses, the Ballylow Brook_010 and the Ballydonnell Brook_010 flow from the south, join together into one watercourse which flows into the river Liffey between the Kippure site and the monitoring location at Ballysmuttan Bridge. I chose the period from 2017 to 2024 (inclusive) as an appropriate time frame for this assessment. See Figure 6.3 below for details of the sampling locations used by the EPA.

Figure 3.3 The sampling locations relative to the WWTS on the Kippure site



Control Waterbodies

3.6.2. I also assessed the water quality data for the Ballylow Brook_010 and Ballydonnell Brook_010 waterbodies for the same period (2017 -2024). These 2 waterbodies act as ‘control’ sites in this scenario as they cannot be impacted by any activity at the Kippure site. The comparison of water quality data from these waterbodies and the river Liffey site downstream of Kippure allows an objective assessment of any changes in nutrient concentrations noted.

Ammonia Data

The ammonia data for Ballysmuttan Bridge was assessed and is presented in figures 3.4 and 3.5 below. The data for 2017 to 2024 shows that ammonia levels at Ballysmuttan Bridge have often been below the limit of detection (0.02 mg/l N) for the analysis of ammonia indicating a low-ammonia environment is present in the river Liffey at this location. Occasional readings > 0.02mg/L N have been noted since 2017 and one reading >0.035mg/L N recorded in September 2023.

Figure 3.4 Ammonia concentration readings at Ballysmuttan Bridge (2017 – 2024)

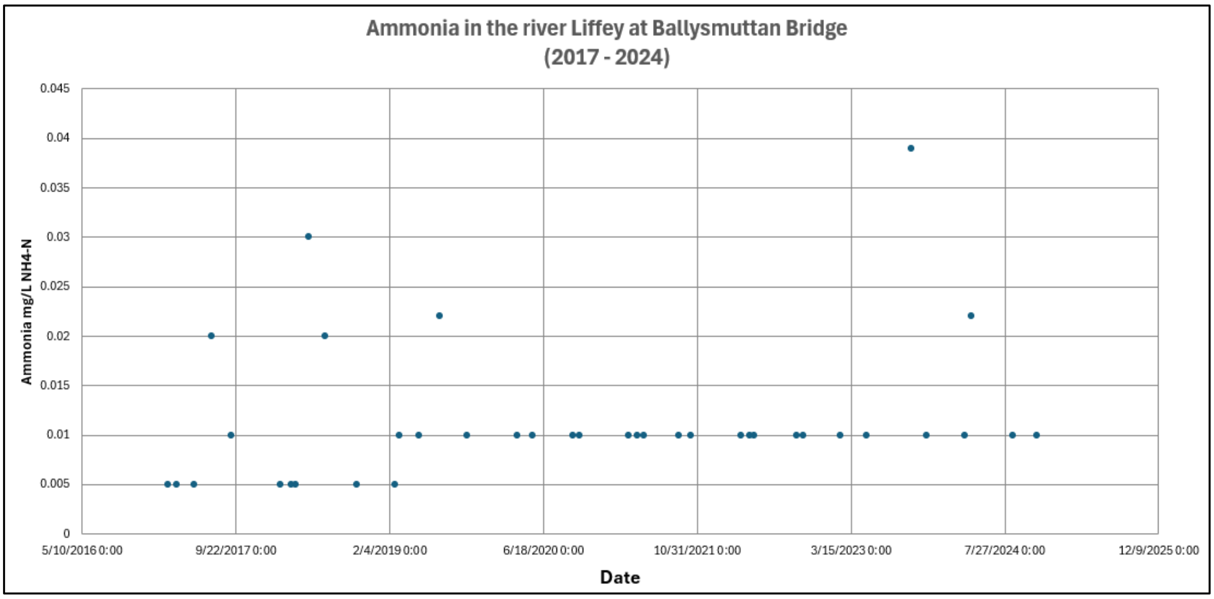
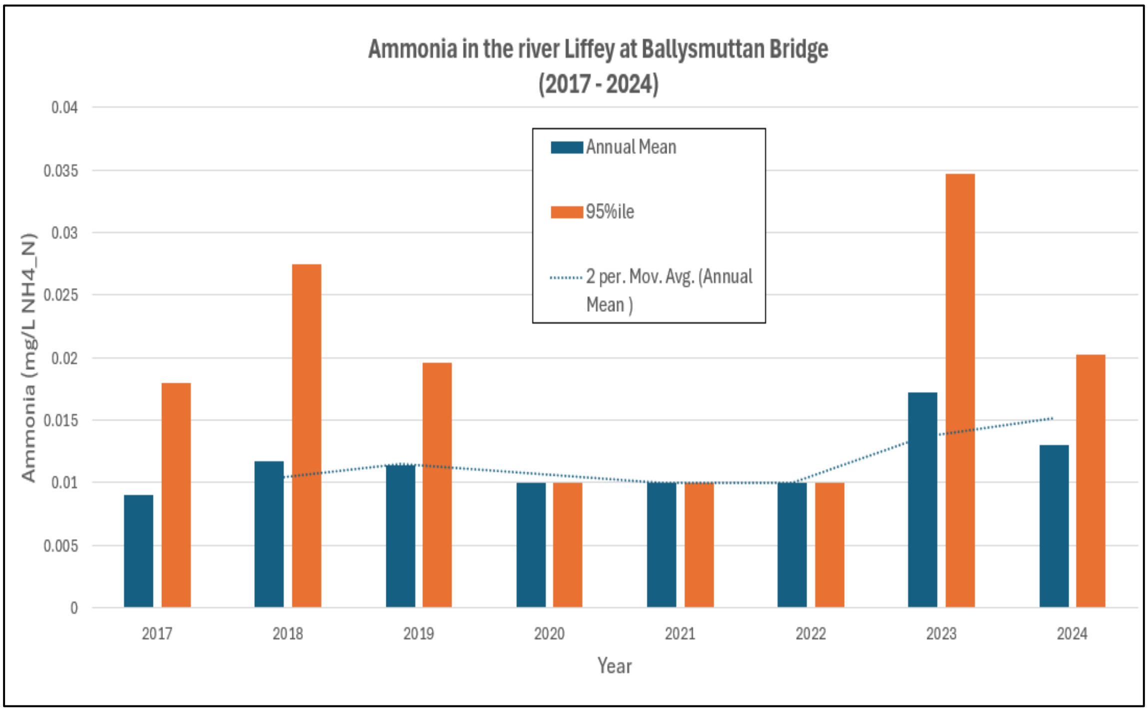


Figure 3.5 Annual average and 95%ile readings for Ammonia concentration at Ballysmuttan Bridge (2017 – 2024)



3.6.3. When the annual averages and 95%ile values were calculated it suggested that these values have increased in 2023 and 2024 compared to the previous 5 years. However, most samples taken over these 2 years were below the limit of detection, and the inclusion of one higher sample result can have a significant impact on the average values when sampling takes place 4 or 5 times per year. In the 2023 and

2024 sampling period, six out of the eight samples taken returned values for ammonia below the limit of detection.

3.6.4. These annual averages and 95%ile values remain indicative of a ‘High Status’ river waterbody being less than the Surface Water Regulations threshold values of 0.040 and 0.090 respectively for Total Ammonia. Having regard to the water quality data, there is no evidence that the malfunctioning wastewater treatment system at Kippure has had an impact on Ammonia concentrations in the river Liffey.

3.6.5. I also assessed the water quality data for the Ballylow Brook_010 and Ballydonnell Brook_010 waterbodies for the same period (2017 -2024) and noted no significant increases in ammonia values in both waterbodies between 2022 and 2024 which mirrors that noted downstream in the river Liffey at Ballysmuttan Bridge. These 2 waterbodies act as ‘control’ sites in this scenario as they cannot be impacted by any activity at the Kippure site.

Total Oxidised Nitrogen (TON)

3.6.6. The Total Oxidised Nitrogen (TON) data for the river Liffey at Ballysmuttan Bridge was assessed and is presented in figures 3.6 and 3.7 below. The data for 2017 to 2024 showed that TON results at Ballysmuttan Bridge have often been below the limit of detection for the analysis of TON indicating a low-oxidised nitrogen environment is present in the river Liffey at this location. Occasional readings > 0.02mg/L N have been noted since 2017 with one reading of 0.85mg/L N in 2022. The data presented in Figure 6.6 indicates that the levels of TON may have increased at this location since 2022.

When the TON annual averages were calculated along with the 95%ile values for the same periods, it confirms that these values have increased in 2022, 2023 and 2024 compared to the previous 5 years.

There are no threshold values for TON or Nitrates in the Surface Water Regulations however a value of 1.8mg NO_3-N is used by the EPA as the level at which impacts to the ecological health of rivers and associated downstream marine waters occurs. The annual average TON values noted in the river Liffey at Ballysmuttan Bridge in the period in question although increased, were below this value by a factor of five or more.

Figure 3.6 Total Oxidised Nitrogen concentration readings at Ballysmuttan Bridge (2017 – 2024)

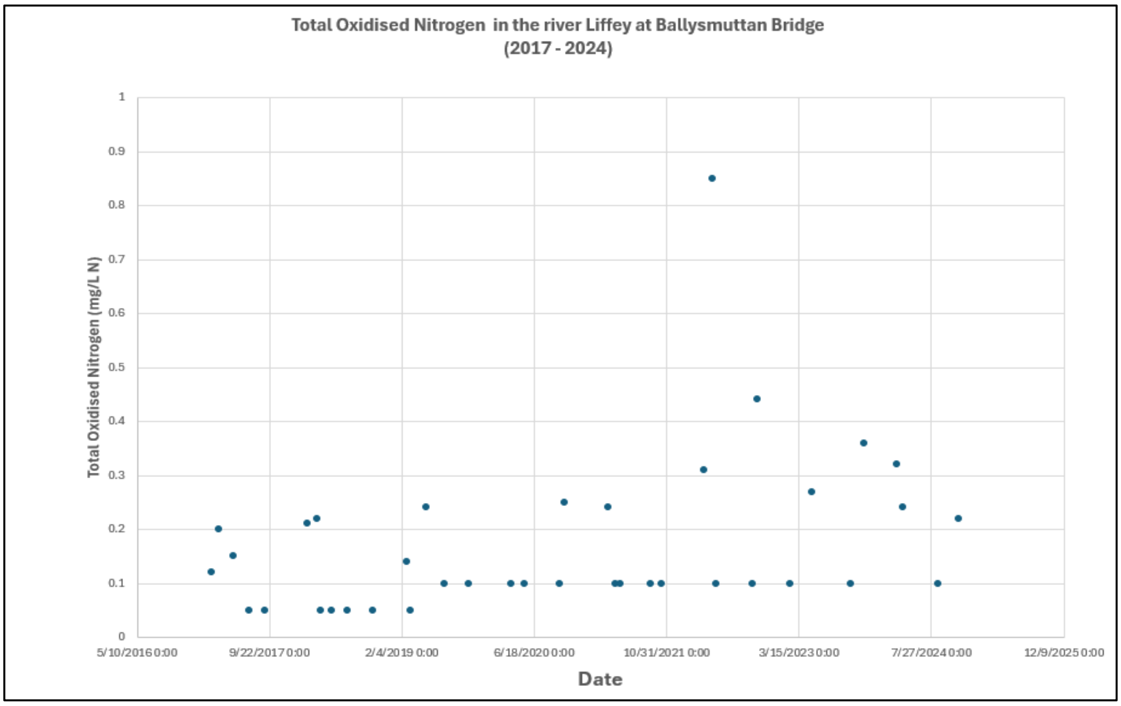
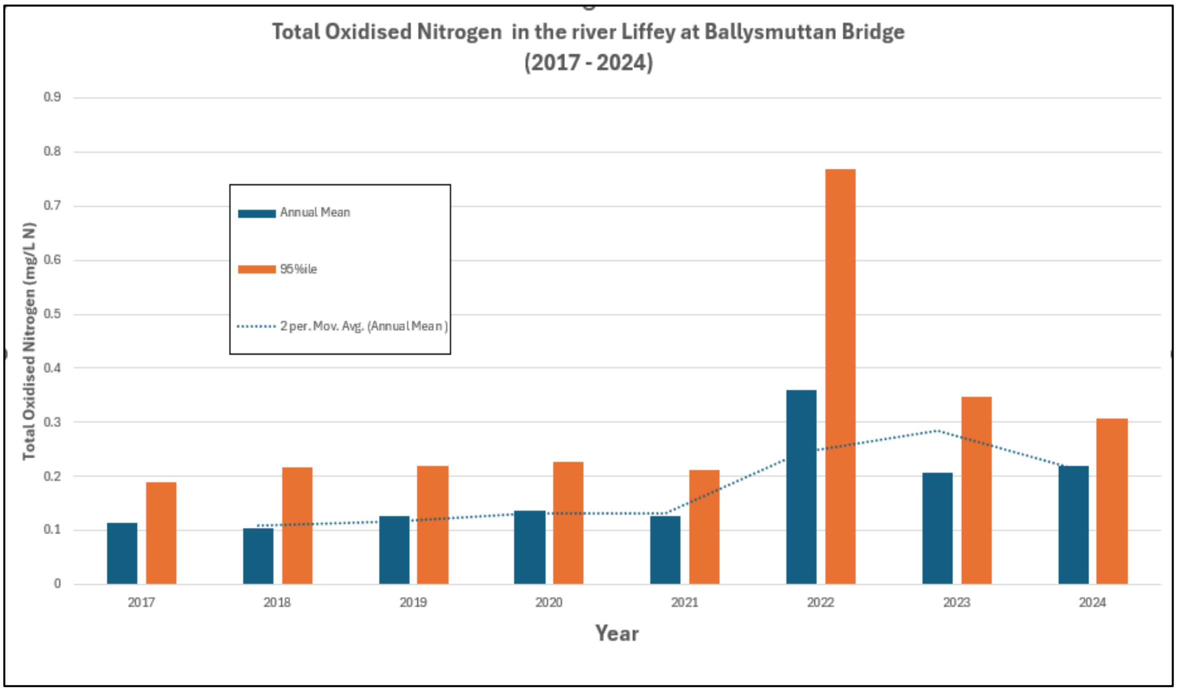


Figure 3.7 Annual average and 95%ile readings for TON concentration at Ballysmuttan Bridge (2017 – 2024)



3.6.7. I assessed the available water quality data for the two ‘control sites’ Ballylow Brook_010 and Ballydonnell Brook_010 waterbodies for the same period (2017 - 2024) and noted an increase in TON values in both waterbodies between 2022 and

2024 which mirrored that noted downstream in the river Liffey at Ballysmuttan Bridge. This suggested that the increases in TON noted at Ballysmuttan Bridge are highly likely to be due to regional impacts from agriculture/forestry etc and not due to any activities at the Kippure site.

3.6.8. Having regard to the water quality data noted in the river Liffey at Ballysmuttan Bridge and at the 2 control sites discussed above, there is no evidence that the malfunctioning wastewater treatment system at Kippure has had an impact on TON concentrations in the river Liffey.

Ortho-phosphate

3.6.9. The Ortho-phosphate data for Ballysmuttan Bridge was assessed and is presented in figures 3.8 and 3.9 below. The data for 2017 to 2024 showed that orthophosphate results for the river Liffey at Ballysmuttan Bridge have often been below the limit of detection (0.01 mg/l P) indicating a low-phosphate environment is present at this location. Occasional readings > 0.02mg/L P have been noted since 2017 and two reading >0.036mg/L N recorded in recent years.

When the annual averages were calculated along with 95%ile values for the same periods, it suggests that the annual average values have increased in 2023 and 2024 compared to the previous 4 years. However, five of the eight samples taken over these 2 years were either below the limit of detection or within 20% of the limit of detection.

The annual averages and 95%ile values are indicative of a ‘High Status’ river waterbody being less than the Surface Water Regulations threshold values of ≤0.025 mgP/l and ≤0.040 mgP/l respectively for Molybdate Reactive Phosphorous (Orthophosphate).

Figure 3.8 Ortho-phosphate concentration readings at Ballysmuttan Bridge (2017 – 2024)

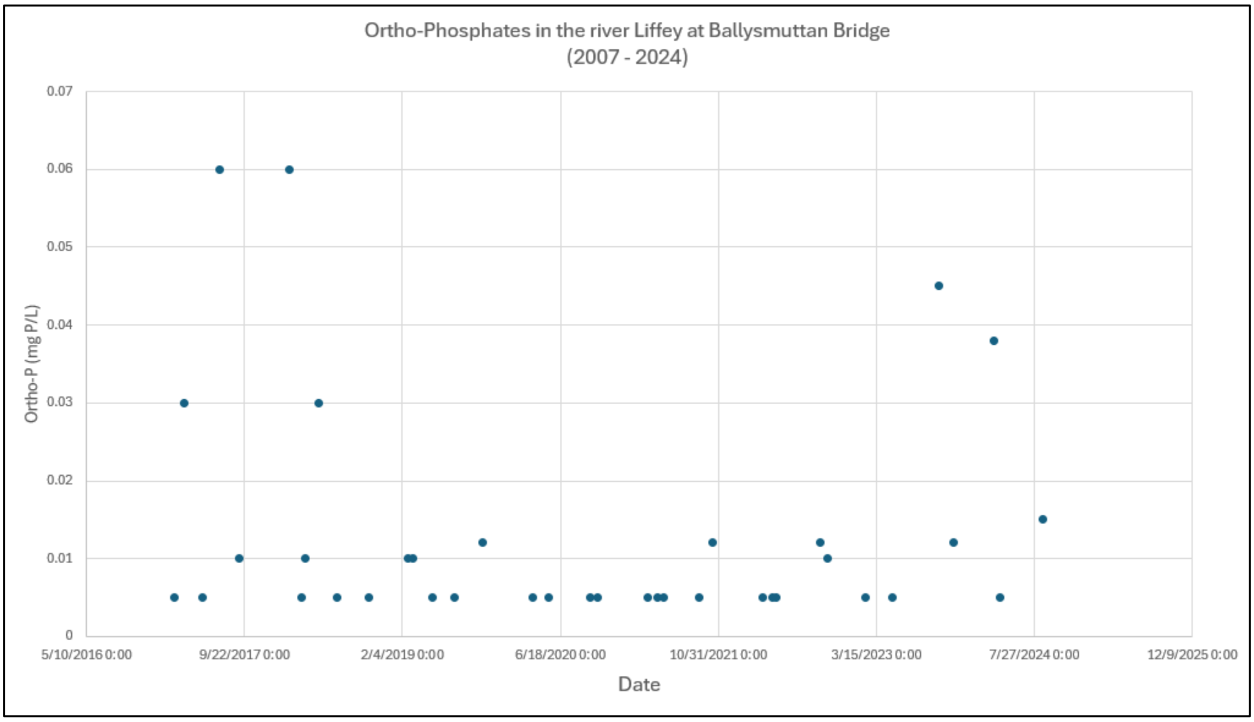
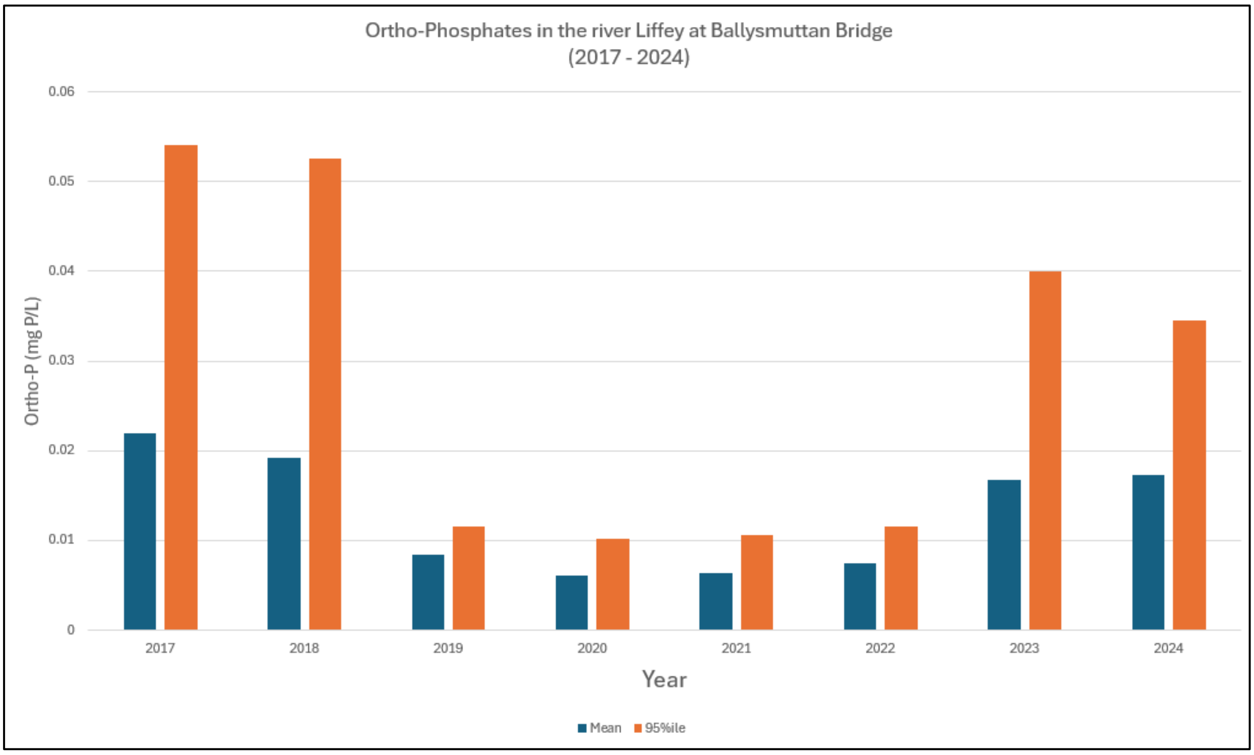


Figure 3.9 Annual average and 95%ile readings for Ortho-phosphate concentration at Ballysmuttan Bridge (2017 – 2024)



3.6.10. I also assessed the water quality data for the Ballylow Brook_010 and Ballydonnell Brook_010 waterbodies for the same period (2017 - 2024) and noted no significant increases in ortho-phosphate values in both waterbodies between 2022 and 2024 which mirrors that noted downstream in the river Liffey at Ballysmuttan Bridge. These 2 waterbodies act as 'control' sites in this scenario as they are not impacted by the Kippure site.

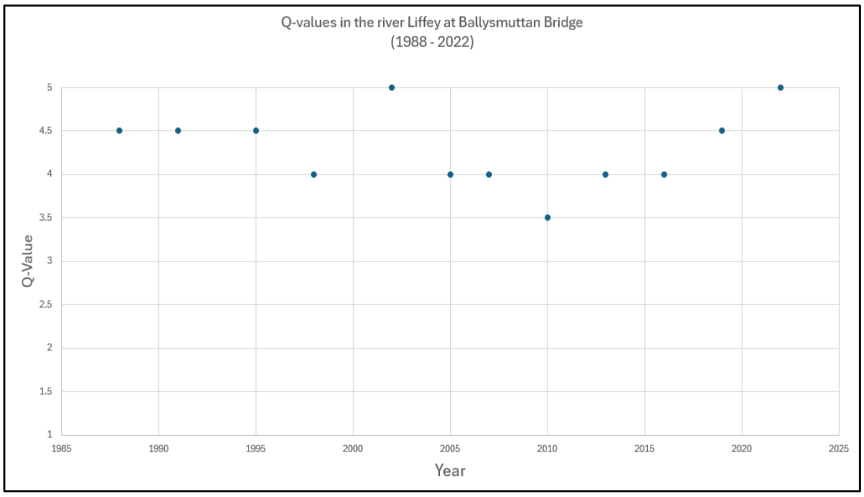
3.6.11. Having regard to the water quality data noted in the river Liffey at Ballysmuttan Bridge and at the 2 control sites discussed above, there is no evidence that the malfunctioning wastewater treatment system at Kippure has had an impact on Ortho-phosphate concentrations in the river Liffey. This finding confirms what the appellant suggested in the grounds of appeal discussed in 5.2.2 above.

3.6.12. In conclusion, having regard to the available water quality chemistry data it is highly unlikely that the existing wastewater treatment plant at Kippure has had any discernible impact on water quality in the river Liffey as measured at Ballysmuttan Bridge.

Biological Monitoring data

3.6.13. In addition to the nutrient data discussed above, I also assessed the available biological monitoring data (Q-values) as recorded by the EPA for the station at Ballysmuttan Bridge from 1988 to 2022. In 2010 the Q-value was recorded as 3-4 but all other samples over the 34-year period were Q4 or higher and the most recent sampling in 2022 showed the site was of 'High Status" having a Q-value of 5, which is the highest possible value. This data is presented in figure 6.9 below. This indicates that the water quality in the river Liffey downstream of the Kippure site at Ballysmuttan Bridge has historically been of good or high status and shows no signs of being impacted by the presence of the existing wastewater treatment system.

3.6.14. **Figure 3.10 Q-Value results for the river Liffey at Ballysmuttan Bridge (1988 – 2022)**



3.6.15. I also assessed the available biological monitoring data (Q-values) for the two 'control' sites Ballylow Brook_010 and Ballydonnell Brook_010 waterbodies and noted that both sites had recorded Q-values of 4-5 when sample by the EPA in 2022, which is also indicative of High-Status waterbodies.

3.6.16. Having regard to the available water quality data for the river Liffey and control sites, the overall conclusion of my assessment is that the water quality in the river Liffey directly downstream of the Kippure site is of a high standard and displays no evidence of having been impacted negatively by the presence of the existing wastewater treatment system.

4.0 Site Inspection

4.1. On the 1st July 2025 I visited the site at Kippure Lodge & Holiday Village for the purposes of inspecting the existing wastewater treatment plant, the existing soil polishing filters, the location of the proposed soil polishing filter, the groundwater monitoring boreholes and the river Liffey and Athdown Brook surface water receptors. During the inspection, several photographs were taken which are available in a separate document.

4.2. I noted the location where the new polishing filter is proposed appears to be dry and has a suitable slope for the installation of a soil polishing filter. The land to the south and southwest of this area slopes towards the river Liffey and Athdown Brook.

4.3. While carrying out my inspection, a 20m^3 capacity tanker truck was observed to be in the process of removing raw wastewater from the treatment system as described in the application documents.

4.4. I inspected the existing soil polishing filter and did not observe any breakout of effluent on the surface of the ground. I did note an area (the approximate location is identified on Figure 6.1) where break out of effluent had taken place in the past. This was evident from the lack of grass growth and the presence of wood chip used to cover the impacted site during the cleanup operation. It was also noted that this location is directly upgradient from the groundwater monitoring borehole GW3 where the elevated ammonia readings were recorded. I noted that the landscape between the breakout area and the borehole sloped downhill with a channel which indicated that any effluent pooling on the surface of the ground would be directed towards the borehole GW3.

4.5. I inspected the river Liffey and Athdown Brook stream adjacent to the site and did not note any visual evidence of eutrophication or pollution of any kind in either watercourse.

5.0 Recommendation

5.1.1. Having regard to the technical reports submitted by Mitchell Environmental and O'Reilly Oakstown, I am satisfied that the proposed wastewater treatment plant will be capable of treating the volume and nature of wastewater produced on-site to the required standard for discharge into a soil polishing filter.

5.1.2. The applicant have demonstrated to the required standard outlined in the *EPA Guidance on Discharges to Groundwater* that the discharge of treated effluent into the new soil polishing filter will not lead to any significant impacts on groundwater quality. The Tier 3 Hydrogeological Assessment has established that the subsoil conditions exist on site to allow safe attenuation of effluent from the wastewater treatment plant with no significant impacts on groundwater quality.

5.1.3. The Assimilative Capacity Assessment has proven that the conditions on site allow for the safe attenuation of the expected volumes of treated wastewater into the ground and that no significant impacts on groundwater or surface water quality will arise as a result of the proposed development.

5.1.4. Therefore, I recommend that the development be granted permission on the grounds that compliance with the objectives of Article 4(1) of the Water Framework Directive have been demonstrated.

I confirm that this report represents my professional scientific assessment, judgement and opinion on the matter assigned to me and that no person has influenced or sought to influence, directly or indirectly, the exercise of my professional judgement in an improper or inappropriate way.

Environmental Scientist

15th October 2025