



Comhairle Chontae Liatroma
Leitrim County Council

GLENCAR AMENITY WASTEWATER TREATMENT PLANT REPORT 2024

DESK STUDY & IMPROVEMENTS OPTIONEERING

FOR CLIENT REVIEW AND COMMENT

APRIL 2025

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GLENCAR AMENITY
WASTEWATER TREATMENT PLANT REPORT 2024
DESK STUDY & IMPROVEMENTS OPTIONEERING

Prepared for:
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ABBREVIATIONS

Nomenclature & Terminology

LCC	Leitrim County Council.
JOD	Jennings O'Donovan & Partners Limited.
EPA	Environmental Protection Agency.
WWTP	Wastewater Treatment Plant.
BAF	Biological Aerated Filter.
BOD	Biological Oxygen Demand.
COD	Chemical Oxygen Demand.
SS	Suspended Solids.
TAN	Total Ammonia Nitrogen: is comprised of two components: un-ionized ammonia (NH ₃) and ionized ammonia (NH ₄ ⁺).
TN	Total Nitrogen: is the sum of all nitrogen forms; TN = TKN + Nitrite (NO ₂) + Nitrate (NO ₃).
TKN	Total Kjeldahl nitrogen is the sum of ammonia nitrogen and organic nitrogenous compounds, (nitrogen in amino acids and proteins).
TP	Total Phosphorus is a measure of all phosphorus found in a sample, whether that phosphorus is dissolved or particulate.
PO ₄	Orthophosphate is the simplest and most common form of phosphorus dissolved in water. Orthophosphate is also referred to as Molybdate Reactive Phosphorous or MRP.
GWB	Groundwater body.
SWB	Surface water body.
SAC	Special Area of Conservation.
LGWPA	Local Government (Water Pollution) Act.

Units of Measurement

µg/L	micrograms per litre.
mg/L	milligrams per litre.
m ³ /day	cubic meters per twenty hour period.

Design Guides & Standards

BS EN 1825-1:2004	Grease separators - Part 1: Principles of design, performance and testing, marking and quality control.
BS EN 1825-2:2002	Grease separators - Part 2: Selection of nominal size, installation, operation and maintenance.
British Water (2013) COP	British Water (2013) Code of Practice: Flows and Loads - 4, Sizing Criteria, Treatment Capacity for Sewage Treatment Systems.
EPA Ireland (1999) WWTM	Environmental Protection Agency, Ireland, (1999) Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels (PE 10 - 500).

1 INTRODUCTION AND SCOPE

1.1 Introduction and Purpose

The tourism amenity of Glencar Lough (Loch Ghleann an Chairthe), Glencar Waterfall (Eas Ghleann an Chairthe famed of W.B. Yeats poem 'The Stolen Child') and, Ireland's tallest waterfall: Sruth in Aghaidh An Aird (Stream Against the Height); are increasing popular destinations.

The tourism amenity is serviced by tourist information centre with a carpark and toilet block. Wastewater is managed by way of an on-site system disposing final effluent to ground.

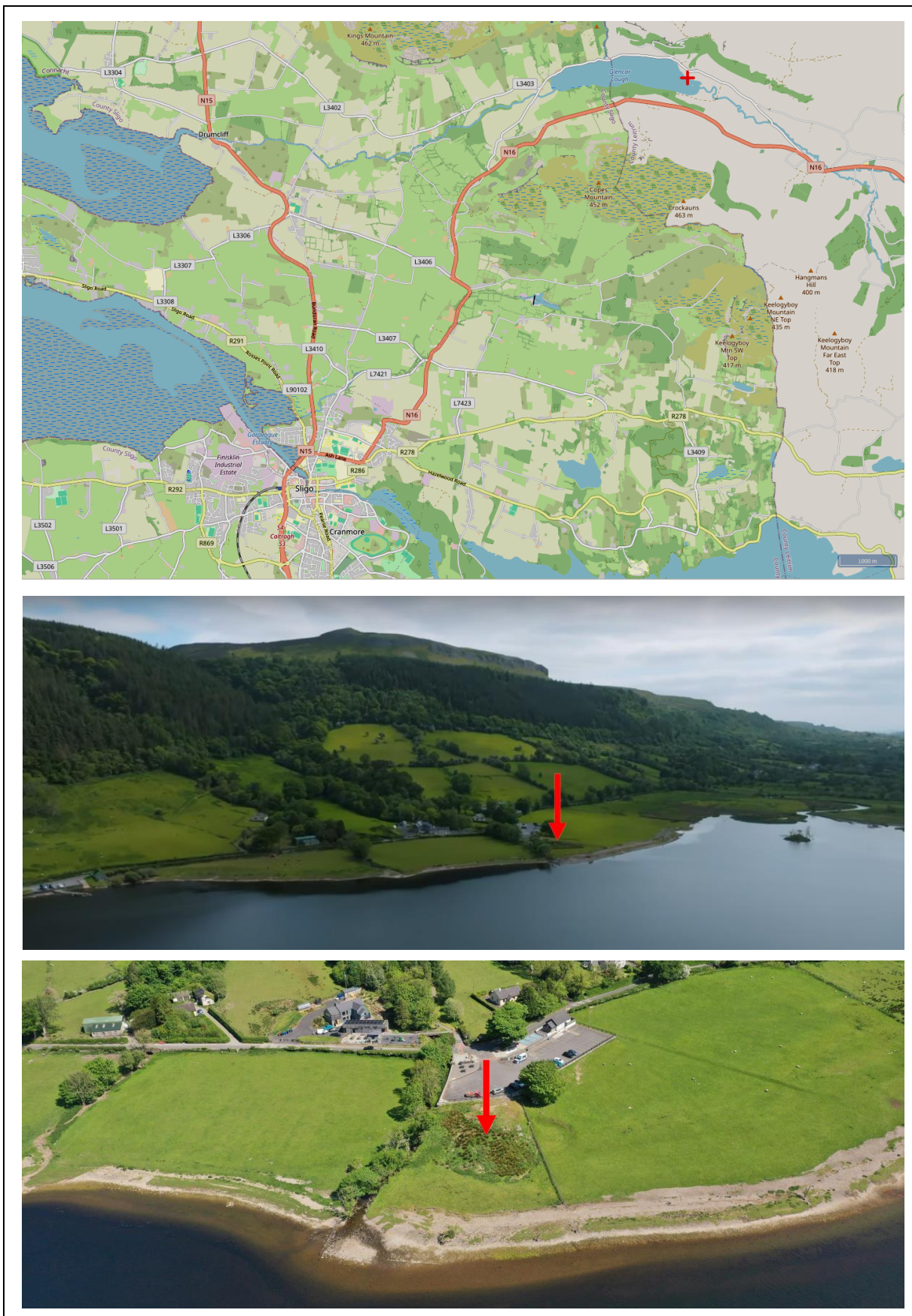
The wastewater treatment (WWTP) was originally designed to cater for flows from the tourist information centre toilet block only and, it dates circa 2006. In 2015 a commercial business (teaSHED) and domestic dwelling (hayHOUSE) connected to into the public sewer collecting to the WWTP. Also circa 2015; the toilet block was refurbished but no appreciable increase in sanitary fixtures were made.

The WWTP has not undergone any modifications/upgrades from its original design.

The WWTP is located to the South of the car park, circa 50m from the shore of Glencar Lough. **The WWTP site is located within an SAC.** Glencar Lough forms part of the Ben Bulbin, Gleniff and Glenade Complex SAC (000623) and is therefore a highly environmentally sensitive site. Glencar Lough has been identified as a Priority Area for Action by the EPA in the River Basin Management Plan 2018 - 2019 due to its deterioration from 'Good' lake quality status to 'Moderate' while the remainder of the sub-catchment has retained its 'Good' status.

Glencar Amenities wastewater infrastructure is vested in and controlled by Leitrim County Council. **The on-site treatment system has been problematic; suffering numerous breakdowns over the years.** It is currently not operating at a level that is satisfactory to Leitrim County Council (LCC).

Figure 1-1: Glencar Amenity Wastewater Treatment Plant – Site Location



1.2 Project Purpose

In December 2023, Jennings O'Donovan & Partners Limited (hereafter referred to as JOD) was engaged by LCC, to provide consultancy services to assess the current operations of the wastewater treatment plant and outline options for improvements and costings for same.

1.3 Understanding of Project Brief

Using available/provided data; carry out an investigation on the existing Wastewater Treatment system at Glencar Amenity and prepare a report which outlines the following;

- Quality of the wastewater discharging from the amenity toilet block;
- Quality of wastewater discharging from the teaSHED;
- Quantity of wastewater entering the WWTP;
- teaSHED grease traps:
 - “Are they of appropriate size, how effective are they and are they being maintained correctly?”
 - “Are the tea rooms complying with planning permission compliance conditions on wastewater discharge?”
- Performance and capacity of WWTP:
 - “Is the plant capable of treating the current loading if maintained correctly?”
 - “Is there room for increased capacity?”
 - “If the current plant is not capable of dealing with current loading and seasonal fluctuations in loading; what are the options to ensure it will run effectively?”
- Assimilative capacity assessment:
 - “What is the waste assimilative capacity of the adjacent Glencar River/Lough where the effluent is supposed to discharge to?”
 - “Phosphorus has been identified as an issue in this lake, what level of tertiary treatment can be utilised to minimise nutrient levels in the effluent. Existing polishing filter has been found to be leaking effluent to the surface of the ground and is considered inadequate to treat the secondary treated effluent given the ground conditions and proximity to the river and lake. What standard should the discharged effluent be to discharge to the surface water body?”
- Outline improvement/upgrade/replacement options to cater for the wastewater effluent at this amenity taking into consideration the visual and environmental impact of such options. Provide estimated costings for said options. Also provide a roadmap with time

frames to achieve any improvements /upgrades/replacements, if necessary, at this amenity, including any licences or planning requirements.

1.4 **The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)**

An on-site meeting was held on 8th Feb 2024. During said meeting, JOD suggested a number preliminary actions to the stakeholders. These suggestions were:

- For purposes of informing the Report, consider the following:
 - Clearing overgrowth from percolation area to facilitate its inspection;
 - Conduct a condition survey of the percolation area distribution pipework;
 - Conduct percolation tests on lands available for upgrade.
- To reduce contribution of detergents to P loadings on the WWTP:
 - **Use phosphate-free: detergents, cleaning agents, laundry/dishwasher additives, and hand soaps;**
- Curtail the amount of disinfecting agents passed to the WWTP and to reduce the risk of upsetting microbial/bacterial balances within same:
 - **Only use soaps, disinfectants, urinal blocks and sanitaryware cleaners of the type labelled 'suitable for septic tanks' and/or 'bleach free';**
 - Where possible those disinfectants and cleaning products used in food serving and preparations areas should be those labelled 'suitable for septic tanks' and/or 'bleach free';
 - Where possible those disinfectants and cleaning products used for kitchenware and laundry washing should be those labelled 'suitable for septic tanks' and/or 'bleach free'.
- To address potentially inappropriate use of the toilet block and risk of shocking the wastewater treatment plant:
 - Prohibition safety signage should be put in place to inform visitors that emptying chemical toilets from campervans / motor-homes / caravans / recreational vehicles or other is not allowed at the toilet block; e.g. “There are no chemical toilet disposal stations at these public toilets. Chemical toilets must not be emptied at these public toilets. Any persons emptying chemical toilets at these public toilets will be subject to fine and prosecution under the provisions of the Waste Management Act and ...”.
 - **Information on location of nearby of chemical toilet disposal stations should made be available to visitors.**
 - All car park manhole covers should be of secured locking type and, all WWTP access covers should be padlocked.

- To inform of the WWTP existing and future loadings/capacity/performance:
 - **Review de-sludging frequency and implement an optimised regime;**
 - Conduct water audit(s) of the welfare facilities and record nature of fixtures;
 - **Commence flow and load surveys and treatment performance surveys;**
 - **Commence water meter data collection for the Toilet Block and the teaSHED;**
 - Commence data collection of tourist/user statistics for the toilet block;
 - Commence data collection of tourist/customer statistics for the teaSHED.

1.5 Review of Other Reports / Data Sources

In preparing this Report a number of documents were reviewed. The following are extracts, and details from publicity available documents found during the initial data search:

Glencar Lake Priority Area for Action Desktop Study_F01, Local Authority Waters Programme (LAWPRO, 07/07/2020):

- “The treatment unit was designed for a P.E. of 50 to service the toilet block located in the Glencar Visitor Centre carpark, subsequently a café was connected to the sewage system, with visitor numbers significantly increasing since 2014 the treatment unit is **no longer fit for purpose**. Surface contamination of the ground above the percolation area by sewage effluent, posing a risk to the lake and the stream, was recorded on the 4th July 2019 by Leitrim Co.Co. staff. Leitrim Co.Co. Environment Department have issued advisory notices since 2016 highlighting this issue and **recommending an upgrade to the treatment system and a relocation away from the lake shore.**”
- The “wastewater treatment unit at the Glencar Visitor Centre on the NE shore of the lake is **not fit for purpose** and Leitrim Co. Co. have recorded that effluent is contaminating a field on the shoreline of the lake, adjacent to an inputting stream.”
- **Glencar Lough baseline concentrations: 0.010mg/L TP; 0.012mg/L NH3-N.**
- **For period of 23/10/2019 to 02/03/2020; averaged secondary effluent values from the WWTP were: 11.21 mg/L TP and 95.93 mg/L NH3-N.**

National Research Survey Programme, Fish Stock Survey of Glencar Lough, Inland Fisheries Ireland, 2020:

- “Glencar Lough was assigned an ecological status of Good for 2020 based on the fish populations present. In previous years, the lake was assigned a fish status of High in 2007, 2010 and 2013”.

teaSHED, Teagasc, Rural Tourism & Food Course, 2020:

- The development comprises two elements: the “teaSHED” and the “hayHOUSE”.
- “teaSHED can seat over 50 people”;
- Open 7days a week from March to November. Open 5days a week during other months.
- “May 2015 – opened in time for summer season”.
- Serves “speciality teas, locally roasted coffee, freshly baked scones, various homemade desserts, delicious sandwiches, homemade soup and bread”;
- Food sales expressed as a fractions of total annual food sales, are typically as follows:

Food Sales	€/€ fraction
Hot Special	0.11
Sandwich / Soup	0.11
Scone	0.16
Coffee / Tea	0.30
Cold Drink	0.09
Sweet / Traybake	0.23

2 DISCHARGES TO SEWER & WASTEWATER TREATMENT PLANT LOADINGS

No flow and load surveys are known to this Report. No customer counts for the teaSHED are known to this Report.

Glencar Amenity WWTP receives flows from a Toilet Block, a Tea Shop and a Private Domestic Dwelling.

Data made available includes one WWTP influent grab sample dating 2019-10-23. Sample testing results suggests that WWTP influent is: low in pH, high in organics, high in solids, high in nutrients. Low and/or wide variations influent pH will/would inhibit and disturb the treatment plant's microbiological processes resulting in loss in treatment performance.

Glencar Group Water Scheme Co-operative Society Limited (5175R) supplies water to the Glencar Amenity Toilet Block, the teaSHED and its adjacent private dwelling. Water quality (background alkalinity) details are unknown to this Report.

The Group Water Scheme code is 1700PRI1099. It's water treatment plant is believed to comprise of the following processes: coagulation (with aluminum sulphate); flocculation;

dissolved-air-flotation; rapid gravity filtration; chlorination (with chlorine gas), and; pH/alkalinity correction using lime. Nothing of the latter process and little of the potable water quality are known to this Report. This scheme appears to produce a potable water of averaging 7.4 pH; its alkalinity is unknown.

2.1 Quality of the Wastewater Discharging from the Amenity Toilet Block

In absence of flow and load survey data for the Amenity Toilet Block; estimates for said have been made using the following:

- Water meter readings;
- Guidance document: Environmental Protection Agency, Ireland, (1999) Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels (PE 10 - 500)
- Guidance document: British Water (2013) Code of Practice: Flows and Loads - 4, Sizing Criteria, Treatment Capacity for Sewage Treatment Systems

For detail on estimates, refer to **Section 2.3** of this Report. Assumptions made in regard to said need to be correctly understood to take meaning from estimates made herein. **Detailed design needs to be careful not to underestimate loads and variability of said.**

2.2 Quality of Wastewater Discharging from Trade

In absence of flow and load survey data for the teaSHED; estimates for said have been made using the following:

- Water meter readings;
- Guidance document: Environmental Protection Agency, Ireland, (1999) Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels (PE 10 - 500)
- Guidance document: British Water (2013) Code of Practice: Flows and Loads - 4, Sizing Criteria, Treatment Capacity for Sewage Treatment Systems

For detail on estimates, refer to **Section 2.3** of this Report. Assumptions made in regard to said need to be correctly understood to take meaning from estimates made herein. **Detailed design needs to be careful not to underestimate loads and variability of said.**

2.3 Quality of Wastewater Discharged-to-Sewer / Received-at-WWTP

Estimated loads and influent concentrations to Glencar Amenity wastewater treatment plant are outlined in **Table 2-1**.

Table 2-1: Glencar Amenity WWTP Estimated Loads and Influent Concentrations

Parameter	Unit	Current Tourism	Future Tourism
Waterfall Gate Count	No./year	95,144	135,000
Flow Peaking Factor	-	6.0	5.8
Estimated Maximum Average Daily Flow	m ³ /day	5.35	7.30
Estimated Peak Hourly Flow	m ³ /hr	1.338	1.755
BOD ₅ Mass Loading	BOD ₅ g/day	6,247	8,544
BOD ₅ Concentration	BOD ₅ mg/L	1,167	1,171
Population Equivalent (60gBOD ₅ /PE.day)	PE	104	142
Total Ammonia Nitrogen Mass Loading	N g/day	994	1,364
Total Ammonia Nitrogen Concentration	N mg/L	186	187

Assumptions and estimates made:

- i) teaSHED Customer Count = 65% Waterfall Gate Count; (which equates to respective Current and Future estimates of 169 and 240 customers per day, averaged over 365days.
- ii) Toilet Block usage = 65% Waterfall Gate Count;
- iii) Inputs in respect to 'EPA Ireland (1999) WWTM' and 'British Water (2013) COP' are assumed best reflections/descriptions of the respective load origins. Inputs are detailed in **Tables A2d** and **A2e** of **Appendix A2** of this Report.
- iv) Of available data the most onerous Waterfall Gate Counter total is **95,144** per year. From site discussion of **8th Feb 2024**; Leitrim County Council anticipates that tourism saturation for the location would be in the magnitude of **35,000** to **40,000** additional visits per year.

Table 2-2: Estimated Flow and Load Contributions

Parameter	Unit	Toilet Block	Trade Effluent
Hydraulic load	% of total	26 – 60 52 (typically)	40 – 74 48 (typically)
BOD ₅ load	% of total	36 (on average)	64 (on average)
NH ₃ -N load	% of total	47 (on average)	53 (on average)

For further detail on derivation of estimates; refer to the following in Appendices A1, A2 and A3 of this Report.

- Table A1a - Glencar Waterfall Gate Counts
- Figure A2a - Source Contributions to Total Flow received by Wastewater Treatment Plant
- Figure A2b - Toilet Block and teaSHED Estimated Combined Total Daily Water Usage
- Table A3c - GA WWTP Estimated Loads & Estimated Concentrations
- Table A3b - Glencar Amenity Wastewater Sample Testing Results

Sample testing results suggests that WWTP influent is: low in pH, high in organics, high in solids, high in nutrients. **Low and/or wide variations influent pH will/would inhibit and disturb the treatment plant's microbiological processes resulting in loss in treatment performance.** Low pH may an indication of an alkalinity deficient influent.

Influent pH should be between 7 - 9 and; it should have sufficient alkalinity to buffer pH change and facilitate N and P removal processes to perform. Furthermore, biological inhibitors must not present in the influent. Comprehensive study of the wastewater will be necessary to inform detailed process design.

Available sampling data on wastewater concentrations is as outlining in **Table A3b** of **Appendix A3** of this Report. In respect to said; both sampling point locations and test methods used are unclear.

3 teaSHED GREASE MANAGEMENT

3.1 Outline Description of Trade Wastewater Source, (the 'teaSHED')

The trade is café/tea shop serving/promoting the tourism amenity of Glencar Lough (Loch Ghleann an Chairthe), Glencar Waterfall (Eas Ghleann an Chairthe famed of W.B. Yeats

poem 'The Stolen Child') and, Ireland's tallest waterfall: Sruth in Aghaidh An Aird (Stream Against the Height).

The 'teaSHED' café/tea shop has capacity to seat up to 50 indoors and a further unknown amount outdoors. The commercial element of the shop "has been sized to cater for tour busses." The amenity carpark has 3No. 49 seater coach parking spaces.

The 'teaSHED' serves tea, coffee, light lunches and cakes and afternoon teas. Its menu includes: speciality teas, craft drinks (coffee/espresso), hot chocolate, smoothies, ice-creams, baked scones, various desserts, sandwiches, homemade soup and bread.

Tea, coffee, drinks, sandwiches and soups are prepared on site; baked goods are made off site. Crockery and cutlery are returnable and washing is by hand.

The 'teaSHED' opened early in the summer season of 2015. Opening hours vary according to tourism trends and economic viability. In respect to opening hours; an agreement regulating development or use of land under Section 47 of the Planning and Development Act 2000 (as amended) is in place; details of said are unknown to this Report.

3.2 **Commercial Kitchen Practises and Grease Separator Locations**

The kitchen is fitted with 1No. grease separator; said is located indoors and immediately beneath a wash-up sink.

teaSHED kitchen practises are understood to encompass the following:

- ✓ All crockery/cutlery/kitchenware/utensils are scraped clean and dry wiped (with a disposable kitchen towel) prior to washing said;
- ✓ All cooker pads/grills are scraped clean and dry wiped (with a disposable kitchen towel) prior to washing said;
- ✓ Food residue/waste/scrapings are disposed of to dedicated waste bin or waste drum.
- ✓ Flows to the grease separator expressly exclude those from:
 - i) pre-rinsing off of food residues;
 - ii) undersink food-waste disposal grinders.
- ✓ No undersink food disposal units are present.

- ✓ There is only 1No. sink in the kitchen. Said is a commercial sink and dedicated for hand wash-up of equipment; it is not used as a sterilising-sink or for any other purpose.
- ✓ Sink plug holes strainers are used and solid trappings are disposed of to dedicated waste bin.
- ✓ No dishwasher or rinser is present. A crockery/cutlery/kitchenware sterilizer unit is present. All wastewater sources are passed for grease removal pre-treatment prior to discharge to sewer.
- ✓ Tea, coffee, drinks, sandwiches and soups are prepared on site; baked goods are made off site.
- ✓ Only wastewater containing kitchen fat, oil or grease are passed to the grease separator. Chemical cleaning agents (strong caustics, bleach etc) that would dissolve fats, oils or grease are not passed in concentrated form or at levels which would have detrimental effects on the grease separator performance.
- ✓ The grease separate is re-filled with clean water following cleandown.
- ✓ The grease separator is fully drained and cleaned every 2 to 4 weeks.
- ✓ The grease separator is inspected daily. The unit's inlet filter basket is emptied at least daily.
- ✓ **As P.13-44 Condition 15(k) a “full record of servicing shall be kept on site.”**
- ✗ All of the above can be evidenced by way of FOG management records.

No FOG management records have been made available to this Report. The Project Brief raises two questions in respect to the teaSHED’s grease separator; these questions are reiterated and answered in **Table 3-1**.

3.3 **Grease Separator Assessment**

The grease separator installing at the teaSHED has been assessed against PL.13/44 Planning Conditions and requirements of BS EN 1825 Parts 1 and 2.

Site specific details for the teaSHED kitchen are unclear. Drain rate from the wash-up sink is unknown. **The wash-up sink is equipped with a rinse-faucet; an outlet flow rate of 300 millilitres per second has been assumed from said.**

It is also assumed that grease separator influent temperature will occasionally exceed 60°C. This assumption is based on premise that the kitchen is equipped with only one sink and that hot liquids and/or boiling water may occasionally be inadvertently emptied into said.

For further detail on assumptions made refer to **Appendices A7** and **A8** of this Report.

Table 3-1: Questions and Answers in Respect to the teaSHED's Grease Separator

LCC Question	Answer
1 - "Are they of appropriate size, how effective are they and are they being maintained correctly?"	• In respect of dimensions and installation; the existing grease separator appears largely non-complaint to EN 1825 Parts 1 and 2. • No operator study into the effectiveness of the existing separator is known to this Report. Also, no manufacturer's documents have been made available. • The effective retention of the installed separator is estimated to be 3.5minutes. No data/evidence is known which supports 3.5minutes as a suitable and adequate time for the following: i) To allowed emulsified grease and oil to separate and float; ii) To provide adequate cooling to allow FOG separate and float; iii) To provide adequate stilling to ensure solids and grease are not kept in suspension by turbulence. • Equipment selection appears to have been led by space restrictions rather than pre-treatment requirements, i.e. the installed separator appears to be the largest which could fit into the space afforded for it and; the space afforded to it results in it not meeting a number of EN 1825 Parts 1 and 2 requirements.

Continued ...

LCC Question	Answer
2 - "Are the tea rooms complying with planning permission compliance conditions on wastewater discharge?"	• P.13-44 is Leitrim County Council's planning reference for the development. Condition 15(k) of said; sets out that grease traps must conform to BS EN 1825 Part 1 and 2. A requirement for alarming is also set down; none is installed. • P.13-44 Condition 15(k) sets out that "<i>adequately sized and fully automatic grease traps</i>" be installed on "<i>all waste pipes from kitchen/food preparation area(s)</i>" and that, a "<i>full record of servicing shall be kept on site.</i>" • Commercial activities discharging trade effluent to the public sewer require a licence under Section 16 of the Local Government (Water Pollution) Acts. Planning 'Advice Notes' set the position that a licence agreement be put in place. The schedule of planning conditions includes no specifics in regard to a trade effluent discharge standard. Condition 15(a) establishes that the sewer connection would be "<i>subject to separate written agreement</i>". • Planning files by LCC Water Services and by LCC Environmental Services include comments/recommends that a licence agreement be put in place. Of trade effluent licence registers known to this Report, no licence agreement was found existing for trade effluent from Glencar teaSHED. Details within the "<i>separate written agreement</i>" are also unknown to this Report. • "<i>Full compliance with all conditions attached to the Grant of Planning Permission is required on an ongoing basis</i>", (LCC, 10-Sep-2014) The question raised is a matter for Leitrim County Council Planning Enforcement Section; said question should be referred to same.

Further detail on the teaSHED's grease separator can be found in **Appendices A7** and **A8** of this Report.

Appendix B is an assemblage of planning file extracts pertinent to wastewater.

4 **PERFORMANCE AND CAPACITY OF WWTP**

4.1 **Description of the Existing Wastewater Infrastructure**

The Wastewater Treatment Plant (WWTP) receives the following flows:

- Foul sewage from Glencar waterfall amenity tourist information centre toilet block;
- Foul sewage from a private domestic dwelling (hayHOUSE);
- Trade effluent from a café/tea shop (teaSHED).

The WWTP was originally designed to cater for flows from the tourist information centre toilet block only. The WWTP has not undergone any modifications/upgrades from its original design. Toilet block sewage is conveyed to the WWTP via a gravity sewer. Domestic and trade effluent are discharged into same said sewer.

The WWTP dates circa 2006. Domestic plus trade effluent loadings to the WWTP date from May 2015. The toilet block was refurbished circa 2015; no appreciable increase in sanitary fixtures occurred.

The treatment plant is proprietary Biological Aerated Filter (BAF)¹ with submerged random media. The WWTP treatment process comprises: primary settlement, biological aerated filter and, secondary settlement. **Final effluent is discharged to a percolation area with footprint of circa 200m². The WWTP design specification was for a (secondary) final effluent standard of 20mg/L BOD₅, 30mg/L SS and, 20mg/L NH₃-N; for loadings of 50PE, 9m³/day and, peak flow of 0.93m³/hr.** No nutrient (N or P) removal processes are in place before discharge to the percolation area. Design performance standards align with those of Table 18 of the Building Regulations 2010 - Technical Guidance Document H - Drainage and Waste Water Disposal (reprinted edition, 2016. Amendments and corrections incorporated).

While no nutrient (N or P) removal processes are in place before discharge to the percolation area; nutrient removal processes could be in play in the sub-surface soil layers. Phosphorous attenuation in soil is controlled by adsorption and mineral precipitation

¹ The process stream includes a gravity solids separate stage downstream of aeration; does not employ media backwashing, and; utilises a high-voidage plastic-media biofilm support: thus, submerged aerated filter (SAF) could be considered a more appropriated process description of the plant.

reactions. Removal mechanisms for nitrogen include: mineralisation, volatilisation, adsorption, cation exchange, incorporation into microbial biomass, nitrification and denitrification. **It is unknown if any of these processes are present and/or if the existing disposal to ground system is or has been stressed beyond its design/actual attenuation capacity.**

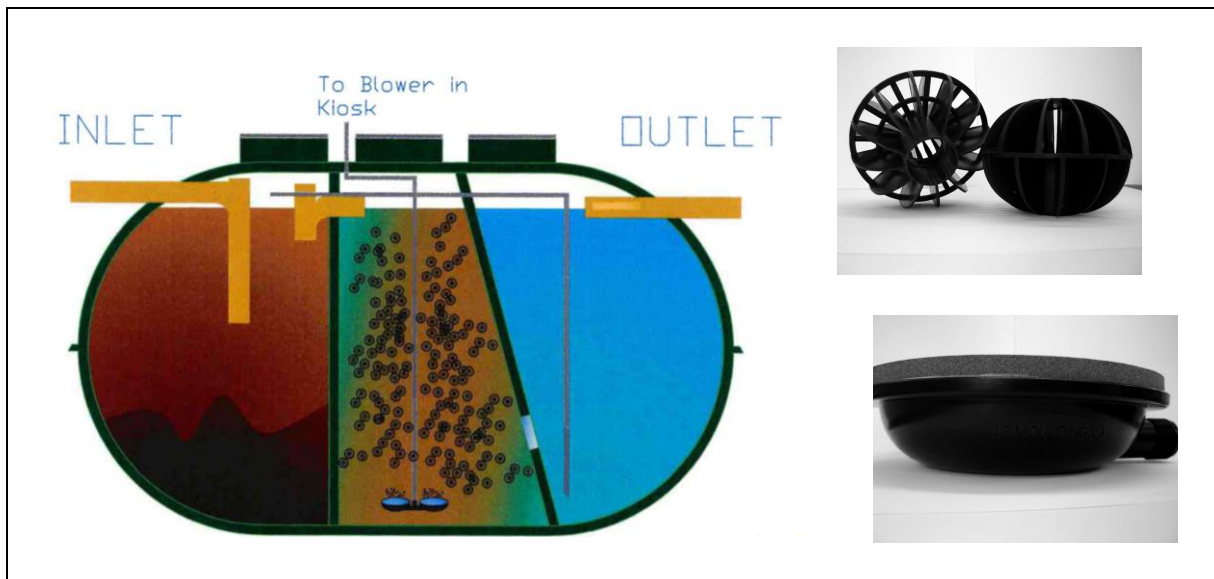
Other than approximate dimensions of 20m x 10m; details of the percolation area are unknown to this Report. Secondary effluent pumping discharges directly into distribution chamber; no measures are in place to still or dissipate energy of incoming flow. Flow splitting within the chamber does not include a means of addressing unbalanced flows across inlets of the five distribution laterals. Secondary effluent is greasy and of very poor quality.

A soil polishing filter typically employs a $\geq 0.9\text{m}$ layer of unsaturated soil; site investigation trial holes found water table at 0.9m below ground level and water ingress at 0.3m.

The proprietary package plant utilises a submerged film-fixed biological process; said is a BAF by J. F. Mouldings Ltd trading as ECO-Tanks®. The Eco-Tank® comprises three treatment stages: a primary settlement zone; an aerobic biological zone and; a secondary clarification zone. The wastewater flows by gravity through each chamber. The treatment plant has no redundancy in terms of: emergency storage; process configuration or standby equipment. This is concerning given its location within an SAC.

Volume and details of carrier media installed is unknown. Biofilm attachment to the installed carrier appears to be poor; see Figure 4-11: Biofilm Carrier Media (Feb 2014). **Oxygen transfer efficient is unknown. It is unclear if mixing pattern (created by air diffusers) is ensuring that wastewater gets into efficient contact with the biofilm attached to the carrier;** see Figure 4-10: WWTP Aeration Tank (Feb 2014).

Figure 4-1: ECO-Tanks® - EC Process Schematic, Bioball Media and Air Diffuser



Appendix A6 of this Report provides additional detail on the existing WWTP.

4.2 Photographs of Glencar Amenity WWTP Environs

Figure 4-2: Glencar Amenity Information Centre and Toilet Block

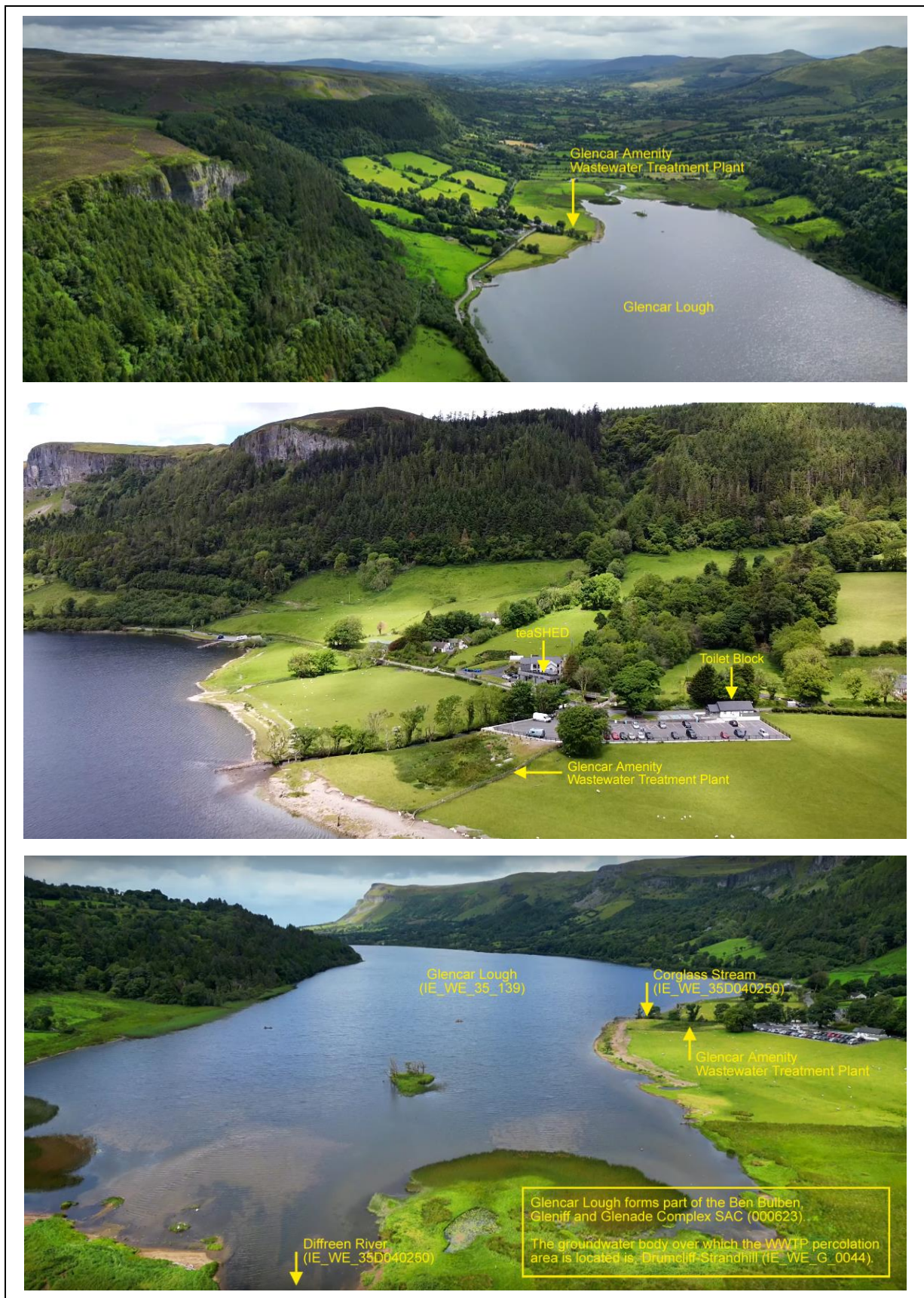


Figure 4-3: Glencar teaSHED



For photographs of Glencar Amenity car park; refer to Figure 6-3.

Figure 4-4: Environs of Glencar Amenity Wastewater Treatment Plant



4.3 Photographic Record of the Glencar Amenity WWTP

Figure 4-5: Glencar Amenity Wastewater Treatment Plant – Site Layout

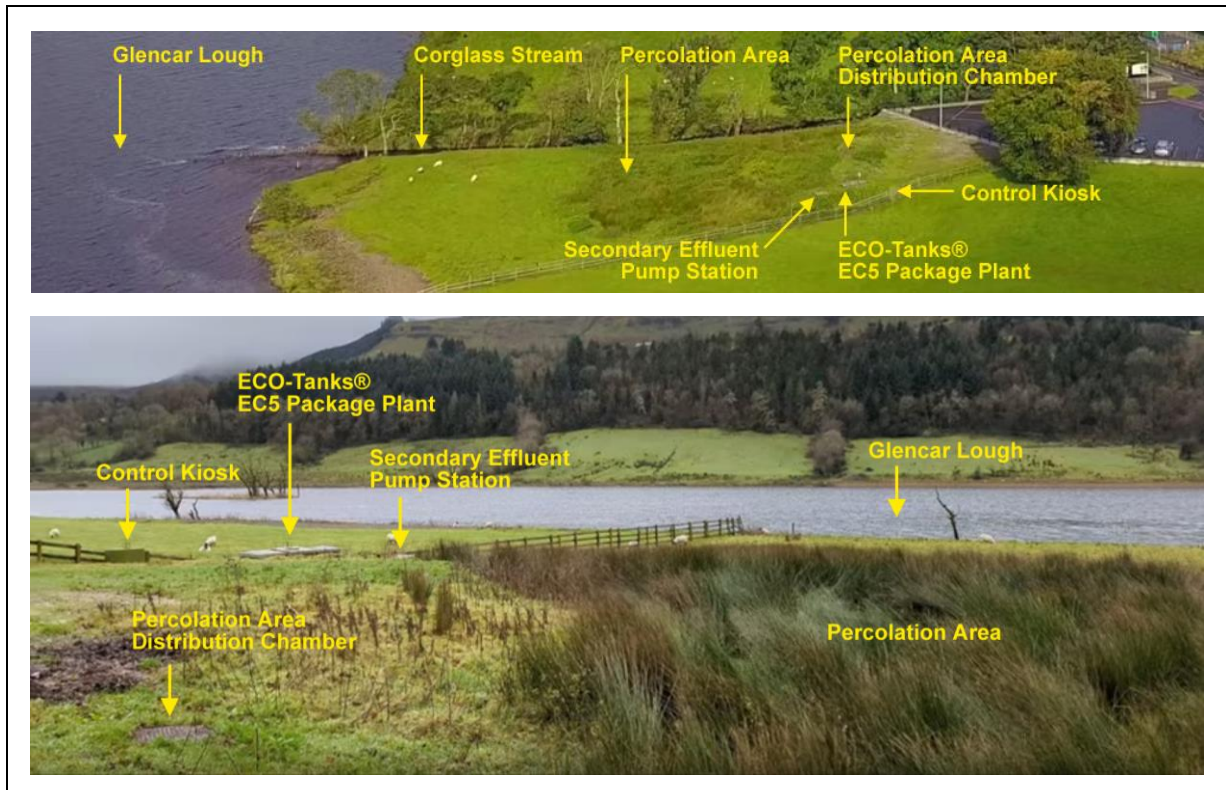


Figure 4-6: Percolation Area Distribution Chamber (Feb 2014)

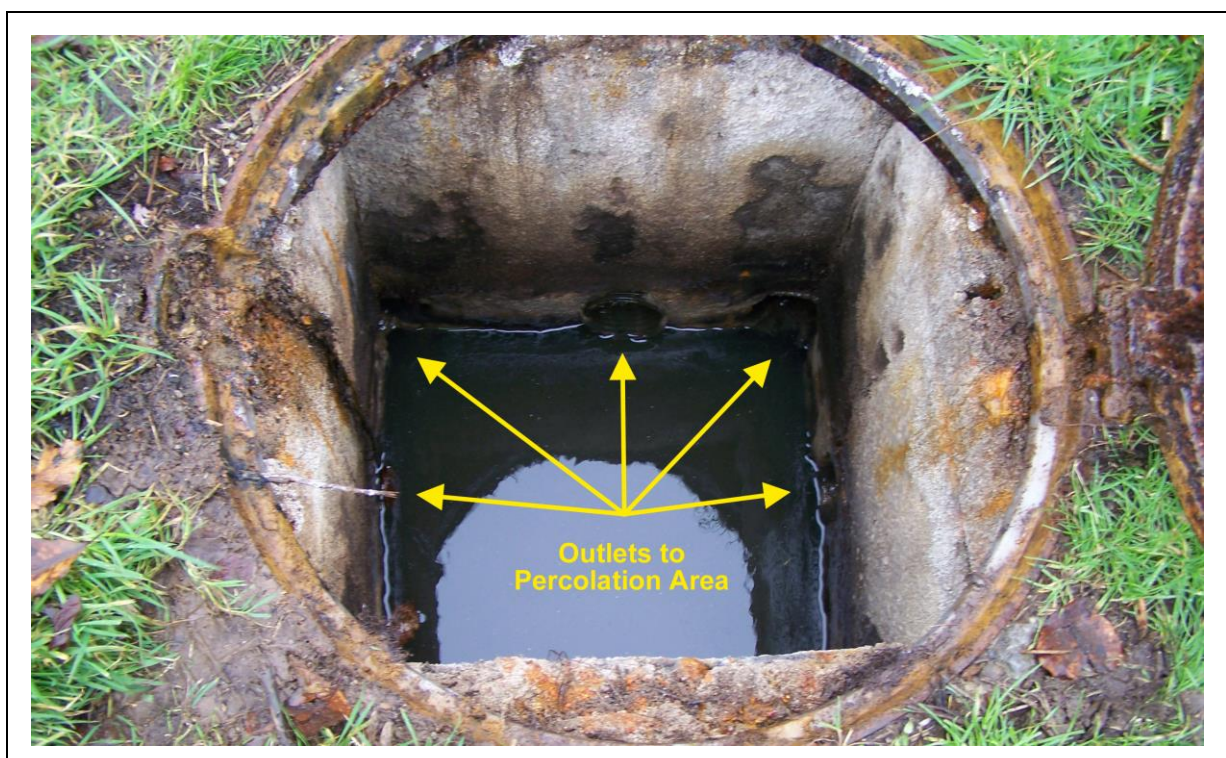


Figure 4-7: WWTP Layout (Feb 2014)

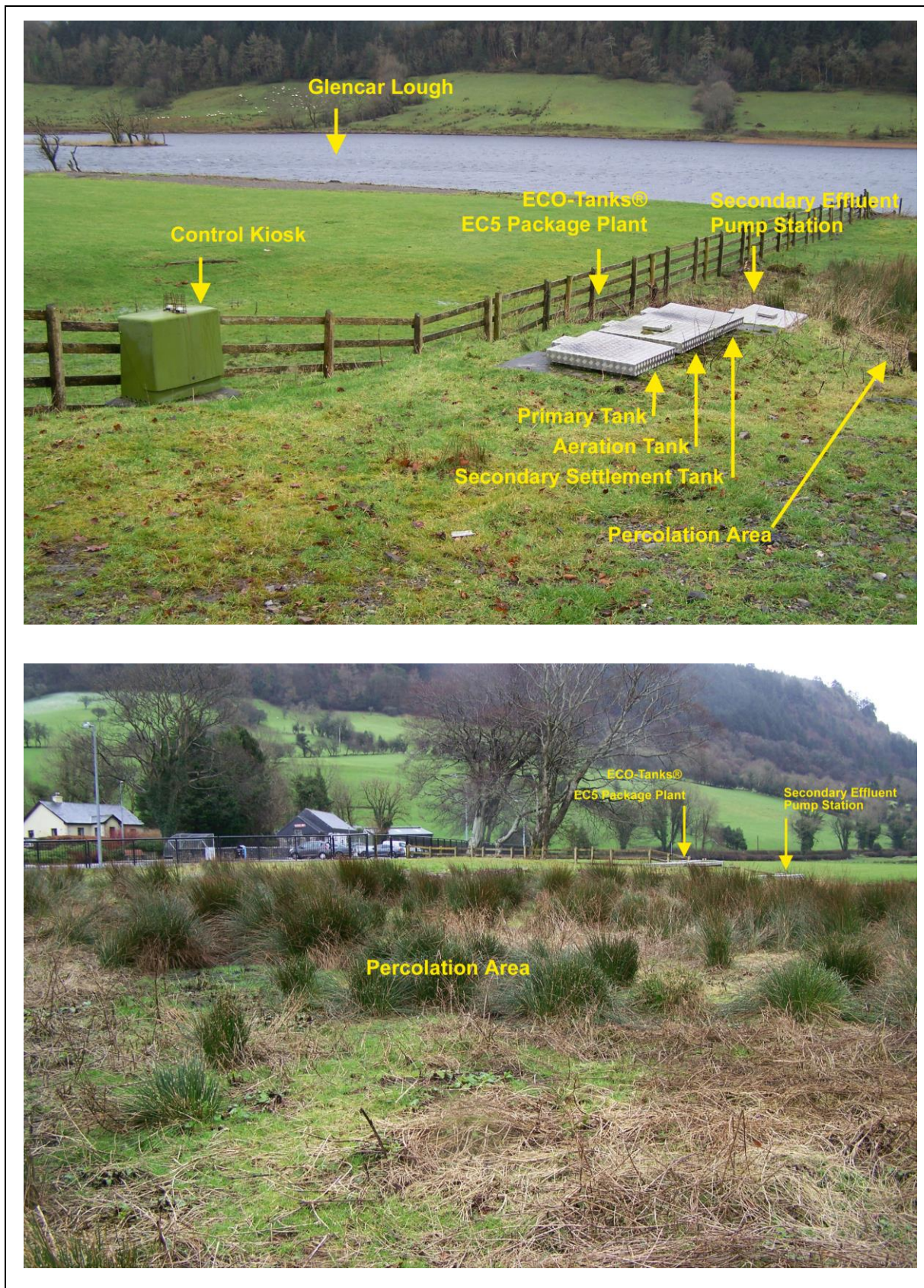


Figure 4-8: WWTP Control Kiosk (Feb 2014)

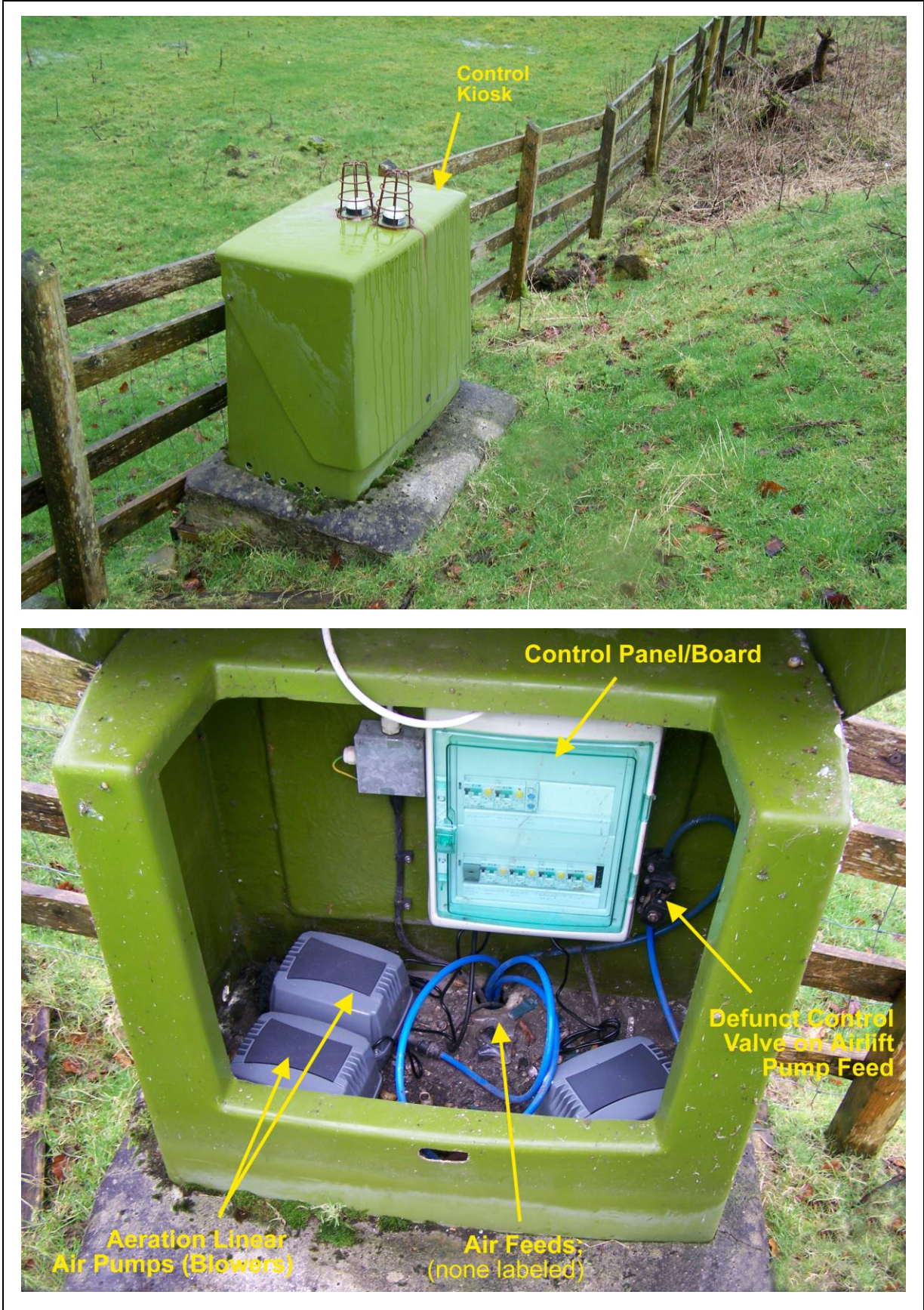


Figure 4-9: WWTP Primary Settlement Tank (Feb 2014)

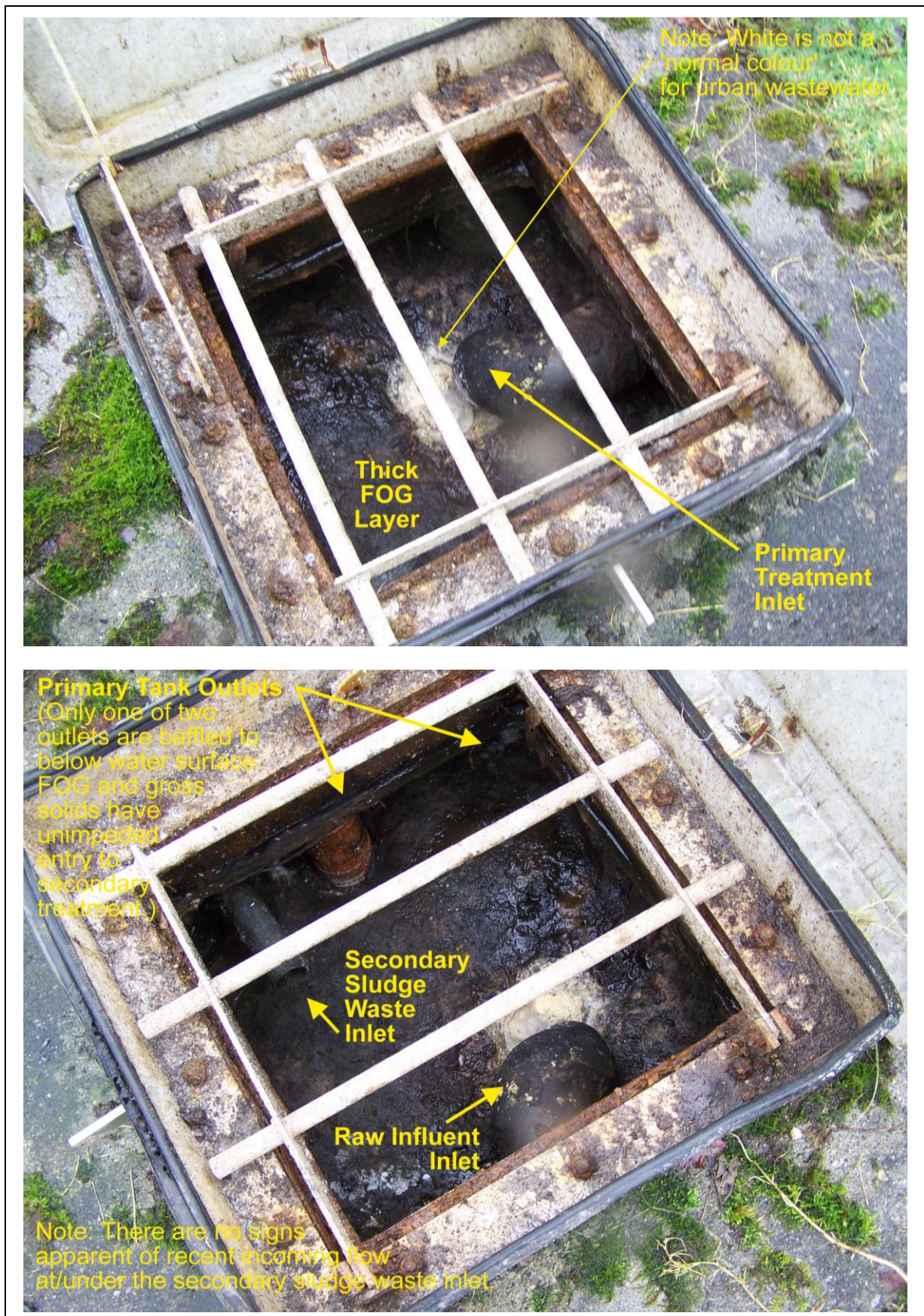
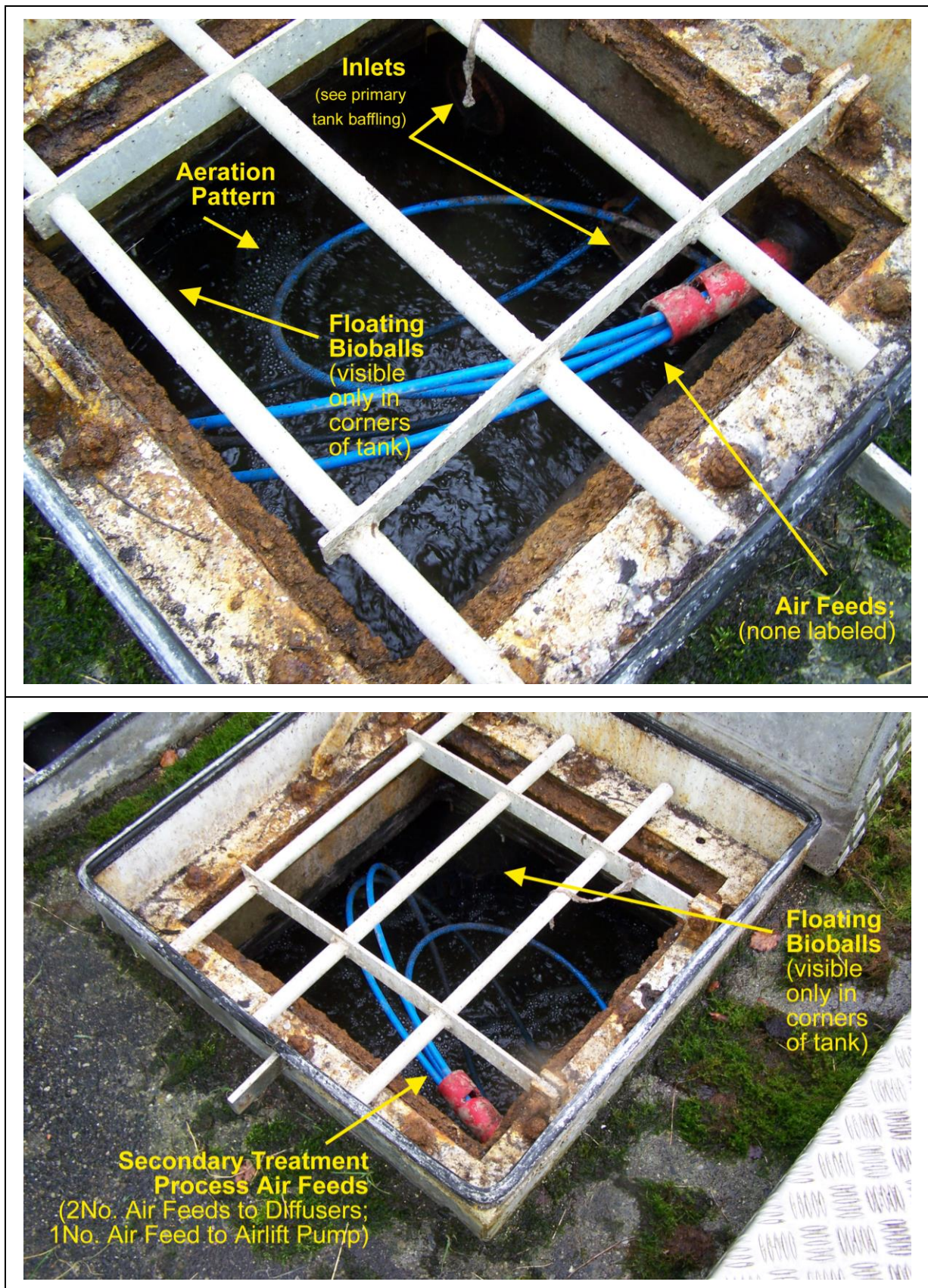
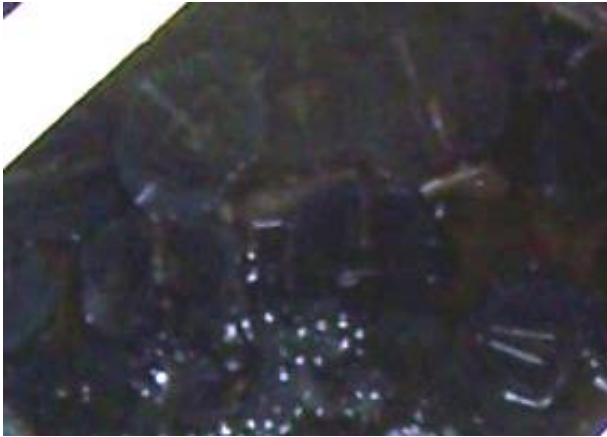
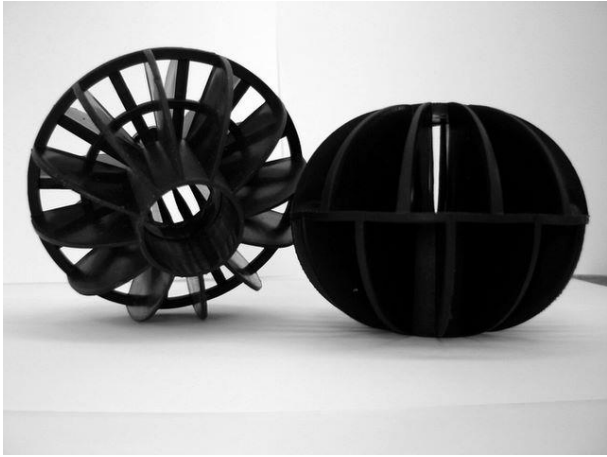


Figure 4-10: WWTP Aeration Tank (Feb 2014)



Grease should not be allowed to enter the aerated zone and foul the support media.

Figure 4-11: Biofilm Carrier Media (Feb 2014)

	Following from Figure 4-10: WWTP Aeration Tank (Feb 2014); biofilm carrier media was neither submerged nor appearing to support biofilm growth/attachment. Absence of biofilm could, in part, be attributable to possible ongoing toxic shocks by chemicals present in the influent (e.g. ionic surfactants², free chlorine). See Section 1.4 ‘The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)’.														
	ECO-Tanks® Bioball Support Media <table><tr><td>Material:</td><td>< ? ></td></tr><tr><td>Material Density:</td><td>< ? ></td></tr><tr><td>Mass:</td><td>< ? ></td></tr><tr><td>Size:</td><td>< ? ></td></tr><tr><td>Voidage:</td><td>< ? ></td></tr><tr><td>Specific surface area:</td><td>< ? ></td></tr><tr><td>Surface roughness:</td><td>< ? ></td></tr></table>	Material:	< ? >	Material Density:	< ? >	Mass:	< ? >	Size:	< ? >	Voidage:	< ? >	Specific surface area:	< ? >	Surface roughness:	< ? >
Material:	< ? >														
Material Density:	< ? >														
Mass:	< ? >														
Size:	< ? >														
Voidage:	< ? >														
Specific surface area:	< ? >														
Surface roughness:	< ? >														

² A surfactant or surface-active agent, is a chemical which if added to a liquid will reduce its surface tension. Surfactants found in cleaning products are both partly soluble in water and partly soluble in oils-fats-grease.

Figure 4-12: Secondary Treatment Tanks (Feb 2014)



Grease should not be allowed to enter or exit the secondary clarifier; its exit would result in fouling of the percolation area, loss of soil permeability, and ponding.

Figure 4-13: Secondary Treatment Tanks (Feb 2014)

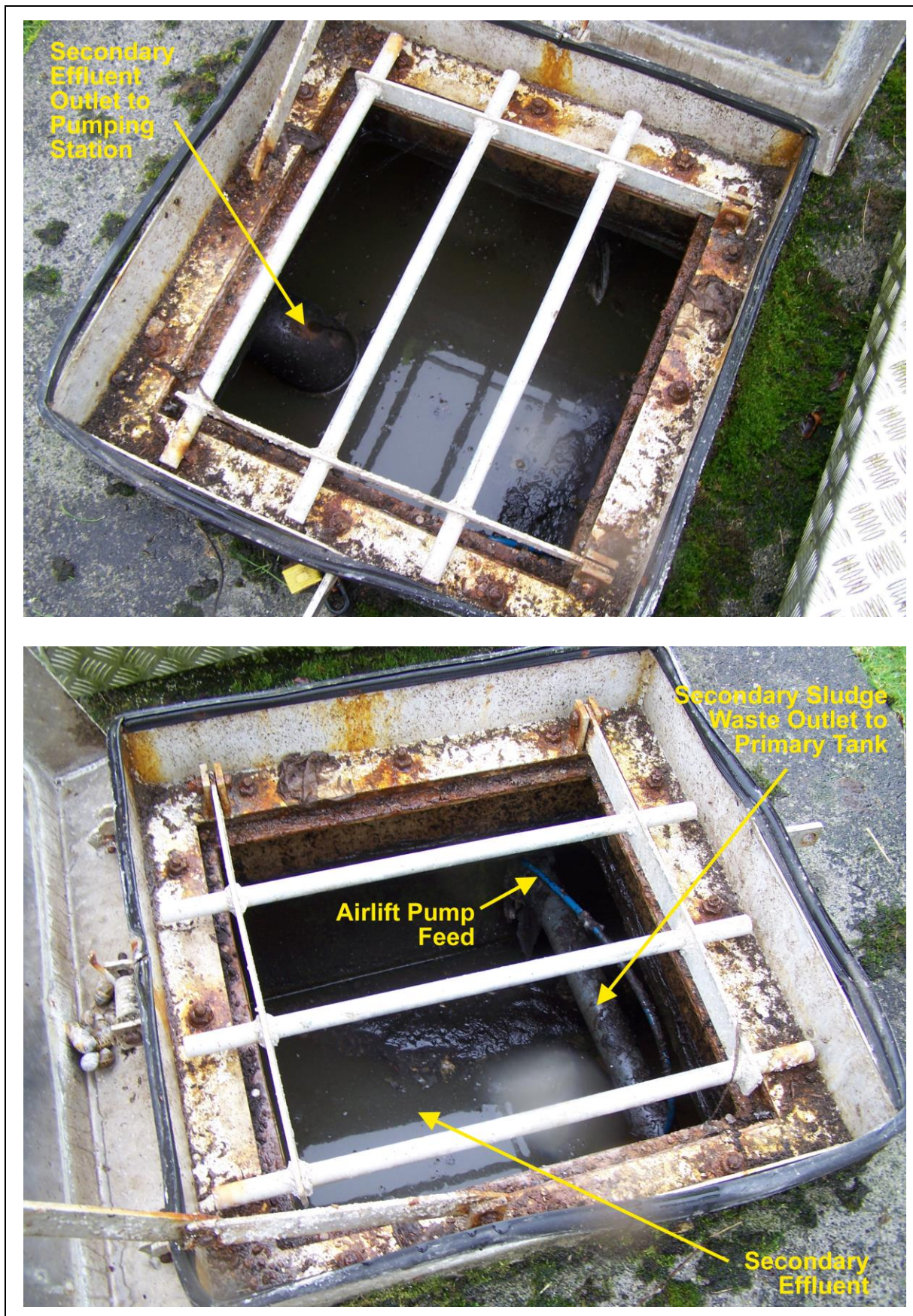


Figure 4-14: Secondary Effluent Pump Station (Feb 2014)



4.4 Carpark Surface Drainage

Glencar Amenity Carpark surface drainage discharges to Corglass Stream via an oil interceptor. It is unknown if said is equipped with an alarm system.

4.5 **Performance of the Existing Wastewater Infrastructure**

The Project Brief raises three questions in respect to the existing wastewater treatment plant; these questions are reiterated and answered in **Table 4-1**.

Appendix A6 of this Report provides additional detail on the existing WWTP.

Table 4-1: Questions and Answers in Respect to the Existing Wastewater Treatment Plant

LCC Question	Answer
1 - "Is the plant capable of treating the current loading if maintained correctly?"	<u>Primary Treatment</u> Primary tank de-sludging frequency will influence treatment performance in terms of SS and BOD removal by primary settlement. Demonstrated treatment performance of primary settlement is unknown to this Report. Dimension and geometry of the primary tank are uncertain; velocities within the tank can not be estimated in absence of said. The primary tank is essentially a septic tank; said typically provides a minimum of 24hr retention in their settlement zone. Manufacturer's literature reports total volume of the installed tank as 10.4m³. From Table 2-1; the estimated maximum daily flow is 7.3m³/day. This affords a combine volume of 3.1m³ for sludge and scum storage. If a de-sludging regime were to preserve a settlement zone of 7.3m³; retention time at peak flow would be 4.15hr. Manufacturer's literature outlines a design SS removal efficient of 30%; it is envisaged that said could be achieved if said de-sludging regime were to be implemented. <u>Secondary Treatment</u> Manufacturer's literature claims no BOD removal across primary treatment. Air supply requirement is based on influent load at a rate of 230 Nm³/kgBOD₅. In terms of PE³; the installed plant was designed for a maximum of 50. Current loading is estimated to be within the range of 78 - 104PE. At tourism saturation; loading is projected to be 142PE. Secondary treatment is neither capable of treating the current nor future loads. The extent of overloading may not be remedied by provision of additional air blower capacity. Oxygen transfer is finite; excessive air would result in unsustainable biofilm shearing from its support media followed by loss in treatment performance.

Continued ...

³ Urban Waste Water Treatment Regulations: "Population Equivalent" is a measurement of organic biodegradable load and a population equivalent of 1 (1 P.E.) means the organic biodegradable load having a five-day biochemical oxygen demand (BOD₅) of 60g of oxygen per day; the load shall be calculated on the basis of the maximum average weekly load entering the treatment plant during the year, excluding unusual situations such as those due to heavy rain.

LCC Question	Answer
2 - "Is there room for increased capacity?"	No. The plant is currently organically overloaded by 56 to 108% of its original design capacity. Demonstrated treatment capacity of the plant is unknown to this Report. Also, no commissioning and process performance records have been made available. Secondary effluent <u>grab</u> samples (of Oct / Nov 2019) suggest that the plant's performance sits within the following ranges: BOD₅: 53 – 81 % removal COD: 65 – 76 % removal SS: 74 – 87 % removal TP: 0 – 21 % removal TN: 0 – 15 % removal NH₃-N: zero % removal Quality of <u>secondary effluent samples</u> tested are very poor and not of dissimilar concentrations to a strong raw urban wastewater. This suggests the plant is receiving outside of design specification wastewater and/or, it is operating at sub-optimal conditions. The quality of secondary effluent being passed to the percolation area will adversely impacted on its permeability and shortened its useful life. Quality of secondary effluent samples tested averaged the following: 84mg/L SS; 299mg/L BOD₅; 737mg/L COD; 13mg/L TP. On 8th Feb 2024 it was visually very poor.

Continued ...

LCC Question	Answer
3 - "If the current plant is not capable of dealing with current loading and seasonal fluctuations in loading; what are the options to ensure it will run effectively?"	The plant is overloaded. Ultimately, a major upgrade is required. It is unknown if any interim measures to the existing WWTP can "ensure it will run effectively" and produce satisfactory effluent quality. In respect to achieving optimal performance; options which could be explored include the following, (some are novel): 1 - Implement an optimised de-sludging program⁴. See Section 1.4 'The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)'; 2a - Repair primary tank outlet baffling to prevent FOG entry to aeration tank. 2b - Repair secondary waste airlift pump and optimise said. 3 - Remove ECO-Tanks® Bioball support media and replace with an optimally selected media. Replace air diffusers and air pumps with those that provide optimal oxygen transfer. Inspect the sludge waste pump (inclusive of air blower) and replace as necessary. 4a - Reconstruct/refurbish the percolation area; inclusive of sampling risers. 4b - Modify the percolation area distribution chamber for even flow splitting. 5a - Trial secondary effluent recirculation with the aim to maximum BOD₅ removal across secondary treatment. It is envisaged that the new pump would be located in the secondary effluent pump station. 5b - Trial a trickling filter arrangement within the secondary effluent pump sump, i.e. modify the sump's inlet arrangement into a distributor and below said install a suspended biofilm carrier media inclusive of waste sludge pumping system. 6 - Trial chemically-assisted-primary-settlement with the aim to maximum BOD₅ removal across primary treatment. Trial would be subject to sufficient alkalinity being present in the wastewater. 7 - Impose/enforce LGWPA Section 16 trade effluent discharge standards which result in a reduction of the combined loadings to within the WWTP's demonstrated operating capacity. 8 - Impose/enforce LGWPA Section 16 trade effluent discharge standards to alleviated excessive solids/grease accumulation in the primary tank. 9 - Collaborative efforts could be made in respect to reduce contribution of detergents to P loadings on the WWTP. See Section 1.4 'The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)'. 10 - Collaborative efforts could be made in respect to curtailing the amount of disinfecting agents passed to the WWTP and to reduce the risk of upsetting microbial/bacterial balances within same. See Section 1.4 'The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)'.

⁴ The amount of sludge accumulated depends on the loading of the plant. Each site has its own specific characteristics which is learned through operational experience.

5 **ASSIMILATIVE CAPACITY ASSESSMENT**

Assimilative capacity refers to the ability of the environment or a portion of the environment (such as a stream, lake, or soil layer) to receive/carry waste material without deleterious effects on the environment or on users of its resources. Pollution occurs when the assimilative capacity is exceeded.

A deterioration of Glencar Lough quality status is reported together with a phosphorus eutrophication pressure. There is no remaining waste assimilative capacity in the lake in respect of total phosphorous and its threshold value for a high quality status.

Immediate and easy to implement redress of phosphorus eutrophication pressures attributable to the Glencar Amenity WWTP have been outlined in Section 1.4, ‘The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)’.

The Project Brief raises two questions in respect to Assimilative Capacity of Glencar Lough and Corglass Stream; these questions are reiterated and answered in **Table 5-1**.

Table 5-1: Questions and Answers in Respect to Assimilative Capacity of Surface Water Bodies

LCC Question	Answer																										
1 - “What is the waste assimilative capacity of the adjacent Glencar River/Lough where the effluent is supposed to discharge to?”	<u>Discharge to Groundwater</u> No nutrient (N or P) removal processes are in place before discharge to the percolation area. While no nutrient (N or P) removal processes are in place before discharge to the percolation area; nutrient removal processes could be in play in the sub-surface soil layers. It is unknown if any of these processes are present and/or if the existing disposal to ground system is or has been stressed beyond its design/actual attenuation capacity. <u>Note:</u> If discharge location is revised to surface and the aforementioned removal processes taken out of play and, phosphorus eutrophication pressures on the lake may be elevated. <u>Discharge to Surface Water</u> From ‘Glencar Lake Priority Area for Action Desktop Study_F01, Local Authority Waters Programme (LAWPRO, 07/07/2020)’: i) Glencar Lough baseline concentrations are 0.010mg/L TP and 0.012mg/L NH3-N. ii) For the period of 23/10/2019 to 02/03/2020; averaged secondary effluent values from the WWTP were: 11.21mg/L TP and 95.93mg/L NH3-N. No baseline information has been available in respect to other parameters. An assimilative capacity assessment has been carried out for Glencar Lough. Assuming a nutrient condition of GOOD is the target; the following Future emission level values (ELV) are suggested for discharge to the surface water body: <table><tr><td>Total Ammonia Nitrogen</td><td>mg/L N</td><td>10.0</td></tr><tr><td>Total Phosphorus</td><td>mg/L P</td><td>3.0</td></tr></table> These ELVs have been calculated using a simple EPA dispersion model and are subject to revision at detailed design stage. Assuming <u>no</u> nutrient removal processes are present in sub-surface soil layers; estimated mass loadings to the receiving water body are as follows: <table><tr><td>Treatment Quality</td><td>-</td><td>Current</td><td>Future</td></tr><tr><td>Waterfall Gate Count</td><td>No./year</td><td>95,144</td><td>135,000</td></tr><tr><td>Total Ammonia Nitrogen</td><td>kg/year</td><td>187.4 - 226.3</td><td>26.6</td></tr><tr><td>Total Phosphorus</td><td>kg/year</td><td>21.9 - 25.07</td><td>8.0</td></tr><tr><td>MRP Phosphorus</td><td>kg/year</td><td>18.8</td><td>-</td></tr></table>	Total Ammonia Nitrogen	mg/L N	10.0	Total Phosphorus	mg/L P	3.0	Treatment Quality	-	Current	Future	Waterfall Gate Count	No./year	95,144	135,000	Total Ammonia Nitrogen	kg/year	187.4 - 226.3	26.6	Total Phosphorus	kg/year	21.9 - 25.07	8.0	MRP Phosphorus	kg/year	18.8	-
Total Ammonia Nitrogen	mg/L N	10.0																									
Total Phosphorus	mg/L P	3.0																									
Treatment Quality	-	Current	Future																								
Waterfall Gate Count	No./year	95,144	135,000																								
Total Ammonia Nitrogen	kg/year	187.4 - 226.3	26.6																								
Total Phosphorus	kg/year	21.9 - 25.07	8.0																								
MRP Phosphorus	kg/year	18.8	-																								

LCC Question	Answer
2 - "Phosphorus has been identified as an issue in this lake, what level of tertiary treatment can be utilised to minimise nutrient levels in the effluent. Existing polishing filter has been found to be leaking effluent to the surface of the ground and is considered inadequate to treat the secondary treated effluent given the ground conditions and proximity to the river and lake. What standard should the discharged effluent be to discharge to the surface water body?"	<u>Discharge to Groundwater</u> No nutrient (N or P) removal processes are in place before discharge to the percolation area. While no nutrient (N or P) removal processes are in place before discharge to the percolation area; nutrient removal processes could be in play in the sub-surface soil layers. It is unknown if any of these processes are present and/or if the existing disposal to ground system is or has been stressed beyond its design/actual attenuation capacity. <u>Note:</u> If discharge location is revised to surface and the aforementioned removal processes taken out of play and phosphorus eutrophication pressures on the lake may be elevated. <u>Limiting Phosphorus at Source</u> Immediate and easy to implement redress of phosphorus eutrophication pressures attributable to the Glencar Amenity WWTP have been outlined in Section 1.4, 'The Suggested List of Preliminary Actions for Stakeholders (JOD, 8th Feb 2024)', i.e. use of eco-friendly chemicals. <u>Current Treatment Performance</u> Quality of secondary effluent tested is very poor and not of dissimilar concentrations to raw influent. Secondary effluent colour would indicate that a level of grease is being passed to the percolation area. This suggests the plant is receiving outside-design-specification wastewater and/or that the plant is operating at less than an optimal condition. In respect to grease see, Figure 4-9 and Figure 4-10. <u>Tertiary Treatment</u> Suggested ELV's are outlined in Answer to Question 1. Low visual impact P-removal technologies include: engineering soil polishing filters; reed beds with suitability selected media; natural ore (calcite) media beds, and; engineered (light-expanded-clay-aggregate) media beds. All of these technologies have infinite P sorption capacities and require ongoing refurbishment. In a typical reed bed system most nutrient removal is the result of micro-organisms, sedimentation, and chemical and physical binding in sand, gravel and soil. Media selection is critical to TP-removal performance.

Appendix A4 of this Report provides further detail on Glencar Lough Waste Assimilative Capacity Assessment. Also see **Appendix A5** of this Report.

6 OUTLINE IMPROVEMENT / UPGRADE / REPLACEMENT OPTIONS

6.1 Lands Available and Land Acquisition Requirements

*“The treatment unit was designed for a P.E. of 50 to service the toilet block located in the Glencar Visitor Centre carpark, subsequently a café was connected to the sewage system, with visitor numbers significantly increasing since 2014 the treatment unit is no longer fit for purpose. Surface contamination of the ground above the percolation area by sewage effluent, posing a risk to the lake and the stream, was recorded on the 4th July 2019 by Leitrim Co.Co. staff. **Leitrim Co.Co. Environment Department have issued advisory notices since 2016 highlighting this issue and recommending an upgrade to the treatment system and a relocation away from the lake shore.**”⁵*

Capital Projects Office brief (Section 1.3) poses the following question:

“What is the waste assimilative capacity of the adjacent Glencar River/Lough where the effluent is supposed to discharge to?”

Leitrim Co.Co. Environment Department express that WWTP upgrade be relocated away from the shore of Glencar Lough. Leitrim Co.Co. Capital Projects Office advise that the WWTP is supposed to discharge into the surface water body rather than discharge to ground. Intents of the Environment Department and the Capital Projects Office appear contradictory, i.e. if relocated, the length of an outfall pipeline would have little impact in terms of effluent mass loadings to the receiving surface water body.

No Leitrim Co.Co. proposed/suggested relocation site/area is known to this Report. It is envisaged that a segment of Land Folio LM3494F Plan Number 5 and/or Land Folio LM8524 Plan Number 1B would be required in order to upgrade/expand the WWTP. Said folios are illustrated in **Figure 6-2. Parts of both folios are inside the SAC boundary; see **Figure 6-1**.**

EPA recommendations on minimum separation distances from WWTP periphery to its surroundings features are influenced by soil percolation values, soil depth and ground slope. No such details are presently known within or beyond the existing WWTP site boundary. It

⁵ Glencar Lake Priority Area for Action Desktop Study_F01, Local Authority Waters Programme (LAWPRO, 07/07/2020)

is unclear if the periphery of existing tankage and percolation area satisfy regulatory requirements in respect to separation distances from surface water bodies and site boundary.

Figure 6-1: WWTP Site Location & Special Area of Conservation Boundary (000623)

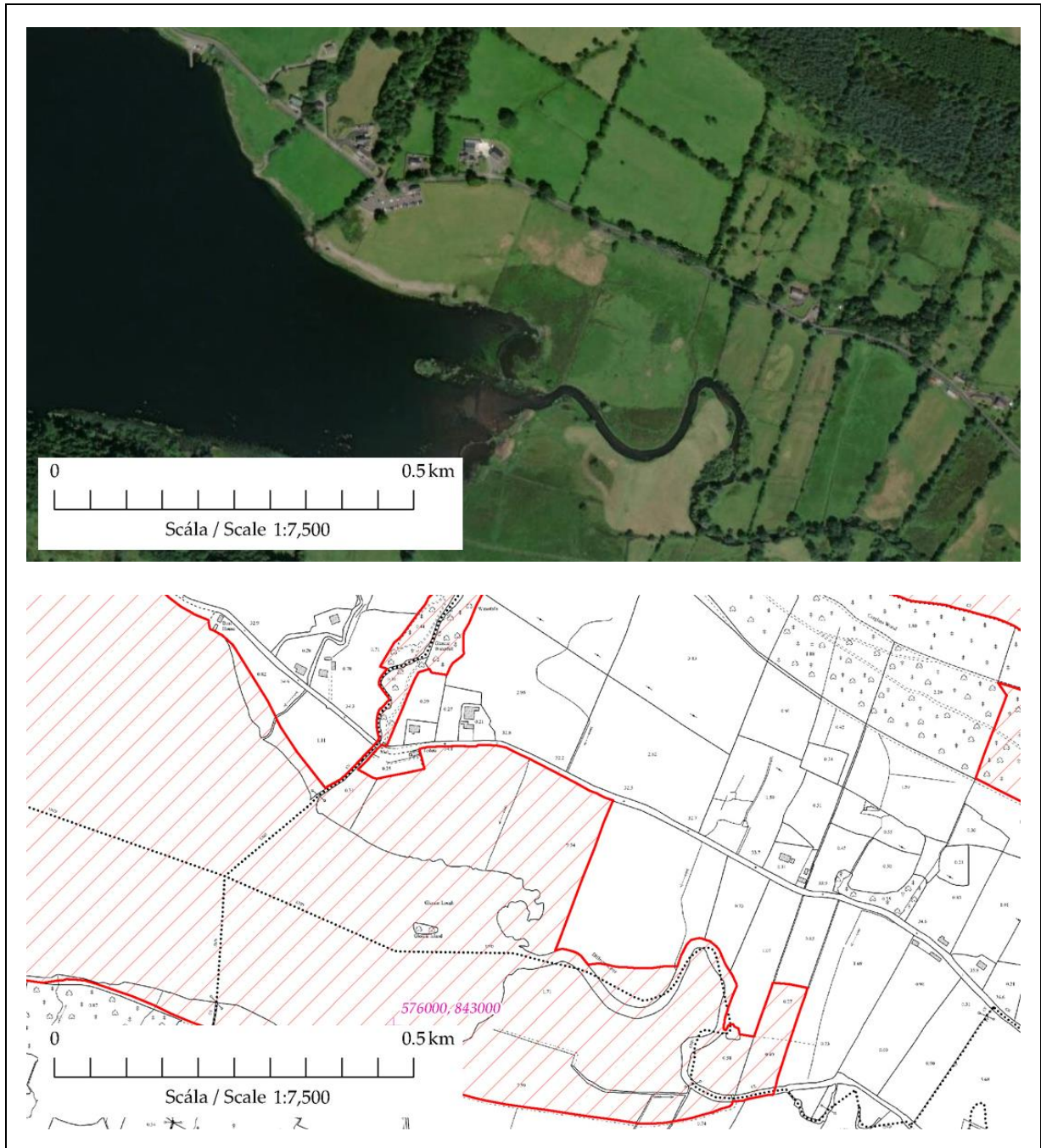
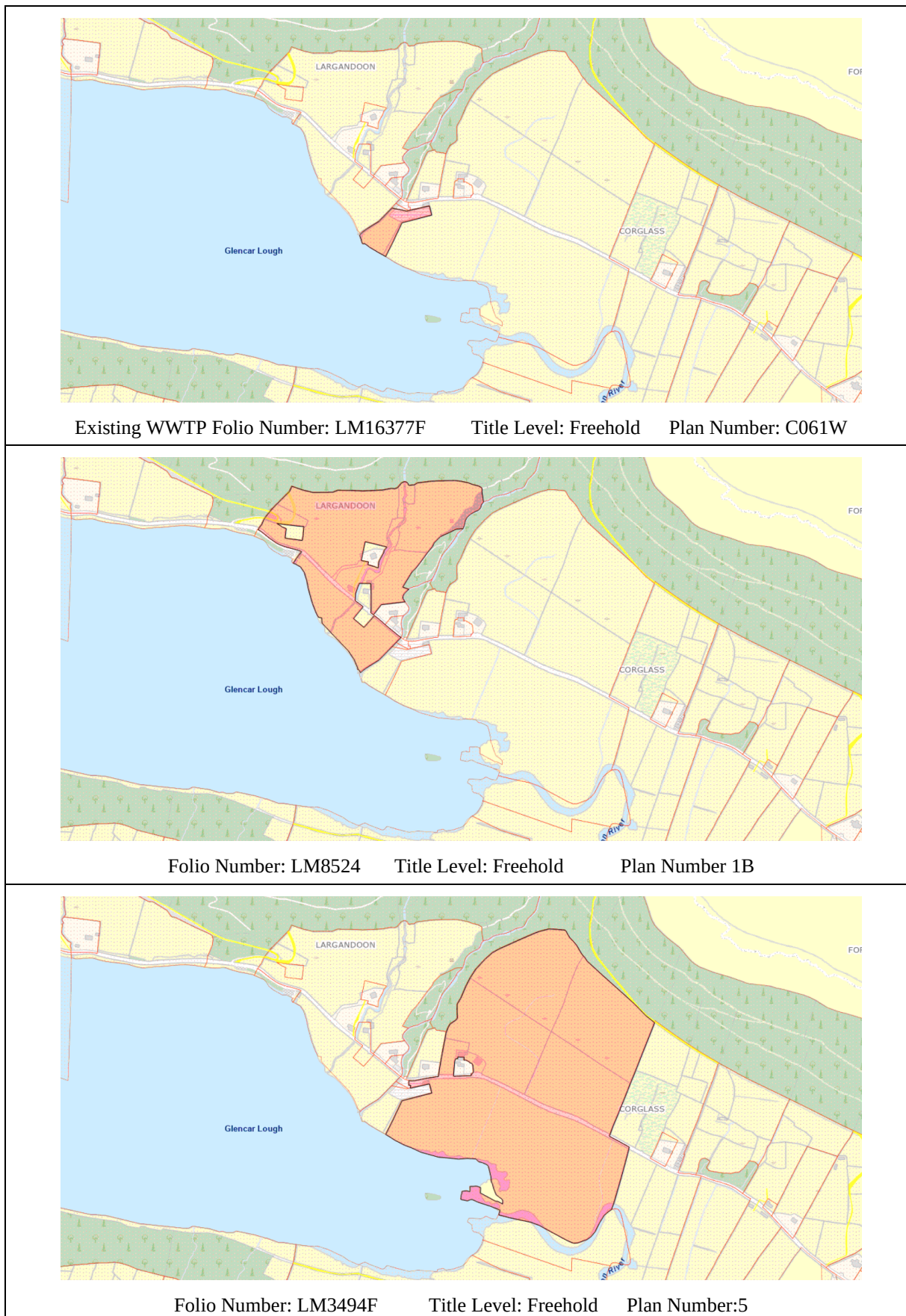


Figure 6-2: WWTP Land Folio & Land Folios Surrounding the Existing WWTP



6.2 **Reactive Maintenance (Option 1)**

Answer to Question 3 of Table 4-1 suggests a number replacements and refurbishments which fall under routine maintenance, proactive/reactive maintenance and, asset management. Note that suggestions made are in respect to treatment performance only.

Most of the suggested works are low cost. Those reactive maintenance items that are not inappreciable costs are the following:

- 3 - Remove ECO-Tanks® Bioball support media and replace with an optimally selected media. Replace air diffusers and air pumps with those that provide optimal oxygen transfer. Inspect the sludge waste pump (inclusive of air blower) and replace as necessary.
- 4a - Reconstruct/refurbish the percolation area; inclusive of sampling risers.
- 4b - Modify the percolation area distribution chamber for even flow splitting.

A number of health and safety issues were observed during Site Visit of 8th Feb 2024. Said are outlined under heading 'Site Visit / Inspection Record' within **Appendix A6** - Existing WWTP - Review of Treatment Performance/Capacity. As a minimum the tank access covers should be replaced. From a process perspective this would part address the treatment performance risk posed by potential irresponsible emptying of motor-home chemical toilets into the wastewater treatment plant.

6.3 Chemical Toilet Reception Station (Option 2)

Install a chemical toilet reception station (CTRS)with suitability sized chemically resistant underground storage tank. The reception station would be a standalone collection facility for all wastewater to be tankered off-site by licenced waste contractor.

Although the site is neither equipped with water recharge station nor a chemical cassette reception station; the amenity is established as a quite, safe and popular stay-over location for motor-homes and campervans, see **Figure 6-3**. The toilet block, with hot water, is open near 24/7/365; this encourages motor-homes and campervans to stay overnight.

Figure 6-3: Glencar Amenity Car Park



From a process perspective the addition of a CTRS would address the treatment performance risk posed by potential irresponsible emptying of motor-home chemical toilets into the wastewater treatment plant. Occurrences of chemical toilet cassettes being emptied into gents water closet have been observed/reported by the general public (August 2023).

ECO-Tanks® O&M manual indicates that it could take up to 6 weeks for biofilm growth to re-establish following acute chemical shock.

6.4 WWTP Upgrade/Remediation Options

The matter of trade effluent grease is to be addressed by upgrades on the trade premises.

Refer to information under heading ‘Possible Upgrade Solutions’ in **Appendix A7** - Trade Wastewater - Review of Existing Pre-Treatments.

The matter of trade effluent discharge quality as per Question 2 of Table 3-1 is referred to Leitrim County Council Planning Enforcement Section.

This section outlines upgrade and remediation options in respect to the wastewater treatment plant. In the interests of brevity; wastewater treatment plant upgrade options are presented in tabular and bullet point formats as **Table 6-1** below.

Table 6-1: Glencar Amenity WWTP Upgrade/Remediation Options

Option	Summary Description
1	Reactive Maintenance: Elements of works include and are not limited to the following: • Repair primary tank outlet baffling to prevent FOG entry into the aeration tank; • Repair secondary waste airlift pump and optimise said; • Remove ECO-Tanks® Bioball support media and replace with an optimally selected media; • Replace air diffusers and air pumps with those that provide optimal oxygen transfer; • New control and plant kiosks as necessary; • Inspect the sludge waste pump (inclusive of air blower) and replace as necessary; • Reconstruct/refurbish the percolation area; inclusive of sampling risers; • Modify the percolation area distribution chamber for even flow splitting; • Provision of critical/standby equipment (boxed spare/standby), or installed duty/standby; • Site security and safety remediation works; • Repair alarming system; • Install alarming system on car-park surface drainage oil-interceptor; • All Temporary, Civil and MEICA works associated with the above; • In addition to the above; an alkaline chemical dosing station, (if needed). See Section 2.3. Also see Section 6.2 and Answer to Question 3 of Table 4-1. Note: The existing plant is overloaded. The works listed above could be explored in respect of achieving optimal performance of the existing WWTP. It is unknown if any of the above interim measures will “ensure it will run effectively” and produce satisfactory effluent quality. Ultimately, a major upgrade is required.

Table Continues ...

2	Chemical Toilet Reception Station (Elsan Point): Elements of works include and are not limited to the following: • Installation of a chemical toilet reception station with suitability sized chemically resistant underground storage tank. (A 6000L tank is envisaged.) The reception station would be a standalone collection facility for all wastewater to be tankered off-site by licenced waste contractor. • The tank would be equipped with a level monitor and high level alarm. Also see Section 6.3. An indicative site layout is presented in APPENDIX F: OPTIONEERING SITE LAYOUTS.
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Table Continues ...

Option	Summary Description
3G	Upgrade the Existing WWTP for Discharge to Ground-Water: Elements of upgrade include and are not limited to the following: • Install a new primary treatment tank (cylindrical underground septic tank); • Alkaline chemical dosing station, (if needed); • Provide multi-stage biological treatment by conversion of the existing primary tank and the existing secondary settlement into, flooded aerated bio-filters similar to the existing but designed for C and N removal; • Install new aeration blowers and biofilm carrier media; • Install a new secondary settlement tank inclusive or sludge pumping system; • Upgrade the secondary effluent pump station to include both forwarding and re-circulating pumping capacity; • Construct a 390m² raised percolation area engineered for nitrogen and phosphate removal⁶; • Influent, effluent and groundwater monitoring stations; • Trade effluent monitoring station; • Process control, monitoring and instrumentation; • Site security, site finishes and site landscaping; • ESB Networks connection upgrade, if necessary; • Control and plant kiosks; • SCADA and alarming system; • Install alarming system on car-park surface drainage oil-interceptor; • All Temporary, Civil and MEICA works associated with the above; • Process guarantee from designers. Note: Viability of this option is contingent the condition of the existing tankage. Viability of this option also contingent on levels and sewer gradients being sufficient to facilitate installation of the new primary treatment tank. If required levels are not available a variant of this Option would be convert the existing WWTP into a primary tank and install all new process tanks down stream of said. For sizing of the 390m² raised percolation are, refer to Table A5a in Appendix A5 of the Report. The above list of items is non-exhaustive and should not be interpreted as complete works scope. An indicative site layout is presented in APPENDIX F: OPTIONEERING SITE LAYOUTS.

Table Continues ...

⁶ Phosphorous attenuation in soil is controlled by adsorption and mineral precipitation reactions. Removal mechanisms for nitrogen include: mineralisation, volatilisation, adsorption, cation exchange, incorporation into microbial biomass, nitrification and denitrification.

Option	Summary Description
3S	Upgrade the Existing WWTP for Discharge to Surface-Water: Elements of upgrade include and are not limited to the following: • Install a new primary treatment tank (cylindrical underground septic tank); • Alkaline chemical dosing station, (if needed); • Provide multi-stage biological treatment by conversion of the existing primary tank and the existing secondary settlement into, flooded aerated bio-filters similar to the existing but designed for C and N removal; • Install new aeration blowers and biofilm carrier media; • Install a new secondary settlement tank inclusive or sludge pumping system; • Upgrade the secondary effluent pump station to include both forwarding and re-circulating pumping capacity; • Provide tertiary treatment via a reed-bed or intermittent-sand-filter engineered for nitrogen and phosphate removal⁷; • Final effluent outfall to surface-water body; • Influent and effluent monitoring stations. • Trade effluent monitoring station; • Process control, monitoring and instrumentation; • Site security, site finishes and site landscaping; • ESB Networks connection upgrade, if necessary; • Control and plant kiosks; • SCADA and alarming system; • Install alarming system on car-park surface drainage oil-interceptor; • All Temporary, Civil and MEICA works associated with the above; • Process guarantee from designers. Note 1: Viability of this option is contingent the condition of the existing tankage. Viability of this option is also contingent on levels and sewer gradients being sufficient to facilitate installation of the new primary treatment tank. If required levels are not available a variant of this Option would be convert the existing WWTP into a primary tank and install all new process tanks down stream of said. Note 2: To minimise visual impact and; the installation would be underground in as much as practicable. The above list of items is non-exhaustive and should not be interpreted as complete works scope. An indicative site layout is presented in APPENDIX F: OPTIONEERING SITE LAYOUTS.

Table Continues ...

⁷ Low visual impact P-removal technologies include: engineering soil polishing filters; reed beds with suitability selected media; natural ore (calcite) media beds, and; engineered (light-expanded-clay-aggregate) media beds. All of these technologies have infinite P sorption capacities and required ongoing refurbishment. In a typical reed bed system most nutrient removal is the result of micro-organisms, sedimentation, and chemical and physical binding in sand, gravel and soil. Media selection is critical to TP-removal performance.

Option	Summary Description
4G	Repurpose the Existing WWTP & Construct a New WWTP with Discharge to Ground-Water: Elements of upgrade include and are not limited to the following: • Convert the existing WWTP into a primary tank (septic tank) and pumping station forwarding primary effluent to new site. • At a new site (location); construct a new WWTP inclusive of the following processes: – Alkaline chemical dosing station, (if needed); – Biological treatment for carbon and nitrogen removal; – Solids separation (secondary settlement); – Raised percolation area engineered for nitrogen and phosphate removal⁸; • Influent, effluent and groundwater monitoring stations. • Trade effluent monitoring station; • Process control, monitoring and instrumentation; • Site security, site finishes and site landscaping; • ESB Networks connections: new and upgrade; • Control and plant kiosks; • SCADA and alarming system; • Install alarming system on car-park surface drainage oil-interceptor; • All Temporary, Civil and MEICA works associated with the above; • Process guarantee from designers. Note 1: Viability of this option is contingent on suitable new lands being available. Viability of this option is also contingent on the condition of the existing tankage. Note 2: To minimise visual impact the installation would be underground in as much as practicable. The above list of items is non-exhaustive and should not be interpreted as complete works scope. Indicative site layouts are not included in APPENDIX F: OPTIONEERING SITE LAYOUTS; suitable lands need to be identified in order to develop said.

Table Continues ...

⁸ Low visual impact P-removal technologies include: engineering soil polishing filters; reed beds with suitability selected media; natural ore (calcite) media beds, and; engineered (light-expanded-clay-aggregate) media beds. All of these technologies have infinite P sorption capacities and required ongoing refurbishment. In a typical reed bed system most nutrient removal is the result of micro-organisms, sedimentation, and chemical and physical binding in sand, gravel and soil. Media selection is critical to TP-removal performance.

Option	Summary Description
4S	Repurpose the Existing WWTP & Construct a New WWTP with Discharge to Surface-Water: Elements of upgrade include and are not limited to the following: • Convert the existing WWTP into a primary tank (septic tank) and pumping station forwarding primary effluent to new site. • At a new site (location); construct a new WWTP inclusive of the following processes: - Alkaline chemical dosing station, (if needed); - Biological treatment for carbon and nitrogen removal; - Solids separation (secondary settlement); - Tertiary treatment for P removal (chemical dosing, reaction chamber and filter); - Final effluent outfall to surface-water body; • Influent and effluent monitoring stations; • Trade effluent monitoring station; • Process control, monitoring and instrumentation; • Site security, site finishes and site landscaping; • ESB Networks connections: new and upgrade; • Control and plant kiosks; • SCADA and alarming system; • Install alarming system on car-park surface drainage oil-interceptor; • All Temporary, Civil and MEICA works associated with the above; • Process guarantee from designers. Note 1: Viability of this option is contingent on suitable new lands being available. Viability of this option is also contingent on the condition of the existing tankage. Note 2: To minimise visual impact the installation would be underground in as much as practicable. The above list of items is non-exhaustive and should not be interpreted as complete works scope. Indicative site layouts are not included in APPENDIX F: OPTIONEERING SITE LAYOUTS; suitable lands need to be identified in order to develop said.

7 **COST ESTIMATES**

Cost estimates are presented in this section. All cost estimate amounts are inclusive of value added tax (VAT).

Table 7-1: Summary Cost Estimates

OPTION	Capital Cost, € CAPEX (Incl. VAT)	Operations Cost, €/yr OPEX (Incl. VAT)
Option 1 – Reactive Maintenance including Refurbishment of the Existing Percolation Area	€71,501.60	n/a
Option 2 – Chemical Toilet (Black Water) Reception Station	€24,434.28	€1,225.80
Option 3G – Upgrade the Existing WWTP for Discharge to Ground-Water	€239,487.27	Outside Project Brief.
Option 3S – Upgrade the Existing WWTP for Discharge to Surface-Water	€285,458.18	Outside Project Brief.
Option 4G - Repurpose the Existing WWTP & Construct at a new location a New WWTP with Discharge to Ground-Water	Suitable lands need to be identified in order to cost this Option.	Suitable lands need to be identified in order to cost this Option.
Option 4S – Repurpose the Existing WWTP & Construct at a new location a New WWTP with Discharge to Surface-Water	Suitable lands need to be identified in order to cost this Option.	Suitable lands need to be identified in order to cost this Option.
FATs Oils & Grease Separator Install a FOG Separator at the Tea Shed.	€8,254.40	Outside Project Brief.

Breakdown of cost estimates are presented in APPENDIX G: COST ESTIMATIONS.

APPENDIX A: DATA COLLATION, ASSESSMENTS & REVIEWS

Contents:

Appendix A1 - Glencar Waterfall Gate Counts - Calculations

Appendix A2 - Water Meter Readings & Glencar Amenity WWTP Estimated Hydraulic Loading - Calculations

Appendix A3 - Wastewater Concentrations & Glencar Amenity WWTP Estimated Mass Loadings - Calculations

Appendix A4 - Environmental Compliance - Lake Waste Assimilative Capacity Assessment - Calculations

Appendix A5 - Environmental Compliance - Groundwater Waste Assimilative Capacity Assessment - Calculations

Appendix A6 - Existing WWTP - Review of Treatment Performance/Capacity

Appendix A7 - Trade Wastewater - Review of Existing Pre-Treatments

Appendix A8 - Trade Wastewater - Review of Planning Conditions

Appendix A9 - Existing Site Drawings / Illustrations

APPENDIX B: PLANNING FILES - SELECT EXACTS

- Contents:** 01 - PL 1344 - conditions [pages 1-6-9-10-11-12].
- 02 - PL 1344 - an taisce.
- 03 - PL 1344 - water services report.
- 04 - PL 1344 - enviro-emer-cult-services report.
- 05 - PL 1344 - planner report.
- 06 - PL 1344 - supporting documentation.
- 07 - PL 1344 - 2014-03-31 - compliance submission.
- 08a - PL 1344 - 2014-07-04 - compliance submission.
- 08b - PL 1344 - 2014-07-04 - 49-(RO)-0013-B.
- 09 - PL 1344 - 2014-09-10 - compliance response.
- 10 - PL 1344 - statement for screening aa.
- 11 - PL 1344 - site location and layout maps.

All of the above are in PDF format.

APPENDIX C: SITE INVESTIGATION REPORTS

Contents: 01- Coyle Environmental Ltd - 24-094 SCAR (2024-11-20).

All of the above are in PDF format.

APPENDIX D: EQUIPMENT MANUALS & LITERATURE

- Contents:** 01 - JF Mouldings Ltd ECO-Tanks® EC 5 Manual Rev1.
02 - JF Mouldings Ltd ECO-Tanks® EC 5 Manual Rev2.
03 - Charles Austen ET SERIES DS 2018.

All of the above are in PDF format.

APPENDIX E: SPECIAL AREA OF CONSERVATION (SAC 000623) MAPS

- Contents:** 01 - SAC MAP000623.
02 - SAC MAP000623 [Tile 0851c].
03 - SAC MAP000623 [Tile 0850d].

All of the above are in PDF format.

APPENDIX F: OPTIONEERING SITE LAYOUTS

- Contents:** 01 - OPTION 2: Conceptual Layout.
02 - OPTION 3G: Conceptual Layout.
03 - OPTION 3S: Conceptual Layout.

All of the above are in both PDF and JPG format.

APPENDIX G: COST ESTIMATIONS

- Contents:** 01 - OPTION 1 Cost Estimate.
02 - OPTION 2 Cost Estimate.
03 - OPTION 3G Cost Estimate.
04 - OPTION 3S Cost Estimate.

All of the above are in PDF format.

