
Drainage Statement



Middlewood Farm, Threapwood
(Reference: 2207015)

August 2022

Revision F | June '23

1.0 INTRODUCTION

Foreword

This Drainage Statement has been produced in support of a planning application (P/2022/0286) for the proposed conversion of a commercial building to 4no. residential dwellings.

2.0 SITE LOCATION & DESCRIPTION

Existing Site

The development site is located off Sarn Road at Middlewood Farm, Threapwood, Malpas SY14 7AW.

The site is located at OS X (Eastings) 343844, Y (Northings) 345522 with the approximate grid reference of SJ4384445522.

An extract of the site location is shown below:-



Existing Structures

The wider Middlewood Farm consists of various buildings forming commercial and equine interests along with SME businesses on land within a 16-acre holding.

English / Welsh Border

The site is situated on the English and Welsh border with an English post code however, a predominant site area is located on the Welsh side.

Special Areas of Conservation (SAC)

The development site falls within the River Dee and Bala Lake SAC which is currently subject to NRW targets for the reduction of phosphate levels.

3.0 DEVELOPMENT PROPOSALS

Planning permission is being sought for the change of use of 1 no. commercial building for redevelopment into 4 no. residential dwellings with associated car parking and bin store / soft landscaped amenities.

The site will utilise the existing access arrangements from the east off of Sarn Road.

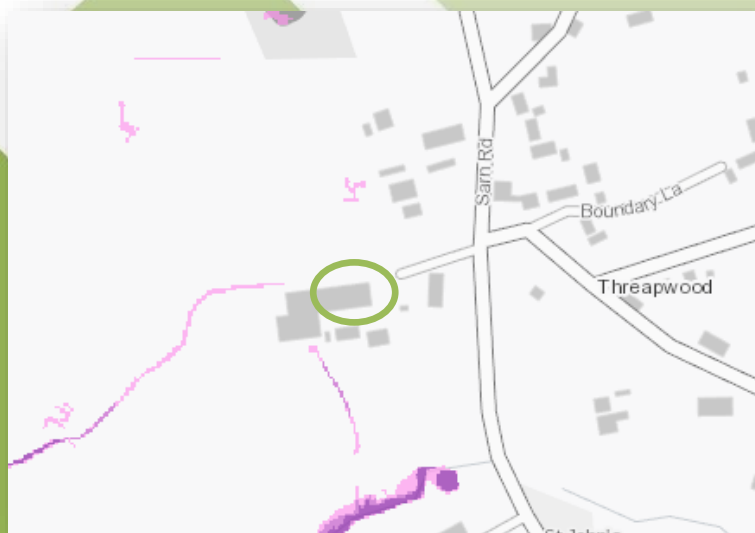
The development is categorised as Brownfield.

4.0 FLOOD RISK

Natural Resource Wales (NRW)

Natural Resource Wales flood mapping indicates that the site is not located within an area at high risk from flooding from fluvial rivers (up to 1 in 100 year annual probability – Flood Zone 3) nor at risk from an extreme flood event (up to 1 in 1000 year annual probability – Flood Zone 2).

An extract of the NRW flood mapping is shown below:-



Flood Risk Assessment (FRA)

The development area is less than 1.0 hectare in size and is located within Flood Zone 1 therefore, an FRA is not required.

Surface Water Flooding

The NRW flood mapping also confirms that the site is not affected by surface water flooding.

Environment Agency (EA)

Due to the border location of the site, the Environment Agency mapping has also been reviewed and reaffirms that the site lies within Flood Zone 1 and is not subject to surface water flooding.

5.0 EXISTING DRAINAGE ASSESSMENT

Sewer Records

No public surface water or foul water sewers are recorded in the local vicinity of the development site and has been investigated via discussions with both United Utilities and Dŵr Cymru Welsh Water; it is considered feasible that the local area of Threapwood is served by an abundance of non-mains drainage discharging to the local river catchment via a plethora of varying tributaries and also, where suitable, via discharges to the ground in the form of soakaways and foul drainage fields.

The Water Industry Regulations 2011

From 1st October 2011, the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 transferred the ownership of private sewers to the responsibility of the local drainage authority. These former private sewers may be located within the site boundary and often not illustrated on statutory sewer records. A protective strip / easement is applied to the sewer(s) and is not typically permitted to be built over.

No drainage serving third parties appears to be present within the site boundary and can be further substantiated by the typical distances to surrounding properties.

Private Drainage

The existing commercial building is served by a network of private foul gravity drainage with a Tricel Novo UK18 treatment plant which discharges treated effluent to a watercourse / ditch some 400m to the west.

The existing impermeable areas are served by a network of private surface water drains which follows the local topography in a western direction and discharges to an existing watercourse / ditch.

6.0 RIVER DEE AND BALA LAKE SAC

The development site falls within the River Dee and Bala Lake SAC which is currently subject to NRW targets for the reduction of phosphate levels.

Due to the River Dee and Bala Lake catchment, additional consideration and information is required to establish any damaging effect on the River Dee and Bala Lake SAC either during construction or operation.

Table 1: Development review of effect on the River Dee SAC;

POTENTIAL DAMAGE	GENERAL COMMENT	CONSTRUCTION PHASE	OPERATION PHASE
Releasing sediment to a watercourse (ditch, drain or stream) either during construction or after (operation / occupation).	There are no watercourses or ditches in close proximity to the site. The existing site currently discharges via separate surface water and foul water drainage networks to a watercourse some 400m away.	Suitable methods will be implemented where applicable during the construction phase to prevent any run-off into the existing private drainage networks.	The existing private surface water drainage is to be unchanged.
Releasing phosphates to a water course (e.g. by connecting to the public Wastewater Treatment Works (WwTWs), connecting to a private WwTW, discharging to ground with insufficient capacity to protect the water course, changes in fertilizer / manure spreading as a result of development).	The development proposal is for the replacement of the existing commercial building with 4no. residential dwellings.	The existing on site facilities shall be utilised by the construction operatives.	The development site replaces the existing foul flows generated by the commercial building.
Any developments which may discharge other pollutants to the river catchment (e.g. through disturbance of contaminated land or spillage of chemicals without secure containment measures).	No other pollutants are envisaged.	Suitable methods will be implemented where applicable during the construction phase to prevent any run-off into the existing ground.	The existing private surface water drainage is to be unchanged.

7.0 COMPARISON OF WASTEWATER PRE-DEVELOPMENT & POST-REDEVELOPMENT

Pre-Redevelopment

The estimated total flow, based upon Full-time Day Staff, per day is calculated based upon an assessment of litres per person per day in accordance with British Water 'Flows and Loads: 4'.

$$\text{Litres per person per day} \times \text{No. of people} = \text{flow (litres)}$$

$$90.0 \times 40 = 3,600\text{l (3.60m}^3\text{)}$$

The calculated Biochemical Oxygen (BOD) is:-

$$38\text{g} \times \text{No. of people} = \text{total grams per day}$$

$$38.0 \times 40 = 1,520\text{g per day}$$

The calculated phosphorus is 12.75kg per year and is based on:-

- Water usage of 90.0 litres per person per day.

SAC Catchment

Centered on 33% of the workforce travelling from outside of the SAC catchment area, which is based on Wrexham County Borough Council Travel to Work data for larger employment developments, the adjusted calculations are below.

$$33\% \text{ of } 40 = 13.2$$

$$\text{Say } 13$$

The estimated total flow, based upon Full-time Day Staff, per day is calculated based upon an assessment of litres per person per day in accordance with British Water 'Flows and Loads: 4'.

$$90.0 \times 13 = 1,170\text{l (1.17m}^3\text{)}$$

The calculated Biochemical Oxygen (BOD) is:-

$$38.0 \times 13 = 494\text{g per day}$$

The calculated phosphorus is 4.15kg per year and based upon an average five day working week is 2.96kg per year.

Post-Redevelopment

The Office for National Statistics (ONS) established in 2021 that there were on average 2.3 residents per household in Wrexham County Borough.

$$\text{Population of Wrexham County Borough} \div \text{No. of households} = \text{Average No. of people per household}$$

$$c135,100 \div 57,914 = 2.3$$

$$\text{ONS Average} \times \text{No. of proposed dwellings} = \text{Total No. of people}$$

$$2.3 \times 4 = 9.2$$

The estimated total flow, based on Standard Residential domestic dwellings, per day is calculated based upon an assessment of litres per person per day in accordance with British Water 'Flows and Loads: 4'.

$$\text{Litres per person per day} \times \text{No. of people} = \text{flow (litres)}$$

$$150.0 \times 9.2 = 1,380\text{l} (1.38\text{m}^3)$$

Due to the proposed installation of an in-line flow restrictor to each property, the estimated total flow per day is reduced accordingly.

$$\text{Litres per person per day} \times \text{No. of people} = \text{flow (litres)}$$

$$90.0 \times 9.2 = 828\text{l} (0.83\text{m}^3)$$

The calculated Biochemical Oxygen (BOD) is:-

$$60\text{g} \times \text{No. of people} = \text{total grams per day}$$

$$60.0 \times 9.2 = 552\text{g per day}$$

The calculated phosphorus is 3.06kg per year and is based on:-

- Water usage of 90.0 litres per person per day.

Wider Site Usage

The personnel remaining on site are understood to be from within the SAC catchment area however, to establish a worst-case scenario the remaining persons have been classified as being from outside of the SAC catchment area.

The remainder of the site shall continue to be utilised and consist of the below personnel and site usage:-

	Stables	Mechanic	Furniture Warehouse (Part-time)	Total
Number of personnel	1	1	1	4
Number of days on site per week	7	6	0.5	
Flow (litres per day)	45	90	45	180
BOD (grams per day)	25	38	25	88
Phosphorus (kg per year)	0.16	0.32	0.01	0.49

The total flow, based upon Full-time Day Staff and Part-time Day Staff, per day is calculated based upon an assessment of litres per person per day in accordance with British Water 'Flows and Loads: 4' and takes into consideration the known working days to establish the level of phosphorus generated per year.

Pre-Redevelopment | Post-Redevelopment Summary

$$\begin{aligned}
 &(\text{Pre} - \text{Redevelopment (40no. people)} - \text{Pre} - \text{Redevelopment (13no. people from outside SAC catchment)}) \\
 &+ \\
 &(\text{Wider Site (4no. people)}) + \text{New Dwellings} \\
 &= \\
 &\text{New Total}
 \end{aligned}$$

	Pre-Redevelopment (40no. people total)	Pre-Redevelopment (13no. people from outside of SAC catchment)	Wider Site (4no. people)	New Dwellings (with in-line flow restrictor)	New Total	Difference
Flow (litres per day)	3,600	1,170	180	828	3,438	<u>-162</u>
BOD (grams per day)	1,520	494	88	552	1,666	146
Phosphorus (kg per year)	9.11	2.96	0.49	2.93	9.57	0.46

The redevelopment would result in a betterment of flows and a small increase in BOD per year however, this would remain within the operating capacity of the existing foul treatment plant. The volume of phosphorus being generated increases by 5% per year therefore, a tertiary drainage system shall be considered.

A Tricel Puraflo Filter System is proposed to be installed downstream of the existing treatment plant as a tertiary treatment system.

	Tricell Novo	Tricel Novo + Tricel Puraflo	Difference
Reduction (%)	42.7	50.0	<u>7.3</u>
Untreated Phosphorus (kg per year)	9.11	9.57	<u>0.46</u>
Treated Phosphorus (kg per year)	5.22	4.79	<u>-0.43</u>

The installation of a tertiary treatment system results in a reduction in final treated phosphorus volume.

8.0 PERCOLATION TESTING

Percolation testing was undertaken in January 2023 to investigate the feasibility of discharging treated foul water to ground.

The percolation testing established an infiltration Vp value of between 12 and 100 however, due to observations of saturated ground at the location of the proposed foul drainage field this drainage option is not considered practicable therefore, the existing drainage outfall should be utilised.

Refer to separate **Foul Drainage Calculations (2207015)** for details.

9.0 PROPOSED DRAINAGE STRATEGY

Pre-Development Enquiry

Due to the lack of public sewers within the local area, a discharge to a public sewer network has been discounted and a Pre-Development Enquiry is not justified.

Foul Water Drainage

The proposed foul drainage would continue to utilise the aforementioned private foul drainage network and outfall along with the Tricel Novo UK18 treatment plant (certified to EN 12566-3), as it is suitably sized to accommodate the 4no. dwellings and continues to provide a reduction in phosphorus levels by 42.7% as confirmed by Tricel.

A Tricel Puraflo Filter System is proposed to be installed downstream of the existing treatment plant as a tertiary treatment system. The Tricel Puraflo product (certified to EN 12566-3) and shall result in final phosphorus levels being reduced by a further 7.3% as confirmed by Tricel.

Refer to separate email correspondence re Tricel confirmation of phosphorus percentages.

The calculated final volume of phosphorus would be reduced by 0.46kg per year to the River Dee and Bala Lake Special Area of Conservation (SAC).

Surface Water Drainage

The development proposals do not include alterations to impermeable areas therefore, no surface water drainage alterations are proposed.

Risk of Flooding from Sewers

There is no increase in flow rates envisaged due to the impermeable area not being altered.

10.0 OWNERSHIP AND MAINTENANCE

The finished development shall continue to manage and maintain shared areas along with the on-site private drainage infrastructure.

A Drainage Operation and Maintenance Plan could be put in place to establish the regular maintenance of the drainage systems to ensure it functions effectively. The Drainage Operation and Maintenance Plan would also put in place measures for actions after significant storm events.

11.0 POTABLE WATER

It is envisaged that the 4no. residential dwellings shall incorporate design measures to minimise water consumption typically through efficient showerheads and taps along with dual flush toilets.

A water usage of 90 litres per person per day is considered feasible by installation of in-line flow restrictors to each property and could be established via the undertaking of Water Efficiency Calculations in accordance with Building Regulations Part G.

12.0 CONCLUSION

The proposed redevelopment of this Brownfield site increases the concentration of waste water by 5% due to the change of use however, the installation of a tertiary treatment plant, approved to EN 12566-3, shall reduce final concentration by 0.46kg per year thus resulting in a betterment. A worst-case scenario for the wider site personnel has been applied.

Any requirement for a NRW Water Exemption or environmental permit does not directly nor indirectly prejudice the integrity of the River Dee and Bala Lake Special Area of Conservation (SAC).

The construction phase of the development shall put in place appropriate measures to prevent water pollution during construction.

