

# **NUTRIENT NEUTRALITY ASSESSMENT & MITIGATION STRATEGY**

Proposed Residential  
Development

Land West of Clay Lane  
Fishbourne  
Chichester  
West Sussex  
PO18 8AB

Prepared for:  
Gleeson Land

24<sup>th</sup> October 2022

Project Number:  
RMA-C2212



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RMA Environmental Limited, 1 Emperor Way, Exeter Business Park, Exeter, EX1 3QS  
t 01392 576227 e [enquiries@rma-environmental.co.uk](mailto:enquiries@rma-environmental.co.uk) w [www.rma-environmental.co.uk](http://www.rma-environmental.co.uk)

*Registered in England No. 6915388. Registered Office: 2 Chartfield House, Castle Street, Taunton TA1 4AS*

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# 1 INTRODUCTION

## Background

- 1.1 RMA Environmental Limited was commissioned by Gleeson Land to carry out a Nutrient Neutrality Assessment (NNA) to inform a Habitats Regulations Assessment (HRA) for an outline planning application for up to 105 dwellings on land west of Clay Lane in Fishbourne near Chichester, West Sussex.
- 1.2 The aim of this NNA is to apply the assessment methodology published by Natural England in July 2020<sup>1</sup> to assess the impacts of nutrient discharges from the proposed development on the status of internationally designated sites in the catchment.

## Site Location and Land Use

- 1.3 The application site is located to the west of the A27. It is centred around National Grid Reference SU 84014 04850 (refer to Figure 1.1) and is bordered by the following land uses:
  - the city of Chichester is located to the east of the development;
  - existing residential housing is located to the west and north of the site; and
  - Fishbourne Roman Palace Museum and areas of open ground lie to the south of the site.

## Proposed Development

- 1.4 Outline planning permission is being sought (with all matters reserved except for access) for the erection of up to 105 residential dwellings including affordable housing with the provision of vehicular and pedestrian and cycle access from Clay Lane, alongside open spaces, biodiversity enhancement, sustainable urban drainage systems, landscaping, infrastructure and earthworks.
- 1.5 An illustrative layout is included as Appendix A.

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<sup>1</sup> Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites – For Local Planning Authorities, Natural England, July 2020

## 2 BASELINE ENVIRONMENTAL CONDITIONS

### Solent Designated Sites

- 2.1 Chichester Harbour is located within the Solent Marine catchment and is designated as a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protection Area (SPA) for birds.

### Chichester Harbour Water Quality

- 2.2 Currently, there are high nutrient inputs (especially nitrates) into the water environment of Chichester Harbour with sound evidence that this is causing eutrophication (algal growth) and the area is classified as being in an 'unfavourable–declining' condition.
- 2.3 These nutrient inputs are thought to arise predominantly from wastewater from existing housing (as well as agricultural and other sources) but will be further impacted by wastewater arising from new residential developments. Therefore, new residential development projects need to be nutrient neutral in order to prevent any adverse effects on the future integrity of the designated sites.

### Wastewater Management Constraints

- 2.4 The Environment Agency and Southern Water Services have prepared a joint position statement on managing new housing development in the Apuldram wastewater treatment works (WwTW) catchment. This statement builds on policies in the “*Chichester Local Plan: Key Policies 2014-2029*”, the “*Surface Water and Foul Drainage Supplementary Planning Document – September 2016*” and the “*Water Quality Assessment Report – 2018*”.
- 2.5 Development in the Apuldram WwTW catchment must adhere to the following principles:
- “New development outside of the Settlement Boundaries\* of Chichester, Fishbourne and Stockbridge will not drain to the Apuldram WwTW. It is expected that larger scale development will be directed to alternative WwTW catchments, notably Tangmere WwTW, via the new sewer pipeline connection once operational”.*
- 2.6 The application site is not located within the settlement boundary of Fishbourne and therefore wastewater from the proposed development is not permitted to connect to Apuldram WwTW. The option to connect to Tangmere WwTW is also not currently a viable solution, so the only feasible option for wastewater management for the proposed development is to use a Package Treatment Plant (PTP).

### 3 ASSESSMENT METHODOLOGY

- 3.1 Natural England advise new developments, which are located within or discharge wastewater to a designated sensitive area, to undertake an appropriate assessment of how water quality changes will impact the area. As reported within Section 2 of this report, the site is located within the Solent Marine catchment area.
- 3.2 Nitrate budgets are calculated by determining the nitrate loading of the existing land use(s) and comparing this to the estimated nitrate budget of the development based on the proposed land uses. The calculation includes key inputs and assumptions that are based on best-available scientific evidence and research as provided by Natural England.
- 3.3 Chichester District Council has adopted Natural England's Solent Marine Nutrient Neutrality Calculator and this has been used to establish the nitrate budgets for the proposed development.
- 3.4 The tool consists of four main work stages which are as follows:
- Stage 1 - Identifies the additional nitrate as a result of wastewater discharges.
  - Stage 2 - Calculates the nitrate budget for the current land use(s).
  - Stage 3 - Calculates the nitrate budget for the proposed land use(s).
  - Stage 4 - Calculates the total change in nitrate budget as a result of the proposed development.
- 3.5 The results of each relevant stage are presented in Section 4 of this report and the nitrate budget calculations are included in full as Appendix B. If there is a surplus in total nitrate, then mitigation is required to achieve nitrate neutrality. If the calculation identifies a deficit in total nitrate at Stage 4, then no mitigation measures are required.

## 4 NUTRIENT BUDGET ASSESSMENT

- 4.1 This section of the report comprises the nutrient budget assessment using Natural England's Solent Marine Nutrient Neutrality Budget Calculator; the budget calculator outputs are included in full as Appendix B.

### Stage 1: Calculate Nitrate in Wastewater Discharges from the Proposed Development

- 4.2 The proposed development is for up to 105 dwellings. An occupancy rate of 2.4 persons per dwelling has been used for the proposed development based on the latest Office for National Statistics figure. The assessment takes into account all types of new housing and overnight accommodation as these will increase the housings stock within the catchment and will result in an associated increase in population levels. Therefore, it is estimated that the proposed development will have an additional occupancy rate (i.e. population equivalent) of 252 persons.
- 4.3 The budget calculator allows the user to input data for the performance of a specific PTP. A candidate PTP to serve the proposed development is a Kingspan Klargester Biodisc; a performance certificate for this type of PTP is included as Appendix C and this confirms a nitrate effluent concentration after treatment in the PTP of 17.9 mg/l.
- 4.4 In order to estimate the nitrate loading in wastewater after treatment in the PTP, it is necessary to multiply the daily flow (based on 120 litres per person per day) by the effluent concentration of 17.9 mg/l, which gives a nitrate budget of **175.62 kg/year**.
- 4.5 The location of the proposed PTP is shown in Appendix A; it is proposed that the PTP would discharge into the watercourse which is located within the redline boundary.

### Stage 2: Adjust Nitrate Budget to Account for Current Land Uses

- 4.6 The application site lies within the 'Western Streams' catchment which discharges into the Solent Marine water body and the soils underlying the site are classified as 'naturally wet'. The existing land uses have been classified as commercial/industrial urban land (0.43 ha), lowland grazing (1.81 ha) and greenspace (5.01 ha).
- 4.7 The total nitrate budget for the current land uses is **38.43 kg/year**.

### Stage 3: Adjust Nitrate Budget to Account for Proposed Development Land Uses

- 4.8 This stage splits the proposed development into land use areas and calculates the nitrate budget that will result from the land uses associated with the new development.
- 4.9 The total site area remains unchanged at 7.25 ha and this is proposed to be used for urban development including gardens (3.84 ha), open urban land (1.05 ha) and biodiversity enhancement areas and/or 'greenspace' (2.36 ha).



- 4.10 The total nitrate budget for the proposed land uses is **67.31 kg/year**.

#### **Stage 4: Calculate the Net Change in Nitrate Budget for the Proposed Development**

- 4.11 The final stage is to calculate the net change in total nitrate load arising from the proposed development. The wastewater nitrate budget in Stage 1 (175.62 kg/year) is adjusted to correct for the difference in nitrate budget between the existing land uses (Stage 2) and the proposed land uses (Stage 3).
- 4.12 As stated within the Methodology Report (Natural England; 2020), all of the figures used in the calculation are based on scientific research, evidence and modelled catchment and are best practice. However, it should be noted that a precautionary buffer is used that recognises the uncertainty within these figures and ensures the approach is in line with the precautionary principle. A 20% buffer is therefore built into the Stage 4 calculation for nutrients that show a surplus post-development.
- 4.13 The application of the precautionary 20% buffer gives a total nitrate budget for the proposed development of **245.4 kg/year**. Therefore, mitigation is required to achieve nutrient neutrality and this is discussed further in the following section.

## 5 MITIGATION STRATEGY

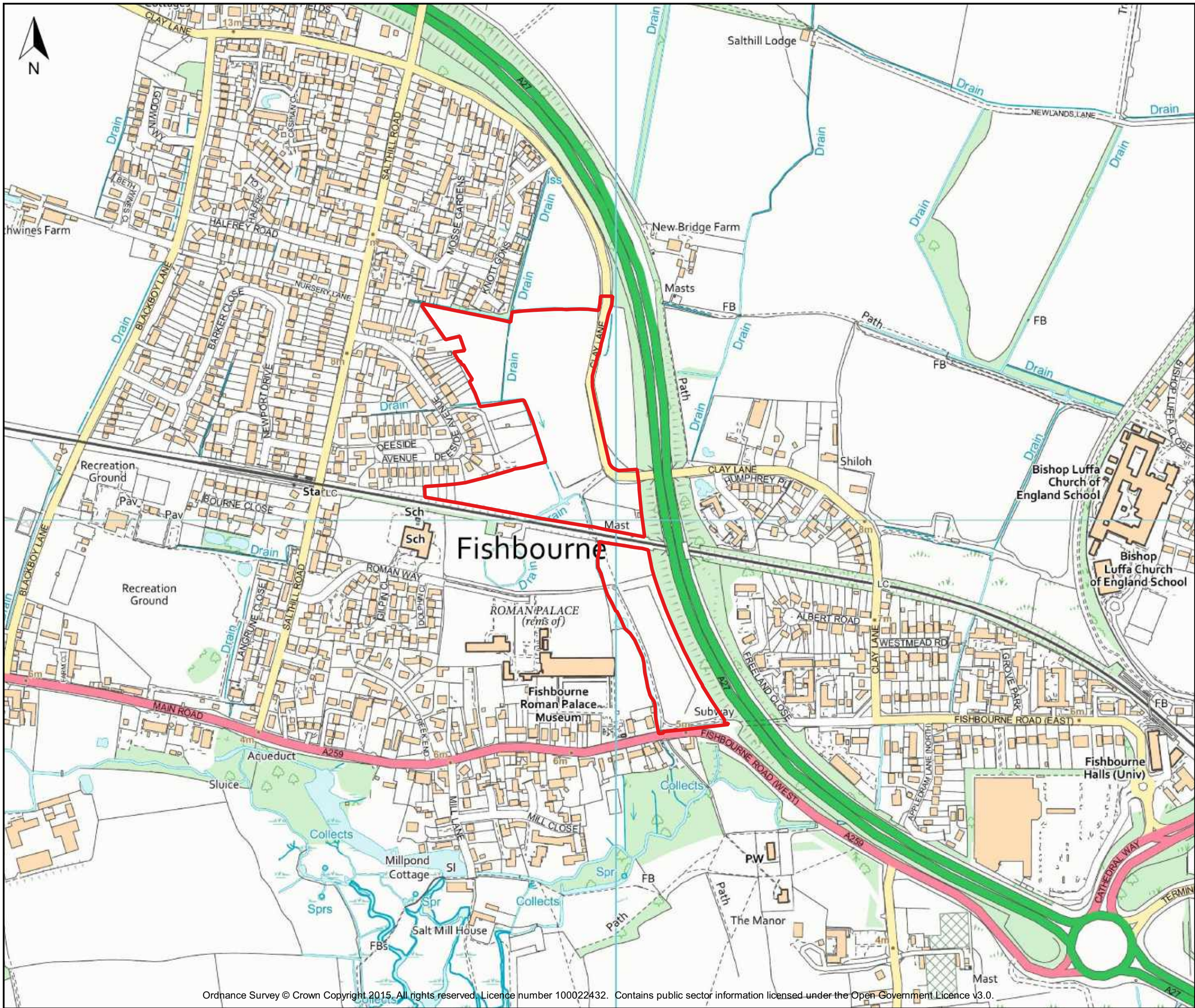
- 5.1 As set out in the previous section, the proposed development would give rise to a nitrate surplus of **245.4 kg/year** and therefore mitigation is required to achieve nutrient neutrality.
- 5.2 It is proposed that a series of wetland ponds is created within the biodiversity enhancement area to the south of the railway which forms part of the application site; these ponds are illustrated on the layout in Appendix A.
- 5.3 The wetland would function by diverting a proportion of flow from the watercourse which flows through the application site into the wetland area which would be designed to remove sufficient nitrate to make the proposed development nitrate neutral. The watercourse at this location has a catchment area of 2.78 km<sup>2</sup>, i.e. 278 hectares.
- 5.4 Based on a conservative assumption that the 2.78 km<sup>2</sup> catchment area comprises land used for 'lowland grazing', an average leaching rate for total nitrate of 11.22 kg/ha/year can be applied. The nitrate loading for the catchment can therefore be estimated by multiplying the catchment area of the watercourse (in ha) by the average nitrate leaching rate for the catchment, i.e. 278 x 11.22 kg/year, which gives a total nitrate loading in the watercourse of at least 3,119 kg/year. There is, therefore, a more than sufficient source of nitrate in the watercourse to offset the requirements of the proposed development.
- 5.5 Appendix 7 of Natural England's Stodmarsh guidance sets out an estimate of the nitrate removal rate in wetlands of 93 g/m<sup>2</sup>/year. The surface area of wetland would need to be approximately 2,650 m<sup>2</sup> in order to remove the **245.4 kg/year** to make the development nitrate neutral. This represents approximately 15% of the biodiversity land (to the south of the railway); the wetland shown on the illustrative masterplan (Appendix A) has a surface area of 3,781 m<sup>2</sup> so there is more than sufficient space to accommodate the wetland area required.
- 5.6 As the application is for outline planning permission, the detailed engineering design of the wetland would be undertaken at the reserved matters stage. However, based on the wetland removal rates provided by Natural England in the Stodmarsh guidance, the proposed wetland would provide sufficient nitrate removal to offset the proposed development and it would also provide a range of biodiversity, amenity and wider water quality and flood risk benefits.

## 6 CONCLUSIONS

- 6.1 RMA Environmental Limited was commissioned by Gleeson Land to carry out a Nutrient Neutrality Assessment (NNA) to inform a Habitats Regulations Assessment (HRA) for an outline planning application for up to 105 dwellings on land west of Clay Lane in Fishbourne near Chichester, West Sussex.
- 6.2 Currently, there are high nutrient inputs (especially nitrates) into the water environment of Chichester Harbour with sound evidence that this is causing eutrophication (algal growth) and the area is classified as being in an ‘unfavourable–declining’ condition.
- 6.3 These nutrient inputs are thought to arise predominantly from wastewater from existing housing (as well as agricultural and other sources) but will be further impacted by wastewater arising from new residential developments. Therefore, new residential development projects need to be nutrient neutral in order to prevent any adverse effects on the future integrity of the designated sites.
- 6.4 Natural England advise new developments, which are located within or discharge wastewater to a designated sensitive area, to undertake an appropriate assessment of how water quality changes will impact the area. As reported within Section 2 of this report, the site is located within the Solent Marine catchment area.
- 6.5 Nutrient budgets are calculated by determining the nitrate loading of the existing land use(s) and comparing this to the estimated nitrate loading of the development based on the proposed land uses and wastewater discharges. The calculation includes key inputs and assumptions that are based on best-available scientific evidence and research as provided by Natural England.
- 6.6 Based on this assessment, the proposed development would give rise to a nitrate surplus of **245.4 kg/year** and therefore mitigation is required to achieve nitrate neutrality.
- 6.7 It is proposed that a series of wetland ponds is created within the biodiversity enhancement area to the south of the railway which also forms part of the application site; these ponds are illustrated on the layout in Appendix A.
- 6.8 The wetland would function by diverting a proportion of flow from the watercourse which flows through the application site into the wetland area which would to remove sufficient nitrate to make the proposed development nitrate neutral. The watercourse at this location has a catchment area of 2.78 km<sup>2</sup>.
- 6.9 Based on a conservative assumption that the 2.78 km<sup>2</sup> catchment area comprises land used for ‘lowland grazing’, an average leaching rate for total nitrate of 11.22 kg/ha/year can be applied. The nitrate loading for the catchment can therefore be estimated by multiplying the catchment area of the watercourse (in ha) by the average nitrate leaching rate for the catchment, i.e. 278 x 11.22 kg/year, which gives a total nitrate loading in the watercourse of at least 3,119 kg/year. There is, therefore, a more than sufficient source of nitrate in the watercourse to offset the requirements of the proposed development.

- 6.10 Appendix 7 of Natural England's Stodmarsh guidance sets out an estimate of the nitrate removal rate in wetlands of 93 g/m<sup>2</sup>/year. The surface area of wetland would need to be approximately 2,650 m<sup>2</sup> in order to remove the **245.4 kg/year** to make the development nitrate neutral. This represents approximately 15% of the biodiversity land (to the south of the railway); the wetland shown on the illustrative masterplan (Appendix A) has a surface area of 3,781 m<sup>2</sup> so there is more than sufficient space to accommodate the wetland area required.
- 6.11 As the application is for outline planning permission, the detailed engineering design of the wetland would be undertaken at the reserved matters stage. However, based on the wetland removal rates provided by Natural England in the Stodmarsh guidance, the proposed wetland would provide sufficient nitrate removal to offset the proposed development and it would also provide a range of biodiversity, amenity and wider water quality and flood risk benefits.

# Figures



**Key**  
 Application Site

Figure 1.1: Site Location Plan

Client: Gleeson Strategic Land

Project: Clay Lane Fishbourne NNA

Project No.: C2212



Drawn: KM	Checked: RM	Date: 25/08/2022	Scale: 1:5,000@A3
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## ***Appendix A: Proposed Development Layout***



Site  
**LAND WEST OF CLAY LANE, FISHBOURNE**

Drawing  
**Illustrative masterplan**

Scale  
 1:1250@A1

Date  
 13.09.22

Drawing ref **1270.02**



- KEY**
- Site boundary
  - Existing public right of way
  - Indicative location of proposed railway crossing



## **Appendix B: Nutrient Neutrality Budget Calculator Outputs**

## Development site details

<b>Date (dd/mm/yyyy):</b>	01/09/2022
<b>Site Name:</b>	Clay Lane Fishbourne
<b>Planning Application number:</b>	N/A
<b>Site Address:</b>	Land West of Clay Lane, Fishbourne, Chichester

## Stage 1

### User Inputs

Date of first occupancy:	01/01/2025
Average occupancy rate:	2.45
Water usage (litres/person/day):	120
Development Proposal (dwelling units):	105
Include deductible acceptable loading?	No
Wastewater treatment works:	Package Treatment Plant user defined
Wastewater treatment works N permit (mg TN/ha):	Please enter value in cell to the right: 17.5

### Stage 1 Calculated Loading

Additional population	252	people
Wastewater by development	90240	litres/day
Annual wastewater TN load	316.82	kg TN/yr

## Stage 2

### User Inputs

Catchment:	Western Streams
Soil drainage type:	Naturally wet
Annual average rainfall (mm):	700.1 - 750
Within Nitrate Vulnerable Zone (NVZ):	Yes

Existing land use type(s)	Area (ha)	Annual nitrogen nutrient export (kg TN)
Commercial/industrial/urban land	0.43	3.10
Lowland	1.81	20.30
Greenspace	5.01	15.03
<b>Total:</b>	<b>7.25</b>	<b>38.43</b>

## Stage 3

### User Inputs

New land use type(s)	Area (ha)	Annual nitrogen nutrient export (kg TN)
Residential urban land	3.84	51.87
Open urban land	1.05	8.36
Greenspace	2.36	7.08
<b>Total:</b>	<b>7.25</b>	<b>67.31</b>

## Stage 4

### Calculated Outputs

The total annual nitrogen load  
to mitigate is:

245.4 kg TN/year

## **Appendix C: PTP Performance Certificate**



# Certificate

353.02C02

**Kingspan Water & Energy Ltd.**

College Road North, Aston Clinton, Aylesbury, HP22 5EW, UK

**EN 12566-3, Annex B**

Small wastewater treatment systems for up to 50 PT

**Small wastewater treatment system BioDisc +P**

Rotating Biological Contactor (RBC) in a GRP tank with chemical dosing equipment

Test report PIA2019-353B47.02

This test certificate is a revised version of test certificate no. 353.02C01.

Nominal organic daily load (influent)	0.28 kg BOD <sub>5</sub> /d																					
Nominal hydraulic daily load	0.9 m <sup>3</sup> /d																					
Material	GRP																					
Treatment efficiency (nominal sequences)	<table><thead><tr><th></th><th>Efficiency</th><th>Effluent</th></tr></thead><tbody><tr><td>COD</td><td>95.9 %</td><td>31 mg/l</td></tr><tr><td>BOD<sub>5</sub></td><td>98.0 %</td><td>6 mg/l</td></tr><tr><td>N<sub>tot</sub>*</td><td>71.1 %</td><td>17.9 mg/l</td></tr><tr><td>NH<sub>4</sub>-N*</td><td>92.1 %</td><td>3.0 mg/l</td></tr><tr><td>P<sub>tot</sub></td><td>95.4 %</td><td>0.3 mg/l</td></tr><tr><td>SS</td><td>95.6 %</td><td>15 mg/l</td></tr></tbody></table>		Efficiency	Effluent	COD	95.9 %	31 mg/l	BOD <sub>5</sub>	98.0 %	6 mg/l	N <sub>tot</sub> *	71.1 %	17.9 mg/l	NH <sub>4</sub> -N*	92.1 %	3.0 mg/l	P <sub>tot</sub>	95.4 %	0.3 mg/l	SS	95.6 %	15 mg/l
	Efficiency	Effluent																				
COD	95.9 %	31 mg/l																				
BOD <sub>5</sub>	98.0 %	6 mg/l																				
N <sub>tot</sub> *	71.1 %	17.9 mg/l																				
NH <sub>4</sub> -N*	92.1 %	3.0 mg/l																				
P <sub>tot</sub>	95.4 %	0.3 mg/l																				
SS	95.6 %	15 mg/l																				
Electrical consumption	1.5 kWh/d																					

\*determined for temperatures  $\geq 12^{\circ}$  C in the bioreactor

Performance tested by:

**PIA – Prüfinstitut für Abwassertechnik GmbH**

Hergener Weg 30

52074 Aachen

Germany

This document replaces neither the declaration of performance nor the CE marking.



Martina Wermter

December 2020