# OTTERPOOL PARK

# ENVIRONMENTAL STATEMENT

## Nutrient Budget Analysis Update

JULY 2022

# ENVIRONMENTAL STATEMENT – Nutrient Budget Analysis Update

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## VERSION CONTROL

| Version | Date | Author | Changes |
|---|---|---|---|
| P1 | 15/07/2022 | EBP | First issue - updating earlier WCS Report (March 2022) assessment to address Natural England latest Guidance and methodology for Nutrient Budget calculations (March 2022) |
| P2 | 21/07/2022 | EBP | Second issue – update to additional wetland areas after consultation with Otterpool LLP |
| | | | |

# Contents

# Tables



# Figures

# Appendices

# 1 Introduction

This report has been prepared by Arcadis on behalf of Otterpool Park LLP. This is an update to the current Otterpool Park Environmental Statement – Appendix 15.2 Water Cycle Study (March 2022) that was prepared by Arcadis, as part of the amended outline planning application for the proposed Development. The amended application for planning permission relates to an existing outline planning application that was submitted to F&HDC as the local planning authority (LPA) in 2019 (the '2019 planning application'), under planning reference Y19/0275/FH.

This report provides the latest nutrient budget calculations and mitigation requirements, including some recommendations to the current nutrient mitigation proposals within the Otterpool Park Tier 1 Outline Planning Application (OPA) and the wider Otterpool Framework Masterplan (FMP), to achieve Nutrient Neutrality at the proposed Otterpool Park garden settlement.

This update is produced based on the latest Natural England (NE) Habitats Regulations Assessments (HRA) Advice for Water Quality and Nutrient Neutrality that was issued to F&HDC on 16th March 2022. This new methodology incorporates the updated information as detailed below as well as a catchment specific (Stodmarsh) nutrient budget calculator:

- The Generic Methodology includes the latest version of Farmscoper (version 5) which includes more up to date values for the various variables. The updated approach also uses the actual outputs rather than averaged values from Farmscoper for detailed farm types broken down by rainfall, soil drainage type and Nitrate Vulnerable Zones (NVZ). The benefit of taking the detailed farm types approach is that it offers a more specific budget calculation for the actual nutrient losses from the development or mitigation land to be taken into account.
- The Generic Methodology covers all potential different situations on water usage that might occur across the full range of catchments.
- It provides a more consistent approach for dealing with onsite wastewater treatment systems.
- Pet waste is not considered in the greenspace export coefficient as this type of waste is taken into account in the urban surface water run off element of the calculator.
- The new methodology uses a different approach for calculating the urban export co-efficient so that it is applicable across the country. The values take into account the type of urban land and development site specific rainfall. This results in export values that will be specific to the rainfall at the location within the catchment.

# 2 Background

**Appendix A Figure 1** gives a location plan for the Otterpool Park OPA and FMP.

Excessive nutrient levels (nitrogen and phosphorous) can negatively impact on the Stodmarsh Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site. The site is also designated as a Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR).

Background to this issue, including the assessments undertaken and proposed mitigations are fully covered in the relevant chapters of Otterpool Park Environmental Statement[1] and following technical documents:

- Environmental Statement – Appendix 15.2 Water Cycle Study (WCS)[2]
- Environmental Statement – Appendix 15.1 Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS)[3]
- Environmental Statement – Appendix 7.19 Habitats Regulation Assessment[4]

[1] Arcadis (March 2022) OP5 – Environmental Statement
[2] Arcadis (March 2022) OP5 – Appendix 15.2 – Water Cycle Study
[3] Arcadis (March 2022) OP5 – Appendix 15.1 – Flood Risk Assessment and Surface Water Drainage
[4] Arcadis (March 2022) OP5 – Appendix 7.19 – Habitats Regulations Assessment

# 3 Proposed Development

## 3.1 Development Details and Assessment Parameters

Otterpool Park Garden Settlement is jointly promoted by F&HDC and Otterpool Park LLP. Details of the proposed Development are given in the Development Specification[5] and Strategic Design Principles Specification[6] submitted as part of the amended Tier 1 OPA documentation, along with the Parameter Plans[7] for approval, and other supporting plans and strategies.

The Otterpool Park Tier 1 OPA includes 8500 new residential homes and associated non-residential uses/infrastructure, covering a total area of 589 ha. However, the existing land use in 37.4 ha of the total OPA site area will be unchanged, and therefore is fully excluded in the updated nutrient budget calculations. In summary, the nutrient budget calculations for the Otterpool Park OPA are based on:

- 7,855 Class C3 residential units;
- 645 Class C2 extra care residential units;
- 117 rooms Class C1 hotel; and
- Land use proposals within a site area of 551.60 ha

The Otterpool Park FMP includes another 1,500 residential units (849 Class C3 and 651 Class C2) and associated non-residential uses/infrastructure, covering a total area of 756 ha which includes 71 ha of existing community areas and 54.9 ha of retained farmland However, the additional area included in the FMP in the nutrient budget calculations is 44.29 ha because the existing land use in the remaining FMP area will be unchanged or will be integrated in the form of the proposed strategic greenspace elements, which have the same nutrient export values.

The two PCC Scenarios shown in Table 1 are used in the nutrient budget assessment discussed in the remaining sections. Both PCC Scenarios provide a robust assessment as the rates used for Class C1 and C2 are higher than the recommended minimum 110 litres/pperson/day by NE[8]. This is based on the optional tighter Building Regulations water use per person standard of 110 litres/person/day with an additional 10 litres per person per day to account for changes to less water efficient fittings throughout the lifetime of the development, as per the NE guidance.

*Table 1 Assumed PCC Scenarios in Nutrient Budget Assessment*

| Residential Land use | Per Capita Consumption (PCC) (l/p/d) Scenario 1<br>See Note 1 | Per Capita Consumption (PCC) (l/p/d) Scenario 2<br>See Note 2 |
|---|---|---|
| Class C3 | 120[1] | 120 |
| Class C2 | 350 | 263 |
| Class C1 | 300 | 225 |

[5] Quod (March 2022) OP5 – Appendix 4.1 – Development Specification
[6] Quod (March 2022) OP5 – Appendix 4.3 – Strategic Design Principles
[7] Farrells (March 2022) OP5 – Appendix 4.2 – Site Boundary and Parameter Plans
[8] Natural England (February 2022) Nutrient Neutrality Generic Methodology. Issue 1.

[1] The PCC rate for Class C3 is based on 110 l/p/d with an additional 10 litres per person per day to account for changes to less water efficient fittings throughout the lifetime of the development. as per NE published guidance and CSR Policy SS9. However, for Class C2 and Class C1 are as per the recommended higher PCC rates in British Water Flows and Loads – 4 Code of Practice (revised in 2013)

Notes

1. Scenario 1 PCC rate for Class C3 is based on 110 l/p/d as per NE published guidance and CSR Policy SS9. However, for Class C2 and Class C1 are as per the recommended higher PCC rates in British Water Flows and Loads – 4 Code of Practice (revised in 2013)

2. Scenario 2 PCC rate for Class C3 is based on 110 l/p/d as per NE published guidance and CSR Policy SS9. However, for Class C2 and Class C1 are as per the recommended PCC rates in British Water Flows and Loads – 4 Code of Practice (revised in 2013) are reduced by 25% to reflect the additional water efficiency measures proposed at Otterpool Park. This is because a similar % reduction can be seen for PCC in relation to the standard Class C3 dwellings when compared with the British Water recommended PCC rates.

# 4 Nutrient Budget Assessment

## 4.1 Overview

The nutrient budget calculator requires a set of inputs to calculate a new development's nutrient budget. The calculations are completed as per the following four key stages, which is still broadly in line with the previous methodology:

> **Stage 1** - Calculate the new nutrient load associated with the additional wastewater from the development site.
>
> **Stage 2** - Calculate the pre-existing nutrient load from current land use on the development site.
>
> **Stage 3** - Calculate the future nutrient load from land use on the development site post-development.
>
> **Stage 4** - Calculate the net change in nutrient loading from the development to the Stodmarsh SAC and Ramsar site with the addition of a buffer. The net change in nutrient loading + the buffer is the nutrient budget.

As part of the Stage 2 assessment, the new calculator now requires the soil drainage type, annual rainfall (mm) and to specify if the Proposed Development is within a NVZ to determine the nutrient export coefficients for the site. However, Otterpool Park Framework Masterplan is a large site area with 756 ha which covers the following three main drainage types according to Soilscapes[9]:

1. Freely Draining
2. Impeded Drainage
3. Naturally Wet)

Therefore, the existing land use classes within the impacted total site area within the OPA and FMP have been split into these three drainage types to undertake Stage 2 assessment. Similarly, proposed land use classes within the site under the Stage 3 assessment have been split according to the same three drainage types to ensure consistency.

One of the main shortcomings of the Stodmarsh calculator is that it is unable to perform nutrient budgets for all Stages 1 - 4 in a single spreadsheet when a specific site falls within multiple drainage types. To overcome this issue, Stages 1 - 3 calculations have been performed using several calculators and their outputs have been separately combined to obtain the Stage 4 nutrient budget for the total site area.

The latest nutrient loading and budget calculations outputs are provided in **Appendix B** and **Appendix C** along with a breakdown of the estimated land use classes for Otterpool OPA and Otterpool Framework Masterplan for each Soilscapes drainage type.

A summary of the nutrient loading for Stages 1 - 3 for the two drainage catchments and the total nutrient budget estimated at Stage 4 is given below.

## 4.2 Stage 1 Additional WwTW Nutrient Loading

As per the previous Nutrient Budget Analysis carried out in March 2022, there are two options for the WwTW solution. The preferred Onsite WwTW solution with Severn Trent Connect has an agreed permitting values with NE of 7.2 mg/l for Total Nitrogen (TN) and a Total Phosphorus (TP) limit of 0.1 mg/l. Nutrient budget estimates have also been undertaken for the alternative Southern Water's Sellindge WwTW solution where a TP discharge permit value of 0.3 mg/l is used and a TN limit of 25 mg/l was assumed (as per NE published guidance and consultations held with Southern Water) in the absence of a defined discharge permit value for TN. A summary of these permits can be seen in Table 2.

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[9] Cranfield Soil and Agrifood Institute. Soilscapes. Available at: http://www.landis.org.uk/soilscapes

*Table 2 WwTW TP and TN permit options*

| Description | Onsite WwTW | Offsite (Sellindge) WwTW |
|---|---|---|
| TN permit | 7.2 mg/l | 25 mg/l |
| TP permit | 0.1 mg/l | 0.3 mg/l |
| 90% of the proposed consent TN limit[1] | 6.48 | 22.5 |
| 90% of the proposed consent TP limit[1] | 0.09 | 0.27 |

[1] the input value for the permit level is multiplied by a factor of 0.9 in the NE calculator, as shown in **Appendix B and Appendix C**

### 4.2.1 Onsite WwTW Option

Table 3 shows the Annual Wastewater TP and TN load for the OPA area which are based on the TP and TN Permit levels for the Onsite WwTW against the two PCC water usage rates scenarios.

*Table 3 Total Annual Wastewater TP and TN Load from the Onsite WwTW option within OPA.*

| Description | Onsite WwTW Scenario 1 | | Onsite WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 74.4 | 5354.3 | 74.4 | 5354.3 |
| Class C2 | 17.8 | 1282.3 | 13.4 | 963.6 |
| Class C1 | 2.3 | 166.2 | 1.7 | 124.6 |
| **OPA Final Stage 1 Output** | **94.5** | **6802.8** | **89.5** | **6442.5** |

Table 4 shows Annual Wastewater TP and TN load for the 1500 residential units (849 Class C3 and 651 Class C2) covered by the FMP, as described in Section 3.1.

Table 4 Additional Total Annual Wastewater TP and TN Load from the Onsite WwTW option within FMP.

| Description | Onsite WwTW Scenario 1 | | Onsite WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 8.0 | 578.7 | 8.0 | 578.7 |
| Class C2 | 18 | 1294.3 | 13.5 | 972.6 |
| Class C1 | - | - | - | - |
| **Additional FMP Final Stage 1 Output** | **26.0** | **1873.0** | **21.5** | **1551.3** |

The Final Stage 1 output from Table 3 and Table 4 can be combined to give the total wastewater TP and TN load for the FMP, as shown in **Appendix B and Appendix C**. This method is also applicable from Table 5 to Table 14 for Stage 2 and Stage 3 of the nutrient budget calculations.

### 4.2.2 Sellindge WwTW Option

Table 5 shows the Annual Wastewater TP and TN load based on the TP and TN Permit levels for Sellindge WwTW against the two PCC water usage rates scenarios.

*Table 5 Total Annual Wastewater TP and TN Load from the Sellindge WwTW Option within OPA*

| Description | Sellindge WwTW Scenario 1 | | Sellindge WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 223.1 | 18591.4 | 223.1 | 18591.4 |
| Class C2 | 53.4 | 4452.6 | 40.2 | 3345.8 |
| Class C1 | 6.9 | 576.9 | 5.2 | 432.7 |
| **OPA Final Stage 1 Output** | **283.5** | **23620.9** | **268.4** | **22369.9** |

Table 6 shows Annual Wastewater TP and TN load for the additional 44.29ha area covered by the FMP, as described in Section 3.1.

*Table 6 Additional Total Annual Wastewater TP and TN Load from the Sellindge WwTW Option within FMP*

| Description | Sellindge WwTW Scenario 1 | | Sellindge WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 24.1 | 2009.4 | 24.1 | 2009.4 |
| Class C2 | 53.9 | 4494.0 | 40.5 | 3376.9 |
| Class C1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Additional FMP Final Stage 1 Output** | **78.0** | **6503.4** | **64.6** | **5386.4** |

## 4.3 Stage 2 Baseline Land Use Nutrient Loading

The existing land use within the area impacted by Otterpool Park FMPOPA boundary is predominately agricultural use or greenfield in nature. **Appendix A Figure 2** includes a figure showing the existing land type categories within the area impacted by the proposed Development.

As per Figure *1*, 51.8% of the Otterpool Park Framework Masterplan boundary lies within the Freely Draining soil types, with 38.7% in Loamy and clayey floodplain soils with naturally high groundwater and the remaining 10% in Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. Therefore, the approach to Stage 2 is to run two nutrient budget calculations for each of the drainage types and then combine the final outputs together. Based on the Soilscapes soil information, the slowly permeable soil type is classified as “Impeded Drainage”, the freely draining soils classified as “Freely Draining” and the naturally high groundwater as “Naturally wet”.

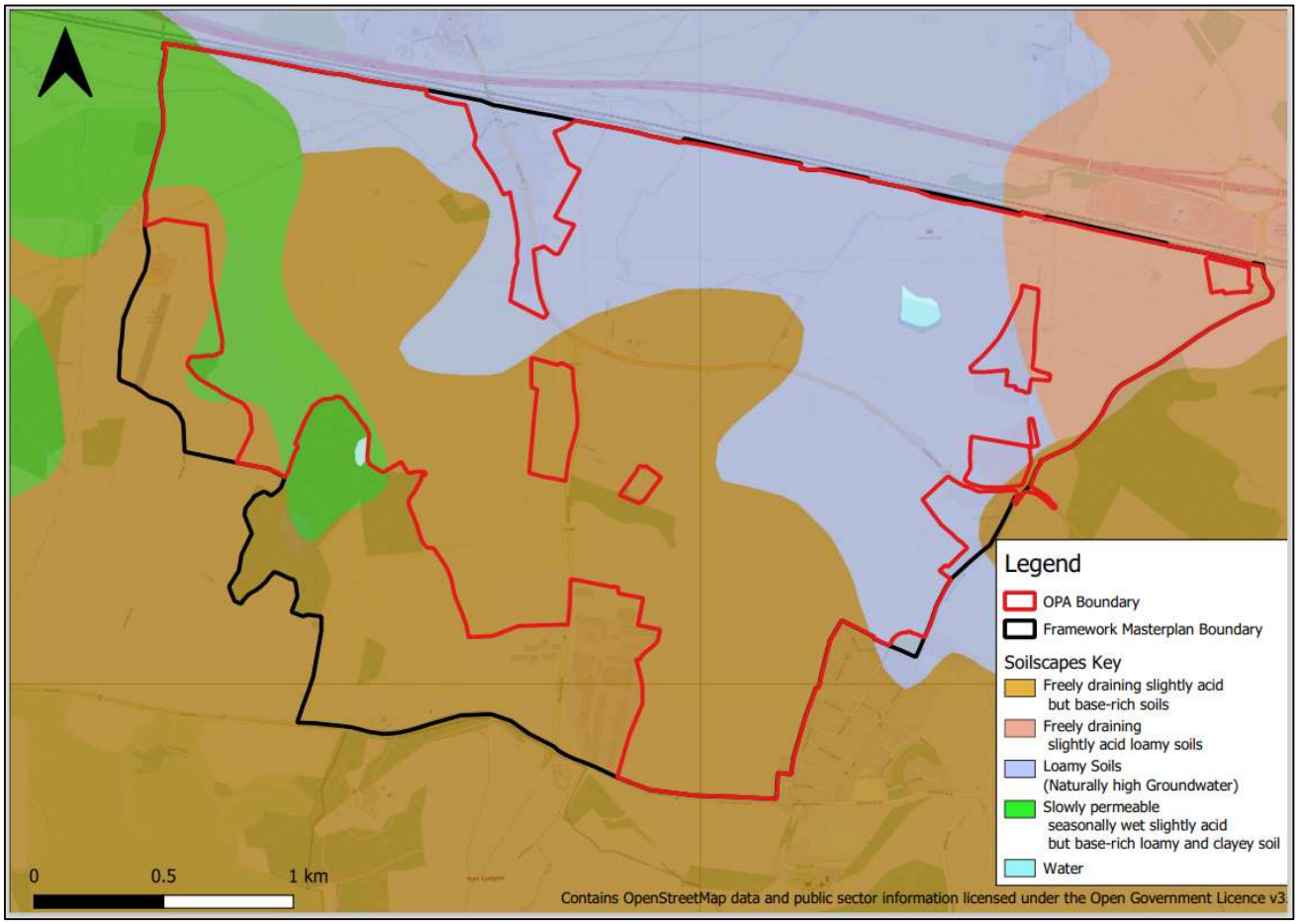



*Figure* 1 *Soil Drainage Types (Soilscapes) for Otterpool OPA and Framework Masterplan*

The existing land use types and their estimated nutrient loading with the 551.60 ha of the impacted total site area within the OPA boundary as well as the extra 44.29 ha of the impacted site area within the FMP boundary are shown below. It provides the Stage 2 nutrient loading outputs within each of the three Soilscapes drainage types.

### 4.3.1 Stage 2 – Freely Draining

Table 7 and Table 8 show the existing land use types by area and their nutrient loss rates, as per NE's calculator for the Freely Draining category for both Otterpool OPA and the additional area covered in the Framework Masterplan boundary.

*Table 7 Existing Land Types and Nutrient Loss Rates for the Freely Draining soil type within Otterpool OPA*

| Existing Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|
| Open Urban Land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.0 | 4906.60 |
| **Total** | **288.57** | **40.0** | **6023.21** |

*Table 8 Additional Existing Land Types and Nutrient Loss Rates for the Freely Draining soil type within Framework Masterplan*

| Existing Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|
| Open Urban Land | 2.96 | 2.30 | 23.57 |
| Greenspace | 16.17 | 0.32 | 48.51 |
| Lowland | 0.00 | 0.00 | 0.00 |
| Shrub | 0.28 | 0.01 | 0.84 |
| Woodland | 0.62 | 0.01 | 1.86 |
| Cereals | 6.11 | 1.01 | 190.51 |
| Commercial/industrial urban land | 18.17 | 19.28 | 130.91 |
| **Total** | **44.31** | **22.93** | **396.2** |

### 4.3.2 Stage 2 – Impeded Drainage

Table 9 shows the existing land use types by area and their nutrient loss rates, as per NE's calculator for the Impeded Drainage category for both Otterpool OPA. There is no additional area covered in the Framework Masterplan boundary within the Impeded Drainage category.

*Table 9 Existing Land Types and Nutrient Loss Rates for the Impeded Drainage soil type within Otterpool OPA*

| Existing Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|
| Open Urban Land | 0 | 0 | 0 |
| Greenspace | 0.80 | 0.02 | 2.4 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0 | 0 | 0 |
| Woodland | 0 | 0 | 0 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total** | **53.05** | **44.18** | **931.02** |

### 4.3.3 Stage 2 – Naturally Wet

Table 10 shows the existing land use types by area and their nutrient loss rates, as per NE's calculator for the Naturally Wet category for both Otterpool OPA. There is no additional area covered in the Framework Masterplan boundary within the Naturally Wet category.

*Table 10 Existing Land Types and Nutrient Loss Rates for the Naturally Wet soil type within Otterpool OPA*

| Existing Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|
| Open Urban Land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total** | **209.99** | **111.82** | **3764.97** |

## 4.4 Stage 3 Future Land Use Nutrient Loading

As per Stage 2, the same development splits based on the three drainage types need to be applied to the proposed land types in the Otterpool OPA and FMP. This is based on the same 551.6a ha of the impacted site area in the OPA boundary and the extra 44.29 ha of the impacted site area within the FMP boundary. It should be noted that approximately 15% of the residential urban land shown in the current parameter plans will also include greenspace areas that are larger than 0.1 ha, which include some strategic SUDS features. Therefore, a general 15% allowance of greenspace is also included within the development parcels under the Stage 3 assessment. Any sports pitches within the designated Public Open Space are considered as open urban land and wetland areas are considered as water, and open space is adjusted to avoid double counting.

### 4.4.1 Stage 3 – Freely Draining

Table 11 and Table 12 shows the proposed land types, area and nutrient loss coefficients for the Freely Draining category in for both Otterpool OPA and the additional area covered in the Framework Masterplan boundary.

*Table 11 Proposed Land Types and Nutrient Loss Rates for the Freely Draining soil type within Otterpool OPA*

| | Proposed Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|---|
| Land use in the Development Parcels | Residential urban land | 145.21 | 210.62 | 1961.59 |
| | Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| | Greenspace | 25.63 | 0.51 | 76.89 |
| Land use in the Public Open Space | Open Urban Land | 5.27 | 4.10 | 41.97 |
| | Greenspace | 95.07 | 1.90 | 285.21 |
| | Community Food Growing | 2.69 | 1.19 | 47.27 |
| | Water (i.e. stormwater wetlands) | 0.23 | 0.00 | 0.00 |
| **TOTAL** | | **288.6** | **233.71** | **2517.4** |

*Table 12 Proposed Land Types and Nutrient Loss Rates for the Freely Draining soil type outside OPA but within Framework Masterplan*

| | Proposed Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|---|
| Land use in the Development Parcels | Residential urban land | 30.53 | 44.28 | 412.42 |
| Land use in the Public Open Space | Open Urban Land | 10.55 | 0.21 | 31.65 |
| | Greenspace | 3.23 | 2.51 | 25.72 |
| **TOTAL** | | **44.31** | **47.0** | **469.79** |

### 4.4.2 Stage 3 – Impeded Drainage

Table 13 shows the proposed land types, area and nutrient loss coefficients for the Impeded Drainage category in for both Otterpool OPA. There is no additional area covered in the Framework Masterplan boundary within the Impeded Drainage category.

*Table 13 Proposed Land Types and Nutrient Loss Rates for the Impeded Drainage soil type within Otterpool OPA*

| | Proposed Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|---|
| Land use in the Development Parcels | Residential urban land | 13.16 | 19.09 | 177.77 |
| | Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| | Greenspace | 2.32 | 0.05 | 6.96 |
| Land use in the Public Open Space | Open Urban Land | 2.57 | 2.00 | 20.44 |
| | Greenspace | 27.98 | 0.56 | 83.94 |
| | Water (i.e. stormwater wetlands) | 2.00 | 0.00 | 0.00 |
| | Water (i.e. wastewater wetlands) | 3.51 | 0.00 | 0.00 |
| **TOTAL** | | **53.03** | **23.28** | **299.92** |

### 4.4.3 Stage 3 – Naturally Wet

Table 14 shows the proposed land types, area and nutrient loss coefficients for the Naturally Wet category in for both Otterpool OPA. There is no additional area covered in the Framework Masterplan boundary within Naturally Wet category.

*Table 14 Proposed Land Types and Nutrient Loss Rates for the Naturally Wet soil type within Otterpool OPA*

| | Proposed Land Type | Area (ha) | Average Total Phosphorus (TP) Loss Rate - Kg/ha/year | Average Total Nitrogen (TN) Loss Rate - Kg/ha/year |
|---|---|---|---|---|
| Land use in the Development Parcels | Residential urban land | 98.25 | 142.51 | 1327.23 |
| | Community food growing | 0.22 | 0.10 | 3.84 |
| | Greenspace | 17.34 | 0.35 | 52.02 |
| Land use in the Public Open Space | Open Urban Land | 6.26 | 4.87 | 49.85 |
| | Greenspace | 60.79 | 1.22 | 182.38 |
| | Community Food Growing | 4.07 | 1.80 | 71.54 |
| | Water (i.e. stormwater wetlands) | 14.96 | 0.00 | 0.00 |
| | Water (i.e. wastewater wetlands) | 8.08 | 0.00 | 0.00 |
| **TOTAL** | | **209.97** | **150.85** | **1686.86** |

## 4.5 Stage 4 Nutrient Budget

Table 15 and Table 16 below summarise the estimated nutrient budget requirement for both WwTW options. The NE methodology adopts a precautionary approach to the nutrient budget calculation. To ensure robustness, an additional 20% buffer is added to the final figure[10], as can be seen in Stage 4 calculations presented in Appendix B and C.

It also shows the calculations for the following three situations for each WwTW option:

- Combined nutrient load from both WwTW and land use discharges
- Nutrient load from WwTW discharges only
- Nutrient load from Land Use discharges only

This was to better understand the influence of WwTW and land use runoff for identifying the best locations for the mitigation wetlands that is being discussed in Section 5.

[10] Natural England (February 2022) Nutrient Neutrality Generic Methodology. Issue 1.

### 4.5.1 Onsite WwTW Option

*Table 15 Nutrient Budget Assessment Summary for Onsite WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Tast - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) |
| Onsite WwTW - PCC Scenario 1 | Otterpool OPA Area Loading | 367.6 | 705.3 | 113.39 | 8163.36 | 254.21 | -7458.02* |
| | Extra Otterpool FMP Area Loading | 60.08 | 2335.90 | 31.21 | 2247.59 | 28.87 | 88.31 |
| | **TOTAL** | **427.68** | **3041.2** | **144.6** | **10410.95** | **283.08** | **-7369.71** |
| Onsite WwTW - PCC Scenario 2 | Otterpool OPA Area Loading | 361.6 | 273.0 | 107.38 | 7731.01 | 254.21 | -7458.02 |
| | Extra Otterpool FMP Area Loading | 54.72 | 1949.83 | 25.85 | 1861.52 | 28.87 | 88.31 |
| | **TOTAL** | **416.32** | **2222.83** | **133.23** | **9592.53** | **283.08** | **-7369.71** |

*Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

### 4.5.2 Sellindge WwTW Option

*Table 16 Nutrient Budget Assessment Summary for Sellindge WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Test - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) |
| Sellindge WwTW - PCC Scenario 1 | Otterpool OPA Area Loading | 594.3 | 20887.0 | 340.14 | 28345.03 | 254.21 | -7458.02* |
| | Extra Otterpool FMP Area Loading | 122.52 | 7892.42 | 93.65 | 7804.12 | 28.87 | 88.31 |
| | **TOTAL** | **716.82** | **28779.42** | **433.79** | **36149.15** | **283.08** | **-7369.71** |
| Sellindge WwTW - PCC Scenario 2 | Otterpool OPA Area Loading | 576.3 | 19385.8 | 322.13 | 26843.82 | 254.21 | -7458.02 |
| | Extra Otterpool FMP Area Loading | 106.43 | 6551.93 | 77.56 | 6463.62 | 28.87 | 88.31 |
| | **TOTAL** | **682.73** | **25937.73** | **399.69** | **33307.44** | **283.08** | **-7369.71** |

*Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

# 5 Updated Nutrient Mitigation Requirements

### 5.1.1 Onsite WwTW Option

Table 17 below summarises the indicative total area of the new wetlands required to offset the nutrient loading surplus shown in Table 15. Whilst wetlands are considered to be an effective nature-based nutrient mitigation solution that can provide multiple benefits they are opposite of wastewater treatment batch type processes in terms of space requirements.

*Table 17 Mitigation Wetland Requirement Summary for Onsite WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Test - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP Wetland Area (ha) [1] | TN Wetland Area (ha) [2] | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Onsite WwTW – PCC Scenario 1 | Otterpool OPA Area Loading | 30.64 | 0.77 | 9.45 | 8.78 | 21.19 | -8.01[3] |
| | Extra Otterpool FMP Area Loading | 5.01 | 2.51 | 2.60 | 2.42 | 2.41 | 0.09 |
| | **TOTAL** | **35.65** | **3.28** | **12.05** | **11.2** | **23.6** | **-7.92** |
| Onsite WwTW – PCC Scenario 2 | Otterpool OPA Area Loading | 30.14 | 0.30 | 8.95 | 8.31 | 21.19 | -8.01 |
| | Extra Otterpool FMP Area Loading | 4.56 | 2.10 | 2.15 | 2.00 | 2.41 | 0.09 |
| | **TOTAL** | **34.7** | **2.4** | **11.1** | **10.31** | **23.6** | **-7.92** |

1 Assumed TN removal rate of 93 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate[11].

2 Assumed TP removal rate of 1.2 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate[11].

3 Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

### 5.1.2 Sellindge WwTW Option

Table 18 below summarises the indicative total area of the new wetlands required to offset the nutrient loading surplus shown in Table 16. As seen in Table 18, the WwTW load, based on the Sellindge permit levels is three times higher than the Onsite WwTW option and significantly increases the total load to be mitigated for the OPA and FMP areas.

[11] Natural England (December 2019) Advice on Nutrient Neutrality for New Development in the Stour Valley Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities

*Table 18 Mitigation Wetland Requirement Summary for Sellindge WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Test - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP [1] Wetland Area (ha) | TN [2] Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Sellindge WwTW – PCC Scenario 1 | Otterpool OPA Area Loading | 49.53 | 22.47 | 28.35 | 30.48 | 21.19 | -8.01[3] |
| | Extra Otterpool FMP Area Loading | 10.21 | 8.49 | 7.80 | 8.39 | 2.41 | 0.09 |
| | **TOTAL** | **59.74** | **30.96** | **36.15** | **38.87** | **23.6** | **-7.92** |
| Sellindge WwTW - PCC Scenario 2 | Otterpool OPA Area Loading | 48.03 | 20.85 | 26.84 | 28.86 | 21.19 | -8.01 |
| | Extra Otterpool FMP Area Loading | 8.87 | 7.05 | 6.45 | 6.95 | 2.41 | 0.09 |
| | **TOTAL** | **56.9** | **27.9** | **33.29** | **35.81** | **23.6** | **-7.92** |

[1] Assumed TN removal rate of 93 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate.

[2] Assumed TP removal rate of 1.2 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate.

[3] Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

# 6 Implications and Recommendations

## 6.1 Implications

The sections below compare the wetland mitigation requirements and wetland areas allocated (as presented in the previous WCS report) against the latest requirements reported in the previous sections based on the latest NE methodology and calculator.

In the previous WCS report, the Onsite WwTW option was recommended as the preferred nutrient mitigation option due to the following key reasons:

- Proposed Development had sufficient space Onsite to completely remove the extra WwTW and land use nutrient loads whereas the Sellindge WwTW option could not without large amount of offsite wetland mitigation
- The ongoing WINEP study for the Stodmarsh catchment presented significant risks for timely implementation of Sellindge WwTW upgrade and any nutrient mitigation measures (including new offsite sewer rising mains) in advance of the Proposed Development
- Onsite solution offers the implementation of a more efficient, integrated and holistic water management solution in line with the proposed development phasing

Figure 2 and Table 19 below summarise the key information related to the proposed wetlands in the previous WCS. It also recommended to optimise wetland sizes where possible to maximise their nutrient removal efficiency by interlinking smaller storm wetlands (including with SuDS features and existing smaller local watercourses where possible), to collectively provide a larger wetland area while maintaining sufficient base flow.

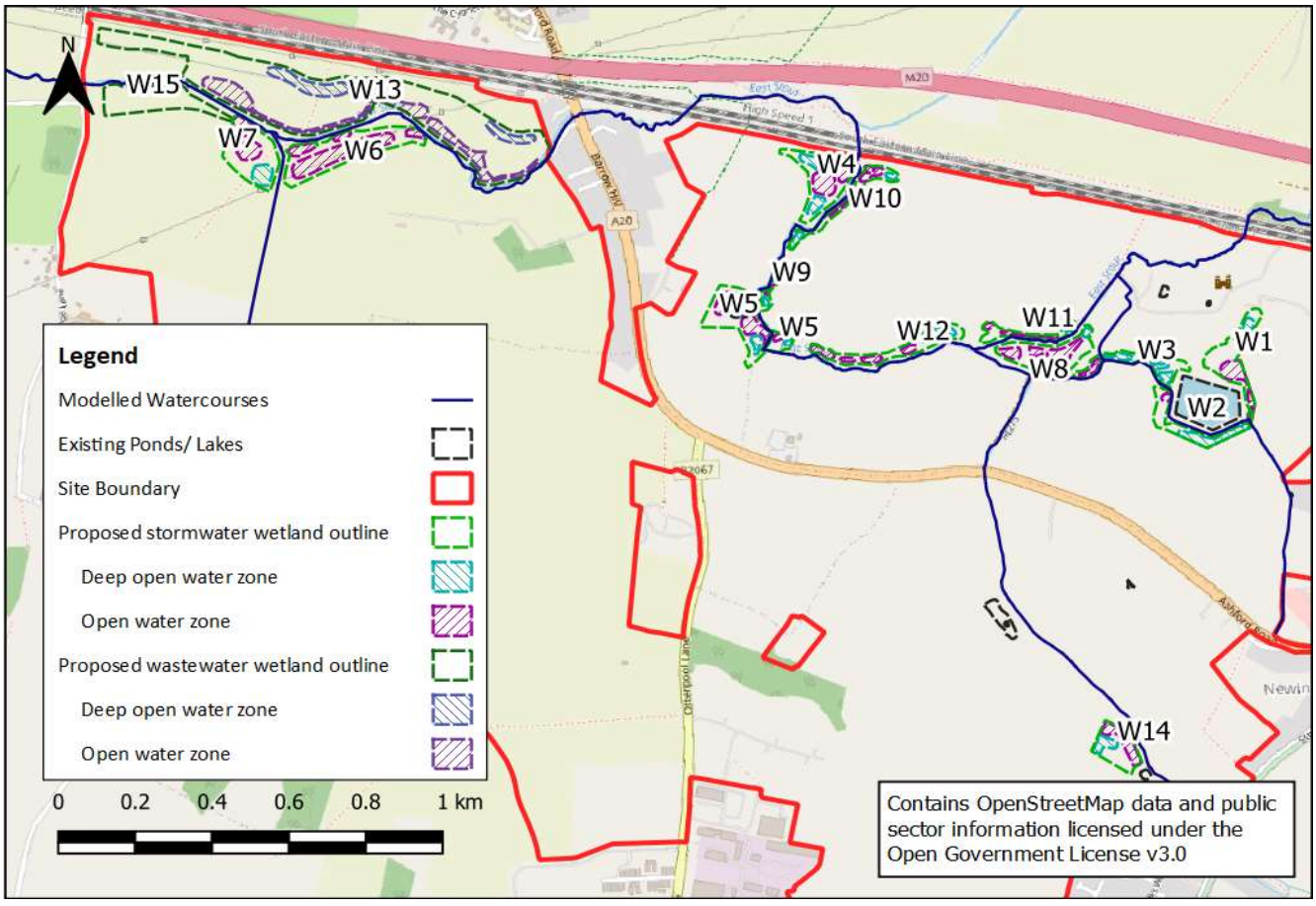



*Figure 2 Overview plan of proposed wetlands in the previous WCS*

*Table 19 Summary of the Proposed Wetlands in the previous WCS*

| Wetland Location Ref. | Indicative Wetland Area (ha) | Treatment Depth (m) | Average Wetland Depth (m) | Comments |
|---|---|---|---|---|
| W1 | 1.46 | 0.35 | 0.65 | Treats OPA Site storm discharge. W1, W2, W3 & W8 are interlinked (Total area: 4.9ha). |
| W2 | 0.92 | 0.38 | 0.68 | Treats OPA Site storm discharge. W1, W2, W3 & W8 are interlinked (Total area: 4.9ha). |
| W3 | 0.94 | 0.04 | 0.34 | Treats s OPA Site storm discharge. W1, W2, W3 & W8 are interlinked (Total area: 4.9ha). |
| W4 | 1.70 | 0.07 | 0.37 | Treats OPA Site storm discharge, W4 and W5 are interlinked (Total area: 3.81ha). |
| W5 | 2.11 | 0.16 | 0.46 | Treats OPA Site storm discharge. W4 and W5 are interlinked (Total area: 3.81ha). |
| W6 | 2.63 | 0.27 | 0.87 | Treats OPA Site storm discharge. |
| W7 | 1.87 | 0.05 | 0.35 | Treats OPA Site storm discharge but can also provide tertiary treatment for the extra wastewater discharge from the remaining 1500 homes in OFMA. W7 and W15 are interlinked (Total area: 3.71 ha). |
| W8 | 1.61 | 0.45 | 0.75 | Treats OPA Site storm discharge. W1, W2, W3 & W8 are interlinked (Total area: 4.9ha). |
| W9 | 0.27 | 0.13 | 0.73 | Treats OPA Site storm discharge. W9, W10, W11 and W12 are interlinked (Total area: 2.83 ha). |
| W10 | 0.78 | 0.21 | 0.81 | Treats OPA Site storm discharge. W9, W10, W11 and W12 are interlinked (Total area: 2.83 ha). |
| W11 | 0.52 | 0.04 | 0.64 | Treats OPA Site storm discharge. W9, W10, W11 and W12 are interlinked (Total area: 2.83 ha). |
| W12 | 1.26 | 0.04 | 0.34 | Treats OPA Site storm discharge. W9, W10, W11 and W12 are interlinked (Total area: 2.83 ha). |
| W13 | 9.75 | 0.25 | 0.50 | Provides tertiary treatment for the wastewater discharge from the OPA site. The total footprint of the wetland is 13.01ha but only 75% is taken as effective area (9.75ha) due to earth works required for cascade wetland features. |
| W14 | 1.11 | 0.08 | 0.38 | Treats storm discharge. |
| W15 | 1.84 | 0.25 | 0.50 | Not required for the Tier 1 OPA – but provides tertiary treatment for the extra wastewater |

| Wetland Location Ref. | Indicative Wetland Area (ha) | Treatment Depth (m) | Average Wetland Depth (m) | Comments |
|---|---|---|---|---|
| | | | | discharge from the remaining 1500 homes in OFMA. W7 and W15 are interlinked (Total area: 3.71 ha). |
| **Total Area** | **28.77** | | | |

Additional nutrient budget sensitivity testing for the worst-case PCC Scenario 1 (i.e., with WwTW and Land Use nutrient loads in isolation) was also performed in the WCS before, but it was undertaken only with the preferred Onsite WwTW option. Therefore, a full comparison of these additional sensitivity testing is not possible in this report for Sellindge WwTW, but a comparison of the total wetland area requirements against the combined nutrient load is presented below for both PCC Scenarios 1 and 2, as shown in Section 6.1.2.

### 6.1.1 Onsite WwTW

For the worst-case PCC Scenario 1, the WCS previously reported that a total of 20.5 ha of wetlands required for the OPA out of which 8.8 ha will be required to treat wastewater discharge and the remaining 11.7 ha will be required to treat the land use runoff discharges. Similarly, it reported that a total of 23.8 ha of wetlands required for the FMP out of which 11.4 ha will be required to treat wastewater discharge and the remaining 12.4 ha will be required to treat the land use runoff discharges.

For the worst-case PCC Scenario 1, the updated assessment above (Table 17) shows that a total of 30.64 ha of wetlands required for the OPA, out of which 9.45 ha will be required to treat wastewater discharge and the remaining 21.19 ha will be required to treat the land use runoff discharges. Similarly, it shows that extra 5.01 ha of wetlands required for the remaining FMP, out of which 2.60 ha will be required to treat wastewater discharge and the remaining 2.41 ha will be required to treat the land use runoff discharges. This means a total of 35.65 ha will be required for the entire FMP area and out of which 12.05 ha will be required to treat wastewater discharge and the remaining 23.60 ha will be required to treat the land use runoff discharges.

Table 20 below summarises the estimated differences in total wetland area requirements to achieve nutrient neutrality for both OPA and FMP, which shows that additional total wetland requirement due to the new NE's methodology is 10.14 ha and 11.84 ha for the OPA and FMP respectively. However, most of this additional wetland requirement is associated with managing land use runoff (i.e., 9.49 ha and 11.19 ha for the OPA and FMP respectively), which is attributed to the reduced baseline P load from the dominant freely draining Soilscapes type. This leads to reduced annual nutrient exports for the baseline case (Stage 2) whilst the dominant residential urban land use type now has a much higher nutrient exports for the proposed case (Stage 3). There is also a small increase of wetland area requirement by 0.65 ha to manage the WwTW discharges for both OPA and FMP, which is attributed to the extra 10 l/d/person buffer introduced in the new NE guidance.

*Table 20 Differences in total wetland area requirements for both OPA and FMP*

| Nutrient Mitigation – Wetland Area Requirement Summary | Combined Load – PCC Scenario 1 | | WwTW Load – PCC Scenario 1 | | Land Use Load – PCC Scenario 1 | |
|---|---|---|---|---|---|---|
| | Wetland for Area TP (ha) | Wetland for Area TN (ha) | Wetland for Area TP (ha) | Wetland for Area TN (ha) | Wetland for Area TP (ha) | Wetland for Area TN (ha) |
| Difference in previous WCS report Wetland areas against latest wetland areas – OPA Area | -10.14* | 0.63 | -0.65 | -0.58 | -9.49 | -1.21 |
| Difference in previous WCS report Wetland areas against latest wetland areas – FMP Area | -11.84 | 0.43 | -0.65 | -0.69 | -11.19 | -1.12 |

*Negative values here mean that there has been an increase in wetland area when comparing the wetland areas from the previous WCS against the latest wetland areas calculated in this assessment

As shown in Table 19, the WCS had previously identified a total of 28.77 ha of wetlands (i.e., 11.59 ha of WwTW wetland and 17.18 ha of stormwater wetlands). This suggests that the current provisions in the WCS is sufficient to manage nutrients from the WwTW discharges within the OPA as the wetland W13 has an effective treatment area of 9.75 ha, which is greater than the required 9.45 ha. However, there is currently a shortfall of 4.01 ha for managing land use nutrients from the OPA as there is only 17.18 ha compared with the 21.19 ha required now.

As shown in Table 17 above, an additional 2.6 ha of wetland is required to manage the nutrients from the WwTW discharges from the remining 1500 homes in the FMP area. W13 is sufficient to treat the wastewater flows from the OPA, however two additional wetlands (W15 and converting 0.76 ha of stormwater W7 to wastewater) are required to accommodate the wastewater and stormwater flows from the remaining FMP. These wetlands are 1.84 ha and 1.87 ha in size (3.71ha in total) respectively and therefore can sufficiently accommodate the additional wastewater nutrients load.

Whereas an additional 2.41 ha of wetland is required to manage land use nutrients (total of 23.6 ha for the entire FMP compared to the available 17.18 ha). This means that there is a shortfall of 6.42 ha to mitigate the latest land use nutrients from the FMP. However, this will potentially increase to 7.18 ha to account for the removed part of stormwater wetland W7 to address WwTW wetland shortfall unless NE are happy to accommodate both wastewater and stormwater in a single larger combined wetland that takes the full 1.87 ha at W7 (i.e., subject to further detailed hydraulic loading calculations). A similar approach can be done to combine both wastewater and land use discharges at the wetland W15, which will help to address some of the shortfall associated with stormwater wetlands.

Recommendations to offset this additional load are further discussed in Section 6.2.

### 6.1.2 Sellindge WwTW

As discussed under Section 6.1, the latest Sellindge WwTW mitigation requirements can only be compared to the previous combined load (WwTWs and Land Use) in the previous WCS report. As seen in Table 21, the latest NE guidance has had a significant increase on the wetland areas required for this option (> 13 ha) to achieve nutrient neutrality. This also means that the total wetland area requirement is now 59.74 ha for the FMP out of which 36.15 ha will be required to treat wastewater discharge and the remaining 23.6 ha will be required to treat the land use runoff discharges, for the worst-cast PCC Scenario 1. Therefore, it is still not considered a suitable viable option for this development as it requires significant offsite wetland mitigation.

*Table 21 Differences in total wetland area requirements for FMP*

| Nutrient Mitigation - Wetland Area Requirement Summary | PCC Rate – Scenario 1 | | PCC Rate – Scenario 2 | |
|---|---|---|---|---|
| | Wetland for Area TP (ha) | Wetland for Area TN (ha) | Wetland for Area TP (ha) | Wetland for Area TN (ha) |
| Difference in previous WCS report Wetland areas against latest wetland areas – FMP Area | -13.34* | -1.05 | -13.30 | -1.09 |

*Negative values here mean that there has been an increase in wetland area when comparing the wetland areas from the previous WCS against the latest wetland areas calculated in this assessment

## 6.2 Recommendations

Section 6.1 highlighted that there is a need to provide approximately 7 ha of additional stormwater wetlands within the current OPA development proposals and future FMP area, to ensure nutrient neutrality can be still achieved in line with the new NE's March 2022 guidance and new Stodmarsh budget calculator. Therefore, it is recommended that some of the current SuDS areas within the OPA boundary should be designed as wetlands or bio-retention features to remove the surplus of Phosphorus load. In addition, some potential areas should be identified for potential wetlands within the additional FMP area.

**Appendix A Figure 4** gives the preliminary suggestions for potential additional stormwater wetlands within the Otterpool Park OPA and extra FMP area, which indicates that they can potentially provide a total area of up to 8.97 ha. However, this needs further investigation prior to the final confirmation of their suitability and wetland extents. It should also be noted that where the current SuDS have been reconfigured as stormwater wetlands for the purpose of Phosphorus mitigation, they can still provide their stormwater flood attenuation function during the large storm events, using a suitable integrated design approach. To enable this, additional storage capacity can be provided in these integrated wetlands to compensate for the loss of flood attenuation storage due to the permanently held water.

Table 22 below summarises the potential area that could be available in these additional stormwater wetlands, which shows it can still easily provide the estimated maximum shortfall of 7.18 ha. Tier 2 and Tier 3 stages can confirm what locations and extents will be taken forward for the final strategy implementation as there is sufficient flexibility to accommodate any site and landownership constraints or detailed masterplanning constraints considering that there is around a 2 ha safe buffer of stormwater wetland areas, based on the current recommendations.

*Table 22 Potential additional stormwater wetlands areas for OPA and FMP*

| Wetland Location Ref. | Indicative Wetland Area (ha) | Within OPA or Extra FMP | Comments |
|---|---|---|---|
| ASW1 | 1.50 | OPA | Treats OPA Site storm discharge. ASW1, W4 & W5 when interlinked can give a total area of 5.31ha. |
| ASW2 | 0.75 | OPA | Treats OPA Site storm discharge. ASW2, ASW3, W9, W10, W11 and W12 when interlinked can give a total area of 4.7 ha. |
| ASW3 | 1.12 | OPA | Treats s OPA Site storm discharge. ASW2, ASW3, W9, W10, W11 and W12 when interlinked can give a total area of 4.7 ha. |
| ASW4 | 0.98 | OPA | Treats OPA Site storm discharge. |
| ASW5 | 0.88 | OPA | Treats OPA Site storm discharge. |
| ASW6 | 1.10 | OPA | Treats OPA Site storm discharge. |
| ASW7 | 0.74 | OPA | Treats OPA Site storm discharge. ASW7, ASW8 and ASW9 when interlinked can provide a total area of 2.64 ha. |
| ASW8 | 0.89 | OPA | Treats OPA Site storm discharge. ASW7, ASW8 and ASW9 when interlinked can provide a total area of 2.64 ha. |
| ASW9 | 1.01 | Extra FMP | Treats extra FMP Site storm discharge. ASW7, ASW8 and ASW9 when interlinked can provide a total area of 2.64 ha. |
| **TOTAL** | **8.97** | | |

# 7 Conclusions

The updated nutrient budget assessment in Section 4 and updated nutrient mitigation requirements in Section 5 show that the latest NE guidance has had a negative impact on the previous calculations and conclusions summarised in the previous WCS report.

For the preferred Onsite WwTW nutrient loads, the latest guidance has only had a minor increase (0.65 ha) on the wetland area requirements for the OPA and FMP due to the extra 10% buffer now introduced to the previous per capita water consumption rates. Therefore, as stated in Section 6.1, the previously proposed wastewater wetlands (W13, W15 and W7) can still provide the total effective wetland area of 13.46 ha, exceeding the required wetland area of 12.05 ha from the FMP.

As per the previous WCS summary, the alternative Sellindge WwTW option is still the less favourable option for achieving NE's Nutrient Neutrality requirements. This is because the higher TP and TN permit levels along with the increased land use nutrient loads means that nearly 60 ha of wetland would be required to offset the latest nutrient loads. Therefore, the Onsite WwTW option with STC is preferred as this option is more technically feasible for both PCC scenario rates assessed. Section 6.1 also highlights the other key reasons for selecting the Onsite WwTW as the preferred option in the previous WCS.

However, the main negative impacts to the nutrient budget calculations come from the new land use coefficients, which are based on the Soilscapes drainage types and rainfall. In terms of Phosphorus, as the majority of the site falls under the freely draining type, this leads to reduced annual nutrient exports for the baseline case (Stage 2) whilst the dominant residential urban land use type now has a much higher nutrient exports for the proposed case (Stage 3). This showed approximately a 10 ha increase in stormwater wetland requirements, which means that the wetland area mitigation requirement from the FMP now exceeds the available total proposed stormwater wetland area (17.18 ha) outlined in the previous WCS report by 6.42 ha. However, this could increase to 7.18ha without W7 which is also needed for wastewater wetlands.

Therefore, to address this shortfall, additional stormwater wetlands will be required to achieve nutrient neutrality and protect the integrity of the Stodmarsh SAC and SPA/ Ramsar sites. This report recommends that some of the current SuDS areas within the OPA boundary should be designed as wetlands (or bio-retention features) to remove the surplus of Phosphorus load. In addition, some potential areas should be identified for potential wetlands within the additional FMP area.

In summary, this report provides the latest nutrient budget calculations and associated mitigation proposals to demonstrate that Nutrient Neutrality can be achieved at the proposed Otterpool Park garden settlement. This is through the provision of a new Onsite WwTW serving the proposed development, accompanied by the proposed four interlinked constructed wetlands system, protecting the integrity of the downstream Stodmarsh designated sites and thereby can meet the required tests under the Habitats Regulation Assessment.

This will be achieved by the implementation of the following (as per an agreed phased implementation plan with NE and the Local Planning Authority):

1. Measures previously identified in Arcadis (March 2022) OP5 – Appendix 15.2 – Water Cycle Study:
    - Direct treatment mitigation with the proposed Severn Trent Connect Onsite WwTW option
    - Direct mitigation, which includes up to 28.77 ha of onsite wastewater and stormwater wetlands, including 35ha of new onsite woodland planting
    - Indirect mitigation, which includes changing existing agricultural land use to a lower nutrient use, such as stormwater SuDS, SANG and ecology/landscape mitigation

2. Additional measures recommended in this Nutrient Budget Assessment Update to provide the identified maximum shortfall of storm wetland area of 7.18 ha, which is based on average household occupancy rate of 2.4, Per Capita Consumption (PCC) rate of 120 l/p/d, 90% of discharge permit values (i.e. 90% of TP limit of 0.1 mg/l and TN limit of 7.2 mg/l) for the proposed Severn Trent Connect Onsite WwTW option as well as the latest NE methodology for land use nutrient budget assessment:

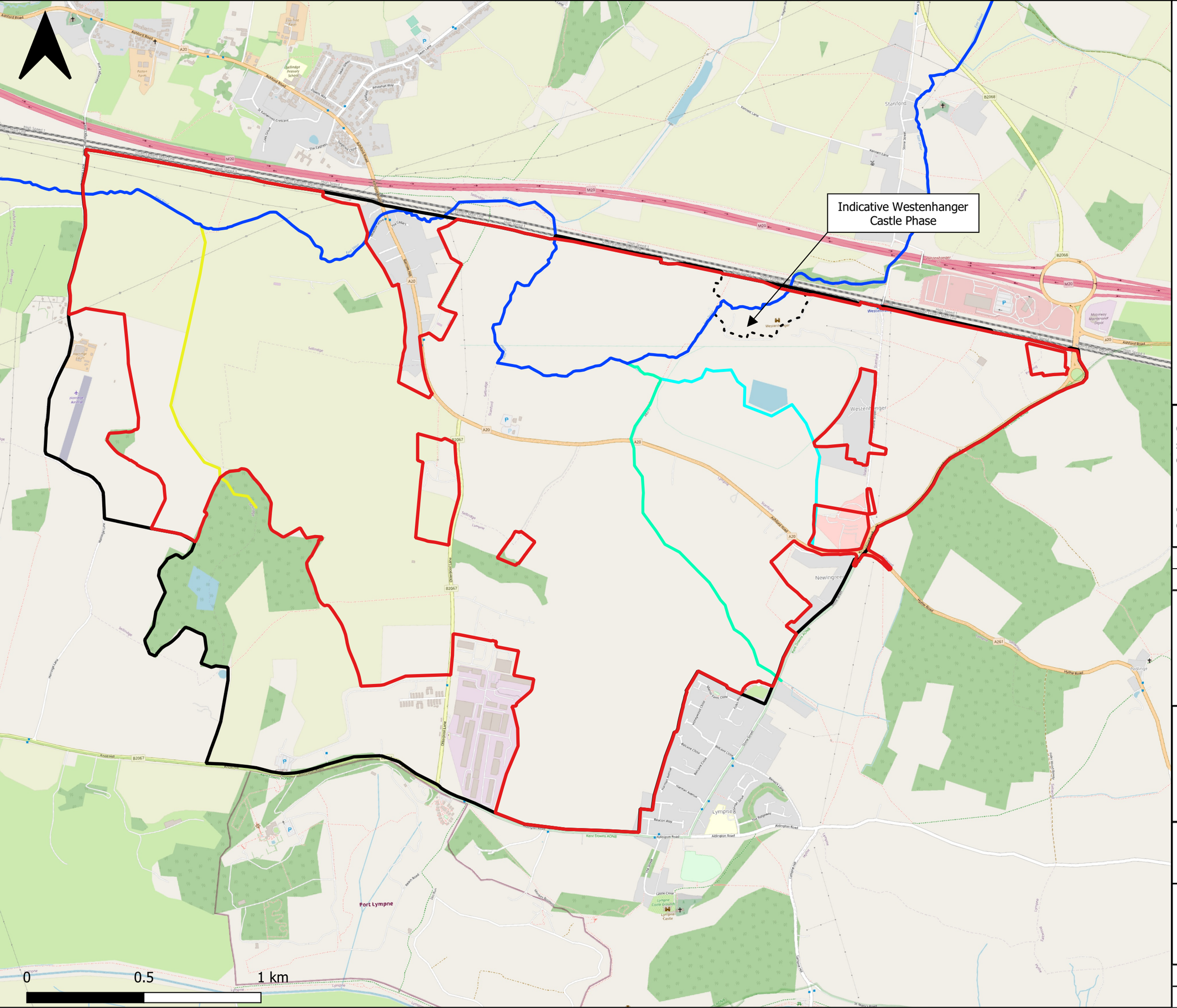
- Provision of additional stormwater wetland locations within the OPA by reconfiguring the proposed SuDS as wetlands (or bio-retention features locations)
- Provision of additional stormwater wetland locations within the remaining FMP

Currently, potential locations to provide up to 8.97 ha of extra wetland have been identified (7.96 ha in OPA and 1.01 ha in remaining FMP). This needs further investigation in Tier 2 and Tier 3 stages, prior to the final confirmation of their suitability and wetland extents. However, there is sufficient flexibility to accommodate any site and landownership constraints or detailed masterplanning requirements considering that there is a safety buffer of around 2 ha.

Therefore, this demonstrates that the Proposed Development will have No Likely Significant Effect on Stodmarsh designated sites and thereby can meet the required tests of the Appropriate Assessment under the Habitats Regulation Assessment in respect to the potential nutrients impact.

# Appendix A

## Report Figures




## Legend

- OPA Boundary
- Framework Masterplan Boundary

**Main Rivers**

- East Stour

**Ordinary Watercourses**

- Harringe Brook
- North Lympne Drain
- Racecourse Drain



| Revision | Date | Status | Author | Checker | Approver |
|---|---|---|---|---|---|
| 01 | 15/7/22 | FINAL | SCM | EBP | RG |

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**Otterpool Park Nutrient Mitigation**

**Appendix A Figure 1: Location Plan**

| Scale | Original Size | Datum | Grid |
|---|---|---|---|
| 1:15,000 | A3 | mAOD | OSGB 27700 |

Indicative Westenhanger Castle Phase where existing land use will not be changed - see Note 1

Soilscape boundaries

0 0.5 1 km



## Legend

- OPA Boundary
- Framework Masterplan Boundary
- Arable
- Greenspace
- Lowland
- Shrub
- Woodland

### Urban

- Open Urban Land
- Commercial/Industrial

### Soilscapes Drainage Type Boundary

- Freely Draining
- Impeded drainage
- Naturally Wet

Notes.

1. Existing land use in 37.4 ha of the total OPA site area will be unchanged, which includes Westenhanger Castle area and existing roads/ buildings/ water bodies/ riparian buffers etc. Therefore such areas are fully excluded in this figure and associated nutrient budget calculations.

2. This figure only shows existing land use for 44.29 ha within the FMP boundary outside the total OPA site boundary. The remaining area will be unchanged, or to be integrated in the form of the proposed strategic greenspace elements, which have the same nutrient export values.

| Revision | Date | Status | Author | Checker | Approver |
|---|---|---|---|---|---|
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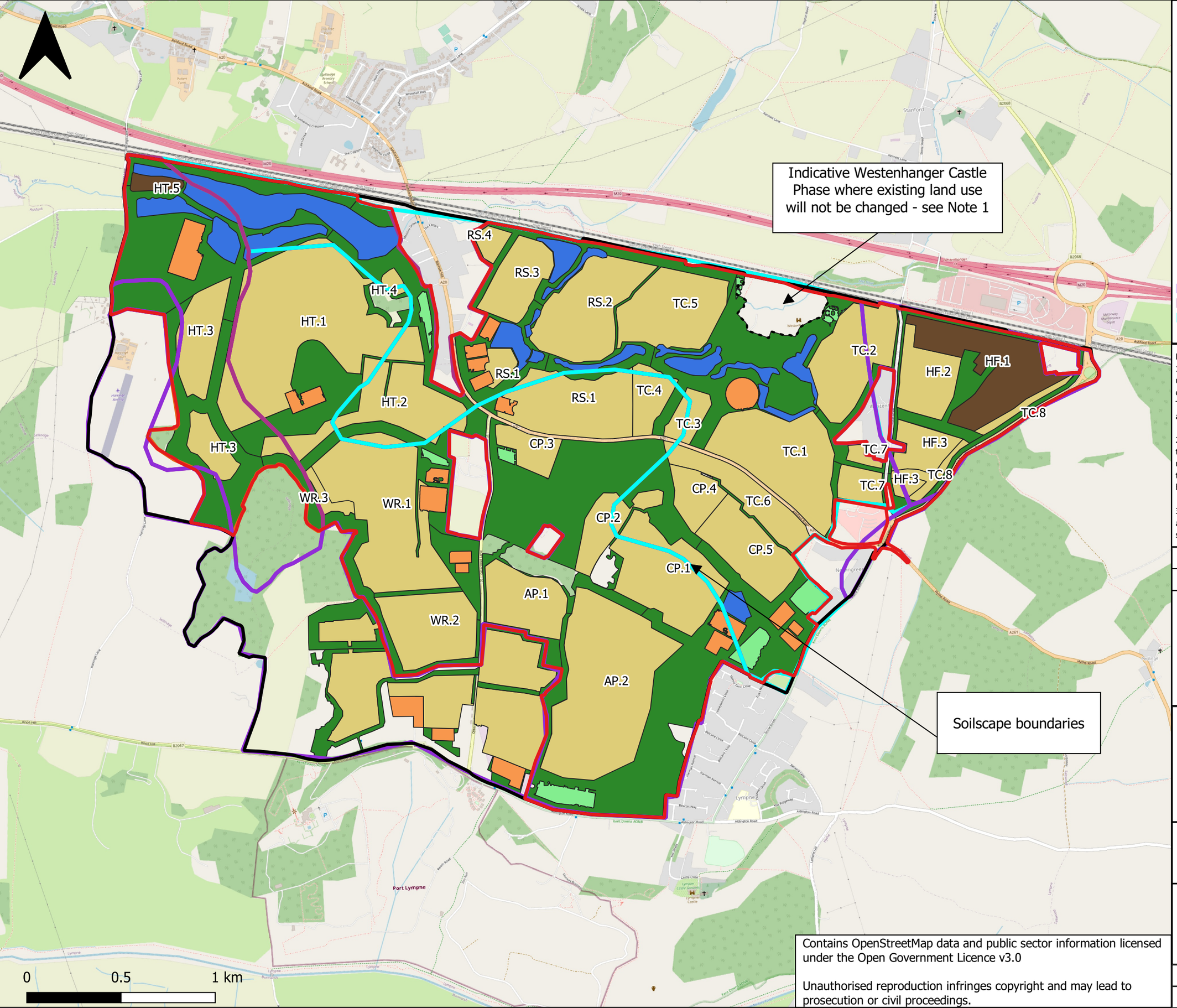
**Appendix A Figure 2: Revised Existing Land Use Types**

| Scale | Original Size | Datum | Grid |
|---|---|---|---|
| 1:15,000 | A3 | mAOD | OSGB 27700 |




## Legend

- OPA Boundary
- Framework Masterplan Boundary

**Residential urban land**
- Residential

**Commercial/industrial urban land**
- Commercial/industrial

**Open urban land**
- Sport Pitches

**Public Open Space**
- Greenspace

**Community food growing**
- Allotments & Community orchards

**Water**
- Wetlands (as per previous WCS)

**Soilscapes Drainage Type Boundary**
- Freely Draining
- Impeded drainage
- Naturally Wet

Notes.
1. Existing land use in 37.4 ha of the total OPA site area will be unchanged, which includes Westenhanger Castle area and existing roads/buildings/ water bodies/ riparian buffers etc. Therefore such areas are fully excluded in this figure and associated nutrient budget calculations.

2. This figure only shows proposed land use for 44.29 ha within the FMP boundary outside the total OPA site boundary. The remaining area will be unchanged, or to be integrated in the form of the proposed strategic greenspace elements, which have the same nutrient export values.

3. Residential parcels also include approximately 15% of additional greenspace areas (including SuDS), which are not shown in this figure.

| Revision | Date | Status | Author | Checker | Approver |
|---|---|---|---|---|---|
| 01 | 15/7/22 | FINAL | SCM | EBP | RG |

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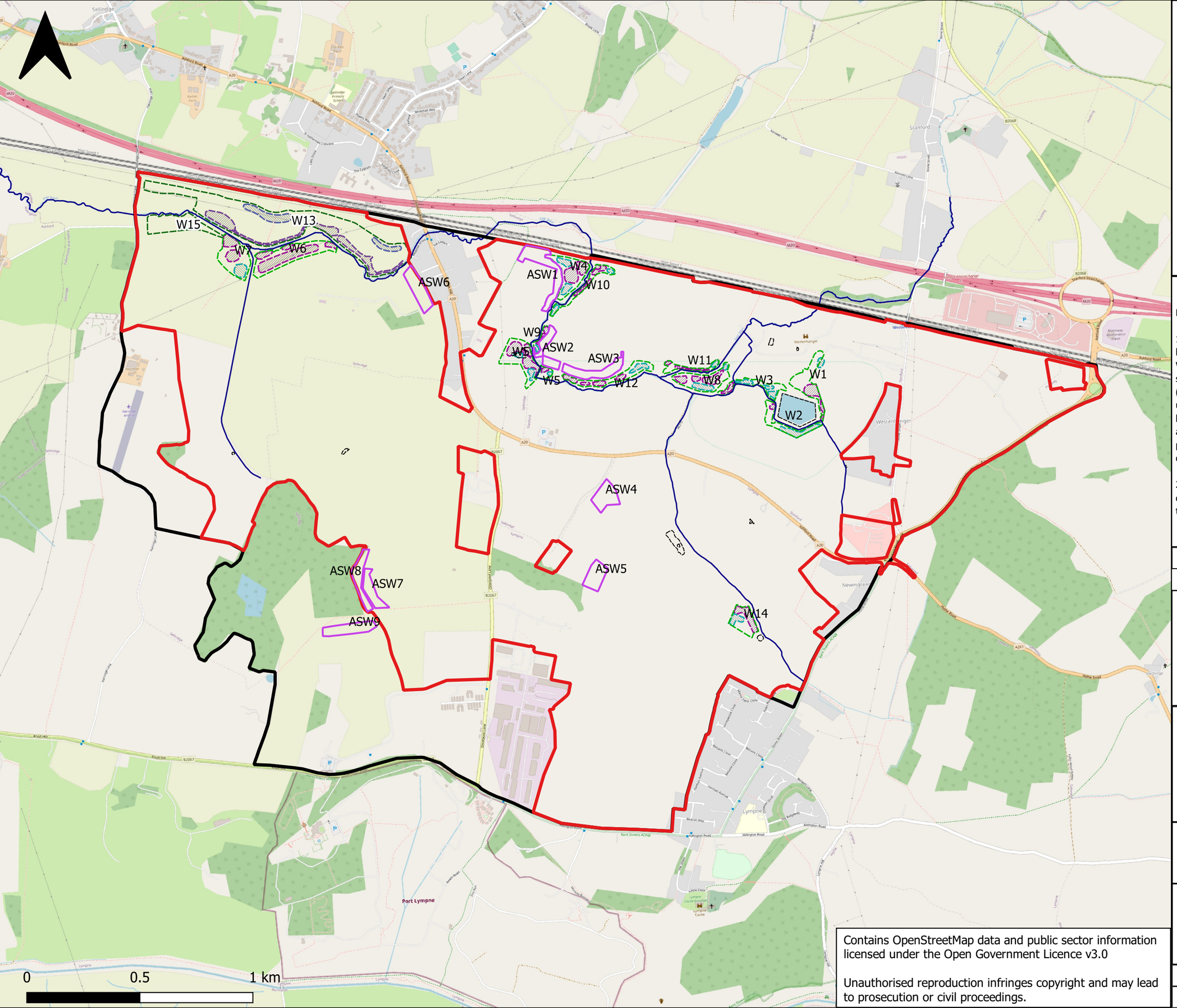
**Appendix A Figure 3: Revised Proposed Land Use Types**

| Scale | Original Size | Datum | Grid |
|---|---|---|---|
| 1:15,000 | A3 | mAOD | OSGB 27700 |




## Legend

- OPA Boundary
- Framework Masterplan Boundary
- Modelled Watercourses
- Existing Ponds/ Lakes
- Previously Proposed stormwater wetland outline
  - Deep open water zone
  - Open water zone
- Previously Proposed wastewater wetland outline
  - Deep open water zone
  - Open water zone
- Potential Additional Stormwater Wetlands (ASW1 - ASW9)

Notes.

1. This figure shows the previously proposed wetland locations in Arcadis (March 22) OP5 - Appendix 15.2 - Water Cycle Report plus the potential additional stormwater wetland locations to address the shortfall (circa 7 ha) identified by this nutrient budget analysis update report. They can potentially provide up to 8.97 ha of extra wetlands, but the most preferred locations and extents will be selected at Tier 2/3 stages to provide the required shortfall amount following detailed investigations.

2. Wastewater Wetland W15 is not required for the current OPA but it will be needed to accommodate the extra 1500 dwellings within the FMP.

| Revision | Date | Status | Author | Checker | Approver |
|---|---|---|---|---|---|
| 02 | 19/7/22 | FINAL | SCM | EBP | RG |

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**Otterpool Park Nutrient Mitigation**

**Appendix A Figure 4: Proposed Nutrient Management Strategy Updates**

| Scale | Original Size | Datum | Grid |
|---|---|---|---|
| 1:15,000 | A3 | mAOD | OSGB 27700 |

## Appendix B

# Nutrient Neutrality Assessment – For Onsite WwTW

# Onsite WwTW - OPA

## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |

| | Proposed Land Use | | | | |
|---|---|---|---|---|---|
| | | Soilscapes classification | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Otterpool OPA Land Use | | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 | |
| | Commercial/industrial urban land | 14.50 | 1.50 | | |
| | Greenspace | 25.63 | 2.32 | 17.34 | |
| | community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 | |
| | Greenspace | 95.07 | 27.98 | 60.79 | |
| | community food growing | 2.69 | 0.00 | 4.07 | |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |
| | | | | | |

## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 74.4 | 5354.3 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 17.8 | 1282.3 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 2.3 | 166.2 |
| **Final Stage 1 Output** | **94.5** | **6802.8** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 7855 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 18852 | people |
| Wastewater by development | 2262240 | litres/day |
| **Annual wastewater TP load** | **74.37** | **kg TP/yr** |
| **Annual wastewater TN load** | **5354.31** | **kg TN/yr** |

**Residential Class C2 (350 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 350 | |
| **Development Proposal** (dwellings/units): | 645 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 1548 | people |
| Wastewater by development | 541800 | litres/day |
| **Annual wastewater TP load** | **17.81** | **kg TP/yr** |
| **Annual wastewater TN load** | **1282.34** | **kg TN/yr** |

**Residential Class C1 (300 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 300 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 70200 | litres/day |
| **Annual wastewater TP load** | **2.31** | **kg TP/yr** |
| **Annual wastewater TN load** | **166.15** | **kg TN/yr** |

| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 74.4 | 5354.3 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 13.4 | 963.6 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 1.7 | 124.6 |
| **Final Stage 1 Output** | **89.5** | **6442.5** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 7855 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 18852 | people |
| Wastewater by development | 2262240 | litres/day |
| **Annual wastewater TP load** | **74.37** | **kg TP/yr** |
| **Annual wastewater TN load** | **5354.31** | **kg TN/yr** |

**Residential Class C2 (263 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 263 | |
| **Development Proposal** (dwellings/units): | 645 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 1548 | people |
| Wastewater by development | 407124 | litres/day |
| **Annual wastewater TP load** | **13.38** | **kg TP/yr** |
| **Annual wastewater TN load** | **963.59** | **kg TN/yr** |

**Residential Class C1 (225 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 225 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 52650 | litres/day |
| **Annual wastewater TP load** | **1.73** | **kg TP/yr** |
| **Annual wastewater TN load** | **124.61** | **kg TN/yr** |

# Stage 2 Outputs

## Stage 2 Results - Breakdown

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 40.0 | 6023.2 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **196.0** | **10719.2** |

### Stage 2 - Freely Draining

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| **Total:** | **288.57** | **40.00** | **6023.21** |

### Stage 2 - Impeded Drainage

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

### Stage 2 - Naturally Wet

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **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 phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

# Stage 3 Outputs

**Stage 3 Results - Breakdown**
**Total Annual Phosphorous and Nitrogen Nutrient Export**

| | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 233.7 | 2517.4 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **407.8** | **4504.2** |

**Stage 3 - Freely Draining**

## Stage 3

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| **Total:** | **288.59894** | **233.72** | **2517.40** |

**Stage 3 - Impeded Drainage**

## Stage 3

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| **Total:** | **53.032** | **23.28** | **299.92** |

**Stage 3 - Naturally Wet**

## Stage 3

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

## Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 306.3 | 587.8 | 301.3 | 227.5 |
| Step 2: Nutrient Budget* X 1.2 | 367.6 | 705.3 | 361.6 | 273.0 |
| **Stage 4 Final Nutrient Load** | **367.60** | **705.3** | **361.58** | **273.0** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 211.84 | -6215.02 | 211.84 | -6215.02 |
| Step 2: Nutrient Budget* X 1.2 | 254.21 | -7458.02 | 254.21 | -7458.02 |
| **Stage 4 Final Nutrient Load** | **254.21** | **-7458.02** | **254.21** | **-7458.02** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 94.49 | 6802.80 | 89.48 | 6442.51 |
| Step 2: Nutrient Budget* X 1.2 | 113.39 | 8163.36 | 107.38 | 7731.01 |
| **Stage 4 Final Nutrient Load** | **113.39** | **8163.36** | **107.38** | **7731.01** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 30.63 | 0.76 | 30.13 | 0.29 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 21.18 | -8.02 | 21.18 | -8.02 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 9.45 | 8.78 | 8.95 | 8.31 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |
| | | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Additional Land Use in the Framework Masterplan | | | | |
| Open urban land | 2.96 | 0 | 0 | |
| Greenspace | 16.17 | 0 | 0 | |
| Lowland | 0.00 | 0 | 0 | |
| Shrub | 0.28 | 0 | 0 | |
| Woodland | 0.62 | 0 | 0 | |
| Cereals | 6.11 | 0 | 0 | |
| Commercial/industrial urban land | 18.17 | 0 | 0 | |
| | | | | |
| | | | | |
| | | | | |
| | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | |
| **TOTAL** | **332.88** | **53.05** | **209.98** | **595.91** |

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Open urban land | 10.58 | 0.00 | 18.09 | |
| Greenspace | 77.27 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.40 | |
| Shrub | 1.97 | 0.00 | 0.36 | |
| Woodland | 0.66 | 0.00 | 0.92 | |
| Cereals | 163.47 | 34.61 | 131.70 | |
| Commercial/industrial urban land | 18.17 | 0.00 | 0.00 | |
| | | | | |
| | **332.88** | **53.05** | **209.98** | **595.91** |

| Proposed Land Use | | | | | |
|---|---|---|---|---|---|
| | | Soilscapes classification | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Otterpool OPA Land Use | | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 | |
| | Commercial/industrial urban land | 14.50 | 1.50 | | |
| | Greenspace | 25.63 | 2.32 | 17.34 | |
| | community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 | |
| | Greenspace | 95.07 | 27.98 | 60.79 | |
| | community food growing | 2.69 | 0.00 | 4.07 | |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |
| | | | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Additional Land Use in the Framework Masterplan | | | | |
| Development Parcels | Residential urban land | 30.53 | 0 | 0 | |
| | Commercial/industrial urban land | 0.00 | 0 | 0 | |
| | | | | | |
| | | | | | |
| Public Open Space | Open urban land | 3.23 | 0 | 0 | |
| | Greenspace | 10.55 | 0 | 0 | |
| | | | | | |
| | | | | | |
| | | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | | |
| | **TOTAL** | **332.91** | **53.04** | **209.97** | **595.92** |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Development Parcels | Residential urban land | 175.74 | 13.16 | 98.25 |
| | Commercial/industrial urban land | 14.50 | 1.50 | 0.00 |
| | Greenspace | 25.63 | 2.32 | 17.34 |
| | community food growing | 0.00 | 0.00 | 0.22 |
| | | | | |
| Public Open Space | Open urban land | 8.50 | 2.57 | 6.26 |
| | Greenspace | 105.62 | 27.98 | 60.79 |
| | community food growing | 2.69 | 0.00 | 4.07 |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 |
| | | | | |
| | **332.91** | **53.04** | **209.97** | **595.92** |

## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 82.4 | 5933.0 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 35.8 | 2576.6 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 2.3 | 166.2 |
| **Final Stage 1 Output** | **120.5** | **8675.8** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 8704 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 20889.6 | people |
| Wastewater by development | 2506752 | litres/day |
| **Annual wastewater TP load** | **82.40** | **kg TP/yr** |
| **Annual wastewater TN load** | **5933.03** | **kg TN/yr** |

**Residential Class C2 (350 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 350 | |
| **Development Proposal** (dwellings/units): | 1296 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 3110.4 | people |
| Wastewater by development | 1088640 | litres/day |
| **Annual wastewater TP load** | **35.79** | **kg TP/yr** |
| **Annual wastewater TN load** | **2576.61** | **kg TN/yr** |

**Residential Class C1 (300 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 300 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 70200 | litres/day |
| **Annual wastewater TP load** | **2.31** | **kg TP/yr** |
| **Annual wastewater TN load** | **166.15** | **kg TN/yr** |

| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 82.4 | 5933.0 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 26.9 | 1936.1 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 1.7 | 124.6 |
| **Final Stage 1 Output** | **111.0** | **7993.8** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 8704 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 20889.6 | people |
| Wastewater by development | 2506752 | litres/day |
| **Annual wastewater TP load** | **82.40** | **kg TP/yr** |
| **Annual wastewater TN load** | **5933.03** | **kg TN/yr** |

**Residential Class C2 (263 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 263 | |
| **Development Proposal** (dwellings/units): | 1296 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 3110.4 | people |
| Wastewater by development | 818035.2 | litres/day |
| **Annual wastewater TP load** | **26.89** | **kg TP/yr** |
| **Annual wastewater TN load** | **1936.14** | **kg TN/yr** |

**Residential Class C1 (225 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 225 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.09 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 6.48 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 52650 | litres/day |
| **Annual wastewater TP load** | **1.73** | **kg TP/yr** |
| **Annual wastewater TN load** | **124.61** | **kg TN/yr** |

# Stage 2 Outputs

## Stage 2 Results - Breakdown

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 62.9 | 6419.4 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **218.9** | **11115.4** |

### Stage 2 - Freely Draining

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| | | | |
| Open urban land | 2.96 | 2.30 | 23.57 |
| Greenspace | 16.17 | 0.32 | 48.51 |
| Lowland | 0.00 | 0.00 | 0.00 |
| Shrub | 0.28 | 0.01 | 0.84 |
| Woodland | 0.62 | 0.01 | 1.86 |
| Cereals | 6.11 | 1.01 | 190.51 |
| Commercial/industrial urban land | 18.17 | 19.28 | 130.91 |
| | | | |
| **Total:** | **332.88** | **62.94** | **6419.41** |

### Stage 2 - Impeded Drainage

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| | | | |
| **Total:** | **53.048** | **44.18** | **931.02** |

### Stage 2 - Naturally Wet

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **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 phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| | | | |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

**Stage 3 Results - Breakdown**
**Total Annual Phosphorous and Nitrogen Nutrient Export**

| | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 280.7 | 2987.2 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **454.8** | **4974.0** |

### Stage 3 - Freely Draining

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| Residential urban land | 30.53 | 44.28 | 412.42 |
| Commercial/industrial urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 10.55 | 0.21 | 31.65 |
| Open urban land | 3.23 | 2.51 | 25.72 |
| **Total:** | **332.908942** | **280.72** | **2987.19** |

### Stage 3 - Impeded Drainage

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| **Total:** | **53.032** | **23.28** | **299.92** |

### Stage 3 - Naturally Wet

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 356.4 | 2534.4 | 346.9 | 1852.4 |
| Step 2: Nutrient Budget* X 1.2 | 427.7 | 3041.2 | 416.3 | 2222.8 |
| **Stage 4 Final Nutrient Load** | **427.7** | **3041.2** | **416.3** | **2222.8** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 235.90 | -6141.43 | 235.90 | -6141.43 |
| Step 2: Nutrient Budget* X 1.2 | 283.08 | -7369.72 | 283.08 | -7369.72 |
| **Stage 4 Final Nutrient Load** | **283.08** | **-7369.72** | **283.08** | **-7369.72** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 120.50 | 8675.79 | 111.02 | 7993.78 |
| Step 2: Nutrient Budget* X 1.2 | 144.60 | 10410.95 | 133.22 | 9592.54 |
| **Stage 4 Final Nutrient Load** | **144.60** | **10410.95** | **133.22** | **9592.54** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 35.64 | 3.27 | 34.69 | 2.39 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 23.59 | -7.92 | 23.59 | -7.92 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 12.05 | 11.19 | 11.10 | 10.31 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

# Appendix C

## Nutrient Neutrality Assessment – For Sellindge WwTW

# Offsite WwTW - OPA

## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | | Soilscapes classification | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet |
| | Otterpool OPA Land Use | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 |
| | Commercial/industrial urban land | 14.50 | 1.50 | |
| | Greenspace | 25.63 | 2.32 | 17.34 |
| | community food growing | 0.00 | 0.00 | 0.22 |
| | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 |
| | Greenspace | 95.07 | 27.98 | 60.79 |
| | community food growing | 2.69 | 0.00 | 4.07 |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 |
| | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |

## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 223.1 | 18591.4 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 53.4 | 4452.6 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 6.9 | 576.9 |
| **Final Stage 1 Output** | **283.5** | **23620.9** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 7855 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 18852 | people |
| Wastewater by development | 2262240 | litres/day |
| **Annual wastewater TP load** | **223.10** | **kg TP/yr** |
| **Annual wastewater TN load** | **18591.37** | **kg TN/yr** |

**Residential Class C2 (350 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 350 | |
| **Development Proposal** (dwellings/units): | 645 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 1548 | people |
| Wastewater by development | 541800 | litres/day |
| **Annual wastewater TP load** | **53.43** | **kg TP/yr** |
| **Annual wastewater TN load** | **4452.58** | **kg TN/yr** |

**Residential Class C1 (300 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 300 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 70200 | litres/day |
| **Annual wastewater TP load** | **6.92** | **kg TP/yr** |
| **Annual wastewater TN load** | **576.91** | **kg TN/yr** |

| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 223.1 | 18591.4 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 40.2 | 3345.8 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 5.2 | 432.7 |
| **Final Stage 1 Output** | **268.4** | **22369.9** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 7855 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 18852 | people |
| Wastewater by development | 2262240 | litres/day |
| **Annual wastewater TP load** | **223.10** | **kg TP/yr** |
| **Annual wastewater TN load** | **18591.37** | **kg TN/yr** |

**Residential Class C2 (263 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 263 | |
| **Development Proposal** (dwellings/units): | 645 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 1548 | people |
| Wastewater by development | 407124 | litres/day |
| **Annual wastewater TP load** | **40.15** | **kg TP/yr** |
| **Annual wastewater TN load** | **3345.80** | **kg TN/yr** |

**Residential Class C1 (225 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 225 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 52650 | litres/day |
| **Annual wastewater TP load** | **5.19** | **kg TP/yr** |
| **Annual wastewater TN load** | **432.68** | **kg TN/yr** |

# Stage 2 Outputs

**Stage 2 Results - Breakdown**

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 40.0 | 6023.2 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **196.0** | **10719.2** |

**Stage 2 - Freely Draining**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm)**:** | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| **Total:** | **288.57** | **40.00** | **6023.21** |

**Stage 2 - Impeded Drainage**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm)**:** | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

**Stage 2 - Naturally Wet**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **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 phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

**Stage 3 Results - Breakdown**
**Total Annual Phosphorous and Nitrogen Nutrient Export**

| | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 233.7 | 2517.4 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **407.8** | **4504.2** |

**Stage 3 - Freely Draining**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| **Total:** | **288.59894** | **233.72** | **2517.40** |

**Stage 3 - Impeded Drainage**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| **Total:** | **53.032** | **23.28** | **299.92** |

**Stage 3 - Naturally Wet**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 495.3 | 17405.8 | 480.3 | 16154.8 |
| Step 2: Nutrient Budget* X 1.2 | 594.3 | 20887.0 | 576.3 | 19385.8 |
| **Stage 4 Final Nutrient Load** | **594.3** | **20887.0** | **576.3** | **19385.8** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 211.84 | -6215.02 | 211.84 | -6215.02 |
| Step 2: Nutrient Budget* X 1.2 | 254.21 | -7458.02 | 254.21 | -7458.02 |
| **Stage 4 Final Nutrient Load** | **254.21** | **-7458.02** | **254.21** | **-7458.02** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 283.45 | 23620.86 | 268.44 | 22369.85 |
| Step 2: Nutrient Budget* X 1.2 | 340.14 | 28345.03 | 322.13 | 26843.82 |
| **Stage 4 Final Nutrient Load** | **340.14** | **28345.03** | **322.13** | **26843.82** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 49.53 | 22.46 | 48.03 | 20.84 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 21.18 | -8.02 | 21.18 | -8.02 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 28.35 | 30.48 | 26.84 | 28.86 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

# Offsite WwTW - FMP

## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |

| | | | | |
|---|---|---|---|---|
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Additional Land Use in the Framework Masterplan | | | | |
| Open urban land | 2.96 | 0 | 0 | |
| Greenspace | 16.17 | 0 | 0 | |
| Lowland | 0.00 | 0 | 0 | |
| Shrub | 0.28 | 0 | 0 | |
| Woodland | 0.62 | 0 | 0 | |
| Cereals | 6.11 | 0 | 0 | |
| Commercial/industrial urban land | 18.17 | 0 | 0 | |
| | | | | |
| | | | | |
| | | | | |
| | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | |
| TOTAL | 332.88 | 53.05 | 209.98 | 595.91 |

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Open urban land | 10.58 | 0.00 | 18.09 | |
| Greenspace | 77.27 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.40 | |
| Shrub | 1.97 | 0.00 | 0.36 | |
| Woodland | 0.66 | 0.00 | 0.92 | |
| Cereals | 163.47 | 34.61 | 131.70 | |
| Commercial/industrial urban land | 18.17 | 0.00 | 0.00 | |
| | | | | |
| | 332.88 | 53.05 | 209.98 | 595.91 |

| Proposed Land Use | | | | | |
|---|---|---|---|---|---|
| | | Soilscapes classification | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Otterpool OPA Land Use | | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 | |
| | Commercial/industrial urban land | 14.50 | 1.50 | | |
| | Greenspace | 25.63 | 2.32 | 17.34 | |
| | community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 | |
| | Greenspace | 95.07 | 27.98 | 60.79 | |
| | community food growing | 2.69 | 0.00 | 4.07 | |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |

| | | | | | |
|---|---|---|---|---|---|
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Additional Land Use in the Framework Masterplan | | | | |
| Development Parcels | Residential urban land | 30.53 | 0 | 0 | |
| | Commercial/industrial urban land | 0.00 | 0 | 0 | |
| | | | | | |
| | | | | | |
| Public Open Space | Open urban land | 3.23 | 0 | 0 | |
| | Greenspace | 10.55 | 0 | 0 | |
| | | | | | |
| | | | | | |
| | | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | | |
| | TOTAL | 332.91 | 53.04 | 209.97 | 595.92 |

| Proposed Land Use | | | | | |
|---|---|---|---|---|---|
| | | Soilscapes classification | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Development Parcels | Residential urban land | 175.74 | 13.16 | 98.25 | |
| | Commercial/industrial urban land | 14.50 | 1.50 | 0.00 | |
| | Greenspace | 25.63 | 2.32 | 17.34 | |
| | community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | | |
| Public Open Space | Open urban land | 8.50 | 2.57 | 6.26 | |
| | Greenspace | 105.62 | 27.98 | 60.79 | |
| | community food growing | 2.69 | 0.00 | 4.07 | |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | | |
| | | 332.91 | 53.04 | 209.97 | 595.92 |

## Stage 1 Outputs

**Scenario 1**

**Stage 1 Results - Breakdown**
**Total Annual Wastewater TP and TN Load**

| | Scenario 1 | |
|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 247.2 | 20600.8 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 107.4 | 8946.6 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 6.9 | 576.9 |
| **Final Stage 1 Output** | **361.5** | **30124.3** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 8704 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 20889.6 | people |
| Wastewater by development | 2506752 | litres/day |
| **Annual wastewater TP load** | **247.21** | **kg TP/yr** |
| **Annual wastewater TN load** | **20600.80** | **kg TN/yr** |

**Residential Class C2 (350 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 350 | |
| **Development Proposal** (dwellings/units): | 1296 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 3110.4 | people |
| Wastewater by development | 1088640 | litres/day |
| **Annual wastewater TP load** | **107.36** | **kg TP/yr** |
| **Annual wastewater TN load** | **8946.58** | **kg TN/yr** |

**Residential Class C1 (300 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 300 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 70200 | litres/day |
| **Annual wastewater TP load** | **6.92** | **kg TP/yr** |
| **Annual wastewater TN load** | **576.91** | **kg TN/yr** |

**Scenario 2**

**Stage 1 Results - Breakdown**
**Total Annual Wastewater TP and TN Load**

| | Scenario 2 | |
|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 247.2 | 20600.8 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 80.7 | 6722.7 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 5.2 | 432.7 |
| **Final Stage 1 Output** | **333.1** | **27756.2** |

**Residential Class C3 (110 l/p/d + 10% buffer)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 120 | |
| **Development Proposal** (dwellings/units): | 8704 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 20889.6 | people |
| Wastewater by development | 2506752 | litres/day |
| **Annual wastewater TP load** | **247.21** | **kg TP/yr** |
| **Annual wastewater TN load** | **20600.80** | **kg TN/yr** |

**Residential Class C2 (263 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.40 | |
| **Water usage** (litres/person/day): | 263 | |
| **Development Proposal** (dwellings/units): | 1296 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 3110.4 | people |
| Wastewater by development | 818035.2 | litres/day |
| **Annual wastewater TP load** | **80.67** | **kg TP/yr** |
| **Annual wastewater TN load** | **6722.72** | **kg TN/yr** |

**Residential Class C1 (225 l/p/d)**

**Stage 1**

**User Inputs**

| | | |
|---|---|---|
| **Date of first occupancy:** | | |
| **Average occupancy rate:** | 2.00 | |
| **Water usage** (litres/person/day): | 225 | |
| **Development Proposal** (dwellings/units): | 117 | |
| **Wastewater treatment works:** | Package Treatment Plant user defined | |
| **Wastewater treatment works P permit** (mg TP/litre): | Please enter value in cell to the right: | 0.27 |
| **Wastewater treatment works N permit** (mg TN/litre): | Please enter value in cell to the right: | 22.5 |

**Stage 1 Calculated Loading**

| | | |
|---|---|---|
| Additional population | 234 | people |
| Wastewater by development | 52650 | litres/day |
| **Annual wastewater TP load** | **5.19** | **kg TP/yr** |
| **Annual wastewater TN load** | **432.68** | **kg TN/yr** |

# Stage 2 Outputs

## Stage 2 Results - Breakdown

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 62.9 | 6419.4 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **218.9** | **11115.4** |

### Stage 2 - Freely Draining

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| Open urban land | 2.96 | 2.30 | 23.57 |
| Greenspace | 16.17 | 0.32 | 48.51 |
| Lowland | 0.00 | 0.00 | 0.00 |
| Shrub | 0.28 | 0.01 | 0.84 |
| Woodland | 0.62 | 0.01 | 1.86 |
| Cereals | 6.11 | 1.01 | 190.51 |
| Commercial/industrial urban land | 18.17 | 19.28 | 130.91 |
| **Total:** | **332.88** | **62.94** | **6419.41** |

### Stage 2 - Impeded Drainage

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

### Stage 2 - Naturally Wet

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **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 phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

| Stage 3 Results - Breakdown<br>Total Annual Phosphorous and Nitrogen Nutrient Export | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 280.7 | 2987.2 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **454.8** | **4974.0** |

### Stage 3 - Freely Draining

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| | | | |
| Residential urban land | 30.53 | 44.28 | 412.42 |
| Commercial/industrial urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 10.55 | 0.21 | 31.65 |
| Open urban land | 3.23 | 2.51 | 25.72 |
| **Total:** | **332.908942** | **280.72** | **2987.19** |

### Stage 3 - Impeded Drainage

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| | | | |
| **Total:** | **53.032** | **23.28** | **299.92** |

### Stage 3 - Naturally Wet

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 597.4 | 23982.9 | 569.0 | 21614.8 |
| Step 2: Nutrient Budget* X 1.2 | 716.9 | 28779.4 | 682.8 | 25937.7 |
| **Stage 4 Final Nutrient Load** | **716.9** | **28779.4** | **682.8** | **25937.7** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 235.90 | -6141.43 | 235.90 | -6141.43 |
| Step 2: Nutrient Budget* X 1.2 | 283.08 | -7369.72 | 283.08 | -7369.72 |
| **Stage 4 Final Nutrient Load** | **283.08** | **-7369.72** | **283.08** | **-7369.72** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 361.49 | 30124.29 | 333.07 | 27756.20 |
| Step 2: Nutrient Budget* X 1.2 | 433.79 | 36149.15 | 399.68 | 33307.44 |
| **Stage 4 Final Nutrient Load** | **433.79** | **36149.15** | **399.68** | **33307.44** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 59.74 | 30.95 | 56.90 | 27.89 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 23.59 | -7.92 | 23.59 | -7.92 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 36.15 | 38.87 | 33.31 | 35.81 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

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