

LITTLEBOURNE, EVENHILL  
LITTLEBOURNE, CANTERBURY

# **NUTRIENT NEUTRALITY ASSESSMENT AND MITIGATION STRATEGY**

GLADMAN DEVELOPMENTS LTD

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## Authorisation and Version Control

This Nutrient Neutrality Assessment was commissioned by Gladman Developments Ltd to investigate and mitigate against the concerns raised by Natural England regarding the nutrient neutrality of the proposed development near Littlebourne, Canterbury and the potential adverse effects on downstream designated sites.

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C02	04/10/2023	Revised to address soil conditions	CMG	MW	GL
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## EXECUTIVE SUMMARY

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In 2018, the European Court of Justice refined the definition of plans and projects and ruled that mitigation needs to be in place to ensure that there will be no significant adverse impacts on the conservation status of designated sites. Additional nutrient loading to designated sites already in an unfavourable conservation status is effectively therefore not permissible unless mitigation is in place. This ruling has come to be known as 'The Dutch Case'.

In the Stour River catchment in East Kent, developments could adversely impact the designated site known as Stodmarsh. Several of the nature reserve lakes of which the Stodmarsh is composed are in a state of eutrophication (an unfavourable conservation status) and therefore the ruling of the Dutch Case applies. All developments in the catchment have to demonstrate 'nutrient neutrality' in order to ensure no adverse effect on the integrity of the designated site, meaning that the nutrients generated by the development must be less than or equal to the nutrients generated by the existing land use.

The application site is 15.77 ha in size and is located on the southwestern edge of Littlebourne, a village located approximately 3.5 km to the east of Canterbury in Kent.

The proposal is for the construction of up to 300 dwellings with associated infrastructure, greenspace, amenities, access roads and parking.

An adverse effect on Stodmarsh cannot be ruled out from the development, in the absence of any mitigation. It is therefore proposed to mitigate the nutrient budget from the site through a wider mitigation strategy. Through this mitigation strategy, nutrient neutrality can be achieved for the site.

Following the passage of the Levelling Up and Regeneration Act, Newnham Valley Preston Wastewater Treatment works will be required to meet new discharge license limits by the 1<sup>st</sup> of April 2030. Due to the considerable reduction in wastewater nutrient load post-2030, the development proposes for foul water to be conveyed to Newnham Valley Preston WwTW, instead of an onsite Wastewater Treatment works.

In order to achieve nutrient neutrality, it has been proposed to use sustainable drainage systems to reduce the surface water nutrient load. The wastewater load will be considerably reduced post-2030 once Newnham Valley Preston WwTW has been upgraded. The remaining budget will be mitigated through the purchase of credits, for both the pre and post 2030 budgets.

## ABBREVIATIONS

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<b>Acronym</b>	<b>Definition</b>
AA	Appropriate Assessment
EA	Environment Agency
CCC	Canterbury City Council
FCT	Favourable Condition Targets
HRA	Habitats Regulations Assessment
LPA	Local Planning Authority
LURA	Levelling Up and Regeneration Act
NE	Natural England
NEGM	Natural England Generic Methodology
NN	Nutrient Neutrality
NVP	Newnham Valley Preston
ONS	Office for National Statistics
SAAR	Standard Annual Average Rainfall
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Urban Drainage
TAL	Technically Achievable Limits
TN	Total Nitrogen
TP	Total Phosphorus
WwTW	Wastewater Treatment Works

# 1 INTRODUCTION

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- 1.1 The application site is 15.77 ha in size and is located on the southwestern edge of Littlebourne, a village located approximately 3.5 km to the east of Canterbury in Kent, under the jurisdiction of Canterbury City Council (CCC), who act as the Local Planning Authority (LPA).
- 1.2 The application is for the construction of up to 300 dwellings with public open space, landscaping, sustainable drainage systems (SuDS), and a vehicular access point.
- 1.3 As the site lies within the catchment of a European and internationally designated site – Stodmarsh – a Habitats Regulations Assessment (HRA) is required.

## Background

- 1.4 A HRA refers to the several distinct stages of assessment which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) to determine if a plan or project may affect the protected features of a habitats site (any site which would be included within the definition at Regulation 8 of the Conservation of Habitats and Species Regulations 2017) before deciding whether to undertake, permit or authorise it.
- 1.5 A significant effect should be considered likely if it cannot be excluded on the basis of objective information and it might undermine a site's conservation objectives. A risk or a possibility of such an effect is enough to warrant the need for an Appropriate Assessment (AA) to be carried out by the competent authority. 'Appropriate' is not a technical term. It indicates that an assessment needs to be proportionate and sufficient to support the task of the competent authority in determining whether the plan or project will adversely affect the integrity of the habitats site. An AA must contain complete, precise, and definitive findings and conclusions to ensure that there is no reasonable scientific doubt as to the effects of the proposed plan or project.<sup>1</sup>
- 1.6 In 2018, the European Court of Justice refined the definition of plans and projects in the so-called 'Dutch case' ruling that mitigation needs to be certain at the time of assessment to ensure that there will be no adverse effect on the conservation status of European designated sites which already exceed compliance limits<sup>2</sup>.
- 1.7 Nutrient neutrality is a means of ensuring that a plan or project does not add to existing nutrient burdens. Where nutrient neutrality is properly applied and the existing land does not undermine the conservation objectives, Natural England (NE) considers that an adverse effect on integrity alone and in combination can be ruled out<sup>3</sup>.
- 1.8 In the Stour Valley River catchment in East Kent, developments could adversely affect Stodmarsh, which is designated a Site of Special Scientific Interest (SSSI), Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site. Several of the nature reserve lakes at Stodmarsh are in a state of eutrophication (an unfavourable conservation status) and therefore the ruling of the Dutch Case applies.
- 1.9 The practical implication of the Dutch Case across England is the necessity to mitigate increases in nutrient loading from new development including nutrients contained in surface water runoff and an increase in wastewater flows to any of the Wastewater Treatment Works (WwTW) in the relevant catchment.

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<sup>1</sup> Guidance on the use of Habitats Regulations Assessment – <https://www.gov.uk/guidance/appropriate-assessment> – accessed 11/2022

<sup>2</sup> Joined Cases C-293/17 and C-294/17 of the European Court of Justice

<sup>3</sup> Wood, A., Wake, H., and McKendrick-Smith, K. (2022) 'Nutrient Neutrality Principles' Natural England Technical Information Note, TIN186

- 1.10 Following the passage of the Levelling Up and Regeneration Act (LURA) on 26<sup>th</sup> of October 2023, WwTW that meet the requirements will need to be upgraded to meet much stricter effluent concentration requirements.
- 1.11 Schedule 15 of the LURA specifies that authorities must assume that the WwTW will be upgraded by the 1<sup>st</sup> of April 2030, and so two different nutrient budgets will be calculated for the development.

## Scope of Study

- 1.12 The main objectives of this study are to:
- Provide an overview of NE's position with respect to water quality within the Habitats Site;
  - Present calculations, based on the absence of any mitigation measures, to outline the potential increase in nutrient loading as a result of the proposed development; and
  - Outline the mitigation strategy proposed to manage surface and wastewater from the proposed development and present supporting calculations to ensure that, from the first occupation of the dwellings, the proposed development is nutrient neutral.

## 2 WATER QUALITY IN STODMARSH

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### Stodmarsh Designated Sites<sup>4</sup>

2.1 The Stodmarsh SSSI is designated by NE for the following features of interest:

- Wetland habitats including extensive reedbeds, swamp and fen communities;
- Open water habitats including lakes, ditches, and lagoons;
- Diverse breeding and non-breeding bird communities. Two rare British birds – Cetti's warbler and bearded tit – breed here in nationally significant numbers;
- Varied invertebrate fauna, including multiple scarce moth species;
- An assemblage of vascular plants.

2.2 The Stodmarsh SPA is designated for the following features and supported species:

- Bittern (Non-Breeding);
- Gadwall (Breeding and Non-Breeding);
- Hen Harrier (Non-Breeding);
- Shoveler (Non-Breeding);
- Breeding bird assemblage;
- Waterbird assemblage;

2.3 The Stodmarsh Ramsar Site is designated, under criteria 2 of the Ramsar Convention, for:

- Wetland invertebrate assemblage;
- Wetland plant assemblage;
- Assemblage of rare wetland birds;
- Bearded tit populations (Breeding and Wintering);
- Bittern (Wintering);
- Gadwall (Breeding and Wintering);
- Hen Harrier (Wintering);
- Shoveler (Wintering);

2.4 The Stodmarsh SAC is designated for the following qualifying species:

- Desmoulin's whorl snail;

2.5 The focus of this letter is on the evidence of degrading water quality in the Stodmarsh SSSI, SPA, Ramsar and SAC, henceforth referred to as the 'Habitats Sites'.

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<sup>4</sup> Designatedsites.naturalengland.org.uk (Accessed 01/2023)

## Nutrients of Significance

- 2.6 It has been found that the nutrients of the highest significance in terms of water quality in the Habitats Sites are Total Nitrogen (TN) and Total Phosphorus (TP).
- 2.7 TN includes organic and inorganic forms of nitrogen, both of which are available for plant growth and can contribute to algal blooming. TN is the sum of inorganic forms of nitrogen – nitrate nitrogen (NO<sub>3</sub>-N), nitrite nitrogen (NO<sub>2</sub>-N) and ammoniacal nitrogen (NH<sub>3</sub>-N and NH<sub>4</sub>-N) – and organically bonded nitrogen.
- 2.8 TP includes all phosphorus components – phosphate phosphorus (PO<sub>4</sub>-P), dissolved organic phosphorus and particulate phosphorus in algal and bacterial cells – and also includes mineral particles such as clay.

## Water Quality

- 2.9 The condition of the Habitats Sites which support the designated features is in part dependent on the water quality within them. The occurrence of excessive nutrients in the Habitats Sites can impact the competitive interactions between high plant species, and between higher plant species and algae, which can result in dominance in attached forms of algae, and a loss of characteristic plant species.
- 2.10 Changes in plant growth and community composition can have implications for the wider food web and the species present. Increased nutrients and the occurrence of eutrophication can also affect the dissolved oxygen levels in the waterbody, which can also impact the biota within the Habitats Sites.
- 2.11 Algal Bloom and fish kill events have been observed in one of the Habitats Sites Lakes (SSSI Unit 010). Assessments by NE have described the condition of this lake as 'unfavourable' and indicated high nutrient levels. TP has been measured at 1000 µg/l where the target for SSSI lakes is 49 µg/l. Eutrophication, which arises as a result of increased water nutrient levels, can lead to a reduction of fish and macrophyte populations. This in turn impacts food availability for SPA/Ramsar birds and the qualifying invertebrate community. The reason for this adverse condition is quoted as 'Freshwater pollution – Water Pollution – Discharge'.
- 2.12 The lake within SSSI Unit 007 has also been described as 'unfavourable' and has been found to fail in reaching nationally agreed water quality targets, including an excess of nitrogen and phosphorus. The reason for this adverse condition is quoted as 'Freshwater pollution – Water Pollution – Agriculture/Runoff'.
- 2.13 Lakes within Units 001, 002 and 005 are described as in 'Favourable' or 'Unfavourable – recovering' condition and thus are not of concern for this assessment.
- 2.14 Concentrations of TN and TP have been recorded within the lakes in SSSI Units 007 and 010 above the NE SSSI Favourable Condition Targets (FCTs) of 49 µg/l TP and 1.5 mg/l TN. It is important to understand the mechanism by which these nutrients enter the Habitats Sites. Some of the major sources of TN and TP have been identified as the following<sup>56</sup>:
- WwTWs which outfall into the Stour upstream of the Habitats Sites;
  - Runoff from urban and agricultural land;
  - Flood waters from the River Great Stour (during both high flow and tidal events); and

<sup>5</sup>APEM, Stodmarsh SSSI, SPA and NNR Lake Hydrology Project Phase 1, April 2016

<sup>6</sup>ATKINS, Stodmarsh Lake Hydrology Study, May 2016

- Recycling of Nutrients within lake 007 itself.

2.15 In the case of TP, it has been estimated<sup>6</sup>, that the dominant source of phosphate in the River Stour is WwTWs, accounting for 50% – 80% of concentrations in the river adjacent to the Habitats Sites.

## Strategic Approach

- 2.16 Where sites are already in unfavourable condition due to elevated nutrient levels, NE considers that competent authorities will need to carefully justify how further inputs from new plans and projects, either alone or in combination, will not adversely affect the integrity of the site given the conservation objectives.<sup>7</sup>
- 2.17 To address the uncertainty and the subsequent risk to the Habitats Sites, the mitigation strategy outlined in this report will ensure that the proposed development does not add to existing nutrient burdens and provides certainty that the whole of the scheme is deliverable in line with the requirements of the Conservation of Habitats and Species Regulations 2017<sup>8</sup> and in light of relevant case law<sup>9</sup>.
- 2.18 The latest NE guidance has been followed to ensure that the proposed development will be nutrient neutral (i.e. will not increase the flux of nutrients to the designated site).
- 2.19 In this report the following staged approach has been implemented: in Part 1, it was calculated, in the absence of any mitigation measures, the potential increase in nutrient loading from the proposed development. In Part 2, a mitigation strategy was proposed and supporting calculations have been presented which provide sufficient and reasonable certainty that the development will not contribute to an increase in nutrient loading.
- 2.20 The nutrient neutrality calculations in this report were based on key inputs and assumptions based on the best available scientific evidence and research. To accommodate for the necessary level of uncertainty in these key assumptions, a buffer has been used when calculating levels of nutrients. This buffer ensures that a precautionary approach is followed throughout.

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<sup>7</sup> Natural England (16 March 2022) Letter to LPA Chief Executives and heads of planning 'Advice for development proposals with the potential to affect water quality resulting in adverse nutrient impacts on habitats sites.'

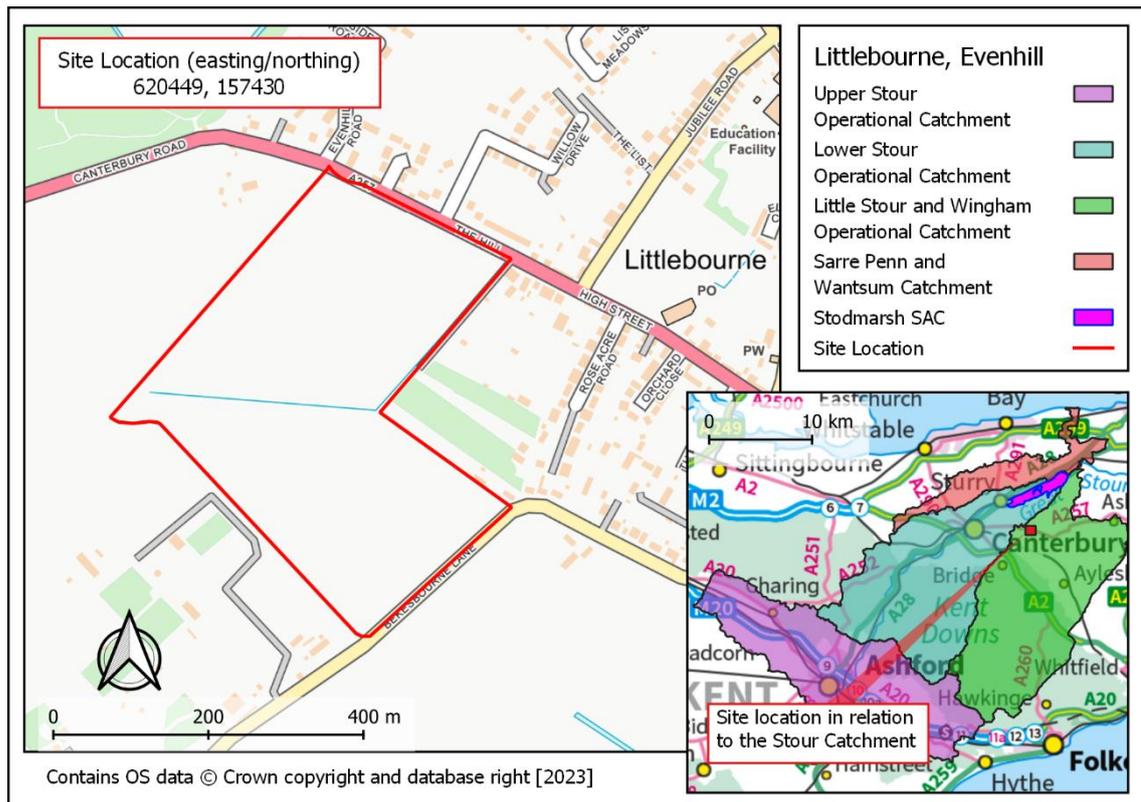
<sup>8</sup> Conservation of Habitats and Species Regulations (England and Wales) Regulations 2017

<sup>9</sup> Including Wildlife and Countryside Act 1981, Countryside and Rights of Way Act 2000 and Rural Communities Act 2006

### 3 SITE DESCRIPTION

#### Location

- 3.1 The application site, henceforth referred to as 'the Site', is 15.77 ha in size and is located on the southwestern edge of Littlebourne, a village located approximately 3.5 km to the east of Canterbury in Kent.
- 3.2 The site boundary and location in respect to the Habitats Site is shown in Figure 1. The site is located in the Little Stour and Wingham Operational Catchment.



**Figure 1: Location of Site**

#### Proposed Development

- 3.3 The application is for the construction of up to 300 dwellings with public open space, landscaping, SuDS, and vehicular access point.
- 3.4 The development framework plan for the proposed scheme is attached in Appendix A.

## 4 PART 1: CALCULATING THE NUTRIENT BUDGET

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### Natural England Methodology

- 4.1 The latest version of the Natural England Generic Methodology (NEGM) for determining whether a site achieves nutrient neutrality was issued in March 2022<sup>10</sup>. This guidance lays out the process of calculating the nutrient budget and provides worked examples.

#### *Stage 1 – Total Wastewater Load*

- 4.2 Stage 1 of the calculation is to calculate the nutrient load from the additional wastewater that will be generated by the development. This stage specifically only includes new overnight stays in the development, as it is assumed that any additional wastewater generated by diurnal use would be accounted for elsewhere.
- 4.3 This is done by multiplying the total amount of wastewater by the expected concentration of treated effluent from the WwTW serving the development. The WwTW can be determined through an enquiry from the wastewater service provider in the development location.
- 4.4 The NEGM recommends using water use as a proxy for total wastewater amount, excluding any garden use. NE's advice is to use the Building Regulations to determine the average water use per person, and then to add 10 litres/person/day (l/p/d) to the value to account for uncertainty in any future changes to fittings.
- 4.5 The increase in the number of people from a development can be determined using census data from the Office for National Statistics (ONS). This gives the average occupancy of a dwelling type, and NE recommends the use of the national average occupancy rate to determine the expected population.

#### *Stage 2 and Stage 3 – Existing and Future Surface Water Loads*

- 4.6 Stage 2 of the calculation is to consider the existing land use on the site, and Stage 3 is to consider the future land-use onsite. Using the ADAS Farmscoper tool, loading factors can be determined for all different agriculture uses within the catchment. These loading factors are further separated by the underlying soil drainage conditions and average rainfall and are measured in kg/ha/year.
- 4.7 The NEGM does not elaborate on how greenspace and woodland loading rates were derived, however, in previous NE Guidance<sup>11</sup>, detail was provided on how TN loading factors for non-agricultural and non-urban land uses were calculated. Three main sources of TN were identified: atmospheric deposition, pet waste and TN fixation. It was estimated, based on several studies, that the catchment would retain 90% of all TN. This was studied in both the Solent catchment and the Stodmarsh catchment, and it was found that the numbers did not vary significantly. It is expected that this would be the case throughout England.
- 4.8 For woodland and heathland, the pet waste was discounted, and a total loading factor of 3 kgN/ha/year was therefore calculated. In the latest guidance, greenspace, open space, and woodland have all been given the same loading factor of 3 kgN/ha/year.
- 4.9 For TP, evidence suggested that non-agricultural, non-urban land uses do not leach TP. It was therefore conservatively assumed that woodland, greenspace, and similar land uses would leach TP at the limit of detection which, in some studies, was 0.02 kgP/ha/year.

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<sup>10</sup> Ricardo and Natural England (February 2022) Nutrient Neutrality Generic Methodology

<sup>11</sup> Natural England (2020), 'Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites'

- 4.10 In the NEGM, urban loading factors were modelled using assumed<sup>12</sup> 'event mean concentrations' (EMC) of nutrients for rainfall events. The average runoff for a site can be calculated using the Modified Rational Method and multiplying the runoff by the EMC will give the nutrient load. This has been standardised for a 1 ha site so that a loading factor can be obtained in the same units of measurement as for agriculture and greenspace.
- 4.11 Using these loading factors, and the area of various land uses on the site, the existing and future nutrient load from diffuse sources can be calculated.

#### *Stage 4 – Final Unmitigated Nutrient Budget*

- 4.12 Stage 4 of the calculation is the final stage. At this point, the totals from Stage 1 and Stage 3 are added together, and the total from Stage 2 is subtracted. If there is a surplus (i.e., the proposed total is higher than the existing total), a buffer (factor of safety) of 20% is added to the total, and this is then referred to as 'the nutrient budget'. If the nutrient budget comes out as less than or equal to zero, then the development has achieved nutrient neutrality.
- 4.13 All the calculations set out in this section can be seen in full in Appendix B of this report.

#### **Additional Wastewater – Pre 2030**

- 4.14 The primary source of nutrients from residential development is usually domestic wastewater. Typically, wastewater is conveyed from the development to the public sewerage and onto the WwTW for treatment before discharge to surface waters.
- 4.15 In this case, wastewater would be discharged to Newnham Valley Preston (NVP) WwTW which has no limit for TN and a limit of 1 mg/l for TP. Therefore, in line with the NEGM, the effluent concentrations are taken as 27 mgN/l and 0.9 mgP/l.
- 4.16 In line with the NEGM, the ONS national average occupancy of 2.4 people per house has been used. As the development is for 300 houses, the future population has therefore been taken as 720 people.
- 4.17 Based on the effluent concentrations laid in the paragraphs above, with an average water consumption of 120l/p/d, it has been calculated that the future wastewater nutrient load from the proposed development will be 852.06 kgN/year and 28.40 kgP/year.

#### **Additional Wastewater – Post 2030**

- 4.18 Following the passage of the LURA on 26<sup>th</sup> of October 2023, NVP WwTW will be required to upgrade its treatment process to meet new licence limits of 10 mgN/l for TN and 0.25 mgP/l for TP respectively.
- 4.19 This will impact the calculation of the wastewater nutrient load, reducing it to 284.02 kgN/year and 7.1 kgP/year, following the upgrade of the WwTW.
- 4.20 Schedule 15 of the LURA specifies that authorities must assume that the WwTW will be upgraded by the 1<sup>st</sup> of April 2030, so two different nutrient budgets have been calculated for the development.

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<sup>12</sup> The latest NE methodology quotes 'Mitchell, G., 2005. Mapping hazard from urban non-point pollution: A screening model to support sustainable urban drainage planning. Journal of Environmental Management, 74(1), pp. 1-9' in the definition of the so-called 'event mean concentrations'. However, the paper does not disclose how the event mean concentrations listed were calculated.

## Land-Use Change

- 4.21 The greenfield runoff estimation tool on the HR Wallingford Website<sup>13</sup> gives a standard annual average rainfall (SAAR) for this site of 660 mm/year, and SoilsCAPES<sup>14</sup> gives a soil drainage type of “Freely Draining”. However, infiltration testing onsite failed to obtain a result, with no drop in water level over the duration of the test. Based on this information, which is presented in Appendix C, the soil drainage type has been taken as “Impeded”.
- 4.22 Prior to this redevelopment, the land was fields used to grow cereals. Under the NE Guidance, this land-use is classified as “Cereals”. At an area of 15.77 ha, this gives an existing surface water nutrient load of 318.15 kgN/year and 8.68 kgP/year.
- 4.23 After redevelopment, the land will be in use as:
- “Residential Urban”, with a total area of 8.58 ha and a leaching rate of 105.58 kgN/year and 11.32 kgP/kg.
  - “Open Urban”, with a total area of 0.21 ha and a leaching rate of 1.51 kgN/year and 0.15 kgP/kg.
  - “Greenspace”, with a total area of 6.71 ha and a leaching rate of 20.14 kgN/year and 0.13 kgP/kg.
  - “Community Food Growing”, with a total area of 0.27 ha and a leaching rate of 5.87 kgN/year and 0.01 kgP/kg.
- 4.24 The future surface water nutrient load will therefore be 133.1 kgN/year and 11.62 kgP/year.

## The Nutrient Budget

- 4.25 Two separate nutrient budgets have been calculated for the pre-2030 and post-2030 periods. The nutrient budget is calculated by adding the future surface water loads to the future wastewater loads, and then subtracting the existing nutrient loads.
- 4.26 Table 1 shows a summary of the nutrient budget calculation both before and after 2030.

**Table 1: Unmitigated Nutrient Budgets Before and After 2030**

All units in kg/year	Future Wastewater Load		Future Surface Water Load		Existing Nutrient Load		Nutrient Budget		Nutrient Budget with 20% Buffer	
	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP
Pre 2030	852.06	28.4	133.1	11.62	318.15	8.68	667.01	31.34	<b>800.41</b>	<b>37.61</b>
Post 2030	284.02	7.1	133.1	11.62	318.15	8.68	98.97	10.04	<b>118.77</b>	<b>12.04</b>

<sup>13</sup> Uksuds.com – accessed 05/2023

<sup>14</sup> <http://www.landis.org.uk/soilsCAPES/#>. – accessed 05/2023

## 5 PART 2: MITIGATION STRATEGY

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- 5.1 As the development will result in an increase in nutrient load, mitigation will be required to achieve nutrient neutrality. The mitigation strategy presented in this section has been designed to reduce the nutrient budget to zero.
- 5.2 All calculations for the proposed mitigation strategy are included in full in Appendix B of this report.
- 5.3 Due to the LURA, there are two separate nutrient budgets that are required to be offset by the development, these are as follows:
  - Pre-2030: 800.41 kgN/year and 37.61 kgP/year
  - Post-2030: 118.77 kgN/year and 12.04 kgP/year

### Reduction in Nutrient Load through Sustainable Drainage Systems

- 5.4 It is recommended that SuDS are included on site. Reduction rates vary depending on the specific type of SuDS implemented, but the highest achievable removal rate under CIRIA's guidance (C808) is 84.5% for TP, without accounting for infiltration. This can be achieved using a bioretention zone, which removes 80% of particulate phosphorus, combined with an adsorptive media basket, which removes 90% of dissolved phosphorus.
- 5.5 CIRIA has released new guidance on TN removal rates (C815)<sup>15</sup>. The guidance suggests that a TN removal rate of 30% can be achieved using a SuDS treatment train, which will be confirmed at the detailed design stage of the application.
- 5.6 Using these removal rates of 30% for TN and 84.5% for TP, the future surface water nutrient load would be reduced from 133.1 kgN/year and 11.62 kgP/year to 100.97 kgN/year and 1.92 kgP/year.
- 5.7 The SuDS elements of the strategy will be maintained according to the appropriate maintenance schedule as listed in the CIRIA SuDS Manual C753.

### Offsite Mitigation via the Purchase of Credits

- 5.8 It is proposed that the development will use nutrient credits, obtained from a nutrient credit scheme, to offset the remaining nutrient budget. Thus, reducing the budget to zero, and meeting the nutrient neutrality requirements.
- 5.9 Post 2030, and with the addition of SuDS, a total of 80.21 kgN/year and 0.41 kgP/year is required to be offset by the development through credits.
- 5.10 Pre-2030, a total of 761.86 kgN/year and 25.97 kgP/year worth of credits is required for the interim period until NVP WwTW is upgraded.
- 5.11 The use of nutrient credits is a feasible solution to offset developments within Stodmarsh. The credits will be provided from an approved development scheme that has a surplus of TN and TP credits available. Gladman Developments have approached a nutrient credit scheme within the Stodmarsh catchment that has already received approval from Canterbury City Council and NE. The nutrient credit provider has confirmed that the number of credits required to offset the

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<sup>15</sup> Bradley, J (2022) *Using SuDS to reduce nitrogen in surface water runoff*. C815, CIRIA, London, UK (ISBN: 978-0-86017-962-7)

proposed development at Littlebourne is available, therefore making the use of credits a viable mitigation solution.

- 5.12 A letter of support from the credit provider can be found in Appendix C.
- 5.13 The nutrient budget to be mitigated will need to be confirmed as part of any subsequent Reserved Matters application. As such, whilst it can be demonstrated for this Outline application the principle of nutrient neutrality using mitigation in the form of credits, it is expected an appropriately worded Condition will require approval prior to occupation.

### Program of Delivery

- 5.14 It is proposed that 150 of the 300-dwelling development will be delivered before 1<sup>st</sup> of April 2030. This will allow for the consent for an Outline Planning Application, submission and approval of a Reserved Matters consent and an anticipated build program of 50 units per year, with first occupation not until January 2027.
- 5.15 Pre 2030, it is proposed that 150 dwellings will be delivered. 75 dwellings can be built with the application of solely SuDS as mitigation to achieve neutrality. The additional 75 dwellings will include SuDS, and the remaining budget will be entirely offset through the purchase of nutrient credits.
- 5.16 Post 2030, the remaining 150 dwellings can be built. The dwellings do not require any offsetting as they achieve nutrient neutrality through the LURA, once NVP WwTW has been upgraded (April 2030), and the credits purchased to offset the 75 dwellings pre-2030, are sufficient to offset the remaining nutrient budget post 2030, for the entire 300 dwelling development. Therefore, no additional credits are required post-2030.
- 5.17 As mentioned previously, the nutrient budget to be mitigated will be confirmed as part of any subsequent Reserved Matters application, and an appropriately worded Condition will require approval prior to occupation.

### Summary of the Mitigation Strategy

- 5.18 The future nutrient budget for the proposed development has been reduced with the application of SuDS, to reduce the nutrient load in surface water, and through the upgrade of NVP WwTW post-2030, to reduce the nutrient load in wastewater. The remaining budget has been offset via nutrient credits.
- 5.19 Pre 2030, 75 dwellings can be delivered through SuDS alone, the additional 75 dwellings will be offset through the purchase of credits.
- 5.20 Post 2030, the remaining 150 dwellings can be built without mitigation, as they achieve nutrient neutrality through the LURA, and the previously acquired credits for the 75 dwellings. No additional credits are required.
- 5.21 As such, it is expected an appropriately worded Condition can be imposed upon any Consent requiring a scheme for nutrient neutrality to be approved prior to any dwelling on any phase of the development.

## 6 CONCLUSIONS

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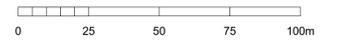
- 6.1 Following the procedure outlined in the NEGM it has been demonstrated, through the implementation of the proposed mitigation strategy, that the proposed development be nutrient neutral in respect to the Habitats Sites.
- 6.2 The wastewater nutrient load will be reduced through the upgrade of NVP WwTW post-2030. SuDS will be used to reduce the onsite nutrient load pre-2030 for the proposed 150 dwellings. The remaining nutrient budget will be reduced by purchasing the necessary number of credits for the 75 dwellings that will be built pre-2030.
- 6.3 Although credits are required to deliver the 75 units pre-2030, no additional credits are required to deliver the whole 300-unit scheme post 2030.
- 6.4 Regardless of the mitigation strategy proposed on the varying phases of the development, it is expected and accepted elsewhere in the UK, that a series of Grampian Planning Conditions and Obligations will be required to limit occupation, providing further certainty to NE, that no unit on the proposed scheme will be occupied until nutrient neutrality can be demonstrated.

## APPENDIX A: DRAWINGS

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**Development Framework Plan:** FPCR Dwg No. 09538-FPCR-XX-XX-DR-L-0001 Issue P15

NOTES  
 This drawing is the property of FPCR Environment and Design Ltd and is issued on the condition it is not reproduced, retained or disclosed to any unauthorised person, either wholly or in part without written consent of FPCR Environment and Design Ltd.  
 Ordnance Survey base mapping - supplied by client.



KEY

- Site Boundary 15.77ha
- Residential Development (up to 300 dwellings at 35dph) 8.58ha
- Pumping Station 0.015ha
- Potential Location of Allotments / Growing area 0.27ha
- Community Facilities (shop etc.)
- Main Road with Avenue Tree Planting and Footpath / Bicycle Route
- Secondary Road
- Vehicular Access Locations
- Pedestrian and Cyclist Access Locations
- Surfaced Footpath / Bicycle Route
- Informal Footpath Routes, Mown and through Native Tree Belt
- Proposed Individual Tree Planting / Avenue Trees
- Proposed Native Tree Groups, Scrub and Hedgrows
- Proposed Native Tree Belts
- Existing Trees, Tree Groups and Hedgrows
- Play Provision 0.208ha
- Community Orchard
- Variety of Species Rich Grass Mixes
- Bulb Planting
- Proposed Attenuation Basins
- Wetland Area
- Ditch Bottom
- 5m Offset from Ditch Bottom
- 20m Offset from Ditch Bottom



POLICY STANDARD CANTERBURY DISTRICT LOCAL PLAN TO 2045 (DRAFT)			
Green Infrastructure Type	Local Plan Requirement	Proposed	Provision Above Requirement
<b>Semi natural &amp; natural space</b>	4.0 per 1000 population = 2.88ha	<b>4.055ha</b>	<b>1.175ha</b>
<b>Parks &amp; gardens</b>	0.8ha per 1000 population = 0.57ha	<b>0.57ha</b>	-
<b>Amenity green space &amp; green corridors</b>	2.25ha per 1000 population = 1.62ha	<b>2.042ha</b>	<b>0.425ha</b>
<b>LEAPs &amp; LAPs facilities</b>	0.25ha per 1000 population = 0.18ha	<b>0.208ha</b>	<b>0.028ha</b>
<b>Allotments / Growing Area</b>	0.375ha per 1000 population = 0.27ha	<b>0.27ha</b>	-

NB: Above Calculations based on 300 dwellings at 2.4 persons per dwelling (= 720 pop)

masterplanning  
 environmental assessment  
 landscape design  
 urban design  
 ecology  
 architecture  
 arboriculture

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 Lockington  
 Derby  
 DE74 2RH  
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File: K:\9500\9538\LANDS\Plans\09538-FPCR-XX-XX-DR-L-0001-P15\_V2024.vwx

## APPENDIX B: CALCULATIONS

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**Water Environment Limited:** Nutrient Neutrality Calculations Ref 21045-NUT-CA-01 C04:

- Sheet 1: Unmitigated pre-2030.
- Sheet 2: Unmitigated post-2030.
- Sheet 3: 75 Units pre-2030
- Sheet 4: 150 Units pre-2030
- Sheet 5: Mitigated post-2030.

**Nutrient Neutrality Calculations  
Unmitigated Pre-2030**



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<i>Reference</i>	<i>Revision</i>	<i>Sheet</i>
<b>21045-NUT-CA-01</b>	<b>C04</b>	<b>1</b>
<i>Client</i>	Gladman Developments Ltd	
<i>Project</i>	Littlebourne	
<i>Author</i>	Megan Ward	
<i>Checker</i>	Christopher Garrard	
<i>Date</i>	26/03/2024	

Standard Average Annual Rainfall (mm)	660	Soil Type	Impeded Drainage
Nitrate Vulnerable Zone	FALSE	Catchment	Little Stour and Wingham

**Stage 1 - Total Nutrient Load from Development Wastewater**

Measurement	Value	Unit	Reference	
New Dwellings	300	number		
Average Occupancy	2.4	persons/dwelling		
Future Population	720.0	persons		
Water Use	120	litres/person/day		
Wastewater Discharging to:	Newnham Valley WwTW	Post-2025		epoch
		TN		TP
Licence Limits (mg/l)	27.00	1.00		
Effluent Concentrations (mg/l)	27.00	0.90		
<b>Future Wastewater Nutrient Load</b>	<b>852.06</b>	<b>28.40</b>		
	kgN/year	kgP/year		

**Stage 2 - Calculation of Existing Nutrient Load from Surface Water**

Existing Land Use	Existing Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
Cereals	15.77	318.15	8.68	
<b>Existing Surface Water Nutrient Loads</b>		<b>318.15</b>	<b>8.68</b>	
		kgN/year	kgP/year	

**Stage 3 - Calculation of Future Nutrient Load from Surface Water**

Future Land Use	Proposed Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
<b>Urban Land Uses</b>				
Residential Urban	8.58	105.58	11.32	
Open Urban		1.51	0.15	
	0.21			
Reduction factor due to SuDS				
<b>Urban Nutrient Load</b>		<b>107.09</b>	<b>11.47</b>	
<b>Non-Urban Land Uses</b>				
Greenspace	6.71	20.14	0.13	
Community Food Growing	0.27	5.87	0.01	
<b>Non-Urban Nutrient Load</b>		<b>26.01</b>	<b>0.14</b>	
<b>Future Surface Water Nutrient Loads</b>		<b>133.10</b>	<b>11.62</b>	
		kgN/year	kgP/year	

**Stage 4 - Calculation of Nutrient Budget**

Measurement	TN	TP	Explanation
Future Nutrient Load	985.16	40.02	The nutrient budget is equal to the future nutrient load minus the existing nutrient load
Existing Nutrient Load	318.15	8.68	
<b>Nutrient Budget</b>	<b>667.01</b>	<b>31.34</b>	
<b>Nutrient Budget with 20% Buffer</b>	<b>800.41</b>	<b>37.61</b>	
	kgN/year	kgP/year	

**Nutrient Neutrality Calculations  
Unmitigated Post-2030**



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<i>Reference</i>	<i>Revision</i>	<i>Sheet</i>
<b>21045-NUT-CA-01</b>	<b>C04</b>	<b>2</b>
<i>Client</i>	Gladman Developments Ltd	
<i>Project</i>	Littlebourne	
<i>Author</i>	Megan Ward	
<i>Checker</i>	Christopher Garrard	
<i>Date</i>	26/03/2024	

Standard Average Annual Rainfall (mm)	660	Soil Type	Impeded Drainage
Nitrate Vulnerable Zone	FALSE	Catchment	Little Stour and Wingham

**Stage 1 - Total Nutrient Load from Development Wastewater**

Measurement	Value	Unit	Reference	
New Dwellings	300	number		
Average Occupancy	2.4	persons/dwelling		
Future Population	720.0	persons		
Water Use	120	litres/person/day		
Wastewater Discharging to:	Newnham Valley WwTW	Post-2030		epoch
		TN		TP
Licence Limits (mg/l)	10.00	0.25		
Effluent Concentrations (mg/l)	9.00	0.23		
<b>Future Wastewater Nutrient Load</b>	<b>284.02</b>	<b>7.10</b>		
	kgN/year	kgP/year		

**Stage 2 - Calculation of Existing Nutrient Load from Surface Water**

Existing Land Use	Existing Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
Cereals	15.77	318.15	8.68	
<b>Existing Surface Water Nutrient Loads</b>		<b>318.15</b>	<b>8.68</b>	
		kgN/year	kgP/year	

**Stage 3 - Calculation of Future Nutrient Load from Surface Water**

Future Land Use	Proposed Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
<b>Urban Land Uses</b>				
Residential Urban	8.58	105.58	11.32	
Open Urban	0.21	1.51	0.15	
Reduction factor due to SuDS				
Urban Nutrient Load		107.09	11.47	
<b>Non-Urban Land Uses</b>				
Greenspace	6.71	20.14	0.13	
Community Food Growing	0.27	5.87	0.01	
Non-Urban Nutrient Load		26.01	0.14	
<b>Future Surface Water Nutrient Loads</b>		<b>133.10</b>	<b>11.62</b>	
		kgN/year	kgP/year	

**Stage 4 - Calculation of Nutrient Budget**

Measurement	TN	TP	Explanation
Future Nutrient Load	417.12	18.72	The nutrient budget is equal to the future nutrient load minus the existing nutrient load
Existing Nutrient Load	318.15	8.68	
Nutrient Budget	98.97	10.04	
<b>Nutrient Budget with 20% Buffer</b>	<b>118.77</b>	<b>12.04</b>	
	kgN/year	kgP/year	

**Nutrient Neutrality Calculations**  
75 Units Pre-2030



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<i>Reference</i>	<i>Revision</i>	<i>Sheet</i>
<b>21045-NUT-CA-01</b>	<b>C04</b>	<b>3</b>
<i>Client</i>	Gladman Developments Ltd	
<i>Project</i>	Littlebourne	
<i>Author</i>	Megan Ward	
<i>Checker</i>	Christopher Garrard	
<i>Date</i>	26/03/2024	

Standard Average Annual Rainfall (mm)	660	Soil Type	Impeded Drainage
Nitrate Vulnerable Zone	FALSE	Catchment	Little Stour and Wingham

**Stage 1 - Total Nutrient Load from Development Wastewater**

Measurement	Value	Unit	Reference
New Dwellings	75	number	
Average Occupancy	2.4	persons/dwelling	
Future Population	180.0	persons	
Water Use	120	litres/person/day	
Wastewater Discharging to:	Newnham Valley WwTW	Post-2025	
		TN	TP
Licence Limits (mg/l)	27.00	1.00	
Effluent Concentrations (mg/l)	27.00	0.90	
<b>Future Wastewater Nutrient Load</b>	<b>213.01</b>	<b>7.10</b>	
	kgN/year	kgP/year	

**Stage 2 - Calculation of Existing Nutrient Load from Surface Water**

Existing Land Use	Existing Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
Cereals	15.77	318.15	8.68	
<b>Existing Surface Water Nutrient Loads</b>		<b>318.15</b>	<b>8.68</b>	
		kgN/year	kgP/year	

**Stage 3 - Calculation of Future Nutrient Load from Surface Water**

Future Land Use	Proposed Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
<b>Urban Land Uses</b>				
Residential Urban	4.29	52.79	5.66	
Open Urban	0.10	0.75	0.07	
Reduction factor due to SuDS		30%	85%	
Urban Nutrient Load		37.48	0.89	
<b>Non-Urban Land Uses</b>				
Greenspace	11.24	33.72	0.22	
Community Food Growing	0.14	2.94	0.00	
Non-Urban Nutrient Load		36.66	0.23	
<b>Future Surface Water Nutrient Loads</b>		<b>74.14</b>	<b>1.12</b>	
		kgN/year	kgP/year	

**Stage 4 - Calculation of Nutrient Budget**

Measurement	TN	TP	Explanation
Future Nutrient Load	287.16	8.22	The nutrient budget is equal to the future nutrient load minus the existing nutrient load
Existing Nutrient Load	318.15	8.68	
Nutrient Budget	-30.99	-0.46	
<b>Nutrient Budget with 20% Buffer</b>	<b>-30.99</b>	<b>-0.46</b>	The buffer is not applied to negative budgets
	kgN/year	kgP/year	

## Nutrient Neutrality Calculations

150 Units Pre-2030



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<i>Reference</i> <b>21045-NUT-CA-01</b>	<i>Revision</i> <b>C04</b>	<i>Sheet</i> <b>4</b>
<i>Client</i> Gladman Developments Ltd		
<i>Project</i> Littlebourne		
<i>Author</i> Megan Ward		
<i>Checker</i> Christopher Garrard		
<i>Date</i> 26/03/2024		

Standard Average Annual Rainfall (mm)	660	Soil Type	Impeded Drainage
Nitrate Vulnerable Zone	FALSE	Catchment	Little Stour and Wingham

### Stage 1 - Total Nutrient Load from Development Wastewater

Measurement	Value	Unit	Reference	
New Dwellings	150	number		
Average Occupancy	2.4	persons/dwelling		
Future Population	360.0	persons		
Water Use	120	litres/person/day		
Wastewater Discharging to:	Newnham Valley WwTW	Post-2025		epoch
		TN		TP
Licence Limits (mg/l)	27.00	1.00		
Effluent Concentrations (mg/l)	27.00	0.90		
<b>Future Wastewater Nutrient Load</b>	<b>426.03</b>	<b>14.20</b>		
	kgN/year	kgP/year		

### Stage 2 - Calculation of Existing Nutrient Load from Surface Water

Existing Land Use	Existing Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
Cereals	15.77	318.15	8.68	
<b>Existing Surface Water Nutrient Loads</b>		<b>318.15</b>	<b>8.68</b>	
		kgN/year	kgP/year	

### Stage 3 - Calculation of Future Nutrient Load from Surface Water

Future Land Use	Proposed Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
<b>Urban Land Uses</b>				
Residential Urban	4.29	52.79	5.66	
Open Urban	0.10	0.75	0.07	
Reduction factor due to SuDS		30%	85%	
Urban Nutrient Load		37.48	0.89	
<b>Non-Urban Land Uses</b>				
Greenspace	11.24	33.72	0.22	
Community Food Growing	0.14	2.94	0.00	
Non-Urban Nutrient Load		36.66	0.23	
<b>Future Surface Water Nutrient Loads</b>		<b>74.14</b>	<b>1.12</b>	
		kgN/year	kgP/year	

### Stage 4 - Calculation of Nutrient Budget

Measurement	TN	TP	Explanation
Future Nutrient Load	500.17	15.32	The nutrient budget is equal to the future nutrient load minus the existing nutrient load
Existing Nutrient Load	318.15	8.68	
Nutrient Budget	182.02	6.64	
<b>Nutrient Budget with 20% Buffer</b>	<b>218.43</b>	<b>7.97</b>	<b>Required nutrient credits to be purchased to achieve neutrality</b>
	kgN/year	kgP/year	

**Nutrient Neutrality Calculations  
Mitigated Post-2030**



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<i>Reference</i>	<i>Revision</i>	<i>Sheet</i>
<b>21045-NUT-CA-01</b>	<b>C04</b>	<b>5</b>
<i>Client</i>	Gladman Developments Ltd	
<i>Project</i>	Littlebourne	
<i>Author</i>	Megan Ward	
<i>Checker</i>	Christopher Garrard	
<i>Date</i>	26/03/2024	

Standard Average Annual Rainfall (mm)	660	Soil Type	Impeded Drainage
Nitrate Vulnerable Zone	FALSE	Catchment	Little Stour and Wingham

**Stage 1 - Total Nutrient Load from Development Wastewater**

Measurement	Value	Unit	Reference	
New Dwellings	300	number		
Average Occupancy	2.4	persons/dwelling		
Future Population	720.0	persons		
Water Use	120	litres/person/day		
Wastewater Discharging to:	Newnham Valley WwTW	Post-2030		epoch
		TN		TP
Licence Limits (mg/l)	10.00	0.25		
Effluent Concentrations (mg/l)	9.00	0.23		
<b>Future Wastewater Nutrient Load</b>	<b>284.02</b>	<b>7.10</b>		
	kgN/year	kgP/year		

**Stage 2 - Calculation of Existing Nutrient Load from Surface Water**

Existing Land Use	Existing Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
Cereals	15.77	318.15	8.68	
<b>Existing Surface Water Nutrient Loads</b>		<b>318.15</b>	<b>8.68</b>	
		kgN/year	kgP/year	

**Stage 3 - Calculation of Future Nutrient Load from Surface Water**

Future Land Use	Proposed Area (ha)	Nutrient Loads (kg/year)		Reference
		TN	TP	
<b>Urban Land Uses</b>				
Residential Urban	8.58	105.58	11.32	
Open Urban	0.21	1.51	0.15	
Reduction factor due to SuDS		30%	85%	
Urban Nutrient Load		74.96	1.78	
<b>Non-Urban Land Uses</b>				
Greenspace	6.71	20.14	0.13	
Community Food Growing	0.27	5.87	0.01	
Non-Urban Nutrient Load		26.01	0.14	
<b>Future Surface Water Nutrient Loads</b>		<b>100.97</b>	<b>1.92</b>	
		kgN/year	kgP/year	

**Stage 4 - Calculation of Nutrient Budget**

Measurement	TN	TP	Explanation
Future Nutrient Load	384.99	9.02	The nutrient budget is equal to the future nutrient load minus the existing nutrient load
Existing Nutrient Load	318.15	8.68	
Nutrient Budget	66.85	0.34	
<b>Nutrient Budget with 20% Buffer</b>	<b>80.21</b>	<b>0.41</b>	
	kgN/year	kgP/year	
<b>Final Nutrient Budget</b>	<b>0.00</b>	<b>0.00</b>	Final Nutrient Budget with the addition of Credits
	kgN/year	kgP/year	

## APPENDIX C: SUPPORTING DOCUMENTATION

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- **RSK Geosciences:** Ground Investigation and Soakaway Test Results
- **Letter of Support:** Nutrient Neutrality Credits

Our ref: 52485-L01 (00)

Date: 16th January 2023

Gladman Developments Limited  
Gladman House  
Alexandria Way  
Congleton  
CW12 1LB

**For the attention of: Mr S Barker**

## **LAND AT LITTLEBOURNE, CANTERBURY: INFILTRATION TESTING**

Dear Steve,

### **1. INTRODUCTION**

RSK have been commissioned by Gladman Developments Limited to undertake investigation works at the land at Littlebourne, Canterbury to investigate the infiltration characteristics of the shallow soils at four locations on site.

The works have been conducted as set out in RSK's original email proposal, dated 8<sup>th</sup> November 2022.

This letter report is subject to the RSK service constraints given in **Appendix A**.

### **2. BACKGROUND**

The Site is located to the south of The Hill A257, Littlebourne, Canterbury and can be located at National Grid reference 620431 E, 157586 N as shown in **Figure 1**. An indicative site boundary and current site layout are shown on **Figure 2**.

The site, which is roughly 'L' shaped, occupies an approximate area of approximately 15.11 hectares and is occupied by open agricultural land.

It is understood that the site will be developed for residential end-use.

Published records (British Geological Survey) for the area detail that the site is underlined by Head Deposits, which generally consists of poorly sorted, sometimes gravelly clay and silt, over the Thanet Sand Formation. The following section provides more detailed discussion of the ground conditions encountered on-site.

### **3. SITE INVESTIGATION**

RSK attended site on the 19<sup>th</sup> and 20<sup>th</sup> December 2022 to conduct soakaway testing at four test locations specified by RSK and agreed with the client. The location references are TP1 to TP4, as presented on **Figure 2**.

### 3.1 Ground conditions

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS 5930:2015. Detailed exploratory hole records are presented within **Appendix B** and a photo log in **Appendix C**. The strata encountered during fieldworks are summarised within **Table 1**.

**Table 1: Summary of strata encountered during site investigation**

Stratum	Exploratory holes encountered	Depth to top of stratum m below ground level (bgl)	Proven thickness (m)
Topsoil	All	Ground Level	0.40 - 0.50
Head Deposits	All	0.40 - 0.50	1.55 - 2.25
Thanet Sand Formation	TP03 & TP04	1.95 - 2.30	Base unproven

### 3.2 Soil descriptions

Topsoil was encountered at all locations. It was generally described as dark brown, sometimes gravelly, sandy silt with rootlets. Gravel is subangular to subrounded fine to coarse flint. Sand is fine to coarse.

Underlying the topsoil was the Head Deposits which were encountered at all exploratory locations. Its thickness was between 1.55m to 2.25m. The Head Deposits comprised orangey brown to dark brown slightly clayey slightly sandy SILT / silty slightly sandy GRAVEL / sandy CLAY / slightly clayey SILT / slightly sandy slightly silty CLAY. Gravel was fine to coarse subrounded to subangular flint. An old clay drainage pipe (likely redundant land drain) was encountered at 0.75m bgl in TP03.

Underlying the Head Deposits, soils believed to be representative of the Thanet Sand Formation were encountered at TP03 and TP04 at 1.95 – 2.30m bgl. The full thickness was not proven. The Thanet Sand Formation comprised yellowish brown or yellowish cream sandy SILT or a slightly sandy slightly silty GRAVEL. Gravel was fine to coarse subrounded to subangular flint.

### 3.3 Groundwater

No groundwater or seepage was encountered during the investigation activities.

### 3.4 Infiltration testing

Infiltration tests were carried out in all four trial pit locations to establish the infiltration rate of the shallow geology. The trial pit tests were carried out generally in accordance with the method described in BRE Digest 365 (BRE, 2016).

The results of the infiltration testing are summarised in **Table 2**.

**Table 2: Summary of infiltration testing**

Location	Testing zone depth (m bgl)	Test number	infiltration rate (m/s)
TP1	0.50 – 2.75	1	*No discernible infiltration
TP2	0.74 – 3.10	1	*No discernible infiltration
TP3	0.62 – 2.55	1	*No discernible infiltration
TP4	0.62 – 2.60	1	*No discernible infiltration

\*Based on extrapolated 50% volume

Copies of the testing records are presented within **Appendix D**.

Note that three (3no.) repeat infiltration tests were not permissible within any exploratory positions, owing to the comparatively low infiltration rates and the permissible time allocated for this round of exploratory works.

We hope that the information provided within this letter is sufficient for your current requirements, however, if you have any questions, then please contact the undersigned.

Yours sincerely

**For RSK Environment Ltd**

**Author:**



**Josh Curnow**

Geo-Environmental Consultant

**Reviewed by:**



**Svetislav Trajkovski**

Associate Director

Enclosed:

**Figures**

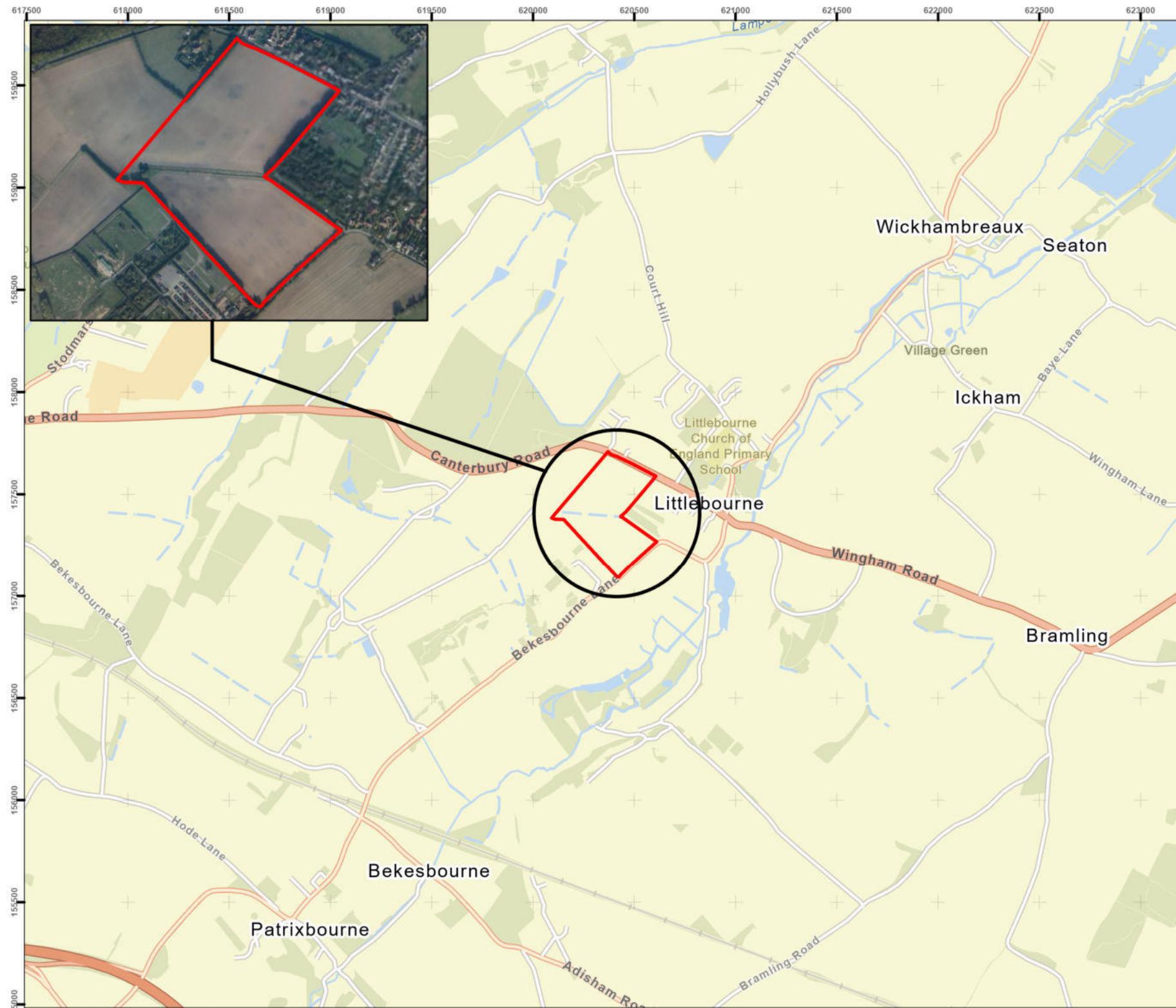
Figure 1 Site location plan  
Figure 2 Exploratory hole location plan

**Appendices**

Appendix A Service constraints  
Appendix B Exploratory logs  
Appendix C Photographic log  
Appendix D Infiltration data

## **FIGURES**

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**Legend:**  
 Site Boundary

Coordinate System: British National Grid  
 Projection: Transverse Mercator  
 Datum: OSGB 1936  
 Units: Meter

Rev	Date	Description	Drn	Chk	App
00	05/01/2023	First Draft	TM	DR	JC

**52485 - Littlebourne**

TITLE: Figure 1:  
Site Location Plan

0 0.25 0.5  
Kilometers  
SCALE: 1:24,000 @ A4

N  
W E  
S

REV 00



**Legend:**

- Site Boundary
- Exploratory Hole Locations

Coordinate System: British National Grid  
 Projection: Transverse Mercator  
 Datum: OSGB 1936  
 Units: Meter

00	05/01/2023	First Draft	TM	DR	JC
Rev	Date	Description	Drn	Chk	App

**52485 - Littlebourne**

TITLE: Figure 2:  
Site Layout Plan

0 75 150  
Meters  
SCALE: 1:5,000 @ A4

N  
W E  
S

REV 00

Document Path: H:\Geoscience\52400 - 52500\52485 - Littlebourne\01 - GIS\Figure 2 - Site Layout Plan A4.aprx

# APPENDIX A

## SERVICE CONSTRAINTS

---

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Gladman Developments Limited (the "Client") in accordance with the terms of a contract [RSK Environment Standard Terms and Conditions] between RSK and the Client. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
  - a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.

- b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.
- c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

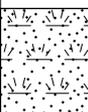
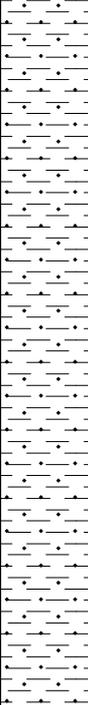
- 8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.
- 9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
- 10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.
- 11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.
- 12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

# APPENDIX B EXPLORATORY LOGS

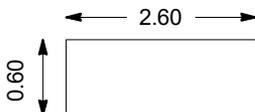
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Contract: <b>Littlebourne, Canterbury</b>		Client: <b>Gladman Developments Ltd</b>		Trial Pit: <b>TP02</b>	
Contract Ref: <b>52485</b>	Start: <b>18.12.22</b> End: <b>18.12.22</b>	Ground Level: <b>28.65</b>	National Grid Co-ordinate: <b>E:620371.1 N:157569.4</b>	Sheet: <b>1 of 1</b>	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Dark brown slightly gravelly slightly sandy SILT with frequent fine rootlets. Gravel is subrounded to subangular fine to coarse flint. Sand is fine to coarse. (TOPSOIL)	(0.40) 0.40	
						Dark brown slightly sandy silty GRAVEL. Gravel is subrounded to subangular fine to coarse flint. (HEAD)	(0.30) 0.70	
						Orange sandy CLAY. Sand is fine to coarse. (HEAD)	(2.40) 3.10	

GINT LIBRARY\_V10\_01.GLB LibVersion: v8\_07 | Log TRIAL PIT LOG - A4P | 52485 LITTLEBOURNE.GPJ - v10\_01.  
 RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT. Tel: 01442 437500, Fax: 01442 437550, Web: www.rsk.co.uk | 10/01/23 - 14:16 | JC12 |

Plan (Not to Scale) 	<h3>General Remarks</h3> <ol style="list-style-type: none"> <li>1. Trial pit backfilled with arisings in reverse order upon completion.</li> <li>2. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.</li> <li>3. No groundwater encountered.</li> <li>4. Trial pit remained dry and stable during excavation.</li> </ol>	
	All dimensions in metres	Scale: <b>1:25</b>
Method Used: <b>Machine dug</b>	Plant Used: <b>JCB-3CX</b>	Logged By: <b>BDrewett</b>
		Checked By: <b>AGS</b>



Contract: <b>Littlebourne, Canterbury</b>		Client: <b>Gladman Developments Ltd</b>		Trial Pit: <b>TP04</b>	
Contract Ref: <b>52485</b>	Start: <b>19.12.22</b> End: <b>19.12.22</b>	Ground Level: <b>20.36</b>	National Grid Co-ordinate: <b>E:620556.9 N:157274.3</b>	Sheet: <b>1 of 1</b>	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Brown slightly gravelly sandy SILT. Gravel is subrounded to subangular fine to medium flint. Sand is fine to coarse. (TOPSOIL)	(0.40) 0.40	
						Orangish brown slightly sandy slightly silty CLAY. Sand is fine to medium. (HEAD)	(1.55) 1.95	
						Yellowish cream sandy SILT. Sand is fine to coarse. (THANET SAND FORMATION)	(0.35) 2.30	
						Yellowish cream slightly sandy slightly silty GRAVEL. Gravel is subrounded to subangular fine to coarse flint. (THANET SAND FORMATION)	(0.30) 2.60	

GINT\_LIBRARY\_V10\_01.GLB LibVersion: v8.07 | Log TRIAL PIT LOG - A4P | 52485 LITTLEBOURNE.GPJ - v10\_01.  
 RSK Environment Ltd, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, HP3 9RT. Tel: 01442 437500, Fax: 01442 437500, Web: www.rsk.co.uk | 10/01/23 - 14:17 | JC12 |

Plan (Not to Scale) 		<h3>General Remarks</h3> <ol style="list-style-type: none"> <li>1. Trial pit backfilled with arisings in reverse order upon completion.</li> <li>2. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.</li> <li>3. No groundwater encountered.</li> <li>4. Trial pit remained dry and stable during excavation.</li> </ol>	
All dimensions in metres		Scale: <b>1:25</b>	
Method Used: <b>Machine dug</b>	Plant Used: <b>JCB-3CX</b>	Logged By: <b>BDrewett</b>	Checked By:

# APPENDIX C

## PHOTOGRAPHIC LOG

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**PHOTOGRAPHIC LOG**

<b>Photo no.</b> 1	<b>Date:</b> 19/12/2022
-----------------------	----------------------------

**Photo Direction:**  
Looking north east.

**Description:**  
Site overview.



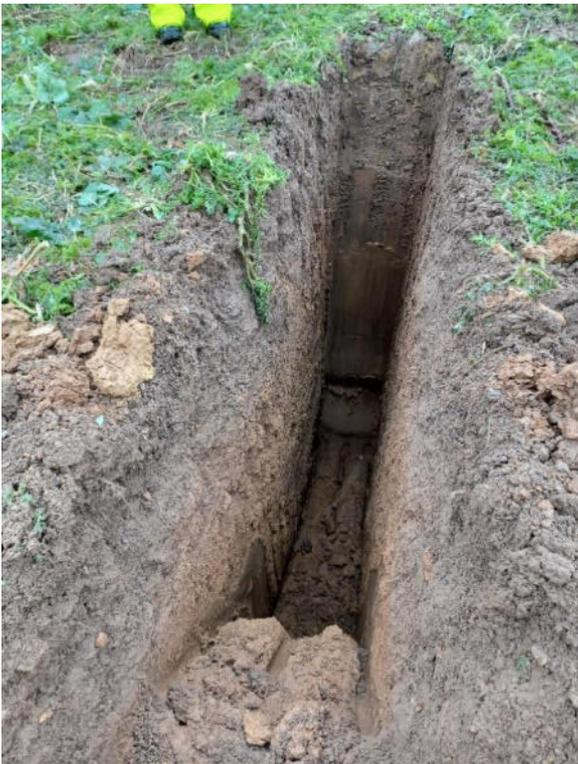
<b>Photo No.</b> 2	<b>Date:</b> 19/12/2022
-----------------------	----------------------------

**Photo Direction:**  
Looking north west.

**Description:**  
Site overview.



<b>Photo no.</b> 3	<b>Date:</b> 19/12/2022	
<b>Photo Direction:</b> N/A		
<b>Description:</b> JCB 3CX.		

<b>Photo No.</b> 4	<b>Date:</b> 19/12/2022	
<b>Photo Direction:</b> N/A		
<b>Description:</b> TP1.		

<b>Photo no.</b> 5	<b>Date:</b> 19/12/2022	
<b>Photo Direction:</b> N/A		
<b>Description:</b> TP2.		

<b>Photo No.</b> 6	<b>Date:</b> 19/12/2022	
<b>Photo Direction:</b> N/A		
<b>Description:</b> TP3.		

<b>Photo No.</b> 6	<b>Date:</b> 19/12/2022	
<b>Photo Direction:</b> N/A		
<b>Description:</b> TP4.		

# APPENDIX D

## INFILTRATION DATA

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# FULL SCALE SOAKAWAY TEST

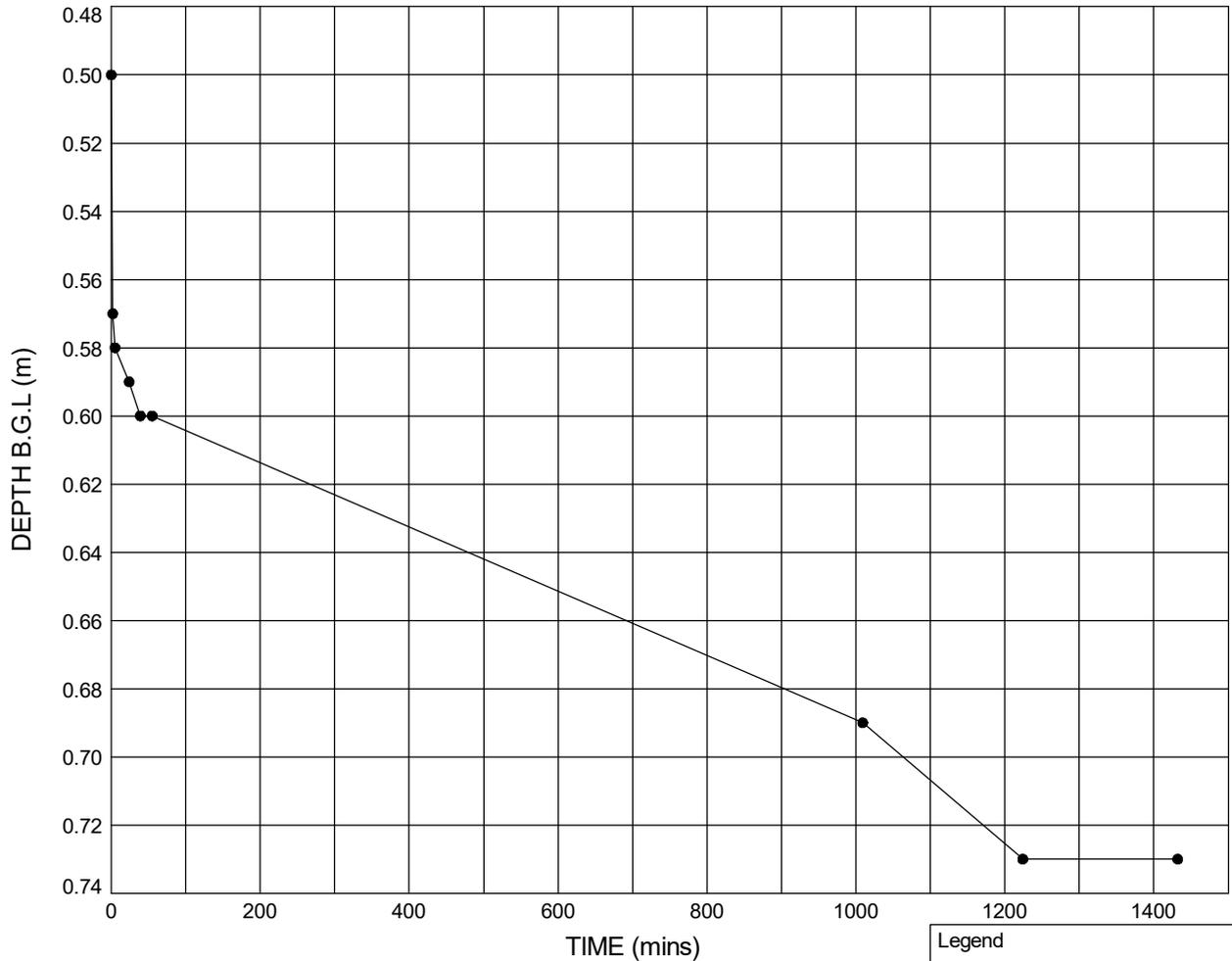
In accordance with BRE Digest 365

Soakaway Test - Position ID : TP01

Ground Level: 19.83

National Grid Co-ordinates: E:620565.0 N:157582.1

## PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1

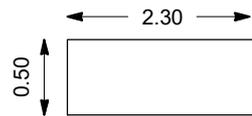
Pit start depth: RES 1 = 2.70 m  
 Pit final depth: = 2.70 m  
 Effective depth,  $D_e$  = 2.20 m  
 Effective storage volume,  $V_{p75-25}$  = 1.2650 m<sup>3</sup>  
 Surface area,  $a_{s50}$  = 7.3100 m<sup>2</sup>  
 Time,  $t_{p75-25}$  = N/A secs  
 Infiltration rate,  $f$  = N/A m/s

Please note test data was extrapolated to obtain tp75-tp25.

Legend

● Test 1 (19.12.22)

Plan (Not to scale)



No Bearing Taken



Compiled By

Date

Checked By

Date

10/01/23

Contract

Contract Ref:

Littlebourne, Canterbury

52485

# FULL SCALE SOAKAWAY TEST

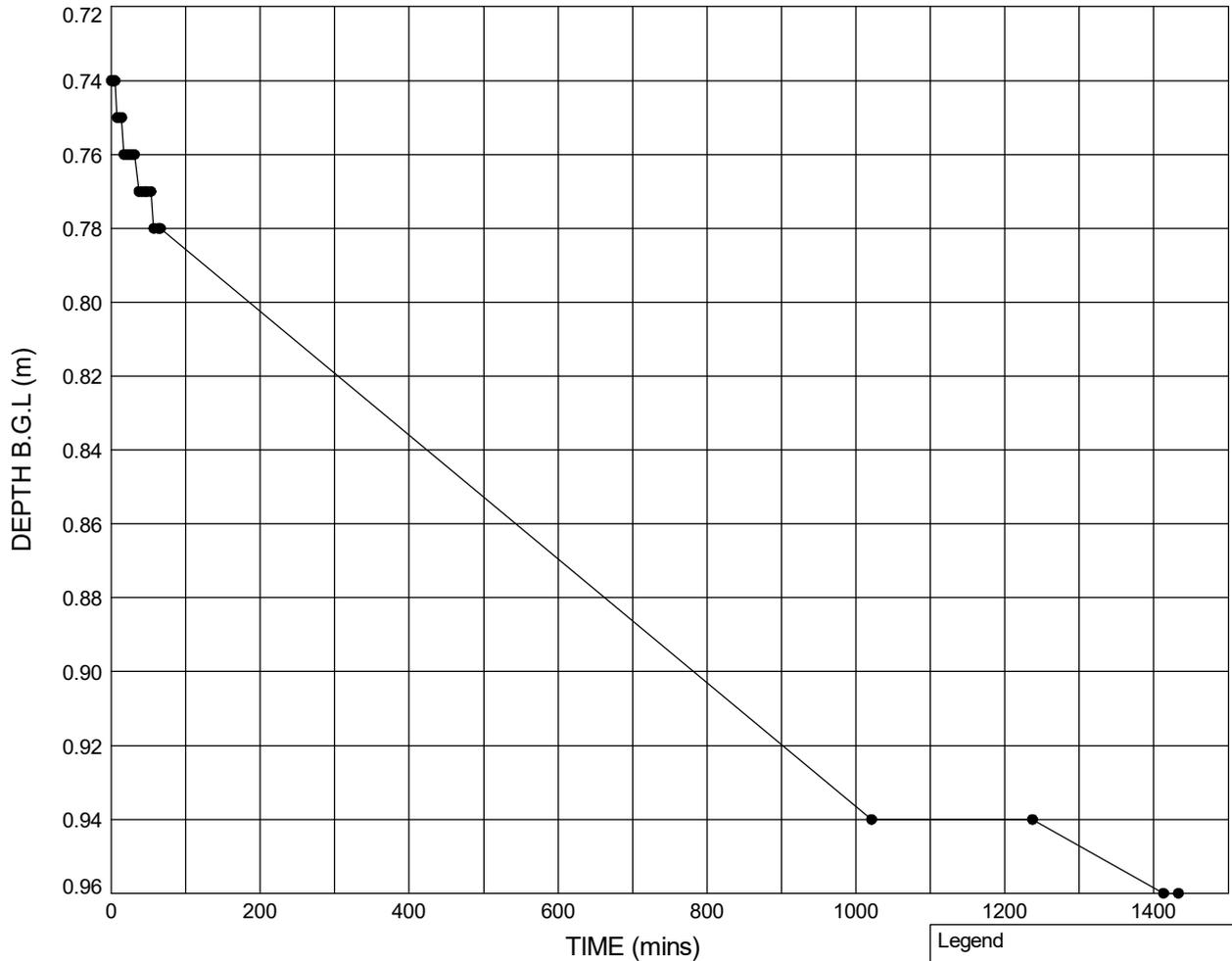
In accordance with BRE Digest 365

Soakaway Test - Position ID : TP02

Ground Level: **28.65**

National Grid Co-ordinates: **E:620371.1 N:157569.4**

## PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



	Test 1	
Pit start depth: RES 1	=	2.75 m
Pit final depth:	=	2.75 m
Effective depth, $D_e$	=	2.01 m
Effective storage volume, $V_{p75-25}$	=	1.5678 m <sup>3</sup>
Surface area, $a_{s50}$	=	7.9920 m <sup>2</sup>
Time, $t_{p75-25}$	=	N/A secs
Infiltration rate, $f$	=	N/A m/s

Please note test data was extrapolated to obtain tp75-tp25.

Legend

● Test 1 (19.12.22)

Plan (Not to scale)

← 2.60 →

0.60 ↑

↓

No Bearing Taken

GINT\_LIBRARY\_V10\_01\_GLB LibVersion: v8\_07\_001 ProjVersion: v8\_07 | Graph 1 - TP SOAKAWAY - 2 - FINAL REPORT - A4P | 52485 LITTLEBOURNE.GPJ - v10\_01 | 10/01/23 - 13:55 | KT3 |



Compiled By	Date	Checked By	Date
<i>READ</i>	10/01/23		
Contract		Contract Ref:	
Littlebourne, Canterbury		52485	

# FULL SCALE SOAKAWAY TEST

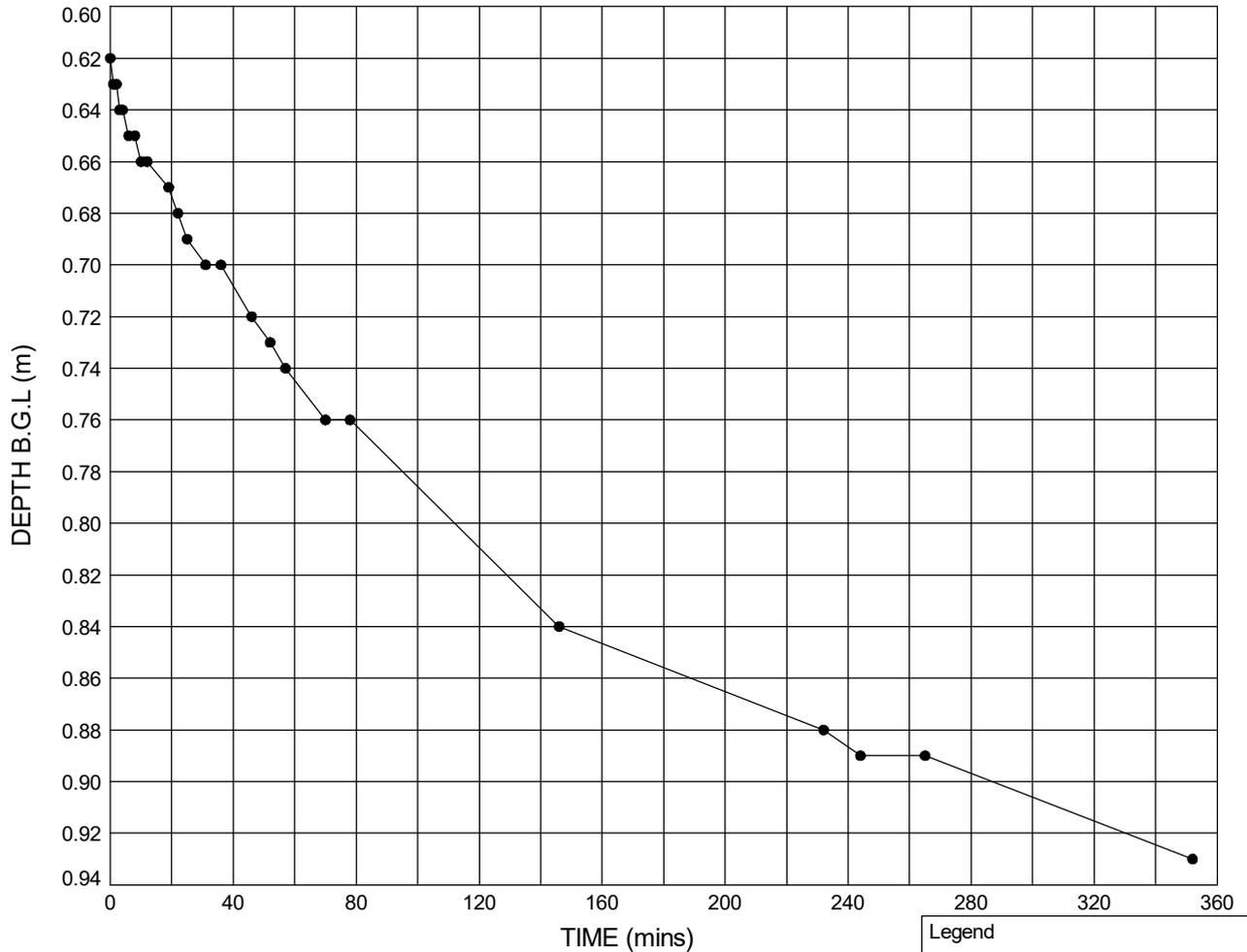
In accordance with BRE Digest 365

Soakaway Test - Position ID : TP03

Ground Level: 24.53

National Grid Co-ordinates: E:620388.1 N:157286.1

## PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1			
Pit start depth: RES 1	=	2.55	m
Pit final depth:	=	2.55	m
Effective depth, $D_e$	=	1.93	m
Effective storage volume, $V_{p75-25}$	=	1.1980	m <sup>3</sup>
Surface area, $a_{s50}$	=	6.5540	m <sup>2</sup>
Time, $t_{p75-25}$	=	N/A	secs
Infiltration rate, $f$	=	N/A	m/s

Please note test data was extrapolated to obtain tp75-tp25. Notes: Test 1 - Insufficient drop in water level for calculation of infiltration coefficient

Legend

● Test 1 (20.12.22)

Plan (Not to scale)

← 2.30 →

0.50 ↑

↓

No Bearing Taken

GINT\_LIBRARY\_V10\_01.GLB LibVersion: v8\_07\_001 PjVersion: v8\_07 | Graph 1 - TP SOAKAWAY - 2 - FINAL REPORT - A4P | 52485 LITTLEBOURNE.GPJ - v10\_01 | 10/01/23 - 13:51 | KT3 |



Compiled By	Date	Checked By	Date
<i>READ</i>	10/01/23		
Contract		Contract Ref:	
Littlebourne, Canterbury		52485	

# FULL SCALE SOAKAWAY TEST

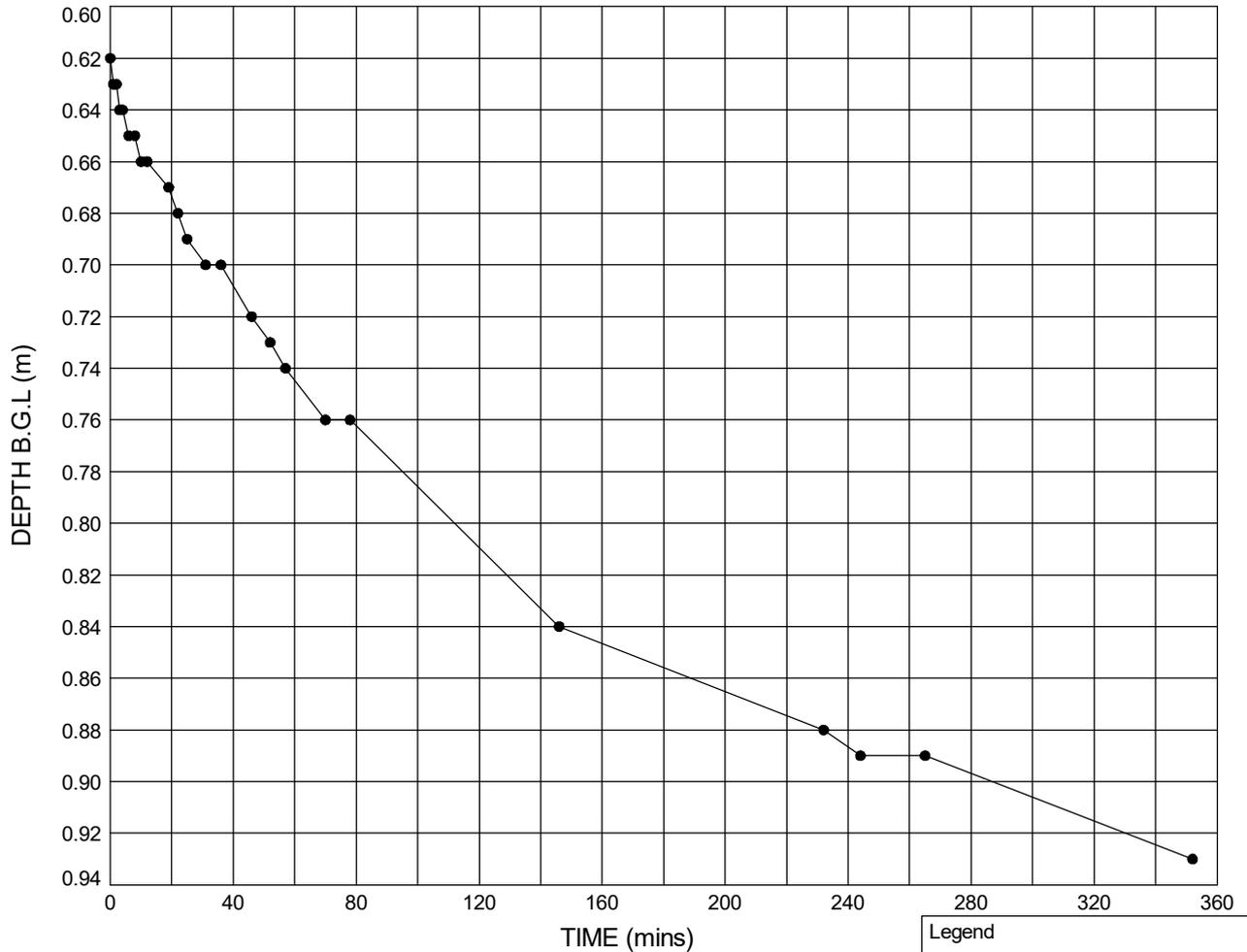
In accordance with BRE Digest 365

Soakaway Test - Position ID : **TP04**

Ground Level: **20.36**

National Grid Co-ordinates: **E:620556.9 N:157274.3**

## PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1			
Pit start depth: RES 1	=	2.60	m
Pit final depth:	=	2.60	m
Effective depth, $D_e$	=	1.98	m
Effective storage volume, $V_{p75-25}$	=	1.0890	m <sup>3</sup>
Surface area, $a_{s50}$	=	6.4460	m <sup>2</sup>
Time, $t_{p75-25}$	=	N/A	secs
Infiltration rate, $f$	=	N/A	m/s

Please note test data was extrapolated to obtain tp75-tp25. Notes: Test 1 - Insufficient drop in water level for calculation of infiltration coefficient

Legend

● Test 1 (20.12.22)

Plan (Not to scale)

← 2.20 →

0.50 ↑

↓

No Bearing Taken

GINT\_LIBRARY\_V10\_01.GLB LibVersion: v8\_07\_001 PjVersion: v8\_07 | Graph 1 - TP SOAKAWAY - 2 - FINAL REPORT - A4P | 52485 LITTLEBOURNE.GPJ - v10\_01 | 10/01/23 - 13:51 | KT3 |



Compiled By	Date	Checked By	Date
<i>READ</i>	10/01/23		
Contract		Contract Ref:	
Littlebourne, Canterbury		52485	

Environmental Trading Platform Limited  
Sallyfield Lane  
Stanton  
Ashbourne  
Derbyshire  
DE6 2DA



21<sup>st</sup> March 2024

The Environmental Trading Platform Limited (ETP) have been approached by Gladman Developments Limited (GDL) to seek nutrient mitigation to support a proposed Outline application for 300 dwellings at Bekesbourne Lane, Littlebourne, Canterbury, Kent.

A Nutrient Neutral Assessment and Mitigation Strategy (NNAMS), has calculated a nutrient budget of 226

86 TN and 8.46kg TP after nutrient reduction from SUDS and includes the 20% buffer that must be mitigated to all 150 of the 300 proposed units to be delivered. The remaining 150 units will be delivered after the 1<sup>st</sup> April 2030, when the upgrades to local foul sewer infrastructure committed as part of the Levelling Up and Regeneration Act will be made.

The mitigation strategy proposes the use of Credits to achieve neutrality for the scheme. This document is aimed to provide comfort to both Natural England (NE) and the Local Planning Authority (LPA), that sourcing 226.86kg TN and 8.46kg TP credits locally is realistic and achievable.

#### **About Environmental Trading Platform Limited:**

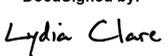
ETP specialises in providing matchmaking services for nutrient neutrality and Biodiversity Net Gain. We play a pivotal role in numerous nutrient mitigation schemes nationwide, including one within the Test Valley catchment. Our solutions encompass a range of strategies such as Cattle Yard closures, land reversion, and wetland creation. An example of our NE approved schemes include, Manor Farm, Haselbury Plucknett, Crewkerne, Somerset. TA18 7PA, (No NE Reference given) North Leaze Farm, North Cadbury, Yeovil. BA22 7BD (No NE Reference given), and DAS/17792/359976, Engineered wetland for nutrient removal, Land off Warlands Lane, Shalfleet, Isle of Wight PO30 4NQ.

#### **Stodmarsh Credit scheme:**

ETP have partnered with a national housebuilder who have a consented development to the east of Canterbury. The phased development has generated surplus nutrient credits by constructing a new onsite water recycling centre (WRC), treating wastewater from the development to a high quality and discharging it to the Great Stour. The scheme has not only achieved nutrient neutrality for all remaining phases on the development, but by diverting wastewater from pre-occupied units into the new onsite WRC which would have gone to Southern Water's Westbere waste water treatment works (WwTW), a nutrient surplus is generated that could offsite other developments within the catchment.

The new onsite WRC has received LPA planning consent, is partially constructed and is awaiting on the Environment Agency permit to discharge. This is expected mid-late 2024. The confirmed operation of the new onsite WRC will subsequently generate enough credit to mitigate the required 226.86kg TN and 8.68kg TP at Bekesborune Lane, Littlebourne. Additionally, ETP is actively developing a wetland solution in the area, although this project's timeline will be longer the kilograms generated will be considerable.

**Conclusion:** The Environmental Trading Platform Limited is an experienced and proven nutrient credit facilitator. Not only does ETP manage their own schemes, providing nutrient credits across the private sector, we have also developed a free-to-use nutrient and BNG credit trading platform, aimed at linking developers with other credit providers. As mentioned, ETP has multiple nutrient mitigation schemes in progress across the UK and specifically Stodmarsh, with some having already received Natural England approval. ETP have previously supported GDL on other projects across the UK and look forward to continuing that support with the application at Littlebourne, Canterbury, Kent.

Sincerely,  
DocuSigned by:  
  
CCAA5E6B30EA44A...  
Lydia Clare

Director - Environmental Trading Platform Limited