

STODMARSH NUTRIENT MITIGATION

DRAFT NUTRIENT MITIGATION STRATEGY

CANTERBURY CITY COUNCIL

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Authorisation and Version Control

Water Environment was commissioned by Canterbury City Council to develop a “Draft Nutrient Mitigation Strategy” to address concerns raised by Natural England regarding the nutrient loading from proposed development within the Stour Catchment and the potential adverse effects on the Stodmarsh Special Area of Conservation, Special Protection Area, Ramsar, and Site of Special Scientific Interest.

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EXECUTIVE SUMMARY

In the Stour Valley River catchment in East Kent, developments could adversely affect the Stodmarsh complex, which is designated a Site of Special Scientific Interest, Special Protection Area, Special Area of Conservation and Ramsar site. Several of the nature reserve lakes at Stodmarsh are in a state of eutrophication (an unfavourable conservation status) and it has been found that the nutrients of highest significance in terms of water quality in Stodmarsh are nitrogen and phosphorus.

The nutrient loading from new developments is due to the nutrients contained in surface water runoff and the increase in wastewater flows to any of the Wastewater Treatment Works in the Stour catchment. A nutrient budget has been calculated for Canterbury City Council based on the existing allocations in the Canterbury District Local Plan 2017 and the emerging New Local Plan 2040 (with projections to 2045).

Dwellings that have been granted a full planning permission at the time of writing, or have agreed on-site mitigation, are omitted from the following analysis. Moreover, proposed new dwellings both lying outside of the surface water catchment and draining to a Wastewater Treatment Works outside of the catchment have been omitted from the analysis.

Following the omission of the relevant dwellings due to either planning status or location, the total number of dwellings which will form the basis for the nutrient budget within the adopted Canterbury District Local Plan and New Local Plan to 2045 is 12,809.

The nutrient budget has been calculated for each development site following the Generic Methodology produced by Natural England. A total increase in nutrient loading has been calculated as 2,920kg of Phosphorus and 22,055kg of Nitrogen.

Considering onsite mitigation measures such as foul water treatment for large developments and surface water treatment through the use of SuDS, a partially mitigated budget has been calculated as 1,177kgP and 10,558kgN. Since through onsite mitigation it is not possible to achieve nutrient neutrality, other offsetting measures such as retrofitting the Canterbury City Council housing stock with water saving devices to reduce consumption, land use change elsewhere in the Stour catchment and nutrient treatment wetlands are discussed.

Strategic constructed wetlands have been established as an efficient large scale offsetting solution to the nutrient problem. The calculation of the wetland area is based on the mitigated budget calculated after the use of onsite mitigation measures. It has been estimated that up to approximately 98ha of wetland will need to be constructed along the Stour river corridor to fully offset the nutrient budget up to 2045, with 35ha of wetland required to offset the budget to 2030.

The Government committed to upgrading all Wastewater Treatment Works to Technically Achievable Limits by 2030. These upgrades are not considered a mitigation but will change the future baseline by reducing the concentration of nutrients reaching the Stodmarsh. It is estimated that the area required for wetlands is 71ha to 2045 (instead of 98ha).

ABBREVIATIONS

Acronym	Definition
AA	Appropriate Assessment
CCC	Canterbury City Council
FWS	Free Water Surface
NE	Natural England
NEGM	Natural England Generic Methodology
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SW	Southern Water
TP	Total Phosphorus
TN	Total Nitrogen

1 INTRODUCTION – “THE PROBLEM”

- 1.1 A Habitats Regulations Assessment refers to the several distinct stages of assessment which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 to determine if a plan or project may affect the protected features of a designated 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. 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 (in this case, Canterbury City Council, CCC). 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.
- 1.2 In 2018, the European Court of Justice refined in the so-called ‘Dutch case’ the definition of plans and projects and ruled that mitigation needs to be in place to ensure that there will be no adverse effect on the conservation status of European designated sites.
- 1.3 In the Stour Valley River catchment in East Kent, developments could adversely affect the Stodmarsh complex, 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. It has been found that the nutrients of highest significance in terms of water quality in Stodmarsh are nitrogen and phosphorus.
- 1.4 The practical implication of The Dutch Case across the Stour catchment 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 WwTW in the Stour catchment. Moreover, the ability to develop strategic growth plans in order to meet housing targets is impacted by uncertainty over the provision of mitigation within the catchment to offset increases in nutrient load in the River Stour resulting from development. This is constrained by the potential limited ability on certain sites to provide on-site mitigation due to spatial and technical constraints.
- 1.5 Water Environment Ltd have been commissioned by CCC to support the development of a Stodmarsh Mitigation Plan to address Natural England (NE) concerns regarding the future impact of new housing development on Stodmarsh.
- 1.6 Through this work, CCC have committed to developing a holistic framework to provide larger-scale mitigation by reducing the nutrient loading from future development through different mitigation strategies including measures such as land use change and constructed wetlands to treat water. Net reductions in nutrient loading on strategic mitigation sites can then be used to offset increases in nutrient loading due to future development within the district. Such mitigation sites must fall within the Stour catchment area to provide benefits in relation to the downstream impacts of human activity on the Stodmarsh.
- 1.7 This report outlines the process by which the CCC Stodmarsh Nutrient Mitigation Framework has been developed and the scale of required mitigation calculated. Key assumptions made during this process are noted.
- 1.8 A more detailed Nutrient Mitigation Plan report has been produced¹ which contains additional background on Stodmarsh, Nutrient Neutrality Methodology, Wastewater Treatment Works (WwTW), mitigation options and case studies. This Nutrient Mitigation Strategy report summarises the key findings of the strategy and reports on the latest nutrient budget calculations

¹ Water Environment Limited (July 2022) Canterbury District Local Plan Nutrient Mitigation Plan. Document reference: 21160-NUT-RP-01-C01

in accordance with the Natural England March 2022 Generic Methodology and Stodmarsh calculator.

2 NUTRIENT NEUTRALITY – “THE CONCEPT”

- 2.1 In December 2019, NE issued methodology² surrounding nutrient neutrality for new development in the Stour Valley catchment, which was updated in July 2020³ and again in November 2020⁴. This methodology lays out the process of calculation and provides a worked example for a single development.
- 2.2 This methodology has been superseded by a Generic Methodology produced by NE⁵ which provides generic national methodology on achieving nutrient neutrality. At the time of writing Issue 1 of the methodology has been made available to LPAs.
- 2.3 This NE Generic Methodology (NEGM) is supplemented by a specific Nutrient Budget Calculator⁶ and associated Guidance Document⁷ for the Stodmarsh SAC and Ramsar site which provides an updated calculation for developments within the Stour catchment. This NEGM has been followed throughout the calculations.
- 2.4 The key measurement, with respects to nitrogen levels, is the amount of Total Nitrogen (TN). This 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 (NO₃-N), nitrate nitrogen (No₂-N) and ammonia) and organically bonded nitrogen. Similarly, in respects to phosphorous levels, the key measurement is the amount of Total Phosphorous (TP). TP includes all phosphorous components: phosphates, dissolved organic phosphorous, particulate phosphorous in algal and bacterial cells, and includes mineral particles such as clay.
- 2.5 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. The NEGM recommends a water usage of 110 litres per person per day (l/p/d), plus an additional 10 l/p/d for any future changes to water fixtures.
- 2.6 Stage 2 of the calculation is to consider the existing land use on the site. Using the ADAS Farmscoper tool⁸, loading factors are determined for all different agriculture uses within the catchment. These loading factors are further separated by the underlying soil drainage conditions in the NEGM.
- 2.7 For non-agricultural uses, it is assumed in the NEGM that the land-use would not leach phosphorus except in the case of urban land-uses. Greenspace, woodlands, and similar were all therefore conservatively assigned a loading factor of 0.02 kgP/ha/year – which, in some studies, was the lowest detectable loading factor. Urban loading factors are modelled using an assumed⁹ concentration of TP for rainfall events, and therefore this varies with the rainfall.
- 2.8 Using these loading factors, and the areas of various land-uses on the site, the existing nutrient load from diffuse sources can be calculated.

² 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

³ Natural England (July 2020) Advice on Nutrient Neutrality for New Development in the Stour Valley Catchment in Relation to Stodmarsh Designated Sites – For Local Planning Authorities

⁴ Natural England (November 2020), Advice on Nutrient Neutrality for New Development in the Stour Valley Catchment in Relation to Stodmarsh.

⁵ Natural England Nutrient Neutrality Generic Methodology – Issue 1: February 2022

⁶ Natural England Nutrient Neutrality Budget Calculator – Stodmarsh SAC and Ramsar

⁷ Natural England Nutrient Budget Calculator Guidance Document – Stodmarsh SAC and Ramsar – Issue 1 v1 March 2022

⁸ <https://www.adas.uk/Service/farmscoper>

⁹ Mitchell, G (2005) does not disclose how he calculated the event mean concentrations listed in his paper

- 2.9 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 on 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.
- 2.10 NE has provided a calculator for the Stour catchment in the form of a Microsoft Excel spreadsheet which incorporates all of the elements listed above. This calculator has been referenced throughout this report.
- 2.11 The methodology has been used in this case to calculate the nutrient budget for all development within the district.

What types of development require mitigation?

- 2.12 The NEGM covers all areas within the Stour Valley river catchment. A map of the catchment is shown in Figure 1. The Stour Valley catchment covers large areas of the district, including Canterbury City.

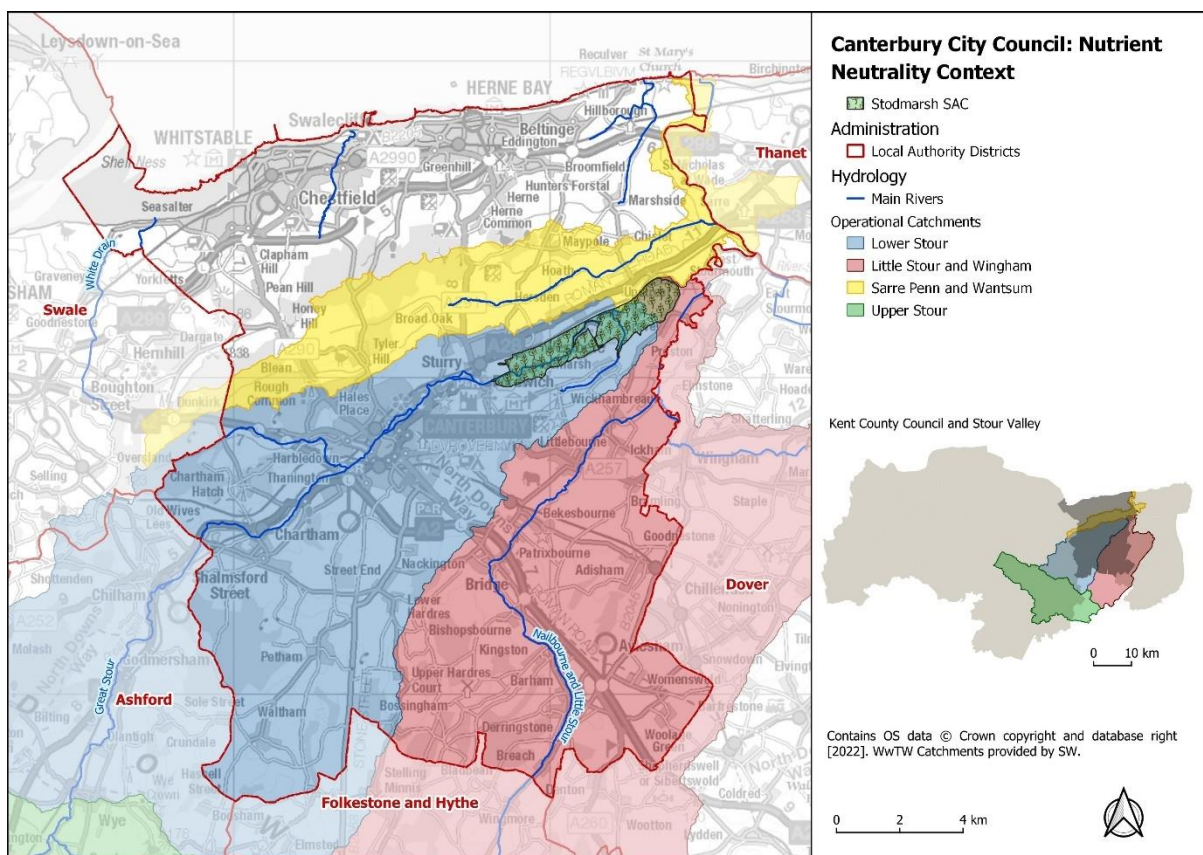


Figure 1: Nutrient Neutrality Context

- 2.13 New developments within the Canterbury district may impact Stodmarsh if one or both of the following are true:
- Treated effluent from the development discharges into a water course that ultimately reaches Stodmarsh (via tidal or storm overtopping); or
 - The runoff from the development discharges into a water course that ultimately reaches the Stodmarsh (via tidal or storm overtopping).

- 2.14 The watercourses that discharge to Stodmarsh belong to the Stour Management Catchment. Within the Canterbury district area, the Operational Catchments of interest are the Lower Stour, the Little Stour and Wingham, as well as part of the Stour Marshes (Sarre Penn and River Wantsum). The Lower Stour (and Upper Stour, although not directly relevant in this case) is part of the upstream 'fluvial' catchment draining in an easterly direction through Stodmarsh, whereas the Little Stour and Wingham, and Sarre Penn and River Wantsum catchments are 'downstream' as they discharge into the tidal section of the River Stour which has a backwater effect in a westerly direction through Stodmarsh.
- 2.15 In accordance with the NEGM, the types of new development which require mitigation include new homes, student accommodation, tourism attractions and tourist accommodation.
- 2.16 Other commercial development, which does not involve overnight accommodation, will generally be exempt from the mitigation strategy unless it has other (non-sewerage) water quality implications. It is recommended that any promoters of high-water use developments engage with Natural England, through their Discretionary Advice Service.
- 2.17 Proposals which would have otherwise been within the scope of the NEGM but which already have full planning permission may proceed without needing to undertake any additional assessment exercise. However, Reserved Matters applications are subject to the NEGM and require mitigation. The council also considers that existing planning applications within the scope of the advice and either undetermined by the council or with a resolution/delegated decision to grant permission subject to the prior completion of a Section 106 Agreement or other matters, are subject to the NEGM. Existing planning applications within the scope of the NEGM and currently the subject of an appeal to the Secretary of State/Planning Inspectorate are also subject to the NEGM.

3 CANTERBURY CITY COUNCIL NUTRIENT BUDGET

- 3.1 In order to establish an estimate for the scale of mitigation required, a nutrient budget has been calculated for CCC based on the existing allocations in the Canterbury District Local Plan 2017 and the emerging New Local Plan 2040 (with projections to 2045).
- 3.2 The current Local Plan (2011-2031) plans for 16,000 new homes and as of April 2022, 6,888 homes have been completed. The draft Local Plan (2020-2045) plans for 31,300 new homes and as of April 2022, 591 of these have been completed.
- 3.3 The remaining need is met by the supply components: existing planning permission (2,295), saved allocations from 2017 Local Plan (11,970), draft proposed allocations (13,035) and an annual windfall site allowance of 170. These data were provided by CCC to facilitate the strategy.
- 3.4 Dwellings that have been granted a full planning permission at the time of writing, or have agreed on-site mitigation, are omitted from the following analysis. All other proposals, including those with reserved matters and/or outline granted permissions are to be included in the analysis.
- 3.5 As parts of the district, including some WwTW's, do not lie within the Stour Valley river catchment, a geographic analysis of the proposed developments in the district has been undertaken. Proposed new dwellings both lying outside of the surface water catchment and draining to a WwTW outside of the catchment can be omitted from the analysis.
- 3.6 Following the omission of the relevant dwellings due to either planning status or location, the total number of dwellings which will form the basis for the nutrient budget is 1,814 for the current Local Plan including non-completed applications and 7,867 (plus 589 single occupation units for older persons accommodation) for the New Local Plan to 2045. A windfall allowance of 136 (80% of the total allowance¹⁰) is added annually resulting in a grand total of dwellings to mitigate of 12,809 to 2045.
- 3.7 The nutrient budget has been calculated for each development site within the adopted Canterbury District Local Plan and New Local Plan to 2045 (for a grand total of 12,809 dwellings, including windfall sites). Calculations have been performed for each operational catchment and on a 5-year basis (excluding the first 2022-2024 period), as shown in Table 1:

Table 1: Dwellings Considered for the Nutrient Budget

Catchment	Number of Dwellings					Total To 2045
	2022/ 2024	2025/ 2029	2030/ 2034	2035/ 2039	2040/ 2044	
Lower Stour	30	927	3,863	2,752	30	7,602
Sarre Penn	0	331	400	148	0	879
Little Stour	0	114	650	112	0	876
Outside Catchment	0	154	170	0	0	324
Total	30	1,526	5,083	3,012	30	9,681
Total Including Windfall Sites	438	2,206	5,763	3,692	710	12,809

¹⁰ For future windfall sites it is assumed that the proportion of new dwellings at each WwTW in the catchment is as follows: 40% to Canterbury WwTW, 20% rural sites, all assumed to discharge to Canterbury WwTW, 20% to Herne Bay WwTW and 20% in Whitstable and therefore outside catchment.

3.8 The budgets from each individual development have been summed to establish a nutrient budget for the entire district in each Local Plan scenario. The following assumptions have been made in the calculation of the initial budget:

- All new development in the Canterbury district area will be expected to achieve a maximum water use standard of 90 litres per person per day (l/p/d). An additional 10 litres have been added to this figure in accordance with the NEGM.
- Additional populations have been calculated using an occupancy rate of 2.37 people per dwelling, figure provided by CCC.
- When designating the current land use of a development site, satellite imagery was reviewed. For development sites on active farmland a judgment has been made on the type of farming and the appropriate leaching coefficients used in light of further information.
- In determining the soil type of a development site, the Soil Scapes¹¹ webtool has been used in accordance with the NEGM. In cases where a development site is shown to have varying soil types, the soil type which covers the majority of the site has been assumed. For cases where the site is split approximately 50/50 in terms of soil types, the type with the lowest leaching rate has been selected as a precautionary measure.
- For windfall sites, a conservative assumption has been made that these will all be developed on freely draining sites.
- In determining the average annual rainfall at each site, the National River Flow Archive database¹² has been used. This is in accordance with the latest NEGM.
- For all residential developments the future land use has been set as entirely 'Residential Urban'. This is a conservative assumption as it does not allow for sites where they may be a proportion of the site set aside for open space.
- All development sites have been assumed to connect to their nearest / most appropriate WwTW. This has been established using shapefiles provided by Southern Water (SW) showing the catchment area of each WwTW. Although some developments will undoubtedly be located in non-sewered areas and therefore require a separate private treatment system, the vast majority of developments are expected to connect to their local WwTW and as such this approach is considered to be robust.
- For future windfall sites it is assumed that the proportion of new dwellings at each WwTW in the catchment is as follows: 40% to Canterbury WwTW, 20% rural sites, all assumed to discharge to Canterbury WwTW, 20% to Herne Bay WwTW and 20% in Whitstable and therefore outside catchment.
- For sites where the existing nutrient load exceed the proposed nutrient load, the nutrient budget is applied as an offset to other sites in the strategy.

3.9 Following the 4-stage calculation process outlined in the NEGM for each identified development site within the district, a total increase in **nutrient loading has been calculated for the current Local Plan and New Local Plan to 2045 combined as 2,920kg of Phosphorus and 22,055kg of Nitrogen.**

3.10 Table 2 shows the phased nutrient budget calculations subdivided by catchments.

¹¹ <http://www.landis.org.uk/soilscapes/#>.

¹² <https://nrfa.ceh.ac.uk/data>

Table 2: Nutrient Budget

Catchment	Nutrient Budget (kg)											
	2022/2024		2025/ 2029		2030/ 2034		2035/ 2039		2040/ 2044		Total to 2045	
	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN
Lower Stour	184	-2,093	189	2,483	1,004	4,455	409	6,130	0	7	1,787	10,982
Sarre Penn	0	0	250	214	277	934	102	346	0	0	630	1,494
Little Stour	0	0	26	17	65	1,265	8	233	0	0	99	1,516
Outside Catchment	0	0	4	360	4	397	0	0	0	0	8	757
Total	184	-2,093	469	3,074	1,350	7,052	519	6,709	0	7	2,523	14,749
Including Windfall sites	248	-1,140	553	4,663	1,434	8,640	602	8,298	84	1,595	2,920	22,055

3.11 A full set of calculations is included in the Appendix.

4 MITIGATING THE NUTRIENT BUDGET

Onsite Mitigation

- 4.1 Large development sites often have the scope, budget, and available space to deliver on-site mitigation to reduce the future nutrient loading from the development. This has been proven through several nutrient neutrality assessments submitted with planning applications to CCC and other districts within the catchment.
- 4.2 Therefore, a key component of the mitigation framework is the enforcement through the planning system that larger sites must undertake some level of onsite mitigation. This mitigation is expected to be delivered both in respect of foul water and surface water. With an assumed level of onsite mitigation achieved on larger sites, the nutrient budget has been refined to provide an estimate of the scale of nutrient offsetting required.

Foul Water Treatment for Large Developments

- 4.3 The following assumptions have been made in order to calculate the reduction in nutrient loading from additional foul water from large developments:
- Large sites are considered as sites which aim to deliver a minimum of 300 dwellings.
 - It is assumed that sites of this size will be able to implement additional foul sewage infrastructure in the form of an onsite treatment works. It is assumed that foul sewage will be able to be treated to a level of 15mgN/l and 0.1mgP/l. This represents the realistic limit of sewage treatment using available technologies.
- 4.4 It has been found that, proposed dwellings considered under the existing Local Plan, 1,200 dwellings are expected to be delivered on large sites. The remaining dwellings would be delivered on other unresolved allocation sites with a capacity less than 300. In terms of the draft allocations, 5,875 dwellings are anticipated to be delivered on large sites. These large sites contribute significantly to the nutrient budget for the district. The focus of this section is on the potential for large sites to deliver mitigation with respect to foul water drainage, in particular, the potential for large sites to install onsite WWTWs operated by Ofwat (Water Services Regulation Authority) regulated New Appointments and Variations (NAVs), which would discharge to surface waters or to ground.
- 4.5 It was originally considered as part of the Nutrient Mitigation Plan that large sites would be able to achieve nutrient neutrality via on-site solutions and would therefore not require any additional offsetting through any CCC mitigation scheme. However, through our experience using the new NE calculator it is proving difficult even for larger sites to achieve complete neutrality onsite, with most schemes still potentially requiring some level of off-site offsetting in order to achieve neutrality. Therefore, a precautionary approach has been taken in assuming that larger sites should be included in the determination of the scale of mitigation offsetting. Offsetting through any CCC scheme will be made available to large sites provided a site-specific mitigation strategy showing a significant reduction in nutrient loading from the development has been submitted and approved.

Surface Water Treatment (SuDS)

- 4.6 The updated NE guidance has increased the assumed leaching rate from residential urban land from 0.83kgP/ha/year to a value that varies according to soil type and average annual rainfall for the area. Across CCC, the Phosphorus leaching rate varies between 1.1kgP/ha/year to 1.45kgP/ha/year. From our discussions with NE, this is to represent more accurately an

'unmitigated' scenario, and sites are expected to reduce their leaching rates significantly through the use of Sustainable Drainage (SuDS) systems.

- 4.7 A development is required to implement SuDS when deemed as 'Major'. Within the context of this strategy and for the calculations, a 'Major' site comprises ten dwellings or more or the development is carried out on an area of one hectare or more.
- 4.8 Therefore, it is a key aspect of the mitigation strategy to enforce 'Major' development sites to significantly reduce their surface water nutrient loading through the implementation of SuDS and other measures such as on-site wetlands. It is assumed for the purpose of this calculation, that all sites will be able to achieve a reduction in leaching rates of 50%.
- 4.9 This level of mitigation is achievable through the implementation of SuDS and surface water wetlands which are known to reduce phosphorus levels by approximately 50%. Further guidance on this point is expected to be published by NE, in collaboration with CIRIA. This factor is considered precautionary due to the fact that there has been no allowance made for open space designations on proposed development sites, therefore the unmitigated surface water load is currently being significantly over estimated.

Summary

- 4.10 The mitigated nutrient budget has been calculated for each development site within the adopted Canterbury District Local Plan and New Local Plan to 2045. Calculations have been performed for each operational catchment and on a 5-year basis (excluding the first 2022-2024 period), as shown in Table 3.

Table 3: Mitigated Nutrient Budget

Catchment	Mitigated Nutrient Budget (kg)											
	2022/2024		2025/ 2029		2030/ 2034		2035/ 2039		2040/ 2044		Total to 2045	
	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN
Lower Stour	87	-2,997	120	1,904	470	-126	23	3,065	0	4	700	1,849
Sarre Penn	0	0	38	-453	3	467	1	173	0	0	43	187
Little Stour	0	0	15	-107	13	449	1	117	0	0	29	459
Outside Catchment	0	0	4	360	4	397	0	0	0	0	8	757
Total	87	-2,997	178	1,704	490	1,188	25	3,355	0	4	780	3,252
Including Windfall sites	151	-2,045	261	3,292	574	2,776	108	4,943	83	1,592	1,177	10,558

- 4.11 Including onsite mitigation at the level described, both for foul and surface water, **a mitigated nutrient budget has been calculated as 1,177kgP and 10,558kgN for the current Local Plan and New Local Plan to 2045.** This represents a 59% reduction in the phosphorus budget and a 52% reduction in the nitrogen budget. The onsite mitigation does not apply to windfall sites. This makes it clear the significance of the onsite wastewater treatment works for large sites aspect of the mitigation strategy.

Offsetting from Other Projects

- 4.12 Through onsite mitigation is not possible to achieve nutrient neutrality, therefore other solutions within the District must be found. Retrofitting the CCC housing stock to reduce water consumption and land use change elsewhere are discussed as offsetting measures in this section.

Retrofitting Housing Stock

- 4.13 A direct connection has been made by NE, through their NMEG, between domestic water usage and nutrient levels in the effluent at WwTWs. Therefore, retrofitting existing homes with water saving measures can reduce the overall nutrient load at the outfall of WwTWs within the catchment can be decreased and used to offset new development. Canterbury has a significant General Needs housing (4,159 of which 3,505 are within the catchment) along with leasehold housing, sheltered housing and hostels which could all be converted. Analysis shows that retrofitting existing properties could reduce the mitigated nutrient budget by approximately 16%.
- 4.14 Further work on viability is currently being conducted to assess the effectiveness of this measure compared with other measures described below, and therefore as precautionary measure the benefits that could be achieved through retrofitting are not included in the mitigation calculations.

Land Use Change Elsewhere

- 4.15 There is significant potential within the district to reduce nutrient loadings further through changes in land use, either specifically for the purpose of nutrient reduction or through other schemes or programs designed for other purposes but which will also provide a reduction in nutrient loading. These schemes may not have nutrient offsetting as their main function, but this may arise as a secondary benefit from other ecological or amenity enhancement programs within the district.
- 4.16 For example, South East Water have plans for a significant new water supply reservoir in Broad Oak (Figure 2).

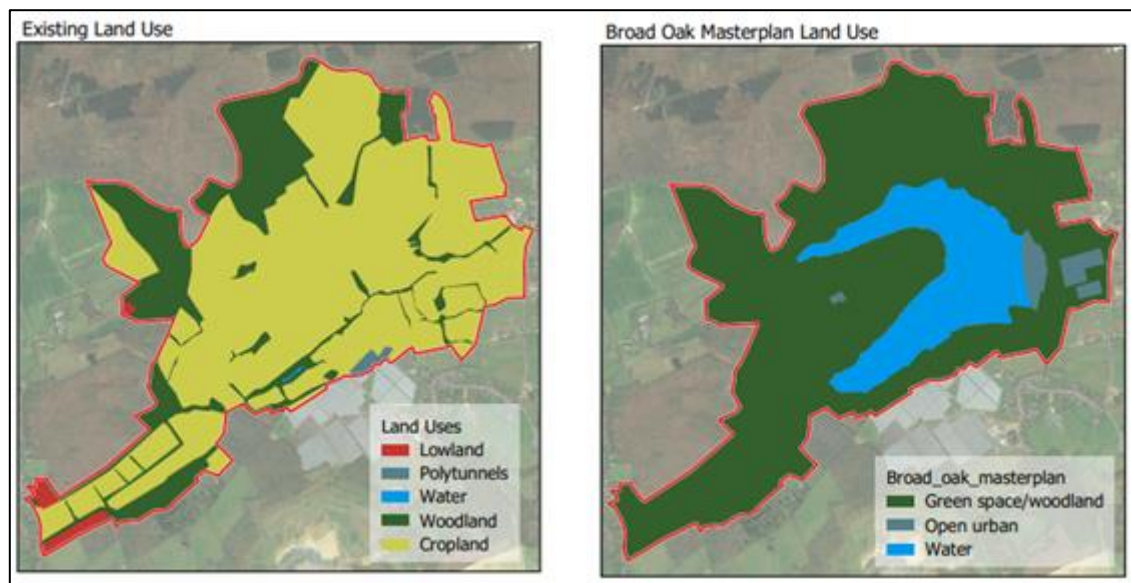


Figure 2: Broad Oak Reservoir

- 4.17 The land is currently agricultural and on 'Impeded drainage' (as defined by NEGM), with a correspondingly relatively high likely nutrient load. Therefore, creation of the reservoir biodiversity enhancement at the site, if implemented correctly, could have a potential beneficial effect on reducing nutrient loading in the downstream catchment. The proposals include a number of different uses including the reservoir top water level outline, main dam and secondary embankments, Water Treatment Works and pump house, 2 x car parks and river diversion, and will be constructed on varying land use types including arable, fruit, pasture, woodland and 'urban' (dwellings/structures). In addition, the NEGM for determining nutrient leaching rates from different land uses depends on the underlying soil classification which is not consistent across

the area. A preliminary calculation based on high level information has been undertaken to broadly estimate the nutrient reductions from the reservoir development, as 145kg TP/year and 5,617kg TN/year. A detailed study will be required to determine the nutrient reduction, but it will be meaningful in the context of the nutrient mitigation framework. It is important to note that any nutrient reductions resulting from the scheme will most likely only count towards offsetting nutrient increases from development also within the Wantsum and Sarre Penn sub catchment due the different hydrology between the upstream and downstream Stour catchments. It is recommended that further work is conducted on this.

- 4.18 There are also a couple of renewable energy projects which should come forward during the plan period. These could also reduce nutrient loading, and should be explored further.
- 4.19 Moreover, woodland planting can complement other wider strategies such as provision of public amenity as well as contributing to other ecological and environmental goals. Woodlands have very low leaching rates, therefore any land use change to woodlands results in offsetting the nutrient load from surface water, and can contribute towards offsetting the District nutrient budget. The exact amount of offsetting is variable and depends on the prior land use, the soil characteristics and the average rainfall at the woodland location. As a reference, in a 600mm to 900mm average rainfall area, 10ha of woodlands can offset between 0.2kg and 9.5kg of Phosphorus per year depending on the soil type.
- 4.20 In general, any small scheme, although having a limited total level of nutrient offsetting, will form a key part of the offsetting strategy as these nutrient reductions can potentially be realised much faster than a large-scale strategic offsetting scheme.

Land Use Change and Wetland Treatment

- 4.21 The nutrient budget has been developed by considering the nutrient contribution from the increased residential occupancy and the change in land use predicted to occur as a result of proposed new development within the Stour Catchment in the Canterbury district area, or from development outside the catchment which is known to discharge foul sewage to a Wastewater Treatment Works (WwTW) within the catchment. An allowance has been included for larger developments achieving some level of onsite foul treatment reduction and for all sites deemed as 'Major' to utilise SuDS for nutrient removal. Following onsite mitigation, the nutrient budgets are calculated to be 1,177kg of Phosphorus and 10,558 kg of Nitrogen for the current Local Plan and New Local Plan to 2045 (including windfall sites).
- 4.22 Strategic constructed wetlands have been established as an efficient large scale offsetting solution to the nutrient problem. Wetlands can remove a proportion of nutrients from incoming nutrient-rich water through, sedimentation, plant growth and denitrification among other processes. Many studies have quantified this effect. For the purpose of this strategy, in line with NE guidance, median removal rates from the Land et al. wetland metastudy¹³ will be used. The study found that the median values for TN and TP removal were 93g/m²/yr. and 1.2g/m²/yr., respectively, and that wetlands remove TN and TP with a median efficiency of 37% and 46%, respectively.
- 4.23 The majority of the offsetting is to be delivered through the creation of strategic wetlands located adjacent to the Great Stour River. It is proposed to create a series of Free Water Surface (FWS) Wetlands. These wetlands have areas of open water, floating vegetation, emergent plants, and are similar in appearance to natural marshes. As water flows through the wetland, nitrogen and phosphorus are removed by the processes of sedimentation, filtration, oxidation, reduction, adsorption, and precipitation. As FWS constructed wetlands closely mimic natural wetlands, it is

¹³ Land et al. (2016), How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal? A systematic review

known that they attract a wide variety of wildlife, namely, insects, molluscs, fish, amphibians, reptiles, birds, and mammals.

- 4.24 Applying a precautionary principle and in the absence of sufficient certainty regarding other offsetting project (as described at the section above, "Offsetting from Other Projects") the calculation of the wetland area is based on the mitigated budget as shown in Table 3. Other offsetting project will be continued to be investigated and once there is further certainty on them these measures will be incorporated within the strategy.
- 4.25 Based on the median removal rates quoted in the Land et al. wetland metastudy, it has been estimated that up to **approximately 98ha of wetland will need to be constructed along this river corridor to fully offset the nutrient budget up to 2045**. A wetland, or series of wetlands, of this size would be expected to remove a minimum of 91,140kgN and 1,177kgP. This is a conservative assumption as it is known that wetlands specifically designed for the purpose of nutrient removal can achieve nutrient removal rates higher than the median values used.
- 4.26 Considering the 5-year phasing (excluding the first 2022-2024 period), the amount of wetland required varies according to the number of sites developed as shown in Table 4

Table 4: Wetland Area Requirements

	Wetland area required based on the Mitigated Budget					
	2022/2024	2025/2029	2030/2034	2035/2039	2040/2044	Total to 2045
Wetland Size (ha)	13	22	48	9	7	98

- 4.27 It is proposed that, in order to establish 98ha of fully operational wetlands, approximately 160ha of total land may be required. This additional area will allow for the appropriate buffer zones and floodplain compensation areas on the site, as well as accommodate for any site constraints which may be present.
- 4.28 It should be noted that the NEGM recommends a 20% buffer is added to nutrient budget calculations. A 20% buffer has not been included in the calculations at this stage. Rather than use an arbitrary factor of safety, a precautionary approach has been taken throughout the calculations. The mitigation strategy will remain adaptive and flexible through the design of the strategic wetlands and the accumulation of other offsetting projects within the district. This will allow the strategy to respond to housing delivery and adjustments can be made as necessary throughout the lifetime of the strategy to ensure that the required level of offsetting is delivered.
- 4.29 Catchment analysis has been carried out to assess potential suitable locations for wetlands. Potentially suitable locations have been identified based on immediate proximity to watercourses for a source of supply, and relatively low lying flat land to minimise excavation. Figure 3 shows potentially suitable wetland locations. The sites have been sifted into those sites for which there are no obvious constraints (high level review) – demarcated in green – those sites for which wetlands are possible but there are constraints such as topography or existing designations – orange – and sites which are low lying adjacent to the river but which would be very difficult to convert into wetlands (e.g. existing lakes) - red. For context the green sites add up to 55ha and there is a potential of removing in the region of 330 - 660 kg of Phosphorus per year. The calculation will be refined in relation to the actual area available, and will depend on the levels of nutrients in the river: in this instance average nutrient removal rates have been used and the total area has conservatively been halved based on 50% of the Green land being constructed as 'fully utilised wetland'.
- 4.30 This is less than required offset the entire budget.

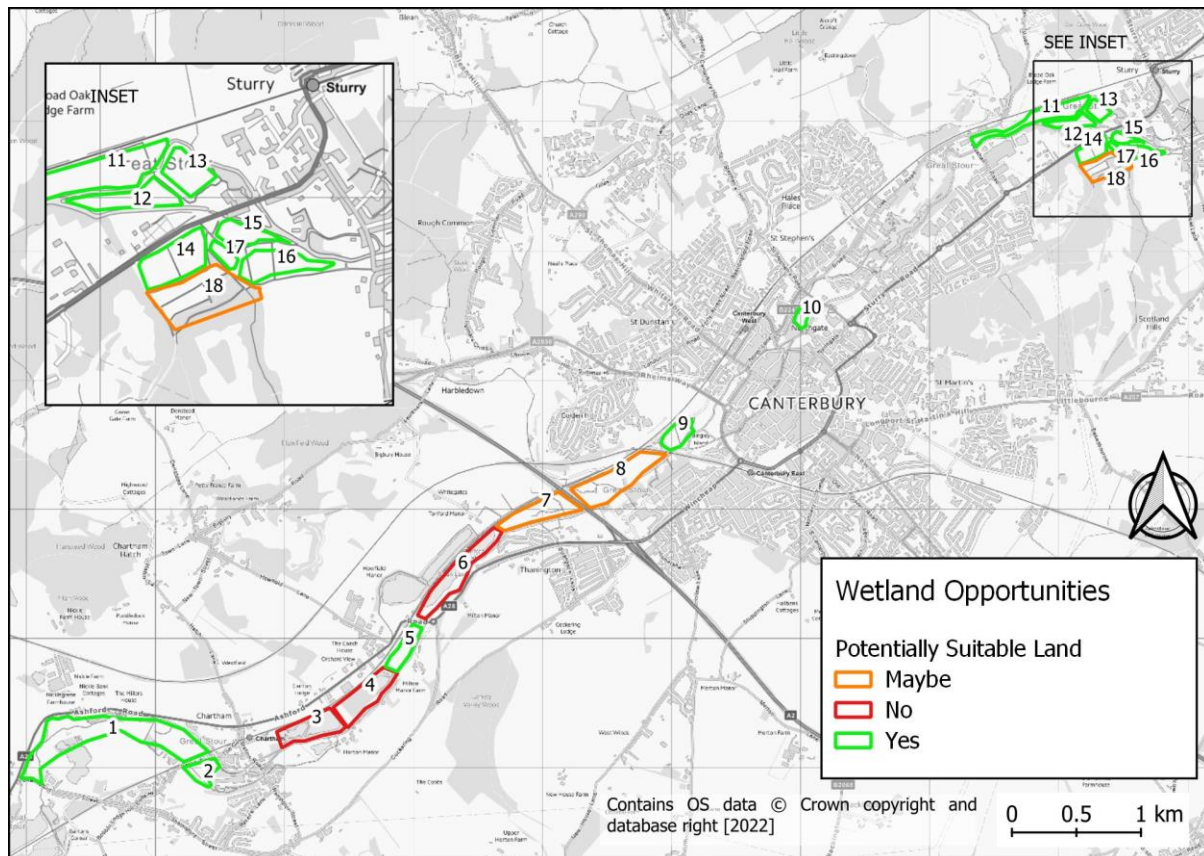


Figure 3: Wetland Opportunities Within CCC

- 4.31 Sites 11 – 17 are of particular interest and are considered 'Prime' locations as they are in close proximity to Canterbury WwTW on Sturry Road.
- 4.32 Taking treated effluent from Canterbury WwTW and passing it through a wetland would result in significant nutrient removal. This solution presents logistical, technical and legislative (permitting) challenges but might solve the nutrients issue in Canterbury District. Preliminary analysis based on the current permit limit (2.0mg/l of TP) suggests that a 10ha constructed wetland can remove more than 1,500 kg of Phosphorus yearly, which is greater than the calculated mitigated budget. Significant further analysis will be required, including considerations on the outcomes of the WINEP study, however, this solution should definitely be pursued further.**

Improvements to WwTW

- 4.33 The committed improvements to WwTW to be delivered by 2024 have been taken into account for the nutrient budget calculations. These upgrades are not considered a mitigation but will change the future baseline by reducing the concentration of nutrients reaching the Stodmarsh.
- 4.34 The WINEP study is still to report at the time of writing, however theoretical analysis has been undertaken to test the potential scale of benefit that could be realised if the Permit limit was reduced to 0.25mg/l TP.
- 4.35 The Government committed to upgrading all WwTWs to Technically Achievable Limits by 2030. This will substantially reduce nutrient loading thereafter, especially as Canterbury WwTW (as the largest WwTW in the Canterbury District) has Total Phosphorus permit limit of 2.0mg/l (reduced down to 0.25mg/l) and no Total Nitrogen limit (reduce down to c.a. 10mg/l).

- 4.36 Using the above mentioned nutrient concentrations, it is estimated that the area required for wetlands in the period up to 2030 is 35ha, and in the period 2030-2045 is 36ha (instead of 64ha), for a total required area of 71ha to 2045 (instead of 98ha).

5 CONCLUSIONS

- 5.1 This report seeks to provide an outline of the methodology followed in the calculation of the nutrient budget for the proposed projected growth based on the Canterbury adopted Local Plan and draft allocations under the emerging Local Plan to 2045 (including windfall development). This methodology follows the clear staged approach outlined by NE in their latest guidance document on the matter. This report has provided details of the key assumptions made when scaling up the NE methodology, which has been written with single developments in mind, to a much larger proposed housing stock.
- 5.2 It has been demonstrated that there is significant potential to reduce the nutrient budget for the district by implementing planning policies to ensure that sites include nutrient reduction measures into their development plans (parallels can be drawn with SuDS which are required for new developments). Large sites are expected to reduce their nutrient loading with respect to both surface water and foul water drainage, and smaller sites are expected to deliver significant reductions in terms of surface water loading.
- 5.3 Furthermore, this note has given an outline to the role of small offsetting projects within the district and the role these can play in reducing the overall nutrient budget.
- 5.4 Following the inclusion of onsite mitigation, an overall nutrient budget has been calculated to the year 2045 at 10,558kgN and 1,177kgP. Strategic constructed wetlands have been established as an efficient large-scale solution to help offset this budget, however based on the current measures included in the framework, the area of wetland required to offset the budget and allow for the delivery of housing to 2045 is considered challenging.
- 5.5 Opportunities will be taken to reduce, and mitigate the nutrient budget, including the potential for retrofitting existing council housing stock to reduce water usage, and other projects within the district which will reduce the nutrient loading from surface water runoff (e.g. Broad Oak Reservoir).
- 5.6 Future upgrades to SW WwTWs will reduce the budget, and, for example, lowering the TP permit limit at Canterbury WwTW alone reduces the required wetland area by c.a. 25%. The results of the WINEP study will be reviewed once available, and further announcements will be followed after the ministerial statement on the 20th July 2022 which included a statement: “.....*tabling an amendment to the Levelling Up and Regeneration Bill. This will place a new statutory duty on water and sewerage companies in England to upgrade wastewater treatment works to the highest technically achievable limits by 2030 in nutrient neutrality areas.*”.
- 5.7 The mitigation framework will be phased with short-, medium- and long-term solutions to allow the released of nutrient credits as quickly as possible whilst also considering the full scale of the Local Plan delivery.
- 5.8 The Stodmarsh mitigation strategy will continue to be adaptive, responding to changes in guidance, housing delivery, the market and as opportunities for offsetting through the district arise. CCC will continue to liaise with neighbouring authorities, as well as all relevant regulators to develop a holistic nutrient mitigation framework.

6 NEXT STEPS

6.1 Next steps include:

- Ongoing identification of land use change projects within the District/Stour catchment;
- Viability assessment for retrofitting housing stocks for water saving measures;
- Scoping of suitable wetland sites, based on the wetland opportunities plan (as shown in Figure 3);
- Develop nutrient credit bank costing and apportionment scheme;
- Develop an Action Plan.

6.2 Below (Figure 4) a flowchart describing the process to secure wetlands as a mitigation measure.

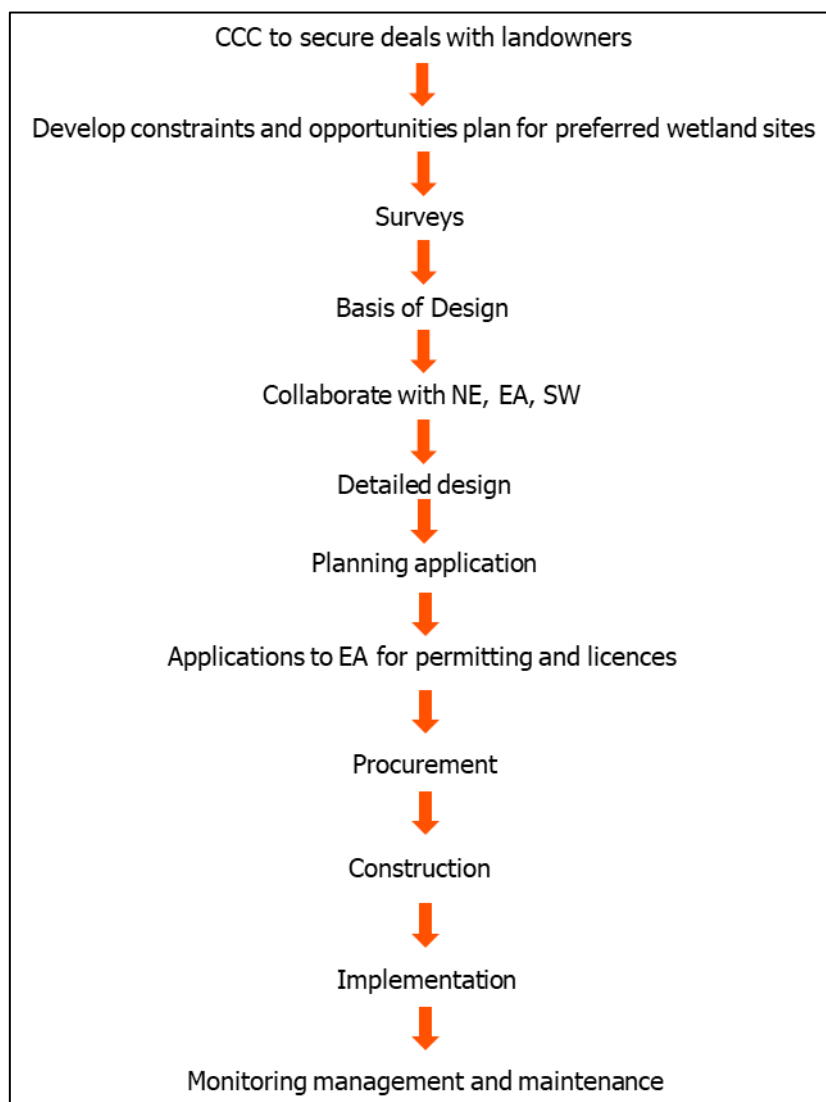


Figure 4: Wetland Flowchart

APPENDIX A: CALCULATIONS

Site code	Site Name	Local Plan	Yield	Older Persons Accommodation	Site Occupation					WwTW Catch	Catchment
					2022/2024	2025/2029	2030/2034	2035/2039	2040/2044		
SLAA163	Bread and Cheese Field	New	150	0	0	0	150	0	0	Westbere	Lower Stour
SLAA090	Milton Manor House	New	95	0	0	0	95	0	0	Chartham	Lower Stour
SLAA110	LAND TO THE WEST OF RATTINGTON STREET	New	170	0	0	0	170	0	0	Chartham	Lower Stour
SLAA011	Land North of Popes Lane, Sturry	New	110	0	0	0	110	0	0	Canterbury	Lower Stour
SLAA066	The Paddocks, Shalloak Road, Sturry	New	50	0	0	0	50	0	0	Canterbury	Lower Stour
SLAA099	43-45 St George's Place	New	50	0	0	0	50	0	0	Canterbury	Lower Stour
SLAA102	LAND AT THE FORMER CHAUCER TECHNOLOGY SCHOOL	New	70	0	0	70	0	0	0	Canterbury	Lower Stour
SLAA105	Land to the north of the Railway Line and to the south of Bekesbourne Lane, Canterbury	New	645	65	0	0	525	185	0	Canterbury	Lower Stour
SLAA122	Land South of Littlebourne Road, Canterbury	New	1400	140	0	0	660	850	30	Canterbury	Lower Stour
SLAA137B	Cockering Farm	New	36	0	0	0	36	0	0	Canterbury	Lower Stour
SLAA151	Merton Park	New	2075	208	0	0	850	1433	0	Canterbury	Lower Stour
SLAA156	Canterbury East Station	New	37	0	0	37	0	0	0	Canterbury	Lower Stour
SLAA162	Folly Farm	New	17	0	0	17	0	0	0	Canterbury	Lower Stour
SLAA183	Canterbury Golf Club	New	74	0	0	0	74	0	0	Canterbury	Lower Stour
SLAA235	Goose Farm	New	26	0	0	0	26	0	0	Canterbury	Lower Stour
SLAA239	Becket House	New	67	0	0	67	0	0	0	Canterbury	Lower Stour
SLAA259	Land on the west side of Hollow Lane	New	735	74	0	0	525	284	0	Canterbury	Lower Stour
	Wincheap	New	300	30	0	0	330	0	0	Canterbury	Lower Stour
SLAA266	Land on Bekesbourne Lane at Hoath Farm	New	67	0	0	0	67	0	0		Lower Stour
SLAA146	Land at Hersden	New	18	0	0	18	0	0	0	Westbere	Sarre Penn and Wantsum
SLAA202	Land at Church Farm Hoath	New	17	0	0	17	0	0	0	Westbere	Sarre Penn and Wantsum
SLAA036	Mill Field	New	36	0	0	36	0	0	0	Canterbury	Sarre Penn and Wantsum
SLAA045	Land fronting Mayton Lane Broad Oak	New	8	0	0	8	0	0	0	Canterbury	Sarre Penn and Wantsum
SLAA062	Land adjacent to Valley Road, Barham	New	9	0	0	9	0	0	0	Newnham Valley	Little Stour and Wingham Operational Catchment
SLAA098	Land off the Hill	New	300	30	0	30	300	0	0	Newnham Valley	Little Stour and Wingham Operational Catchment
SLAA145	Land north of Court Hill, Littlebourne	New	50	0	0	50	0	0	0	Newnham Valley	Little Stour and Wingham Operational Catchment
SLAA180	Aylesham South	New	420	42	0	0	350	112	0	Newnham Valley	Little Stour and Wingham Operational Catchment
SLAA013	Former Metric Site	New	12	0	0	12	0	0	0	Herne Bay	
SLAA067	Land comprising Nusery Industrial Units and former Kent Ambulance Station	New	14	0	0	14	0	0	0	Herne Bay	
SLAA226A	Altira Park and Blacksole Farm	New	70	0	0	70	0	0	0	Herne Bay	
SLAA240	Land at Greenhill adjacent Thornden Close	New	150	0	0	0	150	0	0	Herne Bay	
	Site 11 Land at Cockering Farm, Thanington	Current	400	0	30	300	70	0	0	Canterbury	Lower Stour
	Site 9 Land at Howe Barracks, Canterbury	Current	129	0	0	129	0	0	0	Canterbury	Lower Stour
	Site 8 Land North of Hersden	Current	800	0	0	252	400	148	0	Westbere	Sarre Penn and Wantsum
	CA043B Rosemary Lane Car Park, Canterbury	Current	20	0	0	20	0	0	0	Canterbury	Lower Stour
	CA047 St Radigund's Place, Canterbury	Current	7	0	0	7	0	0	0	Canterbury	Lower Stour
	CA278 Northgate Car Park, Canterbury	Current	21	0	0	21	0	0	0	Canterbury	Lower Stour
	CA281 Hawks Lane, Canterbury	Current	9	0	0	9	0	0	0	Canterbury	Lower Stour
	CA282 St Johns Lane Employment Exch, Canterbury	Current	24	0	0	0	24	0	0	Canterbury	Lower Stour
	CA286 St John's Lane Car Park, Canterbury	Current	5	0	0	5	0	0	0	Canterbury	Lower Stour
	CA347 Ivy Lane North, Canterbury	Current	10	0	0	10	0	0	0	Canterbury	Lower Stour
	CA477 Holmans Meadow Car Park, Canterbury	Current	20	0	0	20	0	0	0	Canterbury	Lower Stour
	CA481 Adj Canterbury West Station, Canterbury	Current	20	0	0	20	0	0	0	Canterbury	Lower Stour
	CA507 Castle Street Car Park, Canterbury	Current	54	0	0	27	27	0	0	Canterbury	Lower Stour
	Rouch Common (Road and Land to rear of 51 Rough Common Road)	Current	28	0	0	28	0	0	0	Canterbury	Lower Stour
	St Martin's Hospital, Canterbury	Current	164	0	0	140	24	0	0	Canterbury	Lower Stour
	Barham Court Farm, Barham	Current	25	0	0	25	0	0	0	Newnham Valley	Little Stour and Wingham Operational Catchment
	CA340 Garage Site, Kings Road, Herne Bay	Current	43	0	0	43	0	0	0	Herne Bay	
	CA491 Herne Bay Station, Land at	Current	35	0	0	15	20	0	0	Herne Bay	

Site code	Site Name	Area (ha)	Open Space (ha)	Existing Land Use	Proposed Land Use	Soilscape Drainage	Rainfall band	Existing Land Use Load	
								TP (kg/year) existing	TN (kg/year) existing
SLAA163	Bread and Cheese Field	7.51	3.15	Greenspace	Residential urban land	Freely draining	600to700	0.15	22.53
SLAA090	Milton Manor House	4.53	1.71	Greenspace	Residential urban land	Freely draining	600to700	0.09	13.59
SLAA110	LAND TO THE WEST OF RATTINGTON STREET	10.33	5.50	Cereals	Residential urban land	Freely draining	700to900	1.03	313.52
SLAA011	Land North of Popes Lane, Sturry	9.31	6.19	Cereals	Residential urban land	Freely draining	600to700	0.37	236.57
SLAA066	The Paddocks, Shalloak Road, Sturry	2.44	0.54	Lowland	Residential urban land	Impeded drainage	600to700	0.46	21.20
SLAA099	43-45 St George's Place	0.15	0.03	Commercial/industrial urban land	Residential urban land	Freely draining	600to700	0.13	0.91
SLAA102	LAND AT THE FORMER CHAUCER TECHNOLOGY SCHOOL	1.66	0.20	Open urban land	Residential urban land	Freely draining	600to700	1.08	11.09
SLAA105	Land to the north of the Railway Line and to the south of Bekesbourne Lane, Canterbury	34.06	13.28	Lowland	Residential urban land	Freely draining	600to700	1.02	357.63
SLAA122	Land South of Littlebourne Road, Canterbury	77.30	25.98	Cereals	Residential urban land	Freely draining	600to700	3.09	1964.19
SLAA137B	Cockering Farm	1.92	0.42	Greenspace	Residential urban land	Freely draining	600to700	0.04	5.76
SLAA151	Merton Park	99.67	43.50	Cereals	Residential urban land	Freely draining	600to700	3.99	2532.61
SLAA156	Canterbury East Station	0.66	0.08	Open urban land	Residential urban land	Freely draining	600to700	0.43	4.41
SLAA162	Folly Farm	0.62	0.14	Greenspace	Residential urban land	Freely draining	600to700	0.01	1.86
SLAA183	Canterbury Golf Club	7.58	0.53	Greenspace	Residential urban land	Freely draining	600to700	0.15	22.74
SLAA235	Goose Farm	2.11	0.46	Commercial/industrial urban land	Residential urban land	Impeded drainage	600to700	1.88	12.74
SLAA239	Becket House	1.01	0.12	Commercial/industrial urban land	Residential urban land	Freely draining	600to700	0.90	6.10
SLAA259	Land on the west side of Hollow Lane	40.89	15.95	Cereals	Residential urban land	Freely draining	600to700	1.64	1039.01
	Wincheap	14.96	1.80	Commercial/industrial urban land	Residential urban land	Freely draining	600to700	13.31	90.36
SLAA266	Land on Bekesbourne Lane at Hoath Farm	2.46	0.36	Lowland	Residential urban land	Freely draining	600to700	0.07	25.83
SLAA146	Land at Hersden	1.24	0.27	Cereals	Residential urban land	Impeded drainage (Sarre Penn)	600to700	0.68	24.95
SLAA202	Land at Church Farm Hoath	1.03	0.23	Cereals	Residential urban land	Freely draining (Sarre Penn)	600to700	0.07	27.15
SLAA036	Mill Field	2.29	0.50	Greenspace	Residential urban land	Impeded drainage (Sarre Penn)	600to700	0.05	6.87
SLAA045	Land fronting Mayton Lane Broad Oak	0.50	0.11	Greenspace	Residential urban land	Impeded drainage (Sarre Penn)	600to700	0.01	1.50
SLAA062	Land adjacent to Valley Road, Barham	2.78	0.61	Greenspace	Residential urban land	Naturally wet (Little Stour)	700to900	0.06	8.34
SLAA098	Land off the Hill	15.99	6.24	Cereals	Residential urban land	Freely draining (Little Stour)	600to700	0.64	408.54
SLAA145	Land north of Court Hill, Littlebourne	1.96	0.43	Greenspace	Residential urban land	Freely draining (Little Stour)	600to700	0.04	5.88
SLAA180	Aylesham South	12.00	0.00	Cereals	Residential urban land	Freely draining (Little Stour)	700to900	1.20	366.36
SLAA013	Former Metric Site	0.17	0.02	Not relevant	Not relevant			0.00	0.00
SLAA067	Land comprising Nusery Industrial Units and former Kent Ambulance Station	0.50	0.11	Not relevant	Not relevant			0.00	0.00
SLAA226A	Altira Park and Blacksole Farm	1.56	0.28	Not relevant	Not relevant			0.00	0.00
SLAA240	Land at Greenhill adjacent Thornden Close	16.25	3.14	Not relevant	Not relevant			0.00	0.00
	Site 11 Land at Cockering Farm, Thanington	153.54	0.00	Cereals	Residential urban land	Freely draining	600to700	6.14	3901.56
	Site 9 Land at Howe Barracks, Canterbury	27.70	0.00	Greenspace	Residential urban land	Freely draining	600to700	0.55	83.09
	Site 8 Land North of Hersden	62.09	0.00	Cereals	Residential urban land	Impeded drainage (Sarre Penn)	600to700	34.15	1249.25
CA043B	Rosemary Lane Car Park, Canterbury	0.27	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.17	1.78
CA047	St Radigund's Place, Canterbury	0.07	0.00	Open urban land	Residential urban land	Naturally wet	600to700	0.05	0.49
CA278	Northgate Car Park, Canterbury	0.21	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.13	1.37
CA281	Hawks Lane, Canterbury	0.03	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.02	0.18
CA282	St Johns Lane Employment Exch, Canterbury	0.08	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.05	0.52
CA286	St John's Lane Car Park, Canterbury	0.06	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.04	0.43
CA347	Ivy Lane North, Canterbury	0.08	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.05	0.54
CA477	Holmans Meadow Car Park, Canterbury	0.54	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.35	3.58
CA481	Adj Canterbury West Station, Canterbury	0.28	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.18	1.86
CA507	Castle Street Car Park, Canterbury	0.28	0.00	Open urban land	Residential urban land	Freely draining	600to700	0.18	1.84
	Rouch Common (Road and Land to rear of 51 Rough Common Road)	1.11	0.00	Greenspace	Residential urban land	Freely draining	600to700	0.02	3.32
	St Martin's Hospital, Canterbury	6.39	0.00	Greenspace	Residential urban land	Freely draining	600to700	0.13	19.16
	Barham Court Farm, Barham	1.46	0.00	Greenspace	Residential urban land	Freely draining (Little Stour)	700to900	0.03	4.37
CA340	Garage Site, Kings Road, Herne Bay	0.13	0.00	Open urban land	Residential urban land			0.00	0.00
CA491	Herne Bay Station, Land at	0.58	0.00	Open urban land	Residential urban land	Naturally wet	Under600	0.00	0.00

		Unmitigated Budget											
		Proposed Land Use Load		WwTW Load									
Site code	Site Name	TP (kg/year) proposed	TN (kg/year) proposed	2022/2024 TP	2022/2024 TN	2025/2029 TP	2025/2029 TN	2030/2034 TP	2030/2034 TN	2035/2039 TP	2035/2039 TN	2040/2044 TP	2040/2044 TN
SLAA163	Bread and Cheese Field	5.33	58.77	0.00	0.00	0.00	0.00	103.81	350.35	0.00	0.00	0.00	0.00
SLAA090	Milton Manor House	3.45	37.05	0.00	0.00	0.00	0.00	65.74	221.89	0.00	0.00	0.00	0.00
SLAA110	LAND TO THE WEST OF RATTINGTON STREET	7.11	81.75	0.00	0.00	0.00	0.00	117.65	397.06	0.00	0.00	0.00	0.00
SLAA011	Land North of Popes Lane, Sturry	3.90	53.89	0.00	0.00	0.00	0.00	17.13	256.92	0.00	0.00	0.00	0.00
SLAA066	The Paddocks, Shalloak Road, Sturry	2.31	23.15	0.00	0.00	0.00	0.00	7.79	116.78	0.00	0.00	0.00	0.00
SLAA099	43-45 St George's Place	0.14	1.42	0.00	0.00	0.00	0.00	7.79	116.78	0.00	0.00	0.00	0.00
SLAA102	LAND AT THE FORMER CHAUCER TECHNOLOGY SCHOOL	1.77	17.13	0.00	0.00	10.90	163.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA105	Land to the north of the Railway Line and to the south of Bekesbourne Lane, Canterbury	25.41	275.07	0.00	0.00	0.00	0.00	78.82	1182.33	25.88	388.21	0.00	0.00
SLAA122	Land South of Littlebourne Road, Canterbury	62.62	658.88	0.00	0.00	0.00	0.00	98.57	1478.51	128.15	1922.28	0.47	7.06
SLAA137B	Cockering Farm	1.82	18.22	0.00	0.00	0.00	0.00	5.61	84.08	0.00	0.00	0.00	0.00
SLAA151	Merton Park	68.84	766.34	0.00	0.00	0.00	0.00	122.99	1844.88	213.77	3206.55	0.00	0.00
SLAA156	Canterbury East Station	0.70	6.81	0.00	0.00	5.76	86.42	0.00	0.00	0.00	0.00	0.00	0.00
SLAA162	Folly Farm	0.59	5.88	0.00	0.00	2.65	39.71	0.00	0.00	0.00	0.00	0.00	0.00
SLAA183	Canterbury Golf Club	8.54	81.41	0.00	0.00	0.00	0.00	11.52	172.84	0.00	0.00	0.00	0.00
SLAA235	Goose Farm	2.00	20.02	0.00	0.00	0.00	0.00	4.05	60.73	0.00	0.00	0.00	0.00
SLAA239	Becket House	1.08	10.42	0.00	0.00	10.43	156.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA259	Land on the west side of Hollow Lane	30.50	330.17	0.00	0.00	0.00	0.00	78.42	1176.25	40.89	613.37	0.00	0.00
	Wincheap	15.97	154.41	0.00	0.00	0.00	0.00	48.68	730.26	0.00	0.00	0.00	0.00
SLAA266	Land on Bekesbourne Lane at Hoath Farm	2.55	24.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SLAA146	Land at Hersden	1.18	11.77	0.00	0.00	12.46	42.04	0.00	0.00	0.00	0.00	0.00	0.00
SLAA202	Land at Church Farm Hoath	0.98	9.77	0.00	0.00	11.76	39.71	0.00	0.00	0.00	0.00	0.00	0.00
SLAA036	Mill Field	2.17	21.73	0.00	0.00	5.61	84.08	0.00	0.00	0.00	0.00	0.00	0.00
SLAA045	Land fronting Mayton Lane Broad Oak	0.47	4.74	0.00	0.00	1.25	18.69	0.00	0.00	0.00	0.00	0.00	0.00
SLAA062	Land adjacent to Valley Road, Barham	3.16	31.13	0.00	0.00	0.70	21.02	0.00	0.00	0.00	0.00	0.00	0.00
SLAA098	Land off the Hill	11.92	129.09	0.00	0.00	1.66	49.82	22.68	680.44	0.00	0.00	0.00	0.00
SLAA145	Land north of Court Hill, Littlebourne	1.86	18.60	0.00	0.00	3.89	116.78	0.00	0.00	0.00	0.00	0.00	0.00
SLAA180	Aylesham South	17.40	162.12	0.00	0.00	0.00	0.00	26.30	789.12	7.77	233.24	0.00	0.00
SLAA013	Former Metric Site	0.00	0.00	0.00	0.00	0.28	28.03	0.00	0.00	0.00	0.00	0.00	0.00
SLAA067	Land comprising Nusery Industrial Units and former Kent Ambulance Station	0.00	0.00	0.00	0.00	0.33	32.70	0.00	0.00	0.00	0.00	0.00	0.00
SLAA226A	Altira Park and Blacksole Farm	0.00	0.00	0.00	0.00	1.63	163.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA240	Land at Greenhill adjacent Thornden Close	0.00	0.00	0.00	0.00	0.00	0.00	3.50	350.35	0.00	0.00	0.00	0.00
	Site 11 Land at Cockering Farm, Thanington	185.79	1738.12	4.67	70.07	46.71	700.69	10.90	163.49	0.00	0.00	0.00	0.00
	Site 9 Land at Howe Barracks, Canterbury	33.51	313.53	0.00	0.00	20.09	301.30	0.00	0.00	0.00	0.00	0.00	0.00
	Site 8 Land North of Hersden	75.13	702.86	0.00	0.00	174.39	588.58	276.82	934.25	102.42	345.67	0.00	0.00
CA043B	Rosemary Lane Car Park, Canterbury	0.32	3.02	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA047	St Radigund's Place, Canterbury	0.09	0.83	0.00	0.00	1.09	16.35	0.00	0.00	0.00	0.00	0.00	0.00
CA278	Northgate Car Park, Canterbury	0.25	2.32	0.00	0.00	3.27	49.05	0.00	0.00	0.00	0.00	0.00	0.00
CA281	Hawks Lane, Canterbury	0.03	0.31	0.00	0.00	1.40	21.02	0.00	0.00	0.00	0.00	0.00	0.00
CA282	St Johns Lane Employment Exch, Canterbury	0.09	0.87	0.00	0.00	0.00	0.00	3.74	56.06	0.00	0.00	0.00	0.00
CA286	St John's Lane Car Park, Canterbury	0.08	0.73	0.00	0.00	0.78	11.68	0.00	0.00	0.00	0.00	0.00	0.00
CA347	Ivy Lane North, Canterbury	0.10	0.91	0.00	0.00	1.56	23.36	0.00	0.00	0.00	0.00	0.00	0.00
CA477	Holmans Meadow Car Park, Canterbury	0.65	6.07	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA481	Adj Canterbury West Station, Canterbury	0.34	3.15	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA507	Castle Street Car Park, Canterbury	0.33	3.11	0.00	0.00	4.20	63.06	4.20	63.06	0.00	0.00	0.00	0.00
	Rouch Common (Road and Land to rear of 51 Rough Common Road)	1.34	12.51	0.00	0.00	4.36	65.40	0.00	0.00	0.00	0.00	0.00	0.00
	St Martin's Hospital, Canterbury	7.73	72.29	0.00	0.00	21.80	326.99	3.74	56.06	0.00	0.00	0.00	0.00
	Barham Court Farm, Barham	2.11	19.70	0.00	0.00	1.95	58.39	0.00	0.00	0.00	0.00	0.00	0.00
CA340	Garage Site, Kings Road, Herne Bay	0.00	0.00	0.00	0.00	1.00	100.43	0.00	0.00	0.00	0.00	0.00	0.00
CA491	Herne Bay Station, Land at	0.00	0.00	0.00	0.00	0.35	35.03	0.47	46.71	0.00	0.00	0.00	0.00

		Mitigated Budget											
		Proposed Land Use Load		WwTW Load									
Site code	Site Name	mTP (kg/year) proposed	mTN (kg/year) proposed	m2022/2024 TP	m2022/2024 TN	m2025/2029 TP	m2025/2029 TN	m2030/2034 TP	m2030/2034 TN	m2035/2039 TP	m2035/2039 TN	m2040/2044 TP	m2040/2044 TN
SLAA163	Bread and Cheese Field	2.67	29.39	0.00	0.00	0.00	0.00	103.81	350.35	0.00	0.00	0.00	0.00
SLAA090	Milton Manor House	1.72	18.53	0.00	0.00	0.00	0.00	65.74	221.89	0.00	0.00	0.00	0.00
SLAA110	LAND TO THE WEST OF RATTINGTON STREET	3.56	40.88	0.00	0.00	0.00	0.00	117.65	397.06	0.00	0.00	0.00	0.00
SLAA011	Land North of Popes Lane, Sturry	1.95	26.94	0.00	0.00	0.00	0.00	17.13	256.92	0.00	0.00	0.00	0.00
SLAA066	The Paddocks, Shalloak Road, Sturry	1.16	11.58	0.00	0.00	0.00	0.00	7.79	116.78	0.00	0.00	0.00	0.00
SLAA099	43-45 St George's Place	0.07	0.71	0.00	0.00	0.00	0.00	7.79	116.78	0.00	0.00	0.00	0.00
SLAA102	LAND AT THE FORMER CHAUCER TECHNOLOGY SCHOOL	0.89	8.57	0.00	0.00	10.90	163.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA105	Land to the north of the Railway Line and to the south of Bekesbourne Lane, Canterbury	12.70	137.53	0.00	0.00	0.00	0.00	4.38	591.16	1.44	194.11	0.00	0.00
SLAA122	Land South of Littlebourne Road, Canterbury	31.31	329.44	0.00	0.00	0.00	0.00	5.48	739.26	7.12	961.14	0.03	3.53
SLAA137B	Cockering Farm	0.91	9.11	0.00	0.00	0.00	0.00	5.61	84.08	0.00	0.00	0.00	0.00
SLAA151	Merton Park	34.42	383.17	0.00	0.00	0.00	0.00	6.83	922.44	11.88	1603.28	0.00	0.00
SLAA156	Canterbury East Station	0.35	3.41	0.00	0.00	5.76	86.42	0.00	0.00	0.00	0.00	0.00	0.00
SLAA162	Folly Farm	0.29	2.94	0.00	0.00	2.65	39.71	0.00	0.00	0.00	0.00	0.00	0.00
SLAA183	Canterbury Golf Club	4.27	40.71	0.00	0.00	0.00	0.00	11.52	172.84	0.00	0.00	0.00	0.00
SLAA235	Goose Farm	1.00	10.01	0.00	0.00	0.00	0.00	4.05	60.73	0.00	0.00	0.00	0.00
SLAA239	Becket House	0.54	5.21	0.00	0.00	10.43	156.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA259	Land on the west side of Hollow Lane	15.25	165.09	0.00	0.00	0.00	0.00	4.36	588.13	2.27	306.68	0.00	0.00
	Wincheap	7.98	77.21	0.00	0.00	0.00	0.00	2.70	365.13	0.00	0.00	0.00	0.00
SLAA266	Land on Bekesbourne Lane at Hoath Farm	1.27	12.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SLAA146	Land at Hersden	0.59	5.88	0.00	0.00	12.46	42.04	0.00	0.00	0.00	0.00	0.00	0.00
SLAA202	Land at Church Farm Hoath	0.49	4.89	0.00	0.00	11.76	39.71	0.00	0.00	0.00	0.00	0.00	0.00
SLAA036	Mill Field	1.09	10.87	0.00	0.00	5.61	84.08	0.00	0.00	0.00	0.00	0.00	0.00
SLAA045	Land fronting Mayton Lane Broad Oak	0.47	4.74	0.00	0.00	1.25	18.69	0.00	0.00	0.00	0.00	0.00	0.00
SLAA062	Land adjacent to Valley Road, Barham	1.58	15.56	0.00	0.00	0.70	21.02	0.00	0.00	0.00	0.00	0.00	0.00
SLAA098	Land off the Hill	5.96	64.55	0.00	0.00	0.18	24.91	2.52	340.22	0.00	0.00	0.00	0.00
SLAA145	Land north of Court Hill, Littlebourne	0.93	9.30	0.00	0.00	3.89	116.78	0.00	0.00	0.00	0.00	0.00	0.00
SLAA180	Aylesham South	8.70	81.06	0.00	0.00	0.00	0.00	2.92	394.56	0.86	116.62	0.00	0.00
SLAA013	Former Metric Site	0.00	0.00	0.00	0.00	0.28	28.03	0.00	0.00	0.00	0.00	0.00	0.00
SLAA067	Land comprising Nusery Industrial Units and former Kent Ambulance Station	0.00	0.00	0.00	0.00	0.33	32.70	0.00	0.00	0.00	0.00	0.00	0.00
SLAA226A	Altira Park and Blacksole Farm	0.00	0.00	0.00	0.00	1.63	163.49	0.00	0.00	0.00	0.00	0.00	0.00
SLAA240	Land at Greenhill adjacent Thornden Close	0.00	0.00	0.00	0.00	0.00	0.00	3.50	350.35	0.00	0.00	0.00	0.00
	Site 11 Land at Cockering Farm, Thanington	92.89	869.06	0.26	35.03	2.60	350.35	0.61	81.75	0.00	0.00	0.00	0.00
	Site 9 Land at Howe Barracks, Canterbury	16.76	156.76	0.00	0.00	20.09	301.30	0.00	0.00	0.00	0.00	0.00	0.00
	Site 8 Land North of Hersden	37.56	351.43	0.00	0.00	2.18	294.29	3.46	467.13	1.28	172.84	0.00	0.00
CA043B	Rosemary Lane Car Park, Canterbury	0.16	1.51	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA047	St Radigund's Place, Canterbury	0.09	0.83	0.00	0.00	1.09	16.35	0.00	0.00	0.00	0.00	0.00	0.00
CA278	Northgate Car Park, Canterbury	0.12	1.16	0.00	0.00	3.27	49.05	0.00	0.00	0.00	0.00	0.00	0.00
CA281	Hawks Lane, Canterbury	0.03	0.31	0.00	0.00	1.40	21.02	0.00	0.00	0.00	0.00	0.00	0.00
CA282	St Johns Lane Employment Exch, Canterbury	0.05	0.44	0.00	0.00	0.00	0.00	3.74	56.06	0.00	0.00	0.00	0.00
CA286	St John's Lane Car Park, Canterbury	0.08	0.73	0.00	0.00	0.78	11.68	0.00	0.00	0.00	0.00	0.00	0.00
CA347	Ivy Lane North, Canterbury	0.05	0.46	0.00	0.00	1.56	23.36	0.00	0.00	0.00	0.00	0.00	0.00
CA477	Holmans Meadow Car Park, Canterbury	0.32	3.04	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA481	Adj Canterbury West Station, Canterbury	0.17	1.58	0.00	0.00	3.11	46.71	0.00	0.00	0.00	0.00	0.00	0.00
CA507	Castle Street Car Park, Canterbury	0.17	1.56	0.00	0.00	4.20	63.06	4.20	63.06	0.00	0.00	0.00	0.00
	Rouch Common (Road and Land to rear of 51 Rough Common Road)	0.67	6.26	0.00	0.00	4.36	65.40	0.00	0.00	0.00	0.00	0.00	0.00
	St Martin's Hospital, Canterbury	3.86	36.14	0.00	0.00	21.80	326.99	3.74	56.06	0.00	0.00	0.00	0.00
	Barham Court Farm, Barham	1.06	9.85	0.00	0.00	1.95	58.39	0.00	0.00	0.00	0.00	0.00	0.00
	CA340 Garage Site, Kings Road, Herne Bay	0.00	0.00	0.00	0.00	1.00	100.43	0.00	0.00	0.00	0.00	0.00	0.00
	CA491 Herne Bay Station, Land at	0.00	0.00	0.00	0.00	0.35	35.03	0.47	46.71	0.00	0.00	0.00	0.00