ONE HORTON HEATH



Upper Acre

Nutrient Neutrality Study

December 2025

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Nutrient Neutrality Study
One Horton Heath: Upper Acre

Eastleigh Borough Council (One Horton Heath Team)

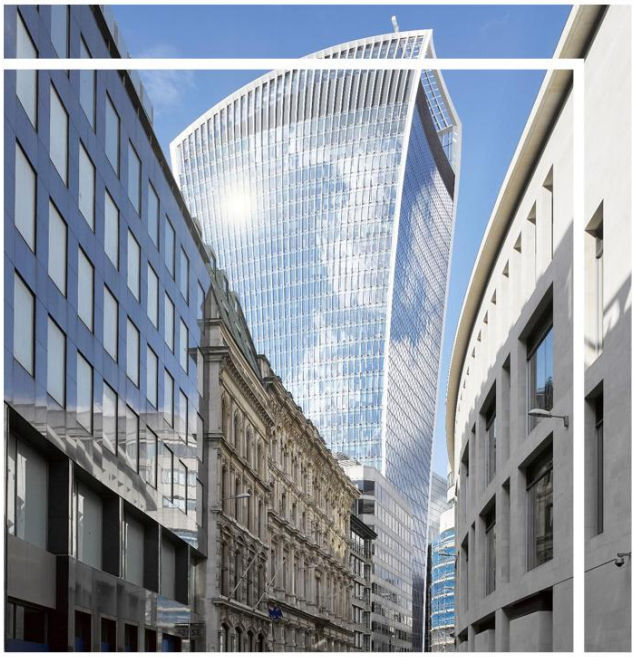
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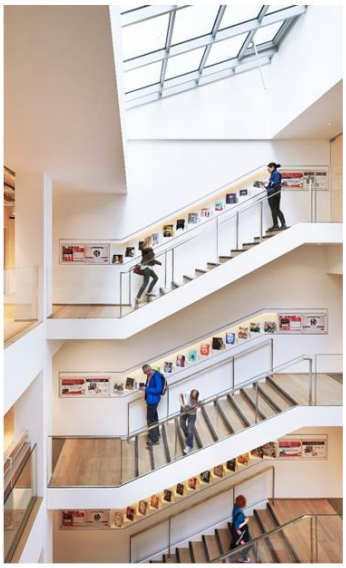
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Executive Summary

Hilson Moran has been appointed by the One Horton Heath (OHH) Project Team at Eastleigh Borough Council (EBC) to provide a Nutrient Neutrality Study of the Upper Acre, part of the OHH masterplan.

OHH is a major mixed-use development, located near Eastleigh in Hampshire, which was granted Outline Planning Permission in October 2025 for up to 2,500 homes, a local centre, a primary school and commercial floorspace. The Upper Acre (National Grid Reference SU 49063 16566), comprises a full planning application for: the erection of 424 residential units with hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces and associated infrastructure.

The aim of the Nutrient Neutrality Study is to provide a robust assessment of the impact of the development on nitrogen (N) and phosphorous (P) losses into the River Itchen catchment and demonstrate how, through the application of appropriate mitigation measures, the Upper Acre scheme can deliver nutrient neutrality. The findings of the study will support EBC, as the competent authority under the Habitat Regulations, in the completion of an appropriate assessment of whether the scheme would adversely affect the integrity of the European Designated Sites associated with the River Itchen and the Solent.

The report provides a summary of the evidence gathered to support the Nutrient Neutrality Study together with the neutrality calculations for the scheme and effect of appropriate mitigation measures proposed for inclusion within the scheme.

Incorporating a 20 % buffer for nutrient losses as per NE guidance, the Upper Acre development is identified to give rise to:

- **98.96 kg N/yr** deficit pre-2030;
- **47.40 kg N/yr** deficit post-2030.
- **10.20 kg TP/yr** deficit pre-2030;
- **12.34 kg TP/yr** deficit post-2030.

The following mitigation measures are proposed to deliver nutrient neutrality in the Upper Acre scheme:

- Benefits brought forward from the previously permitted Lower Acre scheme, which included the removal of pre-existing residential occupation and removal of farmland for the link road, south-east access and north-west access and conversion of farming practices for retained land to the north of Quobleigh Stream and Parcel 47; and
- Temporary offsetting nutrient losses from land changes associated with land within the Applicant's control during the pre-2030 phase.

Following the inclusion of benefits brought forward from the previously permitted Lower Acre scheme, it is demonstrated that better than nutrient neutrality for N & P will be achieved in the post-2030 scenario (benefits of **577.54 kg N/yr** and **9.34 kg P/yr**), with a small deficit of **2.09 kg N/yr** (with the inclusion of the 20% buffer) and a benefit of **0.05 kg P/yr** for the pre-2030 scenario.

The post-2030 N & P benefits of **577.54 kg N/yr** and **9.34 kg P/yr** will be carried forward to future phases of the OHH masterplan (*e.g.* the Quobleigh Breach scheme is also expected to be partially delivered pre-2030) and offset against other development phases on the site as part of the overall mitigation package.

The above, small N deficit (**2.09 kg N/yr**) resulting from the pre-2030 scenario can be readily mitigated through temporary land change measures, prior to the construction of dwellings. For example, when the temporary pre-2030 conversion of 6 ha of parcel 33 from agriculturally managed land to greenspace (*i.e*. with no fertiliser or manure applications, or grazing of livestock) during construction on the rest of the plot (*i.e.* parcels 32, 34, 0.7 and the rest of parcel 33), then the above deficits can be more than offset, resulting in temporary overall benefits of **183.36 kg N/yr** and **4.31 kg P/yr,** prior to 2030.

As better than N & P neutrality can be demonstrated for both the pre- and post-2030 scenarios for the Upper Acre scheme, no further mitigation measures need to be identified for this phase of the OHH development.

It should be noted that it is anticipated that the Quobleigh Breach Reserved Matter scheme will also be constructed at the same time as the Lower Acre scheme, and that 90 dwellings from this scheme (33% of the total) could also be completed by 2030. The above Upper Acre pre-2030 benefits (**183.36 kg N/yr** and **4.31 kg P/yr**), in combination with land use changes associated with the Quobleigh Breach scheme (*i.e*. the temporary change from agricultural land to greenspace for parcel 26) will be sufficient, not only to offset the anticipated 141 pre-2030 completed Upper Acre dwellings, but also the anticipated 90 (33% of the total) pre-2030 completed Quobleigh Breach dwellings. The pre-2030 N & P benefit remaining would still be enough to offset a further 33 completed and occupied dwellings, either within the Upper Acre or Quobleigh Breach schemes. As such, there is plenty of headroom in the calculations to permit higher rates of pre-2030 completion and occupation than the predicted 33%, if required. In the unlikely event that this figure of 264 dwellings completed and occupied by 2030 is desired or exceeded, then it is anticipated that additional agricultural-to-greenspace conversion across the OHH development would readily facilitate any further short-term offset requirements. All other phases of the OHH scheme are scheduled for first completions and occupations to happen post-2030.

1. Introduction

1.1. Background

Proposed development within the Hampshire area, particularly those associated with residential land use and tourism, can have impacts associated with nitrate concentrations reaching the Solent and influencing the qualifying features of internationally designated sites associated with the Solent. These designated sites are the Solent Maritime Special Area of Conservation (SAC), Portsmouth Harbour Special Protection Area (SPA), Chichester and Langstone Harbours SPA and Solent and Southampton Water SPA. Additional nitrogen (N) loadings from new development, principally associated with increased wastewater generation, have been identified to be causing algal blooms within the Solent that influence dissolved oxygen levels within the marine waterbody as well as smothering food resources for birds and marine life.

Following a test case heard in the European court, Natural England (NE) advised that no planning consents should be granted within the region unless they can demonstrate nitrogen neutrality. More recently, there has also been an interest in reducing phosphorous (P) loadings to downstream European protected areas and NE now also expects P neutrality to be demonstrated for all residential schemes coming forward within the River Itchen catchment, as per the OHH scheme.

Hilson Moran has been appointed by the OHH Team at EBC to provide a Nutrient Neutrality Study of the Upper Acre, part of the OHH masterplan, centred on National Grid Reference SU 48815 17105 and identified in Figure 1.1.

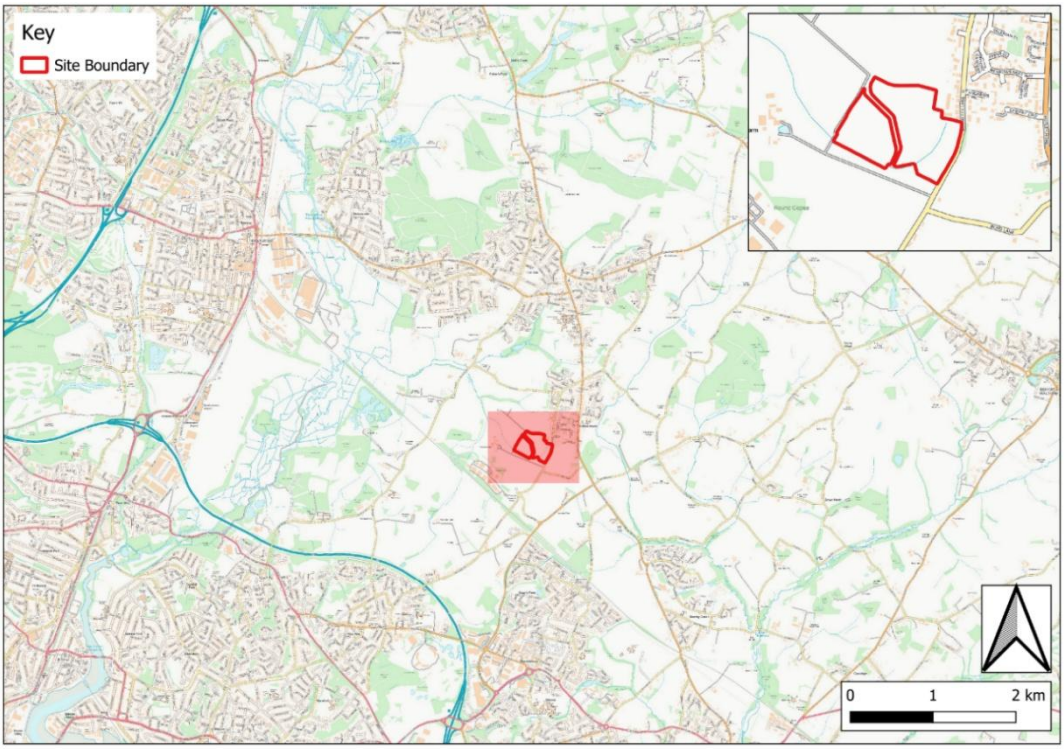


Figure 1.1 Site Location (Contains Ordnance Survey data © Crown copyright and database right 2025)

Upper Acre is located near Eastleigh in Hampshire (National Grid Reference SU 49063 16566) and comprises a full planning application for the erection of 424 residential units with hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, and associated infrastructure.

The layout of the Upper Acre scheme is presented in Figure 1.2.



Figure 1.2 Proposed Layout of Upper Acre

1.2. Purpose of the Report

This Nutrient Neutrality Study has been produced to accompany the full application for the Upper Acre scheme and to provide sufficient evidence to both EBC and NE that N and P neutrality can be achieved as part of the development proposals, in order to avoid any detrimental impacts on downstream European Designated Sites. The study is intended to support EBC's appropriate assessment under the Habitats Regulations.

1.3. Structure

Following this introductory section, an overview to the approach and methodology is provided in Section 2. Section 3 identifies the results of the nutrient balance, considering the nutrient export from the proposed development and the baseline nutrient export to identify the net

change as a result of the scheme. Section 4 outlines the mitigation proposals proposed to deliver nutrient neutrality and Section 5 provides a summary of the study and conclusions.

Appendices and references can be found at the end of the document, with document control information included at the front.

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1.5. Declaration of Competency

This assessment has been carried out by Dr Paul Bond PhD MSc BSc CEnv CSci MIEnvSc MCIEEM. Paul possesses over 30 years' experience of environmental, civil engineering and industrial projects within commercial, public and academic sectors. He holds a doctorate in SuDS, possesses post-doctoral experience in bacterial nitrogen transformations and is also a competent Ecologist, possessing over 20 years environmental consultancy experience. As such, Dr Paul Bond is suitably qualified and experienced to conduct and direct the Nutrient Neutrality study for the development proposals.

2. Approach

There is currently uncertainty surrounding whether the condition of designated ecological areas located within the Solent Region will be detrimentally impacted by increases in discharges of treated sewage effluent from future housing growth in the area. This issue has been subject to ongoing detailed work commissioned by local planning authorities in association with NE, the Environment Agency (EA) and water companies. Consequently, there is the potential for future housing developments across the Solent Region to exacerbate these impacts, which creates a risk to the potential future conservation status of designated sites. Consequently, NE has stated that one way to address this uncertainty is for new development to achieve nutrient neutrality by securing the required mitigation in compliance with the Habitats Regulations.

NE has developed a recommended methodology to determine the potential impact of new developments on local designated sites. Hilson Moran has been appointed by Stantec, on behalf of EBC to provide a detailed Nutrient Neutrality Study for the development of its OHH scheme in Hampshire. The aim of the study is to accurately reflect current land-use practices and nutrient inputs from the existing site, providing a robust assessment of the impact of the development on downstream European Designated Sites and to inform the selection of appropriate mitigation measures for the scheme.

2.1. European Designated Sites

The Habitats Directive and Conservation of Habitats and Species Regulations 2017 (as amended) make reference to the consideration of likely significant effects of a project or plan on one or more European Sites, including SPAs and SACs.

However, national planning policy, as set out in the National Planning Policy Framework (NPPF)[1], also expects those sites under consideration for designation, *i.e.* potential SPAs (pSPAs) and candidate SACs (cSACs), Ramsar sites and areas identified to provide compensatory sites, to be considered through the Habitats Regulations Assessment (HRA) process. The legislation/ agreement governing the designation of the sites are described further below:

- SPAs – classified under the European Council Directive 79/49/EEC 'on the conservation of wild birds' (also known as the 'Birds Directive') for the protection of wild birds and their habitats, including particularly rare and vulnerable species listed in Annex I of the Directive and migratory species;
- SACs – designated under European Council Directive 92/43/EEC 'on the conservation of natural habitats and of wild fauna and flora' (also known as the 'Habitats Directive'), targeting particular habitats (listed on Annex I) and/or species (listed on Annex II) that are identified as being of European importance;
- Ramsar – listed under the Convention on Wetlands of International Importance (Ramsar Convention, 1971) as sites that support important wetland habitats and species, especially waterfowl habitat; and,
- Compensatory Sites – sites that have been identified to provide compensatory habitat for that impacted by plans or projects permitted through the 'imperative reasons for overriding public interest' (IROPI) assessment.

For ease of reference, these designations are collectively referred to within this Nutrient Neutrality Study report as 'European Designated Sites', despite Ramsar designations being made at the international level. SPAs and SACs are also referred to in guidance documents as 'Natura 2000' sites.

2.2. Methodology

Nutrient neutrality advice provided by NE in March 2022 to Local Planning Authorities (LPAs) affected by nutrient neutrality considerations included a new methodology for assessing nutrient neutrality, providing a unified approach for nitrate and phosphate and comprising a nutrient neutrality calculator[2] with an accompanying guidance document[3].

The generic approach is based on four main Stages, with a series of steps in each stage, which are summarised as:

- Stage 1 – Identify the increase in nutrient loading to a Habitats site that results from the increase in wastewater from a new development:
    1. Step 1 – Calculate increase in population due to the development;
    2. Step 2 – Calculate the increase in wastewater production due to the development;
    3. Step 3 – Determine the concentration of nutrients in wastewater and calculate additional wastewater nutrient load;
- Stage 2 – Identify the nutrient loading from the past/present land use of the development site:
    - Step 1 – Obtain nutrient export values from current land use(s);
    - Step 2 – Calculate the annual nutrient export from current land use(s)
- Stage 3 – Identify the nutrient loading from the future mix of land use on the development site:
    - Step 1 – Calculate the annual export from future land use(s);
- Stage 4 – Calculate the net change in nutrient loading to a Habitats site within the addition of a buffer. The net change in nutrient loading and the buffer is the nutrient budget:
    - Step 1 – Calculate the nutrient budget;
    - Step 2 – Add the buffer to the nutrient budget.

Although NE have put this methodology forward for use in demonstrating nutrient neutrality, they identify in their Nutrient Neutrality Summary Guide that the approach is not mandatory and, if they prefer, competent authorities can determine their own solutions as appropriate.

2.2.1. Stage 1: Additional Wastewater Loading

The methodology identifies that Step 1 should consider the additional population that will result from the development, from which the additional nutrients in wastewater can be calculated. However, as the masterplan is delivered in phases and existing residential properties on the site are vacated ahead of respective phases being brought forward, a bespoke approach has been

adopted to allow accurate reflection of how the nutrient loading changes on the wider site under the applicant's control.

The nutrient loading arising from the development has been allocated as the total development population, based on an average occupancy of 2.4 people per dwelling in line with the latest NE methodology. This gives a total nutrient loading for the residential aspect of the developed site. The nutrient loading associated with past/present land use on the development site are accounted for in the baseline nutrient loading (Stage 2), allowing for benefits associated with vacation of residential properties in the wider area under the applicant's control being considered as they occur, providing an offset to the individual plots brought forward at that time.

In addition, Eastleigh and the surrounding areas are classified as 'water-stressed', with potable water largely supplied from local aquifers and by river water abstraction from internationally designated wildlife habitats. In the revised 2015 standards for new housing the Government maintained the water efficiency standard for new buildings at 125 l/person/day. However, it also allowed an 'optional requirement' of 110 l/person/day in 'water stressed areas'. NE states that whichever water efficiency standard is used in its calculator, water usage is increased by an additional 10 litres per person per day to account for changes to less water efficient fittings throughout the lifetime of the development. Consequently, within the updated Nutrient Neutrality Budget Calculator for the River Itchen SAC[2], the per capita daily water usage is preset at 120 litres per person per day. This comprises the optional requirements of 110 l/person/day, + 10 l/person/day buffer. This allows councils to decide whether certain regulations apply to developments being built in their areas and can include water efficiency in areas facing water shortages. In order to help ease the local water supply situation EBC, Southern Water and the EA have been working together to find ways to reduce pressure on existing water resources.

One such solution is the use of a 'variable infrastructure charge' to encourage water efficiency in new developments. Consequently, EBC has signed up to a water usage pilot scheme with Southern Water to help meet the local sustainable supply balance. The partnership has recommended a voluntary target of 95 litres per person per day be set for each new housing development. Under the Water Industry Act 1991 a one-off charge is payable where properties are connected for the first time into the water supply or the public sewage system. For the term of the pilot scheme if developers meet the 95 litres per person per day target for new homes, then Southern Water will give an infrastructure charge discount of 40% on the standard network connection charges, thereby giving a clear price signal for the developers to drive demand reduction. This 95 litres per person per day benchmark has, therefore, been adopted by EBC for the OHH scheme. This has consequently been used in the Nutrient Neutrality calculation with a 10 litres per person per day buffer, as described above.

The remainder of the approach follows the NE calculator approach. Potential sources of nitrogen associated with the proposed development will comprise sewage discharges (first passing through the most appropriate Wastewater Treatment Works (WwTW)) and nutrients associated with urban runoff.

It is intended that all foul sewage from the scheme will be conveyed to Chickenhall Eastleigh WwTW, which is located on the western bank of the River Itchen, approximately 1.8 km west of the site. Chickenhall Eastleigh WwTW currently discharges to the River Itchen. It currently does

not have a consented permit level for N, with mean effluent concentrations estimated to be 27 mg Total Nitrogen (TN)/litre (l), reducing to 25 mg TN/l with allowance for the amount of nitrogen already within potable drinking water, for the calculation of wastewater load. It also has a permitted limit of 0.6 mg Total Phosphorus (TP)/l.

Aligning with the NE Guidance methodology, "*operation of WwTW at 90 % of the consent limit is the closest the water company can reasonably operate the works without risk of breaching the consent limit*", 90 % of the discharge limit (5.4 mg TP/l) should be used to determine the P load from the new development's wastewater. As the 27 mg TN/l concentration in the effluent does not represent a permitted level, the 10 % reduction is not applied to this value.

Chickenhall Eastleigh WwTW will benefit from the proposed upgrades scheduled to take place through the Levelling Up and Regeneration Bill (LURB) in 2030. Consequently, a permitted TN limit of 10 mg/l will be adopted for the WwTW post-1st January 2030. This will reduce to 8 mg TN/l with allowance for the amount of nitrogen already within potable drinking water, and to 7.2 mg TN/l with the 10 % operational reduction.

As a result of the LURB upgrade, the permitted limit of TP will also fall from 6 to 0.25 mg/l, post 1st January 2030. This will reduce to 0.225 mg TP/l with the 10 % operational reduction.

It is intended that construction of the Upper Acre will start pre-2030. Consequently, as a precautionary approach it is assumed that some of the 424 dwellings will be occupied pre-2030. For the purpose of the wastewater calculations, it has been assumed that ⅓ of the dwellings (*i.e.* 141) will become occupied prior to 1st January 2030 and 283 dwellings thereafter.

The final nutrient loadings are converted from mg/l into mg/day using the identified wastewater volume (assuming 100% return to sewer and thus using volume of potable water used as a proxy for volume of wastewater treated, in line with NE guidance). This is then converted into kg/day and multiplied by 365.25 days, in line with the NE methodology, to obtain the annual nitrogen loading from the development.

2.2.2. Stage 2: Baseline Nutrient Losses

Whilst the NE calculator[2] provides a methodology for the establishment of the baseline position, the Guidance Document[3] identifies that "*if there is good evidence, such as the output from farm-specific Farmscoper modelling or a detailed monitoring exercise, this can be used to support a different export efficient*". Therefore, the approach taken for N and P is confirmed in the following sections, including reasoned justification for this where it differs from the latest NE methodology.

The approach taken between the two nutrients considered differs and therefore are discussed in turn below. The establishment of the baseline has been made site-wide, as per the methodology discussed below. However, those aspects specific to the Upper Acre development have been identified from the wider site in the applicant's control to identify a development specific baseline. Therefore, the overall site discussion has been retained for completeness.

2.2.3. Nitrogen Methodology

Prior to the issue of the revised NE methodology, significant work had been undertaken for the scheme using the ADAS Farmscoper modelling approach to establish site specific N loadings based on the land-uses present on site and associated farming practices, including peer review of the approach by Dr Richard Gooday of ADAS (one of the creators of the Farmscoper tool). The establishment of baseline N export values has, therefore, been based on farm-specific Farmscoper modelling, using the wealth of site specific evidence collated to support the assessment and peer review of modelling, as the NE methodology acknowledges such an approach to be acceptable, where good evidence exists.

The establishment of N inputs has been made using the following approach:

- Splitting the site into suitably sized units or appropriate land-use categories and subsequent management of N-budget data through a computer-based Geographic Information System (GIS);
- Gathering available information on the historical farming practices actually employed on the site, supported by observations made during a walkover survey of the site and conversations with those currently farming the site;
- Use of the ADAS Farmscoper modelling approach to estimate agricultural nitrogen-inputs to the site, to include contributions from fertiliser, manure applications and livestock;
- Assessing the current resident population of the site, as a product of dwellings x mean household size;
- Gathering information on the foul sewer network serving the site and calculating current inputs/pathways of nitrogen from sewage associated with existing farms and scattered residential dwellings. A detailed assessment of current residential nitrogen loadings has been conducted as per Stage 1 above; and,
- For urban land-uses (residential and commercial) within the area under the applicant's control, which are not covered by Farmscoper, appropriate nutrient loss values have been identified using the nutrient loss rates contained within the NE guidance.

The findings of the baseline establishment are identified in the following Appendices:

- Appendix 1: GIS Parcels identifying split of the site under the applicant's control and relevant parcels for the Upper Acre and wider land within the applicant's control and associated Agricultural Summaries;
- Appendix 2: Field Observations from Site Walkover;
- Appendix 3: Farmer Interview Notes;
- Appendix 4: ADAS Farmscoper Inputs & Outputs;
- Appendix 5: Sustainable Drainage System (SuDS) network.

With reference to Appendix 1, the Upper Acre development will take place on Land Parcels 0.7, 32, 33 & 34 and totals and area of 10.34 ha.

2.2.3.1. Phosphorus Methodology

The P loading from the baseline site has been calculated as per NE guidance[4], published 28 February 2024, last updated 27 May 2025. The approach for P differs to the N approach in that there was insufficient time for the P aspects of the Farmscoper modelling to undergo ADAS peer review, and therefore the revised standard NE approach was adopted. Using the site parcels established through GIS, as per the N methodology above, each land parcel in the site has been attributed an appropriate land use class within the methodology according to the land use identified in the walkover survey and conversations with farmers.

As with the N methodology above, P inputs from baseline residential properties have been included within the baseline as a product of the resident population and the corresponding wastewater generation.

2.2.3.2. Nutrient Calculator

As a bespoke approach is being taken for nutrient neutrality and the impact of the scheme is being considered alongside land within the applicant's control, a bespoke tracker has been set up using Excel to record the baseline habitat removed/altered. The baseline for the Upper Acre and wider land within the applicant's control are provided in Appendix 1 and, in order to provide supporting information for tracking of changes to land within the applicant's control, Appendix 5.

2.2.4. Stage 3: Development Land Use Losses

The development site areas have been identified according to their primary use, with Upper Acre delivery comprising a split of residential urban land (8.39 ha) and open space (1.95 ha). Nutrient loss rates for the post-development land uses have been applied to the areas using the up to date site specific NE Guidance values, with residential loss rates of 15.38 kg TN/ha and 1.65 kg TP/ha and greenspaces loss rates of 3.00 kg TN/ha and 0.02 kg TP/ha.

2.2.5. Stage 4: Sustainable Drainage Systems

As part of the development proposals, a network of SuDS features is proposed comprising basins, swales and ponds to sustainably manage runoff from the scheme, as identified in Appendix 6. As illustrated in these drawings, it is intended that the proposed SuDS features incorporate permanently wet areas around inlets (sediment forebays), outlets (secondary sedimentation areas) and wetland areas within the base of the features.

As such, the SuDS will provide a "SuDS management train" and comply with the following CIRIA guidance:

- CIRIA C815F: Using SuDS to reduce nitrogen in surface water runoff, 2023; and
- CIRIA C808: Using SuDS to reduce phosphorous in surface water runoff, 2022.

Therefore, TN & TP removal efficiencies of 30 % and 50 %, respectively should be confidently achieved by the SuDS in runoff from the Upper Acre scheme.

The developed area is served by two SuDS catchments, namely:

- Catchment H – draining to the basin to the SW corner of the site. The catchment area is 8.843 ha, with 6.831 ha with an assumed percentage impermeability of 65% and 0.409 ha with an assumed percentage impermeability of 100%; and
- Catchment I- – draining to the basin in the SE corner of the site. The catchment area is 1.556 ha, with an assumed percentage impermeability of 65%.

2.2.6. Stage 5: Net Change in Nutrient Loading

The net change in N and P loading as a result of the development site, considering the post-development wastewater and land-use nutrient losses against the pre-development wastewater and land-use nutrient losses, is undertaken in line with the latest NE Guidance. Where the development results in an additional nutrient load to the European Designated Sites, a precautionary buffer of an additional 20% is applied to the result in line with the NE Guidance.

3. Results

3.1. Stage 1: Development Wastewater Loading

The annual pre-2030 N and P loading resulting from wastewater generation from the residential properties in the Upper Acre are **324.07 kg TN/yr** and **7.00 kg TP/yr**, as identified in Table 3.1.

The annual post-2030 N and P loading resulting from wastewater generation from the residential properties in the Upper Acre are **281.10 kg TN/yr** and **8.78 kg TP/yr**, as identified in Table 3.2.

Table 3.1 Pre-2030 Nutrient Loading from Operational Wastewater Generation

			Nitrogen	Phosphorus
Step 1	Homes (No.)		141	141
	Average Occupancy Rate (persons/dwelling)		2.4	2.4
	Residents (No.)		338	338
Step 2	Water usage (l/person/day)		105	105
	Wastewater Volume Generated (l/person/yr)		38,351	38,351
	Wastewater Volume Generated (l/yr)		12,962,638	12,962,638
Step 3	Chickenhall Eastleigh WwTW Permit (mg /l)		27.0	0.60
	Discharge permit with allowance for potable water removal (mg/l)		25.0	0.60
	Operation at 90 % of the permit limit (mg/l)		N/A	0.54
	Nutrient Discharge	mg/yr	324,065,950	6,999,825
		kg/year	**324.07**	**7.00**

Table 3.2 Post-2030 Nutrient Loading from Operational Wastewater Generation

		Nitrogen	Phosphorus
Step 1	Homes (No.)	424	424
	Average Occupancy Rate (persons/dwelling)	2.4	2.4
	Residents (No.)	1018	1018
Step 2	Water usage (l/person/day)	105	105
	Wastewater Volume Generated (l/person/yr)	38,351	38,351
	Wastewater Volume Generated (l/yr)	39,041,318	39,041,318
Step 3	Chickenhall Eastleigh WwTW Permit (mg /l)	10.0	0.25

			Nitrogen	Phosphorus
	Discharge permit with allowance for potable water removal (mg/l)		8.0	0.25
	Operation at 90 % of the permit limit (mg/l)		7.2	0.225
	Nutrient Discharge	mg/yr	281,097,490	8,784,297
		kg/year	**281.10**	**8.78**

3.2. Stage 2: Baseline Nutrient Losses

The annual N and P loading from baseline land uses within the Upper Acre are **349.45 kg TN/yr** and **7.53 kg TP/yr**, as identified in Table 3.3.

Table 3.3 Baseline Nutrient Loading Pre-Development

Parcel	Area (ha)	Use	Nitrogen		Phosphorus	
			Output/ha (kg)	Total Output (kg)	Output/ha (kg)	Total Output (kg)
0.7	0.03	Urban (U)	15.38	0.46	1.65	0.05
32	1.50	Rotational Grassland (RG)	33.85	50.78	0.73	1.10
33	8.44	Rotational Grassland (RG)	33.85	285.69	0.73	6.16
34	0.37	Permanent Pasture (PP)	33.85	12.52	0.60	0.22
		Total		**349.45**		**7.53**

3.3. Stage 3: Post-Development Land Use Losses

The annual N and P loading from post-development land uses within the Upper Acre are **134.89 kg TN/yr** and **13.88 kg TP/yr**, as identified in Table 3.4.

Table 3.4 Post-Development Land-Use Nutrient Loading

Land Use	Area (ha)	Nitrogen		Phosphorus	
		Output/ha (kg)	Total Output (kg)	Output/ha (kg)	Total Output (kg)
Residential Urban	8.39	15.38	129.04	1.65	13.84
Greenspace	1.95	3.00	5.85	0.02	0.04
Total			**134.89**		**13.88**

3.4. Stage 4: Sustainable Drainage Systems

The annual N and P removal from post-development runoff by SuDS within the Upper Acre are **27.04 kg TN/yr** and **4.85 kg TP/yr**, as identified in Table 3.5.

Table 3.5 Removal of N & P by SuDS

Catchment	Area (ha)	Land Use & % imperm-eability	Annual P inputs to SuDS (kg TP/ yr)	Annual N inputs to SuDS (kg TN/ yr)	N removal rate (%)	P removal rate (%)	Annual P removed by SuDS (kg TP/ yr)	Annual N removed by SuDS (kg TN/ yr)
Catchment H	6.831	Residential Urban (65%)	11.28	105.04	30.0	50.0	3.67	20.48
Catchment I	0.409	Residential Urban (100%)	0.68	6.29	30.0	50.0	0.34	1.89
	3.381	Residential Urban (65%)	2.57	23.93	30.0	50.0	0.84	4.67
Total							**4.85**	**27.04**

3.5. Stage 4: Net Change in Nutrient Loading

The net change in annual N and P loadings as a result of the Upper Acre are **98.96 kg TN/yr** and **10.20 kg TP/yr** pre-2030, incorporating the 20% precautionary buffer as identified in Table 3.5. Post-2030, the net change in annual N and P loadings are **47.40 kg TN/yr** and **12.34 kg TP/yr,** incorporating the 20% precautionary buffer, as identified in Table 3.6.

These values are the volumes of N and P that require mitigation for the Upper Acre scheme to demonstrate delivery of nutrient neutrality.

Table 3.6 Net Change in Nutrient Loading as a result of the Upper Acre

Nutrient		Pre-Development Baseline Losses (kg)	Post-Development Losses (kg)			SuDS Removal (kg)	Net Change (kg)	Net Change plus Pre-cautionary Buffer (kg)
			Waste water	Land-use	Total			
N	Pre-2030	349.45	324.07	134.89	458.96	27.04	82.47	**98.96**
	Post-2030	349.45	281.10	134.89	415.99	27.04	39.50	**47.40**
P	Pre-2030	7.53	7.00	13.88	20.88	4.85	8.50	**10.20**
	Post-2030	7.53	8.78	13.88	22.66	4.85	10.28	**12.34**

4. Mitigation Measures

There are a range of measures available to mitigate the increase in N and P loss associated with the Upper Acre scheme. The following identifies the mitigation measures that we have incorporated to deliver nutrient neutrality for the development proposal:

- Benefits brought forward from the previously permitted Lower Acre; and
- Temporary offsetting nutrient losses from land changes associated with land within the Applicant's control during the pre-2030 phase.

It should be noted that offsetting through a purchase of nutrient credits from EBC will only be required for later phases and is not relevant for this Reserved Matters application.

The application of these mitigation measures are discussed in turn below until neutrality is achieved for the Upper Acre scheme.

4.1. Benefit/disbenefit from the Lower Acre Scheme

With reference to the Hilson Moran report: "*Nutrient Neutrality Study: One Horton Heath, First Residential Parcel*" (1 November 2022, Issue 05, HM Ref. 25709-RP-IE-001), when considering the impact of the First Residential Parcel (Lower Acre) scheme, the on-site mitigation presented in Section 4.2 of the report (which included the removal of residential occupation and removal of farmland for the link road, south-east access and north-west access and included conversion of farming practices for retained land to the north of Quobleigh Stream and Parcel 47), resulted in an N-loading of 144.5 kg N/yr (deficit) and delivered P-neutrality, with an overall decrease of 0.5 kg P/yr (benefit).

At the time of preparing the report, the SuDS element was not yet available on the NE calculator. As such, N & P removal rates of 61 % and 50 % were derived from the literature, and there was an aim to maintain and demonstrate these removal rates through a programme of SuDS optimisation, maintenance and monitoring.

Since then, the updated NE calculator[2] has been applied to the Lower Acre scheme, assuming that the SuDS provision will be compliant with CIRIA guidance, as per Section 2.1.4 above.

Furthermore, the 1 November 2022 First Residential Parcel (Lower Acre) Nutrient Neutrality Assessment assumed a per capita daily water usage of 120 l/person/ day (*i.e*. 110 l/person/day, + 10 l/person/day buffer). Since then, EBC has signed up to a water usage pilot scheme with Southern Water to help meet the local sustainable supply balance. The partnership has recommended a voluntary target of 95 litres per person per day be set for each new housing development (refer to Section 2.1.1 above). This 95 litres per person per day benchmark has, therefore, been adopted by EBC for the OHH scheme. This benchmark (with a NE-recommended 10 l/person/day buffer) has been used in a revised Lower Acre calculation, presented in Appendix 8, which also takes account of the proposed upgrades scheduled to take place at Chickenhall Eastleigh WwTW through LURB in 2030.

These revised calculations for the Lower Acre scheme, result in benefits of **80.73 kg N/yr** and **8.55 kg P/yr** for the pre-2030 scenario and benefits of **617.04 kg N/yr** and **19.62 kg P/yr** for the post-2030 scenario. These benefits have, therefore, been carried over to the Upper Acre scheme for the pre-and post-2030 scenarios, as presented in Tables 4.1 and 4.2 below.

Table 4.1 Pre-2030 Nutrient Balance for the Upper Acre Scheme with Mitigation

Mitigation	Nitrogen (kg TN/yr)	Phosphorus (kg TP/yr)
Impact (from Stages 1-5 above)	82.47	8.50
Benefit brought forward from Lower Acre scheme	-80.73	-8.55
Nutrient Neutrality Balance	1.74	-0.05
Nutrient Neutrality Balance including 20 % buffer where appropriate	**2.09**	**-0.05**

Table 4.2 Post-2030 Nutrient Balance for the Upper Acre Scheme with Mitigation

Mitigation	Nitrogen (kg TN/yr)	Phosphorus (kg TP/yr)
Impact (from Stages 1-5 above)	39.50	10.28
Benefit brought forward from Lower Acre scheme	-617.04	-19.62
	-577.54	-9.34
Nutrient Neutrality Balance including 20 % buffer where appropriate	**-577.54**	**-9.34**

The results of this exercise demonstrate better than nutrient neutrality for N & P in the post-2030 scenario (benefits of **577.54 kg N/yr** and **9.34 kg P/yr**), with a small deficit of **2.09 N/yr** (with the inclusion of the 20% buffer) and a benefit of **0.05 kg P/yr** for the pre-2030 scenario.

Consequently, although it can be demonstrated that when the benefits of the Lower Acre scheme are carried over, better than nutrient neutrality can be achieved for the Upper Acre scheme for N & P post-2030, and for P pre-2030, Section 4.2 below demonstrates that N neutrality can be maintained pre-2030, through temporary land change measures.

4.2. Temporary On-Site Offsetting

A number of development packages on land within the applicant's control, whilst outside of the Upper Acre boundary, have resulted in changes to the extent of farmland both on the site and in the surrounding area. The loss of farming practices to these areas have resulted in changes to the nutrient inputs into the catchment that, as non-residential developments, have not been captured. Further to this, residential properties within the land under the applicant's control have been vacated early in the wider development, and therefore the benefits can be captured early.

In order to manage and track the changes to land within the applicant's control and identify the changes that have been considered in the neutrality assessment a nutrient (and sediment)

tracking tool has been created that maps the removal of residential properties and land parcels for development and allows these to be assessed against the planning application being brought forward.

Therefore, for the Upper Acre application, the following measures have been included in the baseline tracking tool (included in Appendix 5):

- Temporary pre-2030 conversion of 6 ha of parcel 33 from agriculturally managed land to greenspace (*i.e.* with no fertiliser or manure applications, or grazing of livestock), during construction of dwellings on parcels 32, 34, 0.7 and the rest of parcel 33.

Consideration of the above measures will result in total annual N and P reductions of **185.10 kg TN/yr** and **4.26 kg TP/yr** for the period prior to 2030.

Consequently, when this temporary mitigation is taken into account it ensures better than nutrient neutrality for N & P loadings, with benefits of **183.36 kg N/yr** and **4.31 kg P/yr,** prior to 2030. The calculation for this is presented in Table 4.3.

Table 4.3 Pre-2030 Nutrient Balance for the Upper Acre Scheme with Temporary Land Change

Mitigation	Nitrogen (kg TN/yr)	Phosphorus (kg TP/yr)
Impact (from Stages 1-5)	82.47	8.50
Nutrient benefit/disbenefit carried forward from Lower Acre	-80.73	-8.55
Temporary change to greenspace for parcels 12, 13, 14 & 15	-185.10	-4.26
Nutrient Neutrality Balance including 20 % buffer where appropriate	**-183.36**	**-4.31**

Consequently, as better than N & P neutrality can be demonstrated for both the pre- and post-2030 scenarios for the Upper Acre scheme, no further mitigation measures need to be identified for this phase of the OHH development.

The above post-2030 N & P benefits of **577.54 kg N/yr** and **9.34 kg P/yr** will be carried forward to future phases of the OHH masterplan (*e.g.* the Quobleigh Breach scheme is also expected to be partially delivered pre-2030) and offset against other development phases on the site as part of the overall mitigation package.

It should be noted that it is anticipated that the Quobleigh Breach Reserved Matter scheme will also be constructed at the same time as the Lower Acre scheme, and that 90 dwellings from this scheme (33% of the total) could also be completed by 2030. As described in the Hilson Moran report "*Nutrient Neutrality Study, One Horton Heath: Quobleigh Breach*" (29 October 2025, Issue P02, HM Ref.: 35961-HML-XX-XX-RP-U-870002), the above Upper Acre pre-2030 benefit, in combination with land use changes associated with the Quobleigh Breach scheme (*i.e*. the temporary change from agricultural land to greenspace for parcel 26) will be sufficient, not only to offset the anticipated 141 pre-2030 completed Upper Acre dwellings, but also the anticipated 90 (33% of the total) pre-2030 completed Quobleigh Breach dwellings. The pre-2030 N & P

benefit remaining would still be enough to offset a further 33 completed and occupied dwellings, either within the Upper Acre or Quobleigh Breach schemes. As such, there is plenty of headroom in the calculations to permit higher rates of pre-2030 completion and occupation than the predicted 33%, if this should be required. In the unlikely event that this figure of 264 dwellings completed and occupied by 2030 is desired or exceeded, then it is anticipated that additional agricultural-to-greenspace conversion across the OHH development would readily facilitate any further short-term offset requirements. All other phases of the OHH scheme are scheduled for first completions and occupations to happen post-2030.

5. Summary and Conclusion

The aim of this Nutrient Neutrality Study is to provide a robust assessment of the impact of the development on N and P losses into the River Itchen catchment and demonstrate how, through the application of appropriate mitigation measures, the Upper Acre scheme can deliver nutrient neutrality. The findings of the study will support EBC, as the competent authority under the Habitat Regulations, in the completion of an appropriate assessment of whether the scheme adversely affects the integrity of the European Designated Sites associated with the River Itchen and Solent.

The report provides a summary of the evidence gathered to support the Nutrient Neutrality Study together with the neutrality calculations for the scheme and effect of appropriate mitigation measures proposed for inclusion within the scheme.

Incorporating a 20 % buffer for nutrient losses as per NE guidance, the Upper Acre development is identified to give rise to:

- **98.96 kg N/yr** deficit pre-2030;
- **47.40 kg N/yr** deficit post-2030.
- **10.20 kg TP/yr** deficit pre-2030;
- **12.34 kg TP/yr** deficit post-2030.

The following mitigation measures are proposed to deliver nutrient neutrality in the Upper Acre scheme:

- Benefits brought forward from the previously permitted Lower Acre scheme, which included the removal of pre-existing residential occupation and removal of farmland for the link road, south-east access and north-west access and conversion of farming practices for retained land to the north of Quobleigh Stream and Parcel 47; and
- Temporary offsetting nutrient losses from land changes associated with land within the Applicant's control during the pre-2030 phase.

Following the inclusion of benefits brought forward from the previously permitted Lower Acre scheme, it is demonstrated that better than nutrient neutrality for N & P will be achieved in the post-2030 scenario (benefits of **577.54 kg N/yr** and **9.34 kg P/yr**), with a small deficit of **2.09 kg N/yr** (with the inclusion of the 20% buffer) and a benefit of **0.05 kg P/yr** for the pre-2030 scenario.

The post-2030 N & P benefits of **577.54 kg N/yr** and **9.34 kg P/yr** will be carried forward to future phases of the OHH masterplan (*e.g.* the Quobleigh Breach scheme is also expected to be partially delivered pre-2030) and offset against other development phases on the site as part of the overall mitigation package.

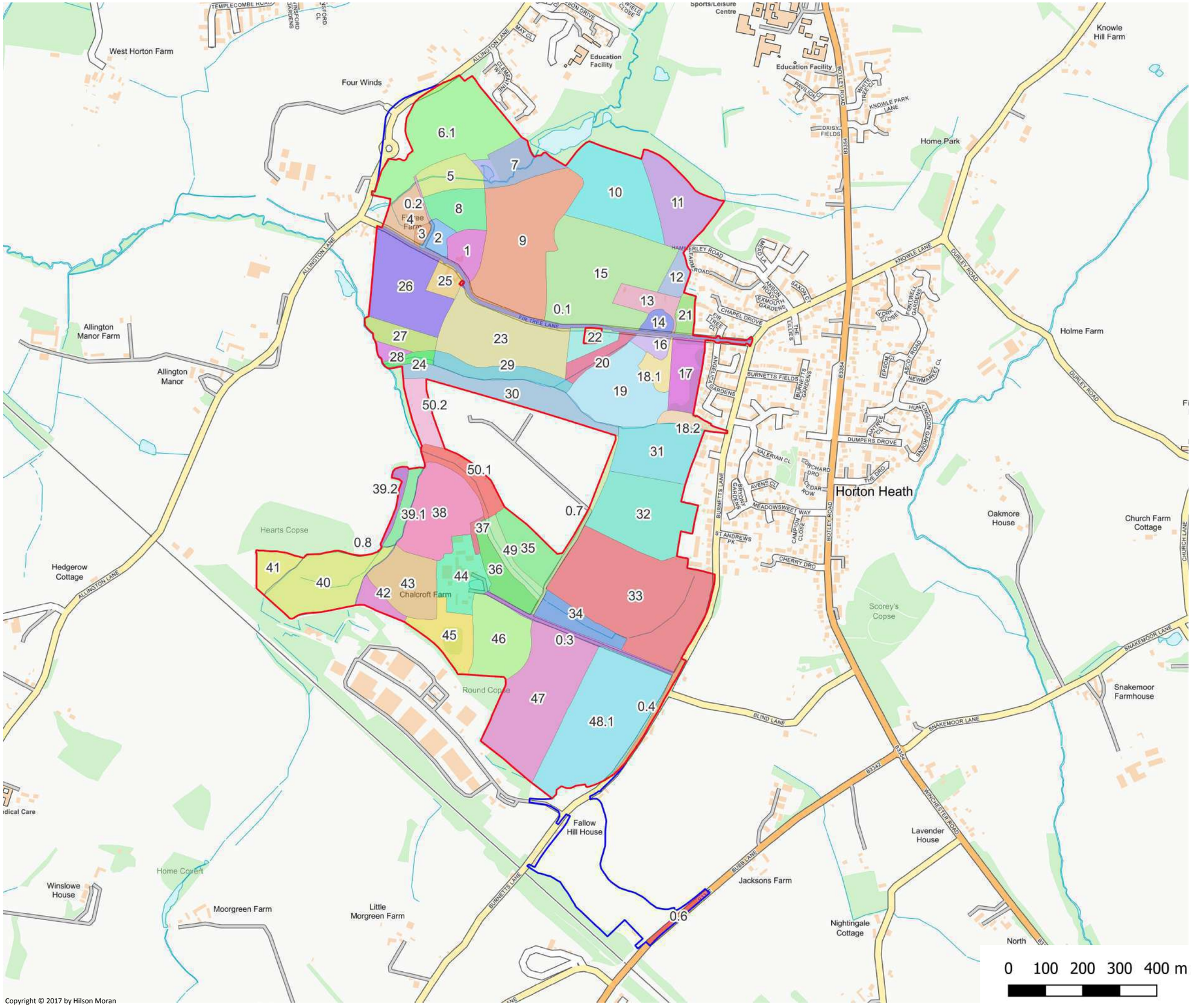
The above, small N deficit (**2.09 kg N/yr**) resulting from the pre-2030 scenario can be readily mitigated through temporary land change measures, prior to the construction of dwellings. For example, when the temporary pre-2030 conversion of 6 ha of parcel 33 from agriculturally managed land to greenspace (*i.e*. with no fertiliser or manure applications, or grazing of livestock) during construction on the rest of the plot (*i.e.* parcels 32, 34, 0.7 and the rest of

parcel 33), then the above deficits can be more than offset, resulting in temporary overall benefits of **183.36 kg N/yr** and **4.31 kg P/yr,** prior to 2030.

As better than N & P neutrality can be demonstrated for both the pre- and post-2030 scenarios for the Upper Acre scheme, no further mitigation measures need to be identified for this phase of the OHH development.

It should be noted that it is anticipated that the Quobleigh Breach Reserved Matter scheme will also be constructed at the same time as the Lower Acre scheme, and that 90 dwellings from this scheme (33% of the total) could also be completed by 2030. The above Upper Acre pre-2030 benefits (**183.36 kg N/yr** and **4.31 kg P/yr**), in combination with land use changes associated with the Quobleigh Breach scheme (*i.e*. the temporary change from agricultural land to greenspace for parcel 26) will be sufficient, not only to offset the anticipated 141 pre-2030 completed Upper Acre dwellings, but also the anticipated 90 (33% of the total) pre-2030 completed Quobleigh Breach dwellings. The pre-2030 N & P benefit remaining would still be enough to offset a further 33 completed and occupied dwellings, either within the Upper Acre or Quobleigh Breach schemes. As such, there is plenty of headroom in the calculations to permit higher rates of pre-2030 completion and occupation than the predicted 33%, if required. In the unlikely event that this figure of 264 dwellings completed and occupied by 2030 is desired or exceeded, then it is anticipated that additional agricultural-to-greenspace conversion across the OHH development would readily facilitate any further short-term offset requirements. All other phases of the OHH scheme are scheduled for first completions and occupations to happen post-2030.

Appendix 1 GIS Parcels and Field Parcel Agricultural Summary



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Do not scale from this drawing.

Verify dimensions by site measurement.

Read this drawing in conjunction with the latest architectural and structural drawings.

This drawing is based on the following information:-

Key

OPA Boundary

Area in Applicant's Control

Rev	Date	Description	Drawn	Checked

H|M

hilsonmoran.com info@hilsonmoran.com

Client

Eastleigh Borough Council

Project

Horton Heath Masterplan

Drawing Title

Horton Heath Masterplan Field Parcels

Scale	Sheet Size	Checked	Approved
1:8,000	A3	TH	

Status

FOR INFORMATION

Drawing No.	Rev
25709-HM-ZZ-XX-DR-IF-6000-02	01

Software: Bluebean Revu

Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
0.1	11,265.10	1.1265	Fir Tree Lane	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Highway with grass verges	U
0.2	701.54	0.0702	Unnamed Track	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Hardstanding track between Parcels 4 and 5/8	U
0.3	6,336.91	0.6337	Chalcroft Farm Access Road	Freely draining slightly acid sandy soils	Sandy	Bedrock - Secondary A	Freely draining. Drains to groundwater.	Vulnerable to leaching of nitrate and pesticides to groundwater; Highly erodible under arable and vegetable crops, where sloping, resulting in eutrophication and clogging of stream bed with sand.	0	0	0.00	0.00	Tarmac road with grass verges	U
				Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.						
0.4	3,540.09	0.3540	Burnetts Lane	Freely draining slightly acid sandy soils	Sandy	Bedrock - Secondary A	Freely draining. Drains to groundwater.	Vulnerable to leaching of nitrate and pesticides to groundwater; Highly erodible under arable and vegetable crops, where sloping, resulting in eutrophication and clogging of stream bed with sand.	0	0	0.00	0.00	Highway with grass verges	U
0.7	5,829.91	0.5830	Chalcroft Farm Track	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Farm track with grass verges	U
0.8	1,313.52	0.1314	River	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Watercourse network around Parcels 40 and 41.	R
1	10,305.93	1.0306	Residential house with gardens	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Residential dwelling with private gardens and swimming pool. Surrounded by 3 m wide hedge (PB1).	U
2	5,184.59	0.5185	Demolished buildings.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Area of bare muddy compacted ground with demolition debris throughout. Surounded by 2 m wide hedge. Small drainage ditch with running water along northern boundary, approx 100 mm deep flowing westwards (PB2).	U
3	1,899.44	0.1899	Boarded up house with derelict pool and gardens.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Derelict residential dwelling, with derelict private gardens and disused swimming pool. Plot surrounded by 2 m wide hedge. Small drainage ditch with running water along northern boundary, approx 100 mm deep flowing westwards (PB3)	U
4	10,993.01	1.0993	Fallow grass field. Cut only, not grazed.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	109.93	0.00	Permanent pasture (hay cut). Small watercourse meanders across this field with shallow open channel/wetland area with rushes established along course. Deep ruts formed where vehicles have tracked aross this very wet field exposing orange silty/clayey soils. Free oil contamination exposed on standing water within ruts. From plant? 2 m wide hedge along southern and eastern boundary. NE boundary is fenced (barbed wire) with vehicle track beyond. South western boundary currently comprises temporary fence to adjacent residential dwelling beyond red-line boundary. North western boundary comprises small watercourse flowing souhwestwards towards pool in residential property. Water muddy and up to 0.5 m deep. Some poaching evident adjacent to watercourse (by sheep and/or cattle, although not present at the time). Free oil evident on standing water in this poached area. Molehills indicate soils pass to sandy/gravelly loam adjacent to watercourse (alluvium?) (PB4, PB5 & PB6).	F
5	13,758.03	1.3758	Fallow grass field. Cut only, not grazed, marshy.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	137.58	0.00	Wet rough unimproved grassland with rushes. Small watercourse, the banks lined with small trees and shrubs, flows through centre of plot, approx 0.4 m deep, flowing westwards. Southern boundary fenced, nortghrn boundary 2 m wide hedge (PB7).	F

Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
6.1	59,692.44	5.9692	Grazed by sheep.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	90	2.2	537.23	13.13	Permanent pasture - grass with buttercups, very little clover. Rutting by vehicles in western half of field indicates a clayey loam soil. Ground very wet with standing water in ruts. Majority of field enclosed by 2 m wide hedge. Archaeological dig in northern half of the field at the time of the survey indicated ~300 mm chestnut brown silty clayey loam overlying orange clay bedrock. Wide drainage channel running along northern boundary adjacent to road. Approx 200 mm depth of water flowing north eastwards. Piezometer with blue wellhead in western centre of field. Free oil contamination observed on standing water in north eastern corner of field, adjacent to spoil heap of sandy clay. Beyond eastern boundary hedge lies a series of small ponds with bullrushes. Residential development progressing beyond. Amphibian fencing around ponds. Ponds interconnected by drainage channel flowing north along northern half of boundary towards highway drainage and south along southern half of boundary towards woodland and Quobleigh Pond (PB8, PB9 & PB10).	RG
7	17,628.34	1.7628	Wet woodland area.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Wet broadleaved woodland, with grass and bramble understorey. Wide vegetated wetland through centre, flowing westwards towards large pond. Dry channel running eastwards along fenced northern boundary (PB11).	W
8	15,646.93	1.5647	Fallow grass field. Cut only, not grazed, marshy.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	156.47	0.00	Permanent pasture. Sloping gently north-westwards towards Parcel 5 and adjacent watercourse. Fenced along northern boundary. Aprox 2 m wide hedges forming remaining boundaries with flowing drainage ditches along south western and western boundaries, flowing westerly and northerly, respectively. Footpath along northern boundary. Molehills indicate soil is a medium brown silty loam (PB12).	F
9	73,477.19	7.3477	Pasture with hay cut.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	90	0	661.29	0.00	Permanent pasture. Southern, western and south eastern boundaries ~2 m thick hedgerow. Northern boundary fenced, with woodland beyond. Scrub and woodland understorey encroaches approx 3 m into field along this boundary. Hedgerow approx 3 m wide in north eastern corner adjacent to Parcel 10. Footpath also along northern boundary. Northern half of field drains north-westerly towards Parcel 7 and associated watercourse. Southern half of field drains south-westerly towards Fir Tree Lane. Piezometer close to northern boundary - metal cover badly damaged by machinery with head of well open to the elements - needs repairing (PB13).	RG
10	45,392.00	4.5392	Wheat.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	300	0	1,361.76	0.00	Arable (wheat?) crop. Known as "10 acre field". Northern boundary fenced, with flailed woodland understorey/set aside encroaching approx 5 m into field (including footpath which is also along this boundary). ield generally drains westwards. Small wet drainage ditch along north western boundary flowing towards the watercourse in Parcel 7. Relic hedge along eastern boundary although mainly just fence with scattered shrubs. 2 m wide hedge along southern boundary, with 3 m wide hedge along western boundary. Occasional free oil contamination on standing water along northern boundary and in north east corner (PB15).	M/W
11	28,651.02	2.8651	Fallow grass field. Cut only, not grazed.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	286.51	0.00	Permanent pasture. Northern and eastern boundary fenced, with flailed woodland understorey/set aside encroaching approx 3 m into field. Western boundary fenced with relic hedge, comprising occasional scattered shrubs. Footpath through centre of field. Field generally drains northwards. Occasional free oil contamination on standing water along northern and western boundarie (PB16).	F

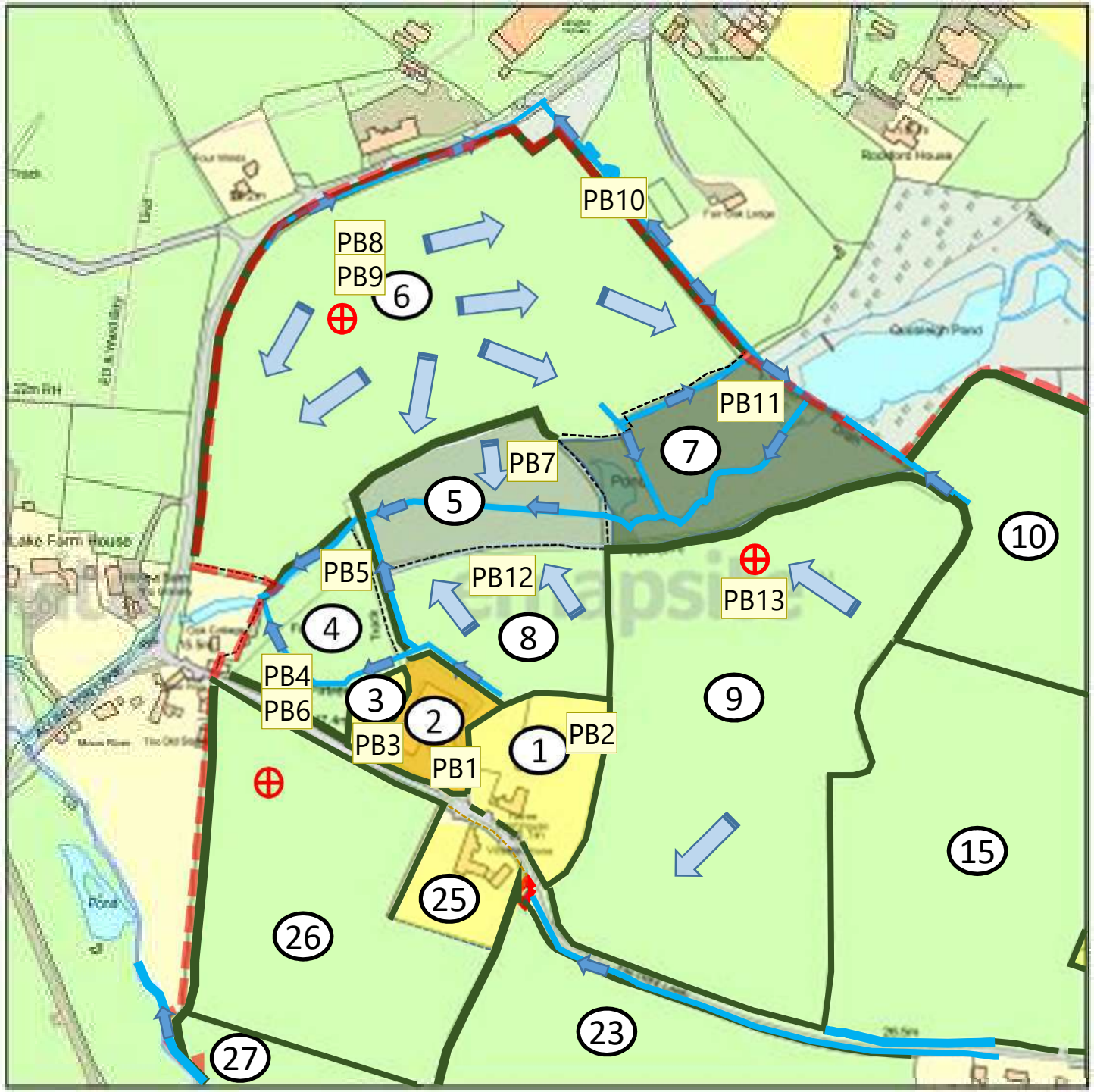
Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
12	6,283.91	0.6284	Fallow grass field. Cut only, containing old manure pile.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	62.84	0.00	Pasture. Some waterlogging at northern end with localised oil contamination. New housing development ciurrently being built beyond site boundary to the east. Ditch running northwards and new trash screen constructed just beyond hedge along eastern boundary, as part of new development. Public footpath runs through middle of field. Large well rotted manure heap, comprising straw and cattle waste at northern end of field adjacent to northern boundary. Low percentage of clover with docks and chickweed in sward. 2 m wide hedge with scatted trees along esatern boundary. Gappy 2 m wide hedge along western boundary, incomplete at northern end (PB17).	F
13	9,523.57	0.9524	Dwelling and surrounding grounds.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Foxhole Cottages - residential dwellings, buildings and associated gardens. Surrounded by thick 2 m wide hedge with scattered trees (PB18).	U
14	4,303.98	0.4304	Fallow grass field. Cut only.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	43.04	0.00	Wet and scrubby fallow land with rushes. 3 m wide hedge with scattered trees along northern, eastern and southern boundaries with scrub encroaching into field. More formal 2 m wide hedge along western boundary (PB19).	F
15	74,614.50	7.4615	Wheat.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	300	0	2,238.44	0.00	Winter wheat. Field gently sloping towards Fir Tree Lane. 2 m wide hedges along northern, esatern and southern boundaries. Thicker 3 m hesge with shrubs and small trees along western boundary. Piezometer located at southern end opposite residential dwelling/flower retailer. Large ditch along southern boundary fronting onto Fir Tree Lane full of standing water and overtopping onto highway (PB20).	M/W
16	4,847.59	0.4848	Fallow grass field. Cut only.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	48.48	0.00	Set aside. Rough grassland with tall ruderals. Thick informal hedge along northern and western boundaries. Remnant hedge along eastern boundary and fencing along southern boundary (PB21) .	F
17	16,069.23	1.6069	Playing field	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Playing fields with relatively long amenity turf surrounded by thick hedges with areas of woodland and shrubs along eastern and southern boundaries. Warterlogging of soils at southern end and associated poaching by human footfall at the southern access point to the fields (PB22).	SA
18.1	6,345.38	0.6345	Demolished farmhouse and surrounding garden (now rubble and scrub).	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Highly disturbed area - former Foxholes Farmhouse, comprising heaps of demolition rubble, comprising bricks, soil, steel supports, corrugated iron sheeting, paint and chemical cans and a number of large gas cylinders. Enclosed by tempoary construction fencing. Standing water in wheel ruts and puddles exhibiting significant algal growth, with large patches of black of oil stained soils in places (PB24).	SA
18.2	5,198.55	0.5199	Small wooded area beside watercourse.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Small strip of coppiced woodland with muddy public footpath and small stream running through it (flowing westwards) (PB23).	W
19	38,757.17	3.8757	Fallow scrubby field.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Rough grassland with tall sward and ruderals (set aside). 3 m wide thick hedgerows along western and eastern boundaries. Thick area of woodland and shrubs along southern boundary with 200 mm deep fast flowing stream - flowing eastwards dissipating in places into diffuse wetland, particularly at eastern end. Channel becomes more defined westwards. Also wet ditch flowing southwards at southern end of western boundary. Large overgrown pond in SW corner, with emergent vegetation and surrounded by brambles. Small island in middel. Small stand of Japanese Knotweed in centre of southern boundary on the northern side of the stream (stand approximately 4 x 3 m) (PB25).	SA
20	7,269.16	0.7269	Wet scrubland area.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Rough grassland with clumps of tall ruderals. Small watercourse flowing through middle of parcel towards stream to the south. All hedgerow boundaries other than fenced boundary with Foxholes Garage to north and west (PB26).	SA

Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
21	5,110.46	0.5110	Small wooded area to east of footpath.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Small area of woodland to east of footpath with public access.	W
22	6,498.21	0.6498	Private grassed field and outbuildings	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Grassland/ lawn surrounding Foxholes Garage and associated outbuildings (PB28).	U
23	49,428.79	4.9429	Wheat.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	300	0	1,482.86	0.00	"12 Acres" field. Winter wheat. 2 m wide hedge along eastern and northern boundaries. Wet shallow ditch full of litter along Fir Tree Lane frontage. Little evidence of flow, but slope westwards. 3 m wide hedge along western boundary with scattered trees. To the south lies a strip of woodland with stream (see Parcel 24) (PB29).	M/W
24	3,794.23	0.3794	Wet scrubland.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Wet scrubby and woodland area with small watercourse (approx 300 mm deep) flowing westwards forming confluence with boundary watercourse to the west, which then flows northwards (PB39).	SA
25	6,371.43	0.6371	Victoria Farmhouse.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Victoria House - residential dwelling with associated gardens and out buildings. Walled along frontage to Fir Tree Lane, with hedges along western and eastern boundaries and fenced along southern boundary (PB33).	U
26	42,012.66	4.2013	Hay field.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	90	38.4	378.11	161.33	Pasture. 3 m wide hedges with scattered treees along western and eastern boundary. 2 m wide hedge along Fir Tree Lane frontage. Piezometer in NW corner. Field slopes southwards with gappy 2 m wide hedge along southern boundary. Molehills indicate that soil is a light brown silty loam PB34).	RG
27	10,167.34	1.0167	Fallow field, only cut.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	101.67	0.00	Pasture - grading into wetter conditions southwards. 3 m wide hedge along western boundary with scattered trees and small watercourse flowing northwards. 3 m wide hedge with scattered trees along eastern boundary, with woodland bordering small watercourse flowing westwards along SE boundary (PB37).	F
28	2,826.64	0.2827	Fallow field, only cut.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	100	0	28.27	0.00	To the south of Parcel 27 lies a triangle of wet tall ruderals. Vegetation recently cut and left on ground. In places standing water exhibited bright orange staining and free oil contamination. To the west lies 3 m wide hedge and associated watercourse (up to 500 mm deep in places) flowing northwards. To the south lies scrubby/woodland area of Parcel 29 with watercourse flowing westwards (PB38).	F
29	13,625.70	1.3626	Wet scrub and woodland.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Strip of woodland and shrubs with small stream running westwards through it (PB30).	W
30	28,785.59	2.8786	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	8.64	278.30	Pasture. Narrow strip of land north of the solar farm. Gentle slope to the north towards the stream. Bordered to the north by trees. While the solar farm is outside the site boundary, Simon Owton mentioned that he owned the land and leased it to the solar farm. He cuts the grass around the solar panels 3 times a year, the grass is left on site (JG21).	PP
31	30,953.66	3.0954	Alternates annually between maize and silage.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	49	66.8	151.67	206.77	Maize (grown every other year) (JG1).	M
32	47,589.84	4.7590	Silage cut in May, than grazed by cattle June -Nov.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	120	38.2	571.08	181.79	Pasture/silage (JG2).	RG

Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
33	98,086.96	9.8087	Silage cut in May, than grazed by cattle June -Nov.	Freely draining slightly acid sandy soils	Sandy	Bedrock - Secondary A	Freely draining. Drains to groundwater.	Vulnerable to leaching of nitrate and pesticides to groundwater; Highly erodible under arable and vegetable crops, where sloping, resulting in eutrophication and clogging of stream bed with sand.	120	38.2	1,177.04	374.69	Pasture/silage. Land gently slopes towards stream. Gravel clay at far south west corner. Fence on boundary with Parcel 2, 3 m hedge all along eastern flank and boundary with parcel 4. Borehole location indicated by red cross. Water sample location 1 at star. Water sample taken as stream enters site boundary shows nitrite levels 0 ppm, ammonia levels between 0.25 and 0.5 ppm and nitrate levels around 5 ppm. Hedge also runs along farm track. North boundary of this field is a barbed wire fence between this field and Parcel 32 (JG3, EF9 & EF10).	RG
34	13,149.53	1.3150	Marshy land, grazed by cattle who have access to watercourse - very large manure pile in this field.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	3.94	127.13	Narrow strip of boggy marsh land with land sloping gently towards a stream cutting through the middle of the field. Path divides Parcel 4 and 6. Large manure heap in south east corner of parcel to the right of the path just as you enter the field (brown circle). Water sample location 2 indicated by yellow star. 3 m hedge borders parcel (JG4 & EF12).	PP
35	17,530.47	1.7530	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	5.26	169.48	Pasture. Gently sloping south east towards stream. Field surrounded with 3 m hedge (JG5).	PP
36	14,219.40	1.4219	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	4.27	137.47	Pasture. Gently sloping towards stream. Flatter in south eastern corner. Low 3 m wide hedge on boundary with Parcel 39, high 3 m hedge on western flank closer to farm buildings (JG8).	PP
37	1,498.10	0.1498	Ditch full of slurry.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	96.68	0.00	14.48	Steeply sloping towards stream. Ditch running along east and south east boundary of parcel filled with polluted water. Manure left in piles. Water run off from farm building and yard runs through here via ditch towards stream in Parcel 20. Contents of the ditch were more like sludge than water despite the recent heavy rain (JG9 & EF6).	PP
38	38,067.78	3.8068	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	11.42	368.04	Pasture. Land quickly falls away towards the streams on the western and northern boundaries of the field as shown by the green lines and arrows. Slope is particularly steep on boundary with Parcel 39 (see image). Tall, wide hedgerow boundary with Parcel 39. Despite the slope, the field is very waterlogged in placed with a mainly clay soil (JG10 & EF4).	PP
39.1	6,566.80	0.6567	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	1.97	63.49	Narrow strip of land accessible by a small rickety bridge. Very waterlogged, parts were knee deep with water at time of site visit. Long grasses and reed species were established here. A small wood on a steep slope is located to the north east of the field. A ditch slowly flowing north was located at the boundary of the waterlogged field and the wooded area. Cut branches were piled around the field (J11 & EF3).	PP
39.2	3,409.73	0.3410	Woodland	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	A small wood on a steep slope located north-east of field 39.	W
40	35,560.41	3.5560	Marshy grazing for cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	10.67	343.80	Pasture, but at time of visit very boggy waterlogged marsh-land. Land flat. Small watercourses found running through the middle of the field and in water ditches along all the edges of the field, all flowing in a north-easterly direction. Two large clumps of frogspawn were found in the stream in the middle of the field. A small wooden footbridge allows access via the footpath through the field over the stream ditches. Woodland on either side (JG12).	PP
41	8,780.17	0.8780	Marshy grazing for cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	2.63	84.89	Pasture. Land is separated from Parcel 10 by a small hedgerow within which was located a drainage ditch. Land is flat and enclosed by woodland to the north and south (JG13).	PP

Parcel	Area (m2)	Area (Ha)	Land Use	Soil Type	Texture	Aquifer	Drainage	Hazard	Fertiliser Application (kg N/ha)	Manure Application (kg N/ha)	Total Fertiliser N (kg)	Total FYM N (kg)	Field Notes	Use
42	6,126.63	0.6127	Marshy grazing for cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	1.84	59.23	Pasture. Flat marsh-land. 3 m wide hedge on northern flank, woodland on southern. Two mounds of earth mixed with rubble and gravel were found close to the woodland side of the field halfway along the length of the field. A ditch runs along the southern boundary closest to the woodland transporting water in a westerly direction. A medium sized stream to the north west separates Parcels 42 and 40 (JG14).	PP
43	25,484.19	2.5484	Grazed by cattle, small manure pile on slope.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	7.65	246.38	Pasture. Gently sloping to the west. Waterlogged ground to the west and south-west. Drainage ditch running alongside hedge on the north west flank. Two streams converge in the northern corner of the field and at the time of site visit the stream was flowing fast. The car park for the farm buildings (capacity approx 50 cars) is adjacent to the eastern flank of the field. Small manure pile in western corner of the field indicated by brown circle (JG15 & EF11).	PP
44	20,909.17	2.0909	Chalcroft Farmstead	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Builidngs to the south of the pond are mostly derelict with a dumping ground behind. Waste is well organised and is mostly scrap metal, broken palletts and cardboard. Car park has space for around 50 cars, with about 40-45 parked at the time of visit. Some butchery occurs in the buildings in the farm yard and there was regular pressure hosing of vehicles and other equipment on this site (JG16 & EF5).	U
45	18,142.81	1.8143	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	5.44	175.40	Flat field with collection of trees in the middle. Used for pasture. Bound by hedge to the east and thin line of tree to south in front of which is a drainage ditch with water flowing west. Clay soils to the south east, gravel/clay soils to the west. Slopes at the edge of the field towards the drainage ditch which contains vegetation (JG17 & EF8).	PP
46	29,440.87	2.9441	Grazed by cattle.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to steam network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	8.83	284.63	Pasture. Flat field with 3 m wide hedge on west side, woodland on south side and a mixture of fence and hedgerow on east side. Clay soils, slight slope towards Parcel 47 in SE corner of field (JG18 & RF13).	PP
47	66,462.29	6.6462	Silage cut in May, then grazed by cattle until early Nov.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	120	38.2	797.55	253.89	Pasture. Mostly flat field with a gentle slope towards the south west. The south west and southern boundary is marked with trees and fence. Eastern boundary is marked with a mixture of hedgerow and fences. Large puddles had formed in front of the fence in places. Clayey soils. There was a borehole in the field shown on the map by the red cross (JG19).	RG
48.1	78,060.91	7.8061	Silage cut in May, then grazed by cattle until early Nov.	Freely draining slightly acid sandy soils	Sandy	Bedrock - Secondary A	Freely draining. Drains to groundwater.	Vulnerable to leaching of nitrate and pesticides to groundwater; Highly erodible under arable and vegetable crops, where sloping, resulting in eutrophication and clogging of stream bed with sand.	120	38.2	936.73	298.19	Pasture/silage. Similar to Parcel 47 except for aspect - here land is highest on the side by Burnetts Lane halfway up the field. There is a small ditch transporting water northwards in the hedgerow separating Parcels 47 and 48. At the time of our visit there was evidence of hedgerow removing on the western flank exposing fence and there were large ruts where vehicles had tracked across the wet field (JG20).	RG
49	8,194.19	0.8194	Marshy land, grazed by cattle who have access to watercourse.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	2.46	79.22	Narrow strip of marshy land surrounding stream. Gentle slope in direction of stream. Bordered by 3 m hedge (JG7).	PP
50.1	13,258.74	1.3259	Marshy land, grazed by cattle who have access to watercourse.	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	3	96.68	3.98	128.19	Narrow strip of marshy land surrounding stream. Gentle slope in direction of stream. Bordered by 3 m hedge. Does not appear to be grazed as longer sedges and grasses in this area, barbed wire fence between this strip of land and the solar farm. Streams join here and flow north (JG6 & EF2).	PP
50.2	10,913.16	1.0913	Solar Farm	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	Loamy and clayey	Superficial - Secondary A/ Bedrock - Secondary A	Impeded. Drains to stream network.	Overland flow of organic slurry, dirty water, fertiliser, pathogens and fine sediment with drain water.	0	0	0.00	0.00	Solar farm with amenity grassland managed to avoid impact on operation of the solar farm.	SA
TOTAL	**1,245,855.89**	**124.5856**									**11,347.55**	**4,049.94**		

Appendix 2 Field Observations from Site Walkover


PB10
PB8
PB9
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PB11
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PB7
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PB5
PB12
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PB13
10
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PB4
PB6
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PB3
PB1
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PB2
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27

Slide 1

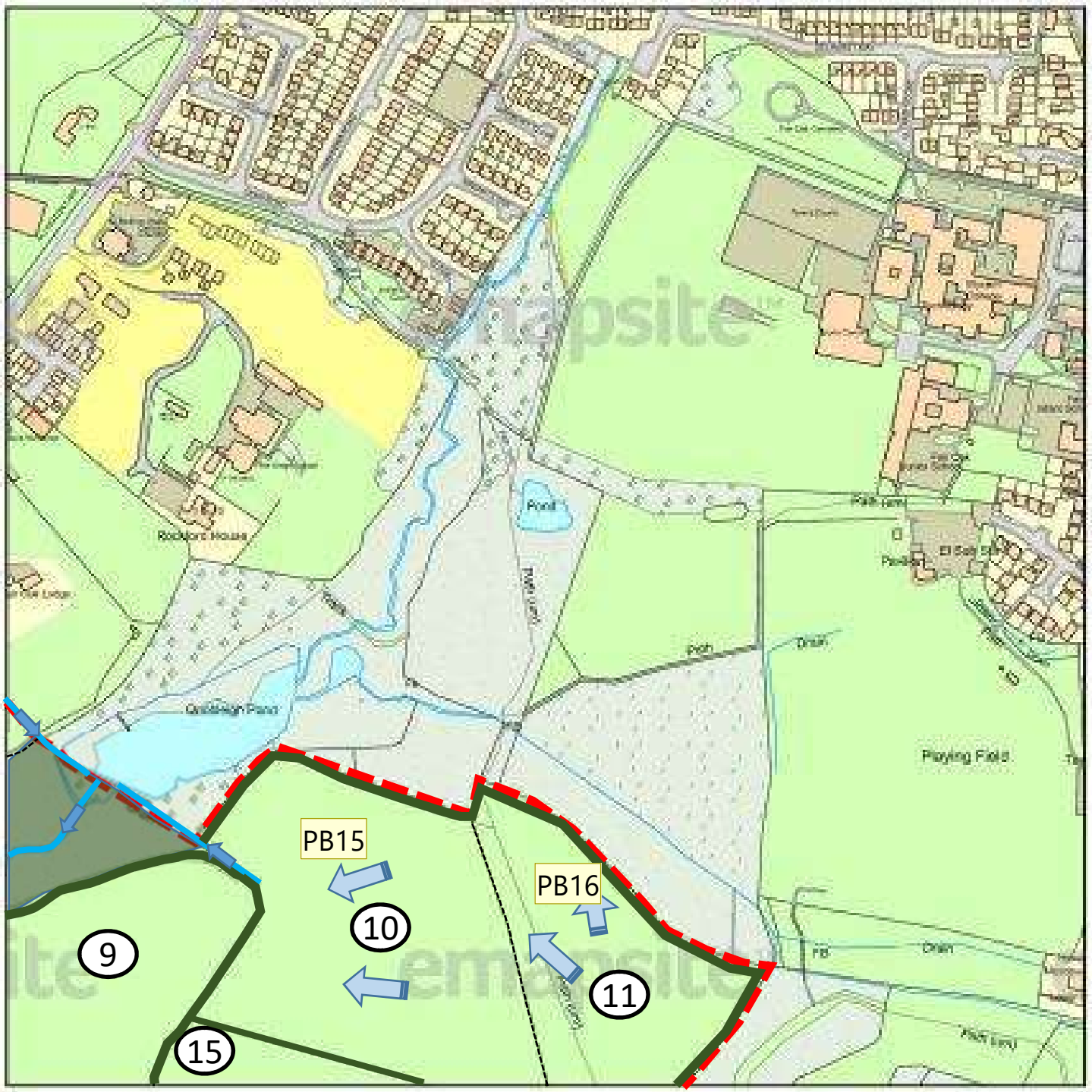
PB1	Parcel 1 - Residential dwelling with private gardens and swimming pool. Surrounded by 3 m wide hedge Paul Bond, 17/02/2020
PB2	Parcel 2 - Area of bare muddy compacted ground with demolition debris throughout. Surounded by 2 m wide hedge. Small drainage ditch with running water along northern boundary, approx 100 mm deep flowing westwards. Paul Bond, 17/02/2020
PB3	Parcel 3 - Derelict residential dwelling, with derelict private gardens and disused swimming pool. Plot surrounded by 2 m wide hedge. Small drainage ditch with running water along northern boundary, approx 100 mm deep flowing westwards. Paul Bond, 17/02/2020
PB4	Parcel 4 - Permanent pasture (hay cut). Small watercourse meanders across this field with shallow open channel/wetland area with rushes established along course. Deep ruts formed where vehicles have tracked aross this very wet field exposing orange silty/clayey soils. Free oil contamination exposed on standing water within ruts. From plant? Paul Bond, 17/02/2020
PB6	2 m wide hedge along southern and eastern boundary. NE boundary is fenced (barbed wire) with vehicle track beyond. South western boundary currently comprises temporary fence to adjacent residential dwelling beyond red-line boundary. Paul Bond, 17/02/2020
PB5	North western boundary comprises small watercourse flowing souhwestwards towards pool in residential property. Water muddy and up to 0.5 m deep. Some poaching evident adjacent to watercourse (by sheep and/or cattle, although not present at the time). Free oil evident on standing water in this poached area. Molehills indicate soils pass to sandy/gravelly loam adjacent to watercourse (alluvium?). Paul Bond, 17/02/2020
PB7	Parcel 5 - Wet rough unimproved grassland with rushes. Small watercourse, the banks lined with small trees and shrubs, flows through centre of plot, approx 0.4 m deep, flowing westwards. Southern boundary fenced, northern boundary 2 m wide hedge. Paul Bond, 17/02/2020
PB8	Parcel 6 - Permanent pasture - grass with buttercups, very little clover. Rutting by vehicles in western half of field indicates a clayey loam soil. Ground very wet with standing water in ruts. Majority of field enclosed by 2 m wide hedge. Paul Bond, 17/02/2020
PB9	Archaeological dig in northern half of the field at the time of the survey indicated ~300 mm chestnut brown silty clayey loam overlying orange clay bedrock. Wide drainage channel running along northern boundary adjacent to road. Approx 200 mm depth of water flowing north eastwards. Piezometer with blue wellhead in western centre of field. Free oil contamination observed on standing water in north eastern corner of field, adjacent to spoil heap of sandy clay. Paul Bond, 17/02/2020
PB10	Beyond eastern boundary hedge lies a series of small ponds with bullrushes. Residential development progressing beyond. Amphibian fencing around ponds. Ponds interconnected by drainage channel flowing north along northern half of boundary towards highway drainage and south

along southern half of boundary towards woodland and Quobleigh Pond.
Paul Bond, 17/02/2020

PB11 Parcel 7 - Wet broadleaved woodland, with grass and bramble understorey. Wide vegetated wetland through centre, flowing westwards towards large pond. Dry channel running eastwards along fenced northern boundary.
Paul Bond, 17/02/2020

PB12 Parcel 8 - Permanent pasture. Sloping gently north-westwards towards Parcel 5 and adjacent watercourse. Fenced along northern boundary. Aprox 2 m wide hedges forming remaining boundaries with flowing drainage ditches along south western and western boundaries, flowing westerly and northerly, respectively. Footpath along northern boundary. Molehills indicate soil is a medium brown silty loam.
Paul Bond, 18/02/2020

PB13 Parcel 9 - Permanent pasture. Southern, western and south eastern boundaries ~2 m thick hedgerow. Northern boundary fenced, with woodland beyond. Scrub and woodland understorey encroaches approx 3 m into field along this boundary. Hedgerow approx 3 m wide in north eastern corner adjacent to Parcel 10. Footpath also along northern boundary. Northern half of field drains north-westerly towards Parcel 7 and associated watercourse. Southern half of field drains south-westerly towards Fir Tree Lane. Piezometer close to northern boundary - metal cover badly damaged by machinery with head of well open to the elements - needs repairing.
Paul Bond, 18/02/2020


PB15
PB16
9
10
11
15
Pond
Drain
Playing Fields

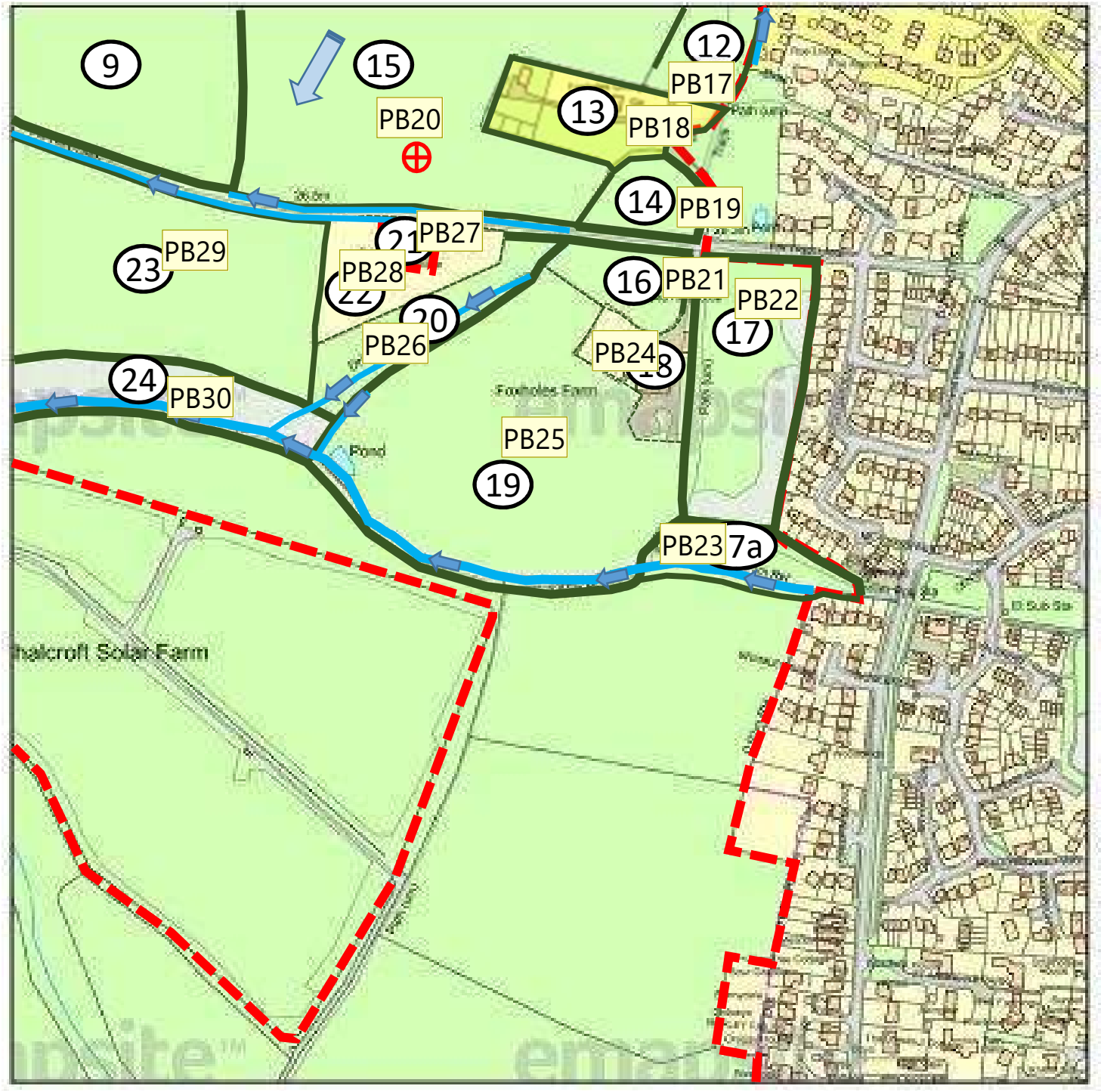
Slide 2

PB15 Parcel 10 - Arable (wheat?) crop. Known as "10 acre field". Northern boundary fenced, with flailed woodland understorey/set aside encroaching approx 5 m into field (including footpath which is also along this boundary). Field generally drains westwards. Small wet drainage ditch along north western boundary flowing towards the watercourse in Parcel 7. Relic hedge along eastern boundary although mainly just fence with scattered shrubs. 2 m wide hedge along southern boundary, with 3 m wide hedge along western boundary. Occasional free oil contamination on standing water along northern boundary and in north east corner.

Paul Bond, 18/02/2020

PB16 Parcel 11- Permanent pasture. Northern and eastern boundary fenced, with flailed woodland understorey/set aside encroaching approx 3 m into field. Western boundary fenced with relic hedge, comprising occasional scattered shrubs. Footpath through centre of field. Field generally drains northwards. Occasional free oil contamination on standing water along northern and western boundaries.

Paul Bond, 18/02/2020


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PB20
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PB17
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PB18
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PB19
PB27
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PB29
PB28
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PB21
PB22
17
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PB26
PB24
18
24
PB30
Foxholes Farm
Pond
PB25
19
PB23
7a
Chalcroft Solar Farm

PB17 Parcel 12 - Pasture. Some waterlogging at northern end with localised oil contamination. New housing development ciurrently being built beyond site boundary to the east. Ditch running northwards and new trash screen constructed just beyond hedge along eastern boundary, as part of new development. Public footpath runs through middle of field. Large well rotted manure heap, comprising straw and cattle waste at northern end of field adjacent to northern boundary. Low percentage of clover with docks and chickweed in sward. 2 m wide hedge with scatted trees along esatern boundary. Gappy 2 m wide hedge along western boundary, incomplete at northern end.
Paul Bond, 18/02/2020

PB18 Parcel 13 - Foxhole Cottages - residential dwellings, buildings and associated gardens. Surrounded by thick 2 m wide hedge with scattered trees.
Paul Bond, 18/03/2020

PB19 Parcel 14 - wet and scrubby fallow land with rushes. 3 m wide hedge with scattered trees along northern, eastern and southern boundaries with scrub encroaching into field. More formal 2 m wide hedge along western boundary.
Paul Bond, 18/03/2020

PB20 Parcel 15 - Winter wheat. Field gently sloping towards Fir Tree Lane. 2 m wide hedges along northern, esatern and southern boundaries. Thicker 3 m hesge with shrubs and small trees along western boundary. Piezometer located at southern end opposite residential dwelling/flower retailer. Large ditch along southern boundary fronting onto Fir Tree Lane full of standing water and overtopping onto highway.
Paul Bond, 19/03/2020

PB21 Parcel 16 - set aside. Rough grassland with tall ruderals. Thick informal hedge along northern and western boundaries. Remnant hedge along eastern boundary and fencing along southern boundary.
Paul Bond, 19/03/2020

PB22 Parcel 17 - Playing fields with relatively long amenity turf surrounded by thick hedges with areas of woodland and shrubs along eastern and southern boundaries. Warterlogging of soils at southern end and associated poaching by human footfall at the southern access point to the fields.
Paul Bond, 19/03/2020

PB23 Parcel 17a - Small strip of coppiced woodland with muddy public footpath and small stream running through it (flowing westwards).
Paul Bond, 19/03/2020

PB24 Parcel 18 - Highly disturbed area - former Foxholes Farmhouse, comprising heaps of demolition rubble, comprising bricks, soil, steel supports, corrugated iron sheeting, paint and chemical cans and a number of large gas cylinders. Enclosed by tempoary construction fencing. Standing water in wheel ruts and puddles exhibiting significant algal growth, with large patches of black of oil stained soils in places.
Paul Bond, 19/03/2020

PB25 Parcel 19 - Rough grassland with tall sward and ruderals (set aside). 3 m wide thick hedgerows along western and eastern boundaries. Thick area of woodland and shrubs along southern boundary with 200 mm deep fast flowing stream - flowing eastwards dissipating in places into diffuse wetland, particularly at eastern end. Channel becomes more defined westwards. Also wet ditch flowing southwards at southern end of western boundary. Large overgrown pond in SW corner, with emergent vegetation and surrounded by brambles. Small island in middel. Small stand of Japanese Knotweed in centre of southern boundary on the northern side of the stream (stand approximately 4 x 3 m).

Paul Bond, 19/03/2020

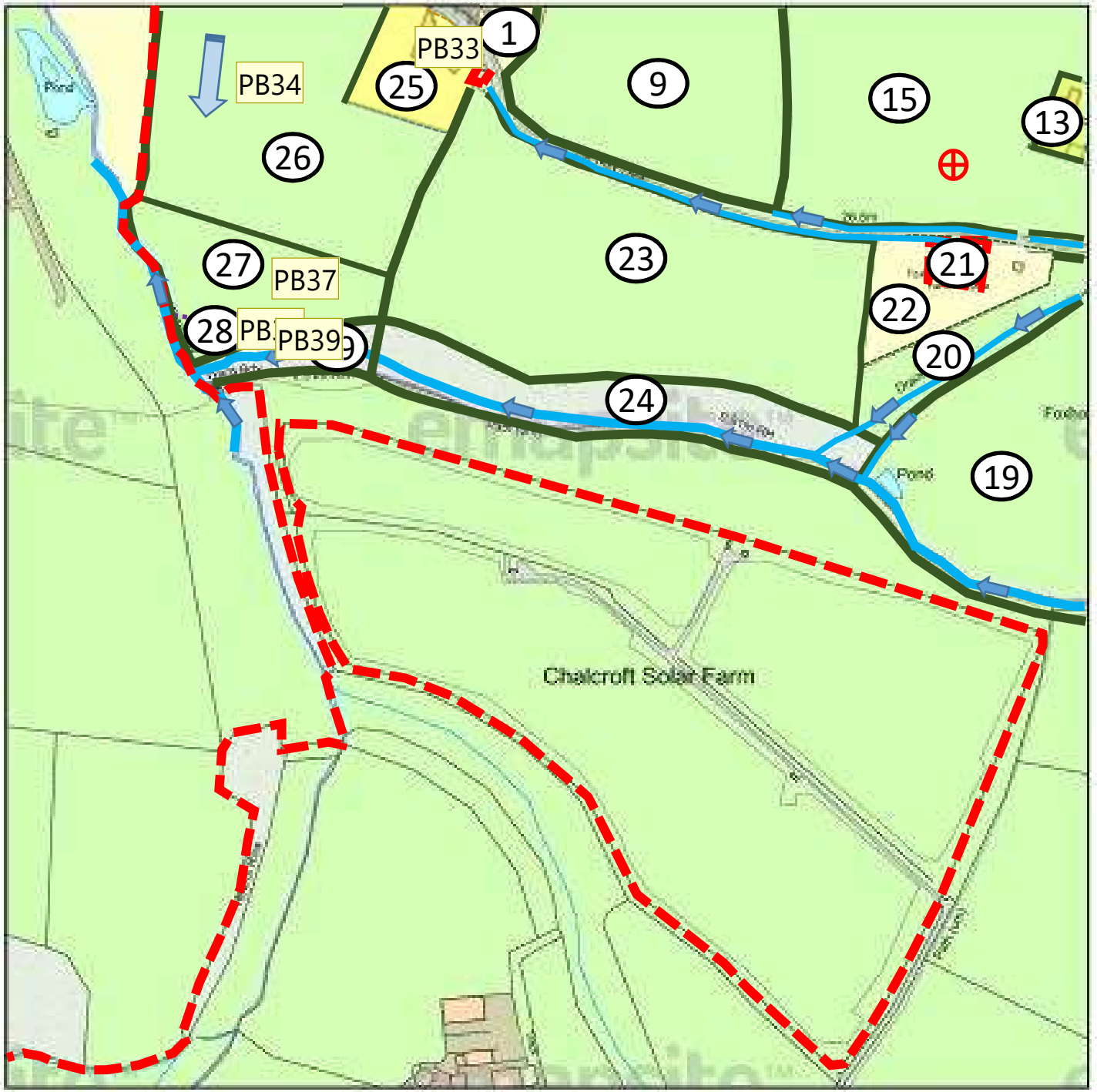
PB26 Parcel 20 - rough grassland with clumps of tall ruderals. Small watercourse flowing through middle of parcel towards stream to the south. All hedgerow boundaries other than fenced boundary with Foxholes Garage to north and west.
Paul Bond, 19/03/2020

PB27 Parcel 21 - Outside of site - residential dwelling and outbuildings including Foxholes Garage and flower retailer. Small wet dicth with standing water along frontage onto Fir Tree Lane.
Paul Bond, 19/03/2020

PB28 Parcel 22 - Outside of Site - grassland/ lawn surrounding Foxholes Garage and associated outbuildings.
Paul Bond, 19/03/2020

PB29 Parcel 23 - "12 Acres" field. Winter wheat. 2 m wide hedge along eastern and northern boundaries. Wet shallow ditch full of litter along Fir Tree Lane frontage. Little evidence of flow, but slope westwards. 3 m wide hedge along western boundary with scattered trees. To the south lies a strip of woodland with stream (see Parcel 24).
Paul Bond, 19/03/2020

PB30 Parcel 24 - Strip of woodland and shrubs with small stream running westwards through it.
Paul Bond, 19/03/2020


PB34
PB33
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PB37
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22
28
PB
PB39
20
24
19
Pond
Chalcroft Solar Farm

Slide 4

PB33 Parcel 25 - Victoria House - residential dwelling with associated gardens and out buildings. Walled along frontage to Fir Tree Lane, with hedges along western and eastern boundaries and fenced along southern boundary.
Paul Bond, 19/03/2020

PB34 Parcel 26 - Pasture. 3 m wide hedges with scattered treees along western and eastern boundary. 2 m wide hedge along Fir Tree Lane frontage. Piezometer in NW corner. Field slopes southwards with gappy 2 m wide hedge along southern boundary. Molehills indicate that soil is a light brown silty loam.
Paul Bond, 19/03/2020

PB37 Parcel 27 - Pasture - grading into wetter conditions southwards. 3 m wide hedge along western boundary with scattered trees and small watercourse flowing northwards. 3 m wide hedge with scattered trees along eastern boundary, with woodland bordering small watercourse flowing westwards along SE boundary.
Paul Bond, 19/03/2020

PB38 Parcel 28 - to the south of Parcel 27 lies a triangle of wet tall ruderals. Vegetation recently cut and left on ground. In places standing water exhibited bright orange staining and free oil contamination. To the west lies 3 m wide hedge and associated watercourse (up to 500 mm deep in places) flowing northwards. To the south lies scrubby/woodland area of Parcel 29 with watercourse flowing westwards.
Paul Bond, 19/03/2020

PB39 Parcel 29 - wet scrubby and woodland area with small watercourse (approx 300 mm deep) flowing westwards forming confluence with boundary watercourse to the west, which then flows northwards.
Paul Bond, 19/03/2020

















30 JG21
Chalcroft Solar Farm
JG6
EF2
EF1
31 JG1
Woodlands
32 JG2
JG7
49
35 JG5
Craggy House
36 JG8
33 JG3
EF9
EF10
34 JG4
EF12
Char House
Flower Cottage
Path
Path
Iss
Sewage
Ppg Sta
MEADOWSWEET WAY
AVENS CL
GOLDEN ROD

Slide 1

JG1	Parcel 31 - Maize (grown every other year). 2.75 ha. James Gibson, 19/02/2020
JG2	Parcel 32 - Pasture/silage. 4.64ha. James Gibson, 19/02/2020
JG3	Parcel 33 - Pasture/silage. Land gently slopes towards stream. Gravel clay at far south west corner. Fence on boundary with Parcel 2, 3m hedge all along eastern flank and boundary with parcel 4. Borehole location indicated by red cross. Water sample location 1 at star. 9.67ha. James Gibson, 19/02/2020
EF9	Water sample taken as stream enters site boundary shows Nitrite levels 0 ppm, ammonia levels between 0.25 and 0.5 ppm and Nitrate levels around 5 ppm. Emma Flower, 26/02/2020
EF10	Hedge also runs along farm track. North boundary of this field is a barbed wire fence between this field and Parcel 32. Emma Flower, 26/02/2020
JG4	Parcel 34 - Narrow strip of boggy marsh land with land sloping gently towards a stream cutting through the middle of the field. Path divides Parcel 4 and 6. Large manure heap in south east corner of parcel to the right of the path just as you enter the field (brown circle). Water sample location 2 indicated by yellow star. 3 m hedge borders parcel. 1.24 ha. James Gibson, 19/02/2020
EF12	Results of the water test at this site show nitrate and nitrite levels very similar to that of the other test site, nitrite around 0 ppm and nitrate around 5 ppm. The levels of ammonia at this site were noticably higher, around 2 ppm, this was noticably higher than the test site 1. Emma Flower, 26/02/2020
JG5	Parcel 35 - Pasture. Gently sloping south east towards stream. Field surrounded with 3 m hedge. 1.56 ha. James Gibson, 19/02/2020
JG6	Parcel 50 - Narrow strip of marshy land surrounding stream. Gentle slope in direction of stream. Bordered by 3 m hedge. 1.04 ha. James Gibson, 19/02/2020
EF2	Does not appear to be grazed as longer sedges and grasses in this area, barbed wire fence between this strip of land and the solar farm. Emma Flower, 26/02/2020
JG7	Parcel 49 - Narrow strip of marshy land surrounding stream. Gentle slope in direction of stream. Bordered by 3 m hedge. 0.8 ha. James Gibson, 19/02/2020

Slide 1 (Continued)

JG8	Parcel 36 - Pasture. Gently sloping towards stream. Flatter in south eastern corner. Low 3 m wide hedge on boundary with Parcel 39, high 3 m hedge on western flank closer to farm buildings. 1.44 ha. James Gibson, 19/02/2020
JG21	Parcel 30 - Pasture. Narrow strip of land north of the solar farm. Gentle slope to the north towards the stream. Bordered to the north by trees. 1.52 ha. James Gibson, 20/02/2020
EF1	While the solar farm is outside the site boundary, Simon Owton mentioned that he owned the land and leased it to the solar farm. He cuts the grass around the solar panels 3 times a year, the grass is left on site. Emma Flower, 25/02/2020

















EF7
Chalcroft Solar Farm
Hearts Row
22m
39
JG11
EF3
38
JG10
EF4
37
JG9
EF6
Cows
Hearts Copse
41
JG13
Path
FB
Drain
JG15
EF11
3
Carpark
EF5
Chalcroft Farm
40
JG12
42
JG14
44
JG16
Drain
Chalcroft
Distribution Park
45
JG17
EF8
Drain
BURNE

JG9 Parcel 37 - Steeply sloping towards stream. Ditch running along east and south east boundary of parcel filled with polluted water. Manure left in piles. Water run off from farm building runs through here via ditch towards stream in Parcel 20. 0.08 ha.
James Gibson, 19/02/2020

EF6 Contents of the ditch were more like sludge than water despite the recent heavy rain.
Emma Flower, 26/02/2020

JG10 Parcel 38 - Pasture. Land quickly falls away towards the streams on the western and northern boundaries of the field as shown by the green lines and arrows. Slope is particularly steep on boundary with Parcel 39 (see image). Tall, wide hedgerow boundary with Parcel 39. 3.72 ha.
James Gibson, 19/02/2020

EF4 Despite the slope, the field is very waterlogged in placed with a mainly clay soil.
Emma Flower, 26/02/2020

JG11 Parcel 39 - Narrow strip of land accessible by a small rickety bridge. Very waterlogged, parts were knee deep with water at time of site visit. Long grasses and reed species were established here. A small wood on a steep slope is located to the north east of the field. 1.27 ha.
James Gibson, 19/02/2020

EF3 A ditch slowly flowing north was located at the boundary of the waterlogged field and the wooded area. Cut branches were piled around the field.
Emma Flower, 26/02/2020

JG12 Parcel 40 - Pasture, but at time of visit very boggy waterlogged marsh-land. Land flat. Small watercourses found running through the middle of the field and in water ditches along all the edges of the field, all flowing in a north-easterly direction. Two large clumps of frogspawn were found in the stream in the middle of the field. A small wooden footbridge allows access via the footpath through the field over the stream ditches. Woodland on either side. 3.3 ha.
James Gibson, 19/02/2020

JG13 Parcel 41 - Pasture. Land is separated from Parcel 10 by a small hedgerow within which was located a drainage ditch. Land is flat and enclosed by woodland to the north and south. 0.9 ha.
James Gibson, 19/02/2020

JG14 Parcel 42 - Pasture. Flat marsh-land. 3 m wide hedge on northern flank, woodland on southern. Two mounds of earth mixed with rubble and gravel were found close to the woodland side of the field halfway along the length of the field. A ditch runs along the southern boundary closest to the woodland transporting water in a westerly direction. A medium sized stream to the north west separates Parcels 42 and 40. 0.66 ha.
James Gibson, 19/02/2020

JG15 Parcel 43 - Pasture. Gently sloping to the west. Waterlogged ground to the west and south-west. Drainage ditch running alongside hedge on the north west flank. Two streams converge in the northern corner of the field and at the time of site visit

the stream was flowing fast. The car park for the farm buildings (capacity approx 50 cars) is adjacent to the eastern flank of the field. 2.42 ha.
James Gibson, 19/02/2020

EF11 Small manure pile in western corner of the field indicated by brown circle.
Emma Flower, 26/02/2020

JG16 Parcel 44 - Builidngs to the south of the pond are mostly derelict with a dumping ground behind. Waste is well organised and is mostly scrap metal, broken palletts and cardboard. 0.36 ha.
James Gibson, 19/02/2020

JG17 Parcel 45 - Flat field with collection of trees in the middle. Used for pasture. Bound by hedge to the east and thin line of tree to south in front of which is a drainage ditch with water flowing west. Clay soils to the south east, gravel/clay soils to the west. 1.82 ha.
James Gibson, 19/02/2020

EF8 Slopes at the edge of the field towards the drainage ditch which contains vegetation.
Emma Flower, 26/02/2020

EF5 Car park has space for around 50 cars, with about 40-45 parked at the time of visit. Some butchery occurs in the buildings in the farm yard and there was regular pressure hosing of vehicles and other equipment on this site.
Emma Flower, 26/02/2020

EF7 Streams join here and flow north.
Emma Flower, 26/02/2020









JG18
4
EF13
Round
Copse
JG19
47
JG20
48
Flower
Cottage
Nightingale
Cottage
emapsite

JG18 Parcel 46 - Pasture. Flat field with 3 m wide hedge on west side, woodland on south side and a mixture of fence and hedgerow on east side. 2.93 ha.
James Gibson, 19/02/2020

EF13 Clay soils, slight slope towards Parcel 47 in SE corner of field.
Emma Flower, 26/02/2020

JG19 Parcel 47 - Pasture. Mostly flat field with a gentle slope towards the south west. The south west and southern boundary is marked with trees and fence. Eastern boundary is marked with a mixture of hedgerow and fences. Large puddles had formed in front of the fence in places. Clayey soils. There was a borehole in the field shown on the map by the red cross. 6.5 ha.
James Gibson, 19/02/2020

JG20 Parcel 48 - Pasture/silage. Similar to Parcel 47 except for aspect - here land is highest on the side by Burnetts Lane halfway up the field. There is a small ditch transporting water northwards in the hedgerow separating Parcels 47 and 48. At the time of our visit there was evidence of hedgerow removing on the western flank exposing fence and there were large ruts where vehicles had tracked across the wet field. 7.85 ha.
James Gibson, 19/02/2020




Nightingale Cottage
Fallow Hill House
Waypoint House
Ashmead House
Salem Cottages
EF14
51
Jacksons Farm
Path
33m
31m
B3342
ESS
Crematorium
30m
BUBB LANE





Slide 4

EF14 Parcel 51 - Grass field sloping steeply towards Burnetts Lane to the NW, and less steeply towards the SE & Bubb Lane. Site is owned by Queens College, so its exact use is not clear. Archaeologists were on site digging trenches. Soil appeared less clayey and more loamy. Trees border the field at the southern boundary with the train line, and a hedge 3 m, to the NE of the field. All hedges had been removed along both boundaries with the roads and heras fencing was in its place. 4.84 ha.

Emma Flower, 26/02/2020

Appendix 3 Farmer Interview Notes

Interview with Rob and Adam Marsh 04/02/20

Management of each parcel (refer to walkover plans for parcel locations)

- Nitrogen Fertiliser Application Field Record Sheets supplied for the following fields:
  - Parcel 10 ("10 acre" field); 4.64 ha (11.5 acres)
  - Parcel 15 ("18 acre" field); and 7.39 ha (18.3 acres)
  - Parcel 23 ("12 acre" field. 4.96 ha (12.3 acres)

These fields above were wheat last year, but alternate between wheat and maize. Figures in the table from the nitrate ordering sheet for Foxholes WW were used for amounts of Nitrate applied to these areas per ha.

- Parcel 6 – Previously grazed by a flock of sheep (~50 head) from the Davies farmstead. Treated as rotational grassland in Farmscoper. 6.12 ha (15.1 acres) within OPA.
- Parcel 9 – Pasture with hay cut. 7.37 ha (18.2 acres), parcels 9 and 26 (11.52 ha total) are classed as Victor's hay on the fertiliser sheets, classed as rotational grassland on Farmscoper
- Parcel 11 – pasture/fodder. 2.86 ha (7.1 acres).
- Parcel 17 – playing field – no applications. Treated as set aside in the calculations. 1.53 ha 3.8 acres.
- Parcels 14 and 16 are fallow with one cut per year. – Treated as fodder in the calculations. Total area 1.0 ha (2.5 acres).
- Parcel 19 with no applications. Treated as set aside in the calculations. Total area 3.73 ha (9.2 acres).
- Parcels 20 and 24 wet and scrubby with no applications and perhaps only one cut per year (1st cut) and perhaps a flail in summer. Treated as set aside in the calculations. Total area 2.03 ha (3.7 acres).

General

- Between 150 to 200 tonne of farmyard manure (FYM) imported into their land within red line boundary. This is applied to the maize crop which is grown alternate years. Consequently, in Farmscoper this is represented as 87.5 tonnes per year on the maize crop *i.e.* (150+200)/2/2.
- Most hay cuts for home (local) trade.
- No boundary walls – all hedges and fences.
- Maize crops require very low nitrogen – typically alternate between maize and wheat.
- Typical annual field operations comprise a machine till, drill, roll, fertiliser application and then harvest. All machinery tractor toed other than a combine for harvesting.
- On-site machinery comprises 1, perhaps 2 tractors, a 4-wheel drive (although most daily access is on foot), a quad which is only used in summer and a combine for harvesting.
- For hay, first cut end of May/beginning of June, 2nd cut in August.
- The areas which are developed buildings or demolished buildings are not included in Farmscoper.

NVZ Field Record Sheet

Crop Management Partners LLP
Rhys Evans
Tel: E-Mail: rhys@cropmanagement.co.uk

Main Business: R & A Marsh Farms Ltd
Year: 2019
Area: ha

10 Acre

Holding name: Main Holding
Field reference:
Map / NG Number: SU4917 / 0167
Postcode:
Crop: Wheat Winter

Holding reference:
Working area (ha): 4.54
Soil type: Medium (Eng)
NVZ Region: England and Wales NVZ (2009 or earlier)
Variety: KWS Zyatt

Field Cropping History

Cropping Year	Part Field Ref	Crop Name	Crop Sequence
2018	Whole field	Maize Forage	1

Nitrogen Fertiliser Applications

Application Date	Product	Manure Type	Quantity	Rate/ha	Units	Available N %	Available N kg/ha	Total Organic N %	Total Organic N kg/ha
? 07/02/2019	38N 19so3	Mineral Fertiliser	1194.020	263.000	kg	38.000	99.94		
? 16/03/2019	34.5% AN	Mineral Fertiliser	1316.600	290.000	kg	34.500	100.05		
? 10/05/2019	34.5% AN	Mineral Fertiliser	1293.900	285.000	kg	34.500	98.33		
							298.32		0.00

Date	Comment

12 Acre

Holding name: Main Holding
Field reference:
Map / NG Number: SU4817 / 4.95
Postcode:
Crop: Wheat Winter

Holding reference:
Working area (ha): 4.95
Soil type: Medium (Eng)
NVZ Region: England and Wales NVZ (2009 or earlier)
Variety: KWS Zyatt

Field Cropping History

Cropping Year	Part Field Ref	Crop Name	Crop Sequence
2018	Whole field	Maize Forage	1

Nitrogen Fertiliser Applications

Application Date	Product	Manure Type	Quantity	Rate/ha	Units	Available N %	Available N kg/ha	Total Organic N %	Total Organic N kg/ha
? 07/02/2019	38N 19so3	Mineral Fertiliser	1301.850	263.000	kg	38.000	99.94		
? 16/03/2019	34.5% AN	Mineral Fertiliser	1435.500	290.000	kg	34.500	100.05		
? 10/05/2019	34.5% AN	Mineral Fertiliser	1410.750	285.000	kg	34.500	98.33		
							298.32		0.00

Date	Comment

NVZ Field Record Sheet

Main Business: R & A Marsh Farms Ltd
Year: 2019
Area: ha

Crop Management Partners LLP
Rhys Evans
Tel: E-Mail: rhys@cropmanagement.co.uk

18 Acre

Holding name: Main Holding
Field reference:
Map / NG Number: SU4817 / 9946
Postcode:
Crop: Wheat Winter

Holding reference:
Working area (ha): 7.46
Soil type: Medium (Eng)
NVZ Region: England and Wales NVZ (2009 or earlier)
Variety: KWS Zyatt

Field Cropping History

Cropping Year	Part Field Ref	Crop Name	Crop Sequence
2018	Whole field	Maize Forage	1

Nitrogen Fertiliser Applications

Application Date	Product	Manure Type	Quantity	Rate/ha	Units	Available N %	Available N kg/ha	Total Organic N %	Total Organic N kg/ha
? 07/02/2019	38N 19so3	Mineral Fertiliser	1961.980	263.000	kg	38.000	99.94		
? 16/03/2019	34.5% AN	Mineral Fertiliser	2163.400	290.000	kg	34.500	100.05		
? 10/05/2019	34.5% AN	Mineral Fertiliser	2126.100	285.000	kg	34.500	98.33		
							298.32		0.00

Date	Comment

Holme, New Barn & Foxholes 2019 Nitrogen & Sulphur Ordering Sheet

ONLY CHANGE NUMBERS IN RED

	Products	27N 9So3				Nitram				MOP				00:20:30				38N 19So3					
		N (kg/t)	So3 (kg/t)			N (kg/t)	So3 (kg/t)			K20 (kg/t)				P205 (kg/t	K20 (Kg/t)			N (kg/t)	So3 (Kg/t)				
		27	9			34.5	0			60	0			20	30			38	19				
Crop	Ha	Total N Req.	Kg/ha N	Kg/ha So3	Kg/ha prod.	Total prod. per crop	Kg/ha N	Kg/ha So3	kg/ha prod.	Total prod. Per crop	Kg/ha K20	Kg/ha MgO	Kg/ha prod.	Total prod. per crop	Kg/ha P205	Kg/ha K20	Kg/ha prod.	Total prod. per crop	Kg/ha N	Kg/ha So3	l/ha prod.	Total prod. per crop	Total N/ha Supplied	Total So3/ha Supplied
Holme WW	14.75	300	0	0	0	0	200	0	580	8551	0	0	0	0	50	75	250	1106	100	50	263	3882	300	50
Foxholes WW	16.95	300	0	0	0	0	200	0	580	9826	0	0	0	0	0	0	0	0	100	50	263	4461	300	50
Grass - Grazing 1	35.49	60	60	20	222	7887	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	20
Grass - Hay 1	14.16	90	90	30	333	4720	0	0	0	0	0	0	0	0	30	45	150	637	0	0	0	0	90	30
Grass - Silage 1 (inc New Crates)	13.97	100	100	33	370	5174	0	0	0	0	0	0	0	0	55	83	275	1153	0	0	0	0	100	33
New Crates Field (New Barn) Silage 2	4.64	75	75	25	278	1289	0	0	0	0	0	0	0	0	40	60	200	278	0	0	0	0	75	25
New Crates Field (New Barn) Silage 3	4.64	75	75	25	278	1289	0	0	0	0	0	0	0	0	30	45	150	209	0	0	0	0	77	25
S Barley (exc Moonlights HLS)	34.22	150	0	0	0	0	70	0	203	6943	0	0	0	0	50	75	250	8555	80	40	211	7204	150	40
S Barley Moonlights	11.84	50	0	0	0	0	0	0	0	0	0	0	0	0	50	75	250	2960	50	25	132	1558	50	25
Maize (Jacksons & Lions Only) (P/K Jackson ONLY)	9.93	120	120	40	444	4413	0	0	0	0	130	0	217	2152	0	0	0	0	0	0	0	0	120	40
			Total Product (kg) =			24772	Total Product (l) =			25320	Total Product (kg) =			2152	Total Product (kg) =			14898	Total Product (l) =			17104		
			In Stock	=		0	In Stock	=		0	In Stock	=		0	In Stock	=		0	In Stock	=		0		
			To Order	=		24772	To Order	=		25320	To Order	=		2151.5	To Order	=		14898	To Order	=		17104		

12t in stock - order 13.2t (conv with Adam 11 2.4t in stock

Wheat

Late Feb/Early March = 250kg/ha 0:20:30 **(Holme Only)**
Late Feb = 116kg/ha Nitram 34.5% N
Mid - Late March = 263kg/ha 38N 19So3
End March/Early April = 290kg/ha Nitram 34.5% AN
Pre Flag Leaf = 174kg/ha Nitram 34.5% AN

Spring Barley

Seedbed = 250kg/ha 0:20:30
Seedbed = 211kg/ha 38N 19So3
1 leaf of Sbarley = 203kg/ha Nitram 34.5% N

Hay (Victors)

Early March = 333kg/ha 27N 9So3
Late Feb/Early March = 150kg/ha 0:20:30

Grazing (all other grass)

Early March = 222kg/ha 27N 9So3

Silage 1st Cut (New Crates, Cheeks, Foxhole Park and Beeches)

Late Feb = 370kg/ha 27N 9So3
Late Feb/Early March = 275kg/ha 0:20:30

Silage 2nd Cut (New Crates)

After Cutting = 278kg/ha 26N 9So3
After Cutting = 200kg/ha 0:20:30

Silage 3rd Cut (New Crates)

After Cutting = 278kg/ha 26N 9So3
After Cutting = 150kg/ha 0:20:30

Maize

Seedbed = 185kg/ha 27N 9So3
Seedbed = 217kg/ha MOP **(MOP NOT NEEDED IF MUCK IS APPLIED)**
1 Leaf of Maize and NO Later = 260kg/ha 27N 9So3

Owton Farm Interview Notes

Focussing on last year's activities/crops it would be useful to know:

6. The percentage of your fields directly adjacent to watercourses; approx. 60%
7. The types of field boundaries and the approximate percentage of these types (i.e. hedges, walls, fences or other); hedges (80%), fences (5%) and trees (15%)
8. The area (in hectares) of each type of land use, including types of crops, pasture, rough grazing, grassland, orchards, bare fallow, woodland and set aside;
    - 60ha total
    - Pasture 50ha
    - Maize 6.75ha (2.75ha and 4ha parcels alternating every two years) I had 4 ha maize
    - Silage 22.16ha I had 60 acres/ 24ha silage
    - 3.25ha other
9. Fertiliser (N and P_2O_5) additions in kg/ha for each type of land use. Typical application rates for some crops are included on the spreadsheet, but these can be modified to suit your own applications;
    - Maize – 20/10/10 fertiliser applied 150kg per acre (or 370kg per ha) = 2497kg total on maize fields.
    - Silage – 25/15 fertiliser 75kg per acre (or 185kg per ha) I had it as after silage cut 25/5/15 applied (75kg)
    - Pasture – 34.5% N fertiliser 200kg in 3 doses
10. Manure applications - including tonnage and type of manure received on site and the percentage application to the respective land uses.
    - Maize – 24 tons per ha (10 tons per acre)
    - Silage – the same as maize? I had the farm yard manure as 10 tonnes overall applied to silage & maize fields (not per acre) applied in 1 dose in April and then ploughed in after 1 week, or sometimes a couple of days between application and ploughing
    - No manure imports
    - All farm yard manure (FYM) only applied on fields used for maize and silage
    - No dirty water store / slurry store on site. No manure exported.

For each type of land use, we would also be interested in the respective field operations, including:

6. Length of ley; 2 years
7. The number of times each year the land is ploughed, cultivated, harrowed, subsoiled, disced, rolled, sprayed, fertilised etc. Land chain harrowed once in spring, they use a slot drill to overseed the grass
8. Type of equipment used for planting; One JCB and one tractor
9. Any irrigation (mm/ha); None
10. Number of cuts per year and type of harvesting equipment used. Contractors brought in to harvest who use the tractor. (For the maize field).
    For hay /

Finally, we would also be interested in what type of vehicles/plant your regularly use on the farm e.g. tractors, pick-ups, quad bikes etc. JCB and tractor only.

Animal stock:

1 bull

70 cows < 1 year old

50 cows 1-2 years old

20 cows 2+ years old

Typically 220 cows start the winter diminishing to 160 in spring.

Simon confirmed that he farmed all of the fields to the south of Fir Tree Lane, apart from the field across Burnetts Lane in the far south east corner of the development site, this is owned by Queens College. He owns the land which the solar farm is and leases it to the solar farm. He cuts the grass around the solar farm 3 times a year and leaves the grass in situ.

24ha/56.8 acres silage but when the silage fields are measured on GIS they are around 29ha so this higher figure is used in Farmscoper. Silage fields receive part of the 10 tonne manure along with 100kg / acre 20/10/10. Also there is an after cut application of 25/5/15 at 75kg/acre

Fields around 72.15 acre total for silage so 7215kg 20/10/10 fertiliser of which 20% is Nitrate, so 1443kg N total, /29.2ha = 49.42 kg/N/ha.

Plus 5411 kg of 25/5/15 of which 25% is N, 1352 kgN / 29.2ha = 46.33 kg N/ha

Both Fertiliser applications total 120 kg/n/yr/ha. The silage production at the Marshes Farm (out of the site) uses 100kgN / yr I don't know whether this is also grazed, so the Owton's figure doesn't seem too far out.

40ha/98.8 acres pasture, around 25 ha of this is permanent pasture (during grazing season) and the remainder is grown for silage in the spring & then grazed afterwards. Fields 32, 33, 47, and 48 are classed as silage fields, these are cut in May and then cattle graze them from June until early November.

4ha maize grown for cattle feed & used on site. Fertilised with manure and 20/10/10

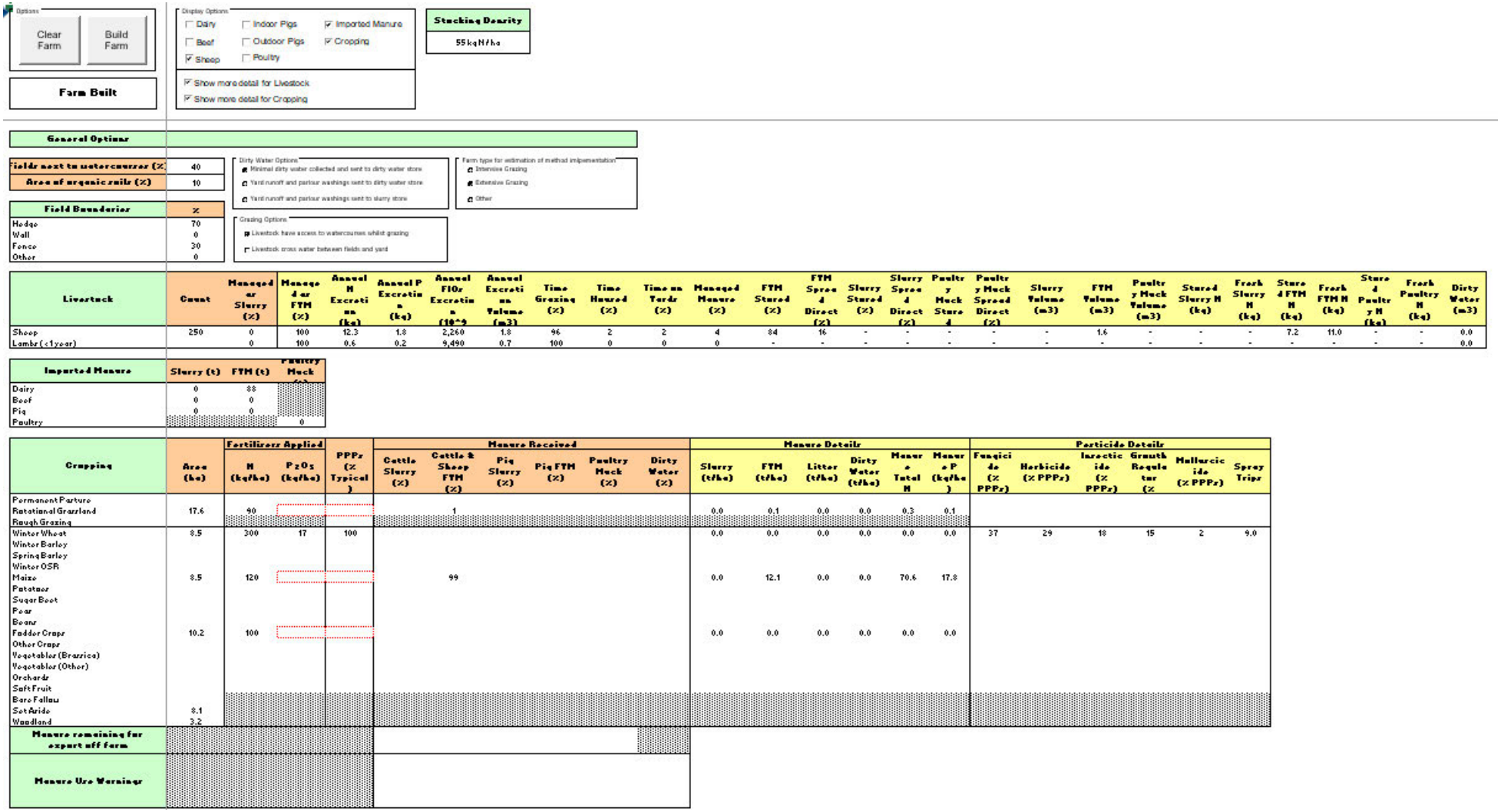
Field 51 classed as set aside as owned by Queens College, grass field possibly grazed but no info on this, if information is obtained then this can be added in.

The fields to the west of the site are not cut for silage and are only grazed, these are grazed from mid-March, cattle are housed in the barn during the winter – early Nov to mid-March depending on how wet the ground is this can vary. Grazing fields receive 34.5N 200kg ammonium nitrate 3 times a year, this is 200kg total throughout the year, not each time. So 34.5%N which equates to around 3kg N/ha applied per year, (this seems low but I did check this figure with him today).

Appendix 4 ADAS Farmscoper Inputs & Outputs

Marsh's Farm

Input



Options

Clear Farm | Build Farm

Farm Built

Display Options

- [ ] Dairy
- [ ] Beef
- [x] Sheep
- [ ] Indoor Pigs
- [ ] Outdoor Pigs
- [ ] Poultry
- [x] Imported Manure
- [x] Cropping
- [x] Show more detail for Livestock
- [x] Show more detail for Cropping

Stocking Density: 55 kgN/ha

General Options

Fields next to watercourses (%)	40
Area of organic soils (%)	10

Dirty Water Options
- (•) Minimal dirty water collected and sent to dirty water store
- ( ) Yard runoff and parlour washings sent to dirty water store
- ( ) Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method implementation
- ( ) Intensive Grazing
- (•) Extensive Grazing
- ( ) Other

Grazing Options
- [x] Livestock have access to watercourses whilst grazing
- [ ] Livestock cross water between fields and yard

Field Boundaries	%
Hedge	70
Wall	0
Fence	30
Other	0

Livestock	Count	Managed as Slurry (%)	Managed as FYM (%)	Annual N Excretion (kg)	Annual P Excretion (kg)	Annual FIOs Excretion (10^3)	Annual Excretion Volume (m3)	Time Grazing (%)	Time Housed (%)	Time on Yards (%)	Managed Manure (%)	FYM Stored (%)	FYM Spread Direct (%)	Slurry Stored (%)	Slurry Spread Direct (%)	Poultry Muck Stored	Poultry Muck Spread Direct (%)	Slurry Volume (m3)	FYM Volume (m3)	Poultry Muck Volume (m3)	Stored Slurry N (kg)	Fresh Slurry N (kg)	Stored FYM N (kg)	Fresh FYM N (kg)	Stored Poultry N (kg)	Fresh Poultry N (kg)	Dirty Water (m3)
Sheep	250	0	100	12.3	1.8	2,260	1.8	96	2	2	4	84	16	-	-	-	-	-	1.6	-	-	-	7.2	11.0	-	-	0.0
Lambs (<1 year)		0	100	0.6	0.2	9,490	0.7	100	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0

Imported Manure	Slurry (t)	FYM (t)	Poultry Muck
Dairy	0	88	
Beef	0	0	
Pig	0	0	
Poultry			0

Cropping	Area (ha)	Fertilisers Applied: N (kg/ha)	Fertilisers Applied: P2O5 (kg/ha)	PPPs (% Typical)	Manure Received: Cattle Slurry (%)	Manure Received: Cattle & Sheep FYM (%)	Manure Received: Pig Slurry (%)	Manure Received: Pig FYM (%)	Manure Received: Poultry Muck (%)	Manure Received: Dirty Water (%)	Manure Details: Slurry (t/ha)	Manure Details: FYM (t/ha)	Manure Details: Litter (t/ha)	Manure Details: Dirty Water (t/ha)	Manure Details: Manure Total N	Manure Details: Manure P (kg/ha)	Pesticide Details: Fungicide (% PPPs)	Pesticide Details: Herbicide (% PPPs)	Pesticide Details: Insecticide (% PPPs)	Pesticide Details: Growth Regulator (%	Pesticide Details: Molluscicide (% PPPs)	Pesticide Details: Spray Trips
Permanent Pasture																						
Rotational Grassland	17.6	90				1					0.0	0.1	0.0	0.0	0.3	0.1						
Rough Grazing																						
Winter Wheat	8.5	300	17	100							0.0	0.0	0.0	0.0	0.0	0.0	37	29	18	15	2	9.0
Winter Barley																						
Spring Barley																						
Winter OSR																						
Maize	8.5	120				99					0.0	12.1	0.0	0.0	70.6	17.8						
Potatoes																						
Sugar Beet																						
Peas																						
Beans																						
Fodder Crops	10.2	100									0.0	0.0	0.0	0.0	0.0	0.0						
Other Crops																						
Vegetables (Brassica)																						
Vegetables (Other)																						
Orchards																						
Soft Fruit																						
Bare Fallow																						
Set Aside	8.1																					
Woodland	3.2																					
Manure remaining for export off farm																						
Manure Use Warnings																						

Farmscoper Create

03/11/2020

File Information	
Create File:	201103 PB Revision FARMSCOPER4 Create March.xls
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable
Farm Area:	56.11 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)	
Arable	1,265	23.15	17,676	430.3	0	266.3	1.28	15	4,748	39,896	-	
Grass	304	2.57	707	187.6	1,966	210.6	0.00	1,477	2,505	15,768	-	
Rough	0	0.00	0	0.0	0	0.0	0.00	0	0	0	-	
Other	7	0.70	1	32.5	82	3.3	0.61	106	0	11,399	-	
Total	1,576	26.42	18,384	650.3	2,047	480.1	1.89	1,598	7,254	67,063	66,147	

Report Units

- (•) Total Loss
- ( ) Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	8
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	8
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	10
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	8
Woodland	3

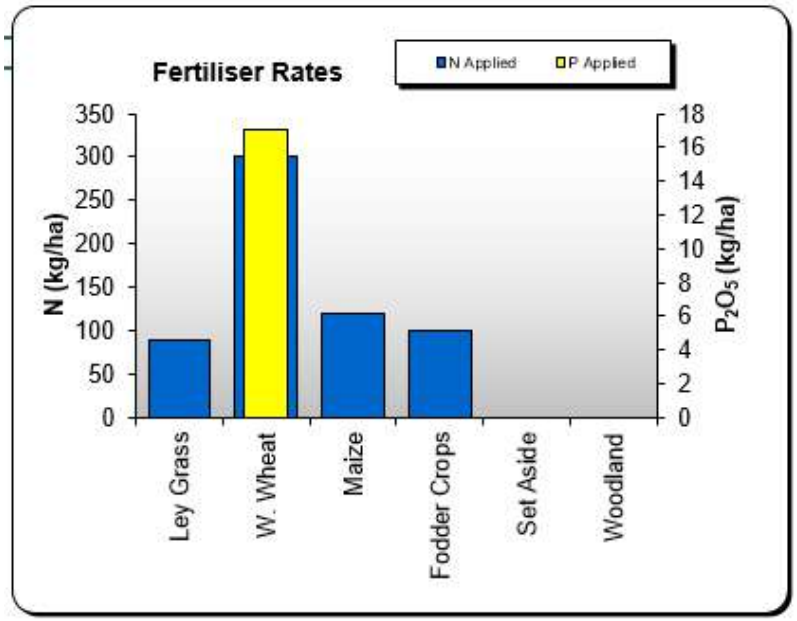
Grassland	ha
Permanent Pasture	0
Rotational Grassland	18
Rough Grazing	0

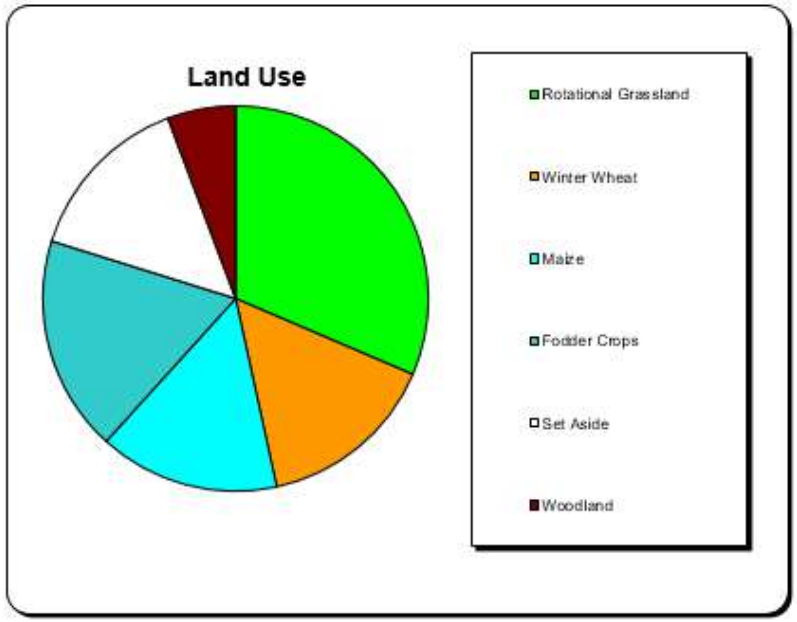
Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	0
Sheep	
Sheep	250
Lambs (< 1 year)	0

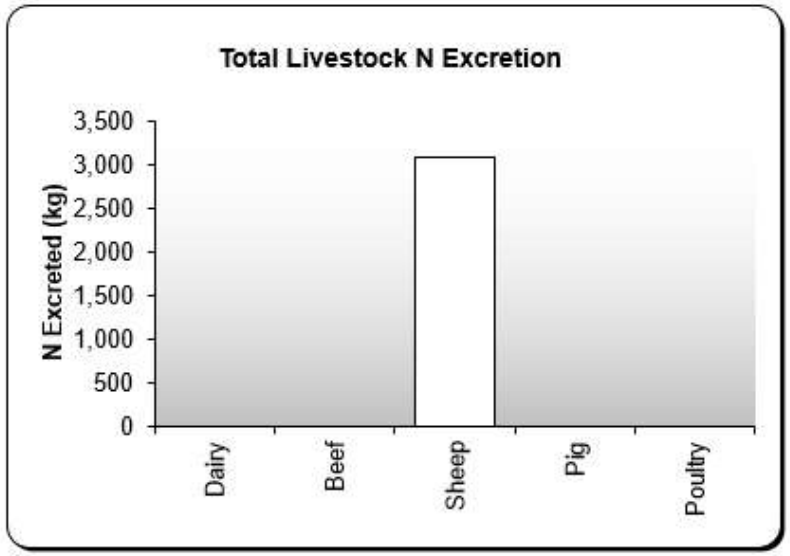
Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

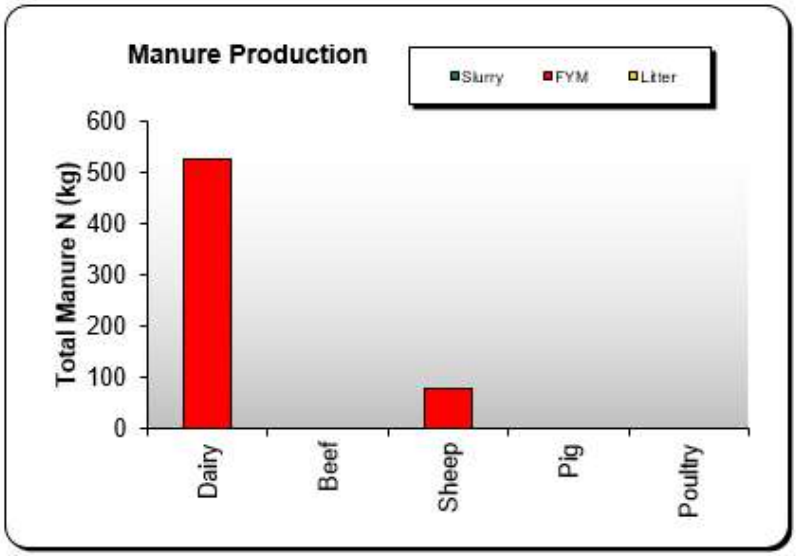
Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

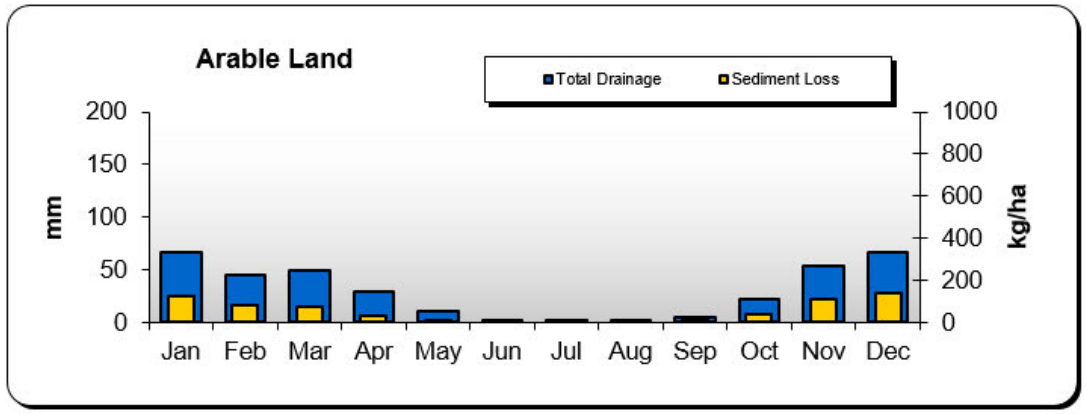
Manure Values	kg N
Dairy FYM	528
Dairy Slurry	0
Beef FYM	0
Beef Slurry	0
Sheep FYM	78
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

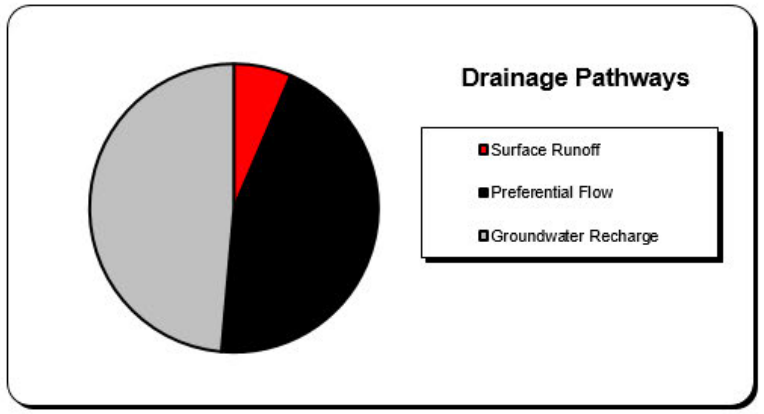

Fertiliser Rates
N Applied
P Applied
N (kg/ha)
P_2O_5 (kg/ha)
350
300
250
200
150
100
50
0
18
16
14
12
10
8
6
4
2
0
Ley Grass
W. Wheat
Maize
Fodder Crops
Set Aside
Woodland

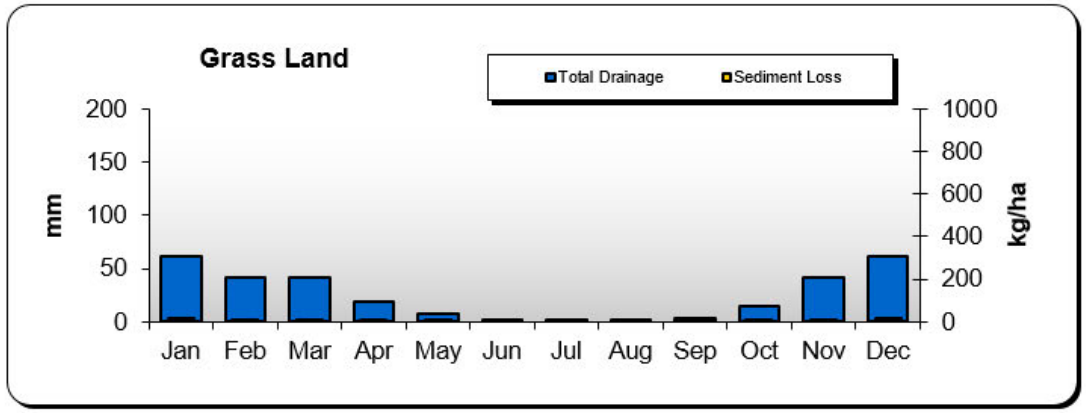

Land Use
Rotational Grassland
Winter Wheat
Maize
Fodder Crops
Set Aside
Woodland

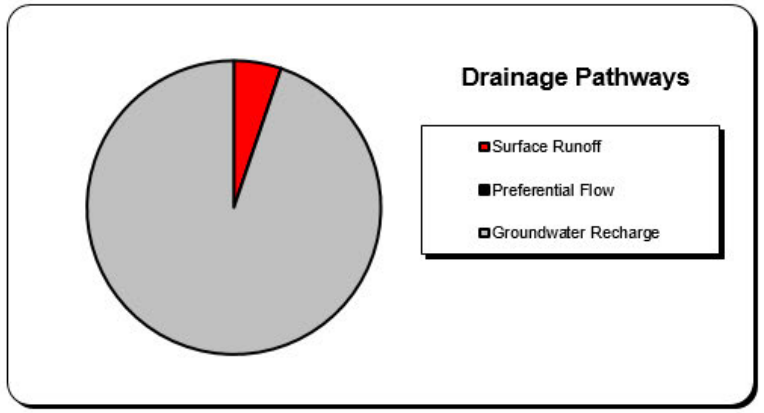

Total Livestock N Excretion
N Excreted (kg)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Dairy
Beef
Sheep
Pig
Poultry

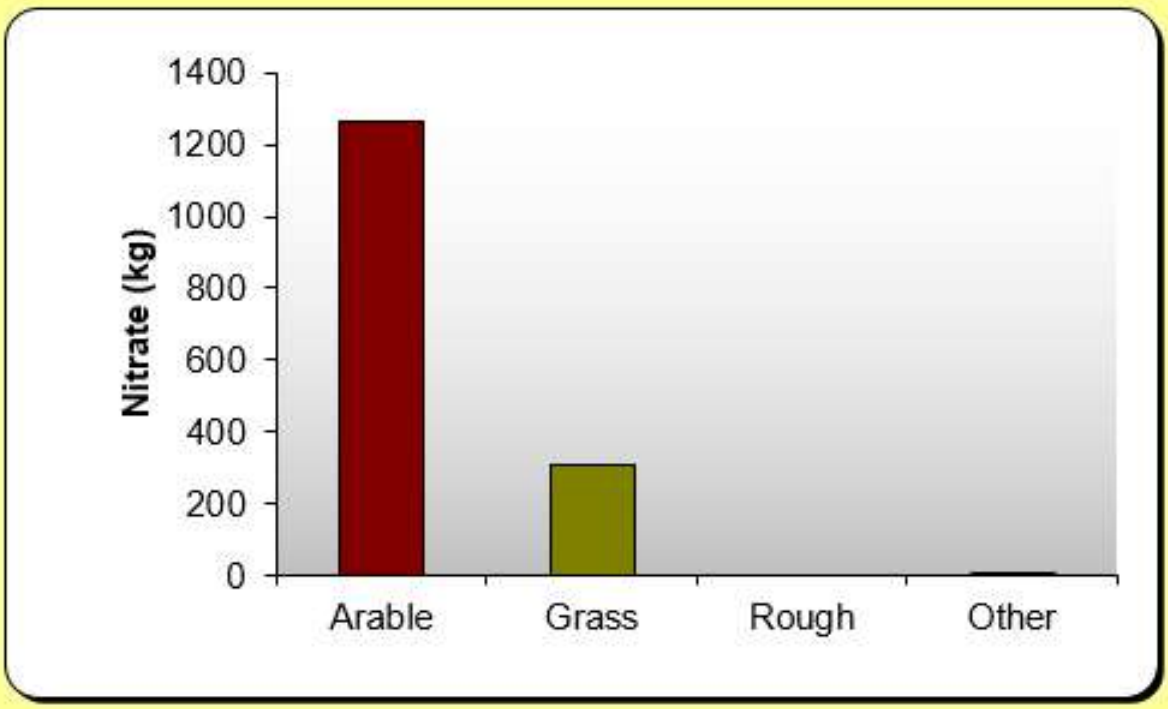

Manure Production
Slurry
FYM
Litter
Total Manure N (kg)
600
500
400
300
200
100
0
Dairy
Beef
Sheep
Pig
Poultry

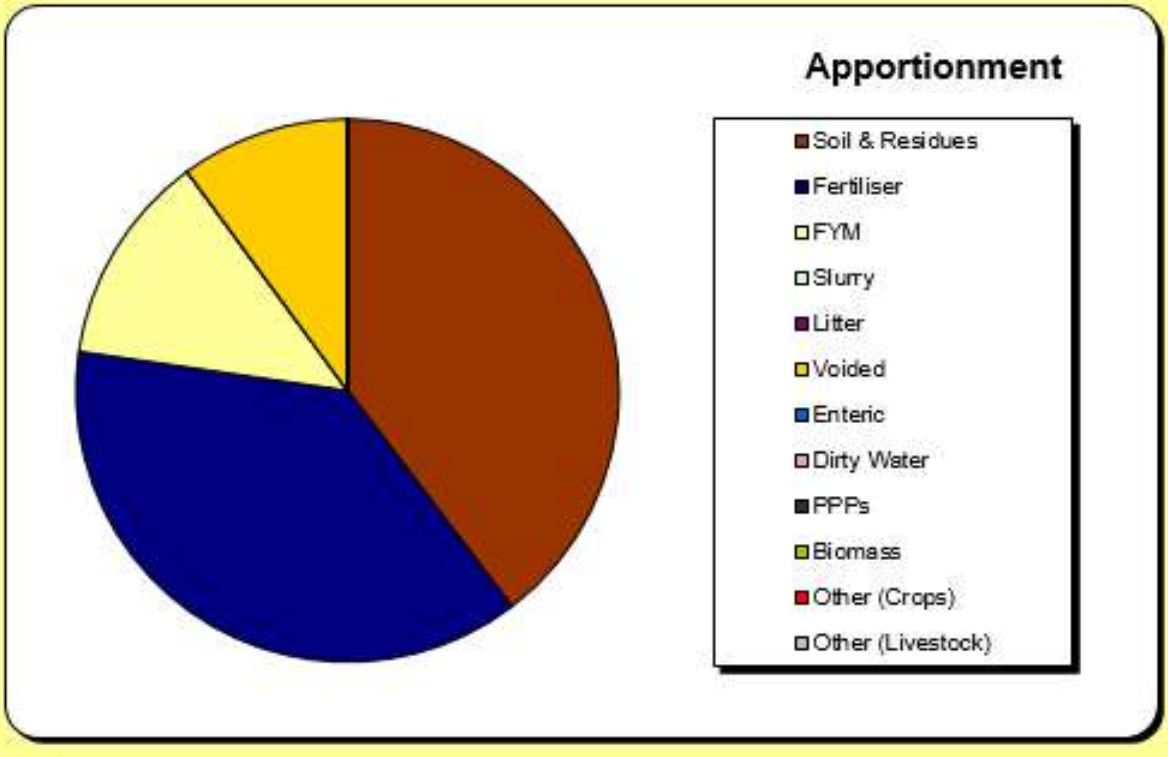

Arable Land
Total Drainage
Sediment Loss
mm
kg/ha
200
150
100
50
0
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Drainage Pathways
Surface Runoff
Preferential Flow
Groundwater Recharge


Grass Land
Total Drainage
Sediment Loss
mm
kg/ha
200
150
100
50
0
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Drainage Pathways
Surface Runoff
Preferential Flow
Groundwater Recharge


1400
1200
1000
800
600
400
200
0
Nitrate (kg)
Arable
Grass
Rough
Other


Apportionment
Soil & Residues
Fertiliser
FYM
Slurry
Litter
Voided
Enteric
Dirty Water
PPPs
Biomass
Other (Crops)
Other (Livestock)

Results Summary

Farmed area = 53.46 ha (including set aside and woodland)

Annual total applied fertiliser-N = 7670.9 kg NO_3-N

Annual total applied FYM-N = 173.0 kg N

Annual total agricultural applied N = 7843.9 kg N

Annual total Nitrate-N loss = **1576.4 kg NO_3-N**

Percentage Nitrate-N loss of agricultural N input = 20.1 %

Nitrate-N loss from arable land uses = 1265 kg NO_3-N (80.2 % of total loss)

Nitrate-N loss from grassland uses = 304 kg NO_3-N (19.3 % of total loss)

Nitrate-N loss from other uses = 7 kg NO_3-N (0.4 % of total loss)

Average concentration in runoff = 8.96 mg NO_3-N/l

Annual total Ammonia (gaseous) loss = 650.3 kg NH_3-N

Annual total Nitrous Oxide (gaseous) loss = 480.2 kg N_2O

Appendix 5 Baseline Tracker

Masterplan

Parcel	Farm Area	Area (Ha)	Use	Nitrate Output/ha (kg)	Total Nitrate Output (kg)	Phosphorus Output/ha (kg)	Total Phosphorus Output (kg)	Sediment Output/ha (kg)	Total Sediment Output (kg)	Comments
0.1	-	1.13	U	15.38	17.33	1.65	1.86	502.00	565.51	
0.2	-	0.07	U	15.38	1.08	1.65	0.12	502.00	35.22	
0.3	Owton	0.63	U	15.38	9.75	1.65	1.05	502.00	318.11	Sediment derived from Ellis (1996) according to most relevant road type
0.4	-	0.35	U	15.38	5.44	1.65	0.58	502.00	177.71	
0.7	Owton	0.58	U	15.38	8.97	1.65	0.96	502.00	292.66	
0.8	Owton	0.13	R	0.00	0.00	0.00	0.00	0.00	0.00	No change through development so included as 0
1	-	1.03	U	15.38	24.51	1.65	2.83	75.00	77.29	1x Residential property allowance added for N and P
2	-	0.52	U	15.38	7.97	1.65	0.86	75.00	38.88	
3	-	0.19	U	15.38	11.58	1.65	1.44	75.00	14.25	1x Residential property allowance added for N and P
4	Marsh	1.10	F	25.33	26.64	0.73	0.80	682.28	750.03	
5	Marsh	1.38	F	25.33	33.35	0.73	1.00	682.28	938.68	
6.1	Marsh	5.97	RG	17.34	99.05	0.73	4.36	40.35	240.87	
7	Marsh	1.76	W	0.25	0.43	0.02	0.04	0.31	0.54	
8	Marsh	1.56	F	25.33	37.92	0.73	1.14	682.28	1,067.56	
9	Marsh	7.35	RG	17.34	121.92	0.73	5.36	40.35	296.49	
10	Marsh	4.54	M/W	49.95	216.97	0.95	4.31	616.70	2,799.34	
11	Marsh	2.87	F	25.33	69.44	0.73	2.09	682.28	1,954.80	
12	Marsh	0.63	F	25.33	15.23	0.73	0.46	682.28	428.74	
13	-	0.95	U	15.38	40.63	1.65	4.96	75.00	123.75	3x Residential property allowance added for N and P
14	Marsh	0.43	F	25.33	10.43	0.73	0.31	682.28	293.65	
15	Marsh	7.46	M/W	49.95	356.64	0.95	7.09	616.70	4,601.51	
16	Marsh	0.48	F	25.33	11.75	0.73	0.35	682.28	330.74	
17	Marsh	1.61	SA	20.96	32.24	0.73	1.17	69.80	112.17	
18.1	Marsh	0.63	SA	20.96	21.39	0.73	1.59	69.80	44.29	1x Residential property allowance added for N and P
18.2	Marsh	0.52	W	0.25	0.13	0.02	0.01	0.31	0.16	
19	Marsh	3.88	SA	20.96	77.75	0.73	2.83	69.80	270.53	
20	Marsh	0.73	SA	20.96	14.58	0.73	0.53	69.80	50.74	
21	Marsh	0.51	W	0.25	0.12	0.02	0.01	0.31	0.16	
22	-	0.65	U	15.38	9.99	1.65	1.07	75.00	48.74	
23	Marsh	4.94	M/W	49.95	236.26	0.95	4.70	616.70	3,048.30	
24	Marsh	0.38	SA	20.96	7.61	0.73	0.28	69.80	26.48	
25	-	0.64	U	15.38	18.46	1.65	2.18	75.00	47.79	1x Residential property allowance added for N and P
26	Marsh	4.20	RG	17.34	69.71	0.73	3.07	40.35	169.53	
27	Marsh	1.02	F	25.33	24.64	0.73	0.74	682.28	693.70	
28	Marsh	0.28	F	25.33	6.85	0.73	0.21	682.28	192.86	
29	Marsh	1.36	W	0.25	0.33	0.02	0.03	0.31	0.42	
30	Owton	2.88	PP	33.85	93.25	0.60	1.73	39.62	114.06	
31	Owton	3.10	M	44.61	132.16	0.95	2.94	691.13	2,139.31	
32	Owton	4.76	RG	33.85	154.17	0.73	3.47	39.62	188.57	NB - 20% uplift to livestock inputs on grazed land for Owtons farm to reflect increased grazing season, added to the Nitrate Output/ha score
33	Owton	9.81	RG	33.85	317.76	0.73	7.16	39.62	388.66	
34	Owton	1.31	PP	33.85	42.60	0.60	0.79	39.62	52.10	
35	Owton	1.75	PP	33.85	56.79	0.60	1.05	39.62	69.46	
36	Owton	1.42	PP	33.85	46.07	0.60	0.85	39.62	56.34	NB - 20% uplift to livestock inputs on grazed land for Owtons farm to reflect increased grazing season, added to the Nitrate Output/ha score
37	Owton	0.15	PP	33.85	4.85	0.60	0.09	39.62	5.94	
38	Owton	3.81	PP	33.85	123.32	0.60	2.28	39.62	150.84	
39.1	Owton	0.66	PP	33.85	21.27	0.60	0.39	39.62	26.02	
39.2	Owton	0.34	W	0.25	0.08	0.02	0.01	0.31	0.10	
40	Owton	3.56	PP	33.85	115.20	0.60	2.13	39.62	140.91	

Parcel	Farm Area	Area (Ha)	Use	Nitrate Output/ha (kg)	Total Nitrate Output (kg)	Phosphorus Output/ha (kg)	Total Phosphorus Output (kg)	Sediment Output/ha (kg)	Total Sediment Output (kg)	Comments
41	Owton	0.88	PP	33.85	28.44	0.60	0.53	39.62	34.79	NB - 20% uplift to livestock inputs on grazed land for Owtons farm to reflect increased
42	Owton	0.61	PP	33.85	19.85	0.60	0.37	39.62	24.28	grazing season, added to the Nitrate Output/ha score
43	Owton	2.55	PP	33.85	82.56	0.60	1.53	39.62	100.98	
44	Owton	2.09	U	8.20	43.13	1.21	5.92	750.00	1,568.19	Added as a commercial/industrial property from Allen (2017) 3x Residential property allowance added for N and P
45	Owton	1.81	PP	33.85	58.78	0.60	1.09	39.62	71.89	
46	Owton	2.94	PP	33.85	95.38	0.60	1.77	39.62	116.66	NB - 20% uplift to livestock inputs on grazed land for Owtons farm to reflect increased
47	Owton	6.65	RG	33.85	215.31	0.73	4.85	39.62	263.35	grazing season, added to the Nitrate Output/ha score
48.1	Owton	7.81	RG	33.85	252.89	0.73	5.70	39.62	309.31	
49	Owton	0.82	PP	33.85	26.55	0.60	0.49	39.62	32.47	NB - 20% uplift to livestock inputs on grazed land for Owtons farm to reflect increased
50.1	Owton	1.33	PP	33.85	42.95	0.60	0.80	39.62	52.54	grazing season, added to the Nitrate Output/ha score
50.2	Owton	1.09	SA	21.63	22.59	0.73	0.80	69.80	76.18	
	Total	**124.59**			**3,643.06**		**107.13**		**26,035.11**	

Appendix 6 Proposed SuDS

N

Foul water rising towards proposed brake manhole in the vicinity of Allington Lane. Gravity connection from brake manhole is proposed to connect to the existing 900mm Dia foul water sewer Ref.:SU48185001

SuDS features serving Northern Access.Part of infrastructure works to be implemented under Planning Permission X/19/86303 : (O/14/79354)

Strategic SuDS Features for N.Roundabout and draining of Northern link Road subject to detailed design. Refer to Note 2.

Watercourse Crossing A

Watercourse Crossing
Crossing requires a clear span of channel with soffit set to a minimum of 600mm above the 1 in 100 year flood level with an appropriate allowance for climate change.
Detailed design to include Level for Level Flood Plain Compensatory Storage.

Strategic SuDS Feature A

Strategic SuDS Feature B

Strategic SuDS Feature C

Strategic SuDS Feature D

Strategic SuDS Feature E

Strategic SuDS Feature F

Strategic SuDS Feature G

SuDS feature serving as conveyance feature with lesser attenuation capacity.

A

B

C

D

E

F

G

FIR TREE LANE

Watercourse Crossing B

Watercourse Crossing
Crossing requires a clear span of channel with soffit set to a minimum of 600mm above the 1 in 100 year flood level with an appropriate allowance for climate change.
Detailed design to include Level for Level Flood Plain Compensatory Storage.

Bioretention Swale
Link road highway drainage design to incorporate bioretention swale. Refer to Note 7.

0m 50m 100m
Scale 1:1250

Strategic SuDS Features Schedule

Strategic SuDS Feature	Contributing Catchment (ha)	% of Impermeability	Q_{BAR} for Catchment (l/s)	1 in 1 Year Storage Volume (m^3)	1 in 1 Year Resulting Discharge (l/s)	1 in 100+40%CC Storage Volume (m^3)	1 in 100+40%CC Resulting Discharge(l/s)
A	2.037	65	18.4	165	17.8	802	18.3
	0.260	100					
B	3.750	65	30.0	260	28.1	1224	29.9
C	6.808	65	54.5	405	50.1	2172	54.4
D	3.381	65	27.1	244	23.7	1112	27
E	3.650	65	32.3	337	24.8	1706	32.3
	0.382	100					
F	3.360	65	26.9	241	23.9	1103	26.9
G	2.762	65	41.5	267	34.7	1450	40.3
	2.415	50					
H	1.603	30	70.8	683	44.1	2694	70.8
	0.409	100					
	6.831	65					
I	1.556	65	29.6	314	26.7	1339	28.7
J	2.139	65					
K	1.696	65	13.6	127	11.0	560	13.5
L	3.884	65	39.6	433	32.5	1860	39.5
	1.046	100					
M	2.213	65	17.7	156	16.2	728	17.7
N	5.759	65	46.1	477	31.1	1924	46.0
EM(Employment)	2.029	85	16.3	150	15.5	878	16.3

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Stratton Park House, Wanborough Road
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For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

1. This drawing should be read in conjunction with PFA Consulting's Flood Risk Assessment (Doc ref G277-00001 FRA – Issue 2) dated May 2021.
2. This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:IR:SAV.1.21.1, Rev E, dated 05 May 2014.
3. This site layout is based on Thrive's Concept Masterplan, Drawing number EAST200403 CMP 01 Rev P13, dated 04.12.20
4. Main River designation based on Flood Map for Planning.
5. All SuDS features shown on this drawing are subject to detailed design.
6. Typical Layout of Strategic SuDS Features to Inform Detailed Design shown on drawing number G277/23.
7. Detailed design of highway drainage features to provide attenuation and restrict flows to the downstream watercourse system. Sufficient attenuation should be provided to ensure discharge rates are restricted for all return periods up to the 100 year design event, including an appropriate allowance for climate change. Refer to PFA's Flood Risk Assessment (dated May 2021) document for guidance on flow rate restrictions.

Key

- Risk of Flooding from Surface Water Outline
- Basin Catchment Allocation
- Q100+105%CC Flood Outlines
- Q100+ 45%CC Flood Outlines
- Indicative Location of Foul Water Sewage Pumping Station with 15m odour offset
- 5m Maintenance Access from Ordinary Watercourse
- 8m Maintenance Access offset from Main Rivers
- Opportunity for swale conveyance feature
- Direction of Exceedance Flows
- Outlet from SuDS Feature to be conveyance swale where feasible
- Indicative Proposed Foul Rising Main
- FS-01 Indicative Proposed Strategic Foul Sewer
- Indicative Foul flow direction

Sheet Key



Rev	Date	Description	Drawn	Check
#	27/11/20	First Issue.	DAB	SAM
A	11/12/20	Revised to latest Masterplan & link road design	DAB	SAM
B	20/05/21	Revised following EA comments	DAB	MWS
C	21/05/21	Updated Proposed Foul sewer routes	DAB	SAM

Status
FOR PLANNING

Client
Eastleigh Borough Council

Project
One Horton Heath
Hampshire

Drawing Title
Preliminary Water Management Strategy Plan (Sheet 1 of 2)

Drawing No. G277/21 Rev C

Date: November 2020 Scale: 1:1250 @ A0

E-Mail: DBuciak@pfaplc.com

N

Watercourse Crossing
Crossing requires a clear span of channel with soffit set to a minimum of 600mm above the 1 in 100 year flood level with an appropriate allowance for climate change.
Detailed design to include Level for Level Flood Plain Compensatory Storage.

Proposed location of highway drainage feature. Refer to Note 7.

Watercourse Crossing C

SOLAR FARM

G

H

H

H

N

M

M

K

L

L

I

J

7B

EM
EMPLOYMENT

Existing Drainage Ditch to be aligned with layout (subject to detail design)

Strategic SuDS Feature N

Strategic SuDS Feature M

Strategic SuDS Feature L

Strategic SuDS Feature K

Strategic SuDS Feature J

Strategic SuDS Feature M

Strategic SuDS Feature SW

SuDS feature serving Southern Access. Part of infrastructure works to be implemented under Planning Permission X/19/86475 : (O/14/75735)

BURNETTS LANE

Offsite Foul Sewer connection proposed via Bubb Lane to existing 525mm Foul Water Sewer located at Grange Road/Locks Road roundabout (node SU4913 3703)

0m 50m 100m
Scale 1:1250

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For Planning
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NOTES

1. This drawing should be read in conjunction with PFA Consulting's Flood Risk Assessment (Doc ref G277-DOC01 FRA – Issue 2) dated May 2021.
2. This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:R:SAV.1.21.1, Rev E, dated 05 May 2014.
3. This site layout is based on Thrive's Concept Masterplan, Drawing number EAST200403 CMP 01 Rev P13, dated 04.12.20
4. Main River designation based on Flood Map for Planning.
5. All SuDS features shown on this drawing are subject to detailed design.
6. Typical Layout of Strategic SuDS Features to Inform Detailed Design shown on drawing number G277/23.
7. Detailed design of highway drainage features to provide attenuation and restrict flows to the downstream watercourse system. Sufficient attenuation should be provided to ensure discharge rates are restricted for all return periods up to the 100 year design event, including an appropriate allowance for climate change. Refer to PFA's Flood Risk Assessment (dated May 2021) document for guidance on flow rate restrictions.

Key

- Risk of Flooding from Surface Water Outline
- Basin Catchment Allocation
- Q100 + 105CC Flood Outlines
- Q100 + 45CC Flood Outlines
- Indicative Location of Foul Water Sewage Pumping Station with 15m odour offset
- 5m Maintenance Access from Ordinary Watercourse
- 8m Maintenance Access offset from Main Rivers
- Opportunity for swale conveyance feature
- Direction of Exceedance Flows
- Outlet from SuDS Feature to be conveyance swale where feasible
- Indicative Proposed Foul Rising Main
- FS-?? Indicative Proposed Strategic Foul Sewer
- Indicative Foul flow direction

Sheet Key



Rev	Date	Description	Drawn	Check
#	27/11/20	First Issue.	DAB	MWS
A	11/12/20	Revised to latest Masterplan & link road design	DAB	SAM
B	10/05/21	Revised following EA comments	DAB	MWS
C	21/05/21	Updated proposed foul sewer routes	DAB	SAM

Status
FOR PLANNING

Client
Eastleigh Borough Council

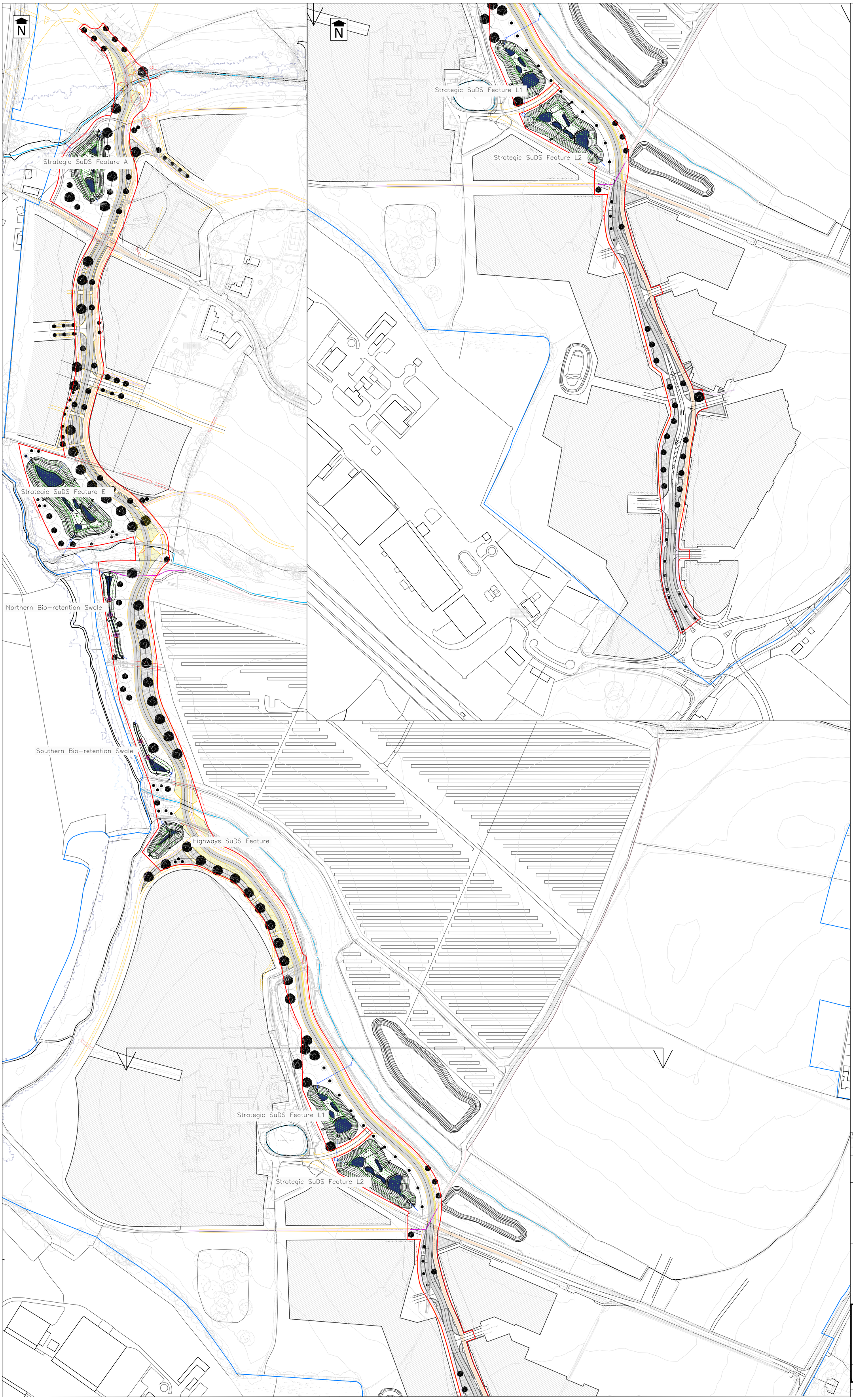
Project
One Horton Heath
Hampshire

Drawing Title
Preliminary Water Management Strategy Plan (Sheet 2 of 2)

Drawing No. G277/22 Rev C

Date: November 2020 | Scale: 1:1250 @ A0

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For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

1. This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:IR.SAV.1.21.1, Rev E, dated 05 May 2014 and Encompass Surveys' drawing number ENC/ONE-HH-DEC20.
2. This drawing is based on Clague Architects' Proposed Illustrative Plan drawing Extracts 1 – 7, drawing number 22100A/20 – 27.
3. Details of upstream surface water drainage network associated with the carriageway and shared paths/footway of Segment 3 of the Link Road is shown on Rueby & Stagg Drawings 10413-SEG 3-350 – 362. (as revised)
4. Typical SuDS drainage details, including typical headwall inlets and outlets is shown on drawing G277/30.
5. The design of the enhanced SuDS features ,including slope of embankments, is in accordance with best practice guidance outlined in The SuDS Manual 2015 (CIRIA C753) and does not include assessment an of slope stability.
6. The permanent water/wetland base within the SuDS features is designed to be seasonally wet and any proposed planting within the feature should be chosen accordingly with the ability to withstand the design conditions along with occasional inundation.
7. This drawing is subject to detailed design.
8. Section details of the SuDS features shown in this overview are shown on drawings G277/26 – 29.

KEY

- Site Boundary Red Line
- Land Owned by Applicant
- Watercourse
- Q100 + 105% Fluvial Flood Outline
- Q100 + 45% Fluvial Flood Outline

Rev	Date	Description	Drawn	Check
#	27/07/21	First Issue.	DAB	MWS/ SAM
A	28/08/21	Minor amendment	DAB	MWS

Status
FOR PLANNING

Client
Eastleigh Borough Council

Project
One Horton Heath - Chalcroft Avenue

Drawing Title
Segment 3 Strategic SuDS Features Layout Plan

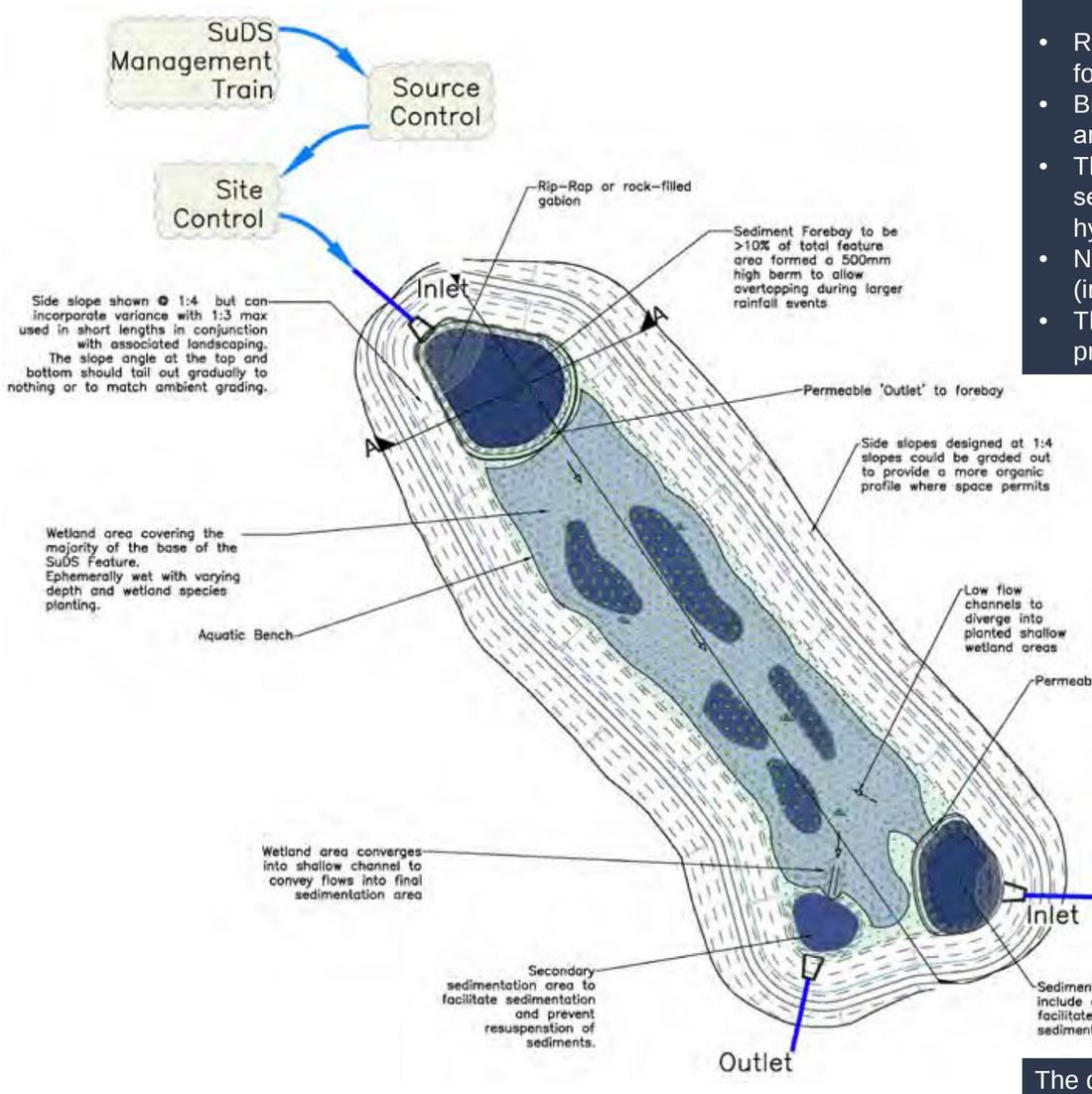
Drawing No.
G277/25 Rev A

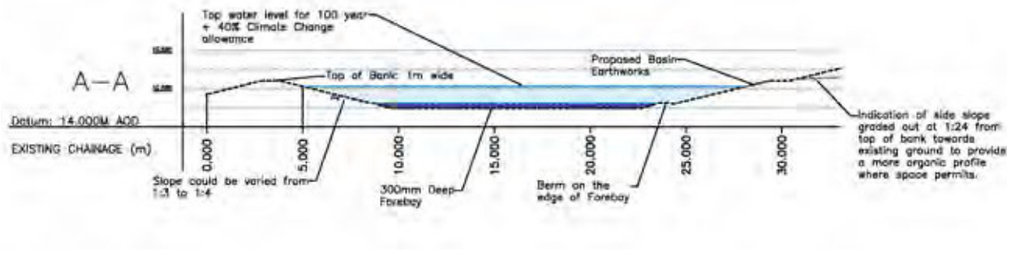
Date: July 2021 | Scale: 1:1250 @ A0

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1 Chalcroft Tolls

Enhanced Basins



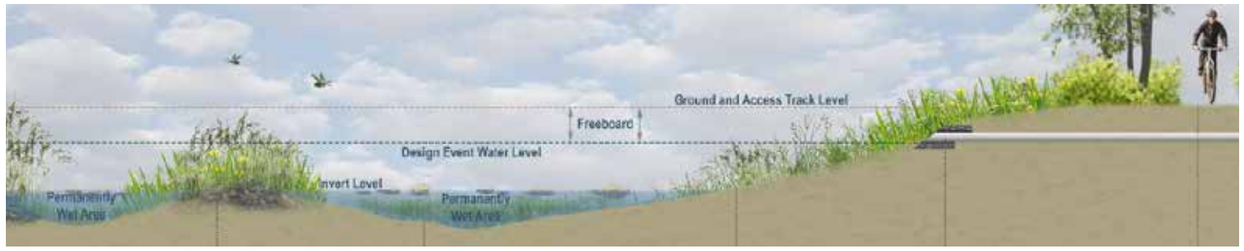


Extract from PFA Consulting Typical Layout of Strategic SuDS features Drawing G 277/23

Enhanced Basins

The 3 stages of filtering and nitrate cleansing within the enhanced basins would be:

- Removal of course sediments within the sediment forebay;
- Biodegradation and removal of hydrocarbons, nutrients and metals by the specific planting; and
- The permanent pool of water provides further settlement of fine sediments and removal of nutrients, hydrocarbons and metals.
- Nitrogen reducing native marginal and aquatic species (including evergreen plants).
- The incorporation of distinct zones in the large basins providing the water quality and quantity volume storage in a number of independent cells. These features create increased attenuation, longer pollutant removal pathways (and therefore enhanced pollution removal) an easier maintenance regime and more varied ecology.
- Basin Zones include a sediment forebay, permanent micro pools, attenuation storage volume above permanent pool water level and aquatic benches surrounding the permanent micro pools, which support wetland planting, acting as a biological filter and providing ecology amenity and safety benefits. Around the micro pools shallow wet/marshy grassland areas provide further filtration.
- Basins will be lined and anchored to prevent impact on functions from rising groundwater.



Indicative Section (ref: Jacobs A9 Basin Proposals)



Indicative Section showing forebay, benches and pools

The detailed design of basins will be subject to the CDM Regulations 2015. CDM Measures can include:

- High vertical drops/headwalls avoided
- Avoidance of fast flowing water (preference of velocities below 0.5m/s)
- Side slopes designed at 1in 4 or shallower to 1 in 24 (no steeper than 1 in 3 in short lengths) to provide safe access and egress including for maintenance operations
- Restrictions on water depth
- Marginal planting designed to a height designed to not obstruct visibility of the water from the surrounding area
- Safety grilles at a 45 degree angle (to avoid blocking) can be placed on any pipes greater than 350mm diameter
- Removal of many pollutants and nutrients from a wider conveyance train closer to source
- A level dry bench at the top of all open structures, 1m wide and a wet bench 1m wide allows stationary rest for a person and safety access
- Danger signs and safety equipment should not be required if the final design incorporates built in safety measures

Appendix 7 Strategic Land Parcels Points of Impact Study

PROJECT NOTE

TO:	Ziyad Thomas, Senior Development Planning Manager, Eastleigh Borough Council (EBC)
CC:	Alastair Atkinson, Andy Lam, Kristina Lewis, Emma Rowlands & Chris Birch, Hilson Moran
FROM:	Paul Bond, Hilson Moran
DATE:	3rd March 2025
FILE REF:	250303_25709_PB1
PROJECT:	25709_Horton Heath Masterplan
SUBJECT:	Natural England request for clarity on flow directions from Strategic Land Parcels to the River Itchen – 3rd March 2025 Revision

Dear Ziyad

Re: Natural England request for clarity on flow directions from Strategic Land Parcels to the River Itchen, Update

Introduction

This Project Note provides commentary responding to the above Natural England (NE) query, requesting further information on the determination of flow directions from Eastleigh Borough Council (EBC)-acquired Strategic Land Parcels to the River Itchen (and the use of the results to inform the suitability of using these sites for off-site mitigation regarding phosphorous (P) neutrality for the One Horton Heath (OHH) scheme). The locations of the Strategic Land Parcels are shown on the plan presented in Appendix A to this project Note.

The study summarised in this Project Note was carried out in response to the NE Discretionary Advice Service (DAS) Letter, dated 7th November 2024 (NE Ref. DAS/A015126/483225), which stated:

"*Mitigation measures should ensure they are in line with the spatial principles set out in the Solent V5 guidance. For phosphorus mitigation this will need to take effect upstream of the location where development sites' run-off and wastewater input will have effects on the designated site, to ensure effects are properly avoided on the river. For developments draining to the Itchen, the sewage treatment works outfall location must be downstream of the mitigation to be able to make use of the scheme. This ensures that no stretch of the Habitats site will be adversely impacted by increased nutrient loads*."

The Hilson Moran Nutrient Neutrality report ("*Nutrient Neutrality: Outline Planning Application*" report, dated 24th June 2024, Ref: XX-HML-XX-XX-RP-U-930001, Issue P04) determined that, in the absence of mitigation (such as the use of SuDS or wetlands), post-2030 the OHH Outline Planning Application (OPA) will require **70.38 kg TP/yr** in P credits to mitigate the scheme.

As per EBC's register of nutrient credits (as of 11/11/24), there are a total of **147.18 P credits** (*i.e.* where 1 credit equates to 1 kg P/year in mitigation) in the ownership of EBC.

The P (and nitrogen (N)) credits for each parcel were determined by Hilson Moran by means of:

- Appropriate questionnaires supplied to the respective land owners (requesting details on historic agricultural practices, including crop types, fertiliser and farmyard manure (FYM) applications, and livestock types/densities, where relevant;
- Agricultural Development and Advisory Service (ADAS) Farmscoper 4 modelling, enabling N & P losses to be derived for each parcel;
- Where there were any gaps in the data, appropriate estimations were made by Chris Coxon of Tiller Consultancy, a FACTS (Fertiliser Advisers Certification & Training Scheme) registered consultant, accredited number: FE/3327, using available nutrient application data, knowledge of farm type and practices and his professional experience and knowledge.

The results of these studies are presented in the Hilson Moran report "*Baseline Phosphorous Loss for Strategic Land Parcels for Eastleigh Borough Council*" (dated 12th November 2021, Issue 0.3, HM Reference 25709-RP-SU-006), which is reproduced in Appendix B of this Project Note.

Of the **147.18 P credits** in the ownership of EBC, **13.150 P credits** had been invoiced and **17.092 P credits** have been reserved by others, leaving a total of **116.938 P credits** remaining (refer to summary of available credits presented in Appendix C to this Project Note).

As all sewage from the OHH scheme will be conveyed to the Chickenhall Wastewater Treatment Works (WwTW), at least **70.38** of these remaining P credits must comply with the above locational principles by draining to a point on the Itchen upstream from the Chickenhall WwTW outfall.

Flow Direction Study Methodology

Firstly the exact location of the Chickenhall WwTW outfall was confirmed with reference to historic Land Registry Records (refer to Appendix D of this Project Note.

The UK Centre for Ecology & Hydrology's Flood Estimation Handbook (FEH) Web Service (refer to https://fehweb.ceh.ac.uk/) was then used to provide the catchment area of a point directly upstream from the Chickenhall WwTW outfall.

The catchment areas and associated nutrient Points of Impact were then derived for each of the Strategic Land Parcels owned by EBC shown in Appendix A. These were then compared to the Chickenhall WwTW outfall catchment to determine whether or not their Points of Impact lie upstream or downstream from the outfall.

Flow Direction Study Results

i. Appendix E provides a plan of the Strategic Land Parcels owned by EBC within the context of the River Itchen SAC catchment. This demonstrates that Parcel 31, "*the Botley site*", lies outside of the River Itchen catchment (lying within the River Hamble catchment) and thus cannot be used to mitigate the OHH scheme.

ii. With reference to Appendix F, the catchments and Points of Impact of Strategic Land Parcel No. 35 (35a & 35b: "*Stoke Park Dairy Farm*" in the Hilson Moran report presented in Appendix B) lie wholly upstream of the Chickenhall WwTW outfall, securing **88.42** P credits for the OHH scheme.

iii. As shown in Appendix F, the catchment and Points of Impact of Strategic Land Parcel No. 4 ("*Morris*" land in the Hilson Moran report in Appendix B) lie wholly upstream of the Chickenhall WwTW outfall, securing **19.20** P credits for the OHH scheme.

iv. As shown in Appendix G, the catchment and Points of Impact of 67.65% of Strategic Land Parcel No. 6 ("*Manor Farm*" in the Hilson Moran report in Appendix B) lie upstream of the Chickenhall WwTW outfall. Farming records and historic Google Earth imagery demonstrate that this land has been farmed for grassland and maize production, on a rotational basis since at least 2020. Consequently, 67.65% of the 32.88 kg TP/yr identified in the above Hilson Moran report equates to **22.24** P credits secured for the OHH scheme.

v. As shown in Appendix H, the catchment and Points of Impact of the remaining part of Strategic Land Parcel No. 6, and all the rest of the of Strategic Land Parcels not described above, lie downstream of the Chickenhall WwTW outfall, and thus cannot be used as offset mitigation for the OHH scheme.

vi. Consequently, the study has identified a total of **129.86** P credits potentially available from EBC's Strategic Land Parcels to provide appropriate offset mitigation for the OHH scheme.

vii. Although the location of the developments for the **30.242** invoiced and ring-fenced P credits (comprising **13.150 P credits** invoiced and **17.092 P credits** reserved) is not known, if it is assumed that all of their Points of Impact lie upstream from the Chickenhall WwTW outfall, this would leave a minimum of **99.618** P credits available to be used as offset mitigation for the OHH scheme.

viii. The figure of **99.619** available P credits is significantly in excess of the **70.38** kg TP/yr deficit resulting from the scheme, and thus the proposed P Mitigation Strategy for the scheme is robust.

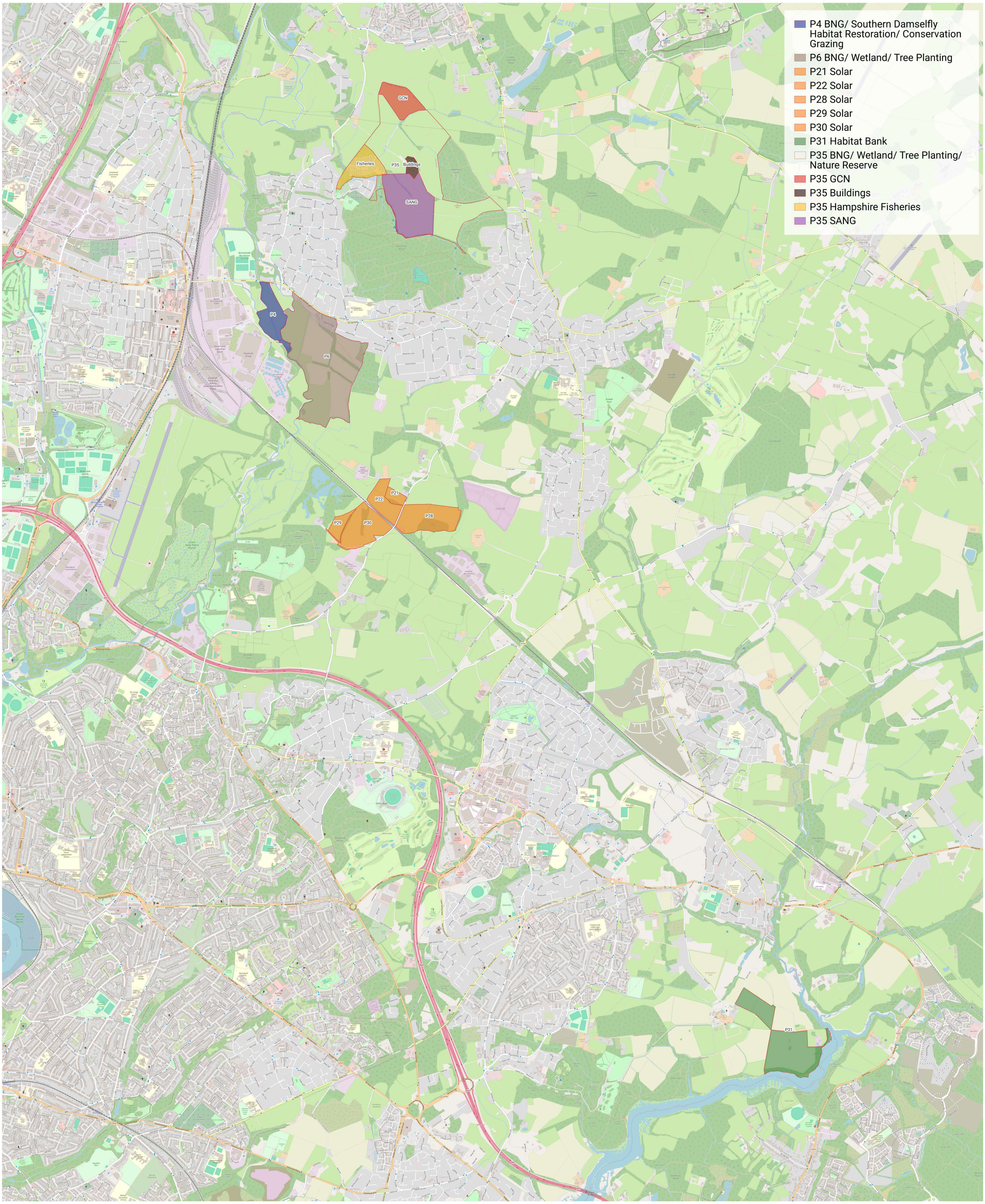
[redacted]

Paul Bond
PhD MSc BSc CEnv CSci MIEnvSc MCIEEM,
Associate Sustainability Consultant, Hilson Moran Partnership Ltd

Appendix A: Location of all Strategic Land Parcels in the ownership of EBC

Strategic Land Uses

Land App



Produced on Feb 9, 2024.

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500 m

Scale 1:12000 (at A0)

N

Appendix B: Baseline Phosphorous Loss for Strategic Land Parcels for Eastleigh Borough Council Report



Baseline Phosphorous Loss for Strategic Land Parcels
for Eastleigh Borough Council

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EBC STRATEGIC LAND PARCELS

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References

1. Introduction

1.1. Background

Hilson Moran has been appointed by Eastleigh Borough Council (EBC) to appraise the baseline phosphorous loss for strategic land parcels within the EBC area.

EBC are interested in purchasing a number of agricultural land parcels to act as a land bank to enable required housing provision to come forward in the area. Where required, this agricultural land would be taken out of use to act as an offset for any increase in phosphorous resulting from residential development which cannot otherwise mitigate associated predicted nitrogen increases.

Farming practices such as conventional tillage, chemical fertilisation and manure application to fields, high livestock stocking rates and overgrazing have all been identified as potential causes of diffuse agricultural nutrient pollution leading to pressures on water quality and European Designated Sites.

Farmscoper (Farm SCale Optimisation of Pollutant Emission Reductions) Decision Support Tool (v.4) is a decision support tool that can be used to assess diffuse agricultural pollutant loads on a farm and quantify the impacts of farm mitigation methods on these pollutants. The Farmscoper tool was developed by ADAS for Defra to enable the assessment of the cost and effect of diffuse pollution mitigation methods at the farm scale. The farm systems within the tool can be customised to reflect management and environmental conditions representative of farming across England and Wales. The tool estimates baseline emissions of a suite of different pollutants, including phosphorus, and predicts the mitigation potential against these pollutants and also quantifies potential benefits for biodiversity. The Farmscoper tool suite of spreadsheets have been used by Defra and the Environment Agency (EA), as well as other public and private bodies with an interest in reducing agricultural pollution. The Farmscoper tool can be used at a range of scales from farm scale and small catchments to national coverage, and is the methodology recommended within the NE's '*Advice on Achieving Nutrient Neutrality for New Development in the Solent Region*'.

Within the Farmscoper tool, the source models used to populate the pollutant loss database (*i.e.* to create the baseline) were applied at 1 km^2 resolution across England and Wales, using local data on soils, slopes, field connectivity, rainfall *etc.*, and the results aggregated for the 3 soil types and 6 climate zones available within Farmscoper. The predicted losses thus represent a typical environmental situation (for the soil type and climate zone selected).

The user is able to specify phosphorous (and nitrogen) fertiliser application rates, which can be input by crop type. Farmscoper also allows the user to enter livestock counts for 28 different categories of livestock and calculates typical excretion and manure quantities from the type of and number of livestock inputted into the model. As such, the tool requires the input of livestock, cropping and management data and combines this with appropriate soil, drainage and climate parameters.

Consequently, in order to understand the current use of the various land parcels, questionnaires were sent to the land owners for completion, which asked specific questions about how their land was managed. Other relevant information such as rainfall levels and soil types were obtained from other readily available sources.

Each land parcel was assessed separately using the Farmscoper 4 tool, enabling a value to be derived for each site indicating the amount of nitrogen currently lost from the land per year.

Where there were gaps in the data, appropriate estimations were made by Chris Coxon of Tiller Consultancy, a FACTS (Fertiliser Advisers Certification & Training Scheme) registered consultant, accredited number: FE/3327, using available nutrient application data, knowledge of farm type and practices and his professional experience and knowledge. His resulting report is presented as Appendix F.

1.2. Nitrate Vulnerable Zone Compliance

All land parcels lie within the "*Hamble Estuary Eutrophic Nitrate Vulnerable Zone*" (NVZ), designated for the purposes of the Nitrate Pollution Prevention Regulations 2015.

NVZs are areas of land that drain to polluted waters and which contribute to the pollution of those waters. Polluted waters include those which are eutrophic or may in the near future become so if the Regulations were not to apply there.

The Hamble Estuary was designated as Polluted Water (Eutrophic) under the Nitrates Directive in 2008, with a NVZ established in its catchment and those of the Test and Itchen. At the time of the designations there was clear evidence that Hamble Estuary was eutrophic, based on the widespread growth of the opportunistic macroalgae *Enteromorpha* spp. and *Ulva* spp. Macroalgal surveys undertaken in 2003, indicated that macroalgae covered 78 ha of the intertidal area, exceeding the 25% of the intertidal area Urban Waste Water Treatment Directive (UWWTD) criteria. A recent nutrient budget for the Hamble Estuary shows that diffuse agricultural riverine sources of nitrogen from all freshwater catchments are approximately 65% of all nitrogen sources[1]. The modelling supports the existing Polluted Water designation in that nitrogen from agricultural sources is a substantial contribution to the nitrogen inputs into the Hamble Estuary.

Current measures to reduce nitrogen into the Hamble, Test and Itchen from agricultural and sewage sources include a mixture of statutory and voluntary measures. Statutory measures include nutrient stripping at several sewage works and a transfer of a discharge to the Solent, plus mandatory agricultural practice rules in the NVZ known as the Action Programme Measures.

Consequently, specific farming practices are controlled in the designated area to reduce nitrogen losses from agriculture to water. The NVZ designation:

- Requires farmers within the NVZ to reduce nitrate pollution.
- The farmers must follow a set of mandatory rules, known as the Action Programme Measures.
- The Action Programme Measures are based on Good Agricultural practice and require the careful management and recording of fertiliser and manure use.

A summary of the NVZ rules are presented in Figure 1.1 below.

Closed Periods	*Arable*	*Grassland*
Manufactured Nitrogen Fertiliser (on all soil types)	1 Sept – 1 Feb	15 Sept – 1 Feb
Organic Manures (with high available N on sandy and shallow soils only e.g. slurry and poultry manure)	1 Aug – 1 Nov (arable land *with no* autumn sown crop)	1 Sept – 1 Nov (including arable land with autumn sown crop)

Nitrogen Limits	*Arable*	*Grassland*
Fertiliser Nitrogen	do *not* exceed crop requirement	do *not* exceed crop requirement
Organic Manures:		
(i) whole farm within NVZ (including grazing deposition)	210 kg/ha[1] total N	250 kg/ha total N
(ii) field limit[2] (excluding grazing deposition)	250 kg/ha total N	250 kg/ha total N

[1] reduces to 170 kg/ha after the first four years of Action Programme in NVZ
[2] NB available N from organic manures must not exceed crop requirement

Spreading Controls

- Do not apply nitrogen fertiliser or organic manures when the soil is:
  – waterlogged; or flooded; or frozen hard; or snow covered.
- Do not apply nitrogen fertiliser or organic manures to steeply sloping fields.
- Spread nitrogen fertiliser and organic manures evenly and accurately.
- Do not apply nitrogen fertiliser in a way that contaminates water courses.
- Do not apply organic manures within 10 metres of water courses.

Slurry Storage

There must be sufficient storage to meet the autumn closed period for spreading slurry.

All new or substantially enlarged/reconstructed storage facilities must comply with the relevant regulations.

Record Keeping

Adequate farm records must be kept for at least five years covering cropping, livestock numbers, and the use of nitrogen fertilisers and organic manures.

Figure 1.1 Summary of NVZ Rules for Farmers (Source DEFRA[4])

In addition, voluntary measures may be employed by farmers within NVZs, which derive from advice and incentives to farmers and landowners and include Catchment Sensitive Farming projects, Environmental Stewardship Schemes and other measures detailed in the Test and Itchen and Solent Diffuse Water Pollution Plans.

Many of these measures also serve to reduce phosphorous inputs into the Hamble, Test and Itchen.

The DEFRA 2011 document "*An Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, Greenhouse Gas Emissions and Ammonia Emissions from Agriculture*"[5] describes over 50 measures that could be employed (other than reducing fertiliser applications or taking the land out of production) that could result in phosphorous loss reductions, using the same fertiliser applications and livestock type and density reported by the farmers. Discussions with Chris Coxon BSc(Hons) Agric, FACTS from Tiller Farm Consultancy Ltd, Eastleigh who advise a number of local farmers on their agricultural practices and nutrient applications, has advised that typically such measures adopted by farmers locally would comprise:

- Early harvesting and establishment of crops in the autumn;
- Maintaining and enhancing soil organic matter levels;
- Making use of improved genetic resources in livestock;
- Using a fertiliser recommendation system;
- Not applying manufactured fertiliser to high-risk areas;
- Avoiding spreading manufactured fertiliser to fields at high-risk times;
- Reducing dietary P (and N) intakes;
- Reducing field stocking rates when soils are wet;
- Adopting batch storage of slurry;
- Adopting (batch) storage of solid manures;
- Locating site solid manure field heaps away from watercourses/field drains;
- Not apply manure to high-risk areas;
- Not spreading FYM to fields at high-risk times; and
- Transporting manure to neighbouring farms.

The 2019 Environment Agency (EA) report "*Catchment Sensitive Farming Evaluation Report – Water Quality*"[6], reviews the effectiveness of CSF, against its water quality objectives, after twelve years of delivery. Targeting areas where action is most needed, CSF has delivered extensive farmer engagement and advice delivery (the 19,776 farms engaged by CSF represent 34 % of the total farmed area of England). Within the report, using the Target Areas of Phase 1 Priority Catchments (which equates to 11 % of England) and widely targeted pollutants as useful indicators of the benefit of sustained activity, the report estimates that the engagement and advice provided by CSF and the subsequent mitigation adopted by farmers has reduced annual agricultural pollutant losses of dissolved P by 5.4 % and of total P by 8.0 %.

Consequently, it is assumed that similar uptake of such mitigation measures has been achieved in the Solent area and that an 8.0 % reduction in total P-losses represents an appropriate allowance to apply to modelled Farmscoper values for this study.

1.3. Extended Grazing Season

It should be noted that with respect to the Morris site (Map Ref. 4), Farmscoper assumes cattle are kept indoors over winter and does not represent all year grazing as practiced on this farm. Losses from a year-round grazing system are likely to be greater than one where livestock are housed over winter.

When previously considering nitrate loss from the sites, we requested Chris Coxon to look at this and to suggest an appropriate uplift the calculations to reflect the extended grazing season at this site. Chris Coxon responded:

"*The Farmscoper model assumes that cattle graze for 54% of the year. Mitigation methods 35, 36, 37 and to some extent 38* [of the DEFRA document "Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, Greenhouse Gas Emissions and Ammonia Emissions from Agriculture"] *could be applied to adjust the outcome in this case as the model isn't reflecting actual management.*

35, 36 & 37 – Relate to the length of the grazing season – all of which are attributed a 20% reduction in Nitrate for cattle that are housed during the winter/wet periods….This will ensure a method has been followed which Natural England can appraise. Unfortunately it is a subjective method rather than a modelled one – but as the model cannot be changed this looks to be the best approach."

In addition, Chris Coxon identified that the grazing season for the Dunford, Stoke Park Dairy, Map Refs. 35a and 35b was also extended *i.e.*:

"This point is not mentioned in the appraisal, but if adjustments are being made to grazing season length for Morris it would make sense to apply them to the Dunford data - Point 13 about the Morris family grazing most of the year has a cross-over with the Dunford's.

The grazing system for the dairy cows aims to make the most of the grazing season and during an average year will be from early March to the end of October (8 months or 65% of the year). Again the Dairy element of the nitrate output will have to be isolated and increased proportionally in Farmscoper."

Following subsequent consultation with Dr Richard Gooday from ADAS (creator of the Farmscoper tool), the following approaches were agreed:

Stoke Park Dairy

In his email of 03/06/21 Dr Richard Gooday stated that:

"*The Mitigation Method User Guide considers a 20% change in N losses to occur from a 20% change in the duration of grazing length – therefore a ~20% modifier for the Stoke Park farm may be more appropriate where the cattle are out for an extra month and a half*."

Consequently, it was agreed to use a 20 % increase in N-loss for Stoke Park Dairy to reflect the increase in the grazing season by 1 ½ months.

Following this approach, a 20 % increase in P loss from Stoke Park Dairy land has also been applied to account for the effects of the extended grazing season.

Morris Map Ref. 4

With regard to an appropriate increase in N-loss to reflect year-round grazing on the Morris' land, Dr Richard Gooday stated the following in his email of 08/06/21:

"*With regards to the Morris farm, it really isn't that simple as risk varies greatly by month (due to subsequent drainage, soil wetness, damage by livestock, crop N demand)…*

As an example (but this is for managed manure applications happening in a given month, rather than livestock remaining out in the field – and importantly for a sandy soil), the N loss is worst in October (when soils are wetting up, there is a lot of winter drainage still to occur and crop demand for nitrogen is ending) but negligible in late winter. So a 20% change may be appropriate for Stoke Park (and you have a referenceable source for that figure), but it might not actually be that different for Morris farm..."

Consequently, in the absence or robust research to demonstrate a greater N-loss, it was agreed to adopt a precautionary approach and limit the increase in N-loss arising from year-round grazing to 20 % (as per Stoke Park Dairy). This increase is subject to revision should further research support a revised figure in the future.

Following this approach, a 20 % increase in P loss from the Morris's site has also been applied to account for the effects of the extended grazing season.

2. Results

Consequently, the results (taking account the above comments from Dr Richard Gooday and Chris Coxon) from all land parcels of interest are presented in Table 3.1 below, with supporting information, together with Farmscoper inputs and outputs, presented in the Appendices to this document.

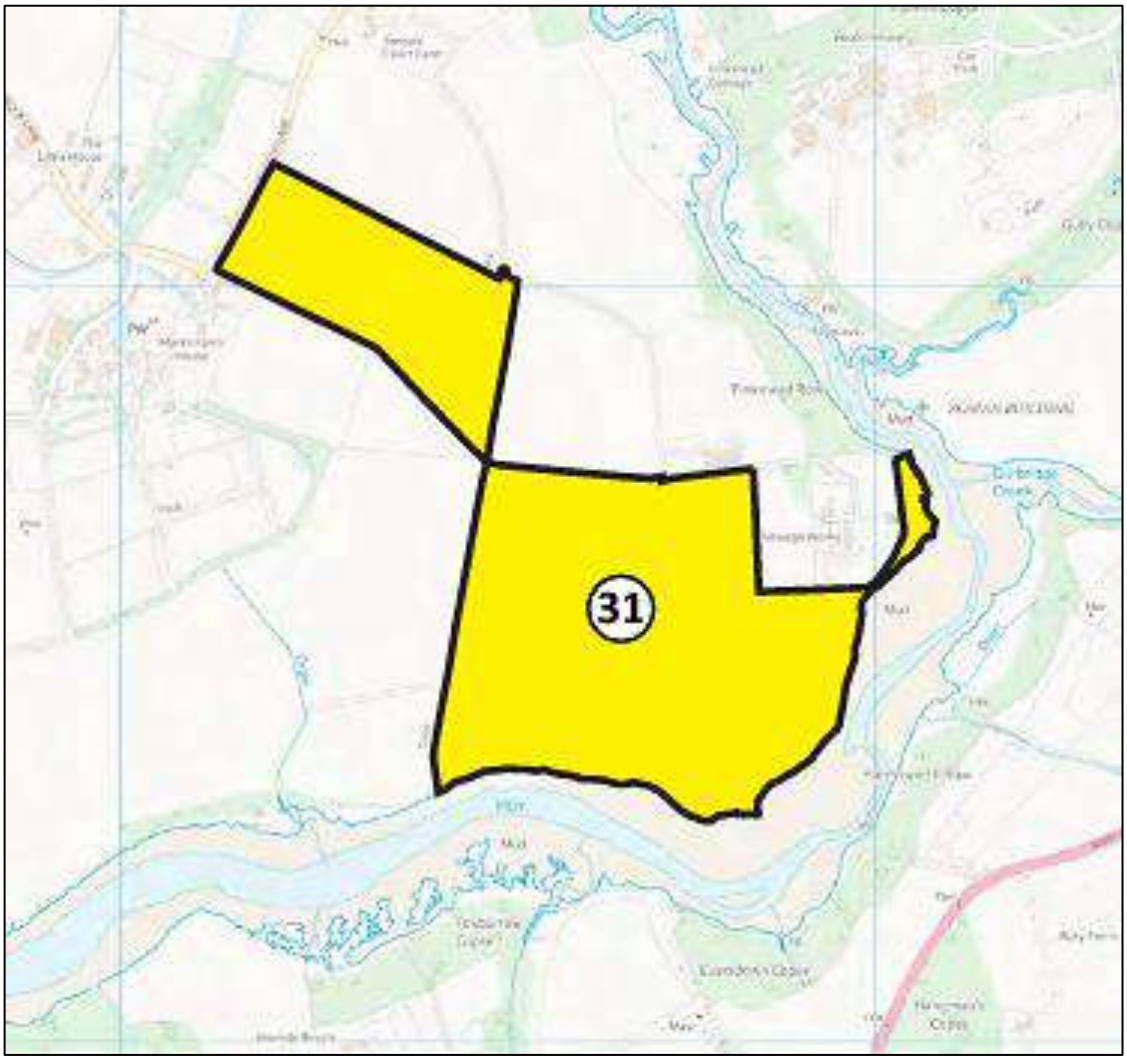
Table 3.1: Summary of Results

Site	Total P loss/site/annum (kg P)	P loss/ha/annum (kg P)
Map Ref. 31, Botley – refer to Appendix A Owner: Gosney Area: 27.1 ha *8.0 % reduction to Farmscoper modelled N-loss of 23.81 kg P/annum applied to account for uptake of mitigation measures, as described in Section 1.2 above i.e. 23.81 x 0.92 = 21.91 kg/annum*	21.91 kg P/annum	0.81 kg P/ha/annum
Map Ref. 35a, Stoke Park Dairy Farm – refer to Appendix B Owner: Dunford Area: 41.9 ha *Note this site has been split into two distinct parts based on differences in soil type. This part is classified as "drained for arable" as the soil type results in impeded drainage.* *20 % increase applied to cattle related P-loss of 48.25 kg P/annum applied as described in Section 1.3 above = 48.25 x 1.2 = 57.90 kg P/annum.* *Add this to arable P-loss of (58.11 – 48.25 = 10.86) ⇒ 57.90 + 10.86 = 68.76 kg P/annum* *8.0 % reduction to Farmscoper modelled P-loss of 68.76 kg P/annum applied to account for uptake of mitigation measures, as described in Section 1.2 above i.e. 68.76 x 0.92 = 63.26 kg/annum.*	63.26 kg P/annum	1.51 kg P/ha/annum

Site	Total P loss/site/annum (kg P)	P loss/ha/annum (kg P)
Map Ref. 35b, Stoke Park Dairy Farm – refer to Appendix B Owner: Dunford Area: 49.1 ha. *Note, based on soil type this part of the site is considered "freely draining".* *20 % increase applied to cattle related P-loss of 20.28 kg P/annum applied as described in Section 1.3 above = 20.28 x 1.2 = 24.34 kg P/annum.* *Add this to arable P-loss of (23.29 – 20.28 = 3.01) ⇒ 24.34 + 3.01 = 27.35 kg P/annum* *8.0 % reduction to Farmscoper modelled P-loss of 27.35 kg P/annum applied to account for uptake of mitigation measures, as described in Point 1.2 above i.e. 27.35 x 0.92 = 25.16 kg P/annum.*	25.16 kg P/annum	0.51 kg P/ha/annum
Map Ref. Fish Farm (a) & (b), Stoke Park Farm Fish Farm – refer to Appendix B Owner: Dunford Area (inc woodland): 8.9 ha	60.1 kg P/annum	6.75 kg/ha/annum
Map Ref. 6, Manor Farm – refer to Appendix C Owner: Dunford Area: 56.0 ha *Assuming that soils are classified as "Other – drained for arable use", as described in the Hilson Moran report " Baseline Nitrogen Loss for Strategic Land Parcels For Eastleigh Borough Council", version 01, dated 09/06/21.* *8.0 % reduction to Farmscoper modelled P-loss of 35.74 kg P/annum applied to account for uptake of mitigation measures, as described in Section 1.2 above i.e. 35.74 x 0.92 = 32.88 kg/annum.*	32.88 kg P/annum	0.59 kg P/ha/annum
Map Refs 21, 22, 28, 29, 30 – refer to Appendix D Owner: Gosney Area: 41.0 ha *8.0 % reduction to Farmscoper modelled P-loss of 11.55 kg/annum applied to account for uptake of mitigation measures, as described in Point 1.2 above i.e. 11.55 x 0.92 =*	10.63 kg P/annum	0.26 kg/ha/annum

10.63 kg/annum.		
Site	**Total P loss/site/annum (kg P)**	**P loss/ha/annum (kg P)**
Map Ref 4 – refer to Appendix E Owner: Morris Area: 9.7 ha *20 % increase applied to cattle related P-loss of 6.68 kg P/annum applied as described in Section 1.3 above = 6.68 x 1.2 = 8.02 kg P/annum.* *Add this to arable P-loss of (19.53 – 6.68 = 12.85) ⇒ 8.02 + 12.85 = 20.87 kg P/annum* *8.0 % reduction to Farmscoper modelled P-loss of 20.87 kg P/annum applied to account for uptake of mitigation measures, as described in Section 1.2 above i.e. 20.87 x 0.92 = 19.20 kg/annum.*	19.20 kg/annum	1.98 kg P/ha/annum

Appendix A: Map Ref 31 Botley site



Parcel 31

H|M

Baseline Nitrogen Questionnaire

1. Name of person filling out form... Mark Cosney
2. Contact details... mob 07889 105865 broomfarm@btinternet.com
3. Date... 27 February 2021
4. Name/ Location of land parcel assessed... Botley
5. Area of land parcel (if known)... 67.07 acres / 27.14 Ha
6. Soil type of land parcel (if known) clay + loam
7. Drainage of land parcel
   - Agricultural land drainage ☐
   - Overland drainage to peripheral ditches ☐
   - Free drainage (infiltration to ground) ☑
8. Please describe any watercourse or drainage ditch adjacent to parcel boundaries (please indicate along which boundary or location within plot) No ditches
   River Hamble runs along south + east boundary
9. Types of field boundaries to land parcel
   - Percentage hedge... 20 %
   - Percentage wall... - %
   - Percentage fence... 10 %
   - Percentage other boundary type (please specify)... 40 % woodland / river 30% open
10. Have any livestock used the land parcel within the last 10 years (Yes/No)? No

If you answered "No" to this question, please move directly on to Question 17.

17. Has any FYM been imported onto the land parcel (in tonnes per year)..... 500 .....t/yr

18. Please list the type of land use below that makes up the land parcel, together with respective annual fertiliser and FYM additions. Please try and provide the average cropping, fertiliser and FYM application regimes over the previous ten year period:

Cropping	Area (ha)	Annual fertiliser addition (kg of Nitrogen per hectare)	Annual FYM addition (tonnes FYM per hectare)
Permanent pasture			
Rotational grassland	2.59	225	22.53t/yr
Rough grazing			
Winter wheat	8.37	200	22.53t/yr
Winter barley	5.36	165	—"—
Spring barley	4.17	130	—"—
Winter OSR			
Maize	1.71	130	22.53t/y
Potatoes			
Sugar beet			
Peas			
Beans			
Fodder crops			
Other crops			
Vegetables (brassica)			
Vegetables (other)			
Orchards			
Soft fruit			
Bare fallow		N/A	N/A
Set aside	4.94	N/A	N/A
Woodland		N/A	N/A

Many thanks for completing this questionnaire, if any queries please contact Paul Bond on 07795183989 (pbond@hilsonmoran.com) or Emma Flower on 01252 550529 (eflower@hilsonmoran.com)

Site 31: Botley Farmscoper Inputs

Options

Clear Farm | Build Farm

Please Build Farm

Display Options

- ☐ Dairy
- ☐ Beef
- ☐ Sheep
- ☐ Indoor Pigs
- ☐ Outdoor Pigs
- ☐ Poultry
- ☑ Imported Manure
- ☑ Cropping

☑ Show more detail for Livestock

☑ Show more detail for Cropping

Stocking Density
0 kg N / ha

General Options

Fields next to watercourses (%)	73
Area of organic soils (%)	0

Field Boundaries	%
Hedge	50
Wall	0
Fence	50
Other	0

Dirty Water Options

- ○ Minimal dirty water collected and sent to dirty water store
- ○ Yard runoff and parlour washings sent to dirty water store
- ◉ Yard runoff and parlour washings sent to slurry store

Grazing Options

- ☐ Livestock have access to watercourses whilst grazing
- ☐ Livestock cross water between fields and yard

Farm type for estimation of method implementation

- ○ Intensive Grazing
- ○ Extensive Grazing
- ◉ Other

Imported Manure	Slurry (t)	FYM (t)	Poultry Muck (t)
Dairy	0	500	
Beef	0	0	
Pig	0	0	
Poultry			0

Cropping	Area (ha)	Fertilisers Applied		PPPs (% Typical)	Manure Received						Manure Details						Pesticide Details					
		N (kg/ha)	P_2O_5 (kg/ha)		Cattle Slurry (%)	Cattle & Sheep FYM (%)	Pig Slurry (%)	Pig FYM (%)	Poultry Muck (%)	Dirty Water (%)	Slurry (t/ha)	FYM (t/ha)	Litter (t/ha)	Dirty Water (t/ha)	Manure Total N (kg/ha)	Manure P (kg/ha)	Fungicide (% PPPs)	Herbicide (% PPPs)	Insecticide (% PPPs)	Growth Regulator (% PPPs)	Molluscicide (% PPPs)	Spray Trips
Permanent Pasture																						
Rotational Grassland	2.6	224	72			12					0.0	23.2	0.0	0.0	139.0	35.4						
Rough Grazing																						
Winter Wheat	8.4	200	72			38					0.0	22.4	0.0	0.0	134.4	34.2						
Winter Barley	5.4	164	72			24					0.0	22.0	0.0	0.0	131.8	33.5						
Spring Barley	4.2	130	72			19					0.0	22.8	0.0	0.0	136.7	34.8						
Winter OSR																						
Maize	1.7	130	72			8					0.0	23.4	0.0	0.0	140.4	35.7						
Potatoes																						
Sugar Beet																						
Peas																						
Beans																						
Fodder Crops																						
Other Crops																						
Vegetables (Brassica)																						
Vegetables (Other)																						
Orchards																						
Soft Fruit																						
Bare Fallow																						
Set Aside																						
Woodland	4.9																					
Manure remaining for export off farm																						
Manure Use Warnings																						

Site 31: Botley Farmscoper results

Farmscoper Create
12/11/2021

File Information	
Create File:	Copy of FARMSCOPER4_Create
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable
Farm Area:	27.13 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	1,479	20.43	12,011	449.0	0.00	210.2	0.00	33.5	2,503	30,273	-
Grass	122	0.83	118	44.3	0.00	35.4	0.00	9.0	337	5,239	-
Rough	0	0.00	0	0.0	0.00	0.0	0.00	0.0	0	0	-
Other	33	2.55	2	0.0	0.00	1.3	0.00	110.3	0	4,793	-
Total	1,635	23.81	12,131	493.4	0.00	247.0	0.00	152.8	2,840	40,304	23,924

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	8
Winter Barley	5
Spring Barley	4
Winter OSR	0
Maize	2
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	5

Grassland	ha
Permanent Pasture	0
Rotational Grassland	3
Rough Grazing	0

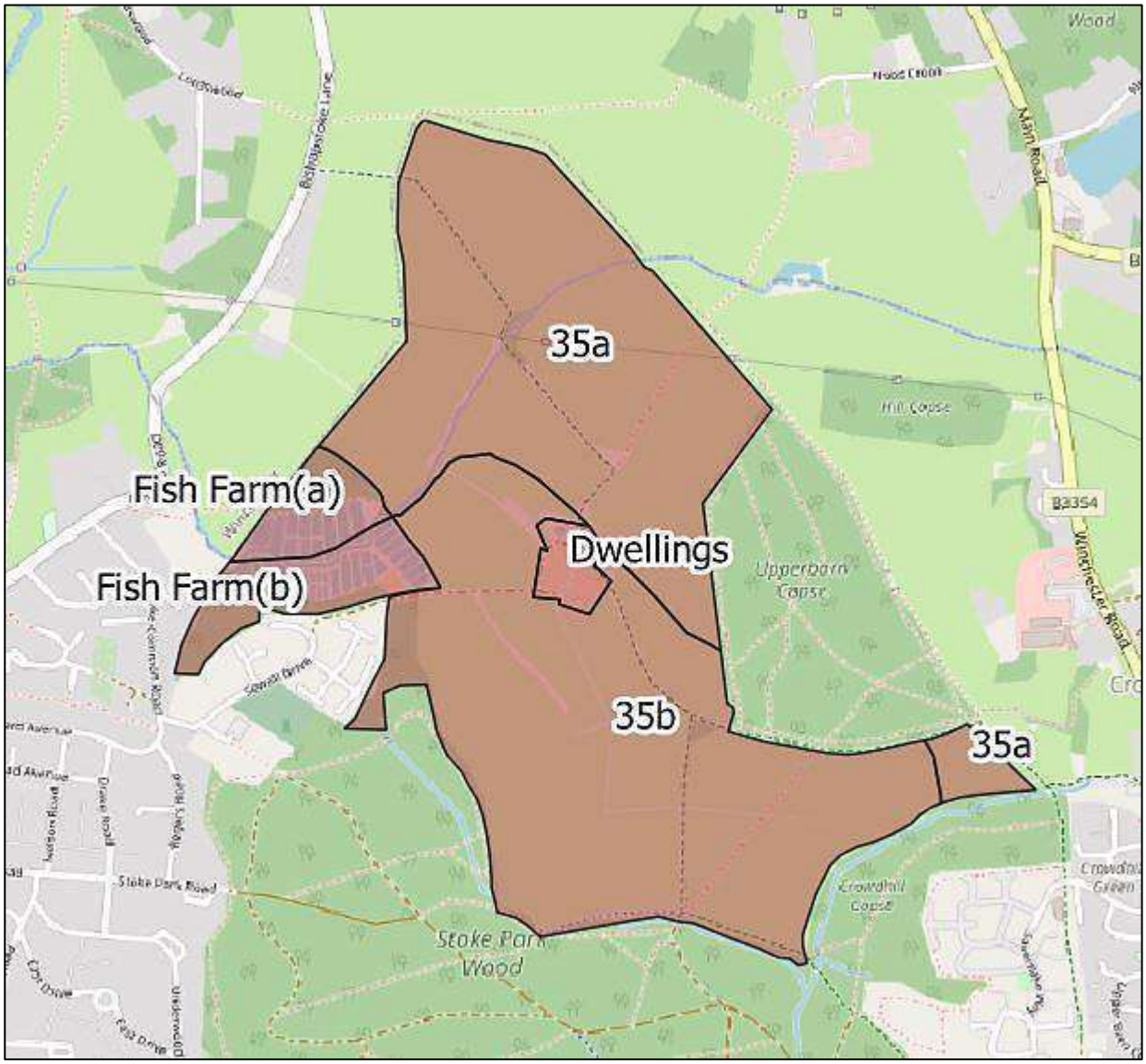
Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	0
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	3,000
Dairy Slurry	0
Beef FYM	0
Beef Slurry	0
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Appendix B: Map Ref 35 Stoke Park Dairy Farm



Note that the Farmscoper analysis has been split based on the differing soil types (35a & b). The fish farm nitrogen loss has been calculated separately using information obtained on this site (as it cannot be modelled using Farmscoper – see following notes).

STOKE PARK FARM BISHOPSTOKE 1/3

H|M

OWNERS: DAVID M DUNFORD

Baseline Nitrogen Questionnaire

1. Name of person filling out form... TIM GARDNER HAVING COLLATED INFORMATION AND DATA FROM MESSRS DAVID M DUNFORD AND TILLER FARM CONSULTANCY.....
2. Contact details... 01483 896422 TIM@IANJUDDANDPARTNERS.CO.UK
3. Date... 28TH AUGUST 2020
4. Name/ Location of land parcel assessed... STOKE PARK FARM, BISHOPSTOKE
5. Area of land parcel (if known)... 86.85 ha ACTUAL FIELD PARCEL AREAS
6. Soil type of land parcel (if known)... SEE ATTACHED SOILSCAPES PLANS SOILSCAPES 18 (45%) AND SOILSCAPES 6 (55%)
7. Drainage of land parcel
   - Agricultural land drainage ☑
   - Overland drainage to peripheral ditches ☐ RELY ON YOUR OWN INSPECTION
   - Free draining (infiltration to ground) ☑
8. Please describe any watercourse or drainage ditch adjacent to parcel boundaries (please indicate along which boundary or location within plot)... MAJORITY OF FIELDS HAVE UNDERDRAINAGE PIPEWORK, LEADING INTO DITCHES SEE ATTACHED PLAN OF FARM HOLDING
9. Types of field boundaries to land parcel
   - Percentage hedge... —%
   - Percentage wall... —%
   - Percentage fence... MOST FIELDS HAVE FENCES 100% BUT WITH HEDGES BEYOND OR WOODLAND EDGE
   - Percentage other boundary type (please specify)... %
10. Have any livestock used the land parcel within the last 10 years (Yes/No)?... YES

If you answered "No" to this question, please move directly on to Question 17.

STOKE PARK FARM 2/3

H|M

11. If you answered "Yes" to question 10 above, please describe the livestock type (*e.g.* dairy, beef, sheep, pigs, poultry), the number and the years kept on the land parcel, together with any further relevant details (*e.g.* No. of cows, bulls, heifers and calves; sheep or lambs; sows, boars, gilts or other pigs; types of poultry *etc*).....

259 DAIRY COWS WITH IN ADDITON

5 DAIRY HEIFERS (PRO-RATA EQUIVALENT FOR 60 HEIFERS FOR 1 MONTH/YEAR) AND IN ADDITION

10 CALVES (UP TO 3 MONTHS) PRO-RATA CALVES KEPT FOR 2 WEEKS

12. If grazing livestock have been present on the land parcel, would you describe their upkeep as "intensive" or "extensive" grazing?..... INTENSIVE

13. If grazing livestock have been present on the land parcel, have they had access to watercourses whilst grazing?..... NO

14. If grazing livestock have been present on the land parcel, have they been able to cross water between the yard and field?..... NO

15. Please state if any farmyard manure (FYM) produced within the land parcel has been managed as slurry (as a percentage)..... 50% FYM and 50% SLURRY 1270 T/yr. 2050 m^3/year ..... %

16. Please state if any FYM has been exported from the land parcel (as a percentage of total produced on the parcel)..... 100% OF FYM EXPORTED. ..... %

100% OF SLURRY SPREAD ON THIS FARM HOLDING

STOKE PARK FARM 3

H|M

17. Has any FYM been imported onto the land parcel (in tonnes per year)..... NO 0 ZERO .....t/yr

18. Please list the type of land use below that makes up the land parcel, together with respective annual fertiliser and FYM additions. Please try and provide the average cropping, fertiliser and FYM application regimes over the previous ten year period:

Cropping	Area (ha)	Annual fertiliser addition (kg of Nitrogen per hectare)	Annual FYM addition (tonnes FYM per hectare)
Permanent pasture			
Rotational grassland	86.85	208	c.24 m^3/ha SLURRY
Rough grazing			
Winter wheat			
Winter barley			
Spring barley			
Winter OSR			
Maize			
Potatoes			
Sugar beet			
Peas			
Beans			
Fodder crops			
Other crops			
Vegetables (brassica)			
Vegetables (other)			
Orchards			
Soft fruit			
Bare fallow		N/A	N/A
Set aside		N/A	N/A
Woodland		N/A	N/A

Many thanks for completing this questionnaire, if any queries please contact Paul Bond on 07795183989 (pbond@hilsonmoran.com) or Emma Flower on 01252 550529 (eflower@hilsonmoran.com)

Site 35a: Stoke Park Farm Farmscoper Inputs

Options: Clear Farm | Build Farm

Farm Built

Display Options

- ☑ Dairy ☐ Indoor Pigs ☐ Imported Manure
- ☑ Beef ☐ Outdoor Pigs ☑ Cropping
- ☐ Sheep ☐ Poultry
- ☑ Show more detail for Livestock
- ☐ Show more detail for Cropping

Stocking Density
333 kg N / ha

General Options

Fields next to watercourses (%)	80
Area of organic soils (%)	80

Dirty Water Options
- (•) Minimal dirty water collected and sent to dirty water store
- ( ) Yard runoff and parlour washings sent to dirty water store
- ( ) Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method implementation
- (•) Intensive Grazing
- ( ) Extensive Grazing
- ( ) Other

Field Boundaries	%
Hedge	40
Wall	
Fence	60
Other	

Grazing Options
- ☐ Livestock have access to watercourses whilst grazing
- ☐ Livestock cross water between fields and yard

Livestock	Count	Managed as Slurry (%)	Managed as FYM (%)	Annual N Excretion (kg)	Annual P Excretion (kg)	Annual FIOs Excretion (10^9 cfu)	Annual Excretion Volume (m3)	Time Grazing (%)	Time Housed (%)	Time on Yards (%)	Managed Manure (%)	FYM Stored (%)	FYM Spread Direct (%)	Slurry Stored (%)	Slurry Spread Direct (%)	Poultry Muck Stored (%)	Poultry Muck Spread Direct (%)	Slurry Volume (m3)	FYM Volume (m3)	Poultry Muck Volume (m3)	Stored Slurry N (kg)	Fresh Slurry N (kg)	Stored FYM N (kg)	Fresh FYM N (kg)	Stored Poultry N (kg)	Fresh Poultry N (kg)	Dirty Water (m3)
Dairy Cows and Heifers	118	50	50	117.0	19.4	4,960	19.3	32	48	20	68	84	16	69	31	-	-	19.3	18.8	-	80.0	95.1	73.8	99.9	-	-	8.9
Dairy Heifers in Calf (2 years +)		100	0	67.0	12.2	4,090	14.6	57	28	15	43	84	16	69	31	-	-	14.6	12.6	-	45.8	54.4	43.1	57.4	-	-	0.4
Dairy Heifers in Calf (< 2 years)		100	0	67.0	12.2	4,090	14.6	57	28	15	43	84	16	69	31	-	-	14.6	12.6	-	45.8	54.4	43.1	57.4	-	-	0.4
Bulls (2 years +)		100	0	53.0	9.1	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	34.9	41.1	34.3	43.5	-	-	0.6
Beef Cows and Heifers		0	100	92.0	13.5	4,230	16.4	54	31	15	46	84	16	69	31	-	-	16.4	14.1	-	60.6	71.3	59.6	75.4	-	-	0.6
Beef Heifers in Calf (2 years +)		0	100	67.0	12.2	3,360	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Beef Heifers in Calf (< 2 years)		0	100	67.0	12.2	2,630	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Other Cattle (2 years +)		0	100	53.0	8.0	3,360	11.7	54	31	15	46	84	16	69	31	-	-	11.7	10.0	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (1 - 2 years)		0	100	56.0	8.0	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (< 1 year) & Calves	5	50	50	27.0	5.0	18,980	6.2	43	42	15	57	84	16	69	31	-	-	6.1	5.3	-	19.0	23.9	18.6	25.2	-	-	0.6

Cropping	Area (ha)	Fertilisers Applied: N (kg/ha)	Fertilisers Applied: P_2O_5 (kg/ha)	PPPs (% Typical)	Manure Received: Cattle Slurry (%)	Manure Received: Cattle & Sheep FYM (%)	Manure Received: Pig Slurry (%)	Manure Received: Pig FYM (%)	Manure Received: Poultry Muck (%)	Manure Received: Dirty Water (%)
Permanent Pasture										
Rotational Grassland	41.9	208			100	0				100
Rough Grazing										
Winter Wheat										
Winter Barley										
Spring Barley										
Winter OSR										
Maize										
Potatoes										
Sugar Beet										
Peas										
Beans										
Fodder Crops										
Other Crops										
Vegetables (Brassica)										
Vegetables (Other)										
Orchards										
Soft Fruit										
Bare Fallow										
Set Aside										
Woodland										
Manure remaining for export off farm						100				
Manure Use Warnings										

Site 35a: Stoke Park Farm Results

1) Cattle Only

Farmscoper Create
25/05/2021

File Information	
Create File:	Copy of FARMSCOPER4_Create_Dunford_Stoke
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable & Grass
Farm Area:	0 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0.0	0.00	0.00	0	0	0.0	0.00	0	0.00	0	-
Grass	638.5	35.40	0.00	204	4,204	229.4	0.00	1,250	0.00	894	-
Rough	0.0	0.00	0.00	0	0	0.0	0.00	0	0.00	0	-
Other	194.9	12.85	0.00	1,747	10,665	136.8	0.00	759	0.00	46,152	-
Total	833.4	48.25	0.00	1,951	14,869	366.2	0.00	2,009	0.00	47,047	211,042

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	0

Grassland	ha
Permanent Pasture	0
Rotational Grassland	0
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	118
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	5
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	3,128
Dairy Slurry	3,397
Beef FYM	28
Beef Slurry	29
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

2) Cattle and Crops

Farmscoper Create
18/12/2020

File Information	
Create File:	Copy of FARMSCOPER4_Create_Dunford_Stoke
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable & Grass
Farm Area:	41.86 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0	0.00	0	0	0	0.0	0.00	0	0	0	-
Grass	1,110	46.25	7,629	502	4,204	615.8	0.00	1,250	9,460	76,153	-
Rough	0	0.00	0	0	0	0.0	0.00	0	0	0	-
Other	195	12.85	0	1,747	10,665	136.8	0.00	759	0	46,152	-
Total	1,305	59.11	7,629	2,249	14,869	752.7	0.00	2,009	9,461	122,306	211,042

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	0

Grassland	ha
Permanent Pasture	0
Rotational Grassland	42
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	118
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	5
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	3,128
Dairy Slurry	3,397
Beef FYM	28
Beef Slurry	29
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Site 35b: Stoke Park Farm Farmscoper Inputs

Fields next to watercourses (%)	80
Area of organic soils (%)	80

Dirty Water Options
- (•) Minimal dirty water collected and sent to dirty water store
- ( ) Yard runoff and parlour washings sent to dirty water store
- ( ) Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method implementation
- (•) Intensive Grazing
- ( ) Extensive Grazing
- ( ) Other

Field Boundaries	%
Hedge	40
Wall	
Fence	60
Other	

Grazing Options
- [ ] Livestock have access to watercourses whilst grazing
- [ ] Livestock cross water between fields and yard

Livestock	Count	Managed as Slurry (%)	Managed as FYM (%)	Annual N Excretion (kg)	Annual P Excretion (kg)	Annual FIOs Excretion (10^3)	Annual Excretion Volume (m3)	Time Grazing (%)	Time Housed (%)	Time on Yards (%)	Managed Manure (%)	FYM Stored (%)	FYM Spread Direct (%)	Slurry Stored (%)	Slurry Spread Direct (%)	Poultry Muck Stored	Poultry Muck Spread Direct (%)	Slurry Volume (m3)	FYM Volume (m3)	Poultry Muck Volume (m3)	Stored Slurry N (kg)	Fresh Slurry N (kg)	Stored FYM N (kg)	Fresh FYM N (kg)	Stored Poultry N (kg)	Fresh Poultry N (kg)	Dirty Water (m3)
Dairy Cows and Heifers	146	50	50	117.0	19.4	4,960	19.3	32	48	20	68	84	16	69	31	-	-	19.3	18.8	-	80.0	95.1	73.8	99.9	-	-	8.9
Dairy Heifers in Calf (2 years +)		100	0	67.0	12.2	4,090	14.6	57	28	15	43	84	16	69	31	-	-	14.6	12.6	-	45.8	54.4	43.1	57.4	-	-	0.4
Dairy Heifers in Calf (<2 years)		100	0	67.0	12.2	4,090	14.6	57	28	15	43	84	16	69	31	-	-	14.6	12.6	-	45.8	54.4	43.1	57.4	-	-	0.4
Bulls (2 years +)		100	0	53.0	9.1	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	34.9	41.1	34.3	43.5	-	-	0.6
Beef Cows and Heifers		0	100	92.0	13.5	4,230	16.4	54	31	15	46	84	16	69	31	-	-	16.4	14.1	-	60.6	71.3	59.6	75.4	-	-	0.6
Beef Heifers in Calf (2 years +)		0	100	67.0	12.2	3,360	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Beef Heifers in Calf (<2 years)		0	100	67.0	12.2	2,630	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Other Cattle (2 years +)		0	100	53.0	8.0	3,360	11.7	54	31	15	46	84	16	69	31	-	-	11.7	10.0	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (1-2 years)		0	100	56.0	8.0	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (<1 year) & Calves	5	50	50	27.0	5.0	18,980	6.2	43	42	15	57	84	16	69	31	-	-	6.1	5.3	-	19.0	23.9	18.6	25.2	-	-	0.6

Cropping	Area (ha)	Fertilisers Applied: N (kg/ha)	Fertilisers Applied: P2O5 (kg/ha)	PPPs (% Typical)	Manure Received: Cattle Slurry (%)	Cattle & Sheep FYM (%)	Pig Slurry (%)	Pig FYM (%)	Poultry Muck (%)	Dirty Water (%)
Permanent Pasture										
Rotational Grassland	49.1	208			100	0				100
Rough Grazing										
Winter Wheat										
Winter Barley										
Spring Barley										
Winter OSR										
Maize										
Potatoes										
Sugar Beet										
Peas										
Beans										
Fodder Crops										
Other Crops										
Vegetables (Brassica)										
Vegetables (Other)										
Orchards										
Soft Fruit										
Bare Fallow										
Set Aside										
Woodland										
Manure remaining for export off farm					100					
Manure Use Warnings										

Site 35b: Stoke Park Farm Farmscoper results

1) *Cattle Only*

Farmscoper Create
25/05/2021

File Information	
Create File:	Copy of FARMSCOPER4_Create_Durford_Stoke
Climate:	700 - 900 mm
Soil Type:	Free Draining
Farm Area:	0 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0	0.00	0.00	0	0	0.0	0.00	0	0.00	0	-
Grass	1,769	3.73	0.00	252	5,183	321.7	0.00	308	0.00	1,105	-
Rough	0	0.00	0.00	0	0	0.0	0.00	0	0.00	0	-
Other	244	16.55	0.00	2,158	13,139	169.3	0.00	898	0.00	57,104	-
Total	2,012	20.28	0.00	2,410	18,321	491.1	0.00	1,206	0.00	58,208	259,874

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	0

Grassland	ha
Permanent Pasture	0
Rotational Grassland	0
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	146
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	5
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	3,871
Dairy Slurry	4,204
Beef FYM	28
Beef Slurry	29
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

3) *Cattle and Crops*

Farmscoper Create
18/12/2020

File Information	
Create File:	Copy of FARMSCOPER4_Create_Dunford_Stoke
Climate:	700 - 900 mm
Soil Type:	Free Draining
Farm Area:	49.08 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0	0.00	0	0	0	0.0	0.00	0	0	0	-
Grass	2,756	6.74	1,434	601	5,183	791.9	0.00	308	11,092	89,344	-
Rough	0	0.00	0	0	0	0.0	0.00	0	0	0	-
Other	244	16.55	0	2,158	13,139	169.3	0.00	898	0	57,104	-
Total	3,000	23.29	1,434	2,759	18,321	961.2	0.00	1,206	11,092	146,448	259,874

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	0

Grassland	ha
Permanent Pasture	0
Rotational Grassland	49
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	146
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	5
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	3,871
Dairy Slurry	4,204
Beef FYM	28
Beef Slurry	29
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Estimation of P-loss from Hampshire Carp Hatcheries to Aquatic Environment per Annum

1. ***Annual feed input***
   From Hampshire Carp Hatcheries (HCH) website[1]: *"The farm uses about 8 tonnes of sustainably sourced feed each year to supplement the natural productivity of the ponds."*

2. ***Phosphorous content of feed***
   With reference to the HCH article in *International Aquafeed*[2] HCH typically use Coppens CarpCo Basic Select or TroCo Prime-18 fish food throughout the year. With reference to online Coppens product information[3 & 4] both of these fish feed formulations comprise 1 % total phosphorous (TP).

3. ***Total phosphorous applied to ponds as fish food per annum***
   8,000 kg fish food x 0.01 (% TP) = 80 kg/yr.

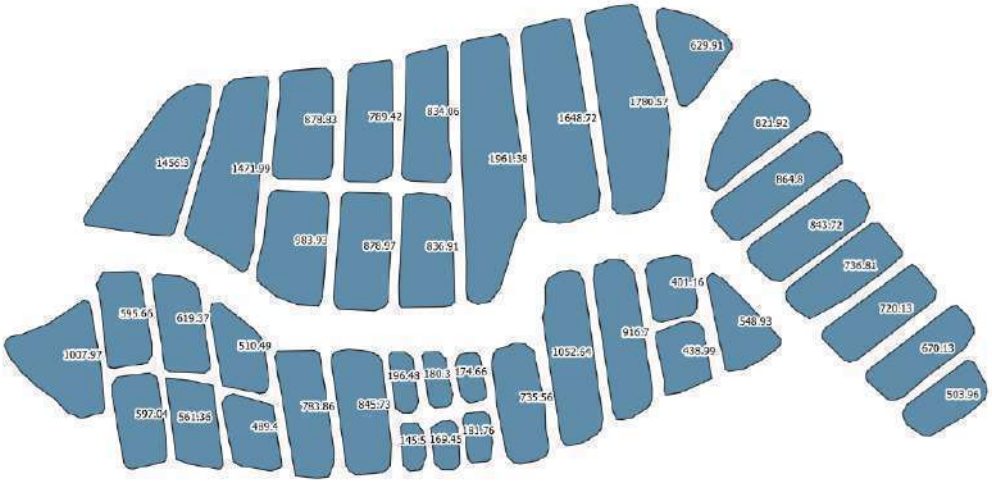
4. ***Fraction of P in feed uneaten and lost to environment***
   With reference to Wang *et al*[5] typically 3% of the total feed input is lost uneaten at modern fish farms *i.e.* 80 kg/yr x 0.03 = 2.4 kg/yr.

5. ***Fraction of P in fish food recovered by fish***
   With reference to Avnimelech & Lacher 1979[6], Boyd 1985[7], and Acosta-Nassar *et al.* 1994[8] it has been shown that fish raised in ponds receiving protein-rich pellets retain within their biomass between 13 to 36% of phosphorus supplied. A precautionary approach has been adopted, assuming 36 % of the phosphorous is retained by the fish.

6. ***Total P lost to aquatic environment from uneaten fish food/excreta***
   ((80 kg/yr – 2.4 kg/yr) x 0.64) + 2.4 kg/yr = **52.1 kg P/yr**

7. ***Fish pond fertilisation***
   With reference to the HCH website[1]: *"Every year all our 40 ponds (average size 1-2,000m²) are drained, dried, disinfected (limed) and fertilised (recycled farm manure) before re-flooding for the new stock."*

8. ***Area of ponds***
   With reference to the figure below, the total area of fish ponds at HCH is 30,465 m².



9. ***Total farm manure application***
With reference to the Food and Agriculture Organization of the United Nations[9],a typical application of farm manure to dry ponds for fertilisation, prior to re-flooding and restocking is 10 to 20 kg dry weight per 100 m^2.

10. ***Typical dry weight fraction of cattle manure***
With reference to FAO[8], fresh cattle manure possesses around 85 % dry weight.

11. ***Typical P content of cattle manure***
With reference to FAO[8] UK cattle manure typically comprises 0.41 % P dry weight.

12. ***Total P applied to ponds each year (assuming precautionary application of 10 kg dry weight farm manure per 100 m^2 per annum)***
30,465 m^2/100 x 10 kg x 0.0041 = **12.5 kg P**.

13. ***Total P lost to aquatic environment from farm manure per annum***
With reference to Avnimelech & Lacher 1979[3], Boyd[4] and Acosta-Nassar *et al.* 1994[5] a maximum of 36% of phosphorus added in feed or other nutrient inputs is recovered by the target organism. Consequently, P-loss to aquatic environment from farm manure = 12.5 x 0.64 = **8.0 kg P/yr**

14. ***Total P lost to aquatic environment from fish farm operations per annum***
Point (6) + point (13) = 52.1 kg P/yr + 8.0 kg P/yr = **60.1 kg P/yr**

15. ***Total N loss per hectare of fish farm***
Area of fish farm = 8.9 ha. Therefore, 60.1 kg P/yr/8.9 = **6.75 kg P/ha/y**

References

1 Hampshire Carp Hatcheries website at https://www.hampshirecarp.co.uk/bowlake-fish-farm

2 Haughton P. (2014). Investigation into alternative commercial diets for carp (*Cyprinus carpio*) production on their rates of growth and feed utilisation". *International Aquafeed, September/October 2014, pp. 34-37.*

3 Coppens CarpCo BASIC SELECT – product information available at: https://www.garden-hobby.com/coppens-carpco-basic-select-otlichna-visoko-kachestvena-zahranka-za-privlichane-na-sharanovi-ribi-16-mm-5-kg.html [accessed 11/11/21].

4 Coppens product brochure available at http://ugra-agro.ru/uploads/coppens_forel.pdf [accessed 11/11/12].

5 Wang X., Olsen L.M., Reitan K.I. and Olsen Y. (2012). Discharge of nutrient wastes from salmon farms: environmental effects, and potential for integrated multi-trophic aquaculture. *Aquaculture Environment Interactions, Vol 2: 267-283.*

6 Avnimelech Y. & Lacher M. (1979). *Tentative nutrient balance for intensive fish ponds*. Bamidgeh 31: 3–8.

7 Boyd C.E. (1985). *Chemical budgets for channel catfish ponds*. Trans Am Fish Soc 114: 291–298.

8 Acosta-Nassar M.V., Morell J.M., Corredor J.E. (1994). *The nitrogen budget of a tropical semi-intensive freshwater fish culture pond.* J World Aquacult Soc 25: 261–270.

9 Food and Agriculture Organization of the United Nations FAO (2010). FAO Training Series: Simple Methods of Aquaculture.

Appendix C: Map Ref 6 Manor Farm



MANOR FARM 1/3
BISHOPSTOKE
H M
OWNERS : D and M DUNFORD

Baseline Nitrogen Questionnaire

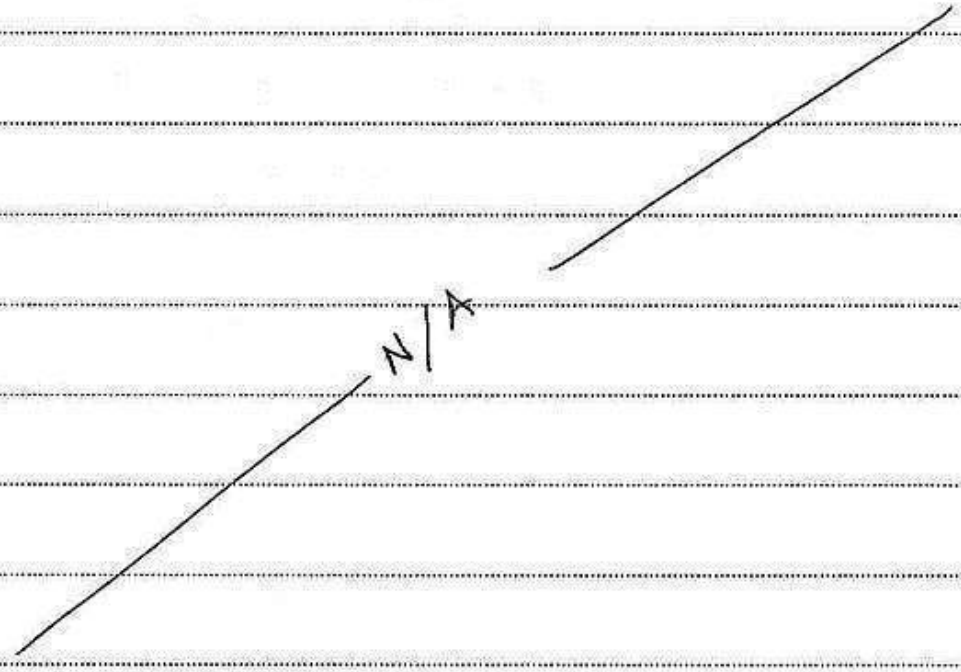
1. Name of person filling out form..... TIM GARDNER HAVING COLLATED INFORMATION AND DATA FROM MESSRS D and M DUNFORD AND TILLER FARM CONSULTANCY.
2. Contact details..... 01489 896422 TIM@IANJUDDANDPARTNERS.CO.UK
3. Date..... 28th AUGUST 2020
4. Name/ Location of land parcel assessed..... MANOR FARM, BISHOPSTOKE
5. Area of land parcel (if known)..... 56.11 ha GROSS 54.60ha CROPPED LAND
6. Soil type of land parcel (if known)..... SEE ATTACHED SOILSCAPES PLAN SOILSCAPE 27
7. Drainage of land parcel
   - Agricultural land drainage ☐
   - Overland drainage to peripheral ditches ☑ RELY ON YOUR OWN INSPECTION
   - Free draining (infiltration to ground) ☑
8. Please describe any watercourse or drainage ditch adjacent to parcel boundaries (please indicate along which boundary or location within plot)..... ~~MAJORITY OF FIELDS HAVE DRAINAGE DITCHES~~ SEE ATTACHED "THE LAND APP" PLAN OF THE FARM HOLDING
9. Types of field boundaries to land parcel
   - Percentage hedge..... 90 %
   - Percentage wall..... %
   - Percentage fence..... 10 %
   - Percentage other boundary type (please specify)..... % AND A LOT OF DITCHES TOO
10. Have any livestock used the land parcel within the last 10 years (Yes/No)?..... NO

If you answered "No" to this question, please move directly on to Question 17.

MANOR FARM 2/2

H|M

11. If you answered "Yes" to question 10 above, please describe the livestock type (*e.g.* dairy, beef, sheep, pigs, poultry), the number and the years kept on the land parcel, together with any further relevant details (*e.g.* No. of cows, bulls, heifers and calves; sheep or lambs; sows, boars, gilts or other pigs; types of poultry *etc*).....



12. If grazing livestock have been present on the land parcel, would you describe their upkeep as "intensive" or "extensive" grazing?..... N/A

13. If grazing livestock have been present on the land parcel, have they had access to watercourses whilst grazing?..... N/A

14. If grazing livestock have been present on the land parcel, have they been able to cross water between the yard and field?..... N/A

15. Please state if any farmyard manure (FYM) produced within the land parcel has been managed as slurry (as a percentage)..... N/A %

16. Please state if any FYM has been exported from the land parcel (as a percentage of total produced on the parcel)..... N/A %

MANOR FARM 3/

H|M

17. Has any FYM been imported onto the land parcel (in tonnes per year) 820 t/yr

18. Please list the type of land use below that makes up the land parcel, together with respective annual fertiliser and FYM additions. Please try and provide the average cropping, fertiliser and FYM application regimes over the previous ten year period:

Cropping	Area (ha)	Annual fertiliser addition (kg of Nitrogen per hectare)	Annual FYM addition (tonnes FYM per hectare)
Permanent pasture			
Rotational grassland	27.02	242	
Rough grazing			
Winter wheat			
Winter barley			
Spring barley			
Winter OSR			
Maize	27.58	119	29.7t/ha/pa.
Potatoes			
Sugar beet			
Peas			
Beans			
Fodder crops			
Other crops			
Vegetables (brassica)			
Vegetables (other)			
Orchards			
Soft fruit			
Bare fallow		N/A	N/A
Set aside		N/A	N/A
Woodland		N/A	N/A

Many thanks for completing this questionnaire, if any queries please contact Paul Bond on 07795183989 (pbond@hilsonmoran.com) or Emma Flower on 01252 550529 (eflower@hilsonmoran.com)

382 Sediment Dynamics from the Summit to the Sea
(Proceedings of a symposium held in New Orleans, Louisiana, USA, 11–14 December 2014) (IAHS Publ. 367, 2014).

The costs and efficacy of sediment mitigation measures for representative farm types across England and Wales

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Abstract A major collaborative research project in the UK is delivering new science to support improved targeting of on-farm pollution mitigation measures for the benefit of freshwater ecology. One important aspect of the project concerns a national scale evaluation of the costs and efficacy of packages of sediment mitigation measures which can be delivered over and above the existing implementation of abatement through various policy instruments including advice and new targeted agri-environment schemes. The assessment includes typical farm types present across England and Wales. Outputs from this assessment of costs and efficacy will eventually be used to help model the potential for closing the sediment pollution gap in those water bodies currently failing water quality targets due to sediment loss from agriculture. Some preliminary uncertainty ranges in costs (–£146,402 to £175,631) and effectiveness (0–80%) associated with a potential policy scenario implementing a large number (up to 93) of abatement measures at 95% uptake are presented in this paper.

Key words sediment; mitigation; costs; efficacy; farm scale; policy support

INTRODUCTION

Agricultural diffuse sediment pollution in England and Wales has been recognised as one of the key problems requiring improved abatement to help meet environmental targets for freshwater habitats (Collins *et al.*, 2011). In particular, enhanced loadings of fine-grained sediment (<63 μm) are associated with a number of important environmental issues receiving increasing attention from policy teams and catchment managers. Fine-grained sediment mobilisation and delivery through catchment systems exerts an important control on the transport and fate of nutrients and contaminants including, amongst others, phosphorus, heavy or trace metals, dioxins, polychlorinated biphenyls, radionuclides and pathogens (Horowitz *et al.*, 1995; Warren *et al.*, 2003; Kay *et al.*, 2005; Ballantine *et al.*, 2009). Sediment transport (coarse and fine) exerts a fundamental control on the hydro-geomorphological function and health of river systems and excessive fine sediment inputs can result in a range of detrimental impacts on aquatic ecology. High suspended sediment concentrations can, for example, impact on the behaviour and health of fish by reducing capacity to predate and damaging fish gills (Kemp *et al.*, 2011). Increased sediment deposition and retention on the river substrate can degrade habitat quality by reducing permeability and porosity and attenuating hyporheic exchanges critical for supporting fish and macroinvertebrate populations (Milner *et al.*, 2003). Equally, fine sediment can impact negatively on macrophytes or diatoms by smothering, abrasion and scour (Clarke, 2002; Jones *et al.*, 2014).

A range of mitigation measures to ameliorate agricultural diffuse pollution, including that resulting from excessive sediment loss from farms, have been identified by recent policy support projects funded by the Department for Environment, Food and Rural Affairs (Defra) (e.g. Newell-Price *et al.*, 2011). These mitigation measures can be implemented through a number of means (McGonigle *et al.*, 2012) including the basic regulatory expectations (Cross Compliance) of farmers to maintain land in good agricultural and environment condition (e.g. GAEC rule 1 embodied in the Soil Protection Review) as a mandatory requirement for receiving subsidy via the Single Payment Scheme, targeted programmes of advice such as the Catchment Sensitive Farming initiative (CSF) and agri-environment schemes (e.g. the existing Entry-Level scheme in England). However, demonstrating the effectiveness of these policy instruments has proved challenging, especially in the short term, given the complexities of sediment redistribution through the landscape with intermediate storage and remobilisation, highly changeable weather conditions

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from year to year and on account of the confounding influence of sediment contributions from alternative sources which may not be targeted by abatement strategies. In addition, disentangling the impact of specific policy instruments or mitigation measures present in the agricultural landscape on sediment loss from farms remains a major challenge using empirical methods.

Despite the evidence base for the detrimental environmental impacts of excessive sediment loss from agriculture, in the broader context of food security and the challenges of feeding a growing population, there is an expectation on farmers to increase food production. Consequently, there is renewed focus on sustainable intensification which embodies the balance between maximising agricultural productivity and minimising environmental burden including that on freshwaters (Foresight, 2011). Critical to this balance, is an improved understanding of the national scale cost-effectiveness of potential sediment mitigation strategies which might be delivered by a range of policy instruments. Accordingly, a collaborative scientific policy support project in the UK has been modelling the cost-effectiveness of on-farm sediment mitigation measures to provide insight into the costs to society of minimising the environmental pressures of modern agricultural production.

METHOD

The approach was founded on the use of the Excel-based decision support tool FARMSCOPER (FARM SCale Optimisation of Pollutant Emission Reductions) recently developed to help inform the management of diffuse agricultural pollution across England and Wales (Zhang *et al.*, 2012; Gooday *et al.*, 2014). FARMSCOPER is founded on a suite of well-established models which have all been used in national-scale predictions for policy support. These models simulate sediment, phosphorus, nitrate, ammonia, methane and nitrous oxide emissions to aquatic environments and the atmosphere. In the case of sediment, FARMSCOPER predictions use the Phosphorus and Sediment Yield CHaracterisation In Catchments (PSYCHIC) process-based model (Collins *et al.*, 2007; Davison *et al.*, 2008; Stromqvist *et al.*, 2008; Collins *et al.*, 2009a). For the construction of FARMSCOPER baseline predictions without prior implementation of abatement measures, the PSYCHIC model was applied using multiple iterations to the whole of England and Wales at 1-km^2 resolution. The results were area-weighted to produce output for six primary rainfall zones and three soil types (see rainfall and soil categories in Table 1). The soil types were chosen to reflect the likelihood of agricultural under-drainage: permeable free draining soils; impermeable soils where artificial drainage is required to make them suitable for arable cultivation; and, impermeable soils where artificial drainage is required to make them suitable for either arable or grassland agriculture. Soils for each 1-km^2 grid cell at national scale were identified using NATMAP1000 (National Soil Resources Institute, Cranfield University) and the corresponding HOST (Hydrology of Soil Types; Boorman *et al.*, 1995) classes used to assign a FARMSCOPER soil category (Table 2). Agricultural management practice is simulated in FARMSCOPER using representative farm types derived from the Defra Robust Farm Type (RFT) classification scheme (Defra, 2010), which is widely adopted in existing farm surveys undertaken across England and Wales. Based on crop specific land areas and categorised livestock data collected in the 2010 June Agricultural Census, default values were identified to describe an 'average' model farm for each farm type for each soil and rainfall combination. Where enterprise specific data are available, FARMSCOPER allows for customisation of these farm types to support more tailored application of the tool. FARMSCOPER comprises a library of 105 mitigation methods, each of which is characterised in terms of its impacts on pollutant emissions and the costs or savings that implementation of the method would incur for farmers. Impacts of multiple mitigation methods are multiplicative, such that the effectiveness of multiple methods targeting the same aspects of pollutant loss will be less than the sum of their individual impacts. The costs of method implementation account for changes to the variable costs and gross margin of a crop or stock enterprise, changes to the fixed costs or overheads associated with labour and machinery and capital investment using a number of sources (e.g. Nix, 2009). Capital costs are typically amortised over 5 to 20 years, depending upon the expected lifetime of the corresponding

investment and any associated loans. The simulations reported here are based on the latest mitigation measure costs for 2013. Costs exclude those to government for policy instrument administration and delivery or enforcement on the ground by agencies or officers.

Table 1 The relative frequency distribution of all possible FARMSCOPER rainfall and soil combinations across England and Wales; AAR is Annual average rainfall.

AAR (1961–1990)	Soil categories: Free draining	Drained for arable	Drained for arable and grass
mm	%	%	%
<600	2.5	4.5	2.4
600–700	8.3	8.3	9.1
700–900	13.1	6.8	10.1
900–1200	10.5	2	3.9
1200–1500	7.7	0.4	1.6
>1500	7.8	0.3	0.9

Table 2 The correspondence between HOST classes and FARMSCOPER soil categories.

HOST class	Soil group	HOST class	Soil group
1	Free draining	15	Free draining
2	Free draining	16	Free draining
3	Free draining	17	Free draining
4	Free draining	18	Drained for arable
5	Free draining	19	Drained for arable
6	Free draining	20	Drained for arable
7	Free draining	21	Drained for arable
8	Free draining	22	Drained for arable
9	Drained for arable	23	Drained for both arable and grass
10	Drained for arable	24	Drained for both arable and grass
11	Free draining	25	Drained for both arable and grass
12	Free draining	26	Free draining
13	Free draining	27	Free draining
14	Drained for arable	28	Free draining

Site 6: Manor Farm Farmscoper inputs

Options: Clear Farm | Build Farm

Farm Built

Display Options: Dairy, Beef, Sheep, Indoor Pigs, Outdoor Pigs, Poultry, Imported Manure, Cropping; Show more detail for Livestock; Show more detail for Cropping

Stocking Density
0 kg N / ha

General Options

Fields next to watercourses (%)	85
Area of organic soils (%)	80

Dirty Water Options: Minimal dirty water collected and sent to dirty water store; Yard runoff and parlour washings sent to dirty water store; Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method imlpementation: Intensive Grazing; Extensive Grazing; Other

Field Boundaries	%
Hedge	90
Wall	
Fence	10
Other	

Grazing Options: Livestock have access to watercourses whilst grazing; Livestock cross water between fields and yard

Imported Manure	Slurry (t)	FYM (t)	Poultry Muck (t)
Dairy	0	820	
Beef	0	0	
Pig	0	0	
Poultry			0

Cropping	Area (ha)	Fertilisers Applied		PPPs (% Typical)	Manure Received						Manure Details						Pesticide Details					
		N (kg/ha)	P_2O_5 (kg/ha)		Cattle Slurry (%)	Cattle & Sheep FYM (%)	Pig Slurry (%)	Pig FYM (%)	Poultry Muck (%)	Dirty Water (%)	Slurry (t/ha)	FYM (t/ha)	Litter (t/ha)	Dirty Water (t/ha)	Manure Total N (kg/ha)	Manure P (kg/ha)	Fungicide (% PPPs)	Herbicide (% PPPs)	Insecticide (% PPPs)	Growth Regulator (% PPPs)	Molluscicide (% PPPs)	Spray Trips
Permanent Pasture																						
Rotational Grassland	27.0	242									0.0	0.0	0.0	0.0	0.0	0.0						
Rough Grazing																						
Winter Wheat																						
Winter Barley																						
Spring Barley																						
Winter OSR																						
Maize	27.6	119				100					0.0	29.7	0.0	0.0	178.4	45.4						
Potatoes																						
Sugar Beet																						
Peas																						
Beans																						
Fodder Crops																						
Other Crops																						
Vegetables (Brassica)																						
Vegetables (Other)																						
Orchards																						
Soft Fruit																						
Bare Fallow																						
Set Aside																						
Woodland	1.1																					
Manure remaining for export off farm																						
Manure Use Warnings																						

Site 6 Manor Farm Farmscoper results

Farmscoper Create
25/05/2021

File Information	
Create File:	Copy of FARMSCOPER4_Create_Dunford_Manor
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable
Farm Area:	55.7 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	2,675	29.02	19,967	589.8	0.00	427.4	0.00	119.8	6,220	30,225	-
Grass	457	1.88	1,060	223.7	0.00	273.1	0.00	0.0	6,107	55,617	-
Rough	0	0.00	0	0.0	0.00	0.0	0.00	0.0	0	0	-
Other	62	4.84	0	0.0	0.00	2.4	0.00	210.5	1	32,901	-
Total	3,194	35.74	21,028	813.5	0.00	703.0	0.00	330.4	12,328	118,743	59,558

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	28
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	1

Grassland	ha
Permanent Pasture	0
Rotational Grassland	27
Rough Grazing	0

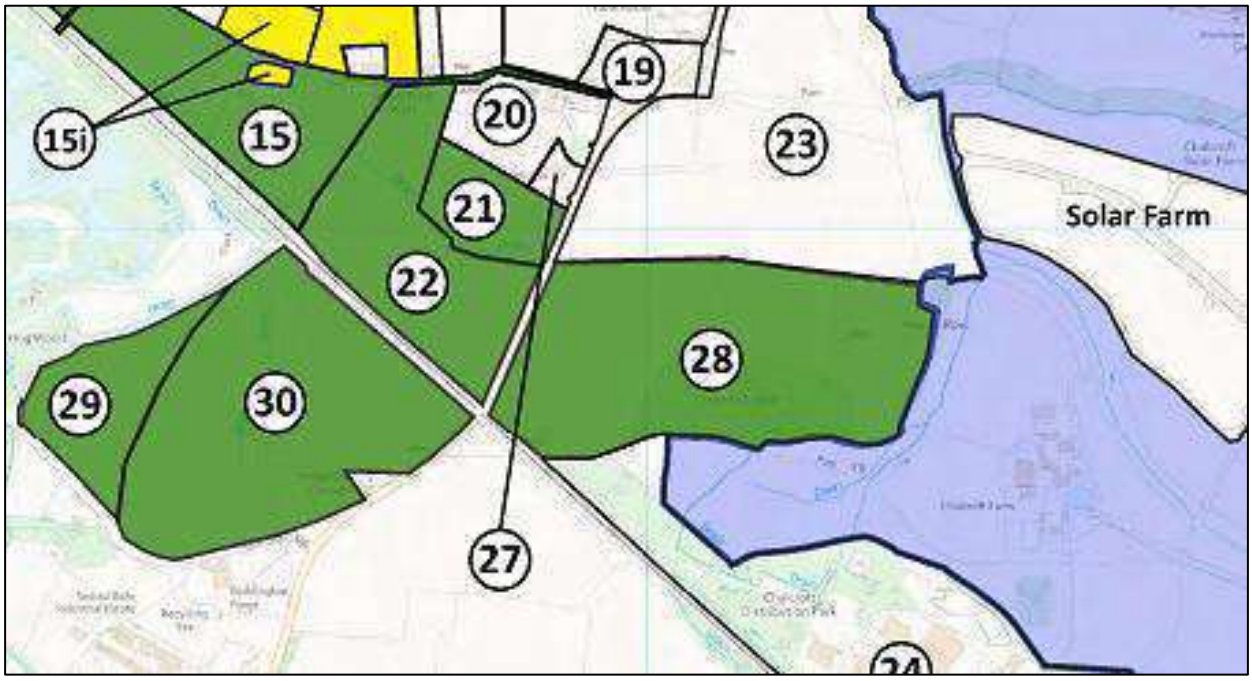
Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	0
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	4,920
Dairy Slurry	0
Beef FYM	0
Beef Slurry	0
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Appendix D: Map Refs 21, 22, 28, 29 & 30 Gosney



Parcels 21, 22, 28, 29, 30

H|M

Baseline Nitrogen Questionnaire

1. Name of person filling out form... Mark Cosney
2. Contact details... mob 07889 105965 broomfarm@btinternet.com
3. Date... 27 February 2021
4. Name/ Location of land parcel assessed... Allington Lane
5. Area of land parcel (if known)... 41.05 ha / 112.26 acres
6. Soil type of land parcel (if known)... clay
7. Drainage of land parcel
   - Agricultural land drainage ☐
   - Overland drainage to peripheral ditches ☐
   - Free draining (infiltration to ground) ☑
8. Please describe any watercourse or drainage ditch adjacent to parcel boundaries (please indicate along which boundary or location within plot) pond in Hoerts Copse fills from rainwater / run off land. Pond on other side of road is the same.
9. Types of field boundaries to land parcel
   - Percentage hedge... 80 %
   - Percentage wall... - %
   - Percentage fence... 20 %
   - Percentage other boundary type (please specify)... - %
10. Have any livestock used the land parcel within the last 10 years (Yes/No)? yes

If you answered "No" to this question, please move directly on to Question 17.

11. If you answered "Yes" to question 10 above, please describe the livestock type (*e.g.* dairy, beef, sheep, pigs, poultry), the number and the years kept on the land parcel, together with any further relevant details (*e.g.* No. of cows, bulls, heifers and calves; sheep or lambs; sows, boars, gilts or other pigs; types of poultry *etc*).....

20 cows, 20 calves, 1 bull

12. If grazing livestock have been present on the land parcel, would you describe their upkeep as "intensive" or "extensive" grazing? extensive

13. If grazing livestock have been present on the land parcel, have they had access to watercourses whilst grazing? No

14. If grazing livestock have been present on the land parcel, have they been able to cross water between the yard and field? No

15. Please state if any farmyard manure (FYM) produced within the land parcel has been managed as slurry (as a percentage)..... No .....%

16. Please state if any FYM has been exported from the land parcel (as a percentage of total produced on the parcel)..... No .....%

17. Has any FYM been imported onto the land parcel (in tonnes per year)..750.....t/yr

18. Please list the type of land use below that makes up the land parcel, together with respective annual fertiliser and FYM additions. Please try and provide the average cropping, fertiliser and FYM application regimes over the previous ten year period:

Cropping	Area (ha)	Annual fertiliser addition (kg of Nitrogen per hectare)	Annual FYM addition (tonnes FYM per hectare)
Permanent pasture	36.2	225	20t/yr cattle grazing
Rotational grassland			
Rough grazing			
Winter wheat			
Winter barley			
Spring barley			
Winter OSR			
Maize			
Potatoes			
Sugar beet			
Peas			
Beans			
Fodder crops			
Other crops			
Vegetables (brassica)			
Vegetables (other)			
Orchards			
Soft fruit			
Bare fallow		N/A	N/A
Set aside	4.85	N/A	N/A
Woodland		N/A	N/A

Many thanks for completing this questionnaire, if any queries please contact Paul Bond on 07795183989 (pbond@hilsonmoran.com) or Emma Flower on 01252 550529 (eflower@hilsonmoran.com)

Sites 21, 22, 28, 29 & 30: Farmscoper Inputs

Options: Clear Farm | Build Farm

Farm Built

Display Options:
- ☐ Dairy ☐ Indoor Pigs ☑ Imported Manure
- ☑ Beef ☐ Outdoor Pigs ☑ Cropping
- ☐ Sheep ☐ Poultry
- ☑ Show more detail for Livestock
- ☐ Show more detail for Cropping

Stocking Density
59 kg N / ha

General Options

Fields next to watercourses (%)	30
Area of organic soils (%)	100

Dirty Water Options:
- ○ Minimal dirty water collected and sent to dirty water store
- ◉ Yard runoff and parlour washings sent to dirty water store
- ○ Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method implementation:
- ○ Intensive Grazing
- ◉ Extensive Grazing
- ○ Other

Field Boundaries	%
Hedge	80
Wall	0
Fence	20
Other	0

Grazing Options:
- ☐ Livestock have access to watercourses whilst grazing
- ☐ Livestock cross water between fields and yard

Livestock	Count	Managed as Slurry (%)	Managed as FYM (%)	Annual N Excretion (kg)	Annual P Excretion (kg)	Annual FIOs Excretion (10^9 cfu)	Annual Excretion Volume (m3)	Time Grazing (%)	Time Housed (%)	Time on Yards (%)	Managed Manure (%)	FYM Stored (%)	FYM Spread Direct (%)	Slurry Stored (%)	Slurry Spread Direct (%)	Poultry Muck Stored (%)	Poultry Muck Spread Direct (%)	Slurry Volume (m3)	FYM Volume (m3)	Poultry Muck Volume (m3)	Stored Slurry N (kg)	Fresh Slurry N (kg)	Stored FYM N (kg)	Fresh FYM N (kg)	Stored Poultry N (kg)	Fresh Poultry N (kg)	Dirty Water (m3)
Bulls (2 years +)	1	0	100	53.0	9.1	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	34.9	41.1	34.3	43.5	-	-	0.6
Beef Cows and Heifers	20	0	100	92.0	13.5	4,230	16.4	54	31	15	46	84	16	69	31	-	-	16.4	14.1	-	60.6	71.3	59.6	75.4	-	-	0.6
Beef Heifers in Calf (2 years +)		0	100	67.0	12.2	3,360	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Beef Heifers in Calf (< 2 years)		0	100	67.0	12.2	2,630	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Other Cattle (2 years +)		0	100	53.0	8.0	3,360	11.7	54	31	15	46	84	16	69	31	-	-	11.7	10.0	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (1 - 2 years)		0	100	56.0	8.0	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (< 1 year) & Calves	20	0	100	27.0	5.0	18,980	6.2	43	42	15	57	84	16	69	31	-	-	6.1	5.3	-	19.0	23.9	18.6	25.2	-	-	0.6

Imported Manure	Slurry (t)	FYM (t)	Poultry Muck (t)
Dairy	0	750	
Beef	0	0	
Pig	0	0	
Poultry			0

Cropping	Area (ha)	Fertilisers Applied: N (kg/ha)	Fertilisers Applied: P_2O_5 (kg/ha)	PPPs (% Typical)	Manure Received: Cattle Slurry (%)	Manure Received: Cattle & Sheep FYM (%)	Manure Received: Pig Slurry (%)	Manure Received: Pig FYM (%)	Manure Received: Poultry Muck (%)	Manure Received: Dirty Water (%)
Permanent Pasture	36.2	225				100				100
Rotational Grassland										
Rough Grazing										
Winter Wheat										
Winter Barley										
Spring Barley										
Winter OSR										
Maize										
Potatoes										
Sugar Beet										
Peas										
Beans										
Fodder Crops										
Other Crops										
Vegetables (Brassica)										
Vegetables (Other)										
Orchards										
Soft Fruit										
Bare Fallow	1.6									
Set Aside	1.6									
Woodland	1.6									
Manure remaining for export off farm										
Manure Use Warnings										

Sites 21, 22, 28, 29 & 30: Farmscoper results

ADAS

Farmscoper Create

26/05/2021

File Information	
Create File:	Copy of FARMSCOPER4_Create_Gosney_Richard
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable
Farm Area:	41 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	59	3.02	2,346	0.0	0	2.3	0.00	0.0	800	0	-
Grass	1,817	6.71	1,414	675.7	870	551.2	0.00	382.4	9,050	67,868	-
Rough	0	0.00	0	0.0	0	0.0	0.00	0.0	0	0	-
Other	23	1.82	1	253.8	881	4.5	0.00	84.9	1	3,291	-
Total	1,899	11.55	3,760	929.5	1,751	558.0	0.00	467.3	9,851	71,159	20,140

Report Units

- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	2
Set Aside	2
Woodland	2

Grassland	ha
Permanent Pasture	36
Rotational Grassland	0
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	20
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	1
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	20
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	4,500
Dairy Slurry	0
Beef FYM	812
Beef Slurry	0
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Appendix E: Map Ref 4 Morris



H M

Baseline Nitrogen Questionnaire

1. Name of person filling out form..... NORMA MORRIS .....
2. Contact details..... 01794 - 368191 .....
3. Date..... 01 / 09 / 2020 .....
4. Name/ Location of land parcel assessed..... OFF BISHOPSTOKE ROAD, EASTLEIGH .....
5. Area of land parcel (if known)..... 25 acres. .....
6. Soil type of land parcel (if known)..... WATER MEADOWS .....
7. Drainage of land parcel
   - Agricultural land drainage ☐
   - Overland drainage to peripheral ditches ☑
   - Free draining (infiltration to ground) ☑
8. Please describe any watercourse or drainage ditch adjacent to parcel boundaries (please indicate along which boundary or location within plot).....
   RIVERS BARTON, ITCHEN & NAVIGATION .....
9. Types of field boundaries to land parcel
   - Percentage hedge..... %
   - Percentage wall..... 0 %
   - Percentage fence..... 95 %
   - Percentage other boundary type (please specify)..... 5 % ..... RIVER .....
10. Have any livestock used the land parcel within the last 10 years (Yes/No)?..... YES .....

    If you answered "No" to this question, please move directly on to Question 17.

H M

11. If you answered "Yes" to question 10 above, please describe the livestock type (*e.g.* dairy, beef, sheep, pigs, poultry), the number and the years kept on the land parcel, together with any further relevant details (*e.g.* No. of cows, bulls, heifers and calves; sheep or lambs; sows, boars, gilts or other pigs; types of poultry *etc*).....

BEEF CATTLE GRAZING SINCE OUR PURCHASE OF THE LAND, WELL OVER 10 YRS.

WE GENERALLY HAD APPROXIMATELY 40 GRAZING IN 2 LOTS OF 20 'ISH EACH, INCLUDING WINTER GRAZING WHEN WE WOULD SUPPLEMENT THE GRASS WITH HAY, SILAGE AND CONCENTRATE. THEY TENDED THEN TO HAVE THE RUN OF THE WHOLE RATHER THAN BEING RESTRICTED TO ONE FIELD AT A TIME. THERE WERE CATTLE ON THE HOLDING PRETTY MUCH ALL YEAR WITH SOME SHELTER IN THE NOW DILAPIDATED STRUCTURE.

12. If grazing livestock have been present on the land parcel, would you describe their upkeep as "intensive" or "extensive" grazing? INTENSIVE

13. If grazing livestock have been present on the land parcel, have they had access to watercourses whilst grazing? YES

14. If grazing livestock have been present on the land parcel, have they been able to cross water between the yard and field? YES

15. Please state if any farmyard manure (FYM) produced within the land parcel has been managed as slurry (as a percentage) 0 %

16. Please state if any FYM has been exported from the land parcel (as a percentage of total produced on the parcel) 0 %

H|M

17. Has any FYM been imported onto the land parcel (in tonnes per year).....t/yr

18. Please list the type of land use below that makes up the land parcel, together with respective annual fertiliser and FYM additions. Please try and provide the average cropping, fertiliser and FYM application regimes over the previous ten year period:

Cropping	Area (ha)	Annual fertiliser addition (kg of Nitrogen per hectare)	Annual FYM addition (tonnes FYM per hectare)
Permanent pasture	9ha.	250 kg.	NIL
Rotational grassland	—		
Rough grazing	—		
Winter wheat	—		
Winter barley	—		
Spring barley	—		
Winter OSR	—		
Maize	—		
Potatoes	—		
Sugar beet	—		
Peas	—		
Beans	—		
Fodder crops	—		
Other crops	—		
Vegetables (brassica)	—		
Vegetables (other)	—		
Orchards	—		
Soft fruit	—		
Bare fallow	—	N/A	N/A
Set aside	—	N/A	N/A
Woodland	—	N/A	N/A

Many thanks for completing this questionnaire, if any queries please contact Paul Bond on 07795183989 (pbond@hilsonmoran.com) or Emma Flower on 01252 550529 (eflower@hilsonmoran.com)

Excerpt from Tiller Farm Consultancy report 8th March 2021

Map Ref. 4, Owner – Morris

The information provided previously (via HM) is based on 25 acres of land, with a total of 9 ha (22.2 ac) on the fertiliser use page, and accounts for grazed beef cattle and artificial fertiliser applications.

1. **Grazing – NVZ Compliance**

The number of beef cattle averaged 40 head across the 9ha, plus a further 2ha of grazing during the summer months (outside the total of sale land). A pro-rata 10% reduction in stocking rate has been applied. The age ranges of the cattle were an even spread of 6 months to 24 months old as is typical with beef rearing systems on farms.

The resulting NVZ whole farm limit report demonstrates NVZ compliance at 156kg N/ha which is under the limit of 170kg N/ha.

Whole Farm Stocking Rate - Nitrogen Loading

Farm:	**Morris**		
Livestock Type	Average Number on-farm (per calender year)	Total N produced (kg/head /year)	Total N produced (kg/year)
Cattle			
Dairy Heifer, 3 mths - <13 mths		29	0
Dairy Heifer, 13 mths - first calf		61	0
Suckler heifer or steer, 3 mths - <13 mths	18	28	504
Suckler heifer or steer, 13 mths - <25 mths	18	50	900
Total N Excreted per year			1,404
Total Farm area, (ha) (excluding non-use areas - tracks, buildings, water etc)			9
	Land INSIDE NVZ	9	
	Land OUTSIDE NVZ	0	
	Allowable Nitrogen	170	kg/ha
	Allowable Nitrogen	**1,530**	**kg N**
Total Livestock Manure N Farm Limit (kg N/ha)			**156**

Site 4: Farmscoper Inputs



General Options

Fields next to watercourses (%)	90
Area of organic soils (%)	0

Field Boundaries	%
Hedge	95
Wall	0
Fence	
Other	5

Dirty Water Options
- (•) Minimal dirty water collected and sent to dirty water store
- ( ) Yard runoff and parlour washings sent to dirty water store
- ( ) Yard runoff and parlour washings sent to slurry store

Farm type for estimation of method implementation
- (•) Intensive Grazing
- ( ) Extensive Grazing
- ( ) Other

Grazing Options
- [x] Livestock have access to watercourses whilst grazing
- [x] Livestock cross water between fields and yard

Livestock	Count	Managed as Slurry (%)	Managed as FYM (%)	Annual N Excretion (kg)	Annual P Excretion (kg)	Annual FIOs Excretion (10^9 cfu)	Annual Excretion Volume (m3)	Time Grazing (%)	Time Housed (%)	Time on Yards (%)	Managed Manure (%)	FYM Stored (%)	FYM Spread Direct (%)	Slurry Stored (%)	Slurry Spread Direct (%)	Poultry Muck Stored (%)	Poultry Muck Spread Direct (%)	Slurry Volume (m3)	FYM Volume (m3)	Poultry Muck Volume (m3)	Stored Slurry N (kg)	Fresh Slurry N (kg)	Stored FYM N (kg)	Fresh FYM N (kg)	Stored Poultry N (kg)	Fresh Poultry N (kg)	Dirty Water (m3)
Bulls (2 years +)		0	100	53.0	9.1	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	34.9	41.1	34.3	43.5	-	-	0.6
Beef Cows and Heifers		0	100	92.0	13.5	4,230	16.4	54	31	15	46	84	16	69	31	-	-	16.4	14.1	-	60.6	71.3	59.6	75.4	-	-	0.6
Beef Heifers in Calf (2 years +)		0	100	67.0	12.2	3,360	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Beef Heifers in Calf (< 2 years)		0	100	67.0	12.2	2,630	14.6	54	31	15	46	84	16	69	31	-	-	14.6	12.6	-	44.1	52.0	43.4	54.9	-	-	0.6
Other Cattle (2 years +)		0	100	53.0	8.0	3,360	11.7	54	31	15	46	84	16	69	31	-	-	11.7	10.0	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (1 - 2 years)	18	0	100	56.0	8.0	2,630	9.5	54	31	15	46	84	16	69	31	-	-	9.5	8.2	-	36.7	43.2	36.0	45.6	-	-	0.6
Other Cattle (< 1 year) & Calves	18	0	100	27.0	5.0	18,980	6.2	43	42	15	57	84	16	69	31	-	-	6.1	5.3	-	19.0	23.9	18.6	25.2	-	-	0.6

Cropping	Area (ha)	Fertilisers Applied N (kg/ha)	Fertilisers Applied P_2O_5 (kg/ha)	PPPs (% Typical)	Manure Received: Cattle Slurry (%)	Manure Received: Cattle & Sheep FYM (%)	Manure Received: Pig Slurry (%)	Manure Received: Pig FYM (%)	Manure Received: Poultry Muck (%)	Manure Received: Dirty Water (%)	Manure Details: Slurry (t/ha)	Manure Details: FYM (t/ha)	Manure Details: Litter (t/ha)	Manure Details: Dirty Water (t/ha)	Manure Details: Manure Total N (kg/ha)	Manure Details: Manure P (kg/ha)	Pesticide Details: Fungicide (% PPPs)	Pesticide Details: Herbicide (% PPPs)	Pesticide Details: Insecticide (% PPPs)	Pesticide Details: Growth Regulator (% PPPs)	Pesticide Details: Molluscicide (% PPPs)	Pesticide Details: Spray Trips
Permanent Pasture	9.0	250	50			100				100	0.0	13.6	0.0	0.2	57.1	13.1						
Rotational Grassland																						
Rough Grazing																						
Winter Wheat																						
Winter Barley																						
Spring Barley																						
Winter OSR																						
Maize																						
Potatoes																						
Sugar Beet																						
Peas																						
Beans																						
Fodder Crops																						
Other Crops																						
Vegetables (Brassica)																						
Vegetables (Other)																						
Orchards																						
Soft Fruit																						
Bare Fallow																						
Set Aside																						
Woodland	0.7																					
Manure remaining for export off farm																						
Manure Use Warnings																						

Site 4: Farmscoper Results

1) *Cattle Only*

Farmscoper Create
12/11/2021

File Information	
Create File:	FARMSCOPER4_Create_Morris_Richard
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable & Grass
Farm Area:	0 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0.0	0.00	0.00	0.0	0	0.00	0.00	0	0.00	0	-
Grass	86.1	4.53	0.00	57.7	769	36.50	0.00	2,056	0.00	173	-
Rough	0.0	0.00	0.00	0.0	0	0.00	0.00	0	0.00	0	-
Other	30.7	2.15	0.00	151.9	780	3.46	0.00	1,132	0.00	2,821	-
Total	116.8	6.68	0.00	209.6	1,549	39.96	0.00	3,189	0.00	2,994	23,328

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	0

Grassland	ha
Permanent Pasture	0
Rotational Grassland	0
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	18
Cattle (< 1 year) & Calves	18
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	0
Dairy Slurry	0
Beef FYM	512
Beef Slurry	0
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

2) Cattle and Crops

Farmscoper Create
12/11/2021

File Information	
Create File:	FARMSCOPER4_Create_Morris_Richard
Climate:	700 - 900 mm
Soil Type:	Impermeable - Drained for Arable & Grass
Farm Area:	9.7 ha

	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)	Ammonia (kg)	Methane (kg)	Nitrous Oxide (kg)	Pesticides (units)	FIOs (10^9 cfu)	Soil Carbon (t)	Energy Use (kg CO2)	Production (£)
Arable	0.0	0.00	0	0.0	0	0.0	0.00	0	0	0	-
Grass	206.5	17.38	1,635	134.6	769	129.4	0.00	2,056	1,170	18,872	-
Rough	0.0	0.00	0	0.0	0	0.0	0.00	0	0	0	-
Other	31.0	2.15	0	151.9	780	3.5	0.00	1,132	0	2,821	-
Total	237.5	19.53	1,635	286.5	1,549	132.9	0.00	3,189	1,170	21,694	23,328

Report Units
- Total Loss
- Loss Per ha

Compact or Expand Report

Arable Cropping	ha
Winter Wheat	0
Winter Barley	0
Spring Barley	0
Winter OSR	0
Maize	0
Potatoes	0
Sugar Beet	0
Peas	0
Beans	0
Fodder Crops	0
Other Crops	0
Vegetables (Brassicas)	0
Vegetables (Other)	0
Orchards	0
Soft Fruit	0
Bare Fallow	0
Set Aside	0
Woodland	1

Grassland	ha
Permanent Pasture	9
Rotational Grassland	0
Rough Grazing	0

Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	18
Cattle (< 1 year) & Calves	18
Sheep	
Sheep	0
Lambs (< 1 year)	0

Livestock	Count
Indoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0
Outdoor Pigs	
Sows in Pig & Other Sows	0
Gilts in Pig & Barren Sows	0
Gilts Not Yet in Pig	0
Boars	0
Other Pigs (> 110kg)	0
Other Pigs (80 - 110kg)	0
Other Pigs (50 - 80kg)	0
Other Pigs (20 - 50kg)	0
Other Pigs (< 20kg)	0

Livestock	Count
Poultry	
Layers	0
Layers (Free range)	0
Pullet	0
Broilers	0
Turkeys	0
Breeding Birds	0
Other Poultry	0

Manure Values	kg N
Dairy FYM	0
Dairy Slurry	0
Beef FYM	512
Beef Slurry	0
Sheep FYM	0
Pig FYM	0
Pig Slurry	0
Poultry Muck	0

Appendix F: Chris Coxon's Phosphate Report

Client: Eastleigh Borough Council

Report: Solent Strategic Land Parcels – Phosphate Report

Date: 14 September 2021

Produced by: Chris Coxon BSc(Hons) Agric

FACTS No: FE/3327

Disclaimer:

Tiller Farm Consultancy Ltd shall not in any event be liable for direct or indirect loss or damage suffered in relation to the information, calculation, and reports.

This report was commissioned by Chris Payne of Eastleigh Borough Council (EBC) and utilises data supplied by Hilson Moran (HM), Environmental Consultancy.

This report is written by Chris Coxon of Tiller Farm Consultancy Ltd, a FACTS (Fertiliser Advisers Certification & Training Scheme) registered consultant, accredited number: FE/3327.

The purpose of this report is to appraise the phosphate applications made across the 5 EBC land parcels in relation to artificial fertiliser, organic manure inputs and deposition from livestock. The report utilises the Hilson Moran questionnaires, as contained in the 'Baseline Nitrogen Loss for Strategic Land Parcels' Report of 9 June 2021.

Phosphate in Soils

The application, crop utilisation, accumulation, and potential loss of phosphate from soil is challenging to fully quantify. The application and crop utilisation of phosphate are relatively straight forward as these can be measured either at source (e.g., by analysing a manure) or at harvest (by analysing a crop). The soil accumulation and/or loss of phosphate is more difficult, as variables in soil chemistry exist across different sites, resulting in total phosphate levels in the soil that are difficult and impractical to measure.

Phosphate is 'held' in soils by strong bonds, mainly with clay soil particles, meaning that clay dominant soils can potentially hold more phosphate. Furthermore, pH affects the availability of the phosphate, as acidic soils high in iron and aluminium compounds will form strong bonds with phosphate, and alkali soils will allow interactions with calcium. Both situations reduce phosphate availability, hence the recommendation to maintain agricultural soils at pH 6 – 6.5.

The loss of phosphate is mainly seen during actual soil erosion as the phosphate continues to maintain strong bonds (with clay), and so is washed away with the soil, while some phosphorus can also mobilise and be lost deep in the soil profile. It is understood that there is only a couple of percent of total soil phosphate available (for crops) in soil solution at any time, with some phosphate held in a readily available pool. Both these forms can be measured by standard soil analysis.

The challenging issue comes from the 'slowly available nutrient pool' which can be formed from any fertiliser application to then come back into the readily available pool in future years. This is best understood by the analogy of an iceberg – with the small section above the water being available to the plant with more rising to the surface if a section of the iceberg erodes near the top.

Crop nutrition relies on the best available techniques of management to know what a crop will require, and offtake at harvest by assessing the 'available pools' of phosphate through soil analysis and then feeding the crop (and the soil) to maintain the soil index, ideally at Olsen's level of '2'. It is understood that as long as soil erosion is minimised through good crop and soil husbandry, overall loses of phosphate will therefore be relatively low.

Phosphate in Artificial Fertilisers and Manures

The application of phosphate on the majority of farms is from 3 main sources:

1. Fertilisers containing phosphate either as a blend, as in '20:10:10' which contains 20% nitrogen, 10% phosphate and 10% potash, through to straight fertilisers as in Triple

Superphosphate (TSP - containing 46% P_2O_5) which is manufactured by treating rock phosphate the phosphoric acid. This latter fertiliser is used as a 'straight' fertiliser on many arable farms to annually supply specific amounts of phosphate where all the phosphate is in the fertiliser is potentially available to the plant.

2. Organic Manures contain variable amounts of phosphate as shown in the tables below. Unlike TSP, the availability of phosphate in manures varies as only a certain percentage is in a readily available form, typically 50-60%. The remaining portion is held for example in fibrous compounds (e.g., straw in FYM) which have to be broken down and then can be available to the crop over time, or even future crops in following years.
3. Compounds from industry – for example Fibrophos, which contains 12% phosphate and 12% potash – which is derived from the incineration of deep litter from the poultry industry to generate power.

The tables below show the relative concentrations of phosphate and their relative availability to a growing crop.

	Dry matter %	Phosphate			Potash[a]			Sulphur[b]	Magnesium
		Total phosphate kg P_2O_5/t	Availability %	Available phosphate kg P_2O_5/t	Total potash kg K_2O/t	Availability %	Available potash kg K_2O/t	Total sulphur kg SO_3/t	Total magnesium kg MgO/t
Cattle FYM	25	3.2	60	1.9	9.4	90	8.5	2.4	1.8
Pig FYM	25	6.0	60	3.6	8.0	90	7.2	3.4	1.8
Sheep FYM	25	3.2	60	1.9	8.0	90	7.2	4.0	2.8
Duck FYM	25	5.5	60	3.3	7.5	90	6.8	2.6	2.4
Horse FYM	25	5.0	60	3.0	6.0	90	5.4	1.6	1.5
Goat FYM	40	4.5	60	2.7	12.0	90	10.8	2.8	1.9

a. Values of potash may be lower for FYM stored for long periods in the open.

Source – Nutrient Management Guide (RB209), Section 2, Organic Materials, p17

	Dry matter %	Phosphate			Potash			Sulphur[a]	Magnesium
		Total phosphate kg P_2O_5/m^3 or /t	Availability %	Available phosphate kg P_2O_5/m^3 or /t	Total potash kg K_2O/m^3 or /t	Availability %	Available potash kg K_2O/m^3 or/t	Total sulphur kg SO_3/m^3 or /t	Total magnesium kg MgO/m^3
Slurries/liquids									
Cattle	2	0.6	50	0.3	1.7	90	1.5	0.3	0.2
	6[b]	**1.2**	**50**	**0.6**	**2.5**	**90**	**2.3**	**0.7**	**0.6**
	10	1.8	50	0.9	3.4	90	3.0	1.0	0.9
Dirty water	0.5	0.1	50	0.05	1.0	100	1.0	0.1	0.1
Separated cattle slurries (liquid portion)									
Strainer box	1.5	0.3	50	0.15	1.5	90	1.4	ND	ND
Weeping wall	3	0.5	50	0.25	2.3	90	2.1	ND	ND
Mechanical separator	4	1.2	50	0.6	2.8	90	2.5	ND	ND
Separated cattle slurry (solid portion)	20	2.0	50	1.0	3.3	90	3.0	ND	ND

a. For crop-available sulphur supply refer to Table 2.1 on page 12.

b. Typical dry matter and nitrogen contents of cattle slurry are shown in bold.

ND = No data

To convert kg/m³ to units/1,000 gallons, multiply by 9.

Source – Nutrient Management Guide (RB209), Section 2, Organic Materials, p21

Crop Applications of Phosphate to EBC Farms

The information used for all these reports was taken from the questionnaires as contained in the Hilson Moran 9 June 2021 report.

Where applicable, any livestock grazing will contribute to the phosphate applied to the land and it is important that this data is entered into any Farmscoper models to assess the overall phosphate balance.

Map Ref. 31 – Botley – Owner, Gosney

1. **Cropping - Questionnaire**

The crop rotation provided is shown Table 1 which highlights how the average cropping areas in the questionnaire were calculated. These have been detailed in a previous Tiller report.

TABLE 1. CROP AREAS / ROTATIONS

Area (Ha)	Winter Wheat	Winter Barley	Spring Barley	Maize	Grass	Other	Total
2020	0.00	0.00	16.19	6.00	0.00	4.94	27.13
2019	10.23	8.50	3.46	0.00	0.00	4.94	27.13
2018	12.00	10.00	0.00	0.00	0.19	4.94	27.13
2017	9.00	8.30	0.00	0.00	4.89	4.94	27.13
2016	10.60	0.00	1.20	2.54	7.85	4.94	27.13
5 Yr Av (Ha)	**8.37**	**5.36**	**4.17**	**1.71**	**2.59**	**4.94**	**27.13**

For clarification, the 4.94ha of 'other' is cited as a combination of bare/fallow land, set-aside, or woodland.

2. **Crop Nutrient Applications - Questionnaire**

The Gosney land received 3 fertiliser products:

- Ammonium Nitrate, containing 34.5% nitrogen
- 'Single Top' containing 27% nitrogen and 12% sulphur (as SO3)
- A compound fertiliser '20:10:10' containing 20% nitrogen, 10% phosphate and 10% potash.

The land also received an average of 500 tonnes of cattle FYM applied annually, spread across the 22.19ha of cropped land.

3. **Crop Application - Calculations**

The full fertiliser regime with specific reference to phosphate applications is detailed in the table 2 overleaf.

The application of FYM (to stubbles where arable) followed by a combination of relevant fertiliser products provides a calculation for the total phosphate applied to each crop.

The table below shows that there is a range of differences between the applied and required phosphate for each crop. This ranges from -22kg/ha (two thirds the requirement) for both Wheat and Winter Barley, through to an over application of 53kg/ha for the maize in the rotation.

While there are no non-compliances from a regulatory perspective, this regime does not appear to consider crop requirement for each specific crop in the rotation.

TABLE 2. NUTRIENT APPLICATIONS & PHOSPHATE APPLIED

Fertiliser Plan Used	Product	kg/ha	kg P/ha TOTAL	kg P/ha AVAILABLE	kg P/ha Required	kg P/ha Difference
Wheat	Cattle FYM	22,500	72	43		
	27N/12SO3	185	0	0		
	34.5% N	435	0	0		
Total			72	43	65	-22
Winter Barley	Cattle FYM	22,500	72	43		
	27N/12SO3	185	0	0		
	34.5% N	330	0	0		
Total			72	43	65	-22
Spring Barley	Cattle FYM	22,500	72	43		
	20:10:10	650	65	65		
Total			137	108	80	28
Maize	Cattle FYM	22,500	72	43		
	20:10:10	650	65	65		
Total			137	108	55	53
Grass	Cattle FYM	22,500	72	43		
	34.5% N	650	0	0		
Total			72	43	65	22

4. FYM Applications and Crop Availability of Phosphate

The 22.5t/ha (22,500kg/ha) of cattle FYM has a standard nutrient content of 3.2kg P_2O_5/tonne. This equates to 72kg P_2O_5/ha.

The RB209 table on p2 of this report show that 60% of the phosphate is available to the next growing crop, which is calculated at 43kg P_2O_5/ha.

Map Ref. 21, 22, 28, 29, 30, Owner – Gosney

The information provided accounts for grazed beef cattle, organic manures, and artificial fertiliser applications.

1. Grazing – NVZ Compliance

The number of beef cattle on the holding averaged 20 beef cows (sucklers), 20 calves and 1 bull. The farm also imported 750 tonnes of FYM annually for spreading on the grassland.

2. Fertiliser Application

The data from the questionnaire was used to check the nutrient applications of phosphate.

Table 3 below shows that the total application of phosphate was 20kg/ha more than that required from a standard grazing system. The phosphate requirements for grazing are relatively low as there is effective cycling of phosphate by cattle where they excrete excess phosphorus which is then utilised by grass regrowth during the season.

TABLE 3. NUTRIENT APPLICATIONS OF PHOSPHATE

Fertiliser Plan Used	**Product**	**kg/ha**	**kg P/ha TOTAL**	**kg P/ha AVAILABLE**	kg P/ha Required	kg P/ha Difference
Grass	Cattle FYM	20,700	66	40		
	34.5% N	650	0	0		
Total			66	40	20	20

3. FYM Applications and Crop Availability of Phosphate

Table 3 shows the assumption that 750 tonnes of FYM were spread across 36.2ha. This is an average application rate of 20.7t/ha (20,700kg/ha) of FYM containing the standard nutrient content of 3.2kg P_2O_5/tonne. This equates to 66kg P_2O_5/ha of which 60% is available equating to 40kg P_2O_5/ha.

Map Ref. 35a, 35b (Stoke Park Farm), Owner - Dunford

The information provided in the HM questionnaire was based on average applications across the holding.

1. Land Use and NVZ Compliance

The average number of livestock on this holding was 259 dairy cows, 5 dairy heifers and an average of 10 calves. The export of FYM from the holding is a requirement for NVZ compliance. All the slurry produced is spread at Stoke Park Farm with 50% of the FYM spread on Manor Farm and the remaining 50% exported to another holding.

2. Fertiliser Applications

The main land use at Stoke Park Farm is for grass silage and grazing. The areas and respective phosphate applications are shown in the table below. The fertilisers used by the Dunford Family were Urea containing 46% nitrogen only.

TABLE 4. NUTRIENT APPLICATIONS & PHOSPHATE APPLIED

Fertiliser Plan Used	Product	kg/ha	kg P/ha TOTAL	kg P/ha AVAILABLE	kg P/ha Required	kg P/ha Difference
Grass - Grazing 59ha	Urea 46% N	417	0	0		
	Slurry	12,000	14	7		
Total			14	7	20	-13
Grass - Silage 28ha	Urea 46% N	522	0	0		
	Slurry	50,000	60	30		
Total			60	30	65	-35

3. Slurry Applications and Crop Availability of Phosphate

Table 4 shows the breakdown of where 2,100 m3 of slurry were spread annually across 87ha. This is an average application rate of 24m3/ha (24,000kg/ha) of slurry containing the standard nutrient content of 1.2kg P_2O_5/m3. This equates to an average of 29kg P_2O_5/ha of which 50% is available equating to 14kg P_2O_5/ha.

The application of phosphate via the slurry across the holding was less than requirement across the reference years.

Map Ref 6 (Manor Farm), Owner – Dunford

The information provided in the HM questionnaire was based on average applications across the holding.

1. Land Use

The Manor land was utilised as a circa 50:50 split of grass for silage and forage maize, all utilised to feed the dairy herd at Stoke Park Farm. There was no livestock grazing on the Manor during the reference years.

2. Fertiliser Applications

The table below highlights that no phosphate was applied to the grass over the reference years and that crop requirement was nearly matched for the maize, as supplied by the FYM.

TABLE 5. NUTRIENT APPLICATIONS & PHOSPHATE APPLIED

Fertiliser Plan Used	Product	kg/ha	kg P/ha TOTAL	kg P/ha AVAILABLE	kg P/ha Required	kg P/ha Difference
Grass - Silage 27ha	Urea 46% N	526	0	0		
Total			0	0	65	-65
Maize - 27.5ha	Urea 46% N	259	0	0		
	FYM	29,700	95	57		
Total			95	57	55	2

3. Slurry Applications and Crop Availability of Phosphate

Table 5 highlights that 29.7t/ha of FYM was spread annually across 27.5ha. At the standard nutrient content of 3.2kg P_2O_5/t, this equates to an average of 95kg P_2O_5/ha of which 60% is available equating to 57kg P_2O_5/ha.

Map Ref. 4, Owner – Morris

The information provided is based on 25 acres of land, with a total of 9 ha (22.2 ac) on the fertiliser use page, and accounts for grazed beef cattle and artificial fertiliser applications.

1. Land Use - Grazing

The number of beef cattle averaged 40 head across the 9ha, plus a further 2ha of grazing during the summer months (outside the total of sale land). A pro-rata 10% reduction in stocking rate was applied as shown in the previous Tiller report.

2. Fertiliser Application

The application of 250kg N/ha to the 9ha of grazing land is shown by the questionnaire.

The actual fertilisers used were not known at the time of writing. There are 2 likely scenarios for product choice.

a. A straight nitrogen fertiliser containing no phosphate
b. A compound fertiliser containing the 25:5:5 (25% nitrogen, 5% phosphate, 5% potash).

As there has been no FYM applied, it could be assumed that the 25:5:5 product use was likely to provide the phosphate and potash required for an intensive grass system.

On this assumption, the application of 250kg N/ha/yr would mean that a calculated ratio of 50kg of P_2O_5/ha would be applied each year.

TABLE 6. NUTRIENT APPLICATIONS OF PHOSPHATE

Fertiliser Plan Used	Product	kg/ha	kg P/ha TOTAL	kg P/ha AVAILABLE	kg P/ha Required	kg P/ha Difference
Grass	25:05:05	1,000	50	50		
Total			50	50	20	30

The table shows that this is effectively an over-application each year of phosphate by 30kg/ha/yr.

Summary

The data provided demonstrates the actual (or typical in the case of Morris) applications of phosphate from applications of organic and artificial fertilisers across the EBC Farms. The data shows a range of management techniques and the comparison with the Nutrient Management Manuals (RB209) highlights where applications have differed to crop requirements for each farm.

Tiller Farm Consultancy would be happy to assist with further data clarification if required.

References

[1] Environment Agency (2016). *Datasheet: Nitrate vulnerable zone (NVZ) designation 2017 – Eutrophic Waters (Estuaries and Coastal Waters), NVZ Name: Hamble Estuary*, NVZ ID: ET3, June 2016

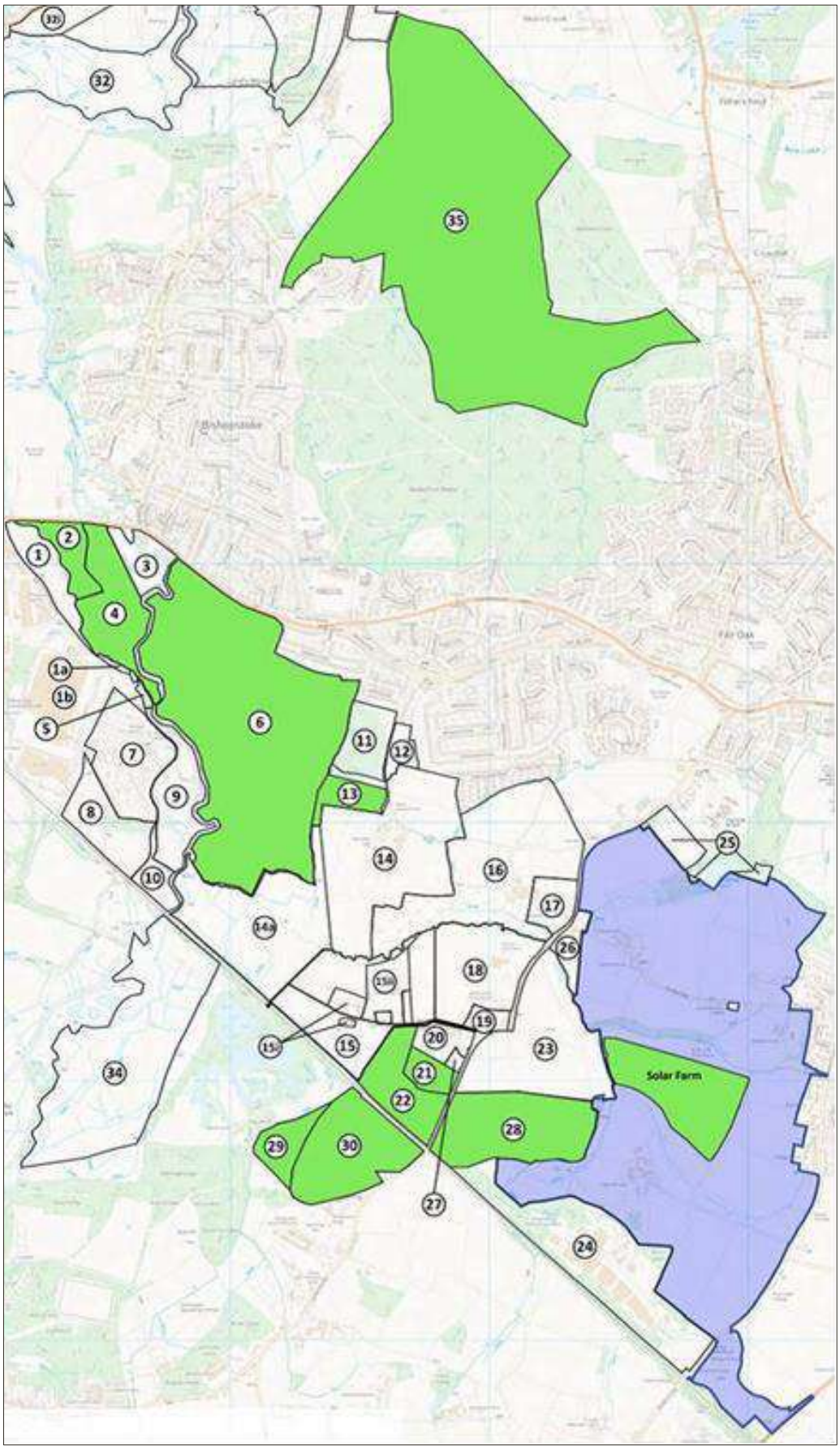
[4] DEFRA (2002). Guidelines for Farmers in NVZs – England, Revised Edition, July 2002.

[5] Newell Price, J.P., Harris, D., Taylor, M., Williams, J.R., Anthony, S.G., Duethmann, D., Gooday, R.D., Lord, E.I., Chambers, B.J., Chadwick, D.R. and Misselbrook, T.H. (2011). *Mitigation Methods – User Guide: An Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, Greenhouse Gas Emissions and Ammonia Emissions from Agriculture*, prepared as part of DEFRA Project WQ0106, December 2011.

[6] Environment Agency (2019). *Catchment Sensitive Farming Evaluation Report – Water Quality, Phases 1 to 4 (2006-2018)*. Natural England publication, June 2019.

Appendix C: EBC Nutrient Register Summary for P Credits as per 11/11/14 and map of Strategic Land Parcels

	Total P Credits	Available P Credits	Reserved P Credits	Invoiced Not Paid P Credits	Invoiced & Paid P Credits
West End	9.800	0.538	5.692	0.110	3.460
Bishopstoke	50.780	30.120	11.400	0.000	9.260
Fair Oak	86.600	86.280	0.000	0.000	0.320
TOTAL	**147.18**	**116.938**	**17.092**	**0.110**	**13.040**


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35
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1a
1b
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Solar Farm

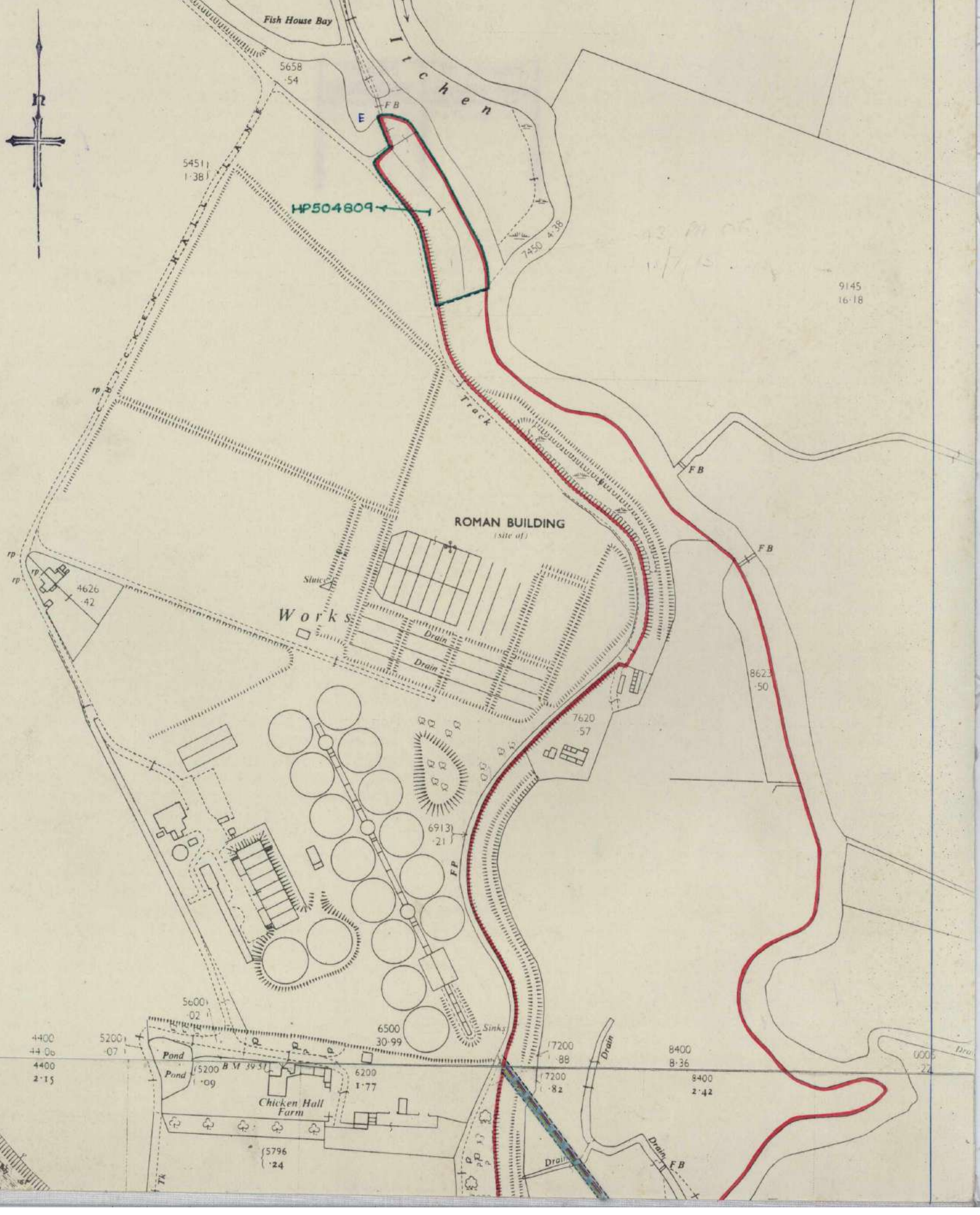
Appendix D: Chickenhall Land Registry & Outfall Easement Plans

MB 25

H.M. LAND REGISTRY

TITLE NUMBER	
HP 127744	

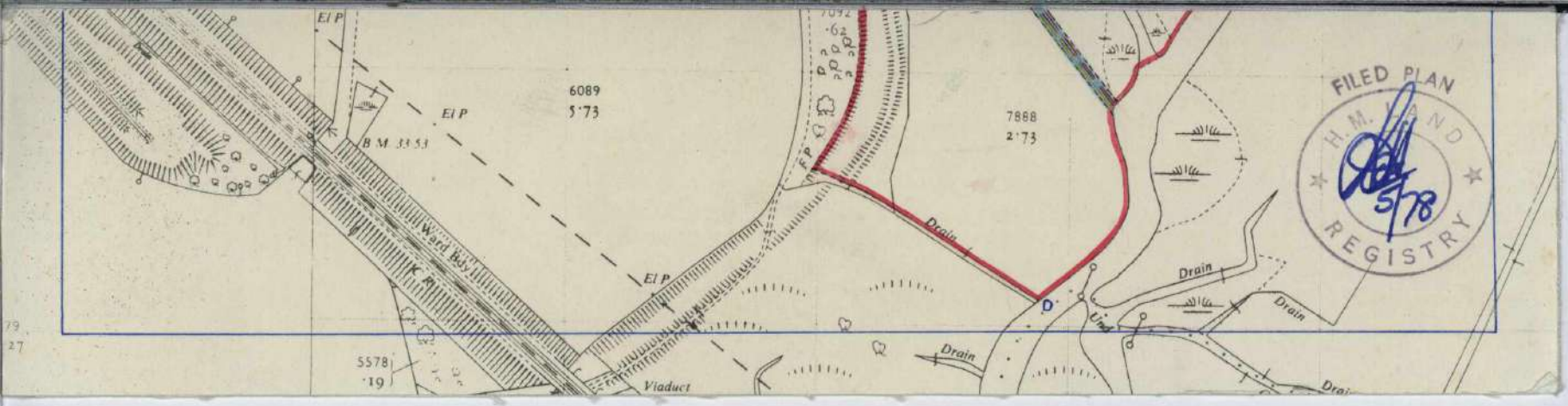
ORDNANCE SURVEY PLAN REFERENCE	SU46/4717 SU46/4718	Scale 1/2500
COUNTY HAMPSHIRE	DISTRICT EASTLEIGH	© Crown copyright



This is a print of the view of the title plan obtained from HM Land Registry showing the state of the title plan on 23 September 2020 at 15:27:01. This title plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale. Measurements scaled from this plan may not match measurements between the same points on the ground.

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DATED 13TH March 1980

E. R.
H.M. LAND REGISTRY
TITLE No. HP127744
NOTICE REGISTERED.

MACSTONE COMPANY
(DEVELOPMENT) LIMITED

to

SOUTHERN WATER AUTHORITY

Duplicate/

DEED OF GRANT

of

easement for an outfall pipe at Stanford Meadows Eastleigh in the County of Hants

SU 4614 - 4713
4618 - 4717

H 133

DH/SD76/SB

HP238859

THIS DEED OF GRANT made the Thirteenth day of March One thousand nine hundred and eighty BETWEEN MACSTONE COMPANY (DEVELOPMENT) LIMITED whose registered office is situate at Somac House Brickfield Lane Chandlers Ford in the County of Hants (hereinafter called "the Owner" which expression where the context so admits shall include its successors in title and assigns) of the one part and SOUTHERN WATER AUTHORITY of Guildbourne House Worthing in the County of West Sussex (hereinafter called "the Authority") of the other part

WHEREAS:

(1) The Owner is registered as proprietor of certain land situate at and known as Stanford Meadows Bishopstoke in the County of Hants TOGETHER with the sole and exclusive fishing rights in the River Itchen incidental to such land which said fishing rights are from the right bank of the said river and extend for about one thousand yards with Title Absolute (Title No. HP127744) under the Land Registration Acts 1925 to 1971

(2) An 18 inch sewer has been laid in the approximate position shown by a brown line on the plan number SP/A/78 and a 36 inch sewer has been laid in the approximate position shown by a green line on the said plan under the provisions of Section 15 of the Public Health Act 1936

(3) See Margin

(4) The Authority is now desirous of laying and maintaining an outfall pipe in and through the said land and has requested the Owner to grant it the easements hereinafter mentioned which the Owner has agreed to do on the terms and conditions hereinafter contained

NOW THIS DEED WITNESSETH as follows:-

1. In pursuance of the said agreement and in considerati of the sum of One pound now paid by the Authority to the Owr (the receipt whereof the Owner hereby acknowledges) the Owr as Beneficial Owner hereby grants and confirms unto t Authority:-

(3) The Authority have since blocked off and raised and sealed the manholes on the section of the sewer shown by a b between the points marked 'A' and B' on the plan

(a) full right and liberty for the Authority its servants and agents at all times and with or without vehicles plant machinery and apparatus to enter upon the land shown coloured blue on the plan (hereinafter called "the blue land") as required for the purpose of laying tapping enlarging altering renewing maintaining inspecting cleansing and repairing an outfall pipe with all necessary valves surface boxes marker posts pillars fittings and apparatus and a cable or cable duct along the line of the outfall pipe (which outfall pipe and ancillary works are hereinafter collectively called "the works")

(b) full and free right at all times to the uninterrupted passage and running of sewage water and soil through the said outfall pipe

TO HOLD the said rights and liberties unto the Authority in fee simple

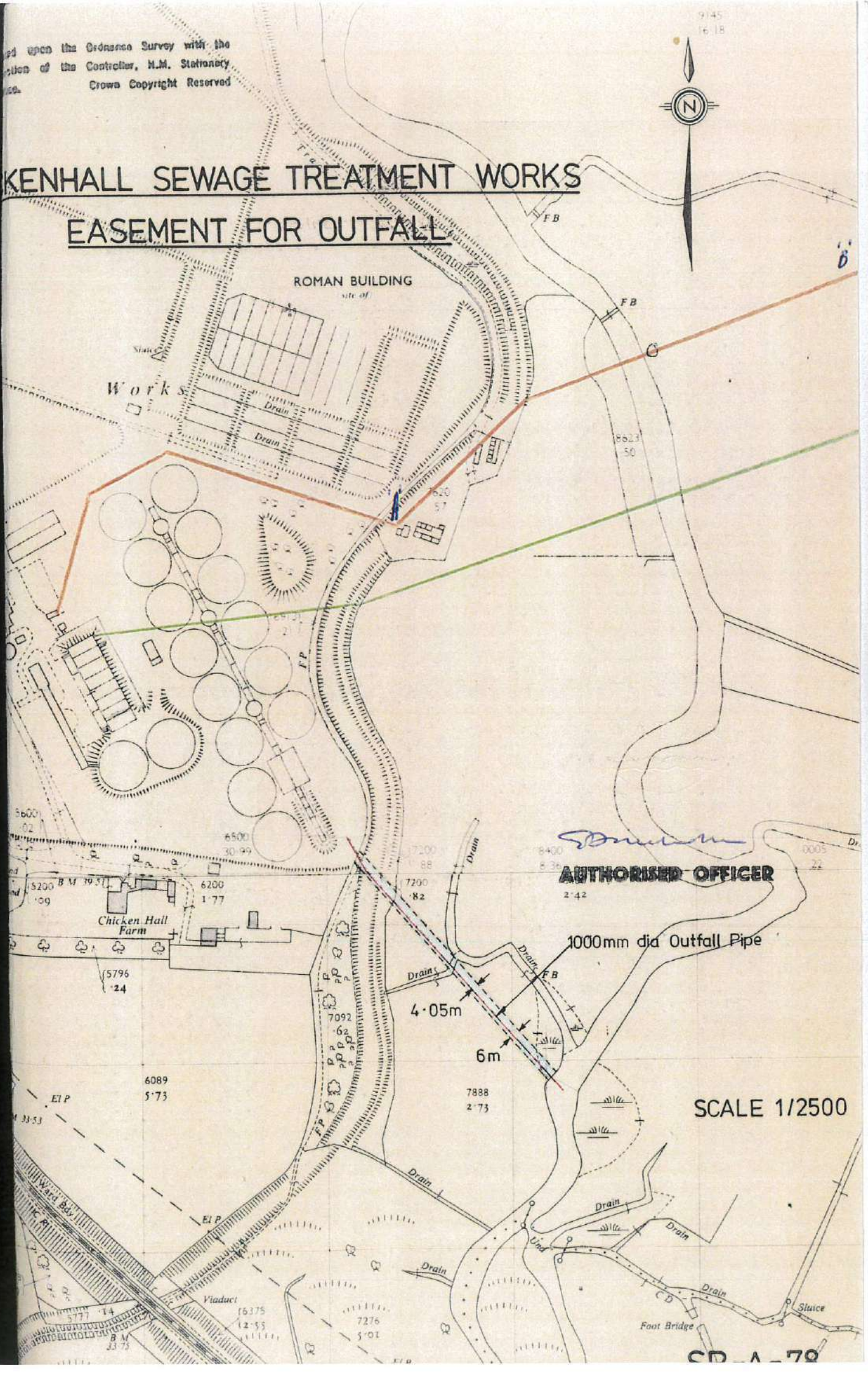
2. The Owner hereby covenants with the Authority for the benefit and protection of the works and the Authority's undertaking and so as to bind the owner or owners for the time being of the blue land and all persons deriving title from it or them not to do or suffer or permit to be done upon the blue land or upon any part of the Owners adjoining or neighbouring land any act or thing which might cause or is likely to cause damage or injury to the works or prevent hinder or obstruct access by the Authority to the works or affect the flow of sewage water or soil carried thereby in accordance with the terms of this grant and the Owner will take all reasonable precautions to prevent such damage or injury and in particular but without prejudice to the generality of the foregoing the Owner will not:-

(a) place or instal or suffer or permit to be placed or installed in over or upon any part of the blue land any sewers pipes drains wires ducts cables or anything of a like nature without the previous written consent of the Authority

ed upon the Ordnance Survey with the
ption of the Controller, H.M. Stationery
ce. Crown Copyright Reserved

KENHALL SEWAGE TREATMENT WORKS

EASEMENT FOR OUTFALL



(b) plant or suffer or permit to be planted upon the blue land any tree or shrub or erect or suffer or permit to be erected thereon any building wall or structure or permanent apparatus of any type whatsoever

(c) place or use or suffer or permit to be placed or used upon the blue land any machinery or vehicles or goods or materials of a heavy nature likely to affect or cause interference or disturbance to the works

(d) reduce or increase the depth of soil above the works nor lessen or in any way interfere with the support afforded to the works by the surrounding soil including minerals without the written consent of the Authority

PROVIDED ALWAYS that nothing contained in this Clause shall prevent the owner or occupier of the land from carrying out normal agricultural operations or acts of good husbandry on the blue land not causing interference or damage or injury to the works or material reduction of the depth of soil as aforesaid

3. The Authority hereby covenants with the Owner as follows:-

(a) on completing the installation of the works or any subsequent maintenance or repair thereof to make good at its own expense all damage or injury which may be done or occasioned to the blue land and the Owners adjoining land through or by reason or in consequence of the exercise by the Authority its servants or agents of all or any of the easements rights and liberties hereby granted

(b) to make good at it's own expense and to the satisfaction of the Owner all damage to gates fences hedges or any building or buildings now erected or within 80 years of the date hereof erected on the Owner's adjoining land and to carry out any necessary restoration and making good of the surface of the land

entered upon and the returfing thereof caused or becoming necessary by reason of the exercise of the rights hereby granted

(c) to make good at it's own expense and to the satisfaction of the Owner all damage caused to the Owner's adjoining land by the escape of sewage water and soil from the said 18 inch and 36 inch sewers and the outfall pipe and to remove forthwith any solid matter deposited on the Owner's adjoining land and thoroughly cleanse and restore such land to it's former condition prior to such deposit

(d) to comply with the provisions of the Rivers (Prevention of Pollution) Acts 1951 to 1961 and any statute modifying or replacing the same and the regulations thereunder respectively and the byelaws of the Hampshire River Authority

(e) not to permit any solid matter to be deposited or escape or any liquid matter to flow or percolate into the River Itchen or into any ditch or channel used in connection or communicating therewith until the same shall have been sufficiently filtered or otherwise treated as to be innocuous to life and incapable or causing any destruction of or injury to fish or the breeding of fish or the young of fish fry or ova of fish or any damage to the bed or banks of the said river or any pollution to the water thereof

(f) to indemnify and keep indemnified the Owner against all actions proceedings costs charges claims and demands (other than actions proceedings costs charges claims and demands occasioned by or arising out of the negligence or wrongful act or default of the Owner its servants or agents or others authorised by the Owner) arising by reason of the laying tapping enlargement alteration renewal maintenance inspection cleansing and repair of the works or failure to repair the same on the part of the Authority Provided Always that (i) the Owner shall

as soon as practicable give notice in writing to the Authority of any actions proceedings claims and demands brought made or threatened against the Owner and shall not admit liability settle adjust or compromise any such actions proceedings claims or demands without the prior consent in writing of the Authority and (ii) the Authority may at its own cost and expense defend settle adjust compromise or otherwise deal with any such actions proceedings claims or demands on such terms as the Authority shall deem fit the Owner giving to the Authority at the like cost and expense all such assistance as the Authority may reasonably require

4. It is hereby agreed and declared that this Deed supersedes and replaces Deeds of Grant dated the Eighteenth day of January One thousand nine hundred and thirty-two and made between the Right Honourable Stuart Baron Swaythling of the first part The Honourable Lionel Samuel Montagu the said Right Honourable Stuart Baron Swaythling and Walter Louis D'Arcy Hart of the second part and The Urban District Council of Eastleigh and Bishopstoke of the third part the Nineteenth day of May One thousand nine hundred and sixty and made between Christopher Bryan Stracey Clitherow of the one part and The Mayor Aldermen and Burgesses of the Borough of Eastleigh of the second part and Seventh day of July One thousand nine hundred and sixty-nine made between Richard Garnett Thomas James Duke and Jack Kingsmill Plumpton of the one part and The Mayor Aldermen and Burgesses of the Borough of Eastleigh of the other part

5. In this Deed where the context so admits words importing the singular number only shall include the plural number and vice versa and words importing the masculine gender shall include the feminine gender and vice versa and words importing persons and all references to persons shall include companies corporations and firms and vice versa and where at any time there are two or more persons included in the expression "the Owner" the covenants entered into or implied hereunder by the Owner shall be deemed to be made by and binding on such persons jointly and severally

7. It is hereby certified that the transaction hereby effected does not form part of a larger transaction or of a series of transactions in respect of which the amount or value or the aggregate amount or value of the consideration exceeds Fifteen thousand pounds

I N W I T N E S S whereof the Owner and the Authority have caused their respective Common Seals to be hereunto affixed the day and year first before written

THE COMMON SEAL of MACSTONE COMPANY)
(DEVELOPMENT) LIMITED was hereunto)
affixed in the presence of :-)

Director [redacted]

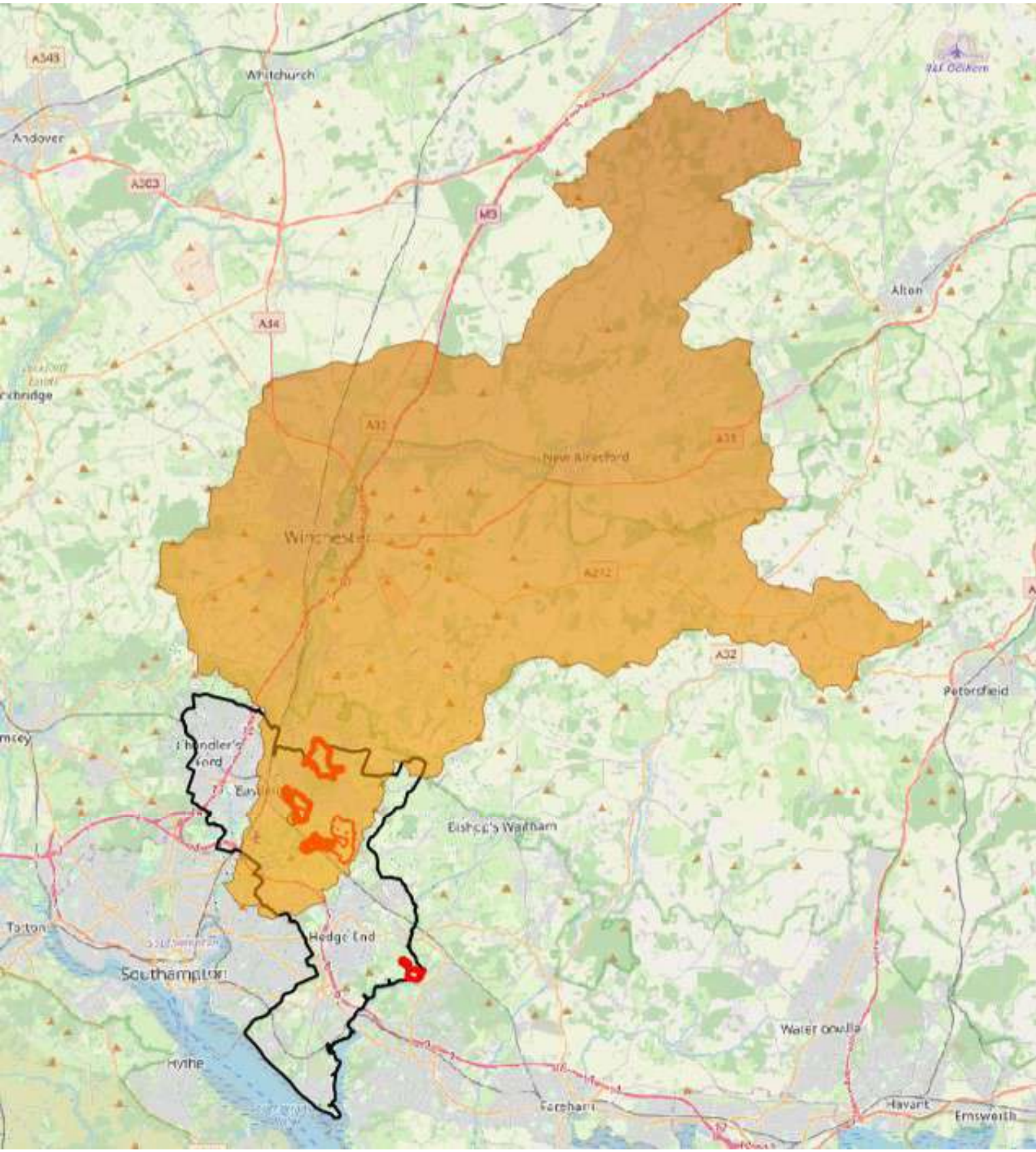
DIRECTOR.
~~Secretary~~

THE COMMON SEAL of SOUTHERN WATER)
AUTHORITY was hereunto affixed in)
the presence of :)

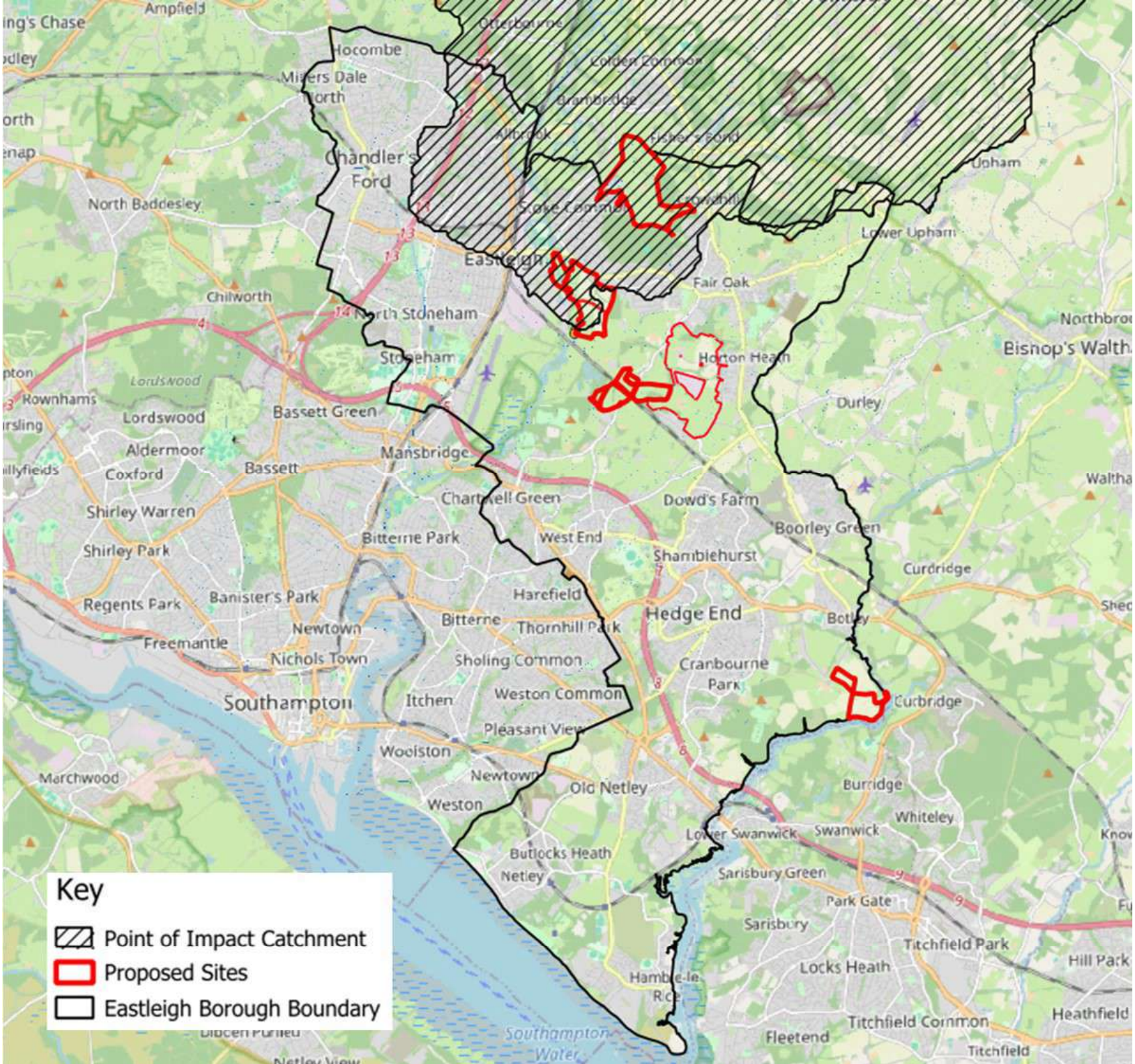
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Authorised Officer

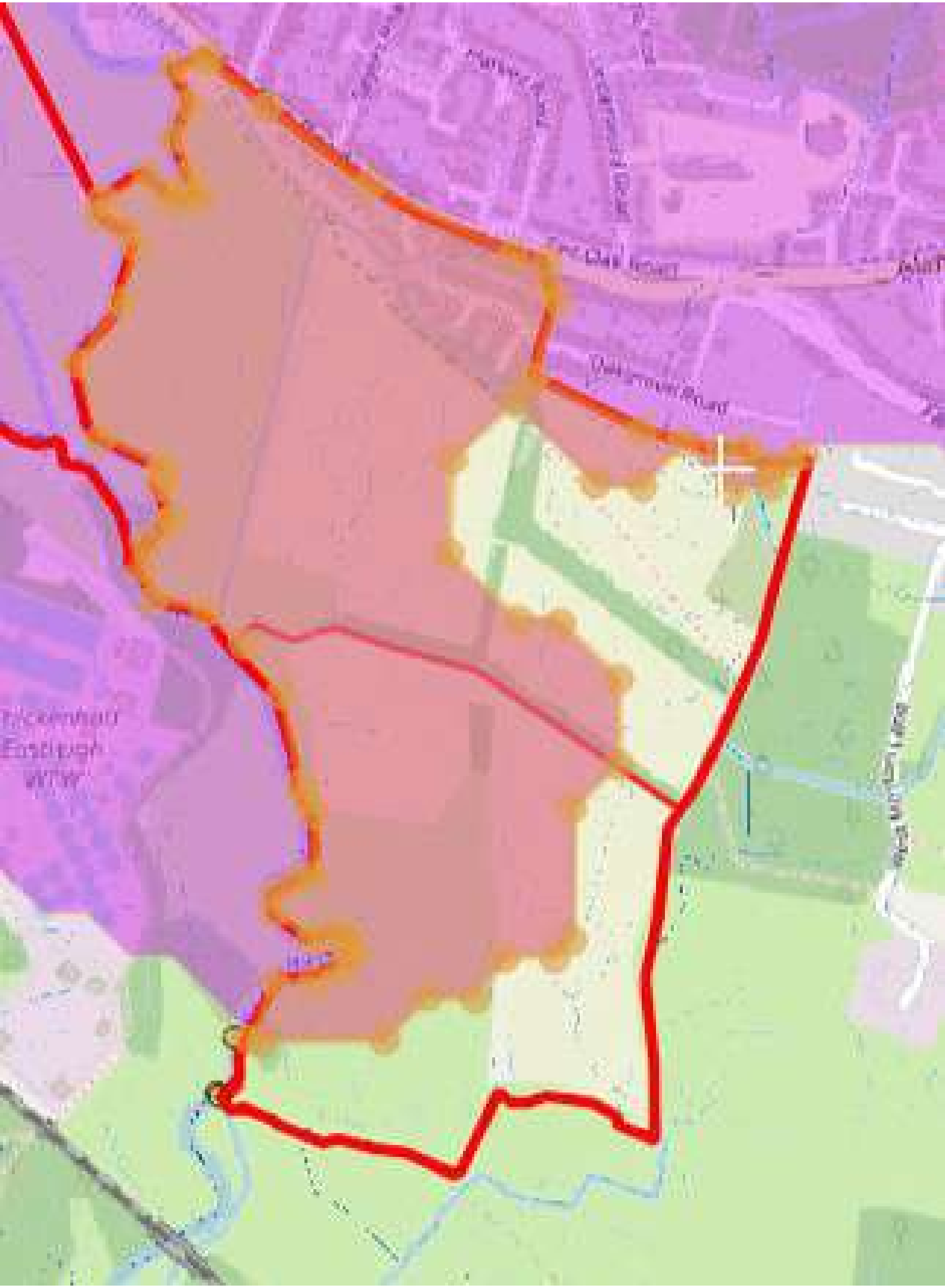
Appendix E: EBC owned Strategic Land Parcels shown within the context of the River Itchen SAC catchment


A343
Andover
A303
M3
A34
A31
A33
A32
Alton
Petersfield
Hedge End
Southampton
Eastleigh
Fareham
Havant
Emsworth
Hythe
Waterlooville

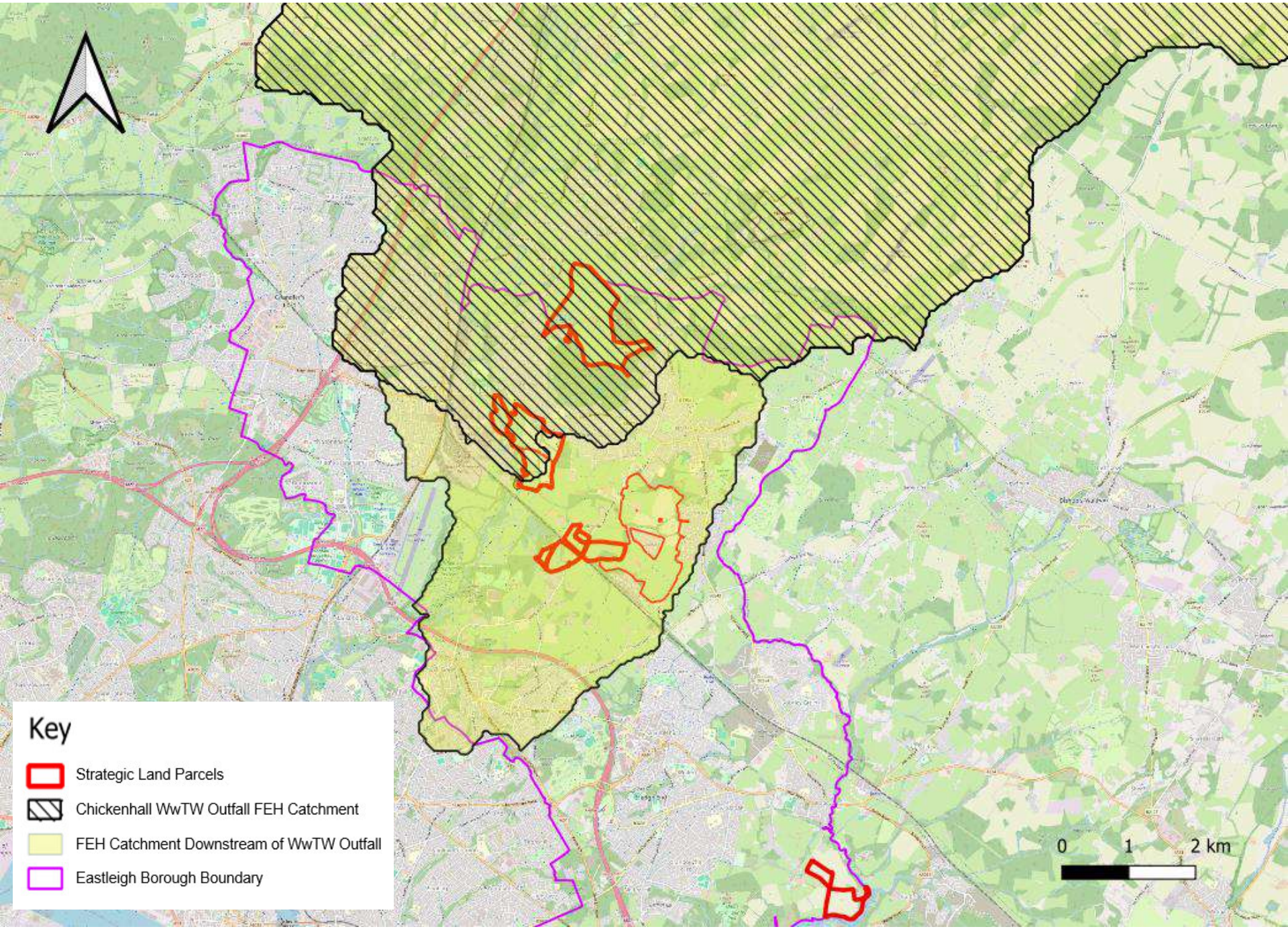
Appendix F: EBC owned Strategic Land Parcels shown within the context of the catchment directly upstream from the Chickenhall WwTW


Key
Point of Impact Catchment
Proposed Sites
Eastleigh Borough Boundary
Southampton
Eastleigh
Chandler's Ford
Hedge End
Bitterne
Woolston
Itchen
Netley
Lordswood
Bassett
Mansbridge
Shirley
Shirley Warren
Shirley Park
Regents Park
Banister's Park
Freemantle
Newtown
Nichols Town
Harefield
Thornhill Park
Sholing Common
Weston Common
Pleasant View
Old Netley
Weston
Butlocks Heath
Lower Swanwick
Swanwick
Whiteley
Burridge
Curbridge
Cranbourne Park
Botley
Boorley Green
Dowd's Farm
Durley
Horton Heath
Fair Oak
Lower Upham
Upham
Bishop's Waltham
Stoneham
North Stoneham
Chilworth
North Baddesley
Otterbourne
Colden Common
Dibden Purlieu
Hamble-le-Rice
Sarisbury
Sarisbury Green
Park Gate
Titchfield Park
Locks Heath
Titchfield Common
Fleetend
Titchfield
Heathfield
Hill Park
Southampton Water

Appendix G: Partition of Strat Land Parcel 6 by Chickenhall outfall catchment boundary



Appendix H: Strategic Land Parcels with Points of Impact downstream from Chickenhall WwTW outfall


Key
Strategic Land Parcels
Chickenhall WwTW Outfall FEH Catchment
FEH Catchment Downstream of WwTW Outfall
Eastleigh Borough Boundary
0
1
2 km

Appendix 8 Updated Lower Acre Nutrient Neutrality Calculation

Revised Lower Acre Parcel Nutrient Neutrality Calculation

Introduction

The following note provides a revised nutrient neutrality calculation for the Lower Acre (First Residential Parcel), updating the calculation presented in the Hilson Moran report: "*Nutrient Neutrality Study: One Horton Heath, First Residential Parcel*" (1st November 2022, Issue 05, HM Ref. 25709-RP-IE-001).

At the time of preparing the report, the Sustainable Drainage Systems (SuDS) element was not yet available on the NE calculator. As such, N & P removal rates of 61 % and 50 % were derived from the literature, and there was an aim to maintain and demonstrate these removal rates through a programme of SuDS optimisation, maintenance and monitoring.

Consequently, the updated NE calculator has been applied to the Lower Acre scheme, assuming that the SuDS provision will be compliant with CIRIA guidance (namely , as per Section 2.1.4 above. This has resulted in a revised pre-2030 N-loading of **123.12 kg N/yr** (deficit) and P-neutrality, with an overall benefit **0.37 kg P/yr** (benefit). (namely CIRIA C815F: "*Using SuDS to reduce nitrogen in surface water runoff*", 2023; and CIRIA C808: "*Using SuDS to reduce phosphorous in surface water runoff*", 2022) and the N & P removal rates therein.

In addition, the 1st November 2022 FRP Nutrient Neutrality Assessment assumed a per capita daily water usage of 120 l/person/ day (i.e. 110 l/person/day, + 10 l/person/day buffer). Since then, EBC has signed up to a water usage pilot scheme with Southern Water to help meet the local sustainable supply balance. As such, the partnership has recommended a voluntary target of 95 litres per person per day be set for each new housing development. Under the Water Industry Act 1991 a one-off charge is payable where properties are connected for the first time into the water supply or the public sewage system. For the term of the pilot scheme if developers meet the 95 litres per person per day target for new homes then Southern Water will give an infrastructure charge discount of 40% on the standard network connection charges, thereby giving a clear price signal for the developers to drive demand reduction. This 95 litres per person per day benchmark has, therefore, been adopted by EBC for the OHH scheme.

This has consequently been used in the revised Lower Acre calculation below (with a NE-recommended 10 l/person/day buffer).

Furthermore, Chickenhall Eastleigh Wastewater Treatment Works (WwTW) will benefit from the proposed upgrades scheduled to take place through the Levelling Up and Regeneration Bill (LURB) in 2030. Consequently, a permitted TN limit of 10 mg/l will be adopted for the WwTW post-1st January 2030. This will reduce to 8 mg TN/l with allowance for the amount of nitrogen already within potable drinking water, and to 7.2 mg TN/l with the 10 % operational reduction.

As a result of the LURB upgrade, the permitted limit of TP will also fall from 6 to 0.25 mg/l, post 1st January 2030. This will reduce to 0.225 mg TP/l with the 10 % operational reduction. Consequently, calculations have been provided for pre-2030 and post-2030 scenarios.

Stage 1: Development Wastewater Loading

The annual pre-2030 N and P loading resulting from wastewater generation from the residential properties in the Lower Acre are **788.69 kg TN/yr** and **18.93 kg TP/yr**, as identified in Table 1.

The annual post-2030 N and P loading resulting from wastewater generation from the residential properties in the Lower Acre are **252.38 kg TN/yr** and **7.89 kg TP/yr**, as identified in Table 2.

Table 1 Pre-2030 Nutrient Loading from Operational Wastewater Generation

			Nitrogen	Phosphorus
Step 1	Homes (No.)		381	381
	Average Occupancy Rate (persons/dwelling)		2.4	2.4
	Residents (No.)		914	914
Step 2	Water usage (l/person/day)		105	105
	Wastewater Volume Generated (l/person/yr)		38,351	38,351
	Wastewater Volume Generated (l/yr)		35,053,043	35,053,043
Step 3	Chickenhall Eastleigh WwTW Permit (mg /l)		27.0	0.60
	Discharge permit with allowance for potable water removal (mg/l)		25.0	0.60
	Operation at 90 % of the permit limit (mg/l)		22.5	0.54
	Nutrient Discharge	mg/yr	788,693,456	18,928,643
		Kg/year	**788.69**	**18.93**

Table 2 Post-2030 Nutrient Loading from Operational Wastewater Generation

			Nitrogen	Phosphorus
Step 1	Homes (No.)		381	381
	Average Occupancy Rate (persons/dwelling)		2.4	2.4
	Residents (No.)		914	914
Step 2	Water usage (l/person/day)		105	105
	Wastewater Volume Generated (l/person/yr)		38,351	38,351
	Wastewater Volume Generated (l/yr)		35,053,043	35,053,043
Step 3	Chickenhall Eastleigh WwTW Permit (mg /l)		10.0	0.25
	Discharge permit with allowance for potable water removal (mg/l)		8.0	0.25
	Operation at 90 % of the permit limit (mg/l)		7.2	0.225
	Nutrient Discharge	mg/yr	252,381,906	7,886,935
		Kg/year	**252.38**	**7.89**

Stage 2 Baseline Nutrient Losses

The annual N and P loading from baseline land uses within the Lower Acre are **378.06 kg TN/yr** and **9.46 kg TP/yr**, as identified in Table 3. There are no residential properties within the Lower Acre area for inclusion within the baseline nutrient losses.

Table 3 Baseline Nutrient Loading Pre-Development

Parcel	Area (ha)	Use	Nitrogen		Phosphorus	
			Output/ha (kg)	Total Output (kg)	Output/ha (kg)	Total Output (kg)
0.3	0.44	Urban	15.38	6.84	1.65	0.73
0.4	0.35	Urban	15.38	5.44	1.65	0.58
0.7	0.01	Urban	15.38	0.21	1.65	0.02
33	0.89	Rotational Grassland	33.85	28.83	0.73	0.65
34	0.89	Permanent Pasture	33.85	28.91	0.60	0.54
35	0.04	Permanent Pasture	33.85	1.29	0.60	0.02
46[1]	0.00	Permanent Pasture	33.85	0.00	0.60	0.00
47	2.31	Rotational Grassland	33.85	74.75	0.73	1.68
48.1	7.16	Rotational Grassland	33.85	231.81	0.73	5.22
		Total		**378.06**		**9.46**

Stage 3: Post-Development Land Use Losses

The annual N and P loading from post-development land uses within the Lower Acre are **149.33 kg TN/yr** and **15.12 kg TP/yr**, as identified in Table 4.

Table 4 Post-Development Land-Use Nutrient Loading

Land Use	Area (ha)	Nitrogen		Phosphorus	
		Output/ha (kg)	Total Output (kg)	Output/ha (kg)	Total Output (kg)
Urban Residential	9.13	15.38	140.42	1.65	15.06
Open Space	2.97	3.00	8.91	0.02	0.06
Total			**149.33**		**15.12**

Stage 4: Sustainable Drainage Systems

The annual N and P removal from post-development runoff by SuDS within the Lower Acre are **20.49 kg TN/yr** and **3.67 kg TP/yr**, as identified in Table 5.

[1] This parcel has been included in the table for clarity regarding the FRP development area, but entirely falls within the Link Road application and has, therefore, been removed from impact to ensure areas are not double counted.

Table 5 Removal of N & P by SuDS

Catchment	Area (ha)	Land Use & %age runoff	Annual P inputs to SuDS (kg TP/yr)	Annual N inputs to SuDS (kg TN/yr)	N removal rate (%)	P removal rate (%)	Annual P removed by SuDS (kg TP/yr)	Annual N removed by SuDS (kg TP/yr)
Catchment J	2.139	Residential Urban (65%)	3.53	32.89	30.0	50.0	1.15	6.41
Catchment K	1.696	Residential Urban (65%)	2.80	26.08	30.0	50.0	0.91	5.09
Catchment L.1	3.894	Residential Urban (65%)	2.29	21.37	30.0	50.0	0.75	4.17
Catchment L.2	1.046	Residential Urban (100%)	1.73	16.09	30.0	50.0	0.86	4.83
Total							**3.67**	**20.49**

Stage 4: Net Change in Nutrient Loading

The net change in annual N and P loading as a result of the Lower Acre are **647.36 kg TN/yr** and **25.10 kg TP/yr**, pre-2030, and **3.79 kg TN/yr** and **11.86 kg TP/yr**, post, incorporating the 20% precautionary buffer as identified in Table 6.

These values are the volumes of N and P that require mitigation for the Lower Acre scheme to demonstrate delivery of nutrient neutrality.

Table 6 Net Change in Nutrient Loading as a result of the Lower Acre

Nutrient		Pre-Development Baseline Losses (kg)	Post-Development Losses (kg)			SuDS Removal (kg)	Net Change (kg)	Net Change plus Precautionary Buffer (kg)
			Waste water	Land-use	Total			
N	Pre-2030	378.06	788.69	149.33	938.02	20.49	539.47	**647.36**
	Post-2030	378.06	252.38	149.33	401.71	20.49	3.16	**3.79**
P	Pre-2030	9.46	18.93	15.12	34.05	3.67	20.92	**25.10**
	Post-2030	9.46	7.89	15.12	23.01	3.67	9.88	**11.86**

Mitigation

When considering the impact of the Lower Acre scheme[2], the mitigation results in benefits of **80.73 kg N/yr** and **8.55 kg P/yr** for the pre-2030 scenario and benefits of **617.04 kg N/yr and 19.62 kg P/yr** for the post-2030 scenario. The calculations for this are identified in Tables 7 & 8 below.

Table 7 Pre-2030 Nutrient Balance for the Lower Acre Scheme with Mitigation

Mitigation	Nitrogen (kg TN/yr)	Phosphorus (kg TP/yr)
Lower Acre Impact (from Steps 1-4)	539.47	20.92
Link Road	-190.21	-5.02
North-West Access	-149.28	-6.10
South-East Access	-97.18	-5.63
Parcel 47	-105.59	-2.55
Residential Properties	-77.94	-10.17
Nutrient Neutrality Balance	**-80.73**	**-8.55**

Table 8 Post-2030 Nutrient Balance for the Lower Acre Scheme with Mitigation

Mitigation	Nitrogen (kg TN/yr)	Phosphorus (kg TP/yr)
Lower Acre Impact (from Steps 1-4)	3.16	9.88
Link Road	-190.21	-5.02
North-West Access	-149.28	-6.10
South-East Access	-97.18	-5.63
Parcel 47	-105.59	-2.55
Residential Properties	-77.94	-10.17
Nutrient Neutrality Balance	**-617.04**	**-19.62**

These benefits will be carried forward to future parcels of the OHH masterplan and offset against future development parcels on the site as part of the overall mitigation package.

[2] As the Link Road, South-East access and North-West access are non-residential developments they do not require nutrient neutrality assessments in their own right. Consequently, consideration of impacts from these developments are not required in the mitigation strategy.

References

[1] Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework. July 2021.

[2] Natural England (2024). River Itchen SAC: nutrient neutrality calculator, *Nutrient_Calculator_Itchen_SAC_V_03_01_3*" last , updated 24/05/24 – refer to **https://www.gov.uk/government/publications/river-itchen-sac-nutrient-neutrality-calculator**

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

[4] Natural England (2024). Guidance: Using the nutrient neutrality calculators, published 28 February 2024, last updated 27 May 2025 – refer to **https://www.gov.uk/guidance/using-the-nutrient-neutrality-calculators**