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.

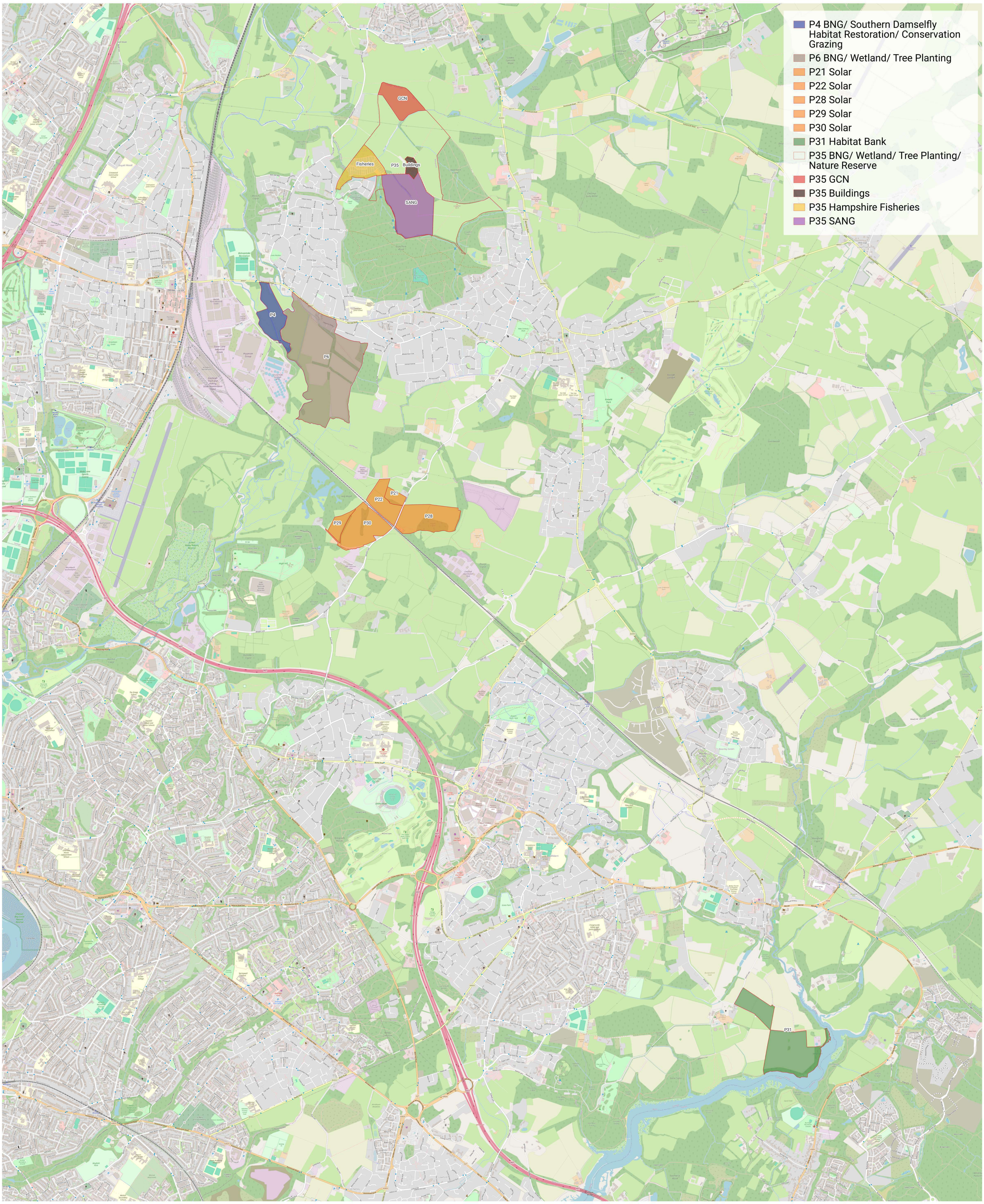
viii. The figure of **99.619** available P credits is significantly in excess of the **70.38** kg TP/yr deficit resulting from the scheme, and thus the proposed P Mitigation Strategy for the scheme is robust.

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

DATE OF ISSUE: **12 NOVEMBER 2021**
ISSUE: **0.3**
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PROJECT:

EBC STRATEGIC LAND PARCELS

CLIENT:

EASTLEIGH BOROUGH COUNCIL

PROJECT NAME:	**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.

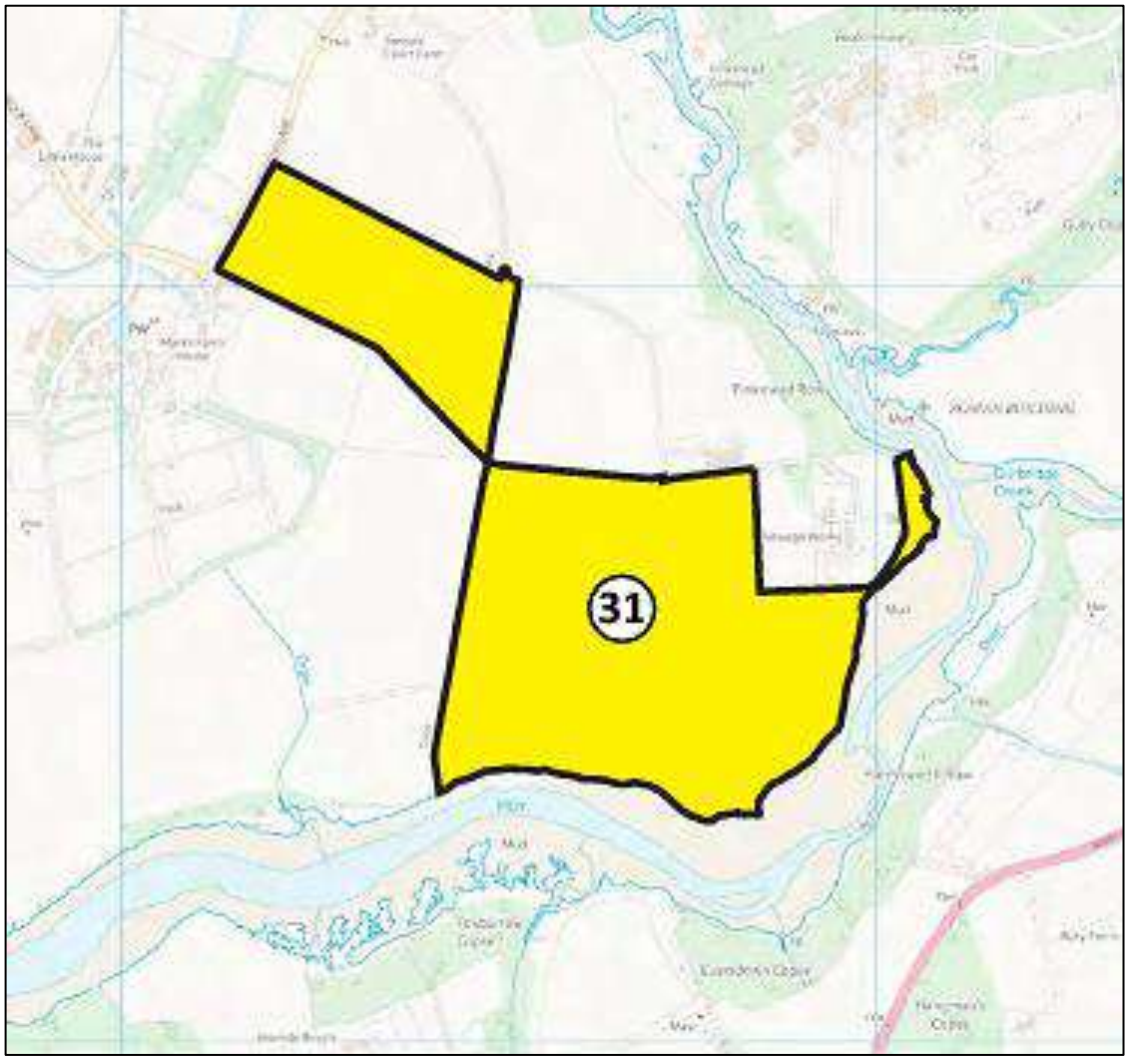
Table 3.1: Summary of Results

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 Gosney
2. Contact details: mob [redacted] 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 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): 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
- [ ] Indoor Pigs
- [x] Imported Manure
- [ ] Beef
- [ ] Outdoor Pigs
- [x] Cropping
- [ ] Sheep
- [ ] Poultry

- [x] Show more detail for Livestock
- [x] 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

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

ADAS

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

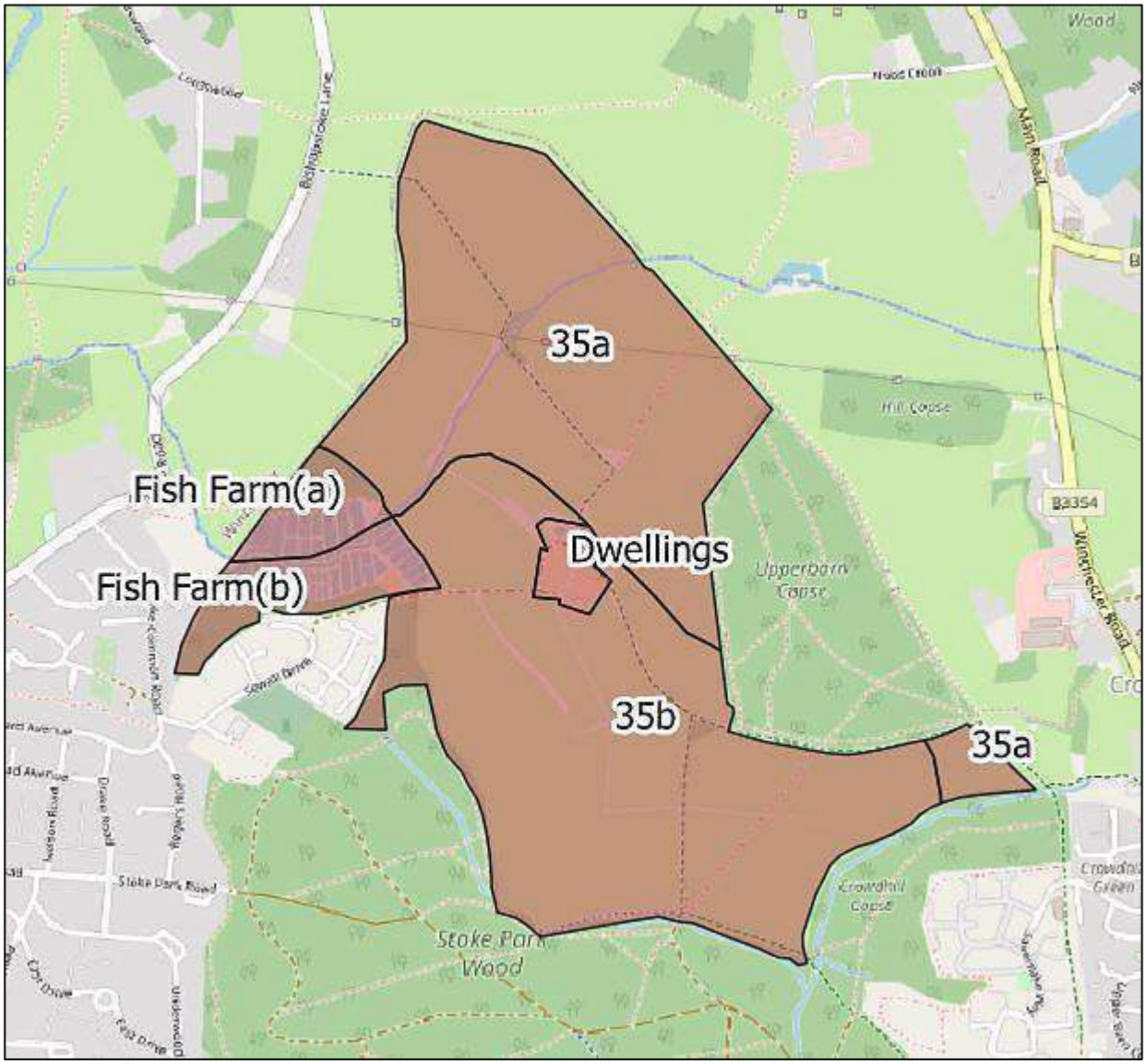
Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	0
Sheep	
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: 01489 896622 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 ☐
   - Free draining (infiltration to ground) ☑

   RELY ON YOUR OWN INSPECTION

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%
   - Percentage other boundary type (please specify): %

   BUT WITH HEDGES BEYOND OR WOODLAND EDGE

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 ADDITION

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.....%
1270t/yr. 2050 m³/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 m³/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

- [x] Dairy
- [x] Beef
- [ ] Sheep
- [ ] Indoor Pigs
- [ ] Outdoor Pigs
- [ ] Poultry
- [ ] Imported Manure
- [x] Cropping
- [x] 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

Field Boundaries	%
Hedge	40
Wall	
Fence	60
Other	

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

- [ ] 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
- [x] 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
- [x] 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 P2O5 Excretion (10^6)	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 (<1year) & 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	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_Dunford_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_Stake
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.

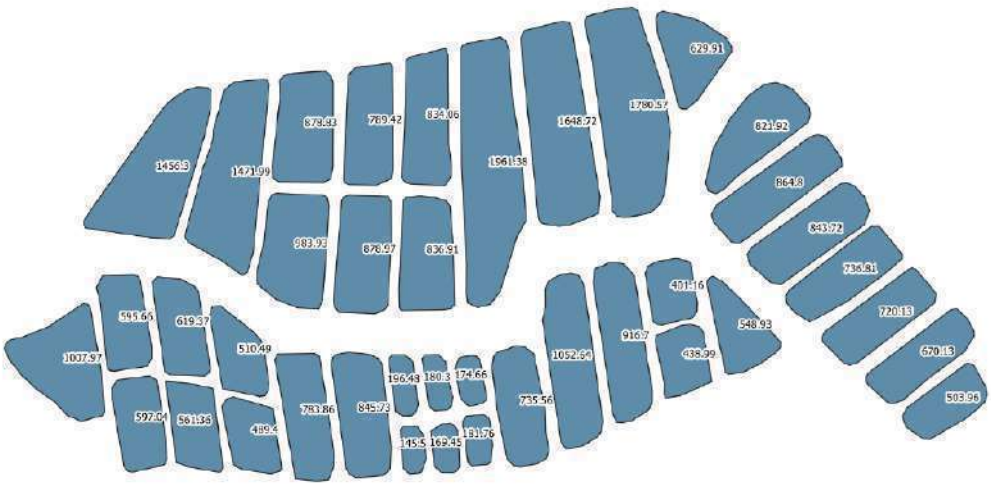
4. ***Fraction of P in feed uneaten and lost to environment***
   With reference to Wang *et al*[5] typically 3% of the total feed input is lost uneaten at modern fish farms *i.e.* 80 kg/yr x 0.03 = 2.4 kg/yr.

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 54.60 ha 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 2/3

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*).....

N/A

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
- [x] Imported Manure
- [x] Cropping
- [ ] Show more detail for Livestock
- [x] Show more detail for Cropping

Stocking Density
0 kg N / ha

General Options

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

Field Boundaries	%
Hedge	90
Wall	
Fence	10
Other	

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	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

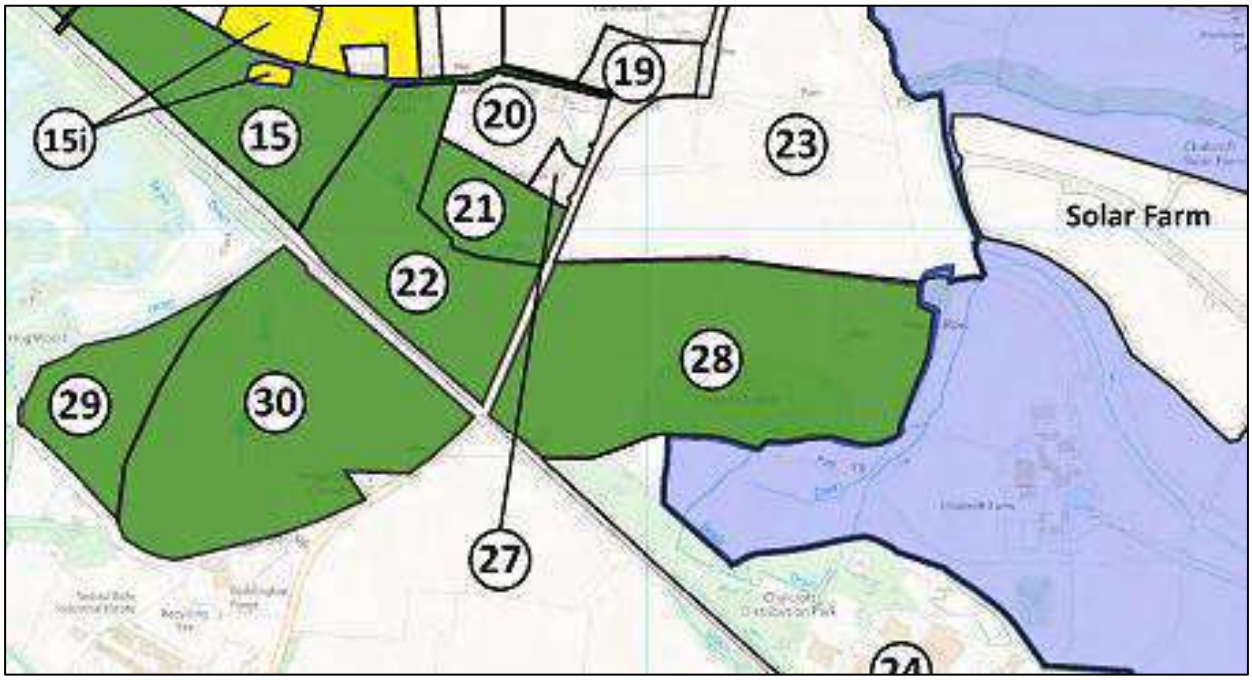
Livestock	Count
Dairy	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Beef	
Cows and Heifers	0
Heifers in Calf (2 years +)	0
Heifers in Calf (< 2 years)	0
Other Cattle	
Bulls (2 years +)	0
Cattle (2 years +)	0
Cattle (1 - 2 years)	0
Cattle (< 1 year) & Calves	0
Sheep	
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 [redacted]
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 Hearts 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
- [x] Imported Manure
- [x] Beef
- [ ] Outdoor Pigs
- [x] Cropping
- [ ] Sheep
- [ ] Poultry

- [x] 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

Field Boundaries	%
Hedge	80
Wall	0
Fence	20
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

Farm type for estimation of method implementation:
- ( ) Intensive Grazing
- (•) Extensive Grazing
- ( ) 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)
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_Gospey_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 ON THE NOW DELAPIDATED 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

Options

Clear Farm | Build Farm

Farm Built

Display Options

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

Stocking Density
154 kg N / ha

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		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	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.

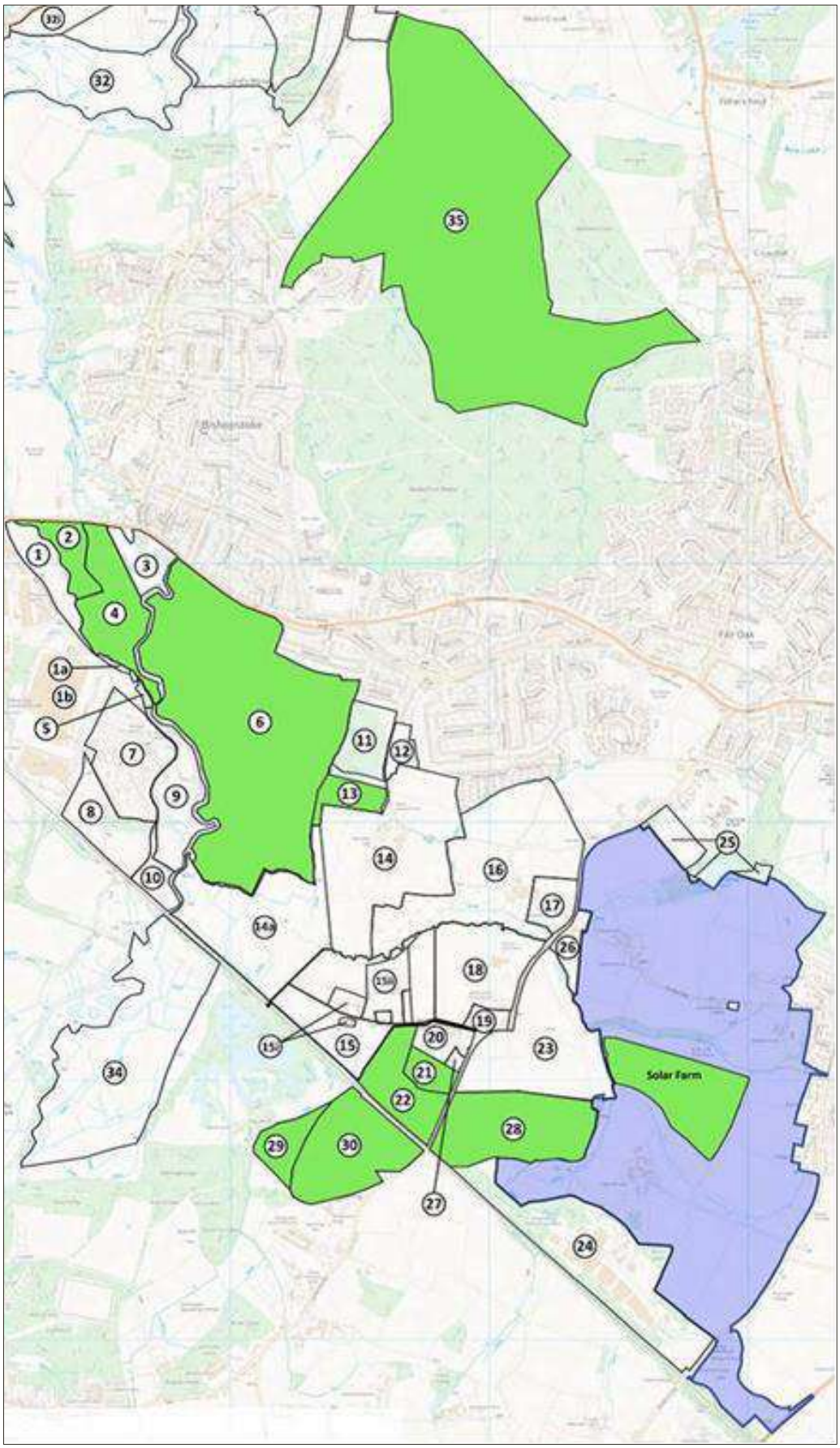
[5] Newell Price, J.P., Harris, D., Taylor, M., Williams, J.R., Anthony, S.G., Duethmann, D., Gooday, R.D., Lord, E.I., Chambers, B.J., Chadwick, D.R. and Misselbrook, T.H. (2011). *Mitigation Methods – User Guide: An Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, 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.

H|M

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**


Solar Farm

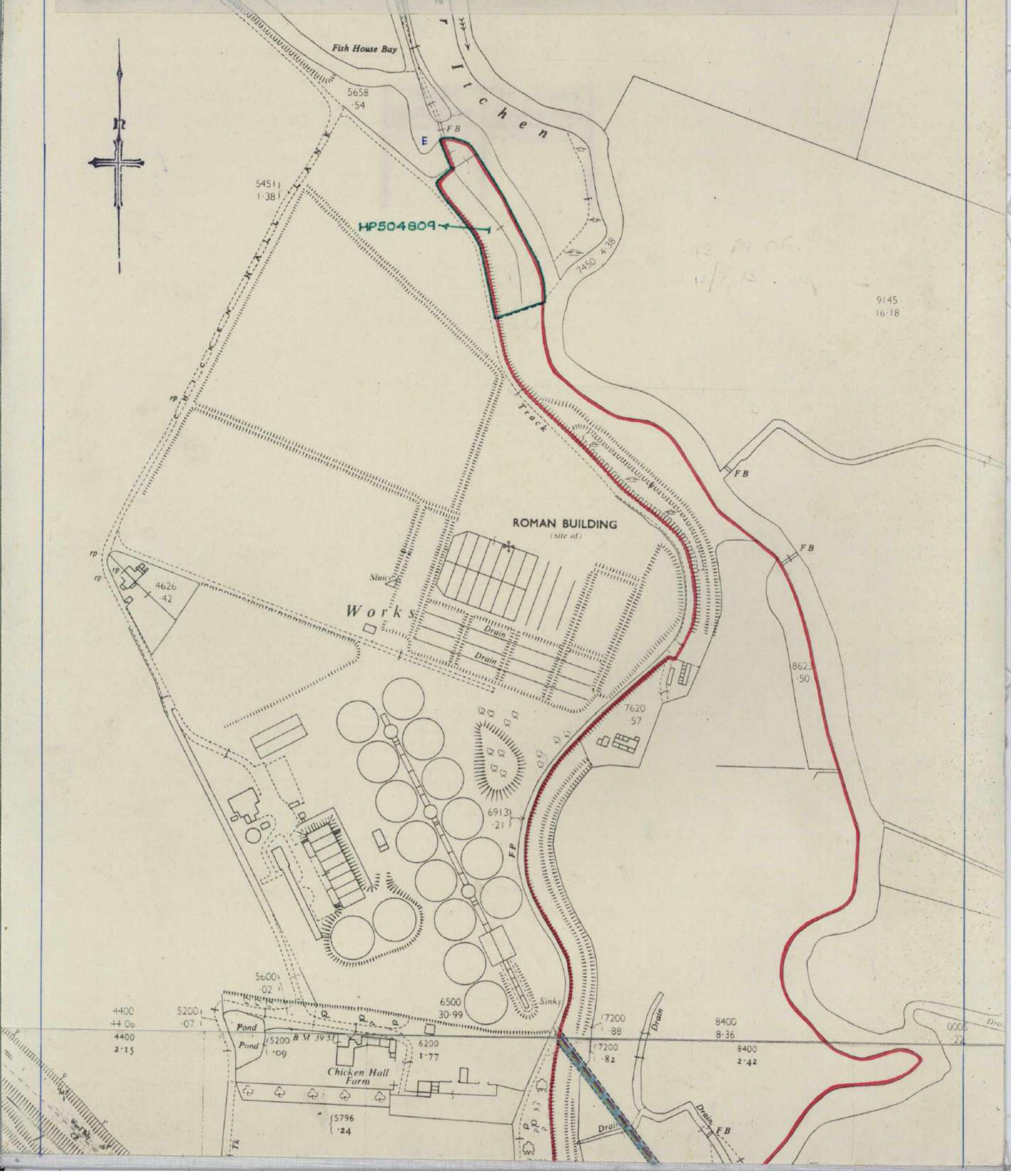
Appendix D: Chickenhall Land Registry & Outfall Easement Plans

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.

This title is dealt with by HM Land Registry, Weymouth Office.

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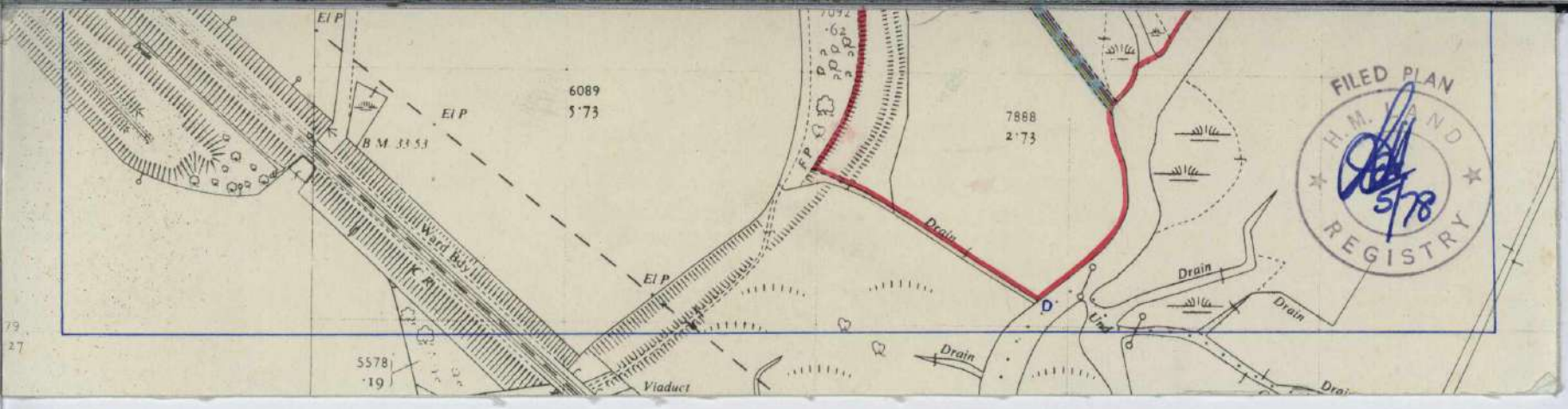

This is a print of the view of the title plan obtained from HM Land Registry showing the state of the title plan on 23 September 2020 at 15:27:01. This title plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale. Measurements scaled from this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

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 - 4717
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 considerat[redacted] of the sum of One pound now paid by the Authority to the Ow[redacted] (the receipt whereof the Owner hereby acknowledges) the Ow[redacted] as Beneficial Owner hereby grants and confirms unto [redacted] Authority:-

(3) The Authority have since blocked off and raised [redacted] manholes on the section of the sewer shown by a [redacted] between the points marked 'A' and 'B' on the pla[redacted]

(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

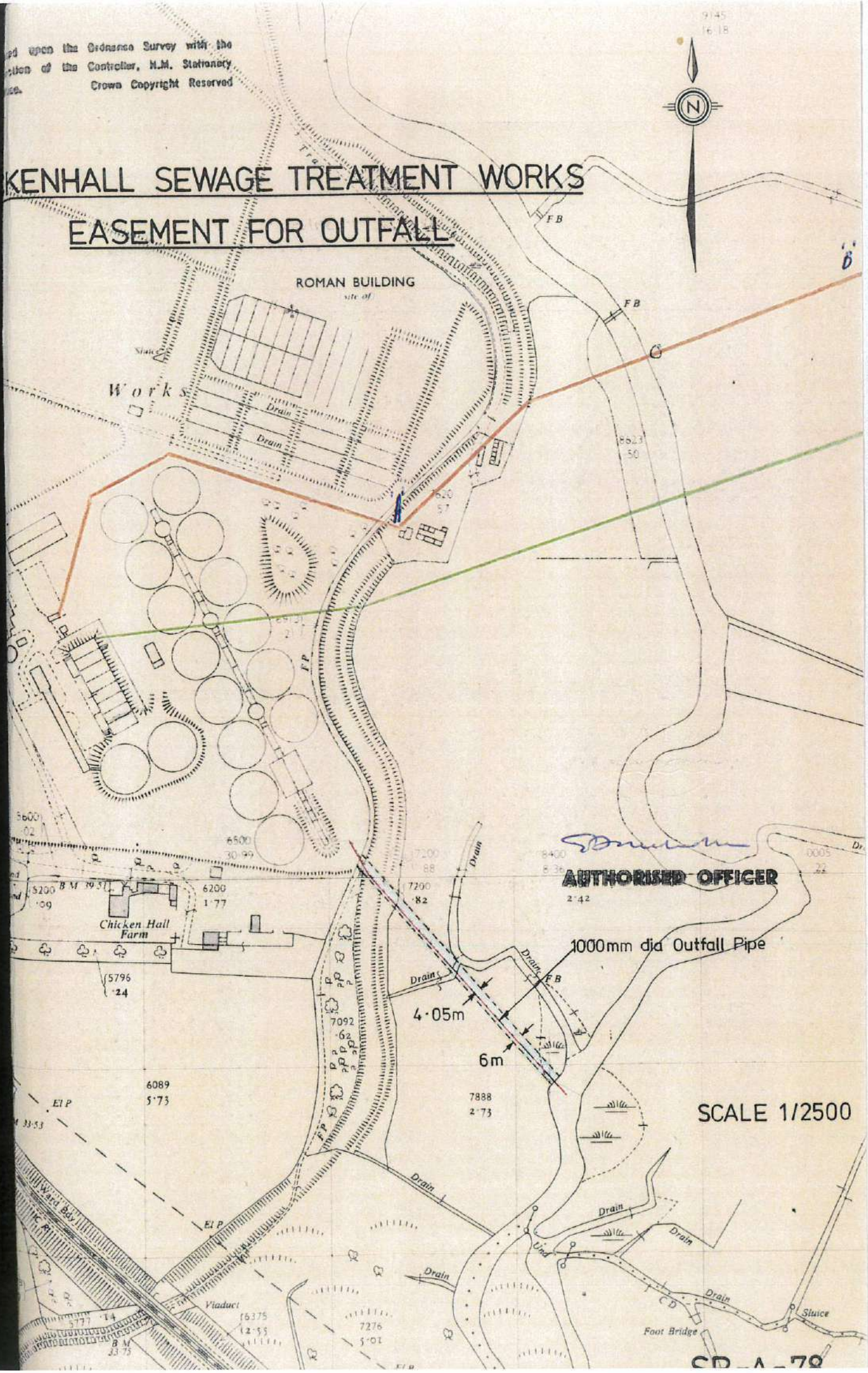
2. The Owner hereby covenants with the Authority for the benefit and protection of the works and the Authority's undertaking and so as to bind the owner or owners for the time being of the blue land and all persons deriving title from it or them not to do or suffer or permit to be done upon the blue 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
ction 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 :-)

[redacted]

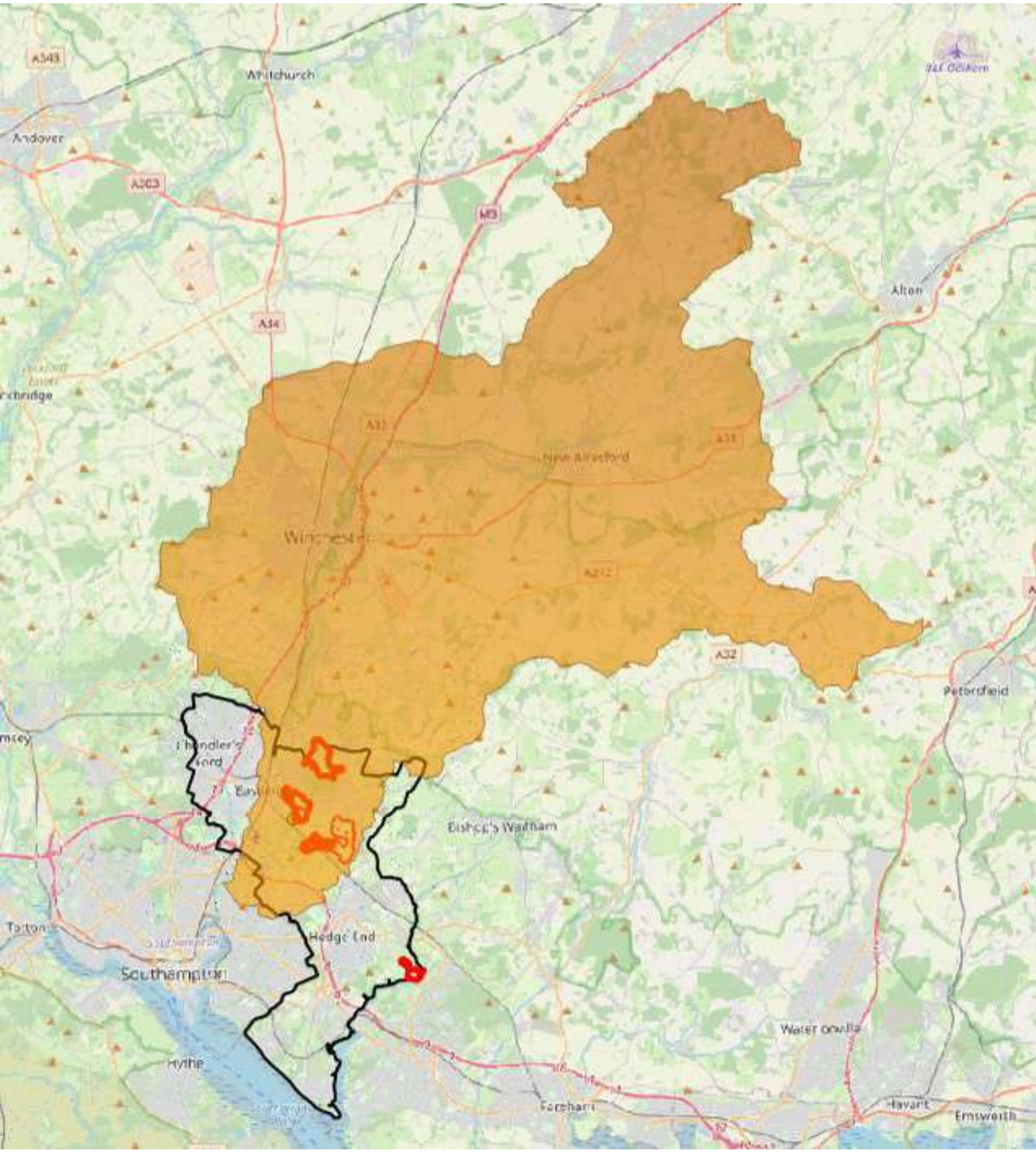
Directo

DIRECTOR.
~~Secreta~~

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

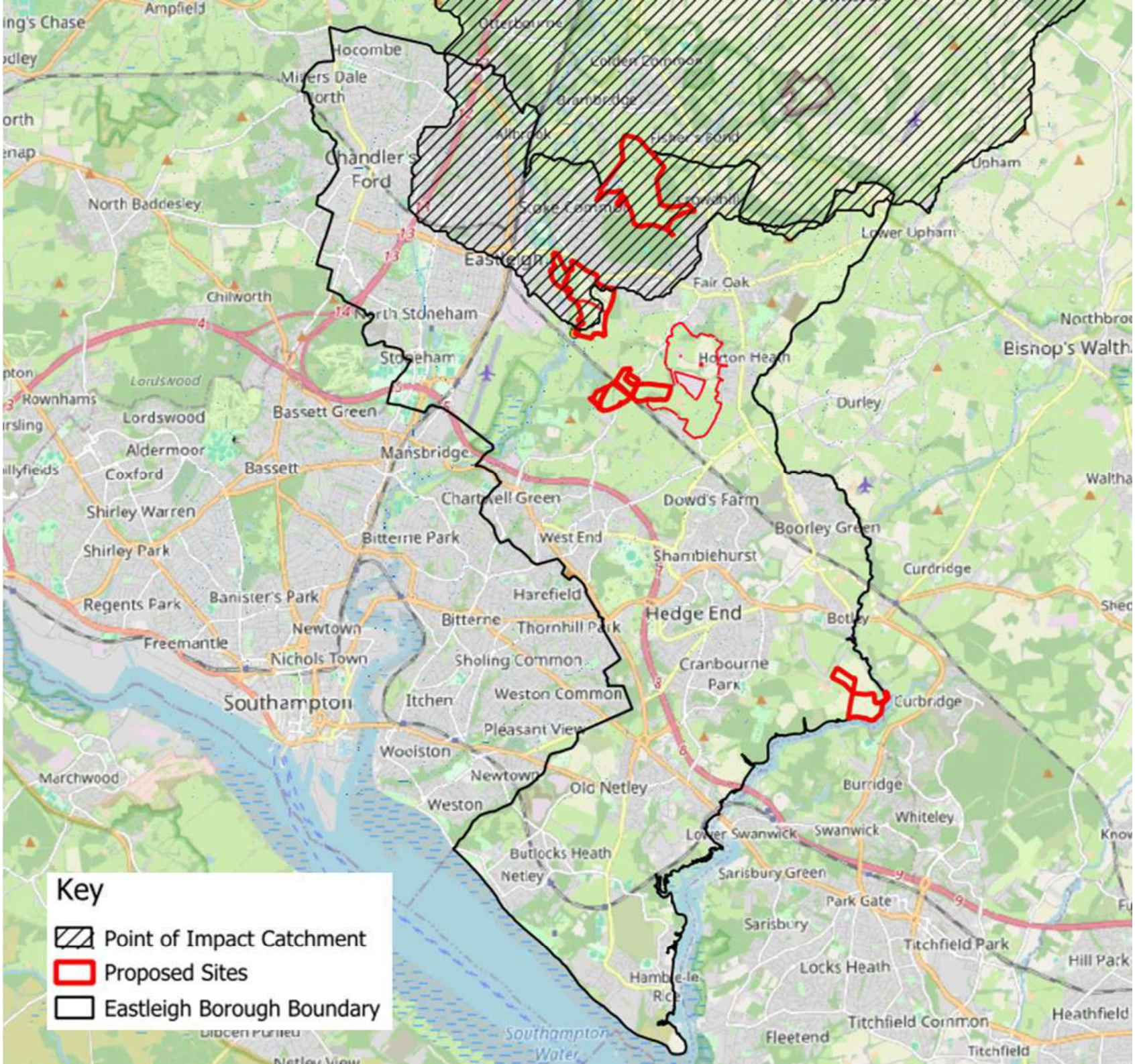
Authorised Officer

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

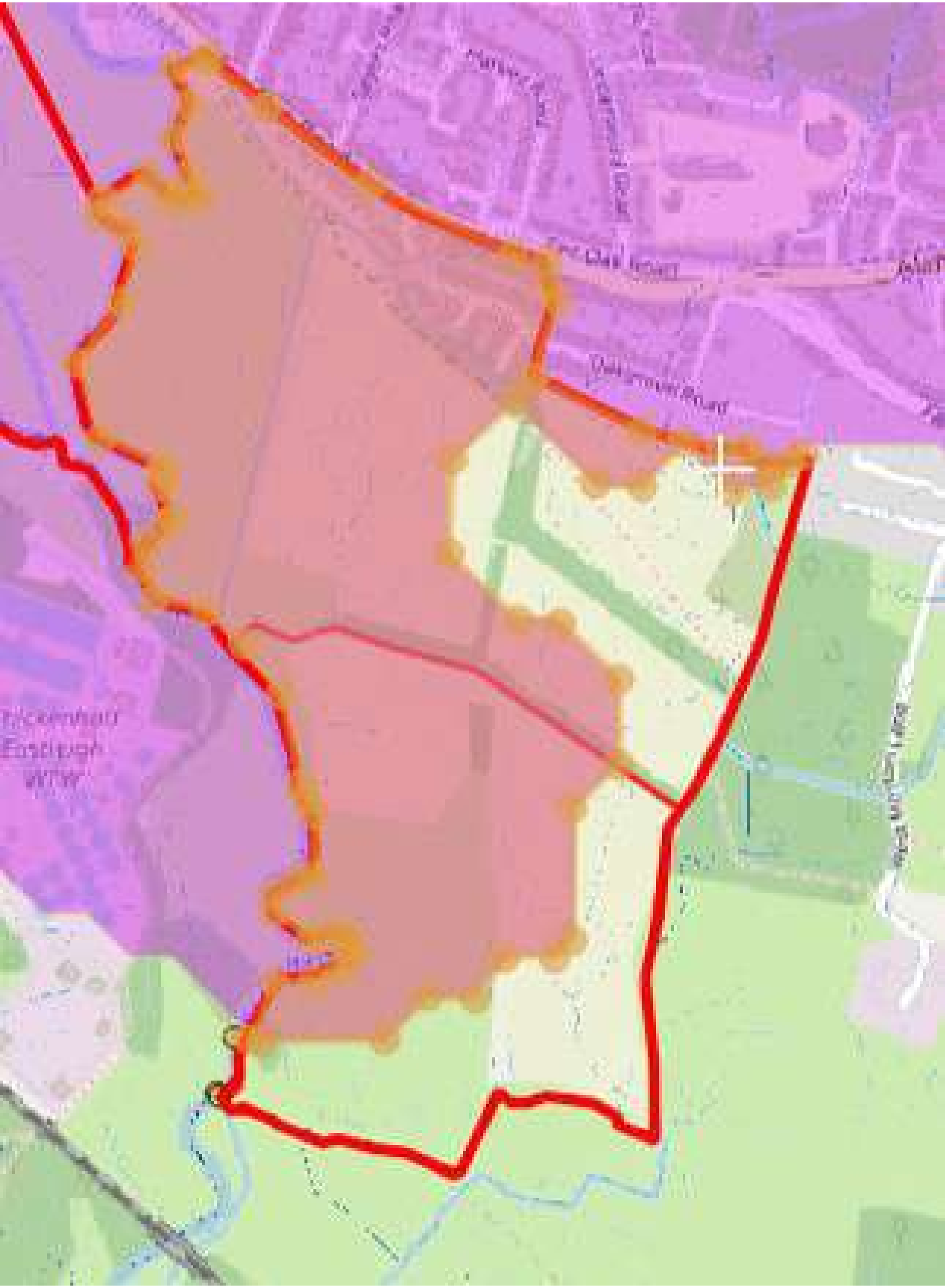


A343
Whitchurch
Andover
A303
M3
A34
Alton
A31
New Alresford
Winchester
A272
A32
Petersfield
Bishop's Waltham
Hedge End
Southampton
Hythe
Fareham
Havant
Emsworth

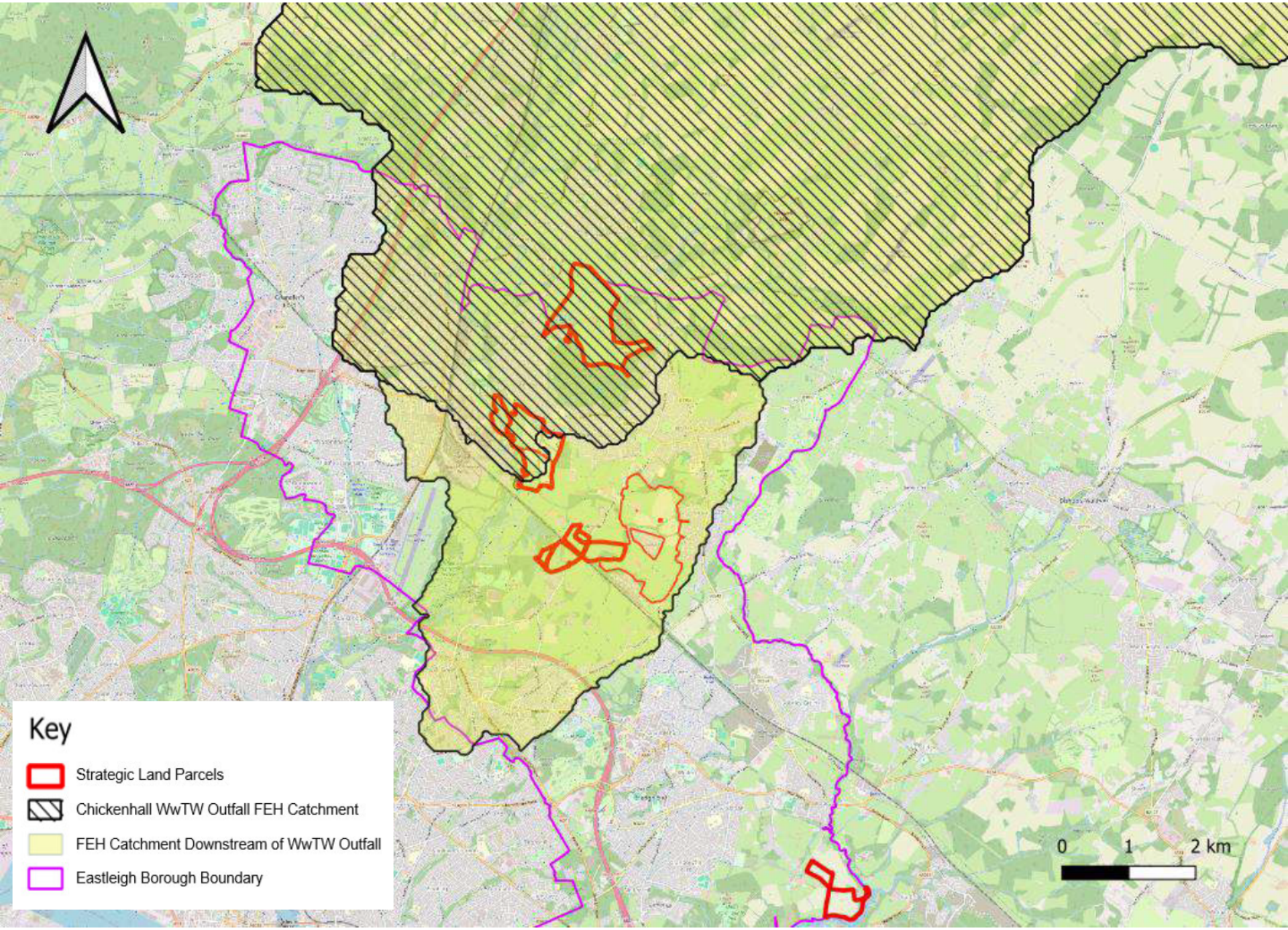
Appendix F: EBC owned Strategic Land Parcels shown within the context of the catchment directly upstream from the Chickenhall WwTW


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

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


Oakgrove Road
Hickenhall
Eastleigh
WTW

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

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**