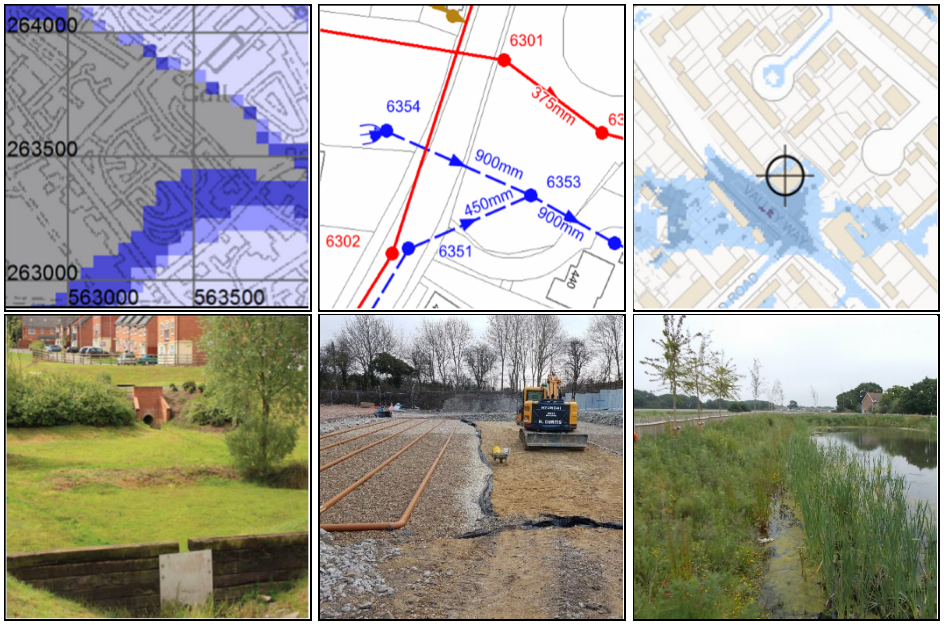

Nutrient Assessment & Budget

108 Woodgreen Avenue
Bedham[pton, Hants

Reference: 22142

Issue:	**Date:**	
1	4/11/2022	*To NE 16/03/2022 methodology with replacement NE calculator June 2022*

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Appendices

A	Existing & Proposed Site Layouts
B	Wastewater Treatment Information
C	Nitrogen Assessment & Mitigation
D	Conditions & Limitations

1. Introduction

1.1 Instructions were received from KF planning to undertake an assessment of the nutrient impact for the proposed development of a dwelling within the curtilage of 108 Woodgreen Avenue, Bedhampton, Hants.

1.2 This assessment has been undertaken by A P Traves BSc CEng MIStructE MCIHT.

1.3 The client's attention is drawn to the conditions and limitations contained in Appendix D.

2. Development Description & Location

2.1 The site comprises 0.30 Ha residential urban fabric at 108 Woodgreen Avenue, Bedhampton, Hants. The site location is indicated on JB Architecture Design location plan PL-613-22-01-B contained in Appendix A of this report.

2.2 It is proposed to develop a 3 bedroom dwelling within the garden area to the south side of the existing dwelling. The proposed layout is identified on JB Architecture Design proposed site plan PL-613-22-01-B contained in Appendix A of this report.

3. Background to Nitrogen Nutrient Assessment

3.1 The background to the issue is set out in current Natural England Advice note version 5 of June 2020 -Achieving Nutrient Neutrality for New Development in The Solent Region (NEv5). Reference should be made to NEv5 for a more in depth understanding which is summarised in the following paragraphs. Reference should also be made to Natural England- Nutrient Neutrality Generic Methodology dated 1 February 2022 (NE-gen1). Whilst NE-gen1 provides update on the calculation approach NEv5 is still current as this contains the catchment specific guidance on mitigation location. NE- gen1 was issued to LPAs on 16 March 2022 inclusive of a defective NE calculator (16/3/2022). This calculator was replaced (20/4/2022) and again in June 2022 which is current.

3.2 The Solent water environment is internationally important and is protected under the Water Environment Regulations and the Conservation of Habitats and Species Regulations, as well as national protections. There are high levels of nitrogen and phosphorus nutrients in these waters and the evidence indicates these nutrients are causing eutrophication of the waters (excess mats of dense green algae which deplete oxygen as these subsequently decay)

3.3 The total nutrient content comes from a number of component parts:

i. Agricultural use of fertilisers, particularly in the latter half of the 20th century
ii. General coastal background content
iii. Nitrate within final discharge from sewage treatment works
iv. Diffuse urban rainfall runoff from urban surfaces

3.4 Since the late 1980's and early 1990's the agricultural sector has reduced the nitrogen content in applied fertiliser by around 35%. However, the Chalk aquifers which underly the region and which are the dominant source of river flows into The Solent contain a massive amount of legacy nitrogen mainly in the form of soluble nitrate, from decades of previous agricultural practice. It is anticipated that it will take decades from now for the nitrogen content in groundwater to gradually reduce.

3.5 Nitrate in treated sewage is the natural product of the breakdown of ammonia contained in human waste. Historic practice was that the permitted concentration of ammoniacal nitrogen in the treated discharge was limited so that the ammonia to nitrate conversion occurred at the treatment works and took up oxygen within the works and did not subsequently take up oxygen from out of the waters into which discharge was made to protect the receiving waters from deoxygenation ,ie that the discharge made would have a low Biological Oxygen Demand (BOD).

3.6 It has been recognised by the Environment Agency, water companies and OFWAT for some time that improvement of the Total Nitrogen (TN) content of discharge needs to be addressed. The water industry works in 5 year spending cycles/programmes referred to as Asset Management Plans (AMPs) and these three parties agree between them how much investment (which comes from increases in sewage bills) can be made in any AMP and what will be delivered in terms of improvement for the investment permitted (affordable). Since the beginning of AMP4 in 2005 Southern Water have begun to systematically upgrade existing treatment works to provide 'nitrogen stripping'. This process has to be artificially 'forced' by careful and continuous control of the treatment process to create a low oxygen environment which 'debonds' the oxygen from the nitrate and stimulates the emission of gaseous nitrogen into the atmosphere (which is 78% nitrogen). This nitrogen release is thus stripped from the effluent that discharges into the receiving waters. It is not practicable to strip 100% of the nitrogen from the sewage, and the upgraded treatment works typically operate to a new TN permit level of around 10 mg/L compared to typical value of around 27 mg/L for traditional works without TN permit limits.

3.7 Treatment works upgrades are difficult and complex to plan and deliver in the context of three of the main constraints:

- There is little space at most works for the finished new infrastructure
- The existing works has to continue to operate during the upgrade and there is little room for this and the working space needed to construct the new infrastructure.
- The investment cashflow is regulated by OFWAT against bill increases and notwithstanding this there are a finite number of specialists to plan and deliver this so there can only be a limited rate at which the upgrades are delivered.

The economies of scale and immediate proximity to The Solent has dictated that it is the large coastal treatment works which have been prioritised by Southern Water in AMPs4-6 from 20005-2019. AMP7 investment and construction programme for 2020-2025 is now underway.

3.8 Wastewater Treatment Works (WwTW) upgrade programme is ongoing but in short it is not realistic to simply add a TN limit to existing permits as there will be no immediate change in performance of existing WwTWs. The upgrade programme will take decades to eventually deliver across the board improved TN performance.

3.9 The NE-gen1 methodology is aimed at planning permissions for proposed developments and does not address agricultural practice or the water industry AMP process. The NE-gen1 methodology is built off a single fundamental premise. This assumes that persons at work or using non-residential offices and commercial/retail premises must also live in the catchment. In the round this is a reasonable basis on which to look at the total sewage volume. However in zero rating commercial development from nitrogen loading it inherently means that residential developers fund the nitrogen nutrient mitigation of all non-residential commercial development in the region.

3.10 As set out in paragraph 3.4 there is a massive amount of largely agricultural legacy nitrogen in the Chalk aquifer below the region which forms the base flow to the rivers flowing into The Solent. The drinking water supplies in southern Hampshire are drawn from this groundwater and these rivers, and this typically contains 7-8 mg/L of nitrogen that does not stem from the proposed developments. The previous NEv2 methodology did not recognise that this represents around 85% of the nitrogen returned to the water environment from upgraded WwTWs and around 30% from traditional WwTWs. NEv5 gives a 2 mg/L allowance ie about 20% on upgraded WwTW effluent and 7% on traditional WwTW discharges. Whilst this is only partial recognition it is better that the previous NEv2 that made no recognition at all. In effect residential developers will therefore also be funding the mitigation of the unrecognised legacy nitrogen predominantly from historic agricultural practices. The 2 mg/L value is still contained within the NE-gen1 assessment spreadsheet but is no longer as transparent as it was previously.

3.11 Natural England nitrogen assessment methodology NE-gen1 considers nitrogen for:

1) Land use with regard to nitrogen contained in surface water run-off and infiltration.
2) Sanitation with regard to nitrogen content in the final treated discharge from the WwTW serving the development.

The assessment compares pre and post development quantities on nitrogen for the land use (1) and sanitation (2) to establish a final figure and then adds a 20% buffer to this.

3.12 Natural England advise the NE-gen1 methodology is advised for all types of development that would result in a net increase in population served by a wastewater system, including new houses, student accommodation, tourism attractions and tourist accommodation.

4. Derivation of Sewage Load

4.1 The NEv5 methodology used a blunt 2.4 average household occupancy and 110 litres per person per day (LPD) for housing as a default. In May 2022 Havant BC eventually departed from the default and adopted a fixed set of bedroom related occupancy values which have been used. The JB Architecture Design floor plans PL-613-22-01-B indicates the proposed dwelling to contain 3 bedrooms. The calculated occupancy of the proposed development is 2.60. A copy of the HBC occupancy calculation is contained in Appendix C.

4.2 NE-gen1 now recognises that water consumption on sites varies:

- Building Regulations maximum 125 LHD
- Building Regulations higher standard 110 LHD
- Higher standard by water efficiency calculation

NE-gen1 directs that the level of proposed water usage is increased by 10 LPD *"to account for changes to less water efficient fittings through the lifetime of the development".* This direction is contrary to the industry direction of travel, Southern Water's own water supply policies which NE recognise in their February 2022 advice note regrading water neutrality within the Sussex North Water Supply Zone and associated Frequently Asked Questions document (December 2021) in which this demonstrates explicit awareness of Southern Water's Target 100 "*to reduce water consumption in Southern Water's <u>whole water supply area in the long term</u> (not just Sussex North), as set out in their Water Resources Management Plan."* The evidence therefore points to a long term reduction in use NOT a long term increase.

4.3 There is a further fundamental error in that sewage load is less than not equal to water use. Water efficiency calculations include a 5 LPD for external use that is not returned to the sewer so does not form part of the sewage load. In water metered properties sewage bills are calculated at 95% of the water supply volume in recognition of this.

4.4 The calculations attached to this report have been undertaken on the basis of 110 LPD unless a water efficiency calculation has been provided to us and is attached. A +10 LPD has been added as directed by Natural England. The liability and accountability for the impact of this direction rest with Natural England as current evidence set out in 4.2 and 4.3 above indicates their current approach is unsound.

5. Wastewater Treatment Works

5.1 Foul water discharge from the site will outfall to the public sewer network and will be conveyed to Southern Water's Budds Farm WwTW about 1 Km south of the site. The WwTW undertakes traditional primary and secondary treatment and also undertakes nitrogen removal. Budds Farm WwTW has a Total Nitrogen permit limit of 9.7 mg/L. The WwTW and outfall location plans and works schematic are contained in Appendix B.

6. Land Use Component

6.1 The site comprises 0.30 Ha of existing residential urban fabric. There will inherently be no change in nutrient from the land use component as a result of the proposed development.

7. Nitrogen Assessment

7.1 The NE-gen 1 sewage loading, WwTW performance for TN and land use component are included in the calculations contained in Appendix C.

7.2 The calculations also include the 2 mg/L allowance in water supply from NEv5 discussed in paragraph 4.41. For the awareness of the LPA the actual nitrogen content removed from the environment in the water supply from the environment but not recognised in NEv5/NE-gen1 in most cases in the Solent area is very significantly greater than the NE methodology acknowledges.

7.3 The calculations indicate that inclusive of the 20% buffer there would be a net nitrogen increase of **+0.95 KgTN/yr** from the proposed development.

8. Mitigation

8.1 NEv5 Figure 1 subdivides the overall Solent catchment into 6 sub catchments. A copy of this Figure is contained in Appendix C.

8.2 The site lies in the East Hampshire subcatchment. However NEv5 directs specific mitigation sites for specific coastal WwTWs. The acceptable mitigation catchment locations for Budds Farm WwTW are; River Meon, Portsmouth Harbour, Medina Estuary, Wootton Creek and Langstone Harbour.

8.3 Section 5 of NEv5 sets out various types of hypothetical mitigation. However most of these are impractical for modest numbers of dwellings in an urban context where served by the public sewer. These are briefly discussed below:

8.4 Upgrade of the public treatment works is not viable in either cost or overall programme/time terms for small sites. Notwithstanding this the site is served by Budds Farm WwTW which has already been upgraded.

8.5 Installation of wetlands to treat foul and or surface water run-off from the site. Sites in urban catchments served by the public foul sewer network must connect to the public foul sewer unless this is too far away to be viable. In most urban contexts the sites are within viable distance of public sewer connection and application for an environment permit for private treated effluent discharge would be refused. Notwithstanding this treatment will not remove 100% of the nitrogen so whether by public treatment works or private treatment plant there will always be some residual nitrogen within the final treated foul water discharge.

The regulatory hierarchy for discharge of site surface water run-off requires that infiltration discharge (eg sokaways and permeable pavements) is provided where possible. Nitrogen treatment wetlands need to permanently retain water and are contrary to national drainage policy on permeable sites.

On non-permeable sites a proportion of the rainfall events that occur within a year are short showers that result in the ground being wetted but do not develop any run-off. The amount of annual run-off (Hydraulically Effective Rainfall, HER) is generally in the region of about 2/3 of the annual rainfall. The amount of annual surface water run-off for a site is therefore finite and limited by the impermeably surfaced area and site HER. Compared to foul water the nitrogen content is also much lower and NEv5 Appendix 2 indicates that 3mg/L is deemed representative. For crude general illustration purposes, assuming a positively drained area of say 200m^2 per dwelling and assuming an HER of say 500mm per annum with the prescribed nitrogen concentration of 3mg/L this would suggest the finite amount of nitrogen within the surface water run-off to be around 0.3 Kg per dwelling. The nitrogen removal efficiency of stormwater wetlands varies and NEv5 Appendix 4 indicates a median removal rate from studies to be 37%. It is therefore implicit from this that the total mitigation potential for the illustration would be around 0.1 KgTN/yr. The corresponding illustrative

buffered TN discharge for treated foul water effluent from 1 dwelling would be of the order of 2.9 KgTN/yr for traditional WwTW and around 0.8 KgTN/yr for a dwelling served by WwTWs with nitrogen removal technology. It is generally not possible to mitigate more than 3-12% of the residual foul water impact by treating 100% of the site surface water run-off, so other mitigation will usually be required anyway.

Notwithstanding this the design of wetlands is a specialist activity and is not usually cost effective on a modest site scale. There is also a significant land take for the wetlands and there would be a requirement to set up and maintain a secured maintenance programme for operation of the wetland in perpetuity.

8.6 Some urban city authorities (eg Portsmouth CC) have a retrofit mitigation scheme whereby the increase in foul water effluent conveyed to the public WwTW from the site is offset by reducing the discharge from older existing housing stock by retrofitting modern water appliances. Havant BC are not known to be operating such a scheme.

8.7 The most common approach is one of land use offset whereby the increase in nitrogen at the site is offset by a corresponding reduction in nitrogen elsewhere in the subcatchment eg by change of use from farm land to woodlands or community open space etc. Some sites can achieve mitigation within their own site when farmland of relatively high existing nitrogen discharge is developed for housing such that the reduction in the nitrogen from the change in land use is greater than the increase from the new foul water loading. For all other developments the mitigation land and development land are at different locations. There are three potential approaches to securing the necessary mitigation land:

i. The applicant already controls a suitable area of private land.
ii. Some LPAs already control such land and buy in to their scheme can be made.
iii. Buy in to a third party scheme

It is a requirement that the change in use at the mitigation site is legally secured in perpetuity and that necessary maintenance to ensure the new low nitrogen usage is also secured. Whilst hypothetically a suitably sized piece of land could be privately procured at a suitable location and taken out of farming use to provide an offset reduction in nitrogen on that land in perpetuity, the urban south Hampshire location of the site, means this may be difficult to find as much nearby local land is similarly earmarked for potential future development.

8.8 Havant BC have developed their own nitrogen mitigation scheme which opened on 18th August 2020. The scheme is only available to application sites within Havant borough. The scheme provides mitigation against effluent discharges made to Budds Farm or Thornham WwTWs and is therefore suitable for mitigation for the assessed site. The HBC mitigation scheme costs are set out in the updated HBC positional statement of May 2022 as £1,308 per kg plus legal fee of £23. The anticipated costs for mitigation from HBC would therefore be of the order £1,500 on this basis.

8.9 Whilst there are other options theoretically existing and others may come forward in the future, at present the HBC scheme would appear to be the most favourable candidate for mitigation being more favourable economically and in terms of risk and timescale.

8.10 One adverse consequence in NE moving from NEv5 to NE-gen1 calculations in March 2022 is that mitigation providers have had to reassess the capacity of their mitigation sites. The number of kg yielded by each mitigation site is likely to have changed and could therefore affect historic unit costs. We would strongly recommend that mitigation costs are confirmed with mitigation schemes until such time as the adverse impact works through the sector and rates restabilise.

8.11 In September 2020 DEFRA announced that it intended to facilitate a nitrogen credit trading platform. This has remained dark until January 2022 when a website for the platform came on line at www.solentnutrient.org.uk.

Until July 2022 the website was at an early skeletal state and the pilot project stages page reported:

Market design:	Currently working on design and settlement process
Platform development:	To be developed ie none available at present
Guidance:	Documents and information will be provided ie none yet available.
System testing:	Before going live the platform will be tested
Market operation:	Further information will be made available ie none yet available
Pilot report & review:	The pilot will be reviewed ie not yet at this stage

In July 2022 the website was updated the market overview page has now replaced the pilot project stages and reports:

Expressions of interest for project supply:
Opened 11th July 2022

Project development:
The Projects will need to be designed, delivered and maintained according to Project Specifications which will be attached to the Nature-based Project Agreements. There are no project specifications at present. These are stated to be coming soon which is a vague and indeterminate timeframe.

Project registration and accreditation:
To participate in the market, landholders must register as a market participant on the Solent Nutrient Market Pilot Platform. There is no market trading platform at present. This is stated to be coming soon which is a vague and indeterminate timeframe.

Landholders then ned to register their proposed Nature-based project, providing the information needed to be accredited for the environmental services it will deliver. There is no accreditation procedure at present. This is stated to be coming soon which is a vague and indeterminate timeframe.

The market operator accredits the projects, quantifying the relevant number and type of environmental credits that project is expected to deliver if delivered and maintained.

Market round:
In the market round landholders that have registered a project for sale in the market round must make a project offer. This will cover the use of the and, the duration of the agreement (the term), the costs of designing and delivering the project to the project specification (including securing relevant consents), the cost of maintaining the project in accordance with the management plan and the cost of compliance reporting required. It is proposed to develop a catchment opportunities statement to set down the process and mechanism for this. There is no mechanism/procedure at present. This is stated to be coming soon which is a vague and indeterminate timeframe.

Settlement mechanism:
The Lindsay Mechanism already exists and will be adopted to, ensure payments are fair both for project suppliers and businesses buying environmental credits.

Contracting and delivery:
If successful in the market, landholders will enter into a nature-based project agreement with the market operator to deliver the project and maintain it to the required standard. A schedule will be agree, and regular monitoring will make sure projects are delivering the expected environmental outcomes. There is no nature based trading agreement templates at present. This is stated to be coming soon which is a vague and indeterminate timeframe.

It seems apparent that strategic mitigation schemes which have already been developed over the last 3 years and which are already operating would be able to

list on the Solent Nutrient market relatively quickly though this may not be the case. In effect the platform would in essence duplicate the listing currently held on the Partnership for South Hampshire (PfSH) website. On its own this will not bring any more mitigation credits to market. It would however at face value transfer the hosting of the listing off of PfSH, however given that PfSH are one of the agency operators of the Solent Nutrient Market this is moot.

Bringing new mitigation credits to market is reliant on the market platform being attractive enough to sway landholders to use it. At present there is no project specifications, no market trading platform, no accreditation procedure, no market round mechanism/procedure, and no nature based trading agreement templates or nature based project agreements. These are all stated to be coming soon which is a vague and indeterminate timeframe.

The indication in the DEFRA statement in September 2020 is that the Solent Nutrient Market platform will take about 2 years for them to develop. It is apparent from the current content of the website that whilst this may in the future become useful this cannot be used for applications in the current period as currently it is a hollow unproven shell. There are no specification, procedures or templates yet in place and there is no determinate timeframe when this might happen.

8.15 In late July 2022 DEFRA issued a further statement which implies the Solent Nutrient pilot would be used as a basis to develop mitigation markets in the nutrient sensitive catchments though the statement does not explicitly state this. The July 2022 DEFRA statement does not expressly indicate any changes to the indeterminacy of the timeline for the Solent Nutrient Market platform.

Appendix A

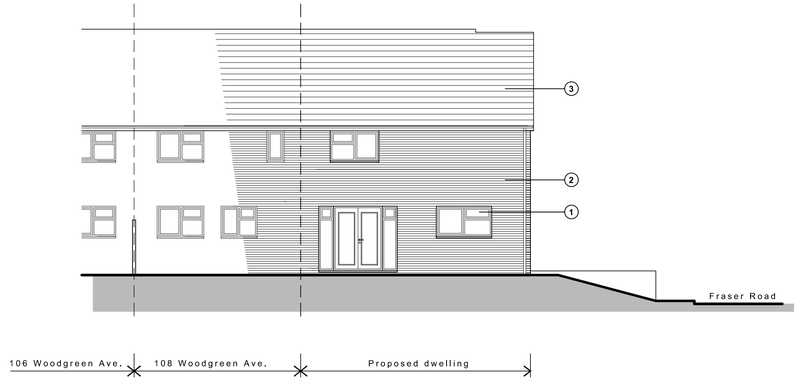
NOTES:

Dimensions to be checked on site before commencing work. Any discrepancies shall be reported to the architect immediately.

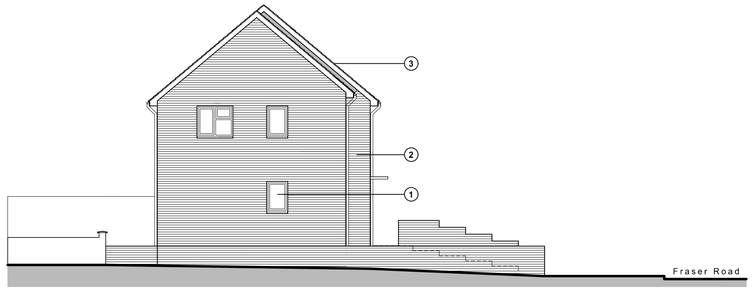
Do not scale from these drawings except for planning purposes. Use figured dimensions only.

Where applicable this drawing is to be read in conjunction with other consultants' drawings.

East (side) elevation

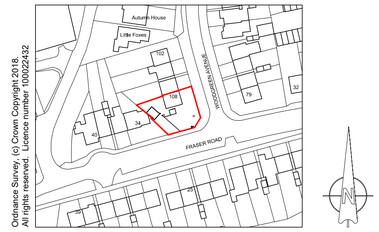


West (side) elevation

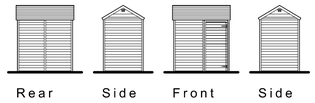


South (front) elevation

Proposed elevations scale 1:100

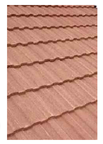


Location plan scale 1:1250

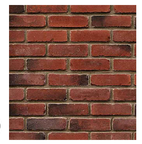


Proposed shed elevations

1 **White UpVC windows & doors**



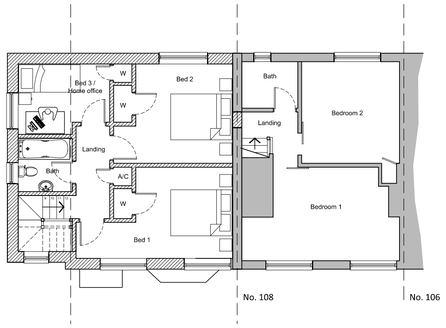
2 **Concrete roof tiles**



3 **Red stock bricks**

Schedule of materials

Proposed dwelling



Proposed first floor plan

Schedule of accomodation

Site area (including 108 Woodgreen):
458 m/sq

Proposed development site area (excluding 108 Woodgreen):
296 m/sq

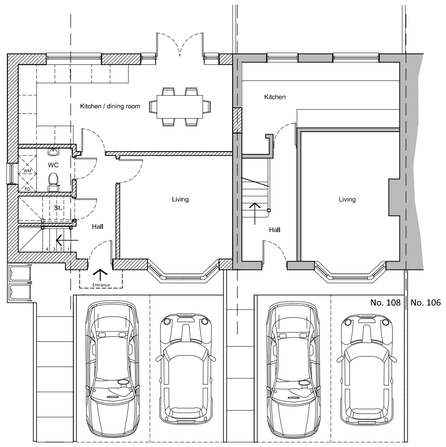
Existing floor area 108 Woodgreen Ave.
66 m/sq

Proposed floor areas (proposed dwelling);

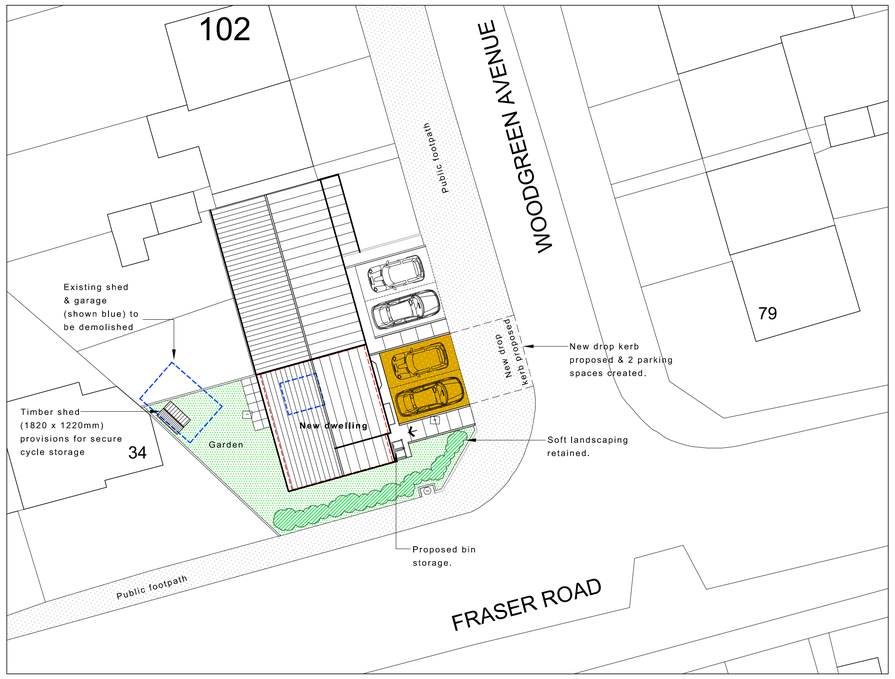
Dwelling 1
5 person, 3 bed house.
Total floor area - 88.8m/sq

Total proposed parking on site - 2 spaces

Proposed dwelling



Proposed ground floor plan scale 1:100



Proposed site plan scale 1:200

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For
MR & MRS KERRIGAN

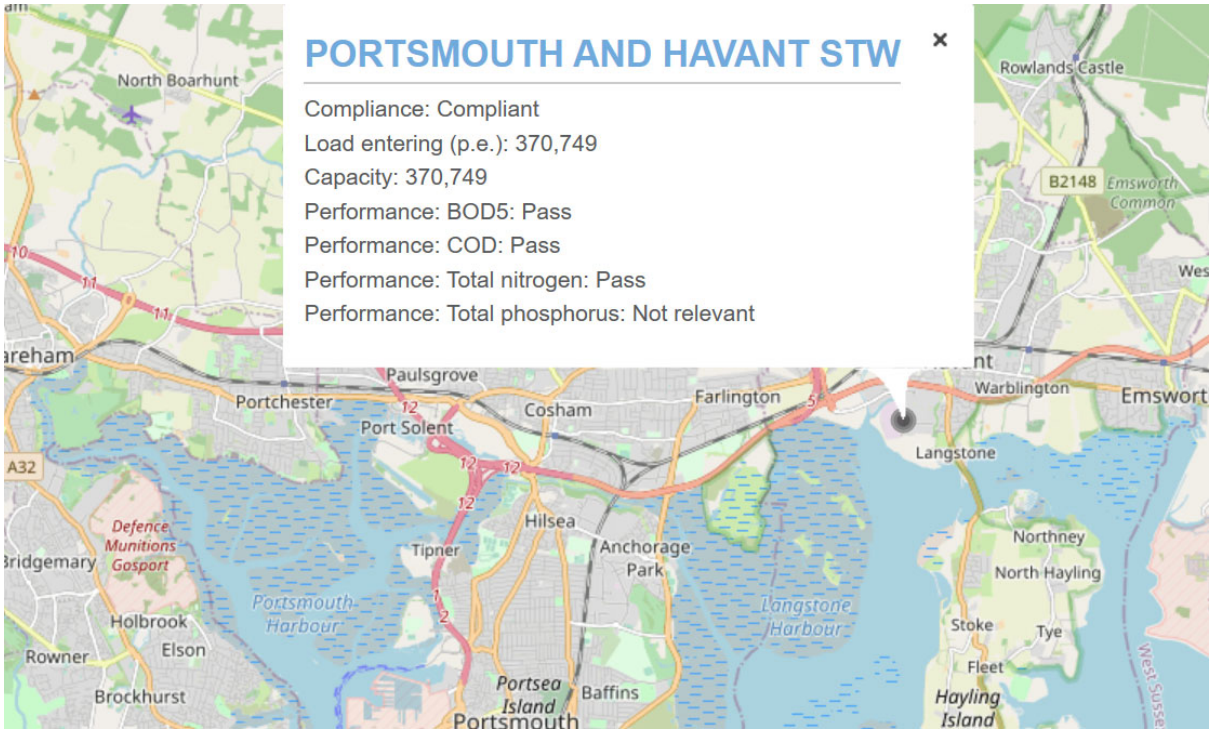
Project
PROPOSED 1 NO. 3 BED DWELLING
AT 108 WOODGREEN AVENUE
BEDHAMPTON
HANTS, PO9 3EE

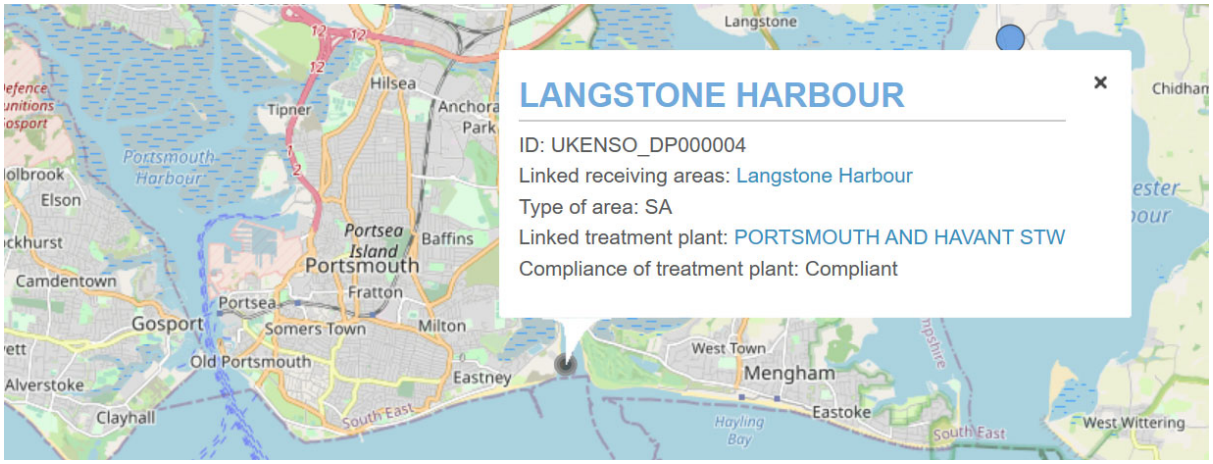
Title
PROPOSED FLOOR PLANS
& ELEVATION, PROPOSED SITE PLAN
& LOCATION PLAN

Date	Drawn	Scale	Checked
AUG 2022	JB	As shown @ A1	-

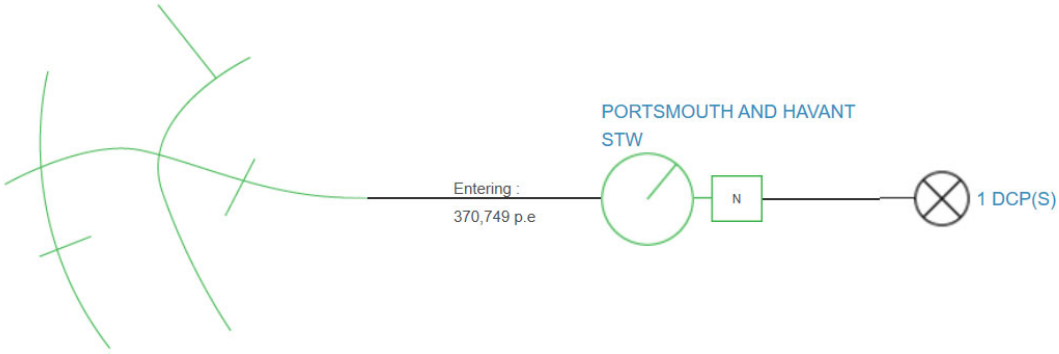
Job Number	Drawing Number	Revision
PL.613.22	01	B

Appendix B





Agglomerations : 1



Appendix C

Occupancy calculator

Date	04/11/2022
Site name	108 woodgreen Avenue
Site address	108 Woodgreen Avenue, bedhampton

	Gross new homes proposed	Gross losses proposed	Net new homes proposed
1 bed			0
2 bed			0
3 bed	1		1
4 bed			0
5+ bed			0
Total	1	0	1

Average occupancy to include in Solent Nutrient Calculator:	**2.60**

Development site details

Date (dd/mm/yyyy):	04/11/2022
Site Name:	108 Woodgreen Avenue
Planning Application number:	to be assigned
Site Address:	108 Woodgreen Avenue, Bedhampton

Stage 1

User Inputs

Date of first occupancy:	01/08/2023
Average occupancy rate:	2.60
Water usage (litres/person/day)**:**	120
Development Proposal (dwellings/units)**:**	1
Include deductible acceptable loading?	Yes
Wastewater treatment works:	Budds Farm WwTW
Wastewater treatment works N permit (mg TN/litre)**:**	7.7

Stage 1 Calculated Loading

Stage 1 Nutrient Loading

Additional population	2.6	people
Wastewater by development	312	litres/day
Annual wastewater TN load	**0.79**	**kg TN/yr**

Stage 2

User Inputs

Catchment:	East Hampshire Rivers
Soil drainage type:	Freely draining
Annual average rainfall (mm)**:**	700.1 - 750
Within Nitrate Vulnerable Zone (NVZ):	Yes

Existing land use type(s)	**Area** (ha)	**Annual nitrogen nutrient export** (kg TN)
Residential urban land	0.30	4.05
Total:	**0.3**	**4.05**

Stage 3

User Inputs

New land use type(s)	**Area** (ha)	**Annual nitrogen nutrient export** (kg TN)
Residential urban land	0.30	4.05
Total:	**0.3**	**4.05**

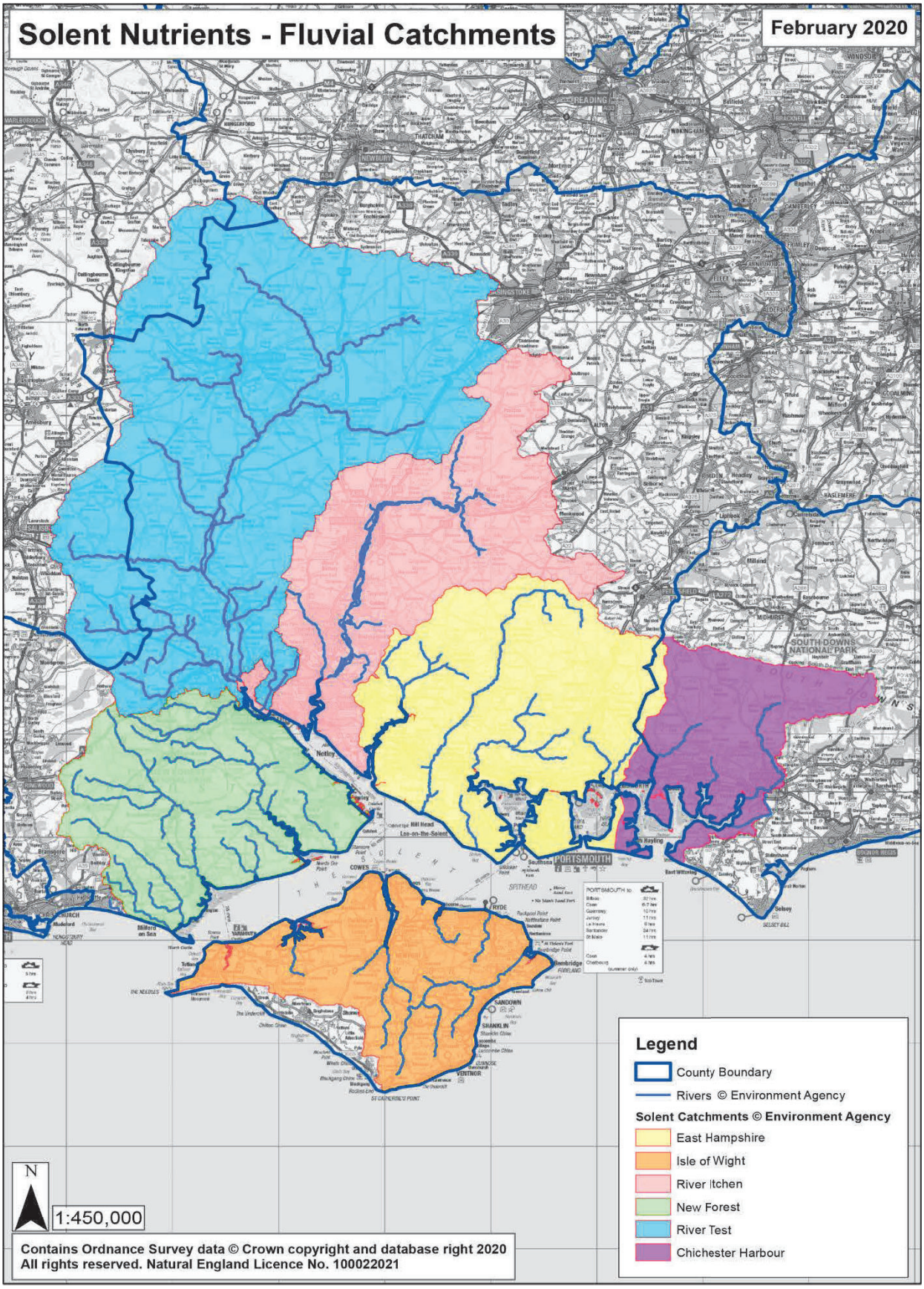
Stage 4

Calculated Outputs

Annual Nutrient Budget

The total annual nitrogen load to mitigate is:	**0.95 kg TN/year**

Figure 1 Solent Catchment Area *Contains public sector information licensed under the Open Government Licence v3.0*



Appendix D

CONDITIONS AND LIMITATIONS OF NITROGEN NUTRIENT ASSESSMENT
May 2020

Aqua Callidus Consulting Ltd is constituted as a limited liability company in accordance with the Companies Act 1989 (with registered number 11390910 and with its registered office at Kintyre House, 70 High Street, Fareham, Hants, PO16 7BB).

1. The report is confidential to the clients stated in the report and has been prepared to their instructions for their own purposes and it is not permitted to disclose this report to other parties (except NHBC, Local Authority, the Client's own Solicitors and Professional Advisers) without the prior consent of Aqua Callidus Consulting Ltd.

2. This report has been prepared by Aqua Callidus Consulting Ltd, with all reasonable skill, care and diligence within the terms of contract with the Client incorporated in our Standard Terms of Business.

3. The copyright of this report remains the property of Aqua Callidus Consulting Ltd.

4. Aqua Callidus Consulting Ltd disclaims any responsibility to the Client and others in the respect of any matters outside the scope of this report.

5. No liability for the contents of this report is accepted to any parties other than the client stated in the report.

6. Unless stated otherwise the nitrogen assessment is based on site specific information provided by the client and manufacturers and wastewater companies public information on the performance of wastewater treatment plants and works. No liability is accepted for the accuracy of such third party information.

7. Unless stated otherwise the nitrogen assessment is undertaken as a desktop assessment and no site visit has been made.