

Nutrient Neutrality

**Belmont Castle Care Home Extension,
Portsdown Hill Road, Bedhampton, PO9 3JY**

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1 INTRODUCTION

1.1 Existing Site

Belmont Castle Care Home is located to the west of Bedhampton (Figure 1.1) 150m west of the A3(M) at the Bedhampton Gap and on the northern slope of Portsdown Hill with views towards the South Downs. The original building is a nineteenth century Grade II listed villa in a mock castle style in its own grounds (Figure 1.2) with castellations and a tower formed of facing brickwork with stone details creating a stripped Gothic style appearance (Figure 1.3). The existing building has three floors with a semi-basement level. An extension of the building was added in the late 1980s designed to respect the vernacular of the existing building and is also built of brick with reconstituted stone and simulated castellations and half octagon towers as shown an aerial photograph of the site (Figure 1.4). The building's windows are a mixture of gothic style, squared and circular.

1.2 Proposed Development

The proposals are to provide a detached extension to the existing care home that will run in conjunction with the existing home and will be for EMI patients (Elderly Mentally Infirm) and which will cover a need identified in the local area. The proposed extension of 12 additional beds is above the previously permitted application (Ref: APP/14/00462) for 36 beds thus creating a 48 bedroom facility as shown on the scheme floor plans (Figure 1.5). The proposals are for a two/three storey building that will, as with the previously accepted scheme, be partially submerged into the landscape with an undercroft level (Figure 1.6). Due to the reduction in height the proposed scheme has a larger footprint than the previous approval but the overall visual impact of the new building has been reduced due to the loss of an additional storey. The designs seek to provide a sensitive addition to the original building's Grade II listed status and to take advantage of its position on a hill overlooking a rural area.

The proposed care home will be sited to the north of the existing building(s) with a central garden courtyard to be created between the existing and proposed buildings. This will provide views from the existing and proposed bedrooms and will serve as the main amenity space for the residents and provide a secure open environment for residents to partake in outdoor activities. The elevation will provide views out across the South Downs.

A previous planning approval (Ref: APP/14/00462) was granted by Bedhampton Borough Council in October 2014 for a part 3 storey, part 4 storey detached building within the grounds of Belmont Castle Care Home at the same location. Whilst a material start has been made on the permitted scheme the Care Home is under new ownership and the owners have decided to resubmit an amended planning application for an extended and amended scheme.

1.3 Requirement for a Nitrate Mitigation Study

As part of this new application the LPA has advised that Natural England's directive for any development with overnight stay accommodation in the Solent catchment area should prove that the proposals will provide a neutral or lower net nitrate emission to these waters, referred to as nutrient neutrality. Natural England's 'Advice for LPAs' (June 2019) sets out the planning and environmental context for the approach and methodology to calculate how nutrient neutrality can be achieved to assess whether any increase in wastewater from the proposed new development will have an adverse effect on the international sites in the Solent. Bedhampton Borough Council has advised that they are not able to comment on the proposed development until these deliberations have been considered. This report is intended to fulfil these requirements.

1.3.1 Approach

To ensure the impact of a new development on designated sites in the Solent is minimised a scheme should ideally achieve nutrient neutrality based on an assessment of the net nitrogen budget of the new development. Natural England recommend that the any new proposals should achieve nitrogen neutrality by securing the required mitigation in compliance with the Habitats Regulations. The nutrient neutrality calculations required and provided in this report include key inputs and assumptions based on the best-available evidence and research but with a degree of uncertainty such as occupancy levels and water use in perpetuity hence a precautionary approach should be used.

The required approach is to calculate the level of Nitrogen (N) likely to be derived from a development. However, N comes in different forms and the key measurement is the Total Nitrogen (TN), i.e. the organic and inorganic forms of nitrogen as this influences plant growth. TN is the sum of the inorganic forms - nitrate-nitrogen (NO₃-N), nitrite-nitrogen (NO₂-N), ammonia - and organically bonded nitrogen.

Total Nitrogen is measured at Wastewater Treatment Works (WwTW) where there is a permit with a TN limit consent. For WwTWs without permits the measurements could be inorganic nitrogen (nitrate + nitrite + ammoniacal N) or TN or a mix and most river quality monitoring by EA only records the inorganic N forms. Nitrate is normally the largest component of TN and quantities of organic N are significant whilst dissolved organic nitrogen has been found to comprise 7% of the potential biologically available nitrogen in local rivers and 13% of in the estuary. The land use change element of this methodology may therefore underestimate TN leaching hence Natural England require that a precautionary approach should be adopted.

1.3.2 Type of Development

Any type of development that would result in a net increase in population served by a wastewater system, including new homes, student accommodation, tourism attractions and tourist accommodation and care homes, will all have wastewater implications. Commercial development not involving overnight accommodation are generally not included but some uses can have a significant nitrogen loading.

1.3.3 Methodology

The procedure is as follows:

Stage 1 Calculate Total Nitrogen (TN) in kg/yr from the development that would exit the Wastewater Treatment Works (WwTW) after treatment

- Step 1 Calculate additional population
- Step 2 Confirm water use
- Step 3 Confirm local WwTW and permit level
- Step 4 Calculate Total Nitrogen (TN) that would exit the WwTW after treatment due to the proposed development.

Stage 2 Adjust Nitrogen load to offset existing nitrogen from current land use on the site.

Stage 3 Adjust nitrogen load to account for land uses within the proposed development.

Stage 4 Calculate the net change in the Total Nitrogen load that would result from the development

Consider Mitigation Measures.

These are described in the following sections of this report.

2 METHODOLOGY

2.1 Stage 1 - Total Nitrogen (TN) from Proposed Development

The first step is to calculate the Total Nitrogen (TN) in kg/year generated by the development and that would enter and exit the local Wastewater Treatment Works (WwTW) after treatment

2.1.1 Step 1 Calculate Additional Population

All types of new housing (market and affordable) and overnight accommodation will increase the population levels within the catchment leading to inevitable wastewater implications. The additional population that would use the proposed development, 12 additional bedrooms in the extension of the approved Care Home, is assumed to be 12 persons. The number of occupants is restricted by the number of bedrooms and 12 persons is therefore a reasonable and rational estimate.

2.1.2 Step 2 Confirm Water Use

The water use / efficiency standard for the proposed development is then defined and the nitrogen load is calculated from the scale of water use. The water use is based on G2 of the Building Regulations 2010 which provides a maximum water use of 125 l/p/d which includes WCs, personal washing, clothes and utensils washing and all general domestic uses. Natural England consider the Building Regs optional rate of 110 l/p/d should be used a precautionary figure, based on the use of water saving devices, and this rate is adopted in these calculations. Although Care Home users may have a different water usage it is not unreasonable to assume the same amount of water per person would be used on the site individually and by communal facilities. This gives the estimated amount of additional wastewater that will be generated by the development and that will flow to the local wastewater treatment works.

2.1.3 Step 3 Confirm WwTW and Permit Level

The next step is (i) to identify the Wastewater treatment works (WwTW) that the development will use, and (ii) to identify the permit concentration limit for Total Nitrogen at this WwTW.

Wastewater from homes across Bedhampton, Hayling Island, Cosham, Paulsgrove, Waterlooville, Horndean and Hambledon is treated at Budds Farm Wastewater Treatment Works to the south of Bedhampton. This serves around 410,000 people and during normal weather conditions treats 109 Mld (million litres per day) of wastewater, up to 200 Mld during storm conditions, and disposes the treated wastewater to Langstone Harbour.

Where the receiving waters are defined as sensitive under the Urban Wastewater Treatment Directive (UWWTD) with respect to particular nutrients, the final effluent discharge needs to achieve an annual average of 15mg/l TN for works serving a population of between 10,000 and 100,000 and an annual average of 10mg/l TN for works of over 100,000 population. The Budds Farm serves a population in excess of 400,000 and as the Solent has been designated as a sensitive area in regard to eutrophication the effluent is required to achieve a 10mg/l TN

standard. Southern Water undertook £1.8billion of capital schemes between 2005 and 2010 to facilitate nitrogen removal at several of their WWTs, including Budd's Farm, which includes a Sludge Treatment Centre and the 10mg/l TN standard was achieved by the end of March 2008.

The load calculations then use a worst case scenario that the WwTW operates at 90% of its permitted limit which is taken as the closest the water company can reasonably operate works without breaching the consent limit.

2.1.4 Step 4 Calculate Total Nitrogen (TN) in Kg/yr

Step 4 is to then calculate the Total Nitrogen (TN) in Kg/year that would exit the WwTW after treatment as derived from the proposed development. This is calculated by multiplying the water use of the proposed development by the appropriate concentration of Total Nitrogen after treatment at the WwTW. The Total Nitrogen load of the proposed development is therefore based on a water use of 110 l/p/d and at 90% of the WwTW consent limit for TN of 10 mg/l. This gives a Wastewater total nitrogen load for the proposed development of 4.34 kg/TN/yr (Table 2.1).

Table 2.1 Total Nitrogen (TN) Load From Development Wastewater

Step	Measurement	Value	Unit	Explanation
Development proposal	Development that would increase the population served by a wastewater system	12	No of units	12 additional bedrooms
Step 1	Additional population	12	Persons	All room are for single occupancy
Step 2	Water use	110	l/p/day	110 litres/day.
Step 2	Wastewater from the development	1320	litres/day	12 persons x 110 litres/day.
Step 3	Receiving WwTW environmental permit limit for TN	10.0	mg/l TN	Consented limit
Step 3	Required Standard	9.0	mg/l TN	90% of consented limit of 10 mg/l TN
Step 4	TN discharged after WwTW treatment	11880	mg/TN/day	1320 l/d x 9.0 mg/l
TN in kg/TN/day		0.01188	Kg/TN/day	Divide by 1,000,000
TN in kg/TN/yr		4.336	Kg/TN/yr	Over 365 days
Wastewater total nitrogen load		4.34kg/TN/yr		

2.2 Stage 2 - Nitrogen Load from Current Land Use

This next stage is to calculate the nitrogen losses from the current land use which is then subtracted from the proposed development land use wastewater Total Nitrogen load detailed above.

2.2.1 Grassland

The Nitrogen–nitrate loss from agricultural land can be estimated using the Farmscoper study commissioned by Natural England from ADAS which gives the average nitrate-nitrogen loss for different farm types across the Solent river catchments such as cereals, dairy, general crops, horticulture, pigs, lowland grazing, mixed use, poultry, allotments, . horse paddocks etc.

This indicates that wildlife areas, woodlands, hedgerows, ponds and lakes should be excluded from the calculations as there is no agricultural nitrogen input onto this land. Similarly, areas of greenfield that are not currently in agricultural use, and have not been used as such for the last 10 years, also have no agricultural nitrogen input and are assigned a TN of 0 kg/yr. In this case the existing land for the development is unoccupied amenity grassed garden area with trees and there are no buildings, point or non-point sources of Nitrogen.

The part of the site to be developed is partly cultivated with a greenhouse and it is assumed that fertilisers are applied once or twice per year to the existing grassed site to make them more pleasant for recreational use. Assuming the development site area is 20m by 60m the built area will be 1200m² and, at the catchment average loading rate of 13 kg/ha, this reduction in fertilizer application would reduce TN by 1.56kg/yr (Table 2.2).

Table 2.2 Total Nitrogen (TN) Load From Existing Site

Measurement	Value	Unit	Explanation
Existing area of land	0.12	Ha	Area of land lost due to proposed built development (20m by 60m)
Land type nitrate loss	13	Kg/ha/yr	Garden grassland
Nitrate loss	1.56	Kg/TN/yr	0.12 ha x 13 kg/ha/yr

2.2.2 Water Use Reduction

Portsmouth City Council's current standards are that if they make water efficiency improvements to 6 of their existing housing stock this will allow new one new house to be built and this offsetting is deemed Nutrient Neutral. The installation of water saving devices to existing homes and buildings is therefore a viable technique to reduce nutrient loading and the same principle can be applied to this Care Home. DEFRA's/Energy Saving Trust 'Water Saving Guidance -At Home with Water' states (Appendix A) that WC capacity has changed:

- pre-1940 - 12 litres/flush
- 1940-1980 - 9 litres/flush
- 1980-2001 - 7.5 litres/flush,
- post-2001 - 5 litres/flush

They also give a WC usage of 5 flushes/day/person.

The existing Care Home has older style WC units which have been inspected and have a capacity of 13 litres and the plans are to replace these with water saving units of 6 litres which will result in a net reduction of 7 litres for each WC use.

The existing use is therefore 40 person, 13 litres and 5 uses per day = 2600 litres/day
Th installation of new WCs is then 40 person, 5 litres and 5 uses per day = 1000 litres/day

The overall water use on the site will therefore be reduced by 1600 litres/day with an overall reduction in TN of 5.11 kg/TN/day (Table 2.3).

Table 2.3 Total Nitrogen (TN) Load From Existing Site

Measurement	Existing	Proposed	Unit	Explanation
Population	40	40	Persons	Number generating TN
Water use	13	5	litres/flush	Pre water saving standard 125 litres/per/day.
Frequency	5	5	Times/day	WC use per day
Wastewater from the development	2600	1000	litres/day	40 persons @ 5 times/day
Net	-1600		litres/day	
Receiving WWTW permit limit for TN	10.0		mg/l TN	Consented limit
Required Standard	9.0		mg/l TN	90% of consented limit of 10 mg/l TN
TN discharged after WWTW treatment	-14,400		mg/TN/day	-1600 x 9.0 mg/l
	-0.014		Kg/TN/day	Divide by 1,000,000
	-5.11		Kg/TN/yr	X 365 days
Wastewater TN load	-5.11		kg/TN/yr	

2.3 Stage 3 - Nitrogen Load from Other Land Uses with the Proposed Development

The third stage is to add the nitrogen load that will result from the new development but that is not received by a WWTW. This includes any new urban developments and open spaces, Suitable Alternative Natural Greenspace areas (SANG), Nature Reserves or Bird Refuge Areas. The calculation only includes the areas of the site where there will be a change in land use, for example from agricultural land to new urban development or agricultural land to Suitable Alternative Natural Greenspace (SANG) / open space.

2.3.1 Urban Development

The nitrogen load from the new urban development results from sewer overflows and from drainage that picks up nitrogen sources on the urban land. Urban development includes the built form, gardens, road verges and small areas of open space within the urban fabric. These nitrogen sources include atmospheric deposition, pet waste, fertilisation of lawns and gardens and inputs to surface water sewers. The nitrogen leaching from urban land equates to 14.3 kg/ha/yr. However, no such new areas are proposed.

2.3.2 Open Space and Green Infrastructure

Nitrogen loss draining from new designated open space or Suitable Alternative Natural Greenspace (SANG) should also be included. The nitrogen leaching from this land is likely to equate to 5 kg/ha/yr. This figure can also be used where new nature reserves or bird refuge areas are created. Small areas of open space within the urban fabric, such as road verges, gardens, children's play areas and other small amenity areas should not be included within this category. The urban development figure is appropriate for these land uses. No such areas are proposed.

2.3.3 Community Food Growing Provision

For any areas of the site that are proposed for community food growing provision it is recommended that the average farm rate is used (26.9 kg/ha/yr). No such areas are proposed.

As there are no proposed changes to the land use this element is excluded from the nitrogen budget as there will be no change to the nitrogen load from these areas.

2.4 Stage 4 - Net Change in the Total Nitrogen Load Due to the Development

Stage 4 calculates the net change in the Total Nitrogen load that would result from the development. This is the difference between the Total Nitrogen load for the proposed development and the existing land use and this gives a net additional Wastewater load of 4.34 kg/TN/yr (Table 2.4).

Natural England also recommend that a 20% precautionary buffer is built into the calculations. There may be cases where the local authority consider an alternative precautionary buffer should be used on a site-specific basis but 20% is adopted for this site and this gives a revised wastewater total nitrogen load of 5.20 kg/TN/yr (Table 2.4). The removal of nitrogen fertilizers and the installation of water saving WCs indicates the TN loading will decrease by 1.47 kg/TN/yr (Table 2.4).

Table 2.4 Net Change In Nitrogen Load From The Development

Step	Measurement	Value	Unit	Explanation
1	Wastewater Nitrogen load from proposed development (stage 1)	4.34	Kg/N/yr	Table 2.1
	Load plus 20% buffer	5.20	Kg/N /yr	Stage 4 add 20%
2	Change existing land use (stage 2)	-1.56	Kg/N/yr	Table 2.2
2	Water Saving Devices on Existing WCs (stage 2)	-5.11	Kg/N/yr	Table 2.3
3	Land use changes (Stage 3)	0.0	Kg/N/yr	Section 2.3
4	Net change. Difference between future and existing Nitrogen loading.	-1.47	Kg/N/yr	Negative indicates the proposals will generate less TN
Net Nitrogen Budget		-1.47 Kg/TN/yr		

3 MITIGATION

If the calculations identify a Nitrogen surplus (a positive figure) hence mitigation is required to achieve nitrogen neutrality. If there is a deficit in TN (a negative figure) then no mitigation is required. In this case the calculations above show the Care Home extension would result in a decrease in the nitrate loading from the WwTW to the Solent estuary and hence further mitigation measures, in addition to low capacity WCs in the existing Care Home, are not required.

4 CONCLUSIONS

- Belmont Castle Care Home is located to the west of Bedhampton and is a 19th century Grade II listed villa in a mock castle style set in its own grounds. The existing building has three floors with a semi-basement level and with an extension added in the late 1980s of a similar style.
- The proposed development is to provide a separate detached building as an extension to the existing care home for EMI patients (Elderly Mentally Infirm) to provide for a need identified in the local area. A previous planning application (Ref: APP/14/00462) for a 36 bed extension at this same location was approved by Bedhampton Borough Council in October 2014 but the new owners of the Care Home have submitted an amended planning application for 12 additional beds to create a 48 bedroom facility.
- As part of this new application the LPA has advised that Natural England's directive for any development with overnight stay accommodation in the Solent catchment area should prove that the proposals will provide a neutral or lower net nitrate emission, referred to as 'Nutrient Neutrality'. Natural England's 'Advice for LPAs' (June 2019) has been used to calculate how nutrient neutrality can be achieved based on the likely increase in wastewater from the proposed development and this report is intended to fulfil these requirements.
- The approach is based on the estimated population increase of 12 persons and an assumed water use of 110 l/p/d. The total Nitrogen (TN) that would exit the Budds Farm waste water treatment works after treatment due to the proposed development is estimated as 4.34 kg/TN/yr. This is adjusted to offset the nitrogen loading from existing site (0 kg/TN/yr) and for other land uses within the proposed development (0 kg/TN/yr) which gives the net change in the Total Nitrogen load of 4.34 kg/TN/yr. Natural England recommend that a 20% precautionary buffer is included which gives a total nitrogen load of 5.20 kg/TN/yr.

However the installation of water saving WCs in the existing Care Home, and the cessation of the application of fertilizers over the new built footprint, will reduce the nitrogen loading to below the existing rate and hence further mitigation measures are not required to achieve nitrogen neutrality.

Figures

Figure 1.1 Site Location Plan

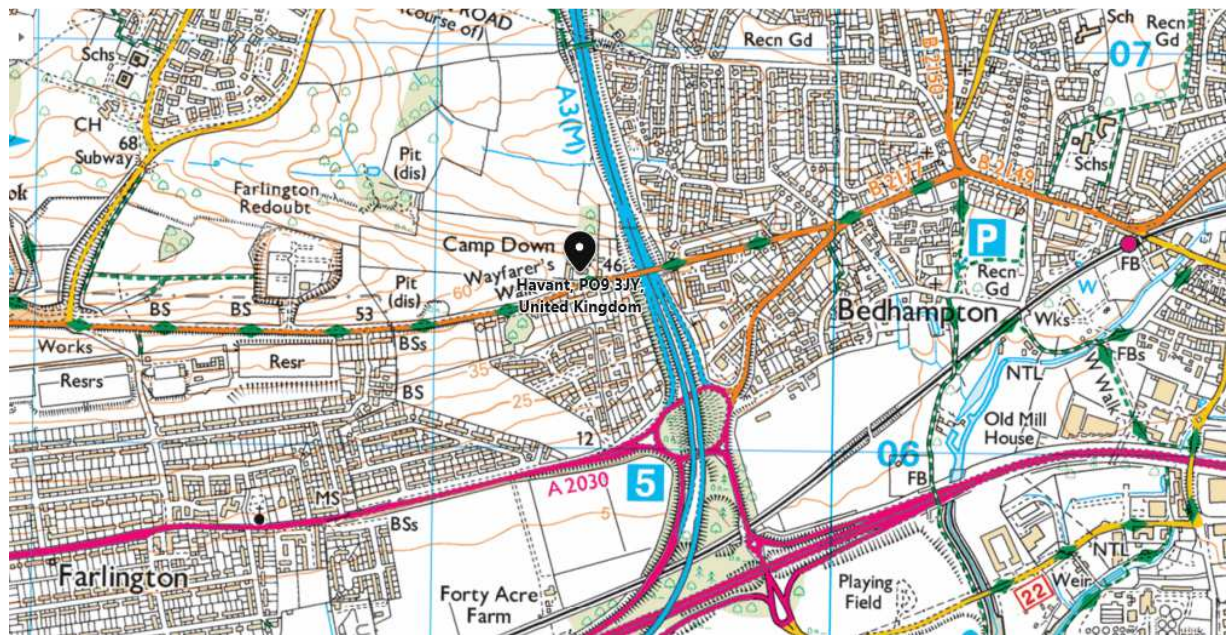


Figure 1.2 Existing Site Layout

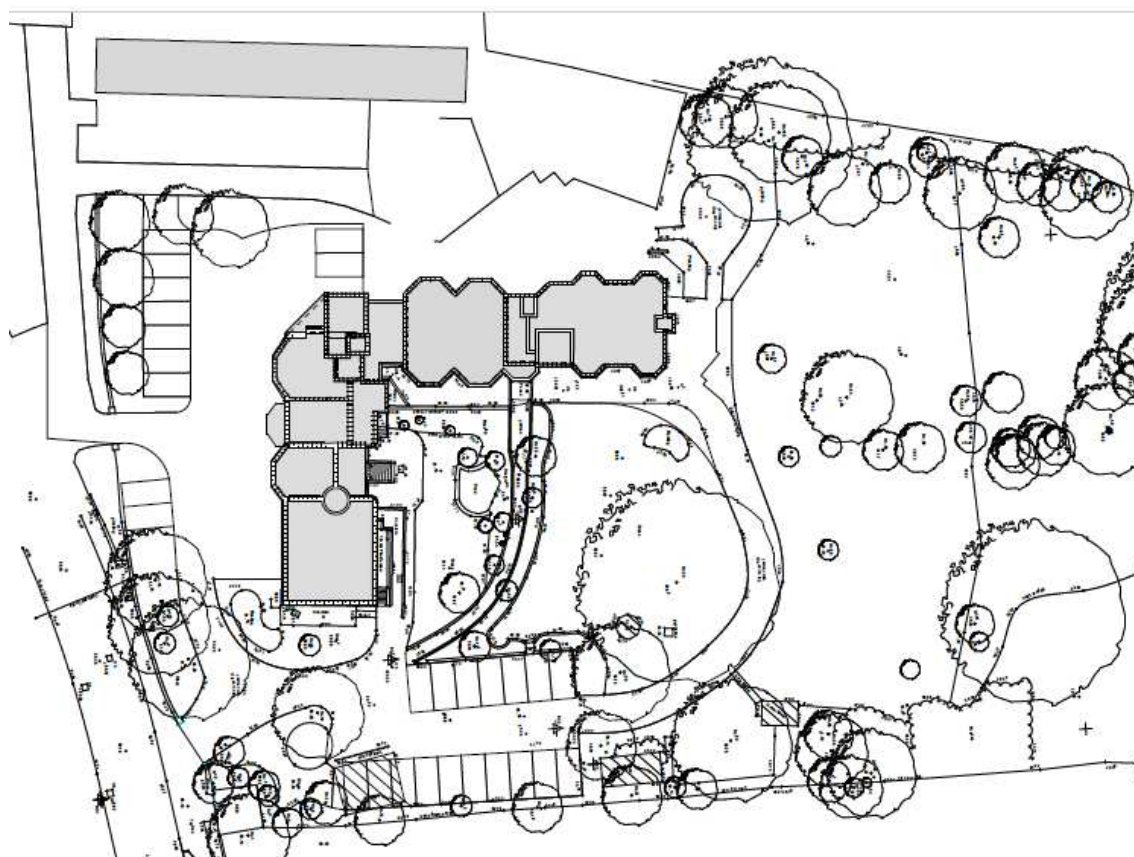


Figure 1.3 Existing Site Photographs



Figure 1.4 Aerial Photograph



Figure 1.5 Proposed Floor Plans

Under-croft



Lower Ground



Upper



Figure 1.6 Proposed Elevation – South

