

Your Ref: SSHP 888888_0000-MAC-XXX-XX-T-O-0009

Date: 15 December 2023

Our Ref: SHF.726.002 version J HMP Kirklevington Grange and Holme House RDCP

Email: paul.hardwick@enzygo.com

Tony Selwyn
Head of Environmental Planning
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London
SE1 0AX

Dear Tony,

RE: Technical Note 8 November 2023: Combined Nutrient Neutrality Assessment- RDCP New Houseblocks HMP Kirklevington Grange, and HMP Holme House - additional 172 bed accommodation provision

1. Introduction

- 1.1 This Nutrient Neutrality Assessment (NNA) has been prepared by Dr Paul Hardwick on behalf of Enzygo Ltd, in support of the Rapid Deployment Cell Programme (RDCP) which seeks to provide additional prison places across existing prison sites through the development of new accommodation houseblocks.
- 1.2 Enzygo was commissioned to review the additional accommodation to be provided by RDCP at HMP Kirklevington Grange and HMP Holme House in the context of nutrient neutrality.
- 1.3 The sites are in the River Tees catchment, a SAC and a 'nutrient neutrality SSSI catchment' (NE 2022¹). The Tees catchment drains to the Teesmouth and Cleveland Coast statutory designated sites. Natural England (NE) has deemed the designated sites to be in unfavourable condition due to excessive nutrients in the contributory watercourses. So, development anywhere in the catchment potentially affecting the designated sites requires a Habitats Regulations Assessment (HRA) to enable it to proceed, and 'nutrient neutrality' is the only solution. Nitrogen is the nutrient of concern for the designate site (Table 1), expressed as Total Nitrogen (TN).

Table 1 Extract of NE Advice Note 16 March 2022 Table 2: "Additional habitats sites in unfavourable condition due to excessive nutrients which require a Habitats Regulations Assessment (HRA) and where nutrient neutrality is a potential solution to enable development to proceed". The affected LPAs are listed in column 2 and the substance of concern is shown in column 3.

<p>Teesmouth & Cleveland Coast SPA/Ramsar</p>	<p>Darlington Borough Council Durham County Council Eden District Council Hambleton District Council Hartlepool Borough Council Middlesbrough Council North York Moors National Park Redcar and Cleveland Borough Council Richmondshire District Council Stockton-on-Tees Borough Council</p>	<p>Nitrogen</p>
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¹ NE785 Revised Edition Natural England Water Quality and Nutrient Neutrality Advice (16 March 2022).

- 1.4 This technical note is an assessment of whether the developments would cause a Likely Significant Effect on the designated sites and uses the calculations from Natural England (NE) national and catchment specific nutrient neutral calculators to determine the magnitude of any effect.
- 1.5 The proposed development provides additional RDCP inmate accommodation of 172 beds in the Tees HMP estates comprising:
 - 152 places at HMP Kirklevington Grange
 - 20 places at HMP Holme House.
- 1.6 The additional inmate numbers were confirmed by Programme Board on 13 October 2023.
- 1.7 The prisoner population number is considered 'worst case' for NNA, as an unquantified number of the prisoner complement will be ordinarily resident in the Tees catchment and so will be double counted.
- 1.8 It is understood that staff numbers will not increase to support either of the two developments and should there be an increase going forward it is a reasonable assumption that most staff reside elsewhere in the River Tees catchment and so should not be included in the NN assessment to avoid double counting.
- 1.9 It is proposed to offset the increased TN from the two additional populations by constructing an adoptable private Wastewater Recycling Centre (WRC) otherwise known as a Sewage Treatment Works (STW) or Wastewater Treatment Works (WwTW) adjacent to but offsite from HMP Holme House. The WRC will be constructed and managed by Severn-Trent Connect (ST-Connect) and will treat wastewater to fully offset the additional wastewater volumes arising from the Kirklevington Grange development as well as all present wastewater arising from Holme House.
- 1.10 The new WRC would treat the wastewater to the current technically achievable limit of 10mg TN/L.

2. The existing sites and proposed developments

HMP Kirklevington Grange

- 2.1 HMP Kirklevington is located near Yarm-on-Tees in North Yorkshire, TS15 9PA.
- 2.2 The prison site is centred on Ordnance Survey grid reference NZ 4288 5112 and comprises prison accommodation with hardstanding areas, roadways, grassed and landscaped areas, sports pitches, and an allotment/garden area. The site elevation is around 39 to 41mAOD and is in the River Tees catchment. The previous accommodation blocks (MUDR) were demolished before NE issued its advice on 16 March 2022 and the former inmates were dispersed to other prison accommodation outside the Tees catchment.
- 2.3 The proposed development will replace the previously demolished prisoner MUDR accommodation blocks with new units D, E, and K to accommodate an additional 152 beds.
- 2.4 The proposed development will connect to the existing prison foul sewer network discharging to the foul sewer operated by Northumbrian Water. Kirklevington Grange is in Northumbrian Water's 'Yarm (11 D58)' drainage area² and the receiving STW is Yarm WRC to the north of site.
- 2.5 Treated effluent from Yarm WRC is discharged under consent into the Tees at a concentration of 27mg TN/l. No future TN reduction is proposed in Northumbrian Water's DWMP for sewer drainage area Yarm (11 D58).

HMP Holme House

- 2.6 HMP Holme House is located at Stockton on Tees in County Durham, TS18 2QU.
- 2.7 The prison site is centred on Ordnance Survey grid reference NZ 4579 2055 and comprises prison accommodation with ancillary infrastructure, hardstanding areas, roadways, and distributed grassed and landscaped areas. The site elevation is around 8 to 10mAOD.
- 2.8 RDCP accommodation to provide an additional 20 beds is proposed.
- 2.9 The proposed development will connect to the existing prison foul sewer network discharging to the foul sewer operated by Northumbrian Water. Holme House is in Northumbrian Water's 'Stockton East (11 D52)'

² [1045 \(arcgis.com\)](https://arcgis.com)

drainage area and the receiving STW is not known but is probably Bran Sands WRC at Teesmouth to the southeast of site.

- 2.10 Treated effluent from Bran Sands is discharged under consent into the Tees at a concentration of 27mg TN /litre. No future reduction is proposed in Northumbrian Water's DWMP for Stockton East (11 D52)³.

3. Background to Nutrient Neutrality

Nutrients

- 3.1 Nutrients (nitrogen (N) and phosphorus (P) compounds) are essential for plant growth, but in excessive concentrations can cause eutrophication of water bodies which derogates water quality and directly affects invertebrates and fish, with indirect detrimental effects on dependent birds and other animals. To reduce the risk of eutrophication, the statutory consultee NE, under the Environment Act 2021 as amended, requires all new development in the catchment of an at-risk designated water body (NNR, SSSI, SAC or SPA) to be as a minimum nutrient neutral and has issued national guidance to that effect (February 2022).
- 3.2 Nutrient neutral means that additional development must not add to N and P loads in catchments containing or draining to designated water bodies.
- 3.3 N and P exist in several forms:
- Nitrogen: N₂ (gas), Nitrite ion (NO₂); Nitrate ion (NO₄), and Ammoniacal N (NH₃-N)
 - Phosphorus: Phosphate ion PO₄³⁻, inorganics (orthophosphate (the form used by plants) and polyphosphate) and organic phosphates.
- 3.4 Wastewater analysis generally determines Total Nitrogen (TN) and Total Phosphorus (TP) concentrations (i.e., all forms of the nutrients).

Primary emissions of N and P

- 3.5 HMP estates produce wastewater from the amenities provided for the collection and removal of human waste from inmates, staff, and visitors. Wastewater from toilets is 'black water' contaminated with chemicals and excrement, and used water from showers, sinks, baths, and laundry facilities is 'grey water' with less harmful contamination. However, both types of water contain concentrations of N and P and in the UK are generally discharged together to foul sewer.
- 3.6 Wastewater estimates are based on per person consumption estimates. Using the MoJ design guides, specifically *STD-Z_DG_80_Custodial Living Accommodation*, the future water usage is based on 105 litres per prisoner per day. Existing water consumption at the three prisons is not known but will be higher than that being proposed for the new developments.
- 3.7 The RDCP at HMP Kirkclevington Grange will be connected to the existing prison site foul sewer which drains to the public foul sewerage network.
- 3.8 All NW WRCs currently discharge treated wastewater at a concentration of 27mg TN/litre⁴.
- 3.9 HMP Holme House will be disconnected from the foul sewer connecting to the Bran Sands WRC and instead will be connected to a new foul and a new adoptable STW provided by Severn Trent Connect, located outside the wire at Holme House.

Secondary emissions of N and P

- 3.10 At Kirkclevington Grange the landscaped areas and other functional greenspace (allotments/market garden area) produce secondary emissions of N and P from the use of nitrogen and/or phosphorus-based fertilisers. These can be emitted in surface water runoff to site drainage into adjacent surface water bodies (West Gill/East Gill and the River Leven tributary of the Tees) or leach through soils and superficial deposits into groundwater. Secondary emissions are not expected to change post development of the RDCP additional accommodation.

³ [1039 \(arcgis.com\)](https://arcgis.com)

⁴ [DWMP | Drainage and Wastewater Management Plans \(nwl.co.uk\)](https://nwl.co.uk)

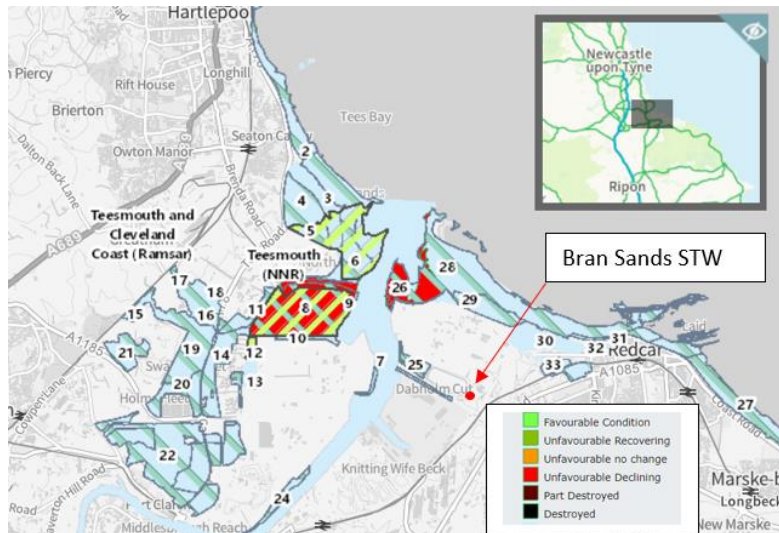
- 3.11 The future development footprint at Kirklevington would directly replace the former residential blocks and the amount of proposed vs existing greenspace is similar.
- 3.12 At Holme House the preferred option is to replace a 'Covid 19 office' building and a 'PPE storage shed' with new RDCP units to accommodate 20 additional prisoners. Consequently, there is no significant change in land use at the site. However, some 0.2ha of greenspace 'outside the wire' will be replaced by a bespoke wastewater treatment plant ('commercial/industrial land').
- 3.13 In summary there will be no change in secondary nutrient emissions from HMP Kirklevington Grange and a small increase in secondary emissions from HMP Holme House. This is accounted for in the nutrient budget assessment (Section 5 and Appendix 1).

4. Designated Sites

- 4.1 Table 2 and Figure 1 summarise the statutory designated sites at Teesmouth that could be affected, Nitrogen is the nutrient of concern.

Table 2 Extract of NE Advice Note 16 March 2022 Table 2: "Additional habitats sites in unfavourable condition due to excessive nutrients which require a Habitats Regulations Assessment (HRA) and where nutrient neutrality is a potential solution to enable development to proceed"

<p>Teesmouth & Cleveland Coast SPA/Ramsar</p>	<p>Darlington Borough Council Durham County Council Eden District Council Hambleton District Council Hartlepool Borough Council Middlesbrough Council North York Moors National Park Redcar and Cleveland Borough Council Richmondshire District Council Stockton-on-Tees Borough Council</p>	<p>Nitrogen</p>
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Teesmouth and Cleveland Coast Ramsar and SPA are Habitats sites with water pollution and eutrophication considered a threat to its condition.

The sites cover a complex of coastal habitats centred on the Tees estuary in the north-east of England. This includes habitats such as sandflats, mudflats, rocky foreshore, saltmarsh, sand dunes, wet grassland and freshwater lagoons.

These habitats support internationally important populations of breeding and non-breeding waterbirds. This includes breeding Little tern, passage Sandwich tern, wintering Knot and Redshank and an assemblage of over 20,000 wintering waterbirds. In addition, there is an internationally important population of Ringed plover. The sites also supports a rich assemblage of invertebrates.

The SPA is a complex of discrete sites, with additional non-designated areas also used by the birds for foraging and roosting.

The area has been highly modified by human activities, with over 90% of intertidal habitats lost to land claim.

Increased levels of nitrogen and phosphorous entering aquatic environments via surface water and groundwater can severely threaten these sensitive habitats and species within the site. The elevated levels of nutrients can cause eutrophication, leading to algal blooms which disrupt normal ecosystem function and cause major changes in the aquatic community. These algal blooms can result in reduced levels of oxygen within the water, which in turn can lead to the death of many aquatic organisms including invertebrates and fish.

The species within Teesmouth and Cleveland Coast that result in designation as an SPA and Ramsar are referred to a 'qualifying features'. Not all of these qualifying features will be sensitive to changes in nutrients within the site. When completing an HRA involving nutrient neutrality, the Competent Authority (normally Local Planning Authority for developments) must identify and screen out qualifying features that are not sensitive to nutrients via a Habitats Regulations Assessment. Developers will be asked to submit information to support this process.

Figure 1 Teesmouth designated areas (Ramsar, proposed Ramsar, SSSIs and NNRs) unfavourable declining sites in red. Information text from Teesmouth Budget Nutrient Calculation version 2

5. Nutrient Neutral Budget- Assessment of Likely Significant Effect

5.1 This assessment determines the Likely Significant Effect of the development on nutrients at the designated sites, and whether a Habitats Risk Assessment/Appropriate Assessment is required.

Primary nutrients in foul sewage and amenity wastewater

5.2 The combined developments at the two Tees Catchment HMP sites would provide up to 172 additional beds, each person generating wastewater containing nutrients which, following treatment by Northumbrian Water at separate wastewater treatment works as for the present sites is discharged into the River Tees and its statutory designated sites. Nitrogen is the nutrient of concern.

Nutrient Budget Calculations

5.3 Treated waste from both prison sites discharges into the Tees from the respective NW WRCs and so a combined baseline nutrient budget assessment is carried out below.

5.4 A nutrient budget for the combined developments was calculated using the catchment- specific Teesmouth Nutrient Budget Calculator Version 2.2 (March 2023) which provides a lookup for the STW consented discharge for nutrients (which for all WRCs is 27 mg/l as total nitrogen (TN)), and an Excel spreadsheet calculator. The Annual nutrient budget calculations are in 4 stages, the results are summarised in Table 3 and described below, the budget calculator is included as Appendix 1.

Table 3 Nutrient Budget Summary 172PE for Kirklevington Grange and Holme House RDCP

Table 3 Nutrient budget summary				
	Additional Population	Additional Nutrient load	Change in land use	Annual nutrient budget
	PE	kg TN/yr	kg TN/yr	kg TN/yr
Kirklevington	152	157.40		
Holme House	20	20.71		
Land use change			0.56	
Total	172	178.11	0.56	
	+ 20% NE recommended buffer for uncertainty		35.62	0.11
Total			213.73	0.67
combined sites would generate 214.40 kg TN/year from increased prison population of 172				

Stage 1: Calculate annual wastewater nutrient load associated with the additional wastewater.

- 5.5 Nutrient budgets require information on the additional numbers of persons who will occupy or use a development and their consumption of potable water, which drives the amount of wastewater requiring treatment to remove the majority of the nutrients.
- 5.6 The proposed additional increase in population is 172 inmates to be housed in RDCP additions to HMP Kirklevington Grange, and HMP Holme House.
- 5.7 The developments will be phased as follows:
 - Phase 1 construction of HMP Kirklevington Grange RDCP and HMP Holme House RDCP providing accommodation for a combined total of 172 person equivalents (PE).
 - Phase 2 Treatment of equivalent wastewater loads for 172 PE at a new Severn Trent- Connect bespoke water recycling centre located at Holme House)
- 5.8 from MoJ design guide STD/Z/DG/80, the water demand will be 105 litres per inmate per day.
- 5.9 Whichever water efficiency standard is selected, NE recommend that water usage is increased by an additional 10 litres per person per day to account for changes to less water efficient fittings throughout the lifetime of the development. However, for the proposed facility there is unlikely to be any long- or short-term change in fittings that would increase water use. New water-efficient taps showers and toilets will help limit that consumption.
- 5.10 The increased water usage is:
 - 172 persons x 105 l/day x 365.25days = 6,596,415 l/year
- 5.11 All Northumbrian Water wastewater treatment works on the Tees are treating to 27 mg TN/litre⁵.
- 5.12 The calculated unmitigated TN in primary wastewater load (wastewater) is **178.11 kg TN/year**.

Stage 2: Effects of land use change and

Stage 3: Annual nutrient load from new (post-development) land use on the development

- 5.13 Only land cover that would be affected by a development footprint needs to be assessed.
- 5.14 The Kirklevington RDCP will be constructed on the current cleared site so there is no significant change in land use.
- 5.15 The Holme House RDCP will be constructed on a cleared area of site and there is no significant change in land use. However, ~0.2 ha of greenspace outside the wire will be replaced by a new wastewater treatment

⁵ Teesmouth Nutrient Budget Calculator Version 2.2 (March 2023). The Northumbrian Water DWMP indicates that this will not change post- 2025 although it will reduce to 10 mgTN/l for WRC serving 20,000 PE or more by 1 April 2030.

plant. This land use change will increase secondary annual nutrient loads from 0.6 kg TN to 1.16 kg TN which is +0.56 kg TN/year.

Stage 4: Annual Nutrient Budget

- 5.16 All Northumbrian Water wastewater treatment works on the Tees are treating to 27 mg TN/litre⁶. The calculated unmitigated TN wastewater load (primary wastewater) and TN load in secondary runoff from land use change, including an overall Natural England 20% precautionary buffer is **214.40 kg TN/year**.

Summary

- 5.17 Without mitigation the proposed developments at Kirklevington and Holme House would add an additional 214.40 kg TN /year to the Tees and its designated sites including a NE precautionary 20% factor to allow for uncertainty.

Assessment of Likely Significant Effect

- 5.18 This high- level assessment follows the NE advice March 2022 Annex E (Figure 2) to determine the Likely Significant Effect of the development on nutrients at the designated sites. This has determined that a Habitats Risk Assessment/Appropriate Assessment is needed.

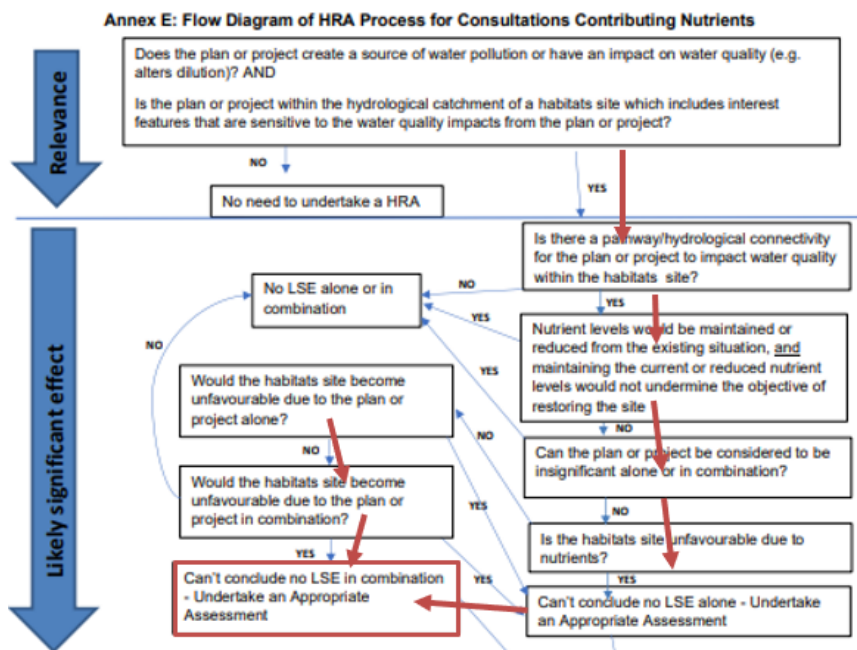


Figure 2 Teesmouth designated areas (Ramsar, proposed Ramsar, SSSIs and NNRs) unfavourable declining sites in red. Information text from Teesmouth Budget Nutrient Calculation version- 2 (2)

NNA Conclusion

- 5.19 There is a Likely Significant Adverse Effect from TN as the substance of concern due to the proposed development nutrient emissions on the designated Teesmouth sites. However, mitigation is proposed to offset the increased TN loads from the Tees HMP developments that will ensure they are nutrient neutral.

6. Proposed mitigation

- 6.1 A nutrient offsetting scheme is proposed to ensure additional prison accommodation of 172 persons for the Kirklevington Grange and Holme House HMP Estates in the River Tees statutory designated sites catchment is nutrient neutral for nitrogen i.e., produce net zero nutrient when mitigated. The scheme comprises:

⁶ Teesmouth Nutrient Budget Calculator Version 2.2 (March 2023). The Northumbrian Water DWMP indicates that this will not change post- 2025 although it will reduce to 10 mgTN/l for WRC serving 20,000 PE or more by 1 April 2030.

- Construction of a private wastewater Wastewater Recycling Centre (WRC) on land ‘outside the fence’ at HMP Holme House. This will treat all wastewater from Holme House sufficient to discount the additional nutrient loads from upstream WRC treating wastewater from Kirklevington Grange.
- Application to Natural England (NE) for nutrient credits on a temporary basis until the WRC at Holme House becomes operational. The credits will be necessary when the new Holme House and or Kirklevington Grange are constructed and need to be occupied before completion of the new WRC. The first prisoner into the Holme House RDCP is projected to be 23 September 2024, with the new wastewater treatment works operational by 2 March 2026.

A nutrient credit scheme for the Tees catchment was launched on 31 March 2023 to allow developers to purchase nutrient credits to discharge their obligations under the Habitats regulations⁷. Round 4 Applications can be submitted from 10am 19 February 2024 to 11:55 on 15 March 2024.

MoJ will apply for credits to provide mitigation until the proposed WRC is operational at which point the Kirklevington Grange RDCP and Holme House RDCP will be nutrient neutral. Natural England indicates that where the number of credits needed has decreased the developer or operator may be entitled to a partial refund and this can be discussed with Natural England.⁸

- 6.2 It is proposed to construct an adoptable WRC by Severn Trent Connect (ST Connect) at Holme House to treat all wastewater arisings from HMP Holme House including the additional 172PE to the Technically Achievable limit (TAL) of 10 mg TN/l.
- 6.3 ST Connect is an Ofwat-regulated water company appointed by the Secretary of State to provide wastewater and surface water management services in England and Wales. It has a strong track record for designing, building, owning and operating wastewater treatment assets (including foul and surface sewerage infrastructure) and are part of the wider Severn Trent Group, which in its portfolio has one of the UK’s largest water and sewerage companies.

Wastewater treatment design

- 6.1 Based on STCs estimates of TN loads in Appendix 02 of its *Fee proposal- initial activities letter to MoJ of 21 March 2023*, the pre-treatment additional TN load per person is approximately 1.035 kg TN/person/year.
- 6.2 The additional population of 172 will produce a load of $172 \times 1.035 = 178.1$ kg TN/year. Applying Natural England’s 20% precautionary buffer and with the small addition due to land use change at HMP Holme House the load to be mitigated is 214.40 kg TN/year (see Table 3).
- 6.3 A new STC- 3000 water recycling centre (WRC) will be installed ‘outside the wire’ at Holme House but on HMP estates property. The WRC will have a useable capacity of 2,400PE.
- 6.4 To treat a net loading of 214.40 kg/year TN in wastewater a minimum of 559.5PE will need to be treated (Table 4), assuming the facility operates to an environmental permit of 10mg TN/l- the Technically Achievable Limit, and development water consumption is a maximum 105 l/person/day).
- 6.5 Treating wastewater arisings from all staff and inmates from HMP Holme House (1958 PE) at the ST-C WRC more than offsets the proposed additional population from both prisons and generates a credit surplus of 536 kg TN/year (i.e. a TN reduction) in the Tees (Table 4). All options are possible within the ST-C WRC useable 2,400PE capacity.

⁷ [Natural England’s Nutrient Mitigation Scheme, devised to protect our waterways from pollution and enable home building, has now launched - Natural England \(blog.gov.uk\)](#)

⁸ [How to apply for nutrient mitigation credits from Natural England - GOV.UK \(www.gov.uk\)](#)

Table 4 Nutrient Neutral assessment calculations for WRC design

ST-C WRC design options			Proposal	PE required to offset 172 additional prisoners	Credit surplus from future prisoner base + all staff and contractors (1958)
Population	A	PE	172	559.5	1958
Water consumption per person	B	l/p/d	105	105	105
Annual consumption	C= AxBx365.25	l/yr	6,596,415	21,442,838	75,040,350
Local NW WRC treated discharge permit	D	mg/l	27		
Gross loading	E=CxD	kg TN/yr	178.1		
ST Connect permit	F	mg TN/l	10	10	10
Net loading	G= CxF	kg TN/yr	66.0	214.4	750.4
Surplus	G-303.49	kg TN/yr	-148.4	0.0	536.0

Proposed wastewater treatment and disposal strategy summary

6.6 The following information will be included in a technical letter of support for the mitigation project to be provided by ST Connect to the LPA.

ONSITE WASTEWATER STRATEGY FOR HMP HOLME HOUSE, STOCKTON-ON-TEES

6.7 It is proposed to collect and convey all (from the existing and proposed prisoner, staff and contractor population) foul sewage from HMP Holme House through a separate foul-only sewerage system to the new onsite Water Recycling Centre (WRC). Following treatment to the required standards, final effluent will be discharged into the Lustrum Beck, a tributary of the River Tees. No sewage from Holme House will be treated by the Northumbrian Water WRC (Bran Sands) which will increase WRC capacity for other users.

6.8 The treatment strategy will comprise an ST Connect designed and built onsite WRC; which shall be adopted, maintained, and operated in the long-term by ST Connect in its capacity as the local statutory wastewater undertaker. ST Connect would operate the WRC in compliance with the requirements of a site-specific Environmental Permit as determined by the Environment Agency (EA). Nitrogen removal limits will be in accordance with the Nutrient Neutrality requirements of 10.00mg/l Total Nitrogen.

6.9 Detailed designs of the WRC will be produced at the next stage of the detailed foul water drainage design. However, ST Connect, will propose to construct a state-of-the-art facility, based on an advanced form of activated sludge treatment. The design will be consistent with other facilities which are currently under construction with the purpose of mitigating Nutrient Neutrality.

Asset and treatment process resilience

6.10 The system will be particularly resilient to catchment contamination events or natural variation of inbound wastewater concentration, due to the significant dilution factors provided by the large balancing tank at the head of the works. The treatment processes will be configured to allow for bolt-on technologies to meet more stringent permits; should they become required in the future.

6.11 ST Connect will design in capacity and asset redundancy which shall all but remove the risk of permit compliance failure. In a worst-case scenario of significant system failure, raw and/or part-treated sewage shall be isolated and tankered to a suitable off-site facility for safe treatment and disposal.

CSOs and river pollution events

6.12 Combined sewer overflows (CSOs) will not be installed at this site as surface waters will be collected and managed in their own drainage and attenuation systems – separate from the foul water drainage networks. As a result, there is no risk of untreated sewage entering the water environment during storm events.

Sludge Management

6.13 Organic sludges generated during the treatment process which cannot be treated onsite will be periodically removed by tanker for further processing at a nearby sludge treatment centre to generate sustainable energy from biogas. The remaining by-product, sludge cake is sold as an organic fertiliser. It should be noted that were farmers within the Teesmouth catchment to use this source of fertiliser, it would act as a direct replacement of other sources of fertilisers (such as inorganic chemical fertilisers).

Long-term asset performance

- 6.14 The onsite treatment system will be designed and built to ST Connect’s adoptable standards, and subsequently be owned and operated by ST Connect in its capacity as the local wastewater undertaker; subject to a licence variation being granted by Ofwat. The assets will therefore be considered “public” assets by the EA, which the company shall have a duty to maintain and operate effectively in perpetuity in line with its licence obligations.
- 6.15 The treatment system shall have in place both planned and reactive operations and maintenance arrangements to ensure the good upkeep of assets and effective wastewater treatment. In addition, the facility will benefit from remote telemetry and sensors to monitor site condition and treatment processes effectiveness.

Environment Agency Environmental Permit

- 6.16 An environmental permit from the EA will be required in order to operate the onsite WRC. ST Connect will apply to the EA for the required permit having undertaken the necessary studies (including a water quality and quantity study). It is important to note that as a statutory wastewater undertaker, ST Connect is able to obtain environmental permits within sewered areas (within the geographic areas of appointment of other wastewater undertakers, such as Northumbrian Water) – the EA does not distinguish between licence applications / variations made by ST Connect and those made by incumbent water companies.

Conclusion

- 6.17 ST Connect in its capacity as a competent sewerage undertaker, experienced in the construction and long-term operations of sewage treatment assets is satisfied that a public onsite wastewater treatment system can be designed, built, adopted, operated, and maintained at HMP Holme House.

7. Summary impact of the HMP developments on TN Loads to the River Tees and its statutory designated sites

- 7.1 The potential additional prisoner population of 172 for the HMPs Kirklevington Grange and Holme House would produce a nutrient load on the Tees of 214.40 kg TN/year including an NE precautionary buffer of 20% (see Table 3).
- 7.2 All wastewater arisings from the 1,938 current population of HMP Holme House (prisoners staff and contractors) currently treated by Northumbrian Water to 27 mg TN/l will be diverted to the new ST-C waste treatment works at Holme House, treating to 10 mg TN/l. This would reduce the nutrient load on the Tees as follows.

- The current TN treated wastewater @27 mg TN/l arising for HMP Holme House PE of 1,938 is:
 $1,938 \text{ PE} \times 105 \text{ l/p/d} \times 27 \text{ mg/l} \times 365.25 \text{ days} / 1,000,000 = \underline{2,006.8 \text{ kg TN/year}}$
- The equivalent current TN treated wastewater @10 mg/l arising for HMP Holme House PE of 1,938 from the new ST-C WRC would be:
 $1,938 \times 105 \text{ l/p/d} \times 10 \text{ mg/l} \times 365.35 / 1,000,000 = \underline{743.25 \text{ kg TN/year}}$
- The TN reduction due to treating to 10 mg TN/l is:
 $2,006.8 - 743.25 = \underline{1,263.55 \text{ kg TN/year}}$
- The proposed TN load from the new accommodation PE of 172 across the two sites is:
 $+ \underline{214.40 \text{ kg TN/year}}$
- The net effect of the proposed development is
 $-1,263.55 + 214.40 \text{ kg/year} = \underline{-1,049.15 \text{ kg TN/year}}$

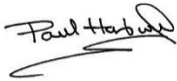
- 7.3 The proposed developments will reduce nutrient concentrations on the Tees designated sites by 1,049 kg/year. So, the developments at HMP Kirklevington Grange and HMP Holme House should not be precluded on the grounds of nutrient neutrality.

- 7.4 There is a potential for future expansion of HMP Deerbolt at Barnard Castle to accommodate a possible 72 inmates in a future RDCP project. Wastewater arisings from that population can be accommodated by treatment of HMP Holme House wastewater in the ST-C WRC, which will simply reduce the surplus TN from the improved wastewater treatment.

8. Author competence statement

- 8.1 I am a practicing hydrologist and hydrogeologist with over 39 years' academic training, research and consultancy experience in the water environment sciences and I have acted as an expert witness for civil litigation cases involving flood risk, drainage, and water quality issues. I am suitably qualified to carry out this assessment.

Yours sincerely,



Dr Paul Hardwick PhD BSc(Hons) FGS FRSA MIEnvSC
Associate Specialist, Water Environment Sciences

For: Enzygo Ltd

APPENDIX

Nutrient Budget Calculation HMP Holme House December 2023

Using

Teesmouth Nutrient Budget Calculator Version 2.2 (March 2023).

Development site details

Date (dd/mm/yyyy):	14/12/2023
Site Name:	HMP Holme House
Planning Application number:	to be announced-
Site Address:	HMP Holme House Holme House Road Stockton-on-Tees TS18 2QU

Stage 1

User Inputs

Date of first occupancy:	
Average occupancy rate:	1.00
Water usage (litres/person/day):	105
Development Proposal (dwellings/units):	172
Wastewater treatment works:	Bran Sands Treatment Works
Wastewater treatment works N permit (mg TN/litre):	27

Stage 1 Calculated Loading

Stage 1 Nutrient Loading

Additional population	172	people
Wastewater by development	18060	litres/day
Annual wastewater TN load	178.10	kg TN/yr

Stage 2

User Inputs

Catchment:	Tees Lower and Estuary
Soil drainage type:	Impeded drainage
Annual average rainfall (mm):	575.1 - 600
Within Nitrate Vulnerable Zone (NVZ):	Yes

Existing land use type(s)	Area (ha)	Annual nitrogen nutrient export (kg TN)
Greenspace	0.20	0.60
Total:	0.2	0.60

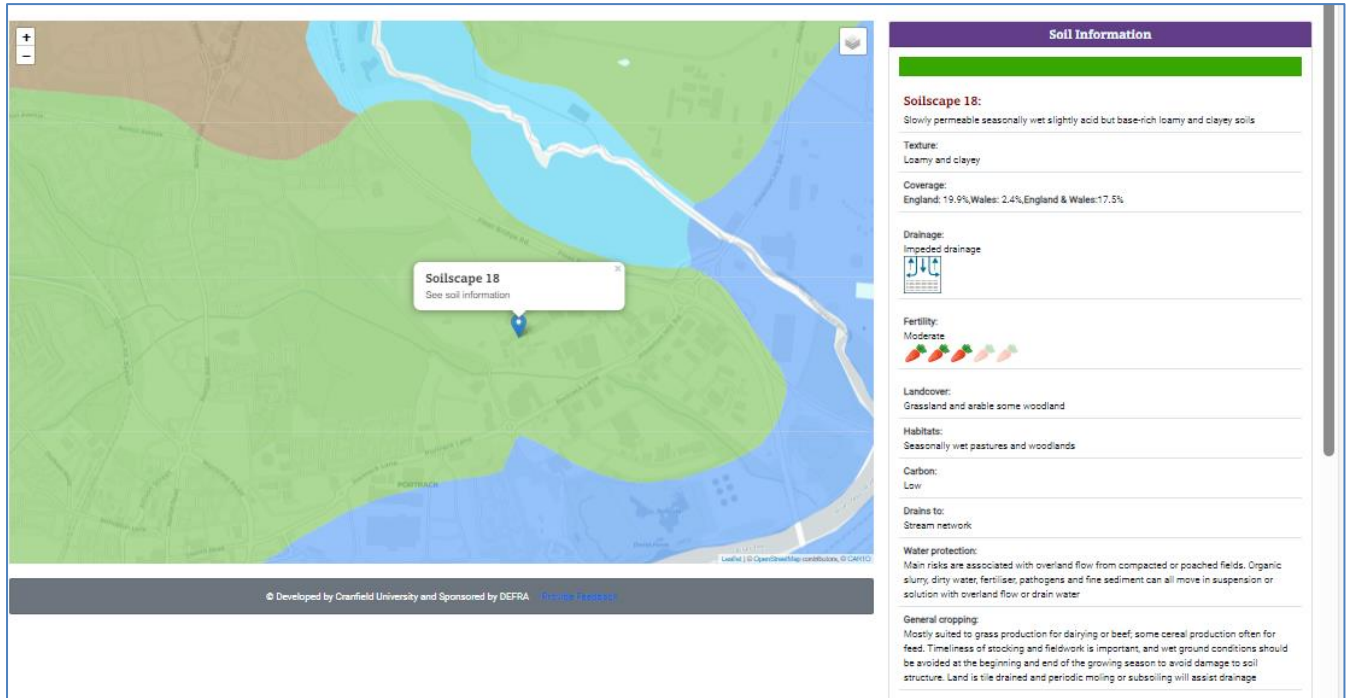


Figure 3 Soil Drainage information for stage 2 nutrient budget

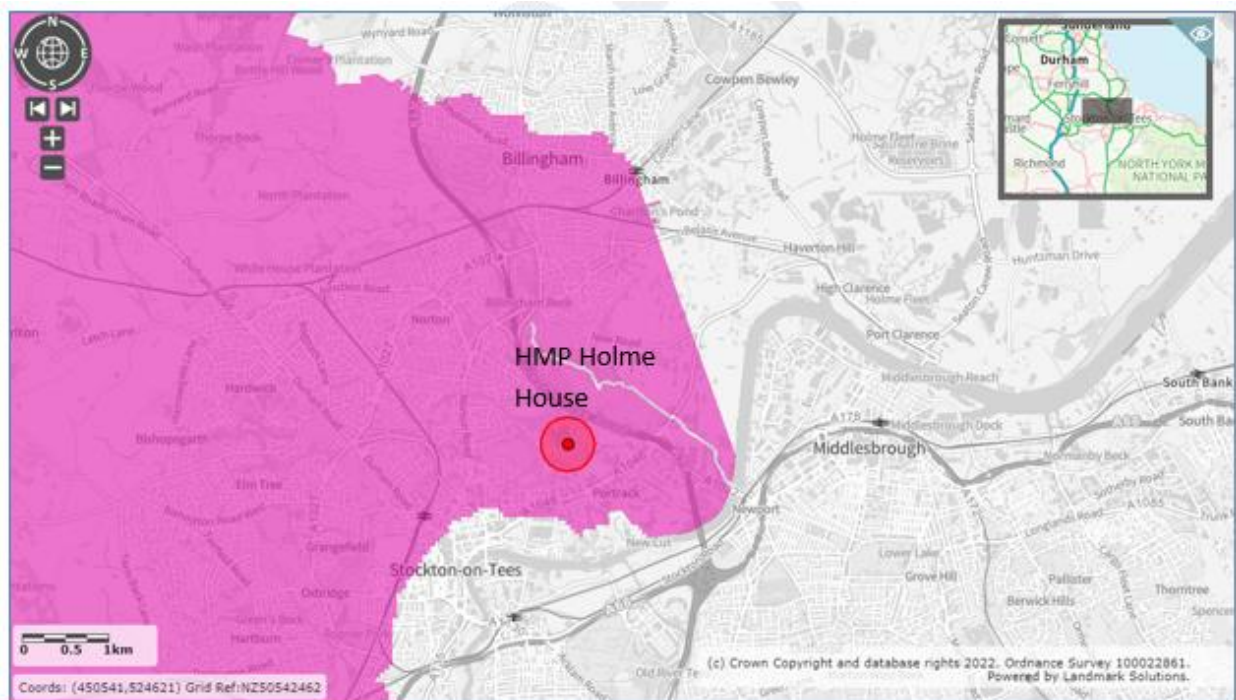


Figure 4 Nitrate Vulnerable Zones

Stage 3

User Inputs

New land use type(s)	Area (ha)	Annual nitrogen nutrient export (kg TN)
Commercial/industrial urban land	0.20	1.16
Total:	0.2	1.16

Please enter area in hectares.

Stage 4

Calculated Outputs Annual Nutrient Budget

The total annual nitrogen load to mitigate is:

214.39 kg TN/year