MOTT MACDONALD

Howdon Sludge Treatment Centre Environmental Permit Application

Main Supporting Document
100105164_MSD_HOW v3

June 2023

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	14/01/2022	Grace Peel Shannon Stone	Alex Symeonidis	Anita Manns	First draft (v1)
B	24/03/2022	Alex Symeonidis	Shannon Stone	Anita Manns	Final (v1)
C	21/02/2023	Shannon Stone	Anita Manns	Anita Manns	Resubmission following return of application, dated 13/02/2023 (v2)
D	20/06/2023	Anita Manns	Shannon Stone	Shannon Stone	Amendments based on RfI received June 2023

Document reference: 100105164_MSD_HOW v3

Information class: Standard

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1 Non-technical summary

1.1 Overview of the site and activities

Howdon Sewage Treatment Works (STW) and Sludge Treatment Centre (STC) is located in Northumberland Dock Road, Wallsend, Newcastle, Tyne and Wear, NE28 0QD (National Grid Reference NZ 33598 66357).

The STW operation is covered by the Urban Wastewater Treatment Regulations and has a standalone Water Discharge Activity Environmental Permit which will remain an independent permitted activity.

The STC operation is a non-hazardous waste activity which is carried out under permit EPR/KP3394ZE. The site also holds a U6 exemption, which is separate from the Industrial Emissions Directive (IED) permit application. The waste activity comprises imports, physio-chemical and anaerobic digestion (AD) of non-hazardous and hazardous wastes, and the storage of waste, all for recovery purposes. The STC handles waste derived from the wastewater treatment process, either indigenously produced on-site or imported from other Northumbrian Water owned assets.

The Site also has a bespoke biogas combustion permit - EPR/YP3331HQ - for the operation of three dual fuel (biogas and natural gas) combined heat and power (CHP) engines and the operation of one natural gas engine.

As advised by the Environment Agency through consultation at WaterUK Waste and Recycling Network and a letter sent to all Water and Sewage Companies at director level in July 2019, Northumbrian Water is applying to vary the above-mentioned permit EPR/KP3394ZE into a Bespoke Installation Permit for the STC waste activity following a joint decision made by Environment Agency and DEFRA that AD treatment facilities at STW STCs are covered by the IED and can no longer operate under standard environmental permits or exemptions.

The primary permitted installation activity will be the AD treatment facility. The AD facility will treat indigenously produced and imported sludges, in addition to imported cake on occasion. Directly Associated Activities (DAAs) will be the import of waste from other STW assets; the physio-chemical treatment of imported and indigenously produced sludges; the storage of indigenously produced sludges, imported sludges and the sludge cake from the AD facility; the storage of biogas derived from the AD treatment of waste, the combustion of biogas in an on-site combined heat and power plant (CHP) and the operation of a biomethane plant to export biomethane to the National Grid. In the event the CHP cannot run in an emergency or due to operational issues, biogas will be combusted via an on-site flare stack and/or back-up boiler system. In the event the biomethane cannot be exported to the National Grid, due to being out of specification, the biomethane is sent back to the gas bag.

Northumbrian Water wishes to vary permit EPR/KP3394ZE into an Installation permit for the site. It is intended that the non-hazardous waste treatment activity, bespoke biogas combustion activity and upgrading of the biogas to biomethane will be three separate listed activities on a single consolidated Installation permit.

1.2 Overview of the STC process

Currently the Site accepts indigenous sludge and imported liquid sludge. Cake is imported on occasion. Cess is imported to the head of the works under the Controlled Waste Regulations, but none of it is imported directly into the STC other than what is routed in from STW.

The Site serves as a regional STW and STC which serves the Greater Tyneside area. Sludge from the primary and secondary settlement tanks is treated by drum thickening before transfer to the thickened sludge day tanks, where it is combined with imported sludge from other sewage works. The combined sludge is then transferred to four strategic sludge storage tanks (each with volumetric capacities of 10,000m^3).

The existing sludge stored on-site is forwarded to a pre-dewatering and screening facility where it passes through 6 No. strainpresses. It is then temporarily stored in a screened sludge buffer tank (600m^3) prior to being passed through 2 No. centrifuges.

The raw sludge cake produced on site is pumped and occasionally sludge in cake form will be imported from elsewhere and will enter the system downstream of the centrifuges. The combined cake will then be transferred to cake buffer tanks and will undergo a blending / dilution process prior to subsequent pumping to the thermal hydrolysis process (THP) buffer tanks. From here the sludge is then pumped into the THP system.

There are two identical streams which will normally operate together. The THP system is a continuous batch process whereby sludge is fed into a preheater tank (pulper), and distributed in turn to one of four batch reactors in the stream. Following the thermal hydrolysis reactors, the sludge is transferred to a flash tank where the excess steam is recycled to the pulper.

The resultant hydrolysed sludge is then pumped forward to 3 No. advanced anaerobic digesters (AADs) (6,000m^3 each) where the blended sludge is pasteurised, then digested to maximise gas production.

Digested sludge is stored in 1 No. post digestion sludge storage tank (4,600m^3) before being dewatered by 2 No. centrifuges in the dewatering treatment plant, after which it is transferred by screw conveyor to a sludge cake silo. The final product is then transferred via a screw conveyor to bulk tippers for transport off-site for storage prior to being recycled to farmland.

Biogas produced from the 3 No. AADs will be transported to the 2 No. gas holders. The biogas will then be:

- Cleaned up to produce biomethane, added with propane, so that it can be injected into grid.
- Combusted in the 3 No. CHP engines to produce electricity, with electricity exported to the grid from the Site's generator. There is also one natural gas engine.
- Combusted in the 3 No. steam boilers to produce heat for the process.

A flare stack is provided as an emergency disposal route should the Gas to Grid, gas engines and boilers be unavailable. The operational procedures have been designed to minimise this event and, therefore, flaring is only expected to occur in an emergency situation.

The IED permit will include:

- Drum thickeners 5 No.
- Thickened sludge day tanks 2 No. (2,000m^3 each)
- Strategic sludge storage tanks 4 No. (10,500m^3 each)
- Screened sludge buffer tank 1 No. (600m^3)
- Advanced anaerobic digesters 3 No. (6,000m^3 each)
- Post digestion storage tank 1 No. (4,600m^3)
- Raw Centrifuges 2 No.
- Digested Centrifuges (duty/standby) 2 No.
- Gas bag holders 2 No. - gas bag 1 (2,250m^3) and gas bag 2 (1,150m^3)

- CHP engines 4 No.: consisting of 3 no. dual fuel engines (biogas and natural gas) each with 1.75MWth thermal rated output and 1 No. natural gas engine with 2.00MWth thermal rated output
- Composite boilers 3 No. powered by biogas and natural gas (2.2MWth each)
- THP plant, including:
  - Raw cake THP buffer tanks (feed silos) 2 No. (320m^3 each)
  - THP reactors
  - THP flash tanks
  - THP pulper
- Biogas burner (flare stack) 1 No.
- Biomethane upgrade plant
- Back-up generator 1 No. (1.7MWth) used in emergencies
- Cake import facilities including 1 No. large 500 tonne silo with storage space for a maximum of two silos (60m^3)
- Odour control units 3 No. odour control system in place uses:
  - a two-stage treatment process. The primary stage is based on a biologically based abatement process using biofilters, followed by the secondary or final polishing stage which will function to reduce the odours down to the agreed odour levels before they are expelled to the atmosphere via the individual exhaust stack.
  - chemical scrubber, which is a process to remove hydrogen sulphide (H_2S) and ammonia (NH_3) that comes from primary settlement, sludge dewatering, pumping stations, wet wells and sludge storage tanks. This is to help prevent a build of gases in a working area, reduce corrosion and improve air quality. Sulphuric acid is dosed into the acid scrubber to treat ammonia. Caustic and sodium hypochlorite are dosed into the scrubber to treat hydrogen sulphide.

The following are outputs from the process:

- Cake (dewatered post digestion sludge) - stored in a cake silo before being transported off-site for agricultural use.
- Bio-gas - stored in 2 No. existing gas holders, then either:
  - Cleaned up to produce biomethane, added with propane, so that it can be injected into grid.
  - Burnt in the CHP engines or back-up boilers to generate electricity.
  - Flared in the waste biogas burner.
- Grit and screenings (small amount) ‑ deposited in skips before being taken off-site.

For further context, the Site is undergoing the following upgrades:

- upgrade of primary effluent pumping station / rising mains;
- increased storm tank capacity;
- increased secondary treatment;
- additional final settlement tanks;
- upgrade of return activated sludge pumping station; and,
- and increased UV treatment.

1.3 Summary of key technical standard

Table 1.1 lists the technical guidance notes (TGNs) used to inform the techniques and measures proposed to prevent and reduce waste arising and emissions of substances,

including during periods of start-up and shut down, momentary stoppage and malfunction, and leaks.

Table 1.1: Part C3, Question 3a, Table 3a: Technical standards

Description of the schedule 1 activity or directly associated activity	Best available technique (BATC, BREF or TGN reference)	Document reference
Section 5.4 non-hazardous waste installation - anaerobic digestion installation regulated under the Industrial Emissions Directive, utilisation biogas for energy	• How to Comply with Your Environmental Permit Additional Guidance for Anaerobic Digestion • Best available techniques (BAT) conclusions for waste treatment (BAT C), for the recovery and disposal of hazardous and non-hazardous waste (SGN S5.06) • Appropriate measures for the biological treatment of waste	• https://www.wiserenvironment.co.uk/how-to-comply-with-your-environmental-permit-additional-guidance-for-anaerobic-digestion/ • https://eippcb.jrc.ec.europa.eu/reference/waste-treatment-0 • https://www.gov.uk/government/publications/sector-guidance-note-s506-recovery-and-disposal-of-hazardous-and-non-hazardous-waste • https://www.gov.uk/guidance/biological-waste-treatment-appropriate-measures-for-permitted-facilities
Biomethane plant R3: Recycling/ reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) and D10: Incineration on land.	• Recovery and disposal of hazardous and non-hazardous waste Sector Guidance Note (SGN) S5.06 • Appropriate measures for the biological treatment of waste • Monitoring enclosed landfill gas flares: Landfill Technical Guidance Note (LFTGN) 05 • Quality Protocol: Biomethane from waste	• https://www.gov.uk/government/publications/sector-guidance-note-s506-recovery-and-disposal-of-hazardous-and-non-hazardous-waste • https://www.gov.uk/guidance/biological-waste-treatment-appropriate-measures-for-permitted-facilities • https://www.gov.uk/government/publications/monitoring-enclosed-landfill-gas-flares-lftgn-05 • https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292518/QP_Biomethane_final_to_publish.pdf#:~:text=1.1.2%20The%20Quality%20Protocol%20sets%20out%20end%20of,recovered%20and%20to%20have%20ceased%20to%20be%20waste
General	• How to comply with your environmental permit – Control and monitor emissions for your environmental permit – Develop a management system: environmental permits • Monitoring stack emissions: technical guidance for selecting a monitoring approach • Monitoring stack emissions: low risk MCPs and specified generators • M9 environmental monitoring of bioaerosols at regulated facilities • Environment Agency environmental permitting guidance, including: – Risk assessments for your environmental permit – H2 Energy efficiency (Energy efficiency for combustion and energy from waste power plants) – H3 Noise assessment and control – H4 Odour management – H5 Site condition report	• https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit • https://www.gov.uk/guidance/develop-a-management-system-environmental-permits • https://www.gov.uk/guidance/monitoring-stack-emissions-technical-guidance-for-selecting-a-monitoring-approach • https://www.gov.uk/government/publications/monitoring-stack-emissions-low-risk-mcps-and-specified-generators • https://www.gov.uk/government/publications/m9-environmental-monitoring-of-bioaerosols-at-regulated-facilities • https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit • https://www.gov.uk/government/publications/energy-efficiency-for-combustion-and-energy-from-waste-power-plants • https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits • https://www.gov.uk/government/publications/environmental-permitting-h4-odour-management • https://www.gov.uk/government/publications/environmental-permitting-h5-site-condition-report

Additional information

The following application forms have been completed to support the application and have been submitted as stand-alone documents:

- Part A: About You (Document reference 100105164_PartA_HOW)
- Part C2: Varying a bespoke permit (Document reference 100105164_PartC2_HOW)
- Part C3: Variation to bespoke installation permit (Document reference 100105164_PartC3_HOW)
- Part C4: Varying a bespoke waste operation permit (Document reference 100105164_PartC4_HOW)
- Part C6: vary a water discharge activity, groundwater activity, or point source emission to water from an installation (Document reference 100105164_PartC6_HOW)
- Part F1: Charges and declarations (Document reference 100105164_PartF1_HOW)

The main body of the Permit application document ("the Main Supporting Document") includes all the supplementary information required in response to relevant questions within the Part A, Part C2, Part C3, Part C4, Part C6 and Part F1 application forms for which there was insufficient space on the forms to answer the questions in full.

The Environmental Permit variation application document ("the Main Supporting Document") consists of two main parts:

- Chapter 5 provides the general information required to inform Part C2 relating to the variation of a bespoke permit; and
- Chapter 6 provides the more detailed information required to inform Part C3 and C4 relating to the variation of a bespoke installation permit.
- Chapter 7 provides the more detailed information required to inform Part C6 relating to point source emission to water from an installation

Part F1 covers the required financial information required for payment of the application fee.

Additional information included as part of this submission and not as stand-alone documents, are found in the following appendices:

- Appendix A – European Waste Catalogue (EWC) Codes

Stand-alone documents included as part of this submission are detailed below:

- Environmental Risk Assessment – Document reference 100105164_ERA_HOW v2
- Environmental Risk Assessment H1 Assessment – Document reference 100105164_ERA_H1_HOW
- Environmental Constraints Maps – Document reference 100105164_ERA_ConstraintsMaps_HOW
- Bio-aerosol Risk Assessment – Document reference 100105164_ERA_BioRA_HOW v5
- Odour Management Plan – Document reference 100105164_OdourMP_HOW v3
- Odour Assessment – Document reference 100105164_OdourAssessment_HOW
- Site Condition Report – Document reference 100105164_MSD_SCR_HOW v3
- BAT analysis – Document reference 100105164_MSD_BAT_HOW_Feb 2023
- Waste Acceptance Procedure – Document reference 100105164_BAT_WasteAcceptance_HOW
- Site Layout and Location Plan – Document reference 100105164_MSD_SiteLayoutPlan_HOW v6

- Drainage Plan – Document reference 100105164_MSD_DrainagePlan_HOW v2
- Schematics – Document reference 100105164_MSD_Schematics_HOW v2
- Environmental Management System Certificate – Document reference 100105164_MSD_EMS_HOW
- Relevant Offences – Document reference 100105164_MSD_RelevantOffences_HOW
- Details of Directors – Document reference 100105164_MSD_Directors_HOW (in a confidential email provided by Northumbrian Water)
- Competency assessment certificates – Document reference 100105164_MSD_CompetencyAssessmentCertificates_HOW v2
- Material safety data sheets – Document reference 100105164_MSD_MSDS_HOW
- Complaints procedure – Document reference 100105164_MSD_ComplaintsProcedure_HOW
- Air Quality Monitoring:
  - Document reference: 100105164_AirQualityMonitoringSep20toSep21_HOW
  - Document reference: 100105164_AirQualityMonitoringNov21_HOW
  - Document reference: 100105164_AirQualityMonitoringJan22_HOW
- Containment assessment (Folder 100105164_Containment_HOW)
  - FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon v2
  - FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon-Option with Rainfall
  - FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon-Option without Rainfall
- Summary of changes from March 2022 application submission – Document reference 100105164_ResubmitSummary_HOW

2 Introduction

2.1 Overview

This document has been prepared to support the application to vary the existing sewage sludge treatment activity (S0819 No 19) as authorised under the permit reference EPR/KP3394ZE (hereafter referred to as 'the Permit') to include the anaerobic digestion activity and biogas upgrading activity, and to consolidate the bespoke combustion activity under permit reference EPR/YP3331HQ to the same Installation permit for the Howdon STW and STC ('the Site') on behalf of Northumbrian Water Limited ('Northumbrian Water' or 'the Operator').

Following the joint Environment Agency and DEFRA decisions that AD treatment facilities at STWs and STCs are covered by the IED the intent of the application is to ensure the Site is permitted in line with the IED and the EPR 2016, as amended.

This document contains a description of the Site, the proposed permitted activities and Directly Associated Activities (DAAs), an assessment of the possible effects of these activities and responses to questions in Parts A, C2, C3, C4, C6 and F1 of the application documentation (plus supporting information where required). Completed forms Part A, C2, C3, C4, C6 and F1 are included as separate documents.

2.2 Document content and structure

The following application forms have been completed to support the application and have been submitted as stand-alone documents:

- Part A: About You (Document reference 100105164_PartA_HOW)
- Part C2: Varying a bespoke permit (Document reference 100105164_PartC2_HOW)
- Part C3: Variation to bespoke installation permit (Document reference 100105164_PartC3_HOW)
- Part C4: Varying a bespoke waste operation permit (Document reference 100105164_PartC4_HOW)
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- Part F1: Charges and declarations (Document reference 100105164_PartF1_HOW)

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- Summary of changes from March 2022 application submission – Document reference 100105164_ResubmitSummary_HOW

3 Process Description

Howdon STW serves the greater Tyneside area, including Newcastle upon Tyne and Gateshead, with a population equivalent of 1,000,000.

Howdon STW consists of preliminary, primary and secondary treatment, with tertiary treatment in the form of UV. Treatment of the incoming sewage comprises the following:

- Municipal treatment (non-permitted area)
  - 6mm screening using fine screens
  - Grit removal using travelling bridge and air blower system
  - Primary settlement in mechanically scraped rectangular tanks
  - Secondary aeration utilising the conventional activated sludge process plus settlement tanks
  - Final Settlement Tanks
  - UV tertiary treatment of final effluent
  - Primary sludge storage
  - Surplus activated sludge (SAS) storage
  - Primary and SAS thickening drums
  - Thickened sludge storage
- Sludge processing (permitted area)
  - Transfer pumps and pipelines
  - Sludge dewatering
  - Advanced anaerobic digestion (AAD) plant
  - Final dewatering cake silo for digested sludge cake storage
  - Final dewatering sludge cake loading bay

The primary settlement tanks accept municipal wastewaters pumped to the works from South of the Tyne and from the North interceptor. Return liquors from the sludge treatment process are also transferred to the primary tank distribution chamber.

The primary settlement and secondary settlement tanks are automatically desludged and this sludge is treated by drum thickening before transfer to the thickened sludge day tanks, where it is combined with imported sludge from other sewage works. The combined sludge is then transferred to 4 No. strategic sludge storage tanks each holding 10,500m^3. This feed may be from a single tank or in any combination of the four as circumstances dictate.

The key requirement of the AAD process is a feed of screened sludge at 17-18% dry solids. To enable this to be achieved it is necessary to screen and dewater the existing sludge prior to it being delivered to the Thermal Hydrolysis Plant (THP). This is achieved by forwarding the existing sludge stored on site to a pre-dewatering and screening facility, where it passes through 6 No. strainpresses. It is then temporarily stored in the screened sludge buffer tank prior to being passed through 2 No. centrifuges. The dewatered and screened sludge is then pumped as raw sludge cake to the AAD process.

The raw sludge cake produced on site is pumped and occasionally sludge in cake form will be imported from elsewhere and will enter the system downstream of the centrifuges. The combined cake will then be transferred to cake buffer tanks and will undergo a blending / dilution process prior to subsequent pumping to the THP buffer tanks. From here the sludge will

then be pumped into the THP system. Two operational THP streams will operate, each consisting of:

- Sludge heating in the pulper / pre-heater;
- Thermal hydrolysis in one of four batch reactors; and
- Pressure let down in the flash tank.

In the pulper the sludge is pre-heated by the injection of recycled steam from the reactors and flash tank. This will ensure that the sludge reaches the optimum temperature in the reactors. In the reactors, steam from the boilers and CHP plant is injected until the appropriate operating temperature of approximately 165°C to 180°C and pressure of 6 bar is reached.

Following the thermal hydrolysis reactors, the sludge is transferred to the flash tank where the excess steam is recycled to the pulper. The resultant hydrolysed sludge is then further diluted as it is pumped forward to 3 No. AADs where the blended sludge is pasteurised in a THP then digested to maximise gas production.

The sludge is of too high a temperature to enter the digesters directly and is blended with sludge recirculating through the digesters mixing system and a proportion is passed through water/sludge coolers before entering the digesters. The temperature of this sludge at the outlet of the coolers is such that the overall digester temperature is maintained at a fixed temperature.

This continuous process displaces sludge from the digesters which passes under gravity to the digested sludge holding tank where it is maintained in an aerobic condition to suppress any further gas production caused by continuing digestion and strip any residual methane to create an un-zoned area for downstream processes.

The optimum temperature for the digesters to work is around 40°C and a re-circulation system linked to adiabatic coolers will maintain the sludge at this temperature. Sludge resides in the digesters for approximately 18 days.

Digested sludge is stored in 1 No. post digestion sludge storage tank (4,600m^3) before being dewatered by 2 No. centrifuges to approximately 27% dry solids (DS) in the dewatering treatment plant centrifuges, and transferred by screw conveyor to a sludge cake silo. The final product is then transferred via the screw conveyor to bulk tippers for transport off-site for storage prior to being recycled to agricultural land under the Sludge (Use Agriculture) Regulations 1990.

Biogas produced from the 3 No. digesters will be transported to 2 No. spherical gas holders. The biogas produced gas will then be burnt in the 3 No. dual fuel CHP engines to produce electricity, with electricity exported to the grid from the Site's generator. The Site also comprises one natural gas engine and three composite steam boilers (two for normal use and one for standby operation). The CHPs and boilers are configured to operate either on biogas or natural gas depending on the mode of operation. The standard mode is for the biogas to go to the grid so natural gas is burned. However, in times of very low demand the biogas can be burned in the CHP units preferentially. The fourth engine reduces electricity demand from the national electricity network. The biogas is stored on site in two double skinned tanks.

A flare stack is provided as an emergency disposal route should the gas engines and boilers be unavailable. The operational procedures have been designed to minimise this event and therefore flaring is only expected to occur as an emergency condition.

The biomethane plant deploys a water wash system and cleans the biogas of contaminants deemed harmful to the natural gas grid and reduces carbon dioxide content, thereby increasing the calorific value (CV) of the gas so that it can be designated as biomethane. The biogas (~ 61% methane, 37% carbon dioxide and 2% of other gases (nitrogen and oxygen)) entering the

biogas upgrade plant is compressed prior to entering the scrubbing tower. In the scrubbing tower, the scrubbing liquid (water) is sprayed and the carbon dioxide is absorbed by the water. Two product streams leave this tower: the methane stream designated as product gas - formed mainly by methane (97%) with a very small amount of carbon dioxide and other gases (3%) and the waste process water stream. The product gas is then dried prior to entering the final polishing filter.

A Supervisory Control and Data Acquisition (SCADA) system is utilised to provide management, control and monitoring of the various treatment processes.

A telemetry system is employed to provide monitoring of the various treatment processes on the site, which provides alarm identification.

4 Part A – About you

4.1 Question 5c: Details of directors

The details of directors at Northumbrian Water Limited (Company number: 02366703) are provided in stand-alone document 100105164_MSD_Directors_HOW.

4.2 Question 7: Contact details

Whereby the contact disclosed in 7a (Anita Manns, Mott MacDonald) is not available the Environment Agency should contact one of the secondary contacts:

Name: Shannon Stone

Address: Mott MacDonald, Mountbatten House, Grosvenor Square, Southampton, S015 2JU

Phone number: 023 8062 8538

Email: Shannon.stone@mottmac.com

5 Part C2 – General – Varying a new bespoke permit

5.1 Question 2 – Table 1: Changes to existing activities

The variation application is to modernise the conditions of the existing sewage sludge treatment activity (S0819 No 19) as authorised under the permit reference EPR/KP3394ZE to include the anaerobic digestion activity and biomethane plant to be in-line with the Industrial Emissions Directive, and to consolidate the bespoke biogas combustion activity under permit reference EPR/YP3331HQ to the same Installation permit.

5.2 Question 3a: Relevant offences

Details of the relevant convictions are provided in the document reference 100105164_MSD_RelevantOffences_HOW (produced by Northumbrian Water).

5.3 Question 3b: Technical ability

The Site has two Certificates of Technical Competence (CoTC) holders, Anthony Rutherford. Howdon STC is the only site Tony Rutherford provides technical competence cover for. Their continuing competency assessment certificates, where applicable, can be found in document reference 100105164_MSD_CompetencyAssessmentCertificates_HOW v2.

Tony Rutherford and Kristopher Brewis have registered for the two additional units required to gain the MROC5 Level 4 competence for Anaerobic Digestion. An email from their registration numbers are included within 100105164_MSD_CompetencyAssessmentCertificates_HOW v2. NWL are awaiting a registration letter from the provider.

Operational management is provided by qualified individuals and considered to be technically competent. All staff on-site are trained to manage and operate activities without causing pollution.

Future competency, in terms of the requirements of the environmental permit, will be ensured through the appropriate training of all staff, covering:

- Awareness of the regulatory implications of the Permit for the permitted activity and their own work activities
- Awareness of all potential environmental effects from operation under normal and abnormal circumstances
- Awareness of the need to report any deviation from the Permit
- Prevention of accidental emissions, and action to be taken when accidental emissions occur

All staff are aware of the implications of activities undertaken including the operation of the Site. Skills and competencies necessary to work on-site are documented and records of training needs and training received for these posts are maintained.

5.4 Question 3c: Finances

No relevant persons within Northumbrian Water have current or past bankruptcy or insolvency proceedings against them.

5.5 Question 3d: Management System

The Site operates under the company-wide Environmental Management System (EMS), which is certified to ISO 14001:2015, and is applicable to water supply and wastewater treatment assets at operational sites (wastewater treatment works, water supply works and water booster stations). The EMS is effective from 20 September 2021 to 12 July 2024 and is accredited by AFNOR UK.

Any monitoring of emissions to air, land and water is undertaken according to Monitoring Certification Scheme (MCERTS) Standards, where the permit requires it.

As a part of the EMS, the Operator has an internal audit programme that takes places every 12 months. During this annual programme operational sites are selected as a subsample and audited. Suppliers and business areas area also audited. An annual report is produced as part of the management review, and this is signed off by Senior Management. In addition, the EMS is subject to audit by the inspection and certification company AFNOR UK (for accreditation purposes) each year, and a full certification audit is conducted every three years.

The EMS addresses the following to ensure staff understand their roles and responsibilities to comply with environmental legislation and protect the environment and human health:

- Resources, roles, responsibility and authority
- Legal and other requirements in protecting the environment and human health
- Competence, training and awareness requirements
- Explanation of the Non-conformance, Corrective and Preventative Action Procedures
- Details of the significance of Environmental Aspects and Impacts
- EMS Review and auditing procedure and requirements
- Monitoring and measurement requirements
- Record keeping procedures

To accompany the Permit the Site will have its own Management System, in line with the Environment Agency guidance. This identifies all the applicable procedures under the accredited EMS but includes additional site-specific information and procedures.

The biomethane plant and THP form part of the existing Site and, as such, will be subject to the same management system arrangements.

One of the key tasks for Northumbrian Water during the permit determination process is the development of the management system arrangements to cover additional requirements in relation to the permitted operations. This will also include Climate Resilience to address measures to adapt to predicted additional pressure from changes in external operational conditions (such as weather and flooding), if required.

The EMS certificate can be found in document reference 100105164_MSD_EMS_HOW.

5.5.1 Accident Management Plan

The Site operates under a site-specific Accident Management Plan, referred to by Northumbrian Water as the Site Emergency Incident Plan, to prevent and manage environmental related accidents. The site-specific AMP includes a description of nominated key personnel and their responsibilities, emergency response procedures, contact details of internal contacts (Works Manager, Team Leader, Process Technician, Radiation Protection Supervisors, Security staff and key HSE staff), national and regional (where appropriate) contact details of emergency services and environmental regulators. The AMP is distributed to key staff, to supervise the implementation of the Plan, and shared with external contacts (emergency services and the

Environment Agency). The AMP is accompanied by a site plan that identifies the locations of designated storage areas (e.g. for chemicals, flammable compounds, bottled gas etc), spill kits, firefighting equipment, site entrances and access routes, gas bags and gas pipeline routes, gas isolation valves, major electrical equipment and possible isolation points, and other significant plant items.

5.6 Question 5a: Site layout plan and process diagram

Plans provided, to satisfy question 5a, can be found in the following stand-alone documents:

- Site Layout and Location Plan – Document reference 100105164_MSD_SiteLayoutPlan_HOW v6
- Drainage Plan – Document reference 100105164_MSD_DrainagePlan_HOW v2
- Schematics – Document reference 100105164_MSD_Schematics_HOW v2

5.7 Question 5b: Site condition report

In accordance with Environment Agency H5 guidance, a Site Condition Report (SCR) has been produced to demonstrate the condition of the land and groundwater at the Site on issue of the proposed permit. The SCR includes the following details (section 1 to 4 of the Environment Agency template):

- Site details;
- Condition of the land at permit issue;
- Permitted activities; and
- Changes to the activity.

A copy of the SCR can be found as document reference 100105164_MSD_SCR_HOW v3.

5.8 Question 6: Environmental risk assessment

As part of the application for an environmental permit, operators must assess the risk to the environment and human health from the activities that they propose to undertake, using the methodology outlined in the Environment Agency's 'Risk assessments for your environmental permit' guidance.

The Environmental Risk Assessment (ERA) sets the requirements for the management of the permitted area, emission control measures etc. It assesses the risks to the environment, amenity and human health. All control measures within the rules must be adhered to in order to obtain the permit.

The ERA assesses the impacts from the following environmental concerns:

- Point source and fugitive emissions to air;
- Point source and fugitive emissions to water and land;
- Noise and vibration;
- Odour;
- Litter, mud and debris;
- Vermin and insects (pests);
- Human health and environment safety (i.e. visual impacts, site security, flood risk); and
- Natural habitats and ecology.

Where emissions result in insignificant effects these have been screened out and where further detailed assessments of potential environmental impacts are required this is noted.

A copy of the ERA can be found as document reference 100105164_ERA_HOW v2.

6 Part C3 – Variation to a bespoke installation permit

6.1 Question 1 - Table 1a: Activities applied for

Table 6.1: Question 1, Table 1a: Activities applied for

Installation name	Schedule 1 or other references	Description of the Activity	Activity capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
Howdon STC	S5.4, Part A (1), (b) and (i)	Anaerobic digestion	Annual: 500,000m^3 wet tonnage Daily: 110 TDS	Recovery or a mix of recovery and disposal of non-hazardous waste with a biological treatment capacity exceeding 100 tonnes per day if the only waste treatment is anaerobic digestions. R3 – Recycling/ reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) R13 – Storage of waste pending any of the operations numbered R1 to R 12.	0	Annual: 500,000m^3 wet tonnage Daily: 110 TDS
	S1.2A(1)(a) – Refining gas where this is likely to involve the use of 1000 more tonnes of gas in any 12-month period.	Upgrading of biogas to biomethane (including the removal of moisture and other substances such as carbon dioxide, hydrogen sulphide and volatile organic compounds) for injection into the National Grid.	16,819 tonnes (based on 1.92 tonnes per hour throughput)		---	---

Installation name	Schedule 1 or other references	Description of the Activity	Activity capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
	Burning of waste as a fuel	Use principally as a fuel or others means to generate electricity (as listed in EPR/YP3331 HQ)		R1		
Directly associated activities						
	Physical treatment of waste	Recycling/reclamation of organic substances which are not used as solvents		R3		
	Waste reception	Import of liquid sludge and cake		R3 D9		
	Use of biogas	Use principally as a fuel or other means to generate energy		R1		
	Use of auxiliary standby flares	Incineration on land		D10		
	Composite steam boilers	Used to provide heat to the AAD process. These do not export electricity to the grid		R1		
	Diesel Generator	Used for emergency only		R1		
	Use of pressure release values	Used for emergency only, do not export electricity to the grid.				
	Storage	Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary		R13		

Installation name	Schedule 1 or other references	Description of the Activity	Activity capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
		storage, pending collection, on the site where it is produced).				
	Raw material storage	Storage of raw materials including chemicals, lubrication oil, antifreeze, diesel, activated carbon		R05		
	Discharge of condensate	Condensate from the CHP exhaust, flare gas pipelines, gas storage bag from collection to the point of discharge at the adjacent STW.				
	Storage of biogas	From receipt of gas from AD plant to dispatch for use				
	Discharge to foul sewer	Discharge of liquid from general site drainage, condensate and cooling water system to head of treatment works				
For installations that take waste	Total storage capacity	Waste imports (cess and septic tank etc) to Head of Works	51,960m^3			
	Annual throughput	49,192 TDS, (500,000m^3 wet tonnage), comprising: • 22,292 TDS of indigenous sludge • 13,353 TDS of liquid sludge imports • 964 TDS of cake imports; and • 12,381 TDS of recycled sludge				

6.1.1 Question 1 – Table 1b: Types of waste accepted

Northumbrian Water requires the permit for Howdon STC to be authorised to accept sludge waste to undergo anaerobic digestion, to comply with the Industrial Emissions Directive. It is requested the annual quantity of indigenous sludge, imported liquid sludge, imported sludge cake and recycled sludge to be accepted is 50,000 tonnes. None of the requested wastes are hazardous. The types of waste accepted are shown in Appendix A - Waste Codes.

Northumbrian Water do intend to co-digest sewage sludge with the highlighted EWC codes in this application, but this will not commence until the Environment Agency's review of the sludge strategy has concluded and any amendments have been ratified into UK law. Northumbrian Water will not spread any co-digested sludge on to agricultural land under the sludge use in agricultural regulations and we will only use EPR deployment permits to do so, or under whatever regime is permitted following the conclusion and ratification of the Environment Agency's sludge strategy. Northumbrian Water are only incorporating these EWC codes into the current permit applications to future proof the sites operations. Only sludge cake derived from sewage sludge only will be spread under Sludge (Use in Agriculture) Regulations (SUiAR).

6.2 Question 2: Point source emissions to air, water and land

6.2.1 Emissions to air

Table 6.2: Part C3, Question 2: Point source emissions to air

Installation name	Howdon STC			
Point source emissions to air				
Emissions point and reference location	**Source**	**Parameter**	**Quantity**	**Unit**
Stack 1 (A5) NZ 33629 66320 Stack 2 (A6) NZ 33637 66320 Stack 3 (A7) NZ 33647 66320	CHP engines 1 - 3 bursting disc (exhaust gas) stack burning natural gas and biogas	Oxides of Nitrogen (as NO^2)	500	Mg/m^3
		Carbon Monoxide	1400	Mg/m^3
		Total VOCs	1000	Mg/m^3
Stack 4 (A8) NZ 33663 66321 As per EPR/YP3331HQ	CHP engine exhaust stack burning natural gas	Oxides of Nitrogen (as NO^2)	95	Mg/m^3
		Carbon Monoxide	No limit set	Mg/m^3
Flare stack (A12) NZ 33648 66360	Waste gas burner (flare stack)	Operating hours	No limit set	
Composite Boiler 1 (A9) NZ 33619 66342 Composite Boiler 2 (A10) NZ 33631 66342 Composite Boiler 3 (A11) NZ 33641 66342	Steam boilers 1- 3 for CHP, including safety valves,	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	No limit set	Mg/m^3
		Carbon Monoxide	No limit set	Mg/m^3
		Total VOCs	No limit set	Mg/m^3
Gas bag holder 1 (A13) NZ 33610 66360	Gasholder pressure relief valves	Biogas release and operational events	No limit set	
Gas bas holder 2 (A14)	Gasholder pressure relief valves	Biogas release and operational events	No limit set	

NZ 33631 66359				
Pressure relief valves on Digester 1 (A1) NZ 33580 66390	Biogas release and operational events	Biogas release and operational events	No limit set	
Pressure relief valves on Digester 2 (A2) NZ 33604 66390	Biogas release and operational events	Biogas release and operational events	No limit set	
Pressure relief valves on Digester 3 (A3) NZ 33629 66390	Biogas release and operational events	Biogas release and operational events	No limit set	
Odour control unit 1 (OS8/OS9) (A15) NZ 33413 66273	Channelled emissions to air as identified on Site plan including dewatering scrubber or polish media.	Ammonia	20	Mg/m^3
		H_2S	No limited specified	
		Odour concentration	1000	Que/Nm^3
Odour control unit 2 (including biofilter) (A16) NZ 33588 66335	Channelled emissions to air as identified on Site plan including dewatering scrubber or polish media.	Ammonia	20	Mg/m^3
		H_2S	No limited specified	
		Odour concentration	1000	Que/Nm^3
Odour control unit 3 (OS12) (A17) NZ 33570 66256	Channelled emissions to air as identified on Site plan including dewatering scrubber or polish media.	Ammonia	20	Mg/m^3
		H_2S	No limited specified	
		Odour concentration	1000	Que/Nm^3
Standby generator (A19) NZ 33596 66366	Diesel generator	Operational hours Recorded duration and frequency	No limit set	
Biomethane plant (A18) NZ 33682 66283	Biomethane plant stack	Nitrogen	No limits set	
		Oxygen		
		Carbon Dioxide		
		Methane		
		H_2S		
		Odour		

The emission points are shown in drawing reference 100105164_MSD_SiteLayoutPlan_HOW v6. The results of air quality monitoring, undertaken from September 2020 to January 2022, are shown in the following documents:

- Document reference: 100105164_AirQualityMonitoringSep20toSep21_HOW
- Document reference: 100105164_AirQualityMonitoringNov21_HOW
- Document reference: 100105164_AirQualityMonitoringJan22_HOW

Table 6.3: Additional combustion plant details

	CHP 1	CHP 2	CHP 3	CHP 4	Back-up Generator	Composite Boiler 1	Composite Boiler 2	Composite Boiler 3
Make/Model number	MWM TCG 2020 V20	MWM TCG 2020 V20	MWM TCG 2020 V20	MTU 16v4000	Volvo Penta TWD1643GE	Cochran ST49	Cochran	Cochran
Date that MCP became operational/was commissioned	24 October 2011	24 October 2011	24 October 2011	15 February 2019	24 October 2011	24 October 2011	24 October 2011	24 October 2011
Thermal input (MWth)	4.8	4.8	4.8	4.5	1.7	2.2	2.2	2.2
Stack height (m)*	25	25	25	13	5	25	25	25
Fuel used (biogas, diesel etc)	Natural gas (biogas in an emergency)	Natural gas (biogas in an emergency)	Natural gas (biogas in an emergency)	Natural gas	Diesel	Biogas and natural gas	Biogas and natural gas	Biogas and natural gas
Estimated total hours of operation per year	Not restricted	Not restricted	Not restricted	Not restricted	6	2,550	1,736	4,681
Annual load (%)	100	100	100	100	0.07	29.1	19.8	53.4
MCPD and SG Regs status	Tranche A Existing MCP	Tranche A Existing MCP	Tranche A Existing MCP	Tranche B Existing MCP	Excluded Specified Generator Existing MCP	Existing MCP	Existing MCP	Existing MCP

Note: *The stack for CHPs 1 to 3 is the same as that for the composite boilers

6.2.2 Emissions to water (other than sewer)

Drainage from the central areas of the Site sends water directly to the head of the works for treatment, with the exception of the surface water drains which send water to a pumping station before the head of the works. Uncontaminated runoff from the roof of the engine kiosk is also routed to the head of the works for treatment.

There will be no other point sources emissions from the Site. There are no direct potentially contaminated discharges to controlled surface waters.

Accidental releases of materials to the environment are controlled through adequate containment measures and working procedures in accordance with the EMS. Spill procedures are in place. All spillages are recorded in the site diary including actions taken.

6.2.3 Emissions to sewers, effluent treatment plants or other transfer off-site

There will be no point source emissions or direct discharges to controlled waters or public sewers as part of the permit operation. The water used at the Site will be contained in a closed circuit; all wastewater streams will either be recycled within the process or captured and rerouted to the Site.

Discharges will be minimal, typically arising from periodic maintenance and cleaning operations, boiler water treatment backwash/regeneration water and the collection and rerouting of condensation from pipelines. As such, there are no direct, potentially contaminated, discharges to controlled surface waters and no significant impacts.

A drainage plan of the Site is presented in document reference 100105164_MSD_DrainagePlan_HOW v2.

The stormwater drainage of potentially contaminated areas from within the Site boundary will be routed into the sewage treatment process with no discharge outside of the Site. There will, therefore, be no risk of polluted runoff affecting off-site features due to the creation of a new hardstanding area.

Due to the anticipated very low levels of contamination of the water and the volumes involved, no monitoring of its composition is proposed prior to discharge to the STW.

Any areas of the Site, where there is a risk of contamination of surface water, groundwater or discharge of process waters are located on impermeable concrete surface. All surface water from these areas drain to the STW internal drainage system and are returned to the head of the works for treatment prior to discharge as final effluent.

A list of the point source emissions to sewers, effluent treatment plants and other transfers off-site is included as Table 6.4.

Table 6.4: Part C3, Question 2, Table 2: Point source emissions to sewers, effluent treatment plants or other transfers off-site

Emission point reference and location	Source	Characteristics	Monitoring/mitigation measures prior to final discharge and emission point discharge	
Discharged to Howdon STW NGR NZ 33670 66540	Condensate from the gas pipelines and gas storage bag	Condensate with slightly elevated levels of H_2S dissolved from the biogas, resulting in a low level of acidity.	Negligible	Rerouted to adjacent STW

Emission point reference and location	Source	Characteristics	Monitoring/mitigation measures prior to final discharge and emission point discharge	
Boiler Maintenance	Boiler blow down to minimise damage from high mineral content water	High purity with traces of chemicals (used for boiler dosing)	Infrequent and negligible	Rerouted to adjacent STW
Drain down of plant	Occurs during maintenance when it is necessary to drain down the feed water, hot well or boiler shell	High purity water with traces of chemicals (used for boiler dosing)	Infrequent	Rerouted to adjacent STW
Rainwater	Uncontaminated roof water from buildings	Clean rainwater from building roofs only		Rerouted to adjacent STW
Rainwater	Run off from impervious surfaces	Clean rainwater from runoff		Routed to head of works via site drainage system
Sanitary water	Domestic facilities	Foul waste	Negligible	Rerouted to adjacent STW

Please refer to the ERA (document reference 100105164_ERA_HOW v2) on the environmental risk the water emissions pose and how these are mitigated, where relevant.

6.2.4 Emissions to land

There are no point source emissions to land as part of the activities carried out on-site.

Indigenous sewer grit and screenings are collected in separate skips and removed off-site by road vehicle and transported to a suitably permitted facility.

6.3 Question 3a: Operating techniques

This section provides a technical overview of the components, the proposed techniques and measures to prevent and reduce waste arising and emissions of substances and heat, including during periods of start-up or shut-down, momentary stoppage and malfunction, and leaks. Specifically, consideration is made of:

- The technology to be used;
- The process, in terms of how it will be operated and controlled;
- In-process controls and Best Available Techniques (BAT) Assessment; and
- Measures implemented to control emissions to air, water, sewer and land.

Table 1.1 lists the technical guidance notes (TGNs) used to inform the techniques and measures proposed to prevent and reduce waste arising and emissions of substances, including during periods of start-up and shut down, momentary stoppage and malfunction, and leaks.

The technical guidance and BAT requirements will also be addressed within Northumbrian Water's Howdon Working Plan, as part of the EMS, to be made available to staff to ensure compliance with a permit, which covers the following:

- Management of activities, including security and staffing
- Emissions and monitoring, including:
  - Point sources to air, water and land

  - Fugitive emissions
  - Site drainage
  - Storage of waste
  - Odour, noise and vibration
- Site record keeping

A copy of the schematics describing the operation and process can be found in document reference 100105164_MSD_Schematics_HOW v2.

6.3.1 BAT Assessment

An assessment against the BAT Conclusions set out in the 2014/738/EU: Commission Implementing Decision of 9 October 2014 establishing best available techniques (BAT) conclusions, under the Industrial Emissions Directive 2010/75/EU has been undertaken for Howdon STW and the outcome of these conclusions can be found in document reference 100105164_MSD_BAT_HOW_Feb 2023. Northumbrian Water can currently comply with the majority of the conclusions assessed against, with the exception of BAT 2a, 2b, 6, 7, and 14h. Further modelling and assessments for containment are provided in Folder 100105164_Containment_HOW, with modelling demonstrating scenarios with and without rainfall. The solutions provided are anticipated to be discussed with the Environment Agency prior to implementation.

The latest Waste Acceptance Procedure is provided in 100105164_BAT_WasteAcceptance_HOW.

Secondary containment assessment and solutions, in accordance with Construction Industry Research and Information Association (CIRIA) ‘Containment systems for the prevention of pollution (C736F)’, is provided in the document reference IED Risk Register-Howden v2. The solution addresses the catastrophic failure for tanks located in the lower section of the site and of the anaerobic digesters.

The containment assessment has been revised to account for rainfall and meet section 4.2.1 of CIRA 736 from multiple tanks across the site. The model assesses risk based on keeping the sludge in the permitted area, because otherwise the sludge would sit in an area due for future development in the unlikely event that there is ever a catastrophic failure. Therefore, Northumbrian Water are reluctant to move the permit boundary to the east as this will affect any future development.

6.4 Question 3b: General requirements

6.4.1 Overview

The section provides an overview of the measures in place at the Site for controlling fugitive emissions, noise and odour. An ERA has been completed and is provided with the application (Document reference 100105164_ERA_HOW). The response to this question relates to Table 4 in the Part C3 form.

6.4.2 Control of fugitive emissions to air

There are no significant fugitive emissions to air of gases, vapours, or particulates as part of normal Site operation.

Details of the procedures Northumbrian Water follows, with regards to the control of mud and debris and potentially polluting leaks and spillages, are addressed in the EMS.

As combustion activities are not being changed on site as a result of permitting the AD plant and associated processes, it is not anticipated that Air Dispersion Modelling (ADM) will be required for this permit application.

The existing approaches and relevant procedures presented in the EMS and operational procedures are considered to adequately address the emissions that may present a risk, and, therefore, an Emission Management Plan is not considered be required.

6.4.2.1 Odour

The Site is located in an industrialised area along Northumberland Dock Road, north of the River Tyne. The Site is located within 250m of seven sensitive receptors and has received 41 odour complaints from 2017 to 2020. The number of complaints decreased from 30 in 2017/2018 to 11 in 2019/2020. Northumbrian Water has undertaken numerous works in the last five years to improve odour mitigation, including refurbishment of the PSTs, AAD drainage pumping station, primary sludge buffer tanks, odour scrubbers, AAD plant OCU biofilter, and of the OCU in the sludge thickening and strategic storage area. H_2S monitoring instrumentation has been installed, improvements have been made to existing odour extraction duct work, and works undertaken at the AAD raw centrifuges to ensure centrate is diverted away from the AAD drainage system to the pumping station. There are no proposed works to be undertaken on the Site in respect of this permit application, therefore, the activities on-site are not anticipated to increase the off-site impact or result in adverse impact upon nearby sensitive receptors or the amenity of the area surrounding the Site.

The sludge and wastewater treatment processes of the Site are either covered or enclosed. Sludge cake is stored in a silo and is covered when transported. The following areas all have odour extraction to extract odorous air from the process units.

- Inlet works, screening and grit removal areas
- Primary settlement tanks
- Aeration lanes
- Sludge storage and handling area
- Final sludge dewatering

The overall strategy for the advanced anaerobic digestion process is to mitigate against potential odours being generated and released from the various stages of the digestion process in order to prevent them from dispersing from the site. This approach has been designed to:

- contain the odours at source by enclosing these odour sources with suitable containment covers
- direct and combine these odorous air volumes from the various sources via a network of plastic ductwork to a system which will
- abate these odours to a pre-agreed quantity on the stack outlet via a two-stage odour control system

The Site uses a proven odour control technological system comprising a two-stage treatment process. The primary stage is capable of removing up to 90% of the incoming odours and is based on a biologically based abatement process, followed by the secondary or final polishing stage which will function to reduce the odours down to the agreed odour levels before they are expelled to the atmosphere via the individual exhaust stack.

The biological activity of organisms within the primary biofilter stage allows for the removal of a wide range of chemical components present in the incoming airstream (organic and inorganic) which are perceived as odorous. This stage consists of porous rock media which is wetted with either final effluent or potable water (as back-up) to ensure that the biological population is kept

viable and highly active while the airborne odours are being solubilised within the contact media. The supplier has indicated a minimum media life guarantee of 20 years.

The remaining odorous components are presented to the final dry polishing stage which consists of a layered activated carbon. This media has a large surface area which physically traps and reacts the chemical odours within its structure as they pass through the final stage of treatment. Although the system has been sized for a guaranteed minimum media life of 5 years at the expected loads, this will depend on how often the biological stage is bypassed for maintenance or the number of peak loads generated by the process.

To prevent any period of downtime of the OCU during planned media changes, a bypass system is provided around the biological stage and two second stage units are provided to ensure secondary treatment is always available during media change.

Odorous air is extracted from various process units in the sludge thickening and strategic storage area by duty/standby extraction fans for treatment by two catalytic iron filters (CIFs) to attenuate incoming H_2S levels. Odorous air is blown through the CIFs and then enters twin Odorgard chemical scrubbers for further treatment.

Duty/standby fans extract odours from various parts of the centrifuge dewatering facility and sludge liquors wet well using a four-stage chemical scrubbing system. An OCU also treats odours from the AAD plant, including cake import building, pre-dewatering/silos, THP, and post-digestion sludge storage tank.

Biofilter / Carbon Filter with 1 emission stack

The Site has an Odour Management Plan (OMP), which identifies potential odour emissions from site operations and procedures to manage, control and minimise odour impacts. It sets out the procedures for how the Operator will manage complaints, and the actions to be taken in the case of pollution events. The OMP also describes the monitoring and maintenance procedures to maintain the control measures.

The OMP was written in accordance with the Environment Agency's H4 Odour Management guidance (2011). The level of odour risk from the Site is considered to be Medium, as shown in Appendix B of the ERA (document reference 100105164_ERA_HOW v2) and the OMP provides sufficient mitigation.

The Odour Management Plan can be found in document reference 100105164_ERA_OdourMP_HOW v3.

6.4.2.2 Noise

Initial screening has been carried out for the Site. Noise Impact Assessments (NIAs) have been undertaken in 2010, 2014 and 2017, the latter two relating to the biomethane facility and blowers respectively. Since the Site is not undergoing changes to equipment and vehicle movements prior to application submission, an NIA is not considered to be required. Appropriate mitigation for noise and vibration impacts are provided by the ERA.

A Noise and Vibration Management Plan would be required whereby the NIA concludes that noise and vibration requires management, such as monitoring and maintaining abatement measures. Since noise and vibration impacts are considered to be appropriately mitigated in the ERA, a Noise and Vibration Management Plan is also not considered to be required.

There have not been any noise complaints recorded at the Site in the past five years.

6.4.2.3 Dust and particulates

There are not considered to be any significant dust or particulate sources from the site as identified in the ERA document reference 100105164_ERA_HOW v2.

6.4.2.4 Bio-aerosols

A bioaerosols risk assessment has been undertaken for the Site and considers the magnitude of risk to be low.

The bioaerosols risk assessment can be found in 100105164_ERA_BioRA_HOW v5.

6.4.3 Control of fugitive emissions to surface water, sewers and groundwater

There are not considered to be any fugitive emissions to surface water, sewers or groundwater. There is appropriate containment for the control of liquid wastes put in place to minimise any potential releases, as identified in the EMS.

6.4.4 Control of fugitive emissions to land

Waste generated on the Site includes the following:

Table 6.5: Waste recovery of different waste streams

Activity	Waste stream	Waste recovery/disposal
Sludge screening	Screening	Organic and grit screenings sent to composting facilities
Sludge thickening and sludge dewatering	Centrate	Returned to STW for treatment
Anaerobic digestion	Biogas	Transferred to CHP unit for electricity and heat production
Maturation stage	Biosolids	Compliant biosolids are recycled to agriculture (as soil conditioner)
CHP engines and generators	Oils and filters	Recycled where possible at a materials recycling facility. Non-recyclable waste is disposed of at a designated landfill site
	Scrap metal	Recycled at scrap metal recycling facilities
	WEEE	Recycled WEEE recycling facilities
Biomethane plant	Carbon filters	Spent activated carbon media will be collected by the biomethane plant contractor and delivered to a specialist facility for recycling and thermal reactivation. Steel rings (CIF rings) collected by Harpers Waste Company and sent to landfill.

To reduce volumes of waste:

- All materials and consumables delivered to Site are inspected to ensure that they are fit-for-purpose. Damaged items are refused and returned to the supplier.
- The sludge from the post digestion sludge storage tank is dewatered by two centrifuges to reduce its volume. Dewatered digested cake is stored 2 No. 60m^3 silos prior to being transported off-site for recycling to agricultural land as a soil conditioner.
- Sewage sludge is de-watered from the works to be treated at the Site. Treated sludge is then recycled to agricultural land as a soil fertiliser. The treated sludge meets the Biosolids Assurance Scheme Quality Standards. The volume of sludge recycled to agricultural land is monitored by the waste services team.

- The biogas from the AD process is burned in a CHP engine and is used to provide power for the Site processes. Surplus power is exported to the grid.
- The biogas from the sludge is processed in the biomethane facility and injected back into the National Grid.
- Polymer intermediate bulk containers (IBCs) are sent back to the supplier for re-use.
- WEEE, batteries, waste oils and oil contaminated items such as oily rags are treated as waste hazardous waste in accordance with legislation, these are removed from Site by an approved suppler, using approved waste carriers.

6.5 Site security

Activities are managed and operated in accordance with the management system.

Access to site and waste is restricted by a 2m high steel palisade fence. The Site is accessed by a 24-hour manned security barriered entrance and monitored by CCTV cameras. There is another barriered entrance adjacent to the former Chemson site. The Site is staffed 24 hours a day, 7 days a week. For visitors and unauthorised personnel, an intercom system at the Site entrance is used. The Site also benefits from a CCTV system.

Regular inspections of the boundary fencing and buildings are undertaken to ensure that these have not been compromised and continue to prevent easy access to Site. Repairs are undertaken in accordance with the EMS requirements.

Other risks relating to human health and the environment are presented in the ERA in document reference 100105164_ERA_HOW v2.

6.6 Complaints procedure

Northumbrian Water operates a Customer Contact Centre that employs a number of management systems and procedures to provide an efficient and effective service for their customers. Customer contacts can be received by telephone or as a written communication, with the majority of contacts being received by telephone. All complaints received relating to any aspect of the Site and its activities will be recorded on the day of receipt and acted upon. Complaints, and actions taken, will be recorded and stored on a computerised system.

The Customer Contact Centre is the central point of contact for the company, with the Regional Control Room (RCR) taking on this role outside of the Call Centre opening hours. Complaints are assessed and dealt with by the Customer Contact Centre, in conjunction with site management as necessary, and liaison with local stakeholders is managed by these two groups, in conjunction with the Communications Department (as appropriate). Where significant schemes are involved, site management, Customer Contact Centre and Communications Department will be involved and employ a range of techniques to communicate with local stakeholders (e.g.: letter drops, newsletters, face-to-face meetings). Wastewater Production Management have the responsibility for dealing with those complaints assessed as significant, as well as the liaison with Environmental Health and the local authority on issues.

Complaints will be investigated promptly and any appropriate remedial action taken. The complainant and anyone else likely to have been affected, should be informed about what has been found and actions taken in a timely manner. Northumbrian Water promises to respond to complaints within a maximum of 10 working days from the date these were received. If the complaint is more complex, Northumbrian Water will keep the complainant informed as more detailed investigation into the complaint is undertaken. If Northumbrian Water fails to meet this standard we promise to automatically pay the complainant £50. If customers are unhappy with Northumbrian Water's response, they will be informed of how to contact the Consumer Council for Water (CCW).

Northumbrian Water directors receive a report on the number of complaints and the speed of our responses every month. We also check the quality of the responses we give and continuously try to improve the service we provide. Our records are assessed independently by members of the CCW on a regular basis. Each year information is given to Ofwat and the CCW on the number of complaints and our speed of response. This information is published so that performance between different water companies in England and Wales can be compared.

The aim will be to undertake measures to prevent complaints from being raised. However, where this is not possible, proactive measures will be taken to prevent further complaints from being made. For example, if a complaint is made with respect to dust, the Site Manager will arrange for dust suppression equipment to be used. The Site Manager will assess whether further control measures will be required to ensure that the risk of recurrence is minimised. The details of the complaint will be recorded in the complaints register on the computerised system. If a complaint is received Northumbrian Water will be informed as soon as is practicable and the complaints procedure will be followed. Confirmation will be recorded in the Site Diary or equivalent. The Site Manager will inform the Environment Agency of the complaint, if appropriate.

The complaints procedure deployed by Northumbrian Water is presented in document reference 100105164_MSD_ComplaintsProcedure_HOW.

6.7 Question 3c: Types and amounts of raw materials

The list of types and amounts of raw materials for the Site is presented in Table 6.6.

Table 6.6: Part C3, Question 3c, Table 5: Types and amounts of raw materials used on-site

Name of the installation	Howdon STC			
Schedule 1 activity	**Description of raw material and composition**	**Maximum amount stored (tonnes or m^3)**	**Annual throughput (tonnes or m3 each year)**	**Description of the use of the raw material including any main hazards (include safety data sheets)**
5.4, Part A (1), (b) and (i)	Diesel	60 litres	$1m^3$	Used to fuel generators and also mechanical plant on-site i.e. telehandlers, mobile pumps. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Polyelectrolyte (powder – bag)	30 tonnes (40 x 750kg)	250 tonnes	Used as flocculant to enhance thickening and dewatering processes. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Polyelectrolyte (liquid – IBC)	20 tonnes (20 x IBCs)	240 tonnes	Used as flocculant to enhance thickening and dewatering processes. The main hazards are detailed in the safety data sheet shown in document

				reference 100105164_MSD_MSDS_HOW.
	Anti-foam	5 tonnes	10 tonnes	Used to suppress foaming of sludge within the digester or dewatering process. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Sodium hydroxide	15m^3	260m^3	Used within chemical scrubbing process of odour control plant. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Sodium hypochlorite	20m^3 30m^3	410m^3	Used within chemical scrubbing process of odour control plant. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Sulphuric acid	5m^3	7m^3	Used for ammonia polishing in OS 12 (odour control unit). The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Lubrication oils	1m^3	1m^3	Used for the lubrication of CHP engines. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Coolant	5m^3	5m^3	Used for cooling CHP engines. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
S1.2A(1)(a)	Test/calibration gases	0.05m^3 0.02m^3 0.02m^3	0.08m^3	Used for the calibration testing for the gas to grid entry unit. The main hazards are detailed in the safety data sheet shown in document reference

				100105164_MSD_MSDS_HOW.
	Carbon filters	10m^3	1m^3	Used in the AAD OCU to remove contaminants, odours and residual hydrogen sulphide. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Propane	24 tonnes	740 tonnes	Used in the biomethane plant to enrich the biomethane and raise its calorific value prior to injection to the National Grid. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Odorant	0.01m^3	0.02m^3	Used to odorise enriched biomethane in the Grid Entry Unit. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Sodium Bicarbonate	0.4 tonnes	1.2 tonnes	Used for pH control in the biomethane plant. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.
	Sodium Bisulphate	0.5m^3	3,5m^3	User to water conditioning in the boilers. The main hazards are detailed in the safety data sheet shown in document reference 100105164_MSD_MSDS_HOW.

6.8 Question 4: Monitoring

This section provides a summary of the proposed monitoring at the Site.

6.8.1 Emissions to air

Stack emissions monitoring will be undertaken for each stack in accordance with M5 monitoring guidance, MCERTs BS EN 14792 and the requirements of the environmental permit issued for the Site.

Periodic monitoring will be undertaken on an annual basis as part of the routine maintenance programme. No abatement technology is required, and continuous monitoring is not considered necessary. Sample monitoring will be carried out after each maintenance period on the CHP and boilers, in order to ensure compliance with ELVs as required in the Environmental Permit.

Once permitted monitoring will be undertaken in accordance with the relevant standards. It is anticipated the monitoring standards required are as follows:

Table 6.7: Monitoring of air emissions

Emission point type	Parameter	Reference period	Monitoring frequency	Monitoring standard or method
Stacks on engines Burning biogas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	periodic over minimum 1-hour period	Annual	In accordance with TGN M5 – Monitoring of stack emissions to air
	Carbon monoxide			
	Sulphur dioxide			
	Total volatile organic compounds including methane			
Boilers (biogas and natural gas)	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	periodic over minimum 1-hour period	Annual	In accordance with TGN M5 – Monitoring of stack emissions to air
Channelled emissions to air (biofilter, dewatering scrubber and polishing media)	Ammonia	periodic over minimum 1-hour period	Once every 6 months, or more frequent if stated in the permit	Emissions of pollutants into the environment through any kind of duct, pipe, stack, etc
	H_2S			
	Odour concentration		Once every 6 months, or more frequent if stated in the permit	BS EN 13725
Pressure relief valves	Biogas release and operational events	Recorded duration and frequency.	Daily inspection	Operational record including date, time duration of pressure relief events and calculated annual mass release

6.8.1.1 Assessment of sampling locations

Northumbrian Water will bring in sub-contractors accredited to MCERTS to monitor the emissions points in accordance with the permit requirements. An assessment of sampling locations is therefore not appropriate as this will be the responsibility of the sub-contractors.

6.8.1.2 Sampling locations and BS EN 15259

The requirements of BS EN 15259 have been met, however, Northumbrian Water does not believe the BS EN 15259 applies at the Site due to the diameter of circular ducts. The stack

core diameter of the ducts for CHP exhaust gases, used by Northumbrian Water, are 0.458m Therefore, under Environment Agency's Method Implementation Document for EN 15259:2007 circular ducts with diameters <1.13m are not required to meet BS EN 15259.

Summary responses to the questions answered no for Question 4 of Part C3:

Question	Response
If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)	Not applicable, as ducts are circular

6.8.2 Emissions to water (other than sewers)

There will be no point sources emissions from the Site. There are no direct potentially contaminated discharges to controlled surface waters. As such no monitoring or reporting is required.

6.8.3 Emissions to sewers, effluent treatment plant or other transfers off-site

There will be no point source emissions or direct discharges to controlled waters or public sewers as part of the permit operation. Drainage from the central areas of the Site sends water to the head of the works for treatment.

The condensate from the CHP exhaust, gas bag and digester is returned to the head of the works and will undergo treatment through the works before being discharged under an existing environmental permit for discharge to water. This condensate is clean, uncontaminated water and occurs in small volumes. As such, no monitoring or reporting is required. There are no direct releases to public sewers, effluent treatment plants or other transfer off-site of emissions arising from the STC.

6.8.4 Emissions to land

There will be no point source emissions to land as part of the activities carried out on-site.

The condensate from the CHP exhaust, gas bag and digester is collected in a sump and returned to the head of the works.

As required by the Northumbrian Water EMS various housekeeping and waste management practices are in place to monitor waste emissions. These include segregation of wastes according to their classification and nature, labelling waste and using designated storage containers.

In accordance with the Northumbrian Water EMS solid waste is disposed of in accordance with 'Duty of Care' Regulations. The composition of the waste, its hazard characteristics and any relevant precautions are clearly stated on the transfer notes provided to licensed waste contractors removing waste from Site for recycling and/or disposal. Records are maintained on-site and reported to the regulator as required by the Permit.

6.9 Environmental impact assessment

The Site was subject to an environmental impact assessment (EIA) under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment] (EIS) in July 2010.

Northumbrian Water produced an Environmental Statement which detailed the findings of the EIA. The conclusions identified that the Site would create environmental benefits in terms of the following:

- Provision of renewable energy generation.
- Provision of a more efficient sewage treatment process.

- Reduction of the number of road miles travelled and the subsequent amount of CO_2 emitted to the atmosphere from associated road transport.
- Very slight improvements in local air quality and traffic noise as a result of decreased traffic.
- Modification of an existing process that had the potential to generate intense odours, replacing it with a process that produces lower volume and strength odour.

Overall, it was concluded that although some adverse effects will occur, in terms of air quality and landscape and visual effects, these effects were of a negligible nature and, therefore, were not considered to be of significance. Mitigation measures were proposed to ensure that all adverse effects that arose were controlled to a level which is acceptable.

This permit variation will not result in any additional environmental impacts and will help provide further mitigation and improve environmental performance of the Site, therefore, resulting in a positive environmental effect.

6.10 Question 6: Resource efficiency and climate change

6.10.1 Basic energy requirements

Northumbrian Water aims to maximise the efficiency of the energy flows from its processes ensuring that, where possible, heat is recovered, and energy is not wasted.

There are a number of pieces of infrastructure and equipment that use electrical energy supply including:

- Fans, coolers and heating;
- Motors and motor drivers and drive systems;
- Aeration;
- Pumps/boosters/conveyors;
- Facilities – heating and lighting;
- Sludge handling and management e.g. AD, dewatering and polymer dosing equipment; and
- Ventilation and odour control/abatement systems.

Biogas is used to provide energy, produced by burning in a CHP engine, for the Site's processes. Biogas and natural gas is used for heating or running the boilers, and diesel is used for primary generators where required.

6.10.2 Questions 6a: Basic measures for improving energy efficiency

Northumbria Water deals with the measurement and reporting of operational carbon emissions in existing installations through:

- Monitoring of energy use from electricity meters
- Quarterly estimation and reporting of operational carbon emissions for internal reporting purposes
- Annual estimation and reporting of operational carbon emissions for regulatory reporting (Ofwat and CRC)

Energy efficiency measures implemented at the Site include (but not limited to) the following:

- The combustion temperature is optimised for reduced NO_x emissions and increased efficiency.
- Heat from the sludge cooling, following the thermal hydrolysis plant, is recovered and then used in the process of the AAD plant by pre-warming the boiler water and sludge, reducing gas consumption.

- The CHP engines are equipped with turbochargers, further increasing energy efficiency.
- Ongoing monitoring of plant operating parameters is carried out to ensure process is operating optimally and to enable constant optimisation to increase the plant's efficiency.
- Sludge treatment plant are audited for efficiency and actions raised accordingly. Outputs from the audits are used to inform future investment.
- The maintenance scheme in place ensures fuel is combusted as completely as possible and heat is transferred efficiently.
- Good housekeeping measures are employed, and regular preventative maintenance will ensure the operations, and therefore energy efficiency, is optimised.
- Low-cost measures in place to avoid inefficiencies of excessive heating or cooling, include:
  - Insulation of main hot water pipes; and
  - Insulation of heating equipment such as steam raising boiler feed, sludge coolers and boiler feed water pumps and pipework.

Various options to improve energy efficiency onsite are currently under investigation, including Variable Speed Drive (VSD) used on digester mixing, reverse osmosis (RO), warm pulper dilution, steam accumulator, heat recovery, steam use reduction, increased energy generation (ETC), organic ranking cycle (ORC), warm combustion air, load adjustment for centrifuges, gas chiller, sludge cooler control/digester temperature, digester feed control, LED lighting

Various other investigations and potential trials are ongoing including the deployment of solar panels (250kW peak), gas recovery from digestate, UV treatment of odour, algae treatment of digested liquors, digester DNA profiling

Biogas is a renewable gas, produced from organic waste. Heat generated from the CHP is used in the AD process. The energy created by burning of biogas in the CHP engine is used to supply the Site to reduce the need to import electricity from the grid.

Biomethane is also a renewable gas, and is injected into the gas grid. Biomethane can make a contribution to the UK's low carbon economy, will help to manage organic waste products and has the added benefit of being a secure energy supply. The benefit of biomethane as a renewable gas is recognised through the UK Government's Renewable Heat Incentive (RHI) scheme which provides financial incentives to promote the generation of renewable heat and biomethane.

Northumbrian Water carries out planned maintenance as a means to ensure operations are energy efficient. Overall, the energy use is relatively low and the purpose of the installation is to produce energy by supplying biogas, no further measures are identified at this stage to improve upon energy efficiency. Nevertheless, Northumbrian Water will regularly review energy use and disclose potential opportunities to reduce energy consumption from the four-yearly (or more frequent) energy reviews as required by a varied permit. In addition, Northumbrian Water implements optimisation measures across all its sites in a proactive approach to ensuring efficiency measures across all its Site operations meets optimal and efficient operating requirements.

6.10.3 Question 6b: Changes to the energy the permitted activities use up and create

There will not be any changes to the energy that the permitted activities use or create.

6.10.4 Question 6c: Climate change levy agreement

Northumbrian Water is not a participant to the Climate Change Levy (CCL) agreement.

6.10.5 Question 6d: Raw and other materials, other substances and water use

The raw materials required to operate the installation are described in section 6.6.

All materials will be handled and stored in such a way as to ensure containment. Fugitive emissions to the environment are therefore negligible.

Biogas is the primary raw material. Its consumption will be monitored. The use of biogas as the fuel source offers the best environmental option and there is therefore no environmental incentive to reduce biogas consumption and consider an alternative source of fuel.

Biogas is stored within 1 No. double membrane inflatable bag type holder, constructed of a Type IV fabric, which is resistant to UV and microbial degradation. The base of the holders are constructed from reinforced concrete treated to withstand the potentially acidic conditions within the holder. The gas bag is completely enclosed so the gas is not in contact with the concrete.

Secondary raw materials include chemicals used in processes such as water treatment, polymer and diesel for the boilers and generators. Their consumption will be monitored, based on purchase records.

There is a propane storage and transfer plant which adds propane to the biomethane from the biomethane plant to increase its calorific value. The plant is formed by 2 No. 12 tonne tanks, 2 No. pumps and 1 No. control panel.

Gas odorant storage required to comply with the Gas Grid operator is located inside the Grid Entry Unit. The plant contains a 30L storage tank and a pump. The odorant plant manufacturer is gAvilar.

All substances are assessed for COSHH (Control of Substances Hazardous to Health) compliance, where relevant. Material safety data sheets for all materials used and kept on-site will be maintained on the Site.

All raw materials are handled and stored within the confines of the buildings on-site, or in IBCs in bunded areas, with the exception of biogas which is contained within the gas handling system.

Potable water usage on-site include:

- Poly make up - concerns over the impact of using final effluent for this purpose
- Heat exchanger system water - concerns over the impact of using final effluent for this purpose
- Eye baths and safety showers - potable water essential
- Limited wash-down points where it would be uneconomic to extend the final effluent wash-water system
- Office mess facilities - kitchen, washing and welfare facilities etc
- Odour control units
- Boilers

To ensure appropriate use of raw materials to prevent releases of substances to the environment and limit environmental impact Northumbrian Water will follow quality assurance procedures for the purchasing of materials. The raw materials will be selected from specialist suppliers determined by pre-established material specifications and will include environmental considerations. Priority choice of purchased raw material will be given to those with the least environmentally harmful chemicals compared to their alternatives, wherever practicable.

Resource efficiency will be achieved through the minimum use of raw materials and water (where possible), and Northumbrian Water will undertake the following:

- Maintain records of raw materials and water used;
- Routine resource efficiency audits;
- Review the feasibility of alternative materials that could reduce environmental impact or provide further opportunities to improve resources efficiency at least once every four years; and
- Implement further appropriate measures identified from a review.

6.10.6 Question 6e: Reducing production of waste

Northumbrian Water manages its waste in accordance with the Council Directive 2008/98/EC on waste (the Waste Framework Directive), UK legislative requirements and the EMS (ISO 14001:2015), by maximising materials re-use, prevent waste, minimise waste generation and maximise recycling and recovery of waste generated from the operation of the Site. There are procedures in the EMS which includes details of the types of waste produced on Site, how wastes are segregated, stored and removed from Site. Only minimal volumes of waste shall be generated at the STC, with waste streams segregated and recovered for recycling where possible. Northumbrian Water treat all sewage sludge by THP and recover to agricultural land via internal Northumbrian Water Grow trucks. All other wastes are put into on-site skips, which are removed by Biffa, and grit waste is sent for composting.

All waste streams shall be managed in accordance with existing EMS, with any final off-site disposal to be carried out by licensed waste contractors in accordance with Duty of Care requirements, and the application of the waste hierarchy is central to any decision-making process.

Implementation of EMS procedures and the current Environmental Policy ensures optimum disposal of the wastes produced. Submission of a detailed assessment is not considered necessary due to the minimal quantity of waste produced.

Further consultation with waste contractors will ensure that all waste streams have been considered. The sampling and characterisation of wastes will be covered under the requirements of Duty of Care. The wastes are handled to a minimum and are stored in suitably designed containers prior to being removed from Site, to minimise releases of pollutants to the environment.

The main wastes produced by the installation are waste oils and filters associated with the operation and maintenance of the engines. Other wastes include from Site office (paper, packaging etc), waste collected from general housekeeping across the Site (debris, litter), scrap metals and waste electronic and electrical equipment (WEEE), such as computer equipment, printers etc.

Waste generation from the operation of the plant is minimal and limited only to essential maintenance fluids and materials. Waste streams are segregated and recovered for recycling where possible, as shown in Table 6.5 for different Site activities. General waste is sent for recycling, where possible, scrap metal is sent to metal merchants for recycling and WEEE re-used where possible or sent to specialist WEEE recycling facilities. Fat, oils and grease waste is sent to for recovery where possible. All waste and sewage companies (WaSCs) are currently planning to implement measures to prevent avoidable waste being generated by 2030. Northumbrian Water apply a Duty of Care by ensuring waste is removed by an appropriately licenced waster carrier.

The sampling and characterisation of wastes and the final off-site transport of waste is carried out by licensed waste contractors in accordance with Duty of Care requirements. The implementation of EMS procedures and the current Environmental Policy ensures optimum disposal of the wastes produced.

NWL has implemented a ‘zero avoidable waste by 2025’ policy, which includes producing a waste accounting workbook to monitor and reduce waste generation. This is applicable to all sites including Howdon STC.

7 Part C6 - vary a water discharge activity, groundwater activity, or point source emission to water from an installation

The form responds to question listed in Table 1 of the C6 application form for the last listed option 'Effluent and/or contaminated surface water run - off arising from the operation of an installation.

Therefore, only the following questions have been responded to:

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Effluent and/or contaminated surface water run-off arising from the operation of an installation	No additional charge, as already included as part of the installation variation application charge	✔	a, b, d	c	b, c, d, f		a, b2	a, b, c	b, c, d, e, f, g	d*, e*, f	a, b, d, e, f, h, i	a, b, c

* Check the relevant question and our guidance notes on part C6 to see if you need to give an answer.

Note Question 6c is not within the application, despite being listed as being required by Table 1 of the application form.

7.1 Question 1 About the variation you are applying for

Effluent name is: Effluent from centrate returns, cake storage and sludge thickening process.

7.2 Question 3 How much do you want to discharge?

Northumbrian Water is not aware of the quantity of water sent to the inlet works from the Sludge Treatment Centre (STC) via a 'shared' sump, other than raw and digested centrate flows (see below), which is sampled from the post AD dewatering sump, before discharging into the 'shared' sump collecting process water from the AAD. As other parameters are not currently monitored for, from this 'shared' sump, no details have been provided for Question 3.

Centrate flow:

- 1480513m^3/year
- 4056m^3/day
- 169m^3/hour

7.3 Question 5 Should your discharge be made to the foul sewer?

The discharge point for the effluent discharge from the AAD ('shared' sump and primary distribution chamber (post inlet works) NGR NZ 33467, 66519 prior to entering the inlet works, NGR NZ 33670 66540) is located within the operator's own sewage treatment works, therefore, the distance to the nearest foul sewer is 0m and response to Question 5b2 is not applicable.

7.4 Question 6 How will the effluent be treated?

Effluent is not currently treated before reaching the inlet works (NGR NZ 33670 66540). Once leaving the inlet works the effluent will be treated through the Sewage Treatment Works. The process description is provided in Section 3 of the Main Supporting Document (document reference 100105164_MSD_ HOW v3).

7.5 Question 7 What will be in the effluent?

Northumbrian Water currently only monitors the pH, suspended solids, BOD, COD and ammonium content of the digested centrate and raw centrate sent from the STC, going to the shared sump via the post AD dewatering sump. This centrate is only sampled and analysed on a monthly basis for operational and optimisation purposes only. The information relating to the centrate only from the post AD dewatering is provided in Table 7.1.

The site has two liquor collection sumps. The sump (the post AD dewatering sump) that the digested centrate is sampled from feeds into a 'shared' sump. This 'shared' collects the liquor from the other STC processes such as drum thickeners, centrifuges and post AD dewatering sump, before entering the inlet work for treatment in the adjacent WwTW. The effluent from this 'shared' sump is currently not sampled. It has been identified that this will be the correct sump to sample from for the return liquors going to the inlet works. Therefore, Northumbrian Water do not monitor for any of the 'specific substances' for treated sewage or trade effluent discharges to surface water or groundwater.

Table 7.1: Howdon STW Digested Centrate

Date	Time	pH	suspended solids	BOD (ATU) 5 day	BOD settled (ATU) 5 day	COD	ammonium
Taken	Taken	pH units	mg/l	mg/l	mg/l	mg/l	mg/l as N
25/01/22	14:10	8.3	2500	2800		8200	400
25/02/22	14:05	8.2	1500	2400		8200	2000
17/03/22	10:05	8.5	2900	1600		7800	2000
22/04/22	14:10	8.3	1700	1600		6900	1900
27/05/22	13:30	8.2	1800	2400		8400	2200
16/06/22	13:05	8.5	4200	2600		10000	2200
18/07/22	14:30	8.5	6500	2600		15000	150
15/08/22	08:05	8.6	7800	2400		15000	3400
28/09/22	14:20	8.5	3500	1800		9500	2100
26/10/22	14:15	8.5	4200	2000	2000	9000	2200

Northumbrian Water is committed to undertaking a full characterisation of the sludge received at the Howdon site and will amend the pre-acceptance procedures to take this into account.

The temperature of effluent is not known but since the water is not direct from processes it is expected to be ambient.

7.6 Question 8 Environmental risk assessments and modelling

Discharges from the STC are to the adjacent STW, therefore no further modelling or environmental assessment is deemed applicable.

7.7 Question 9 Monitoring arrangements

Northumbrian Water monitors the pH, suspended solids, BOD, COD and ammonium content of the digested centrate and raw centrate from the STC entering the inlet works (NGR NZ 33670 66540). Sampling Points are shown in 100105164_MSD_DrainagePlan_HOW v2.

NWL are committed to undertaking the sampling and analysis in line with BAT 3. For any sampling and analysis undertaken as part of permit compliance NWL is committed to ensure that those undertaking the sampling and analysis will be by accredited to MCERTs, or equivalent standards.

Northumbrian Water are currently progressing design of a flow monitor and all required flow monitoring will be installed by end April 2024.

7.8 Question 10: Where will the effluent discharge to?

The listed appendices do not feature a ‘relevant environment’ that the discharge from the STC will enter, as it will be to the WWTP. Therefore, no appendix has been completed. The final effluent discharge from the WWTP and it is permitted under the permit reference 235/1695 (Schedule 01), from ‘Consent Point’ in The Tyne at NZ 33700 66130, and sampling is undertaken in accordance with the permit conditions at NZ 3365 6657.

8 Part F1 – Changes and declarations

8.1 Question 1: Working out charges

Table 1, Table 2 and Table 3 are completed on the Part F1 form.

8.2 Question 2: Payment

Payment will be made by BACS.

8.3 Question 4: Confidentiality and National Security

Northumbrian Water do not wish to claim confidentiality with this application.

8.4 Question 6: Applicant checklist

Table 8.1: Part F1, Question 6, Table 4: Application checklist

Question reference	Document title	Document reference
	Summary of changes from March 2022 submission	100105164_ResubmitSummary_HOW
Part A – Q5c Part A – Appendix 1 Part C2 – Appendix 2	Details of Directors	100105164_MSD_Directors_HOW (confidential email sent by Northumbrian Water)
Part A – Q7 Part C2 – Q2,3,5,6 Part C3 – Q1,2,3,4,5,6 Part F1 – Q1,2,6	Main Supporting Document	100105164_MSD_ HOW v3
Part C2 – Q3a Part C2 – Appendix 2	List of Relevant Offences	100105164_MSD_RelevantOffences_HOW
	BAT analysis	100105164_MSD_BAT_HOW_Feb 2023
	Waste Acceptance procedure	100105164_BAT_WasteAcceptance_HOW
	Containment assessment Folder	100105164_Containment_HOW • FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon v2 • FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon-Option with Rainfall • FA05-01a-NWG-IED-HOWD-001 - IED Risk Register-Howdon-Option without Rainfall
Part C2 – Q3b	Competency assessment certificates	100105164_MSD_CompetencyAssessmentCertificates_HOW v2
Part C2 – Q3d	Environmental Management System Certificate	100105164_MSD_EMS_HOW
Part C2 – Q5a	Site Location Plan	100105164_MSD_SiteLayoutPlan_HOW v6
	Site Layout Plan	
	Drainage Plan	100105164_MSD_DrainagePlan_HOW v2
Part C2 – Q5b	Site Condition Report	100105164_MSD_SCR_HOW v3
Part C2 – Q6	Environmental Risk Assessment	100105164_MSD_ERA_HOW v2
	Environmental Constraints Maps	100105164_ERA_ConstraintsMaps_HOW
	H1 assessment	100105164_ERA_H1_HOW
Part C2 – Q6	Odour Management Plan	100105164_ERA_OdourMP_HOW v3
	Odour Assessment	100105164_OdourAssessment_HOW
Part C2 – Q6	Bio-aerosol Risk Assessment	100105164_ERA_BioRA_HOW v5

Question reference	Document title	Document reference
Part C3 – Q1b	Waste Codes	Appendix A of 100105164_MSD_HOW v2
Part C3 – Q2	Air Quality Monitoring	100105164_AirQualityMonitoringSep20toSep21_HOW 100105164_AirQualityMonitoringNov21_HOW 100105164_AirQualityMonitoringJan22_HOW
Part C3 – Q3a	Schematics	100105164_MSD_Schematics_HOW v2
Part C3 – Q3b	Complaints Procedure	100105164_MSD_ComplaintsProcedure_HOW
Part C3 – Q3c, Table5	Material Safety Data Sheets	100105164_MSD_MSDS_HOW

A. Waste Codes

It is requested the annual quantity of indigenous sludge, imported liquid sludge, imported sludge cake and recycled sludge to be accepted is 50,000 TDS.

EWC code		Description	Where accepted	Indigenous or imported
16 10		**aqueous liquid wastes destined for off-site treatment**		
	16 10 02	aqueous liquid wastes other than those mentioned in 16 10 01 Cesspool waste and other sewage sludge only; Cess pool liquor. (Under RPS231)	Head of works	Imported
19 02		**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**		
	19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05	AD/Imported cake reception building pre-digestion	Imported
19 08		**wastes from waste water treatment plants not otherwise specified**		
	19 08 05	sludges from treatment of urban waste water	AD	Indigenous/Imported

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