Permit Variation Supporting Statement

Preston Waste Management Centre

EPR/BU5500IC/V009

Veolia ES Cleanaway (UK) Limited

Permit variation to add equipment to process discarded paint containers and nitrous bottles and inclusion of additional EWC for storage and repacking

Version	Date
1	May 2026

Table of Contents

1. Non-technical summary

This non-technical summary supports the application for a variation to the environmental permit held by Veolia ES Cleanaway (UK) Limited 'Veolia', referenced BU5500IC (as varied) to add two additional treatment activities to the permit and some additional EWC for use in the existing activities. The following list summarises the proposed new permitted activities.

- Depackaging of liquids to separate residual contents from the containers (e.g. waste paint from HWRC) facilitating size reduction for transport and allowing flexibility in disposal / recovery routes for the solid and liquid fractions.
- Treatment of waste nitrous oxide cylinders through a plant which converts the gas into molecular nitrogen and oxygen which can be released harmlessly to the atmosphere.
- The addition of several EWC which will be stored and or repacked via the existing activities on site.

1.1. Treatment of Containerised Liquid Products (Including Nominally Empty Paint Containers)

As a hazardous waste stream, preventing the uncontrolled disposal of end of life paints reduces the risk of soil and water contamination from the release of volatile organic compounds (VOCs), heavy metals and other harmful constituents. Paint has a wide variety of industrial, commercial and domestic applications and is commonly stored and transported in sealed metal or plastic containers which become waste at the end of their useful life, often with residual paint remaining within the container. Paint waste is particularly prevalent in the construction and manufacturing sectors but is also commonly generated as a domestic waste stream.

Using a paint separation process, Veolia proposes to introduce a safe and sustainable method for processing end of life paints in their original containers for recycling. The technology uses a system whereby paint containers are fed into a processing unit which mechanically separates the residual paint from its container. The paint is collected and consolidated for onward treatment or recovery, whilst the emptied containers are crushed and baled for recycling as scrap metal or plastic.

Emissions to air from the process will be managed through the use of appropriate extraction and filtration systems to capture any VOCs released during the separation process. There are no significant liquid emissions from the process beyond the recovered paint itself, the noise output is consistent with existing operations and there will be no odours beyond those already associated with the existing facility. There will be no additional land required for the operation and the process will utilise existing waste codes already permitted at the facility. There will be no increase to the operational hours for the facility.

We are applying to increase the throughput of the existing hazardous physico-chemical treatment activity specifically for the processing of end of life paints in their original containers.

1.2. Treatment of Nitrous oxide cylinders

As a potent greenhouse gas, preventing uncontrolled atmospheric release of nitrous oxide (N_2O) reduces its contribution to global warming. N_2O has a variety of industrial, commercial and domestic applications and it is commonly transported and stored for use in pressurised gas cylinders which become waste when the useful pressure has been released, often leaving residual gas remaining. N_2O is particularly widely used in the healthcare sector as an analgesic but is also a common recreational drug under the common name 'laughing gas'.

Using Medclair technology, Veolia was the first in the UK to introduce a safe and sustainable method for processing nitrous oxide canisters for recycling and has been successfully processing nitrous in pressurised cylinders since

2023. The technology uses a system whereby either the nitrous oxide cylinders are connected by the existing valve onto a manifold or using a hopper system with an airlock where both delivery systems feed the gas into a destruction unit which uses a catalyst to convert the N_2O into nitrogen and oxygen with a minimum of 96% efficiency.

Emissions to air of nitrogen and oxygen as the two most common atmospheric gases (78.080 and 20.95% by volume respectively) will have no environmental impact. There are no liquid emissions from the process, the noise output is insignificant and there will be no odours from the released gasses. There will be no additional land required for the operation and no additional waste codes inputs will be needed. There will be no increase to the operational hours for the facility.

We are applying to increase the throughput of the existing hazardous physico-chemical treatment activity specifically for processing of N_2O only.

1.3. Additional EWC codes

In total, seven additional hazardous waste codes and one non hazardous code are being applied for, spanning five waste categories. The waste streams will be managed through repacking and storage on site prior to being sent for recovery where possible, with high temperature incineration or landfill as alternative disposal routes where recovery is not practicable. All waste streams will be stored in appropriate containment including drums, IBCs and palletised sacks, in accordance with the relevant waste management controls and best practice guidance.

No treatment of these waste streams will take place on site beyond repacking and consolidation for onward transport. Waste types are consistent with other materials accepted by the site but currently have to be diverted to other transfer stations. Inclusion of the codes would mean avoiding unnecessary transport including the associated carbon emissions.

2. Introduction

2.1. Treatment of Containerised Liquid Products (Including Nominally Empty Paint Containers)

Paints, liquid cosmetics, and inks are complex liquid or liquefiable mixtures composed of combinations of pigments or dyes, binders, solvents, surfactants, and additives. At room temperature, these products are typically viscous liquids characterised by a wide range of colours and properties. They are used extensively across multiple sectors, including construction, manufacturing, printing, and personal care. Due to their widespread use and the large volumes generated—particularly from product write-offs, off-specification batches, and end-of-life disposal—waste paints, cosmetics, and inks represent a significant hazardous waste stream requiring careful management.
The uncontrolled release of these products into the environment is a significant concern due to their hazardous chemical constituents. Some of the key environmental and health issues associated with improper disposal include:

- **Volatile Organic Compounds (VOCs):** Many paints, cosmetics, and inks contain VOCs, such as alcohols, esters, ketones, and aromatic hydrocarbons. Furthermore, VOCs can have direct toxic effects on human health, acting as central nervous system depressants and causing mucosa and respiratory irritation. Certain solvents used in these formulations are also classified as carcinogenic.

- **Soil and Water Contamination:** Improper disposal can lead to the direct contamination of soils and water bodies. Solvent-based coatings and heavy organic chemical mixtures can persist in the environment for extended periods, causing long-term damage to soil structures and aquatic ecosystems.

- **Aquatic Toxicity:** Many constituents found in these liquids are acutely toxic to aquatic organisms. Biocides used in paints, as well as various surfactants, neutralising agents, and preservatives present in liquid cosmetics and inks, can cause significant harm to aquatic ecosystems if released into water bodies.

- **Waste Volume:** Discarded paints, cosmetics, and inks constitute a massive proportion of industrial and commercial hazardous waste. The large volume of plastic and metal containers disposed of each year, which often still hold residual liquid product, presents a major spatial and logistical challenge for waste management infrastructure.

To mitigate the risks of uncontrolled disposal and the subsequent environmental impacts associated with these waste streams, the treatment process at the Preston Waste Management Centre utilises an automated mechanical separation process. The facility uses a RUNI SK370 screw compactor, which is specifically designed to process both metal and plastic containers holding paints and cosmetics. This system physically crushes the buckets to squeeze out and recover the residual liquids, consolidating the hazardous waste for safe onward treatment or destruction. Concurrently, the emptied containers are heavily compacted and collected for recycling, ensuring that faulty products cannot be resold and vastly reducing the environmental footprint of the waste.

2.2. Treatment of Nitrous oxide cylinders

Nitrous Oxide is a chemical compound with the formula N_2O, composed of two Nitrogen atoms and one Oxygen atom. At room temperature, the gas is 50% denser than air and is characterised by being colorless, tasteless, with a slightly sweet odour.

It is used across multiple industries including but not limited to health care (both medical and dental), food preparation as well as automotive and other manufacturing industries. Due to the short-lived feelings of euphoria, relaxation it produces (hence the name "laughing gas"), nitrous oxide is also used as a recreational drug.

In healthcare and dentistry, it plays a key role in anesthesia and pain management. When mixed with oxygen, it serves as a mild sedative and analgesic, providing effective pain relief, reducing stress, and alleviating anxiety during medical and dental procedures. In the food industry it is used as a gas to create foam in products like whipped cream. It also has other commercial uses such as an oxidiser in rocket propellant and a fuel additive to increase engine performance as well as niche uses in the semiconductor industry.

N_2O released into the environment is a significant climate concern due to its potent greenhouse gas properties.

Some of the key climate-related issues associated with N_2O emissions include:

- High Global Warming Potential (GWP): N_2O is a highly potent greenhouse gas, with a Global Warming Potential (GWP) 273 times greater than Carbon Dioxide (CO_2) over a 100-year timeframe making it the third most important greenhouse gas after CO_2 and methane (CH_4).
- Long Atmospheric Lifetime: N_2O persists in the atmosphere for approximately 114 years, meaning its effects are long-lasting and cumulative.
- Ozone Depletion: In addition to its greenhouse effect, N_2O also contributes to the depletion of the ozone layer. When it reaches the stratosphere, N_2O is broken down by ultraviolet radiation, releasing nitrogen oxides (NO_x) that catalyze the destruction of ozone molecules.
- Ecosystem Disruption: Excess nitrogen compounds can lead to eutrophication of water bodies, causing algal blooms, oxygen depletion, and harm to aquatic ecosystems.
- Feedback Loops: Climate warming can increase N_2O emissions from soils and oceans, creating positive feedback loops that accelerate climate change.
- Air Quality: While not directly toxic at atmospheric concentrations, N_2O contributes to formation of tropospheric ozone, a harmful air pollutant.

The treatment process at the Preston Waste Management Centre uses low energy catalytic conversion of nitrous oxide to molecular nitrogen and oxygen to treat cylinders containing N_2O to mitigate against the risks of uncontrolled release and the subsequent contribution to global warming.

2.3. Additional EWC codes

In total, seven additional hazardous waste codes and one non hazardous code are being applied for, spanning five waste categories. The waste streams will be managed through repacking and storage on site prior to being sent for recovery where possible, with high temperature incineration or landfill as alternative disposal routes where recovery is not practicable. All waste streams will be stored in appropriate containment including drums, IBCs and palletised sacks, in accordance with the relevant waste management controls and best practice guidance.

No treatment of these waste streams will take place on site beyond repacking and consolidation for onward transport. Waste types are consistent with other materials accepted by the site but currently have to be diverted to other transfer stations. Inclusion of the codes would mean avoiding unnecessary transport including the associated carbon emissions.

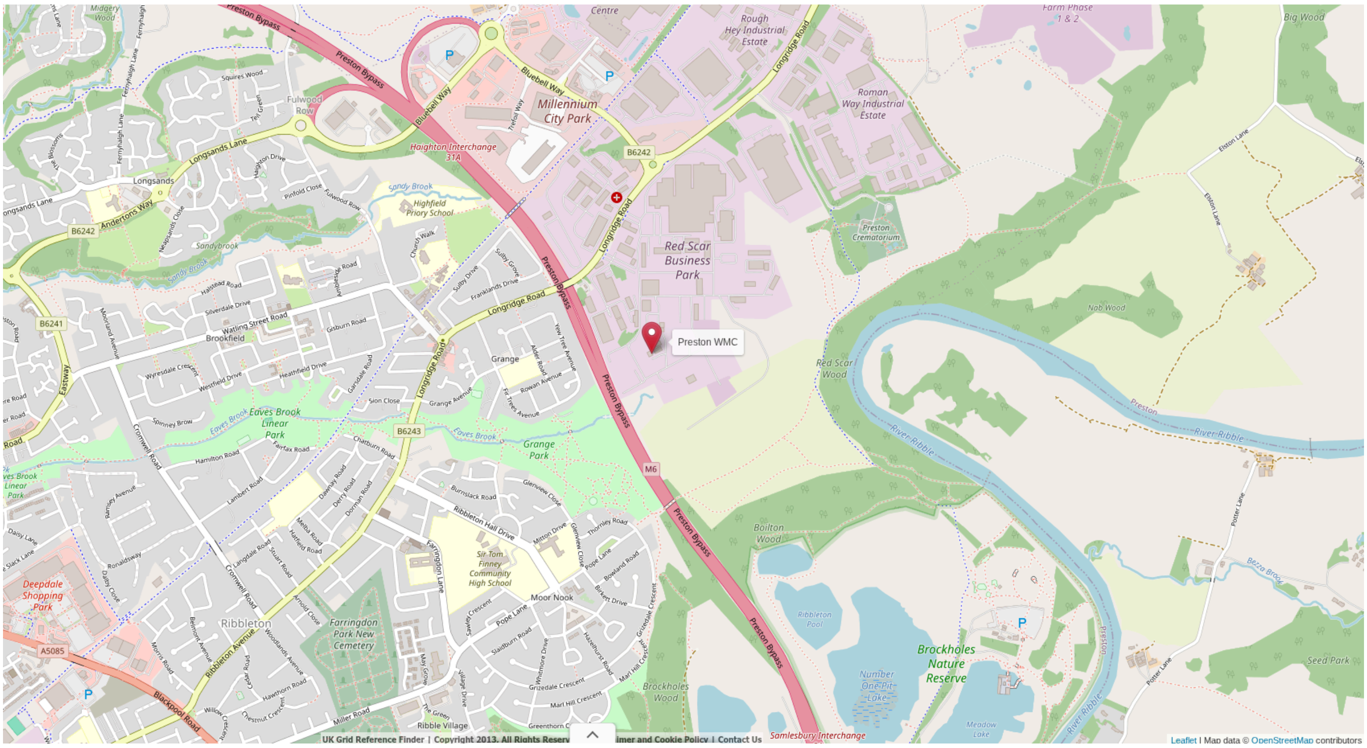
2.4. Site location

The Preston Waste Management Centre site is located at the following address:

Preston Waste Management Centre,
Units 4 and 5
Redscar Industrial Estate
Longridge Road
Preston
Lancashire
PR2 5NQ

The site is centred on National Grid Reference: SD 57541 31938

Map of site location



2.5. Recent permit history and background to the variation

The permit for Preston Waste Management Centre, which was initially issued on 30th June 2006, has been varied on seven subsequent occasions.

- The first variation (V002) was determined and issued on 28th April 2010.
- The second variation (V003) was determined on 4th January 2011.
- V004 was an Agency variation determined on 13th January 2014 to implement the changes introduced by the Industrial Emissions Directive (IED).

- The fifth variation (V005) was made to consolidate the waste permit EPR/FP3091CQ with the installation permit EPR/BU5500IC and update the permit to modern conditions. V005 was determined on 4th January 2016.
- The permit was once again varied and consolidated (V006) on 20th April 2020 to reintroduce the trade waste interceptor activity.
- V007 added a number of Chapter 18 waste codes to the existing healthcare wastes that can be accepted and stored at the site under activity AR1. In addition, the new waste codes were added to activity AR2 to allow repacking of these wastes. A new activity (A7) was created to allow repackaging of non-hazardous waste too. We also took this opportunity to add various EWC codes to activity AR6 - Trade Waste Interceptor. This variation was issued on 15th March 2022.
- V008 extended the permit boundary to the north east to incorporate a piece of land approximately 850m^2 in area. A concrete pad (27m x 17m) has been constructed in this area.

This application (V09) seeks to permit a process for the processing of nitrous oxide cylinders through a nitrous treatment plant, a separation and size reduction process for waste containers holding liquids and the addition of EWC for existing activities.

3. Operating techniques

3.1. Current activities

Preston WMC is an Installation operated by Veolia ES Cleanaway (UK) Limited at Redscar Industrial Estate on Longridge Road in Preston. The site is centred on National Grid Reference: SD 57522 31887, the specific location of the new land is centred on National Grid Reference: SD 57543 31950.

The installation is situated just outside the north eastern boundary of the town of Preston on an industrial estate being separated from the nearest residential property by the Preston bypass (M6 motorway). The immediately surrounding area is industrial and warehousing. The nearest residential properties are approximately 275 metres to the south west in Grange.

Red Scar and Turn Brock Woods (SSSI) is 530m to the east forming a crescent shape alongside the River Ribble which is approximately 650m from the site at the closest point. There are also four Local Nature Reserves within 2km of the site; Fishwick Bottoms 80m to the south, Pope Lane Open Space 380m to the south, Grange Valley 200m to the west and Hills and Hollows 940m to the north west.

The primary activity undertaken at the facility is the storage of a range of hazardous wastes, prior to transfer for off site recovery, treatment or disposal. The facility also undertakes bulking of non-hazardous and hazardous aqueous wastes and solvents from industrial sources prior to transfer for off site recovery, treatment or disposal. The treatment of aqueous wastes and the subsequent recovery of oil is also permitted at this site.

The permit includes EPR schedule 1 activities, under section 5 (disposal or recovery of hazardous waste) and a waste operation for sub IED threshold non-hazardous waste activities. Under the permit the site can also store and transfer healthcare waste, alongside repackaging of specified healthcare waste fractions.

3.2. Proposed activities

Veolia is proposing to add the following activities to the permit:

- Processing of nominally empty waste paint containers to separate the residual contents from the containers facilitating size reduction for transport and allowing flexibility in disposal / recovery routes.
- Treatment of waste nitrous oxide cylinders through a plant which converts the gas into nitrogen and oxygen which can be released harmlessly to the atmosphere.
- The addition of several EWC which will be treated through the existing activities on site.

Operational techniques and controls for each of the activities are outlined in the next sections below including process flow, controls, capacity and waste types.

3.3. Summary of permit changes and application type

- Addition of a waste operation for treatment of nitrous oxide cylinders with associated waste codes
- Addition of a waste operation for treatment of containers holding liquid (such as nominally empty paints from HWRC).
- Addition of EWC for existing activities on site as specified in section 6.

4. Treatment of Containerised Liquid Products (Including Nominally Empty Paint Containers)

4.1. Processing

The process uses a proprietary screw compactor unit from RUNI (model SK370/600). The compacting unit separates residual fluids from metal and plastic containers, achieving a packaging compaction density of up to 300 kg/m³ for plastic and 1500 kg/m³ for metal containers. The separation is performed through a mechanical process during which the containers are crushed by a heavy-duty screw, and liquid is pressed out through a perforated matrix. The process incorporates safety measures to mitigate explosion risks in ATEX zones; the screw rotates slowly to prevent sparks, and potentially explosive gases and volatile fumes are actively pulled by a 750m³/hr extraction fan.

The principal input to the process will be water or latex based paints discarded by members of the public at household waste reception centers 'HWRC'. However the RUNI unit can process a wider range of products where there is a requirement to separate fluids from solid packaging. This can include off specification products; for example cosmetics like shampoo, cleaning products such as washing up liquid, hand sanitiser and water based inks. The unit can also be used to carry out simple size reduction of lightly contaminated waste packaging to improve the efficiency of onward transport.

The process comprises three stages:

- **Capturing (Loading)**

  Paint containers or other appropriate waste types are initially manually transferred from IBC into the machine's hopper using an incline feed conveyor, which includes a dedicated undertray and sump to extract and catch any accidental spillage. Once the waste in the IBC cannot be reached by hand it is tipped onto a sorting table with scissor lift. Once sorted the scissor lift mechanism tips the remaining waste directly into the hopper.

- **Separating and Compacting**

  The unit uses a mechanical, slow-rotating 600mm screw to physically crush the containers and squeeze the residual paint / product out through a perforated, acid-resistant stainless steel (AISI316) matrix.

- **Releasing (Discharging)**

  The separated liquid is collected in a stainless steel tray and safely discharged via a butterfly valve into an IBC container or storage tank for disposal. The compacted solid containers are pushed through a pressure chamber and ejected out of a horizontal chute into a collection bin e.g. an IBC to be recycled.

4.2. Process flow

Infeed: IBC of used paints / suitable products are first manually picked from IBC with and loaded onto an incline conveyor (set at a 25-30 degree gradient) into the main hopper. The feed conveyor features a covered undertray and sump to collect any accidental spillage. Any paints / products not suitable for processing are manually removed during the picking process. Once operatives are unable to reach remaining containers in the IBC the contents are tipped onto a sorting table with a scissor lift system where operatives can carry out remaining acceptance checks. Once completed a scissor lift tipping system discharges the remaining contents directly into the RUNI hopper. The initial picking stage may be bypassed if the inputs are a single stream, e.g. off specification dish soap in which case the IBC may be directly tipped into the hopper.

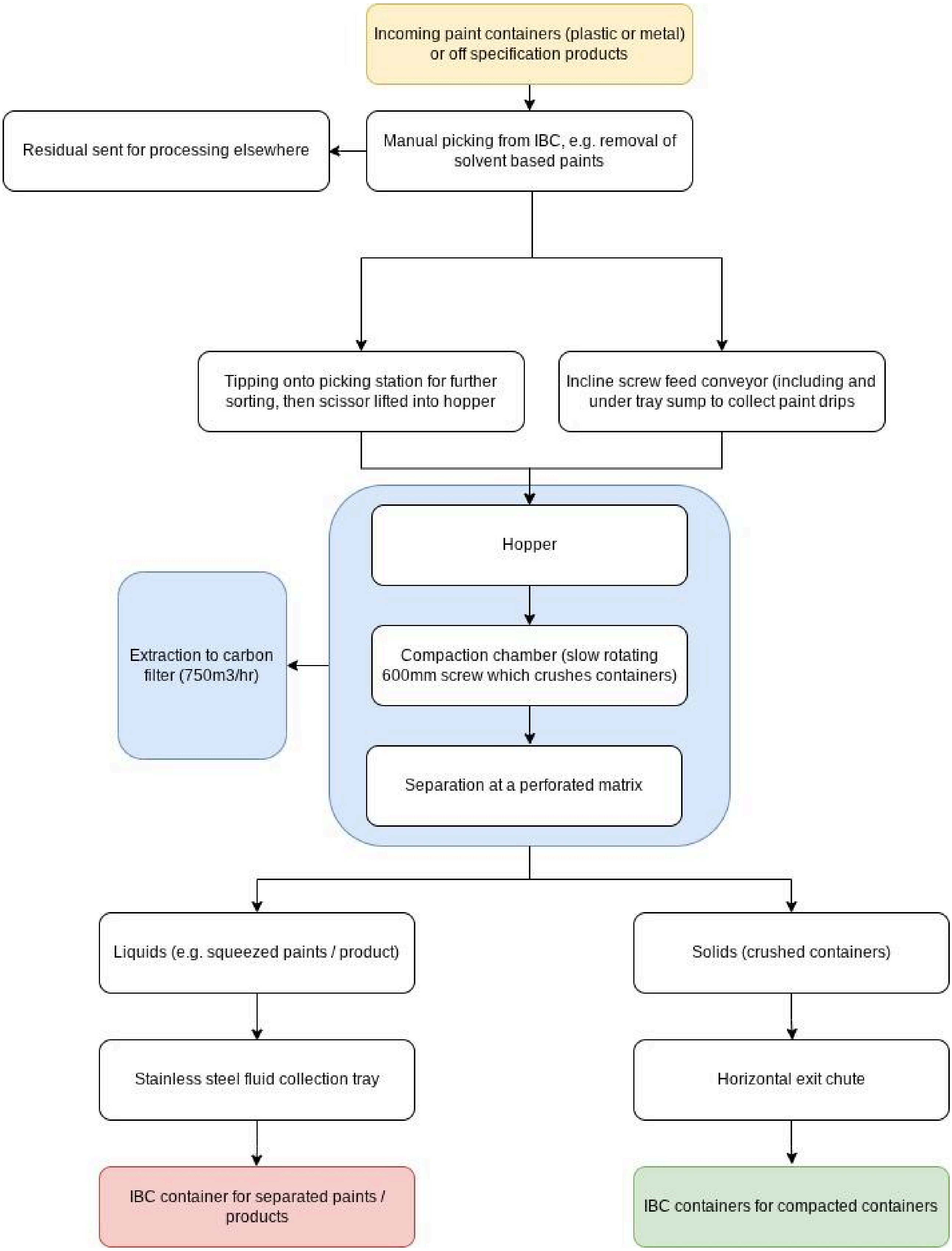
Separation & Compaction: Once in the RUNI SK370 machine, a slow-rotating 600mm screw physically crushes the containers. The pressure forces the residual liquids out through a perforated, acid-resistant stainless steel matrix (featuring holes sized between 3mm and 13mm).

Liquid Recovery: The extracted product drips into a stainless steel fluid collection tray located underneath the matrix. It is then discharged through a butterfly valve into an IBC container or storage tank positioned below.

Solid Ejection: The crushed, emptied containers (compacted to a density of up to 300 kg/m³ for plastic and 1500 kg/m³ for metal) are pushed through a pressure chamber controlled by hydraulic jaws. They exit the machine via an 850mm horizontal chute and fall into a separate bin to be sold for recycling if possible or sent for disposal.

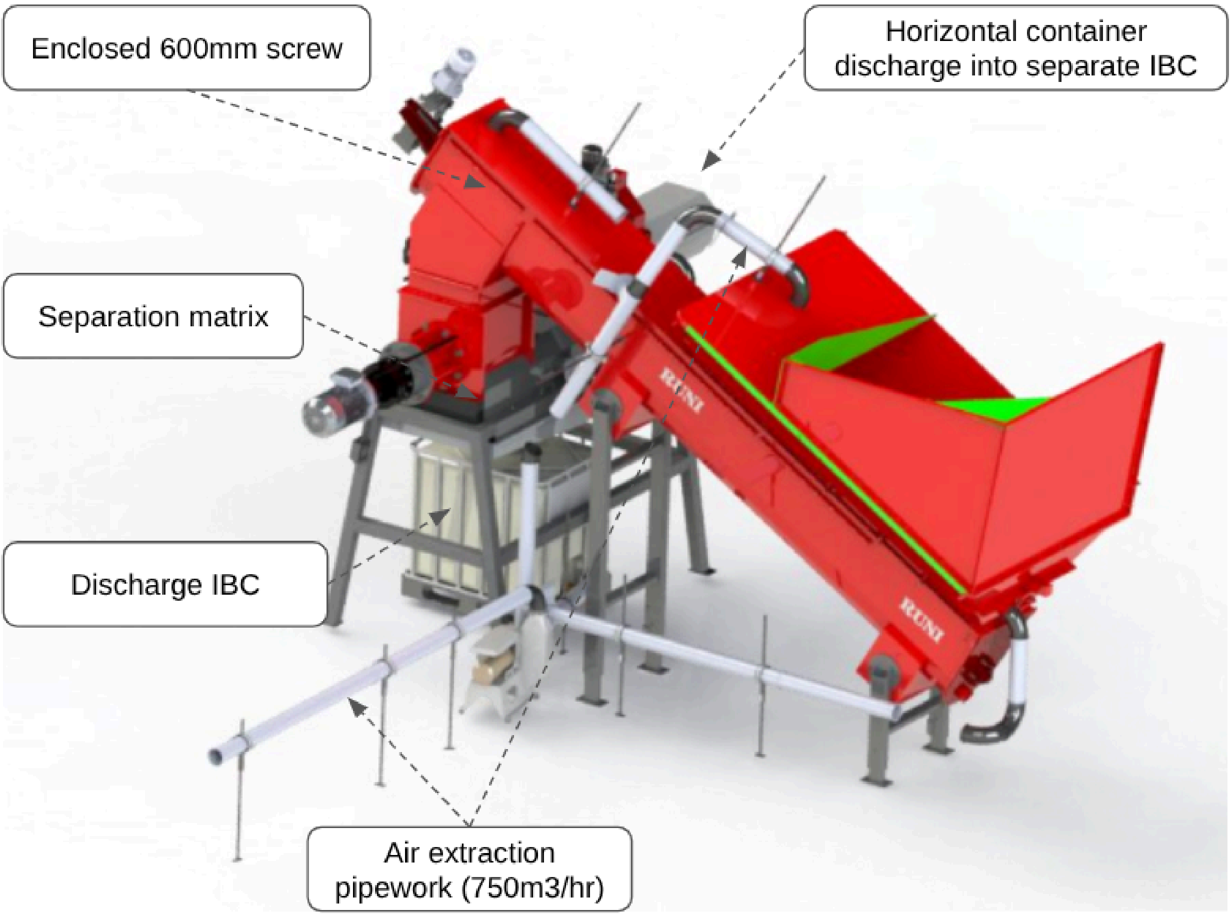
Air Extraction: A 750m³/hour fume extraction fan pulls potentially explosive ATEX gases and volatile vapours from the feeding areas. When processing water based paints or aqueous products only, low VOC levels will mean that no abatement should be required. When processing non water based paints or non aqueous products the emissions can be abated via a carbon filter.

4.3. Process flow diagram

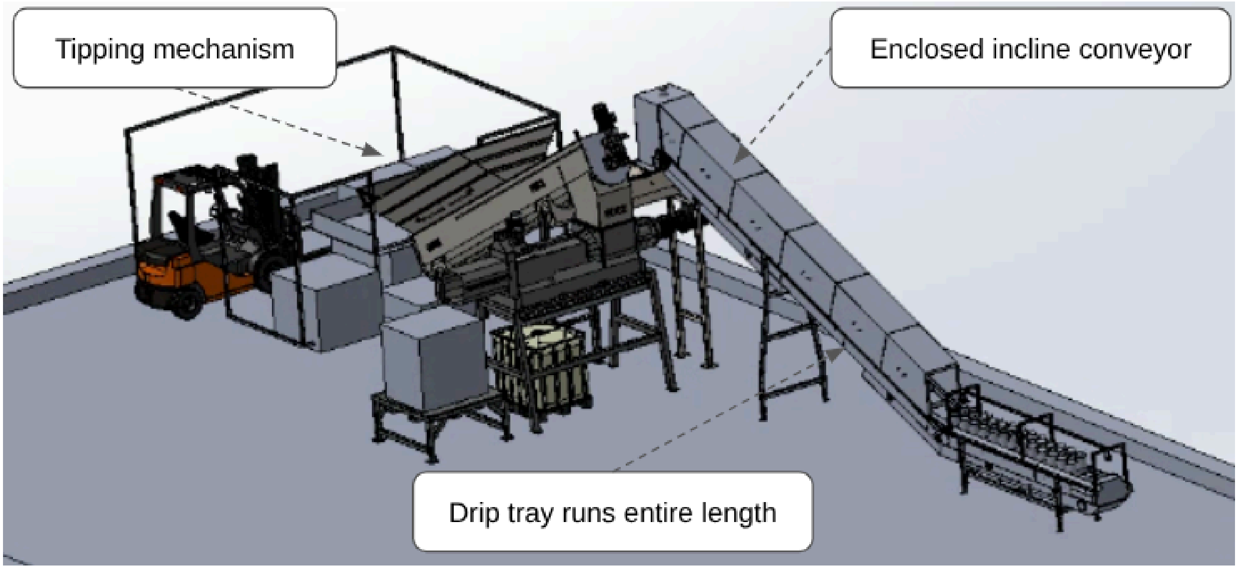


4.4. RUNI equipment visualisation

4.4.1. Main unit



4.4.2. Conveyor



4.5. Process controls / monitoring

The RUNI SK370/600 system incorporates several specific alarms, monitoring sensors, and safety checks to ensure safe and efficient operation, these include:

Alarms and Status Signals The machine has a control box to exchange signals with external systems using software delays and relays. This provides the following specific alarms and status checks:

- Master control alarm signal
- Hopper full signal
- System healthy / system healthy auto signals
- Running signal
- Line signal

Operational Sensors and Checks

- **Photosensors:** The 500mm hopper features built-in photo cells (photosensors) to monitor the feed, which come with a dedicated pressurised air unit designed to keep the sensors clean.
- **Level Sensor:** To maintain ATEX safety, the compactor screw is monitored by a level sensor that scans through a glass pane from the outside.
- **Visual Checks:** The hopper includes an inspection door, and the undertray of the elevator has an inspection hatch to check for paint residue buildup.

Safety Stops and Interlocks

- **Emergency Stops:** The main controls feature manual and auto settings with standard emergency stops, including a specific emergency stop located right at the feed opening.
- **Safety Pull Cord:** The feed-on section of the additional can conveyor is fitted with a safety pull cord.
- **Interlocked Cage:** The scissor lift picking table operates within a full surround interlocked safety cage to protect operators during loading

Covered processing

- The processing will be carried out under a Tentiq structure engineered from a lightweight aluminium frame and an industrial grade PVC roofing system. The structure will be open on two sides but will mean that the processing area will remain dry at all times.

4.6. Throughput

The equipment is expected to process approximately 100 IBC full of nominally empty paint containers per week. The rate will be limited by the manual stages including the movement of waste awaiting processing, manual decanting and picking of the IBC containers and removal of processed material into storage. At an approximate weight of <0.45 tonnes for each IBC assuming plant operation Monday to Friday this equates to around 9 tonnes. This aligns to an annual throughput of 2340 tonnes assuming continuous operation 52 weeks per year.

4.7. Waste Storage

Storage of in process inputs and outputs will be in IBC containers which will either be stored within a Tentiq type structure ready for processing or within designated existing storage areas. The site has several large storage areas suitable for both hazardous and non hazardous waste. There is no requirement for any increase in static storage limits for the EWC involved in the process.

Example Tentiq Canopy style building (note wall not included in the image below)

4.8. Waste types

The table below lists the European Waste Codes required for the process. This includes both hazardous and non hazardous codes. It is not intended to treat wastes higher in potentially harmful VOC like solvent based paints. However, water based / low VOC paints could still be hazardous in accordance with WM3 (e.g. HP4 or HP14) even though they may not be under transport rules / ADR, e.g. bathroom paints do contain small amounts of biocides, also fence paints are low VOC but have some hazardous components like zinc or copper.

Waste codes required for the operation

Waste code	Description of waste
08 Wastes from the manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks	
08 01	**wastes from MFSU and removal of paint and varnish**
08 01 11*	Waste paint and varnish containing organic solvents or other dangerous substances
08 01 12	waste paint and varnish other than those mentioned in 08 01 11
08 01 13*	Sludges from paint or varnish containing organic solvents or other dangerous substances
08 01 14	sludges from paint or varnish other than those mentioned in 08 01 13

08 01 15*	Aqueous sludges containing paint or varnish containing organic solvents or other dangerous substances
08 01 16	aqueous sludges containing paint or varnish other than those mentioned in 08 01 15
08 01 17*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
08 01 19*	Aqueous suspensions containing paint or varnish containing organic solvents or other dangerous substances
08 01 20	aqueous suspensions containing paint or varnish other than those mentioned in 08 01 19
08 03 07	Aqueous sludges containing ink
08 03 08	Aqueous liquid waste containing ink
08 03 12*	Waste ink containing dangerous substance
08 03 13	Waste ink other than those mentioned in 08 03 12
08 03 14*	Ink sludges containing dangerous substances
08 03 15	Ink sludges other than those mentioned in 08 03 14
15 01 02	Plastic packaging
15 01 04	Metallic packaging
15 01 05	Composite packaging
15 01 06	Mixed packaging
15 01 10*	Packaging containing residues of or contaminated by dangerous substance
16 03 03*	Inorganic wastes containing dangerous substances
16 03 04	Inorganic wastes other than those mentioned in 16 03 03
16 03 05*	Organic wastes containing dangerous substances
16 03 06	Organic wastes other than those mentioned in 16 03 05
20 Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
20 01	**separately collected fractions (except 15 01)**
20 01 27*	Paint, inks, adhesives and resins containing dangerous substances
20 01 28	paint, inks, adhesives and resins other than those mentioned in 20 01 27

4.9. H1 screening assessment

The emission point to which this assessment relates is the extraction from the RUNI crushing and separation process. In the first instance, a screening assessment of emissions has been undertaken using the Environment Agency Guidance 'Air emissions risk assessment for your environmental permit'

4.9.1. Site location and receptors

The facility is located on Red Scar Industrial Estate off Longridge Road in Preston, which has the primary purpose is for the storage and repacking of hazardous waste prior to disposal and recovery. The area immediately surrounding the Facility is industrial in nature. The closest area of relevant exposure for both long and short term Air Quality Assessment Levels (AQAL) are residential houses to the west of the M6 motorway approximately 225m from the subject emission points. Red Scar and Turn Brock Woods (SSSI) is 530m to the east forming a crescent shape alongside the River Ribble which is approximately 650m from the site at the closest point. There are also four Local Nature Reserves within 2km of the site; Fishwick Bottoms 80m to the south, Pope Lane Open Space 380m to the south, Grange Valley 200m to the west and Hills and Hollows 940m to the north west. There are no Air Quality Management Areas (AQMA) within 1km of the Facility.

4.9.2. System purpose and design

The RUNI RUNI SK370/600 equipment is designed to compact and separate small containers holding liquid product such as paints, hair care products, dish soaps, water based inks and hand sanitiser; the containers are crushed, and the residual liquids and plastic (or less commonly metal) containers are separated and pressed out into a collection tray. The purpose of the extraction system is to ensure health and safety requirements are achieved with respect to operative exposure to vapour, and to exhaust possible explosive ATEX gases generated during the crushing process. The system comprises a 0.75kW extraction fan with a capacity of 750m^3/hr. The contaminated air is ducted to a Chemviron VENTSORB 90 activated carbon adsorber. The unit is filled with ENVIROCARB AP4-50 (or equivalent) pelletised coal-based activated carbon designed for high-efficiency VOC abatement from air and gas streams. The filtered air is exhausted to atmosphere.

It is expected that most of the time the equipment will be used for processing of nominally empty tins of water based paints received from household waste reception centers but may occasionally treat other products as described above. These would be for example batches of off specification products like washing up liquid.

4.9.3. Operational profile

Use of the equipment will occur between 08:00 and 17:00, Monday to Friday. This equates to 45 hours per week, or a 26.78% annual operational load. The operational profile means that actual long-term emissions will be a fraction of the maximum theoretical load. As the extraction units could be operated continuously during the course of a shift, short-term standards must still be considered for screening purposes without percentage adjustments.

4.9.4. Emission inventory

Because the RUNI system utilises a "cold crushing" mechanical process without the application of heat or rapid mechanical mixing, vaporisation during processing is reduced. The residual liquids are decanted into an Intermediate Bulk Container (IBC) within minutes, exposing a maximum of 1m^2 of surface area to the ambient air while the container is being filled. Therefore, while all the compounds listed below are capable of being released during ambient temperature decanting, the actual processing conditions substantially restrict their evaporation compared to normal consumer use where they are designed to release VOC rapidly after being spread thinly and left to dry.

- **Water-Based Paints**

- Main VOCs & Amounts: These products primarily contain co-solvents, wetting agents, and coalescent aids in medium quantities, specifically ethanol, isopropanol (IPA), 2-butoxyethanol, and ammonia. They also may contain low quantities of pH stabilisers, biocides / oxidative byproducts (formaldehyde), and fragrances (limonene, alpha-pinene).
- Likelihood of Release: Moderate to low. While the aqueous carriers and co-solvents are capable of evaporating at ambient temperatures, paints are chemically designed to release their VOCs when spread thinly over large surface areas to dry. Decanting them quickly as a bulk liquid into an IBC severely limits the exposed surface area, meaning the majority of the VOCs will remain trapped in the liquid phase during processing. Additionally, most of the paints processed will be end of life residues in containers which are discarded at HWRC sites and as a result some of the VOC will already have been released during consumer use and storage.

- **Latex-Based Paints**
- Main VOCs & Amounts: Latex paints feature complex emulsions containing unreacted monomers and reactive diluents in medium quantities, such as styrene, vinyl acetate, and ethyl acrylate. They also contain medium amounts of co-solvents and stabilisers (ethanol, isopropanol, ammonia). Present in low quantities are trace preservatives (formaldehyde), neutralising amines (morpholine), and fragrances (limonene, alpha-pinene, beta-pinene).
- Likelihood of Release: Moderate to low. Similar to water-based paints, the thick emulsion matrix holds onto its volatile components unless spread thinly or heated. The cold mechanical crushing of the RUNI machine will release some of the more volatile unreacted monomers, but bulk capture in the IBC will prevent significant off-gassing.

- **Shampoo**
- Main VOCs & Amounts: The primary VOCs are solvents and viscosity modifiers like ethanol and fragrance compounds like limonene, both present in medium quantities. They contain low amounts of other fragrances (alpha-pinene, beta-pinene), co-solvents (isopropanol), and trace byproducts or formaldehyde-releasing preservatives (formaldehyde, acetaldehyde).
- Likelihood of Release: Low. Wash-off consumer products like shampoos generally possess low-to-medium total VOC contents. Because they are thick liquids designed to lather in hot showers, cold-crushing them at ambient temperatures will result in very low emission rates, as they will be collected into the IBC long before substantial evaporation can occur.

- **Dish Soap**
- Main VOCs & Amounts: Like shampoos, dish soaps contain medium quantities of ethanol (as a co-solvent/preservative aid) and limonene (as a fragrance and degreasing aid). They feature low amounts of other fragrances (alpha-pinene, beta-pinene, benzaldehyde, isoamyl acetate), pH adjusters (ammonia), grease-cutting co-solvents (2-butoxyethanol), and trace formaldehyde.
- Likelihood of Release: Low. The high viscosity and relatively low volatility of the mixture at ambient temperatures means that the rapid decanting process will generate minimal atmospheric emissions before the liquid is sealed in the IBC.

- **Hand Sanitiser**
- Main VOCs & Amounts: These products are dominated by high quantities of primary active biocidal alcohols, specifically ethanol and isopropanol. Some formulations (such as WHO-accepted ones) may contain medium amounts of n-propanol. They also contain low quantities of co-solvents/esterification byproducts (ethyl acetate), trace biocides (formaldehyde), and fragrances such as limonene and alpha-pinene.
- Likelihood of Release: Hand sanitisers are heavily alcohol-based and specifically formulated to vaporise rapidly at room temperature. Even with the short residence time of the cold-crushing process and the restricted 1m² surface area of the IBC, a proportion of the alcohols will readily flash off into the extraction

system's headspace.

- **Water-Based Inks**
- Main VOCs & Amounts: Inks rely on fast-evaporating solvents, containing high quantities of ethanol as a primary co-solvent and drying aid. They also contain medium quantities of surface tension and evaporation rate modifiers, including isopropanol, n-propanol. Trace compounds in low quantities include methyl ethyl ketone (MEK), ammonia, formaldehyde, and limonene.
- Likelihood of Release: Moderate to High. Because water-based inks contain a large proportion of volatile co-solvents intended to promote rapid drying at ambient temperatures.

Emission inventory summary table

Compound	Reported Quantity in Product	Product Type & Use in Product	Vapour Pressure at 20°C (kPa)
Ethanol	**High** (Hand sanitiser, Inks), **Medium** (Water/Latex paints, Shampoo, Dish soap)	**Hand sanitiser:** Primary active biocidal ingredient, **Water-based inks:** Primary co-solvent / drying aid, **Water-based & Latex-based paints:** Co-solvent / wetting / viscosity modifier, **Shampoo & Dish soap:** Solvent / preservative / viscosity modifier	5.95
Isopropanol (IPA) *(Listed as 2-propanol)*	**High** (Hand sanitiser), **Medium** (Water/Latex paints, Inks), **Low** (Shampoo, Dish soap)	**Hand sanitiser:** Primary active biocidal ingredient, **Water-based & Latex-based paints:** Co-solvent / wetting agent, **Water-based inks:** Co-solvent / surface tension modifier, **Shampoo & Dish soap:** Co-solvent / viscosity modifier	4.4
Methyl ethyl ketone (MEK)	**High** (Solvent paints), **Low** (Inks)	**Solvent-based paints:** Primary solvent / viscosity modifier, **Water-based inks:** Co-solvent AND degradation byproduct	10.5
Toluene	**High** (Solvent paints)	**Solvent-based paints:** Primary solvent carrier	3.79
Xylene (mixed isomers)	**High** (Solvent paints)	**Solvent-based paints:** Primary solvent carrier	0.87–1.13

Ammonia	**Medium** (Water/Latex paints), **Low** (Dish soap, Inks)	**Water-based paints & Dish soap:** pH stabiliser / neutralising agent, **Latex-based paints:** pH stabiliser / neutralising agent for acrylic resins, **Water-based inks:** pH modifier / resin stabiliser	857
Ethyl acrylate	**Medium** (Latex paints)	**Latex-based paints:** Monomer in acrylic binder AND residual unreacted monomer	3.97
n-Propanol *(Listed as 1-propanol)*	**Medium** (Hand sanitiser, Inks)	**Hand sanitiser:** Active biocidal ingredient (WHO formulation), **Water-based inks:** Co-solvent / drying rate modifier	1.99
Styrene	**Medium** (Solvent/Latex paints)	**Solvent-based paints:** Solvent / reactive diluent in alkyd systems, **Latex-based paints:** Reactive diluent AND residual unreacted monomer	0.85
Vinyl acetate	**Medium** (Latex paints)	**Latex-based paints:** Monomer in PVA binder AND residual unreacted monomer	11.2
Formaldehyde	**Low** (Water/Latex paints, Shampoo, Dish soap, Hand sanitiser, Inks)	**Water-based paints:** Added as biocide AND oxidative byproduct, **Latex-based paints:** Released from preservatives AND oxidative byproduct, **Shampoo, Dish soap, Hand sanitiser:** Released from formaldehyde-releasing preservatives, **Water-based inks:** Released from formaldehyde-releasing biocides	435
Acetaldehyde	**Low** (Shampoo)	**Shampoo:** Oxidative degradation of ethanol during storage	101

Morpholine	**Low** (Latex paints)	**Latex-based paints:** pH stabiliser / neutralising amine	1.07

4.9.5. Emission characteristics

The assessment of emissions from this activity is highly conservative due to several operational and physical factors that inherently reduce the risk:

- **Product Design vs. Processing:** Consumer products (like paints, hair care, and cleaning liquids) are specifically formulated to release VOCs when they are spread thinly over large surface areas (e.g., painted walls or lathered hair). In the RUNI machine, each unit is rapidly decanted within a few minutes. Once decanted, the residual liquids are immediately captured in an IBC. This exposes only a maximum of 1m² of surface area to the ambient air. Once filled, the IBC is securely closed, preventing any further VOC release.
- **Low Residence Time & Cold Processing:** The mechanical crushing is a rapid, cold process. The low residence time of the liquid in the open air, combined with the lack of applied heat or rapid mechanical mixing, means vaporisation rates are a fraction of what they would be during normal consumer use.
- **Low VOC Waste Streams:** Wash-off consumer products such as dish soaps, shampoos, and similar cleaning liquids generally possess a low to medium VOC content, meaning they present a low risk.
- Water based paints are formulated to minimise release of harmful VOC and are therefore low risk. Products like hand sanitiser are formulated with mostly low risk alcohols such as ethanol which are low risk (propanol/IPA can be used as a conservative proxy).

4.9.6. Source data

Item	Unit	Value
Stack data		
Stack height	m	1
Effective stack height	m	0
Stack location	OS Grid Reference	SD 57527 31940
Flue gas conditions		
Volume at actual conditions	Am^3/s	750 (0.20833 Am^3/s)
VOC release concentration	mg/m^3	5 (benzene and formaldehyde) emissions of other compounds are back calculated for reference.
VOC release rate	g/s	0.00104
VOC release rate	kg/hr	0.00375
Operational profile	%	26.78 (45hr per week maximum)

4.9.7. H1 Output (PC)

Using the Environment Agency's dispersion factors for a 0m effective stack height, the process contributions (PC) are assessed against selected environmental standards including representatives of the key alcohols, aldehydes, amines & anilines, aromatic hydrocarbons, esters & acrylates, and ketones likely to be present in the waste stream.

- **Long Term Assessment:** The calculated long-term PC, factoring in the 26.78% operational profile, is 0.041 µg/m³.
- **Short-Term PC (1-hour mean):** 4.062 µg/m³
- **Short-Term PC (30-minute mean):** 5.280 µg/m³ (Hourly PC × 1.3)
- **Short-Term PC (24-hour mean):** 2.397 µg/m³ (Hourly PC × 0.59)

4.9.8. H1 calculations (High-Risk VOC Proxies)

Description of the H1 Calculation Process

The H1 Air Emissions Risk Assessment methodology dictates that Process Contributions (PCs) must be compared against the Environment Agency's published Environmental Assessment Levels (EALs) to determine if emissions are insignificant. A substance screens out at Stage 1 if its Long-Term PC is less than 1% of the Long-Term EAL, and its Short-Term PC is less than 10% of the Short-Term EAL.

To maintain a highly conservative "worst-case scenario", the calculation process assumes that 100% of a 5 mg/m³ total VOC emission limit from the 750 m³/hr extraction fan consists entirely of the single substance being evaluated. This represents substances which may be present in low or trace amounts which are higher risk i.e. have lower short and long term screening values. However, assuming all of the VOC emissions are 100% benzene is considered too conservative in this case. In the UK, modern solvent-based paints (such as gloss, satin, and eggshell for trim) are strictly regulated, and benzene is not generally used as a deliberate ingredient. Safety Data Sheets (SDS) for common trade products typically indicate that benzene content is less than 0.1%. Formaldehyde is included conservatively as it can be present as in water-based paints containing preservatives such as MIT (Methylisothiazolinone) and BIT (Benzisothiazolinone) which can release small amounts of formaldehyde as a by-product. Also formaldehyde-releasing biocides can be present in some older paint formulations using OIT (Octylisothiazolinone) to prevent microbial growth in the can and on the dried paint film. Some acrylic and vinyl acetate binders used in water-based paints can release trace amounts of formaldehyde during the drying and curing process.

Actual emissions from the process would be mainly alcohol co-solvents such as ethanol and propanol (IPA). However, the following section shows that where there are smaller quantities of higher risk VOC these would screen out.

Base Parameters Used for Calculations:

- **Release rate:** 5 mg/m³ at a volumetric flow of 750 m³/hr equates to a mass release rate of **0.00104 g/s**.
- **Base Dispersion Factors:** Using the 0m stack height, the Long-Term dispersion factor is 148 µg/m³ per g/s, and the Hourly Short-Term dispersion factor is 3,900 µg/m³ per g/s.
- **Operating Profile:** An operating profile of 26.78% is applied *only* to the annual Long-Term mean, reducing the baseline Annual PC to **0.041 µg/m³**. The unadjusted 1-hour Short-Term PC is **4.062 µg/m³**.

Because different substances have EALs based on different exposure periods (e.g., 24-hour or 30-minute means), Environment Agency conversion factors must be applied to the 1-hour Short-Term PC to calculate the correct concentration for each specific chemical.

1. Benzene Calculation Process

- **Long-Term Assessment:** The Environment Agency sets the Annual Long-Term EAL for benzene at 5 µg/m³. Using the adjusted annual PC of 0.041 µg/m³, benzene represents **0.82%** of the EAL (0.041 ÷ 5 = 0.0082). Because this is below the 1% threshold, it screens out.
- **Short-Term Assessment:** The Short-Term EAL for benzene is 30 µg/m³, which is based on a 24-hour mean. To calculate the 24-hour PC, the base 1-hour PC (4.062 µg/m³) is multiplied by a conversion factor of 0.59, resulting in a 24-hour ST PC of **2.397 µg/m³**. This represents **7.99%** of the EAL (2.397 ÷ 30 = 0.0799). Because this is below the 10% threshold, it screens out.

2. Formaldehyde Calculation Process

- **Long-Term Assessment:** The Annual Long-Term EAL for formaldehyde is 5 µg/m³. Using the adjusted annual PC of 0.041 µg/m³, formaldehyde represents **0.82%** of the EAL (0.041 ÷ 5 = 0.0082). As this is less than 1%, it successfully screens out.
- **Short-Term Assessment:** The Short-Term EAL for formaldehyde is 100 µg/m³, based on a stricter 30-minute mean. To adjust for the shorter timeframe, the base 1-hour PC (4.062 µg/m³) is multiplied by a conversion factor of 1.3, resulting in a 30-minute ST PC of **5.280 µg/m³**. This represents **5.28%** of the EAL (5.280 ÷ 100 = 0.0528). As this is well below the 10% threshold, it screens out.

3. Morpholine (MOR) Calculation Process

- **Long-Term Assessment:** The Environment Agency has not published an Annual Long-Term EAL for morpholine. Therefore, a long-term assessment is marked as N/A.
- **Short-Term Assessment:** Morpholine has a newly derived 24-hour Short-Term EAL of 40 µg/m³. Just as with benzene, the 24-hour conversion factor of 0.59 is applied to the 1-hour PC (4.062 µg/m³), resulting in an ST PC of **2.397 µg/m³**. This represents **5.99%** of the EAL (2.397 ÷ 40 = 0.0599). Since 5.99% is less than the 10% threshold, morpholine successfully screens out

Table of higher risk VOC

Substance	Long-Term EAL	LT PC	Screened Out? (<1%)	Short-Term EAL	ST PC	Screened Out? (<10%)
Benzene	5 µg/m³ (Annual)	0.041 µg/m³	**Yes** (0.82%)	30 µg/m³ (24hr ST)	2.397 µg/m³	**Yes** (7.99%)
Formaldehyde	5 µg/m³ (Annual)	0.041 µg/m³	**Yes** (0.82%)	100 µg/m³ (30min)	5.280 µg/m³	**Yes** (5.28%)
Morpholine (MOR)	N/A	N/A	**N/A**	40 µg/m³ (24hr ST)	2.397 µg/m³	**Yes** (5.99%)

4.9.9. H1 calculations (lower risk VOC)

The majority of the VOC emitted during the process will be low risk alcohol co-solvents such as ethanol and propanol (IPA). These may be emitted in variable amounts depending on the product being processed.

To demonstrate the margin of safety within the assessment, the tables below show the back-calculated maximum concentration (in mg/m³) that each substance could theoretically reach before exceeding the Environment Agency's insignificance thresholds (during initial conservative screening) and requiring detailed atmospheric modelling. The figures are based on an effective stack height of zero and a volumetric release of 750m^3/hr.

Water-Based Paint

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
Ammonia	218.0 mg/m³	307.7 mg/m³	**218.0 mg/m³**	Long-Term

Latex-Based Paints

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
Ammonia	218.0 mg/m³	307.7 mg/m³	**218.0 mg/m³**	Long-Term
Styrene	10.32 mg/m³	98.5 mg/m³	**10.32 mg/m³**	Long-Term (1-week)*
Vinyl acetate	436.0 mg/m³	886.2 mg/m³	**436.0 mg/m³**	Long-Term
Ethyl acrylate	254.3 mg/m³	763.1 mg/m³	**254.3 mg/m³**	Long-Term

Note: Styrene is a foundational raw material used to manufacture synthetic polymer binders for water-based (latex) paints. Although styrene is classified as a volatile organic compound (VOC) in its pure liquid form, the actual polymerization process turns it into a solid, inert plastic resin. Therefore styrene-based latex paints can still have very low or zero-VOC ratings.

Shampoo

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor

Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
Acetaldehyde	448.1 mg/m³	1,132.3 mg/m³	**448.1 mg/m³**	Long-Term

Dish Soap

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
Ammonia	218.0 mg/m³	307.7 mg/m³	**218.0 mg/m³**	Long-Term

Hand Sanitiser

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
n-Propanol	6,055.4 mg/m³	7,692.3 mg/m³	**6,055.4 mg/m³**	Long-Term

Water-Based Inks

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Isopropanol	12,098.6 mg/m³	15,384.6 mg/m³	**12,098.6 mg/m³**	Long-Term
n-Propanol	6,055.4 mg/m³	7,692.3 mg/m³	**6,055.4 mg/m³**	Long-Term

Methyl ethyl ketone (MEK)	7,266.4 mg/m³	11,064.6 mg/m³	**7,266.4 mg/m³**	Long-Term
Ammonia	218.0 mg/m³	307.7 mg/m³	**218.0 mg/m³**	Long-Term

Solvent based products

Substance	Max Allowed by Long-Term	Max Allowed by Short-Term	Emission Limit at the point of significance for screening	Limiting Factor
Toluene	10.32 mg/m³	984.6 mg/m³	**10.32 mg/m³**	Long-Term (1-week)
Xylene (mixed)	5,340.8 mg/m³	8,147.7 mg/m³	**5,340.8 mg/m³**	Long-Term
Methyl ethyl ketone (MEK)	7,266.4 mg/m³	11,064.6 mg/m³	**7,266.4 mg/m³**	Long-Term
Styrene	10.32 mg/m³	98.5 mg/m³	**10.32 mg/m³**	Long-Term (1-week)

4.9.10. Conclusion

All selected emissions are screened out at stage 1 of the H1 assessment, meaning that long-term emissions are less than 1% of the respective long-term AQAL and short-term emissions are less than 10% of the relevant short-term AQAL. In air quality terms, the emissions can be considered insignificant. There are also several reasons why the assessment can be considered very conservative.

- Both the extraction and abatement systems have been designed and installed to serve a health and safety purpose for the operatives carrying out the activities.
- The operational profile of the plant will include loading, unloading and staff breaks so it will not run continuously during the day.
- Most of the waste processed will be water based paints discarded at HWRC sites. These will comprise residual amounts of used paints in plastic containers and some of the VOC will already have been released.
- Residence time during processing is low which means that the length of time the continents of the containers are exposed to atmosphere is limited which limits VOC emissions.
- Wash off products such as dish soap and shampoo only contain low to moderate amounts of primarily low risk VOC limiting the risk.

4.10. Containment and drainage

4.10.1. Equipment and Processing Containment Measures

Reservoir and Conveyor Catchment: The RUNI SK370 system's loading reservoir is equipped with a draining tap specifically designed for easily tapping off accidental paint spillage. Additionally, the incline feed elevator (scissor lift) features a full-length undertray and a small well or sump to collect any paint residue or drips, which is fitted with an outlet valve for a pump connection so that it can be emptied when required.

Specialised Spray Guards: To contain liquids during the physical crushing process, the machine utilises special spray guards including a steel guard over the perforated matrix that close tightly against the unit.

Controlled Fluid Transfer: Extracted paint drips into an acid-resistant stainless steel (AISI316) fluid collection tray. The flow of paint into the receiving IBC container is securely controlled by a butterfly valve located at the tray's central outlet.

4.10.2. Storage and Handling Controls

Output storage: The IBC containers holding the separated liquid paint are closed with screw tops preventing water ingress during storage. These are stored in existing designated areas within the wider transfer station awaiting dispatch. Compacted metal and plastic buckets discharge into cut open IBC containers which when they are not within the Tentiq (i.e. in the open) are stored with a plastic covering to ensure that rainwater cannot come into contact with the solid waste.

Spill Response: Because the waste is individually containerised prior to processing, and intermediate storage is limited to the maximum capacity of an IBC, any potential spills are inherently limited in volume and can be efficiently dealt with locally to the processing area where there will be a spill kit available.

4.10.3. Site Infrastructure and Secondary Containment

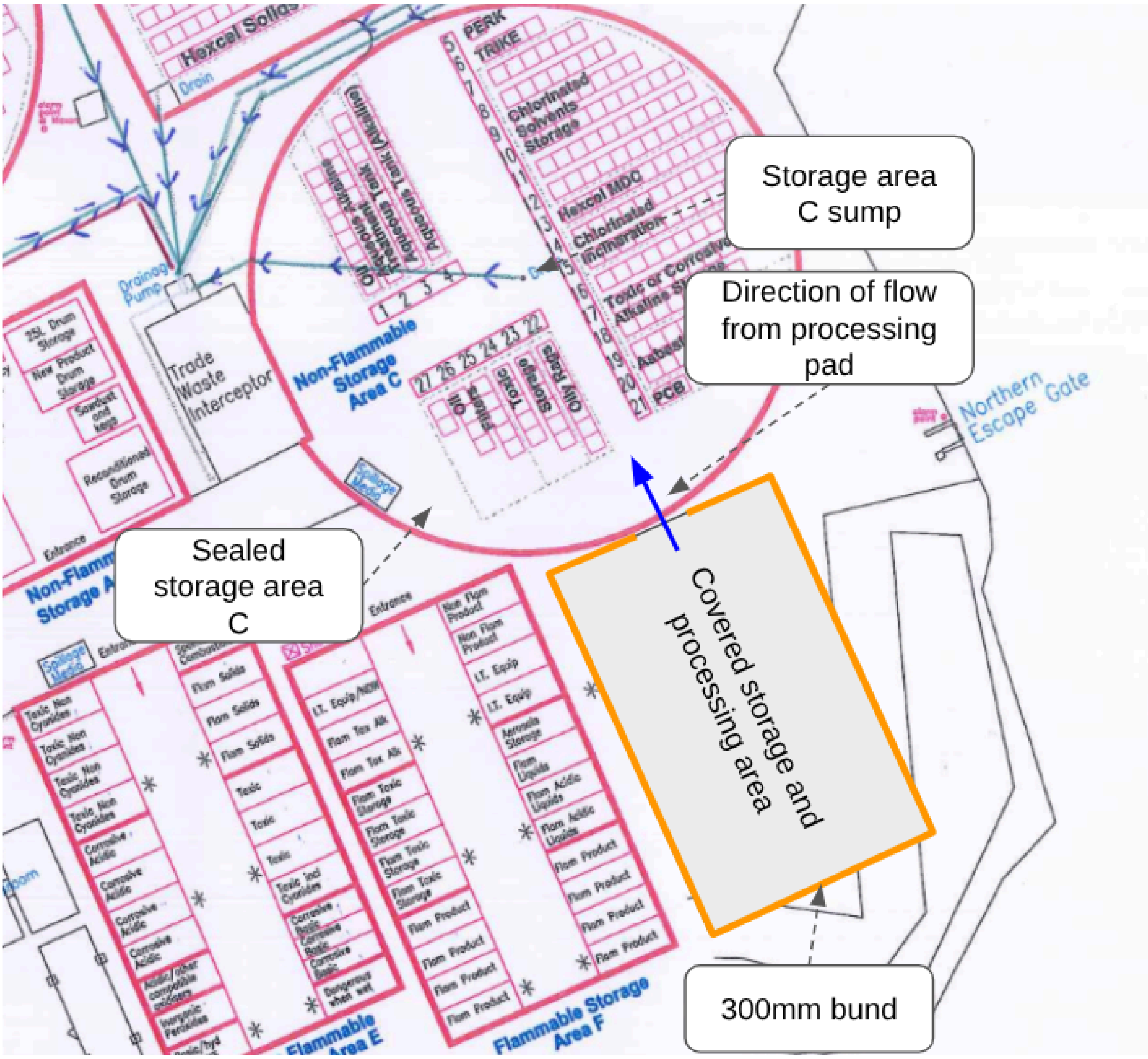
Weatherproof Structure: The entire processing and intermediate storage area is housed under a Tentiq structure, which ensures the operational zone remains dry.

Engineered Bunding: The RUNI equipment is situated on an engineered concrete pad enclosed by a 300mm raised bund with a single entrance and exit, ensuring that any catastrophic or fugitive leaks or spills remain contained within the immediate footprint of the processing area.

Sealed Drainage and Interceptor: Drainage from the processing area is completely sealed. Any liquid that runs off the concrete processing pad would flow directly into storage area C, which is also completely sealed. Liquids here are routed into a sump that is manually pumped out into the facility's trade waste interceptor, preventing any untreated runoff from escaping the site.

Wider storage areas: Inputs and outputs from the paint processing activity may be stored in designated areas of the existing site and the waste codes for doing so are already listed in the permit. The wider site comprises a number of sealed waste storage areas which are manually pumped into the site interceptor. The risk of a spillage discharging from site accidentally is therefore highly unlikely.

4.10.4. Drainage layout diagram



5. Assessment of change (RUNI)

The table below provides a summary of the changes being requested by this permit variation.

Synopsis of application changes

Aspect	Impact
Permitted Materials	EWC codes have been selected on the basis of appropriateness for the treatment process covering, paints, inks and off specification batches such as soaps, hand sanitisers etc
Releases to Air	Emissions to air would comprise low risk VOC such as alcohols. A H1 assessment has been completed to show these emissions will not be significant

	based on the high concentrations required. The cold process and low residence time should reduce VOC emissions.
Process Throughput	The requested processing capacity will be up to 2340 tonnes.
Releases to Water	No releases to water.
Releases to Land	No releases to land.
Energy Use	There will be a small increase in electricity usage to operate the RUNI unit and scissor lift only.
Raw Materials Use	The plant does not use water or any gaseous or solid fuel. IBC for storage will be recycled.
Noise	The equipment is fundamentally a low speed screw meaning noise emissions will be localised and given the site setting inaudible at the nearest relevant receptor.
Odour	Odour emissions are expected to be localised and given the site setting will not be detectable at the nearest relevant receptor.
Permitted Processes	Normal variation to add 2340 tonnes for processing through depackaging plant.
Waste Hierarchy	Separation of container from the residual liquid generates options for further recycling of the packaging and may give some options for reuse of single stream products such as washing up liquid e.g. even off specification products may meet required standards for other applications (following further processing) such as a vehicle wash.
Waste Generation and Disposal	Other than separation of liquid from solid fractions the plant will not produce significant amounts of other waste. There may be some liquid waste generated during cleaning cycles which will be collected and sent for disposal.

6. Treatment of cylinders containing nitrous oxide

6.1. Processing

The process uses a proprietary destruction unit from Medclair. The destruction unit purifies collected nitrous oxide to a minimum 96% producing molecular nitrogen and oxygen. Actual destruction efficiency of similar units has been tested by Medclair (see IVL_Report_Validation_MDU) and determined to be 'higher than 99.9%'. The purification is performed through a catalytic process during which the collected nitrous oxide is decomposed into oxygen and nitrogen, which are the main components of normal air. The process is self-contained and so there is no risk of exposure of personnel to nitrous oxide during operation of the destruction unit.

The process comprises three stages:

- **Capturing**

  Exhaled N_2O is captured from the canisters using a connected wagon or hopper / airlock system that extracts the gas.

- **Decomposing**

  The unit uses a catalytic process to decompose N_2O into Nitrogen (N_2) and Oxygen (O_2).

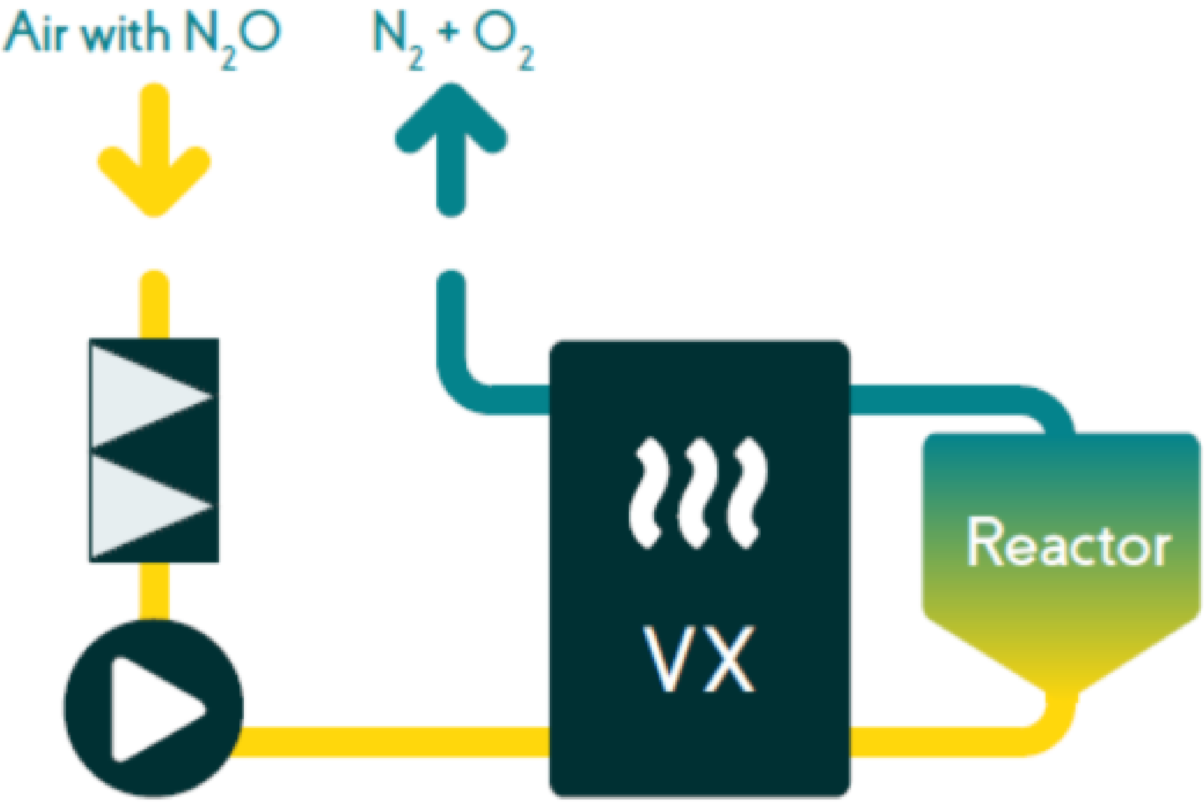
- **Releasing**

  Purified air is safely returned to the environment, significantly reducing harmful emissions.

6.2. Process flow

The exhaled air from cylinders containing nitrous oxide is sucked into the system with an ID fan. A catalytic process in the electrically heated reactor then breaks down nitrous oxide (N_2O) at high reaction temperatures into oxygen (O_2) and nitrogen (N_2) plus excess heat from the process. The intake box includes the fan that sucks the gas from the cylinders into the unit, where there is also an integrated filter that evens out the gas before it is sent to the reactor package for destruction. In the reactor package there is a specially designed heat exchanger comprising a heater with sensors and the actual reactor. These components ensure that the temperature needed for the decomposition / conversion (splitting N_2O into O_2 and N_2) is kept on a stable level in an energy efficient way. The hot outlet air is fed into a heat exchanger, where the heat is recycled to warm up the incoming gas. In the bottom of the unit are components for cooling and filtering of outgoing air (filtering to ensure that no particles from the process come out in the surrounding air). Once the system monitoring has detected that there is no nitrous oxide remaining the bottles may be removed and replaced for another cycle.

6.3. Process flow diagram

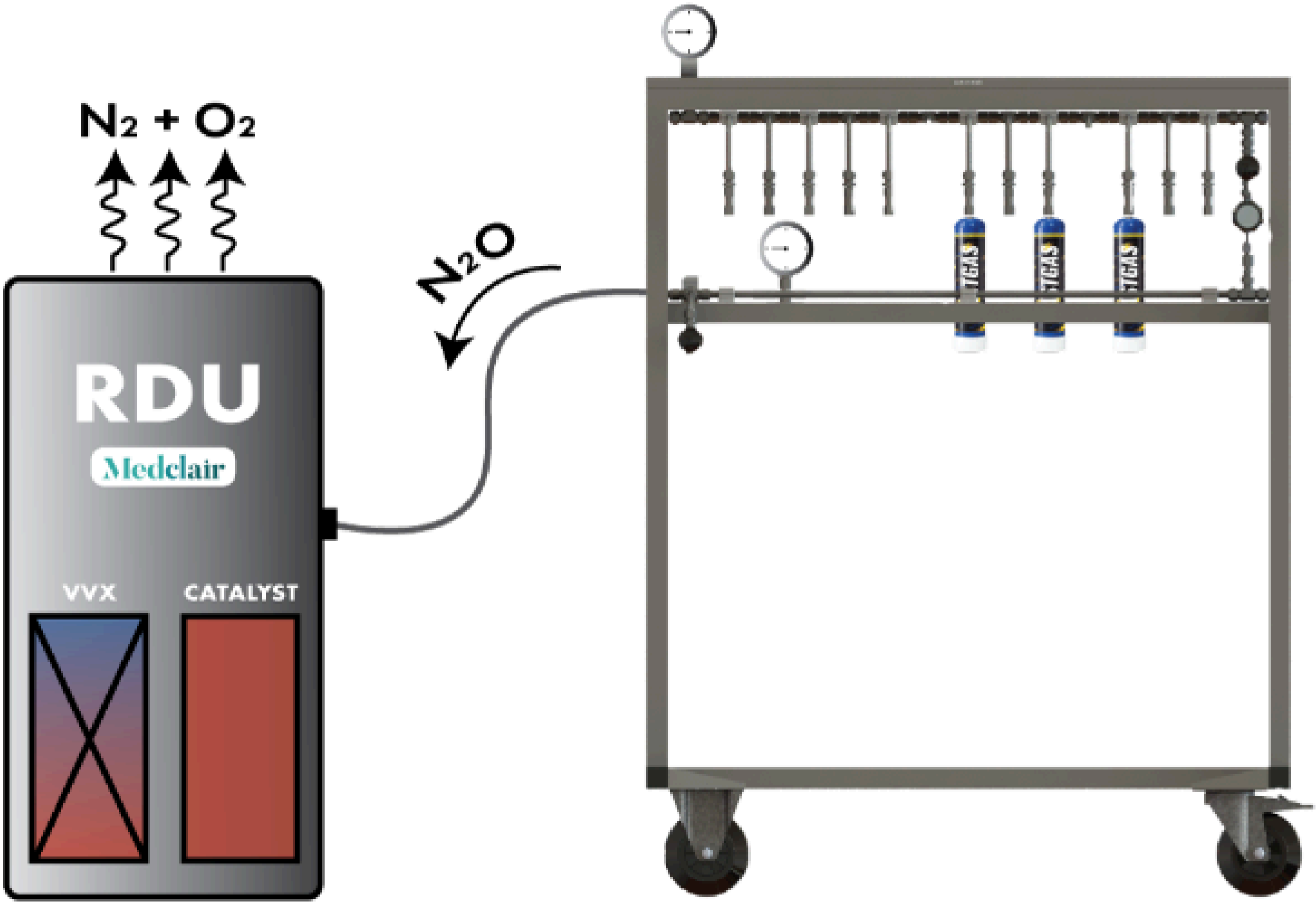


Depending on the size of the cylinder they are linked to the destruction unit in one of two ways, either a manifold or hopper type system with an airlock.

6.4. Medium to large cylinders

Cylinders are attached to a manifold on a trolly system which feeds the gas via pipework into the destruction unit where the gasses are decomposed. The manifold capacity is typically 26 cylinders but this can be varied by design to suit processing requirements. The system is fitted with non-return valves, therefore the manifold does not need to be fully loaded and the destruction unit regulates the flow. Multiple manifold arrays can be attached simultaneously to a single destruction unit and spare trolleys can be prepared for attachment enabling a quick turnaround.

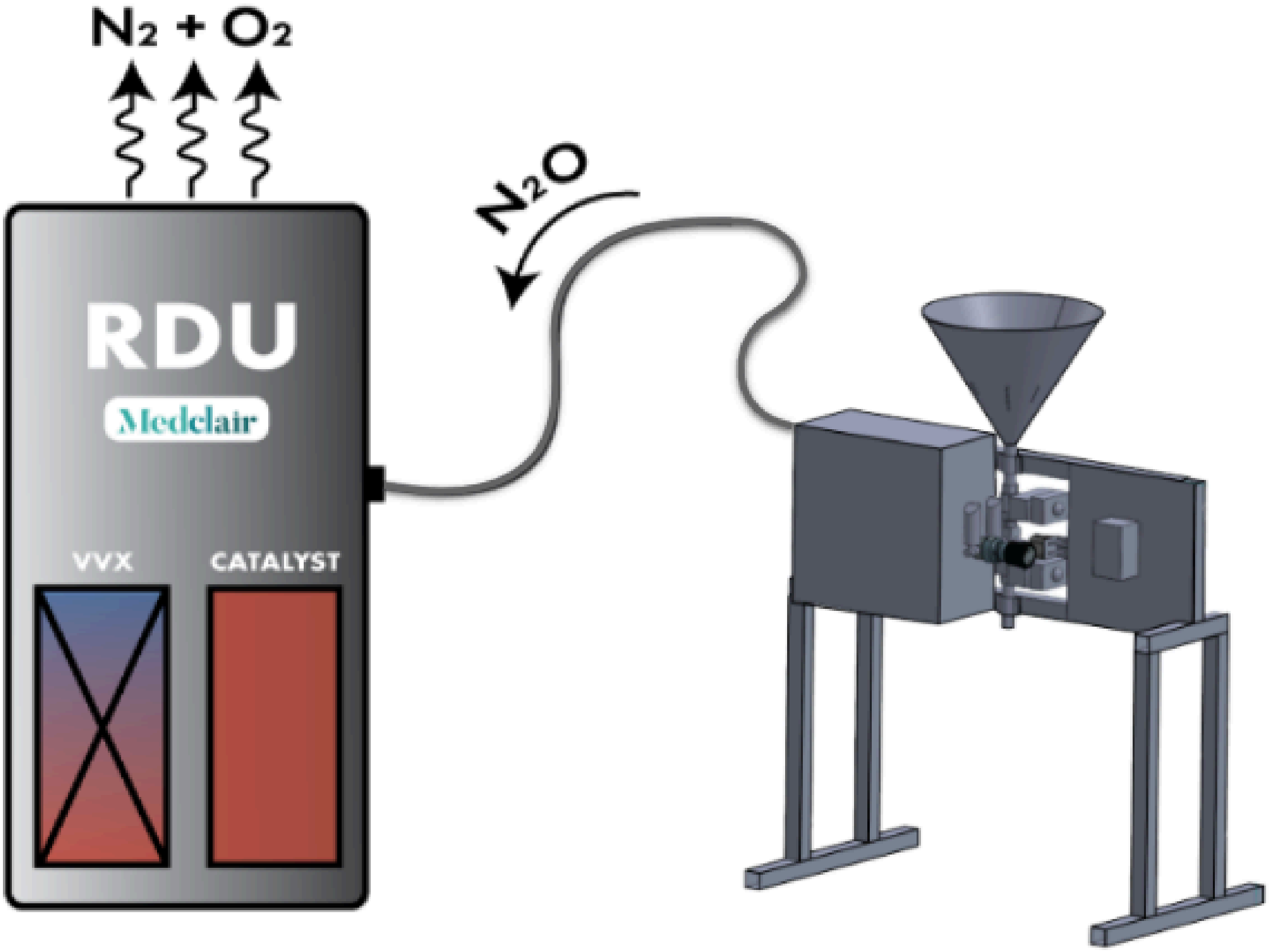
6.5. Manifold trolley system



6.6. Small cylinders 'wippets'

Cylinders are introduced via a funnel system where they are then oriented correctly. An initial airlock then opens to allow the cylinder into the cutting mechanism. The cylinder is then punctured and the gas is released into a volume / expansion chamber. The volume chamber is 60-100 times larger than the cylinder allowing for a controlled pressure reduction. Once the pressure in the chamber normalises as the gas is treated the cylinder is discharged into a collection bin.

6.7. Hopper system



6.8. Process controls / monitoring

The destruction process is fully automated, with an in-built control system that monitors and controls the process. The unit has an integrated control system that continuously monitors several parameters, including temperature and gas flows. An infrared sensor measures N_2O concentration (ppm) in the outlet gas. An average value is calculated with 5 minute intervals and an alarm is sounded if a decrease in conversion is detected. If an issue occurs, the unit will automatically shut down; for example if the catalytic process has exceeded its maximum allowed temperature (in this case the destruction unit will shut down the process completely until the temperature falls below the limit). In the event that the destruction unit does fail, an electromagnetic valve closes to stop potential emissions of untreated nitrous oxide to atmosphere. The destruction unit is always connected to the internet to enable remote support, analysis and diagnostics for potential issues with the unit. This connection can only be accessed by authorised service personnel.

Following N_2O treatment completion, the unit is left running for an additional 5 minutes in order to allow for the complete removal of residual N_2O.

A regular servicing schedule will ensure that the destruction unit operates reliably and efficiently during processing.

During a service check, the unit undergoes a comprehensive inspection, including an evaluation of its overall functionality, performance, and key components. This includes checking startup time, reviewing efficiency, and ensuring that gas decomposition remains within expected parameters. The unit's particle filter is inspected and replaced if needed, and the alarm history is reviewed to identify any recurring issues. Additionally, any problems reported by users are assessed and addressed as part of the service process.

The processing building is fitted with a nitrous leak detection system which, due to N_2O being heavier than air, is fitted at base level ensuring early warning of any accumulation of gas in the building. Should this occur the building would be evacuated and processing would be discontinued until the fault is resolved. An emergency stop is low risk because the system fails safe, N_2O would remain contained within the system and there would be no uncontrolled release.

The catalyst within the system needs to be regenerated or replaced periodically and this is carried out by service contract with the manufacturer.

6.9. Throughput

Nitrous oxide cylinders come in various sizes, with common capacities including small 8 gram cartridges, medium cylinders for more commercial uses commonly containing 600 - 670 or less typically up to 2000 grams of gas. Larger cylinders are used for healthcare and dentistry applications; these are typically size ‘G’ containing 9000L of gas (approximately 17kg).

The following cylinder types can be received for degassing:

- Smaller cylinders (whippets) weighing approximately 30g and containing up to 8g
- Medium cylinders each weigh approximately 1.4kg gross weight and contain 0.670kg of nitrous oxide
- Type G type cylinder with a weight of 35kg containing 17kg of nitrous oxide

Other cylinder sizes may be encountered but the principle of attachment to the destruction unit remains the same. The Medclair destruction units vary in capacity by design and the example here is based on a conversion of nitrous oxide to nitrogen and oxygen of 180g/m, note the example manual provided in the application is for a slightly smaller unit. The capacity of the operation is scaled by simply increasing the number of destruction units, or the increasing the unit capacity. The table below shows the processing capacity on an hourly, daily and annual basis showing based on the example single destruction unit of the capacity described above processing up to 95 tonnes per year of pure gas and the effect of increasing to multiple units.

6.10. Processing unit capacity

Processing capacity	Units
180	g/min
10.8	kg/h
260	kg/d
95	t/y
380	t/y (four units)

The overall weight of packaging i.e. cylinders will vary depending on both the size of the cylinder and the remaining capacity i.e. weight of gas left inside. Along with full cylinders e.g. those seized from the recreational drug supply chain, many cylinders will be received either nominally empty or partially depleted. The fractional split of cylinders arriving full or partially depleted will depend on the source sector and reason for treatment e.g. pre or post consumer units. The split of cylinder sizes processed will also depend on the source sector and reason for the treatment. The smaller containers have the lowest ratio of gas to packaging and can therefore be used to estimate processing throughput.

Cylinder size and gas ratios

Cylinder type	Gross weight	Cylinder weight	N_2O weight	Ratio of gas / cylinder
Small: 8g whippets	0.03	0.022	0.008	0.36
Medium: Fast gas / food grade - medium containers	2	1.4	0.670	0.47
Large: Medical and industrial cylinders (based on size G)	52	35	17	0.48

Due to the reducing ratio of gas / cylinder weight as they become more empty, when accounting for packaging the required overall treatment throughput becomes higher for the same quantity of gas. The table below shows the impact on required throughput increases as cylinder remaining capacity changes from 100% to 40%.

Cylinder content versus throughput

Cylinder average state	Small	Medium	Large
Cylinders 100% full	1419	1169	1158
Cylinders 40% full	2980	2355	2326

Given the variability in cylinder size and remaining capacity varies depending on source sector and the reason for treatment the requested throughput is based at the higher end of the estimate at 3000 tonnes per annum (rounded).

6.11. Storage

The Preston facility is currently permitted to accept nitrous cylinders (16 05 04* gases in pressure containers (including halons) containing dangerous substances) for storage and repacking (AR1 and AR2) so this variation is not adding any new storage techniques. Existing procedures are in place for acceptance and handling.

Nitrous oxide cylinders are stored inside the repack building (non-flamable storage area G). While non-flammable in its own right N_2O is oxidising and hence flammable in the presence of reducing and / or combustible materials. The storage is in a lockable building which is of non combustible concrete construction in a segregated area. Storage of the cylinders is in vented drums, on pallets or in battery boxes designed to be stacked two high. The building has good forklift access and access for inspection. Larger cylinders are stored on load-bearing concrete with storage with valves uppermost.

6.12. Waste types

The table below lists the European Waste Codes required for the process. This code is already listed in the permit.

Waste codes required for the operation

Waste code	Description of waste
16 Wastes not otherwise specified in the list	
16 05	Gases in pressure containers and discarded chemicals
16 05 04*	gases in pressure containers (including halons) containing dangerous substances

6.13. Environmental risk assessment

A qualitative environmental risk assessment 'ERA' for the increased nitrous oxide processing throughput has been produced to consider the risks.

6.13.1. Technical standards

Activities at Preston Waste Management Centre are covered by corporate and local procedures which form part of the Company's documented management system.

Local procedures reflect amongst other things the requirements of the Waste Treatment BREF and Sector Guidance Note S5.06, now replaced with Appropriate Measures guidance:

- Best Available Techniques (BAT) Reference Document for Waste Treatment
- Appropriate measures for permitted facilities that take Chemical Waste
- Relevant HSE guidance documents: HSG51 and HSG71
- Relevant statutory instruments and related or supported technical guidance

A review of the BAT requirements of the Waste Treatment BREF and the relevant Appropriate Measures are included in the application.

6.13.2. Avoidance of waste production from the activity

Empty cylinders and valves which have been removed are sent whole for recycling as metal waste under EWC 15 01 04.

6.13.3. BAT assessment

A BAT assessment has been carried out as part of this application against the Waste Treatment BREF / appropriate measures. The review concludes that best available techniques are being applied.

6.13.4. Habitats Assessment

Red Scar and Turn Brock Woods (SSSI) is 530m to the east forming a crescent shape alongside the River Ribble which is approximately 650m from the site at the closest point. There are also four Local Nature Reserves within 2km of the site; Fishwick Bottoms 80m to the south, Pope Lane Open Space 380m to the south, Grange Valley 200m to the west and Hills and Hollows 940m to the north west.

The release of molecular nitrogen and oxygen will not have any impact on any of the identified habitats.

6.13.5. Emissions to air

The only emissions from the process will be to air and these will comprise the products from the catalytic decomposition of nitrous oxide which will include nitrogen and oxygen. These emissions are of no environmental significance as they are naturally occurring in the atmosphere and won't have any impact on human health or habitats. As such these may be either vented into the building or via an emission point A17 which is adjacent to the cylinder treatment building.

Measurement of residual N_2O at the point of emission would be unreliable as the emission would be diluted with the air extracted from the building meaning its concentration would be very low therefore hard to monitor. The impact from N_2O is principally due to its global warming potential which is not regulated by the Environment Agency with numerical limits. Minimisation of emissions is demonstrated through the use of equipment and processes which ensure Best Available Techniques 'BAT' is being applied.

As highlighted in the section above relating to process control and the accompanying technical documentation the equipment is installed with failsafes which prevent operation should there be a fault and this includes IR monitoring of the nitrous content of the treatment process and an alarm system. The treatment building has also been fitted with a detection system that triggers an alarm if nitrous oxide is detected within the building envelope. This is more effective than personal monitors as the gas is heavier than air and will therefore accumulate at lower levels before reaching the breathing zone and the positioning of the sensors at base level will provide much earlier warning should there be a leak or fugitive release.

6.13.6. Emissions to sewer

There will be no emissions to the sewer resulting from the proposed changes and there are no associated liquid inputs or outputs.

6.13.7. Emissions to surface water and groundwater

There will be no emissions to surface water or groundwater resulting from the proposed changes as there are no associated liquid inputs or outputs.

6.14. Emissions to land

There will be no emissions to land resulting from the proposed changes.

6.14.1. Noise

The local acoustic setting of the Facility is predominantly industrial in nature and is of generally very low sensitivity. The installation is situated just outside the north eastern boundary of the town of Preston on an industrial estate being separated from the nearest residential property by the Preston bypass (M6 motorway). The immediately surrounding area is industrial and warehousing. The nearest residential properties are approximately 275 metres to the south west in Grange.

The destruction units do not generate significant noise levels or result in vibration (see also IVL Report Validation MDU). The relatively low gas treatment capacity per unit means that the vacuum fans drawing gas into the catalyst are of small size and the location of the equipment within a building means the activity will not be audible externally and will not contribute to a perceptible increase in noise at the nearest sensitive receptor. The siting of the equipment within the cylinder treatment plant building does not result in a change in pathway for noise transmission i.e. it does not introduce a new line of sight from the source to any adjacent receptors. The existing plant already operating at the site from the same manufacturer of similar design has not generated any perceptible noise.

The storage building is located within the existing site and the operation will not be perceivable off site. Movements of waste will be within the building and plant limited to fork lift trucks and delivery vans.

6.14.2. Odour

Gases emitted from the process include nitrogen and oxygen which are the principal fractions of air and will not result in any odour.

6.14.3. Site Condition Report

No change to the Site Condition Report.

6.14.4. Monitoring and measurement

The destruction process is fully automated, with an in-built control system that monitors and controls the process. The unit has an integrated control system that continuously monitors several parameters, including temperature and gas flows. If an issue occurs, the unit will automatically shut down for example if the catalytic process has exceeded its maximum allowed temperature (in this case the RDU will shut down the process completely until the temperature falls below the limit). The unit is always connected to the internet to enable remote support and analysis and diagnostics for potential issues with the unit. This connection can only be accessed by authorised service personnel.

The IR sensor is measuring N_2O concentration (ppm) in the outlet gas. An average value is calculated with 5 minute intervals and alarm is given in two levels if a decrease of conversion is detected.

6.14.5. Energy efficiency

Medclair has developed a unique technology for heat exchanging and isolation of the RDU 3X, which recovers the input energy and minimises the energy consumption. The solution is based upon a high degree of energy recovery, few moving parts and a stable and reliable catalytic process.

6.14.6. Raw Material Usage

The use of raw materials will be limited to diesel for forklift trucks carrying out transfer operations.

7. Assessment of change (NOS)

The table below provides a summary of the changes being requested by this permit variation.

Synopsis of application changes

Aspect	Impact
Permitted Materials	Single EWC requirement (16 05 04* gases in pressure containers (including halons) containing dangerous substances) already linked to the activity.
Releases to Air	Emissions to air are via existing emission point A17 comprising molecular nitrogen and oxygen.
Process Throughput	The requested processing capacity will be up to 3000 t including gasses and cylinders.

Releases to Water	No releases to water.
Releases to Land	No releases to land.
Energy Use	There will be a small increase in electricity usage to operate the destruction units however they are energy efficiency and use a heat exchanger to recover the heat generated by the decomposition process and reuse it to warm incoming gas.
Raw Materials Use	The plant does not use water or any gaseous or solid fuel. The contact catalyst will need to be replaced or regenerated periodically.
Noise	Noise emissions will be insignificant.
Odour	Odour emissions will be insignificant.
Permitted Processes	Normal variation to add 3000 t processing capacity for nitrous oxide only to activity AR6.
Waste Hierarchy	The global warming potential of uncontrolled release of nitrous oxide is equivalent to 273 times that of carbon dioxide. Low energy catalytic destruction is therefore an environmentally preferential way to mitigate the potential global warming impacts.
Waste Generation and Disposal	The process produces waste metal cylinders which are readily recyclable.

8. Additional European Waste Codes

The following section summarises the additional waste codes being applied for as part of this environmental permit application for the waste transfer station. In total, seven additional hazardous waste codes and one non hazardous code are being applied for, spanning five waste categories. The majority of waste streams will be managed through repacking and storage on site prior to being sent for recovery where possible, with high temperature incineration or landfill as alternative disposal routes where recovery is not practicable. All waste streams will be stored in appropriate containment including drums, IBCs and palletised sacks, in accordance with the relevant waste management controls and best practice guidance. No treatment of these waste streams will take place on site beyond repacking and consolidation for onward transport.

8.1. Requested codes

The facility is applying to accept a number of additional waste codes across several waste categories. The following provides a summary of each waste stream, its source, how it will be managed on site and its intended destination. Waste types are consistent with other materials accepted by the site but currently have to be diverted to other transfer stations. Inclusion of the codes would mean avoiding unnecessary transport including the associated carbon emissions.

- **03 01 04* - Sawdust, shavings, cuttings, wood, particle board and veneer containing hazardous substances**

  This waste stream comprises hazardous wood-based materials arising from the retail and manufacturing of wood products. Materials will be received palletised in sacks or in metal drums and will be stored on site pending onward disposal. Where possible, materials will be sent for recovery, with high temperature incineration as an alternative disposal route where recovery is not practicable.

- **05 01 05* - Oil spills and 05 01 06 - Oily sludges from maintenance operations**

  These two waste streams comprise hazardous liquid wastes arising from oil and gas refining operations, both offshore and onshore. Materials will be received and stored in drums or IBCs pending onward disposal and will be sent for recovery by energy generation. These waste streams are already listed on the permit in relation to activity AR3 (trade waste interceptor) so are already handled on site but they need to be added to AR1.

- **07 02 17 - Wastes containing silicones other than those mentioned in 07 02 16***

  This waste stream comprises silicone-containing wastes arising from the retail, manufacturing and building trades sectors. Materials will be received and stored in drums, repacked where necessary and stored pending onward disposal. Where possible, materials will be sent for recovery, with high temperature incineration as an alternative disposal route where recovery is not practicable.

- **19 08 06* - Saturated or spent ion exchange resins**

  This waste stream comprises hazardous spent ion exchange resins arising from the maintenance of water filtration systems. Materials will be received and stored in drums and IBCs, repacked where necessary and stored pending onward disposal. Where possible, materials will be sent for recovery, with high temperature incineration as an alternative disposal route where recovery is not practicable.

- **16 11 01*, 16 11 03* and 16 11 05* - Waste linings and refractories containing hazardous substances**

These three waste streams comprise hazardous waste linings and refractories arising from ceramics, glass and refractory manufacturing and research and development activities. This includes carbon-based linings and refractories from metallurgical processes (16 11 01*), other linings and refractories from metallurgical processes (16 11 03*) and linings and refractories from non-metallurgical processes (16 11 05*). All three waste streams will be received and stored in drums and IBCs pending onward disposal to landfill.

8.2. Throughput and storage

There is no request to increase the annual throughput or storage limits for AR1-3 as a consequence of adding the codes.

8.3. Waste types

Additional waste codes with further information.

Waste code	Description of waste	Example source(s) of material	Storage arrangements	Activity	Onward recovery or disposal
03 Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard					
03 01	Wastes from wood processing and the production of panels and furniture				
03 01 04*	Sawdust, shavings, cuttings, wood, particle board and veneer containing hazardous substances	Retail/manufacturing of wood products.	Palletised in sacks or in metal drums	Storage pending onward disposal	Recovery if possible, or high temperature incineration
05 Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal					
05 01	**Wastes from petroleum refining**				
05 01 05*	Oil spills	Oil/gas refining off shore, oil refining and processing	Drums and IBCs	Storage pending onward disposal	Recovery by energy generation
05 01 06*	Oily sludges from maintenance operations of the plant or equipment	Oil/gas refining off shore, oil refining and processing	Drums and IBCs	Storage pending onward disposal	Recovery by energy generation
07 Wastes from organic chemical processes					
07 02	**Wastes from the MFSU of plastics, synthetic rubber and man-made fibres**				
07 02 17	Wastes containing silicones other than those mentioned in 07 02 16*	Retail/manufacturing and building trades	Drums	Repacking and storage pending onward disposal	Recovery if possible, or high temperature incineration
19 Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use					

19 08	**Wastes from waste water treatment plants not otherwise specified**				
19 08 06*	Saturated or spent ion exchange resins	Maintenance of water filtration systems	Drums and IBCs	Repacking and storage pending onward disposal	Recovery if possible, or high temperature incineration
16 Wastes not otherwise specified in the list					
16 11	**Waste linings and refractories**				
16 11 01*	Carbon-based linings and refractories from metallurgical processes containing hazardous substances	Ceramics/glass/refractory manufacturing and R&D	Drums and IBCs	Storage pending disposal	Landfill
16 11 03*	Other linings and refractories from metallurgical processes containing hazardous substances	Ceramics/glass/refractory manufacturing and R&D	Drums and IBCs	Storage pending disposal	Landfill
16 11 05*	Linings and refractories from non-metallurgical processes containing hazardous substances	Ceramics/glass/refractory manufacturing and R&D	Drums and IBCs	Storage pending disposal	Landfill

9. Assessment of change (EWC)

The table below provides a summary of the changes being requested by this permit variation.

Synopsis of application changes

Aspect	Impact
Permitted Materials	Eight additional wastes codes all of which are containerised and can readily be handled at the facility with no changes to operating techniques.
Releases to Air	None
Process Throughput	No change
Releases to Water	None
Releases to Land	None
Energy Use	No change
Raw Materials Use	None
Noise	No increase
Odour	No increase
Permitted Processes	Minor variation to add the codes to the permit - calculated in accordance with section 3.7.3 of the EA guidance for fees and charges
Waste Hierarchy	The inclusion of the codes will mean that waste which can be readily accepted by the site will not have to be diverted to other facilities reducing the carbon needed for the additional transport.
Waste Generation and Disposal	Storage and / or repack will not generate any additional wastes or residue.

10. Management system

The Veolia Management System is registered and approved to standards ISO 9001, ISO 45001 and ISO 14001. The operational, monitoring and management procedures implemented at the subject facility, are in accordance with the Veolia Management System and have been audited against the requirements of the standards detailed previously.

The proposed operation will be covered by group level and local procedures which form part of the Company's documented management system. A summary of Veolia's Business Management System is provided in Appendix D.

Local procedures reflect the requirements of the relevant appropriate measures and HSE guidance on chemical warehousing and storage of flammable wastes. These are under regular review and are updated as required. A well established Standard Operating Procedures (SOPs) Matrix is used to keep track of the operational procedures, both extant and superseded.

Veolia ES (UK) Limited is a quality assured company with its sites registered under the Quality Management System ISO 9001, ISO 45001 and ISO 14001. The operational, monitoring and management procedures implemented on site are in accordance with the Veolia Management System and have been audited against the requirements of the standards detailed previously.

The following local procedures and associated risk assessments continue to be applicable for the process:

- HAZ/3/450 - Procedure for Compatibility Assessment
- WP024-E - Discharging Bulk Tanker Loads Into Sludge Storage Tanks
- WP030-E - Maintenance & Monitoring of Gas Scrubbing Equipment Associated with the Acid and APCr plant
- WP050-E - Working Instruction for Opening, Screening and Sampling Containerised Waste
- WP052-E - The Inspection of Containers in Drum Reception and Storage Areas
- WP054-E - Reception, Off-loading and Storage of Containerised Waste
- WP058-E - The selection for addition to and treatment of containerised waste in the SP tanks
- WP059-E - Waste Acceptance
- WP092A-E - Controlling the Treatment of a batch of sludge in the T Tanks
- WP095-E - Maintenance & Monitoring of Gas Scrubbing Equipment Associated with APCr plant
- WP511-E - Procedure for drawing & analysing gas sample from gas scrubbers on the Acid,APCr Plant Storage and Reaction Tanks, APCr Mixers 1-3, Water Storage Tanks and Mechanical Shredder
- WP92B-E Processing APCr Residues for consolidation to Landfill ver 5 May 2018

11. Waste tracking

Waste pre-acceptance, acceptance, handling and storage procedures are in place for the Preston Waste Management Centre and these will continue to be used for the additional processes requested.

Veolia uses a computerised waste tracking system to update information about the available capacity, quarantine, reception, general storage areas of a given facility. The Waste Information Management System (WIMS) is a complete waste information management system designed specifically for waste treatment, storage, disposal and recycling facilities linking sales, waste approval, transportation, treatment, and disposal activities.

12. Operational hours

There will be no change to the operational hours of the site resulting from the changes to the permit being requested in this application.

13. Application contact information

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