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Knauf Insulation Limited

Knauf Shotton Environmental Permit Application

Supporting Report (redacted)

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Document distribution

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List of Acronyms

Abbreviations

Description	Acronym
Air Quality Management Area	AQMA
Best Available Techniques	BAT
Blast Furnace	BF
BAT reference document	BREF
Carbon Dioxide	CO ₂
Carbon Monoxide	CO
Directly Associated Activities	DAA
Electric Arc Furnace	EAF
Environmental Management System	EMS
Emergency Response Plan	ERP
Fire Prevention Plan	FPP
Heavy Goods Vehicle	HGV
Intermediate Bulk Container	IBC
Key Performance Indicator	KPI
Knauf Insulation Management System	KIMS
List of Waste	LoW
Marine Conservation Zones	MCZ
Marine Nature Reserves	MNR
Medium Combustion Plant	MCP
Nitrous Oxide	NO _x
National Grid Reference	NGR
National Nature Reserve	NNR
Natural Resources Wales	NRW
Particulate Matter	PM
Rock Mineral Wool	RMW
Regenerative Thermal Oxidiser	RTO
Supervisory Control and Data Acquisition	SCADA

Description	Acronym
Site of Special Scientific Interest	SSSI
Special Area of Conservation	SAC
Submerged Arc Furnace	SAF
Volatile Organic Compound	VOC
Wet Electrostatic Precipitator	WESP
Waste Transfer Note	WTN

1. Non-Technical Summary

Knauf Insulation Limited (“Knauf”) is responsible for the operation of the Rock Mineral Wool (RMW) insulation manufacturing factory in Shotton, Wales. Knauf will be the sole operator of the installation using dedicated site staff, supported by wider Knauf employees from business functions based elsewhere and approved contractors (as required).

The facility produces a RMW insulation product for various applications that meet its customer’s requirements.

The facility comprises: raw material reception (including waste and recycling reception); materials processing, product formation and curing, product fabrication and packaging, and abatement processes. The process requires the preparation of a binder spray, which is dependent upon the final product, and continuous equipment cleaning system.

Knauf is applying for a bespoke installation permit from Natural Resource Wales (NRW) to permit operations, as per the Environmental Permitting Regulations (2016), as amended.

As part of this permit application, the following requirements have been considered:

- **Management Systems:** Knauf operates the existing business and installations in accordance with an Environmental Management System (EMS) that is certified to ISO 14001 (see Appendix 5 for a copy of the certificate). The scope of the EMS will be extended to include Knauf Shotton once the site has become operational. Existing processes, procedures and management plans forming this EMS will be reviewed and updated as necessary to ensure that new operations are undertaken in accordance with the EMS.
- **Energy Efficiency:** Knauf operates an integrated management system across all Knauf Insulation locations which includes an ISO 50001 certified Energy Management System (see Appendix 6 for a copy of the certificate). The design of the new facility includes energy efficiency measures including insulation, use of heat pumps, LED lighting and use of heat exchange to recover energy. The emissions abatement system has been designed to use electrical power, rather than natural gas, which is more energy efficient. Knauf compares manufacturing facilities across the portfolio (where applicable) to compare and improve energy consumption and efficiency.
- **Raw Materials and Water:** the manufacturing factory will consume both primary and secondary raw materials and consume raw materials within product packaging. Consumption of water by the manufacturing process will be met by mains supply and there will be no on-site abstraction.
- **Waste Management:** generation of solid waste is minimised by the consumption of internal material back into the production process. The site is also designed to accept waste RMW products from Knauf customers and waste RMW from manufacturing of RMW products at Knauf’s Queensferry facility, for reprocessing and production of new product. This has an environmental benefit of reducing the amount of waste sent for disposal from Queensferry. Waste acceptance and pre-acceptance procedures will apply to all waste streams accepted at the facility. A small number of solid waste streams will be generated through operations of the new site which will mainly consist of packaging wastes.

- **Emission to Air:** the site will have nine new point source emissions to air from the main process. These primarily include emissions from the operation of the melter and emissions from the downstream processes producing the RMW. There are also a number of vents and dust filters that will be included within the environmental permit and an emergency stack.

A summary of the findings from air quality dispersion modelling will be provided separately to this main application document and the full Air Emission Risk Assessment will be provided at a later date, as an appendix to this application (Appendix 9).

- **Habitats Regulation Assessment:** An assessment under the Habitats Regulations has been completed for the operation of the manufacturing factory and a package of information to inform the competent authority has been prepared separately to this main application document.

A summary of the findings from the habitats regulation assessment will be provided separately to this main application document and the full package of information will be provided at a later date as an appendix to this application (Appendix 10).

- **Emissions to Water:** the new manufacturing factory will be the source of one emission to water of surface water run-off from areas of the installation for waste waters not entering the washwater recycling system via two emission points. This surface water run-off will be discharged to surface water via an attenuation system to manage discharges.

A process effluent containing salts which will be generated by ion exchange softening in the water treatment plant will be collected within a tank for removal and tankering off-site. A second process effluent containing ammonium sulfate from the WESP will be collected within a tank for removal and tankering off-site (as required).

- **Emissions to Sewer:** there will be no point source emissions to sewer from the installation. It is proposed that foul water (domestic sewage) from toilets and welfare facilities is subject to an application to dispose of domestic water to surface water as it is not possible to connect the facility to a public sewer.
- **Emissions of Substances not Controlled by Emission Limits:** Fugitive emissions to air and water have been considered in relation to raw materials and chemical storage.
- **A Dust Emissions Management Plan** has been developed to identify potential sources of dust and how these will be reduced in order to minimise impacts on local sensitive receptors.
- The design of the site and storage of raw materials and chemicals has also been considered and the containment that is provided by primary, secondary and tertiary containment will eliminate a pathway to the environment.
- **Odour:** the main raw materials are not inherently odorous, and the new manufacturing factory is not expected to present an odour impact to offsite receptors. Exhaust gases arising within the melter are oxidised to remove potentially odorous components prior to the release to air. The design of the downstream abatement system uses a wet scrubbing system which has been specifically designed for Knauf Shotton based on experience of operations at other facilities. A wet scrubber is expected to prevent emissions of odour with greater efficacy when compared to equivalent facilities which use dry systems. The impacts of odour from the installation have been screened out from further consideration through the Environmental Risk.

- Noise and Vibration: The impacts of noise and vibration from the installation have been screened out from further consideration through the Environmental Risk Assessment. Although the impacts of noise and vibration are not expected to be significant and will not have an impact on offsite receptors, a number of standard measures will be used to prevent and reduce any sources of noise and vibration from the manufacturing factory.
- Environmental Risk Assessment: An environmental risk assessment has been produced which covers the potential risks associated with emissions to air, ground and water, odour, noise and fugitive emissions. The risk assessment concludes that risks associated with the operations on site are not significant as a result of the risk management techniques and mitigations.
- Best Available Techniques: the application includes an assessment against the BAT Conclusions from the most recent BREF for the Manufacture of Glass.
- Site Condition Report: a Site Condition Report for the area of land to be permitted by the new manufacturing factory is included within this permit application.
- A site location plan and a site layout plan have also been included to support the permit application.

A Fire Prevention Plan (FPP) is not included within the application as the waste materials stored on the site are inorganic materials, mostly basalt material and insulation materials with a melting point near to 1,000°C. This waste is considered to have low combustibility which minimises the likelihood of a fire event happening and the three objectives of a FPP can be met with existing techniques.

An Odour Management Plan is not included within the application due to the installation not being a source of significant odours as result of the measures proposed and the containment of operations within the building which prevent odour sources. There is also a lack of sensitive receptors located within one kilometre of the site boundary. Therefore, the source-pathway-receptor model has two broken links.

A Noise/Vibration Management Plan is not included within the application due to the installation not being a source of significant noise and vibration. Although noise has been considered as part of the planning and design of the facility, operations will take place inside of a building which prevents noise emissions. Due to the location of the facility, there are also a lack of sensitive receptors located within one kilometre of the site boundary. Therefore, the source-pathway-receptor model has two broken links.

A Pest Management Plan is not included within the application as the raw materials and waste stored on the site does not involve biodegradable materials as the input raw materials consist of inorganic substances such as basalt rock which would not be attractive to pests.

A Bioaerosol Risk Assessment and bioaerosols monitoring is not included within the application as the installation will not be the source of point source or fugitive bioaerosols as the installation will not be treating organic material.

2. Background and Introduction

2.1 About the Installation

This application is for a new bespoke environmental permit for the new RMW facility, to be regulated as an Installation as defined by the EPR Regulations (2016), in Deeside which is operated by Knauf Insulation Limited (“Knauf”). The site address is:

Knauf Insulation Limited
Knauf Shotton
Deeside
Flintshire,
Wales
CH5 2NH

The site location is shown in Figure 2.1 below, it is situated immediately east of the existing Tata Steel’s Shotton steel works within a wider industrial area of Shotton, in Deeside, Flintshire. The National Grid Reference (NGR) of the approximate centre of the site is SJ 31194 70357.

Figure 2.1 Site Location (source: Google Earth)



Figure 2.2 Site Boundary



The site boundary is shown in red in Figure 2.2 above. The installation boundary shown in green and showing the permitted area of the facility can be found in Appendix 1a of this Main Application Document.

Tata's steel works can be found to the west of the proposed facility, and to the east is a railway line beyond which is Deeside Industrial Estate. Land to the north is part undeveloped although it is partly occupied by the Flintshire Bridge HVDC Converter Station and beyond this by the Shotton Mill paper mill site. The majority of the site comprises previously developed land laid to grass and low-lying vegetation. The location is industrial by nature of its associated former industrial processes and presence of buildings and compounds.

The nearest residential receptors are houses approximately 1.1 km to the southeast of the site perimeter. Other human receptors working within industrial buildings located in and around the perimeter of the new site can also be found, less than 100m away from the site boundary.

The nearest surface water course are historical ponds located in close proximity to the southern boundary of the installation but are not within the permit boundary and connecting surface water drainage ditches. The nearest major surface water course is the River Dee, which is located to the south of the site and is approximately 700m distance from the installation.

There are a number of sensitive ecological receptors located within the relevant distances of the installation. The closest is The River Dee and Bala Lake Special Area of Conservation (SAC) and The River Dee Site of Special Scientific Interest (SSSI) which is approximately 545m south-west of the installation. The Dee Estuary, which is a Ramsar site, SAC and SSSI can also be found approximately

575m to the south-west of the installation, adjacent to the River Dee sites mentioned above. A further two SACs and two SSSIs are also located within the relevant distance along with two areas of Ancient Woodland. There are no National Nature Reserves (NNRs), Marine Nature Reserves/Marine Conservation Zones (MNRs/MCZs) or Areas of Outstanding Natural Beauty located within the relevant distance of the site. A list of the nearby sensitive ecological receptors can be found in Table 2.1 and a map is shown in Figure 2.3 (both below).

The installation is not located within an area that is identified as having a high flood risk, as per the map in Figure 2.4 below. Peripheral areas of the industrial estate, to the west are located within a Flood Zone 2 and Flood Zone 3, indicating a high risk >1 in 100 chance of flooding from the sea in a given year, although benefitting from flood defences against sea flooding along the River Dee. Surface water flooding is associated with the larger of the two attenuation ponds located south of the site outside of the permit boundary, which is a Flood Zone 3 shown in purple, indicating a more than 1% chance of flooding from surface water in a given year. However, the installation boundary does not include this surface water pond.

The site is not located within an Air Quality Management Area (AQMA).

The site is not located within a Source Protection Zone.

Figure 2.3 Nearby Ecological Receptors (10km from Installation Location) (source Defra/Magic)

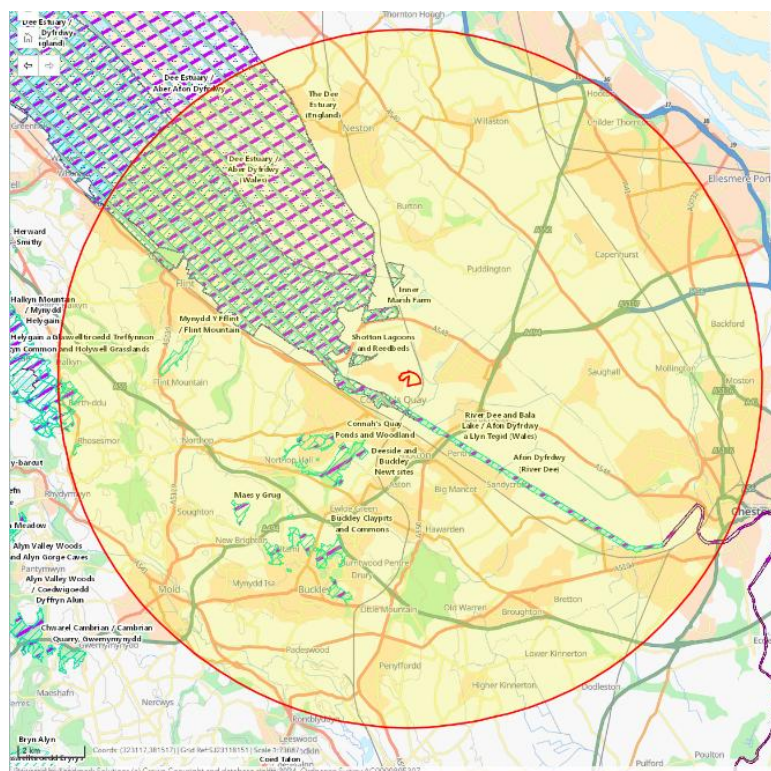


Figure 2.4 Flood Risk Map with approximate site boundary shown in red (source NRW Flood Map for Planning)

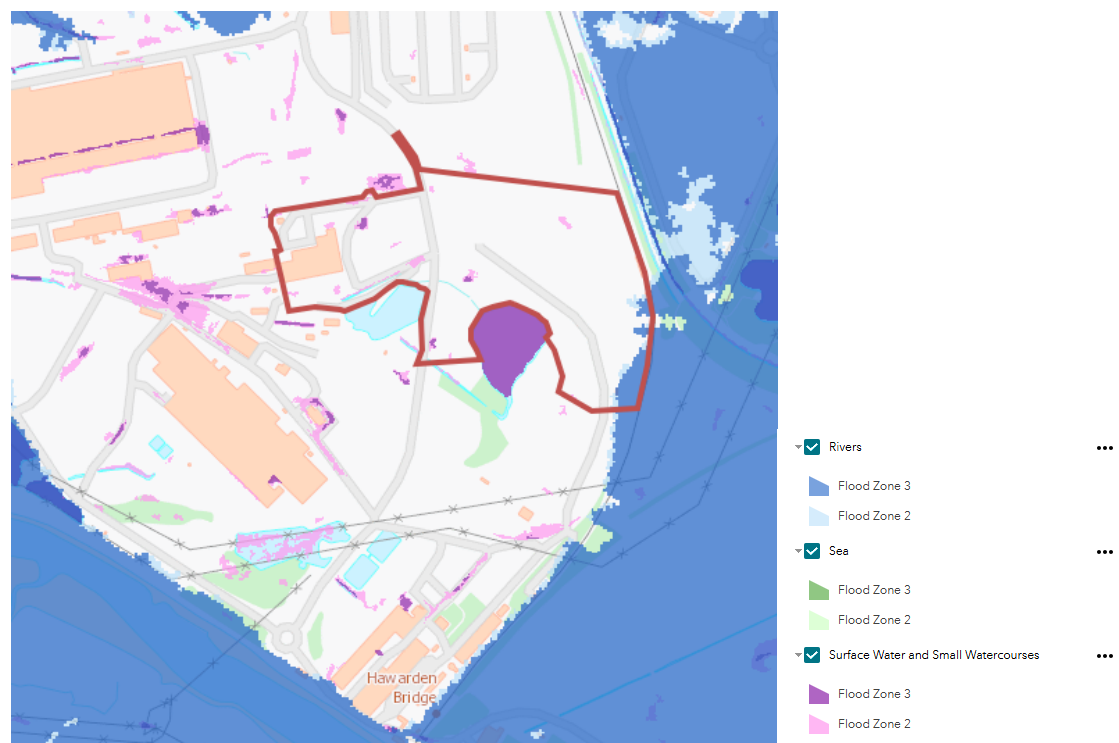


Table 2.1 Table of Sensitive Ecological Receptors

Site Name	Designation	Direction	Distance from site
River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid (Wales) and River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid (England)	SAC	SW	545m
Dee Estuary/Aber Dyfrdwy	SAC	SW	575m
Deeside and Buckley Newt sites	SAC	SW	1,990m
Halkyn Mountain / Mynydd Helygain	SAC	W	9,270m
The Dee Estuary (Wales) and The Dee Estuary (England)	SPA	SW	575m
The Dee Estuary (Wales)	Ramsar	SW	575m
Dee Estuary / Aber Afon Dyfrdwy	SSSI	SW	575m
Afon Dyfrdwy/River Dee	SSSI	SW	545m
Shotton Lagoons and Reedbeds	SSSI	NW	900m
Connah's Quay Ponds and Woodland	SSSI	SW	1,990m

Site Name	Designation	Direction	Distance from site
Ancient Semi Natural Woodland (unnamed)	Ancient Woodland	E	1,950m
Ancient Semi Natural Woodland (Wepre Park)	Ancient Woodland	SW	2,000m

The above data has been taken from MAGIC.gov.uk website, accessed May 2026.

For habitat sites, the relevant distance for consideration are: International designations (SAC, MPA, SPA and Ramsar – 10 km); National designations (SSSI, Nature reserves - 2 km). Ancient woodland data taken from Natural Resources Wales website, accessed May 2026 (2km).

2.2 Regulatory Context

The site is located within Wales and therefore regulatory responsibility lies with Natural Resources Wales (NRW).

The plant is a new RMW insulation manufacturing factory and intends to come into operation in July 2028.

A new Environmental Permit is required because:

- The plant will have a melting capacity that exceeds 20 tonnes per day;
- The site will accept and then recover more than 75 tonnes per day of returned product (non-hazardous waste) in the manufacturing process; and

The relevant regulatory listings under Schedule 1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) are:

- *Section 3.4 A(1)(a) Production of other mineral fibres, melting mineral substances including the production of mineral fibres in plant with a melting capacity exceeding 20 tonnes per day.*

The site will additionally include the following Directly Associated Activities (DAAs):

- Handling and storage of waste materials
- Handling and storage of raw materials
- Operation of combustion plant
- Operation of an emergency stack
- Discharge of surface water

This application also includes the following combustion plant which provides back-up power to the installation in case of grid failure only to protect the integrity of plant and is subject to regular, monthly testing.

- One < 1 MWth standby generator

Due to the size of the standby generator being less than 1 MWth, the standby generator will not need a permit as a Medium Combustion Plant (MCP). As the generator is only used during an emergency, it is

excluded from meeting the requirements of a Specified Generator because it meets the definition of an emergency backup generator as its only use is to provide power during an emergency.

This technical supporting document has been developed to provide the information required for an environmental permit application for the site referenced in Section 2.1.

2.3 Pre-application Discussions

Pre-application discussions have been held with Natural Resource Wales to discuss the site, operations and application. This was held on Thursday 17th July 2025 between members of the Knauf Insulation team, WSP team and Regulator; Natural Resource Wales (NRW).

Further discussions between Natural Resource Wales, Net Zero Industry Wales, Knauf and WSP were held on 17th April 2026 to discuss how the application would be submitted and agree to a phased submission of different parts of the application, as and when they were finalised for submission to the regulator.

2.4 Application Structure

The application for a bespoke environmental permit requires the completion of an online tool on the NRW website.

The completed online application tool is supported by this main application document which details the proposed activities at the installation and a comprehensive review of their potential for environmental impact.

This application also considers the management techniques to avoid and control emissions from the installation and how the design of the process meets Best Available Techniques (BAT).

This report is supported by a number of appendices providing detailed environmental assessments in support of this application.

Appendix 1a – Knauf Shotton Site Boundary Plan and Emission Points (Drawing: 14173-AEW-SI-XX-DR-A-05111, P12)

Appendix 1b – Knauf Shotton Drainage Plan (Drawing: 14173-TCG-XX-XX-DR-C-5500, Revision T2)

Appendix 2 Site Condition Report

Appendix 3 Dust Emissions Management Plan

Appendix 4 Environmental Risk Assessment

Appendix 5 Knauf Insulation ISO 140001 Certificate

Appendix 6 Knauf Insulation ISO 50001 Certificate

Appendix 7 KIMS Waste Acceptance Procedure

Appendix 8 NRW Charge Tool

Appendix 9 Air Emissions Risk Assessment

Appendix 10: Habitats Regulation Assessment

This report has been structured and developed in accordance with reference to the relevant technical guidance for the site activities, namely:

- Environmental permit guidance obtained from GOV.UK webpages (replacing previous EPR 1.00 'How to Comply' guidance); and
- Best available techniques (BAT) conclusions under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions for the manufacture of glass

3. Managing Your Activities

3.1 Proposed Techniques

Environmental Management

Knauf Insulation has a companywide Management System, Knauf Integrated Management System (hereinafter referred to as KIMS) which includes an EMS.

Knauf Insulation holds an organisational level EMS certified to ISO 140001:2015. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will be extended to include Knauf Shotton once the site has become operational.

Details of the current KIMS have been assessed for conformance with the requirements of BAT and are presented below in Section 0.

Additionally, Environment Agency summary guidance on the development of a management system, to carry out activities under an environmental permit¹, specifies the following aspects are required:

Table 3.1 Guidance on Environmental Management Systems from GOV.UK

GOV.UK Requirements	Proposed Arrangements
Your management system must include a plan of your site, drawn to scale. The plan must highlight where you do the activities covered by your permits	The management system will include a scaled Site Plan, showing the installation's permitted boundary and footprint, operational areas and site layout, identifying the key process and storage areas. This permit application includes a copy of the proposed Site Plan showing which areas are included within the installation and which do not form part of the installation. This Site Plan will be incorporated into the EMS and certified to ISO 140001:2015.
Your plan must also show any: ■ buildings, and other main constructions, like treatment plants, incinerators, storage silos and security fences ■ storage facilities for hazardous materials like oil and fuel tanks, chemical stores, waste materials	The Site Plan shows features including buildings, raw material storage tanks/silos, chemical storage, hazardous materials storage, emission points, entrances and exits to the site. A Site Drainage Plan has been created for this application and the EMS showing the locations and types of drainage (surface water drainage and foul drainage). The site's Site Condition Report (SCR) will also identify areas of contaminated land and will form part of this application submission and future EMS.

¹ [Develop a management system: environmental permits - GOV.UK](#)

GOV.UK Requirements	Proposed Arrangements
- location of items for use in accidents and emergencies, like absorbents for chemical spills - entrances and exits that can be used by emergency services - points designed to control pollution, for example inspection or monitoring points - trade effluent or sewage effluent treatment plants - effluent discharge points - land that you believe is contaminated, for example areas of your site that have previously been used for industrial purposes	Emission and discharge points will also be included on the Site's layout plan, including in this application submission and future EMS. Included within Knauf Shotton's Emergency Response Plan is a plan which includes: - Location and identification of hazardous materials (asbestos, oxygen, gas, ...) - Location of emergency equipment including spill kits, absorbents, medical support devices - Location of muster points, evacuation and emerging routing, access and egress points for emergency use. - Overview of the plant / site drainage system(s) - Location of the fire water hydrants Details on materials or hazardous materials that will require special firefighting equipment (e.g., hazardous materials that will react violently with water)
Your plan must also show areas particularly vulnerable to pollution that are on or near to your site, for example: - rivers or streams - groundwater used for drinking water - residential, commercial or industrial premises - areas where wildlife is vulnerable or protected	The site plan shows features which may be vulnerable to pollution which are on or near to the site including: - surface water ponds - drainage ditches - neighbouring commercial and industrial premises. Additionally, the Site's drainage plan highlights attenuation tanks, surface water and foul water drainage networks.
Your plan must show your foul and combined drainage facilities marked in red and your surface water drainage, facilities marked in blue. It must also show: - the direction of flow of the water in the drain - the location of discharge points to the sewer, watercourse or soakaway	The site has a drainage plan showing the locations and features associated with site drainage. The site drainage plan clearly shows the direction of flow within the drainage system(s). Location of discharge points to ground or watercourse are also clearly marked. Manhole covers and access points are also marked and identified within the key, together with control points such as stop valves, diverter valves and oil water interceptors.

GOV.UK Requirements	Proposed Arrangements
- the location of manhole covers and drains - the location of stop and diverter valves and interceptors	
Your plan must show the location of mains water, gas and electricity supplies on your site, including: - the mains water stop tap - gas and electric isolating valves and switches - the routes for gas, electricity and water supplies around your site - electric wiring and gas and water pipes must be labelled on the plan	New utility service connections will be made to provide the site with gas, water, electricity and telecommunications services. The exact location is subject to detailed design and utilities plans will be included within the Site's EMS. These are not required as part of the permit application submission and have not been provided in support of this application, but the operator is aware of the current location of utility services and the indicative locations of the new service connections. This will include mains water connection, gas and electrical isolating valves and switches. The routes of services will be identified on detailed design drawings.
Water discharge and groundwater activity If you are applying for a permit for a standalone water discharge activity or a point source standalone groundwater activity your site plan must show: - your wastewater treatment plant - monitoring points - the locations from which you will take samples to check for contaminants or pollutant substances as required by your permit - the location of emergency equipment - the location of any mitigation measures referred to in your management system - the outlet to surface water (standalone water discharges only) - the infiltration system (standalone groundwater activity only) If you are applying for a permit for a standalone groundwater activity where you are land spreading, your site plan must show: - the field locations for spreading	This application is not for a permit for a standalone water discharge activity or a point source standalone groundwater activity.

GOV.UK Requirements	Proposed Arrangements
■ monitoring points - the locations from which you will check your discharge for contaminants or pollutant substances as required by your permit ■ the location of emergency equipment ■ the locations of any pollutant storage areas linked to your permit	
Site operations Break down the operations that will be carried out on your site during start up, normal operation and shut down, into a list of activities and processes, for example unloading waste, storing waste, incinerating waste. For waste, mining waste, and installations, list the wastes that will be produced by each activity or process. List the steps you will take to prevent or minimise risks to the environment from each activity or process and type of waste. Be specific about the actions you will carry out to do this. For water discharge and point source groundwater activities, this will normally be the operation of a wastewater treatment works or effluent treatment equipment that is part of your activity and included in	Site activities and operations have been identified in Section 2.2 of this Technical Supporting Document in support of the permit application. This includes the listing of Scheduled Activities and Directly Associated Activities that the Site will be regulated under. An Environmental Risk Assessment (ERA) has been created in support of this permit application which identifies the risk to the environment from activities and also includes detail of mitigation measures, controls and proposed operating techniques to limit and reduce risk and potential impact. The ERA will form part of the Site's EMS. Knauf's certified management system will include all of the aspects of site operations. Knauf has policies for complying with legal and other obligations, managing change, managing documents, handling and using hazardous substances, preparing and responding to emergencies and managing non-conformities. The Process Handbook describes the site operations and processes will be developed for the site to describe start up and shut down of operations. The site has been designed to achieve highest quality standards and with a focus on HSEEQ considerations and will meet compliance obligations. To minimise risk to the environment, all employees will be fully trained to discharge their site duties and operations will be controlled by a SCADA system from the site control room. Outputs from the process, including wastes, will be monitored as per the Plan Do Check Act approach which is built into the KIMS.
Site operations for a business that manages, treats or disposes of waste If you are a waste operator you must include a waste storage plan that states:	A waste storage plan is not required for the Site. The Site's principal activity is not a waste operation. The Site will be regulated under

GOV.UK Requirements	Proposed Arrangements
- the longest amount of time that you will store each type of waste - how you will make sure you will not exceed these time limits – you need to consider your emissions when deciding how long you can store types of waste for - the maximum amount of each type of waste you will store in terms of volume - the maximum height of each storage pile on site - how you will identify the specific types of waste you are storing - how you will separate different types of waste if required, for example how far apart you will keep waste types that cannot be mixed - how you will make sure your site only takes waste that your permit allows you to store	scheduled activity S3.4A(1)a which means the Site will be regulated as an Installation under the Environmental Permitting Regulations. Installations must demonstrate a higher level of site management through the implementation of an Environmental Management System, which is regulated through conditions within the environmental permit. The site will include waste pre-acceptance, acceptance and handling procedures as waste materials will be accepted at the site and will need to meet pre-acceptance conditions to be accepted at the site and conforming wastes will be stored within designated bays within a designated area of the site. Designated bays will keep different waste types separate, in order to prevent cross-contamination and aligned to appropriate measures for waste. Waste will be stored for a minimal amount of time due to the continuous nature of the site operations and required throughput of the production processes. Maximum storage volumes are provided within Table 3.6 below.
Fire prevention plans If you need a permit for waste activities and you plan to store combustible waste you will need to write a fire prevention plan and submit it with your application. This must explain how you would prevent fire at your site or manage risks from fire if one occurs. Read the fire prevention plan guidance for more information on how to do this.	The installation does not store wastes that are combustible and therefore the requirements for a fire prevention plan are not met. The Emergency Response Plan (ERP) includes a fire and explosion emergency scenario and details of the design and installation of firefighting equipment.
Site and equipment maintenance plan You need a plan for how you will maintain the infrastructure of your site and any machinery. You must maintain any machinery according to the manufacturers or supplier's recommendations (for example, following the instructions and guidelines of any manuals that came with your equipment). You will need to record each time you carry out maintenance, for example, each time you check the calibration of monitoring	A site maintenance plan will be developed and included as a key document in the Site EMS. All maintenance plans are built in tandem with the assets installed and in conjunction with original equipment manufacturer recommendations and frequencies. The Maintenance Plan is part of SAP system and configured for release as per the frequencies stipulated.

GOV.UK Requirements	Proposed Arrangements
equipment to make sure it meets the manufacturer's recommendations.	
Contingency plans You need a plan for how you will minimise the impact on the environment of any: ■ breakdowns ■ enforced shutdowns ■ any other changes in normal operations, for example due to extreme weather	The KIMS includes provision of a Business Continuity Plan. Knauf has companywide procedures for identifying hazards and managing risks and for preparing and responding to emergencies, which includes the development of an Emergency Response Plan (ERP). The Business Continuity Plan is developed as a result of the company risk assessment process and procedure for identifying hazards and managing risk which includes breakdowns, scenarios leading to plant shutdown and external factors that could impact operations (e.g. extreme weather). Should an emergency occur, the ERP describes how impacts are minimised due to systematic and coordinated response. The Business Continuity Plan is regularly reviewed.
Accident Prevention and Management Plan (APMP) You need a plan for dealing with any incidents or events that could result in: ■ pollution ■ not being able to comply with your permit The plan must identify potential accidents, for example: ■ equipment breakdowns ■ enforced shutdowns ■ fires ■ vandalism ■ flooding ■ any other incident which causes an unexpected change to normal operations, such as extreme weather For each potential incident, it must also state the: ■ likelihood of the accident happening ■ consequences of the accident happening	An APMP will be developed for the Site's EMS ahead of operation of the Site. The KIMS includes provision of procedures for identifying hazards and managing risks, and for complying with legal and other requirements in order to prevent accidents and manage risk from accidents. Knauf's compliance obligations and requirements are identified and recorded within the Site's Legal and Other Requirements Register. This register is reviewed annually. Responsible members of staff are identified to ensure compliance, manage change and new requirements and for reviewing compliance to prevent pollution or incidents of permit non-compliance. In the event of permit breaches, audit non-conformities, accidents or incidents associated with site activities and operations, the Site will investigate and report on these occurrences, identifying root causes and solutions identified to prevent reoccurrence. This will be captured within the Site EMS and KIMS.

GOV.UK Requirements	Proposed Arrangements
■ measures you'll take to avoid the accident happening ■ measures you'll take to minimise the impact if the accident does happen Your accident plan must also say how you will record, investigate and respond to accidents or breaches of your permit. Your accident plan must also include: ■ the date it was reviewed ■ when it will next be reviewed ■ a list of emergency contacts and how to reach them ■ a list of substances stored at your site, and your storage facilities ■ forms to record accidents on Consider taking the following actions, if you think they are relevant to the operations you carry out at your site: ■ make emergency services aware of your activities ■ take out insurance to cover the cost of clean up following an accident ■ check whether you're in a flood risk area and sign up for flood warnings ■ develop a system to allow access to important information away from your site	
Contact information for the public If you have a waste or installations permit you must display a notice board at or near the site entrance telling the public about the site. It must include: ■ the permit holder's name (company name at least) ■ an emergency contact name and telephone number ■ a statement that the site is permitted by the Environment Agency	Knauf will display a notice board at the entrance to the site containing information relevant to the site including details of how to contact Natural Resource Wales.

GOV.UK Requirements	Proposed Arrangements
- the permit number - Environment Agency telephone number 03708 506506 and the incident hotline 0800 807060 (or another number they subsequently tell you about in writing) A notice board is optional for other permits and will depend on whether you consider that the public will need to see emergency contact information at your site.	
A Changing Climate If your permit was issued on or after 1 April 2023, you need to integrate climate change adaptation planning into your management system	The KIMS considers the potential impacts of climate change on the organisation and stakeholders including customers and neighbours. Climate change has also been considered as part of the ERA, in support of this permit application submission.
Complaints procedure You need a procedure that records: - any complaints you receive in relation to activities covered by your permit (for example complaints from neighbours about noise, odour or dust from your site) - how you investigate those complaints - any actions taken as a result of complaints	The KIMS includes a procedure for reporting and investigating quality and compliance incidents for health, safety, environmental, energy and quality management. This includes a methodology for recording and notification incidents, investigation and reporting incidents, corrective and preventive actions and evaluation and review of incidents. The procedure identifies who is responsible for recording, where they are recorded, investigating incidents, defining actions and sharing learning events.
Managing staff competence and training records You need to have enough staff and resources to make sure the site is run effectively in order to comply with your permit. Your management system needs to explain who is responsible for what procedures and who is technically competent. For each of your managers, staff and contractors make a list of any roles they carry out that relate to activities covered by your permit. You will also need a procedure to:	The KIMS policy is for provision of appropriate resources, information and supervision. Responsibilities and competence are achieved via both clear job descriptions which identify the necessary skills and the company process for developing and training employees, including how to identify training needs. There is a company policy for development and training of Knauf people and for management of subcontractors. Knauf is not considered to be a waste operator and therefore competence requirements to not apply. Selection of contractors or third parties will be through a pre-determined process and procedure as part of the IMS requirements to ensure suitably qualified and certified persons are contracted to undertake works on site.

GOV.UK Requirements	Proposed Arrangements
■ check your staff and contractors have taken the training or qualifications required for the work they do ■ record any training, refresher training or qualifications taken by your staff or contractors If you have a permit for a waste, mining waste or installations permit you also need to look at legal operator and competence requirements.	
Keeping records You must keep any records required by your permit. In some cases the permit will tell you how long to keep a record for. Otherwise you must consider how long you'll need to keep different records for (and write this in your management system). You must keep records to show how your management system is being implemented in line with the requirements of your permit and this guide. You need to keep: ■ permits issued to the site ■ other legal requirements ■ your risk assessment ■ all management system plans ■ any plans required by the application or permit depending on your type of activity (for example odour management plan at waste sites) ■ all operating procedures ■ staff competence and training (for example qualifications, courses attended) ■ emissions and any other monitoring undertaken (for example water samples) ■ compliance checks, findings of investigation and actions taken ■ complaints made, findings of investigation and actions taken	The KIMS Policy includes a procedure for managing documents. This procedure specifies the minimum requirements and responsibilities for the management of documents and records during their life cycle. Both the site EMS and IMS will be audited to maintain certification with the appropriate International Standard Orders (ISO). This will ensure that compliance, management and record keeping is maintained and sustained in line with both company and legal requirements.

GOV.UK Requirements	Proposed Arrangements
■ audits of management system, findings (reports) and actions taken ■ management reviews and changes made to the management system ■ where applicable, certification audit reports and any actions carried out ■ You also need to include copies of your plans with your management system if: ■ your permit requires you to implement an approved plan ■ you have been asked to do this because there's a problem at your site	
If you manage, treat or dispose of waste If you are a waste operator you must record the following for each delivery of waste to your site: ■ its quantity (weight or volume) ■ its List of Waste (LoW) Code ■ its origin (for example, the location the waste sent from) ■ the identity of the producer of the waste (for example the company name) ■ the date the waste arrives at your site ■ the date the waste was first produced, if the waste is likely to cause odour ■ any quarantined materials that are part of the delivery, and what you did with them You must also: ■ keep records to show that you are meeting your duty of care requirements as a business that produces waste ■ comply with the site record and return requirements for hazardous waste	n/a – the site is not a waste site. However, duty of care documents will be maintained as is required.
Waste, mining waste or installations	This application includes a Site Condition Report.

GOV.UK Requirements	Proposed Arrangements
If you have a permit for waste, mining waste or installations you will need to <u>have a site condition report</u> to record the condition of land or quality of groundwater on your site. Keep this up to date through the life of your permit and include the following information: ■ details of any historic spills or contamination (incidents that took place before you began operating) and what was done in response to those incidents ■ evidence of the effectiveness of any measures you have taken to protect land or groundwater since you started operating If you want to cancel (surrender) your permit you will need to show you have taken the necessary measures to avoid any pollution risk from your activities. You also need to show that you have returned the site to a satisfactory state. This means that the condition of land and groundwater has not deteriorated as a result of your activities. Sites for waste, mining waste or installations may have to include the following plans: ■ an odour management plan ■ an emissions management plan ■ a noise and vibration management plan ■ a pests management plan	This application includes a Fugitive Emissions Management Plan. The site does not require either an Odour, Noise and Vibration; or Pest Management Plan due to the nature of the activities and risks associated being negligible / not significant.
Review your management system You must have a procedure for checking you are complying with your permit, procedures and management system. Record what checks are carried out, who did them and what action was taken. You must review and update your management system: ■ when you make changes to your site, operations or equipment that affect the activities covered by your permit, for example if you install a new boiler	The KIMS is subject to review using a Plan Do Check Act to confirm the suitability of the overall system. The KIMS includes a procedure for managing change, including defining what constitutes a change, how to identify a change and assess the impact of a change. Managements systems will be audited to maintain accreditation and certification.

GOV.UK Requirements	Proposed Arrangements
■ whenever you apply to change ('vary') your permit ■ after any accident, complaint or breach of your permit ■ if you encounter a new environmental problem or issue, and have implemented new control measures to control it You must keep a record of changes to your management system, particularly major changes such as: ■ a change to the maximum amount of waste stored on your site ■ a new noise screen ■ new waste treatment equipment, for example a Trommel ■ implementation of new control measures The Environment Agency may also review your management system and make recommendations for improvements after any accident, permit breach or other incident. It may also ask you to improve your management system if it thinks you have not identified or minimised risks from pollution.	
Site closure You will have a period of site closure from when you stop operating until you are able to cancel (surrender) your permit if you have a permit for a: ■ landfill ■ category A mining waste facility During this time, you will need to continue to monitor emissions from your site. You will need to submit the site closure parts of the <u>site condition report</u> when you stop operating. ■ Make sure people understand what you do Your staff must have access to and understand any sections of the management system that deal with activities they carry out. It is up to you how you do this, for	A Site Closure Plan will be developed as part of the Site's Environmental Management System, this will include consideration of the approach and procedures for Site Closure, which will include: ■ review of emissions monitoring ■ roles and responsibilities of staff during site closure ■ update ERA Management System and Procedural review to ensure appropriate measures are in place during decommissioning and closure stages.

GOV.UK Requirements	Proposed Arrangements
example whether you print the system out, or provide electronic copies. You must be able to show the Environment Agency your management system if asked. If you have an overarching management system for a number of sites you can provide both: ■ an overview or summary of the whole system ■ copies of the sections that relate to the activity type or aspect of the management system that the Environment Agency has asked about Consider whether you need to provide information to interested parties such as neighbours and your local community to explain how you manage your activities to comply with your permit.	

Energy efficiency

Knauf operates an integrated management system across all Knauf Insulation locations which includes an ISO 50001 certified Energy Management System. This Energy Management System includes the need for identifying aspects of the site which influence energy efficiency and require auditing and is the way in which Knauf ensures its UK operations comply with ESOS. Knauf also compare energy efficiency and applies benchmarking across its portfolio of manufacturing facilities in order to identify opportunities for improving energy efficiency.

The installation will require the use of energy to operate safely, of which the greatest electrical demand will be within the Submerged Arc Furnace (SAF) melter that is used to melt the raw materials to produce the rock melt. A heat recovery system is included within the SAF flue gas cleaning system to pre-heat SAF flue gases prior to combustion which will help optimise energy consumption and the emission abatement system for the SAF is electrically powered instead of being fuelled by natural gas. This both reduces the emissions to air from the combustion process and reduces the overall energy requirement from the abatement system (in terms of kWh). Energy efficiency measures have also been applied within the design of the building, including but not limited to insulation, efficient lighting and heat pumps for space heating. Specialist components such as power cables, capacitor banks and transformers have been selected to be energy efficient for the process need and operate with optimum energy efficiency, for example, with low energy losses while operating on nominal loading.

Estimates of electricity consumption are provided for the main processes below (see Table 3.2). All parts of the process have energy metering fitted, and energy consumption is tracked by the SCADA system. This enables the plant to work efficiently as deviations are identified, and necessary corrections are undertaken by the maintenance team.

Table 3.2 Knauf Shotton Electrical Power Consumption overview

Process area	Nominal capacity (kW)
Compressed air	120
Utilities	280
Binder preparation	50
Batch preparation	50
Melting (charging, exhaust, utilities)	500
Melting exhaust RTO	100
Fans	1,240
Stonewool forming	240
Wet exhaust system (WESP & wash water)	800
Curing oven and cooling section	420
Packaging line and equipment	850
Vacuum evaporator	240
Melting power SAF	13,900
Total main line power (incl. melter)	18,790

Natural gas will also be consumed by a number of processes of which the curing oven is the greatest consumer. Estimates of natural gas consumption are provided for the main processes (see Table 3.3 below).

Table 3.3 Knauf Shotton Natural Gas Consumption overview

Process area	Nominal consumption (kWh)
Trough burners	155
Curing oven	1,597
Preheat system	237
Building heating and warm water boiler	103

Process area	Nominal consumption (kWh)
Total natural gas for process	2,092

As per the 2013 BREF² “In general, the energy necessary for melting glass may account for over 75% of the total energy requirements of glass manufacture, with an average of about 65 % of the total energy input when considering all the sectors of the glass industry” (page 310) and the specific energy consumption for the Mineral wool/Stone wool sector is given as 4.2 -10.0 GJ/tonne of melted glass (furnace energy consumption) and <12 GJ/tonne of finished product (overall energy consumption of the installation).

The installation will use both electricity and natural gas to operate. Estimates of the quantity of energy to be used are included below in Table 3.4.

Table 3.4 Estimated Annual Energy Consumption

Energy Source	Estimated Primary Energy (MWh)	Estimated Primary Energy (GJ)
Electricity (from the public supply)	146,000	525,600
Natural Gas (from the public supply)	16,800	60,480
Total	166,200	586,080

The installation is planned to produce approximately 104,000 tonnes of RMW per annum, resulting in a specific energy consumption of 5.64 GJ/tonne of finished product. This is less than the range specified within the BREF, which is 4.2 GJ/tonne of melted glass (furnace energy consumption) and <12 GJ/tonne of finished product (overall energy consumption of the installation), demonstrating meeting BAT.

The installation will recover energy, via heat exchange, from the SAF melter exhaust gases to pre-heat gases prior to the de-NO_x system in order to maximise the efficiency of the abatement process and minimise electrical power consumption within the RTO.

Table 3.5 BAT Requirements for energy efficiency from the glass manufacturing processes (from the Manufacture of Glass BREF, 2013)

BREF Requirement	Proposed Arrangements	BAT?
BAT 2. BAT is to reduce the specific energy consumption by using one or a combination of the following techniques:	Knauf Insulation holds an organisational level energy management system certified to ISO 50001:2018. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will extend to include it in future.	Yes

² European Commission, 2013. Best Available Techniques (BAT) Reference Document for the Manufacturer of Glass. Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and Control.

BREF Requirement	Proposed Arrangements	BAT?
(i) Process optimisation, through the control of the operating parameters (ii) Regular maintenance of the melting furnace (iii) Optimisation of the furnace design and the selection of the melting technique (iv) Application of combustion control techniques (v) Use of increasing levels of cullet, where available and economically and technically viable (vi) Use of a waste heat boiler for energy recovery, where technically and economically viable (vii) Use of batch and cullet preheating, where technically and economically viable	(i) The installation will comply with this BAT requirement with operating parameters used dependent upon the requirements of the finished product outputs. Dependent upon the raw material inputs, different operating parameters will be used to control the temperatures within the combustion chamber of the incinerator, the input of air, natural gas and abatement materials and quantity and use of cooling air. The SAF melter design includes full monitoring and control of cooling water temperatures and quality. Energy input is monitored and controlled by the site SCADA system which is continuously monitored by site operatives who are able to intervene and take corrective actions to reduce energy consumption as required. Knauf compares energy consumption across manufacturing sites on a monthly basis and will make adjustments to the process where energy savings can be achieved. Knauf benchmarks against publicly available information. (ii) Regular maintenance of the melting furnace is planned as per the manufacturers recommendation with planned downtime built into the production schedule. A maintenance strategy including schedules of recommended maintenance and inspection programmes will be used to determine the status of the melter lining which will contribute towards efficient use of energy. The maintenance strategy is driven and underpinned by SAP PM module. The site Engineering manager has overall accountability, which can be delegated to the Maintenance Planner and Electrical & Mechanical supervisors to undertake tasks. (iii) A SAF melter design has been chosen instead of a conventional cupola based on a number of factors including the: ability to use raw materials with a higher recycled content, reduced environmental impact from fewer Scope 1 CO₂ emissions and reduced melting energy demand. (iv) Applicable to fuel/air and oxy-fuel fired furnaces Technique is not applicable. (v) Granulate is used within the production process which is a by-product from the process that is returned to the melter. The amount of granulate used depends on the availability of volumes waste and by-products from both Shotton and other Knauf facilities.	

BREF Requirement	Proposed Arrangements	BAT?
	(vi) Technique not applicable (vii) Technique not applicable	

Efficient Use of Raw Materials

The principal raw material used at the installation is basalt, an igneous rock that is used in the production of RMW. The process also uses two by-products from the production of steel and one waste RMW from Knauf's Queensferry plant.

- Blast furnace (BF) slag and electric arc furnace (EAF) slag is imported to the site from steel production facilities and is used within the production of RMW without any further processing.
- RMW products from the Queensferry plant will consist of shots, cut-offs, scrap and filter dust waste. These are all from material losses in the production of RMW at Knauf's Queensferry plant. This will be imported to Knauf Shotton and used directly without any further processing. Wastes will be subject to transfer from Knauf Queensferry by a licensed waste carrier and is subject to duty of care requirements (e.g. use of a Waste Transfer Note).

Waste materials will also be imported to the installation and used within the production of RMW. This waste material consists of suitable mineral wool imports separated from construction and demolition wastes collected from, or returned by, Knauf Insulation customers.

All imported waste materials are subject to duty of care requirements, pre-acceptance and acceptance checks to check conformity; analysis is also undertaken on raw material inputs to check quality standards are met. This reduces the instances of waste generation through generation of off-specification products which fail quality control.

A final source of raw material will be the by-product generated from the production of RMW at the installation. Internal by-products will consist of all losses due to line and spinner efficiency including; melt granulate, spinner waste, wet electrostatic precipitator (WESP) filter waste, saw and grinding dust, scrap slabs and punking wastes from material losses.

The finished product will contain up to 80% recycled (recovered) materials consisting of BF slag, EAF slag, imported waste from Knauf Queensferry, imported wastes and internal recycled by-product. Recycled RMW will be up to 50% of the finished product.

Dependent upon the RMW product being produced on the manufacturing line, different binder materials will be added to produce the requested RMW product. As per the following inventory (Table 3.6), a number of raw materials will be used on site and stored in either bulk silos or intermediate bulk containers (IBCs).

Table 3.6 Raw Material Inventory

Raw Material Name	CAS / EC Number	Storage Type	Storage Volume	MSDS No.
		Tank	70m ³	01
		Tank	30m ³	02

Raw Material Name	CAS / EC Number	Storage Type	Storage Volume	MSDS No.
		IBC	4x 1,000 litre	03
		IBC	4x 1,000 litre	04
		IBC	8x 1,000 litre	05
		IBC	8x 1,000 litre	06
Ammonia (≥10%- ≤35%)	1336-21-6	Tank	30m ³	07
		IBC	4x 1,000 litre	09
		Tank	2x 70m ³	10
		IBC	4x 1,000 litre	11
		IBC/Drums	30x 1,000 litre	12
		FIBC bulk bags	4m ³	13
		Tank	30m ³	14
		Tank	30m ³	15
		IBC	4x 1,000 litre	16
Calcium Hydroxide Sorbacal – de-SOx sorbent	1305-62-0	Silo	80m ³	17
Reacted de-SOx salt	1305-62-0 / 7778-18-9	Silo	80m ³	n/a
Diesel	68334-30-5	Tank	2x 2,500 litre	18

All raw material data is based on current knowledge and available design information. Raw material selection is subject to change, based on factors not limited to; availability of supply, sustainability factors, selection of approved suppliers and cost.

Table 3.7 Estimated Raw Material Use and Hazards

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Basalt, Solid [MSDS no. 19]	Primary Raw Material	Total Primary Raw Materials use <400 tonnes per day. This will vary depending upon the product being manufactured and its composition.	Not classified as hazardous.	n/a	Principal raw material in process.
BF Slag, Solid [MSDS no. 20]	Primary Raw Material		Not classified as hazardous.	n/a	Principal raw material in process.
EAF Slag, Solid [MSDS no. 21]	Primary Raw Material		H302 harmful if swallowed. H318: Causes serious eye damage. H335 may cause respiratory irritation. H360 may damage fertility or the unborn child.	Dust is highly alkaline and may give rise to dust in dry and windy conditions. Low solubility in water. Low bioaccumulation potential.	Principal raw material in process.
Internal RMW, Solid [MSDS no. 22]	Primary Raw Material		Not classified as hazardous.	n/a	Raw material in process.
Queensferry RMW (Dolomite), Solid [MSDS no. 23]	Primary Raw Material		Not classified as hazardous.	n/a	Raw material in process.
Imported waste RMW (Dunite), Solid [MSDS no. 24]	Primary Raw Material		Not classified as hazardous.	n/a	Raw material in process.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
	Chemical Binder	Total Chemical Binder use <60 tonnes per day.	Not classified as hazardous.	Substance is soluble but not a hazardous substance.	Appropriate to binder application.
	Chemical Binder	This will vary depending upon the product being manufactured, the properties of the product and the additional binder which is applied to meet customer requirements.	H319 causes serious eye irritation. H335 may cause respiratory irritation.	Soluble in water. Reacts with strong alkalis. Not considered toxic to fish.	Appropriate to binder application.
	Chemical Binder		Not classified as hazardous.	Substance should not be allowed to enter drains.	Appropriate to binder application.
	Chemical Binder		Not classified as hazardous.	Substance is mobile in soil so not expected to adsorb in soil.	Appropriate to binder application.
	Chemical Binder		H361 suspected of damaging fertility. H410 very toxic to aquatic life with long last effects.	Very toxic to aquatic life. May accumulate in soil and water.	Appropriate to binder application and only used in very small quantities.
	Chemical Binder		H318: Causes serious eye damage.	May accumulate in soil.	Appropriate to binder application and only used in very small quantities.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Ammonia, Liquid [MSDS no. 07]	Chemical Binder	Total Chemical Binder use <60 tonnes per day. This will vary depending upon the product being manufactured, the properties of the product and the additional binder which is applied to meet customer requirements.	H314 causes severe skin burns and eye damage. H335 may cause respiratory irritation. H400 very toxic to aquatic life.	Very toxic to aquatic life.	Appropriate to binder application.
	Chemical Binder		H317 may cause an allergic skin reaction. H318: Causes serious eye damage. H332 harmful if inhaled. H373 may cause damage to organs through prolonged or repeated exposure.	If discharge to the environment, can cause contamination of groundwater, surface water and soil. Not miscible.	Appropriate to binder application.
	Chemical Binder		H319 causes serious eye irritation. H317 may cause an allergic skin reaction. H350 may cause cancer.	Substance is soluble and should not be released to soil, water ways, drains or sewers.	Appropriate to binder application.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
	Chemical Binder	Total Chemical Binder use <60 tonnes per day.	Not classified as hazardous.	Substance is not considered hazardous and is generally chemically stable.	Appropriate to binder application.
	Chemical Binder	This will vary depending upon the product being manufactured, the properties of the product and the additional binder which is applied to meet customer requirements.	H302 harmful if swallowed H312 Harmful if swallowed or in contact with skin. H314 causes severe skin burns and eye damage. H335 may cause respiratory irritation.	Can be harmful effects on aquatic life with moderate toxicity.	Appropriate to binder application.
	Chemical Binder		Not classified as hazardous.	No known ecotoxicological effects but highly soluble so should not be discharged to sewer.	Appropriate to binder application.
	Chemical Binder		Not classified as hazardous.	Substance should not be discharged to drains, surface water or ground water.	Appropriate to binder application.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
	Chemical Binder	Total Chemical Binder use <60 tonnes per day.	H317 may cause an allergic skin reaction.	Substance could emulsify with water to create an emulsion in ground water if released to soil.	Appropriate to binder application.
	Chemical Binder	This will vary depending upon the product being manufactured, the properties of the product and the additional binder which is applied to meet customer requirements.	H302 harmful if swallowed. H314 causes severe skin burns and eye damage. H317 may cause an allergic skin reaction.	Substance may cause pollution in soils but less likely to mix with water.	Appropriate to binder application.
Calcium Hydroxide Sorbacal, Solid [MSDS no. 17]	Abatement	3	H315: Causes skin irritation. H318: Causes serious eye damage. H335: May cause respiratory irritation.	Should not be allowed to enter drains. Forms a very alkaline solution.	Appropriate to abatement requirements.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Diesel, Liquid [MSDS no. 18]	Back-up fuel Use in site plant and equipment	Diesel is only used in standby generators as a back-up fuel in the event of electricity grid failure and is used during the regular, monthly testing. Diesel is also used in fork lift trucks and plant	H226 flammable liquid and vapour. H304 aspiration hazard. H315 causes skin irritation. H332 Harmful if inhaled. H351 Suspected of causing cancer. H373 May cause damage to organs through prolonged or repeated exposure. H411 Toxic to aquatic life with long lasting effects.	If discharge to the environment, can cause contamination of groundwater, surface water and soil. Can be harmful to aquatic life with long lasting effects.	Standard back-up fuel source during periods of grid failure and testing. Potential to use battery electric fork lift trucks subject to reliability and safety.
Aquaserv C519 [MSDS no. 25]	Corrosion inhibitor in water treatment	Total Water Treatment Raw Materials use <5 tonnes per day.	H412 harmful to aquatic life with long lasting effects.	Substance should not be released to the environment and the substance is soluble in water so has the potential to contaminate groundwaters.	Recommended by water treatment manufacturer.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Sodium metabisulfite, Liquid [MSDS no. 26]	Dechloration agent in water treatment		H302 harmful if swallowed. H318 causes serious eye damage. EUH031 contact with acids liberates toxic gas.	Substantial amounts may lead to changes in pH / acidity in small water systems which could impact aquatic organisms if discharged to the environment. Potential risk from toxic gases if spilt with incompatible substances also stored on side.	Recommended by water treatment manufacturer.
Sodium chloride, Solid [MSDS no. 27]	Water softener in water treatment		Not classified as hazardous.	Not classified as an environmental hazard.	Recommended by water treatment manufacturer.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Nalco 7330, Liquid [MSDS no. 28]	Biocide in water treatment		H290 may be corrosive to metals. H314 causes severe skin burns and eye damage. H317 may cause an allergic skin reaction. H318 causes serious eye damage. H400 very toxic to aquatic life. H401 toxic to aquatic life.	If discharge to the environment, can cause contamination of groundwater, surface water and soil. Very harmful to aquatic life with long lasting effects.	Used in very small quantities and use is recommended by water treatment manufacturer.
Aquaserv TP, Liquid [MSDS no. 29]	Biocide in water treatment		H317 may cause an allergic skin reaction. H318 causes serious eye damage. H332 harmful if inhaled. H360 may damage the unborn child.	Substance should not be released to drains, sewers or watercourses.	Recommended by water treatment manufacturer.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Caustic soda, Liquid [MSDS no. 30]	pH control in water treatment		H314 causes severe skin burns and eye damage. H315 causes skin irritation.	Substance is not expected to bioaccumulate but should not be released into sewer or surface waters undiluted.	Recommended by water treatment manufacturer.
Sulphuric acid, Liquid [MSDS no. 31]	Abatement	500 litres per day	H314 Causes severe skin burns and eye damage H402 Harmful to aquatic life	Substance should not be allowed to enter drains. Spillages will require containment and neutralisation.	Recommended by abatement system manufacturer.
Plastic shrink wrap, Solid	Packaging final product	0.5	None.	Not applicable – solid material and non-soluble. Any waste generated onsite will be subject to appropriate segregation and recovery/disposal.	Most appropriate storage material for application.

Material and Composition	Use of Material	Approximate Daily Use (tonnes per day)	Hazard Statements	Environmental Impact (where known) e.g. degradability, toxicity	Suitable Alternative for those with Significant Impact Potential / Justification
Wooden pallets, Solid	Packaging final product	<0.5	None.	Not applicable – solid material and non-soluble. Any waste generated onsite will be subject to appropriate segregation and recovery/disposal.	Most appropriate transport material for application.
* Binder Raw material consumption is based on maximum rate per binder formulation each day					

Table 3.8 BAT Requirements for materials storage and handling from the glass manufacturing processes

BREF Requirement	Proposed Arrangements	BAT?
BAT 3. BAT is to prevent, or where that is not practicable, to reduce diffuse dust emissions from the storage and handling of solid materials by using one or a combination of the following techniques: I. Storage of raw materials (i) Store bulk powder materials in enclosed silos equipped with a dust abatement system (e.g. fabric filter) (ii) Store fine materials in enclosed containers or sealed bags (iii) Store under cover stockpiles of coarse dusty materials (iv) Use of road cleaning vehicles and water damping techniques II. Handling of raw materials (i) For materials which are transported by above ground conveying, use enclosed conveyors to prevent material loss (ii) Where pneumatic conveying is used, apply a sealed system equipped with a filter to clean the transport air before release (iii) Moistening of the batch (iv) Application of a slightly negative pressure within the furnace (v) Use of raw materials that do not cause decrepitation phenomena (mainly dolomite and limestone). These phenomena consist of minerals that ‘crackle’ when exposed to heat, with a consequent potential increase of dust emissions	I. Storage of raw materials (i) Raw material silos for sodium hydroxide, recycling dusts and fibres are equipped with filters on the extracts to reduce emissions of dust to air. Other raw materials e.g. liquids are not prone to generation dust. (ii) Fine raw materials are enclosed within silos, as required. (iii) Stockpiles for imported raw materials e.g. basalt and slag are stored within a covered structure that is enclosed on three sides. (iv) If required due to generation of dust or because HGVs are transferring mud/dust onto the public highway, road cleaning vehicles will be used on site to remove depositions. II. Handling of raw materials (i) The techniques are generally applicable for above ground conveyors. Conveyors will be covered for transporting raw materials outside of the main facility buildings. Internal roller conveyors for manufactured product are not covered but are located inside of a building. (ii) Where the pneumatic system is used for transferring fibres, transport is filtered prior to release. (iii) Technique not applicable. The moisture content of the raw material is controlled for process optimisation. Wet binder material is added as necessary for the product formulation. (iv) The SAF melter operates under a slightly negative pressure which prevents and reduces diffuse emissions from this source. (v) Installation will use raw materials that do not cause decrepitation. (vi) The installation will vent to a filter system from the processes which could generate dusts with suitable filters to remove particles. Differential pressure across bag filters is measured to ensure they work properly. Filter	Yes

BREF Requirement	Proposed Arrangements	BAT?
(vi) Use of an extraction which vents to a filter system in processes where dust is likely to be generated (e.g. bag opening, frits batch mixing, fabric filter dust disposal, cold-top melters) The techniques are generally applicable (vii) Use of enclosed screw feeders (viii) Enclosure of feed pockets	material is then transferred and re-introduced into the process. (vii) Silo screw feeds are enclosed to the point where raw materials are deposited onto the conveyor. (viii) Technique not applicable	
BAT 4. BAT is to prevent, or where that is not practicable, to reduce diffuse gaseous emissions from the storage and handling of volatile raw materials by using one or a combination of the following techniques: (i) Use of tank paint with low solar absorbency for bulk storage subject to temperature changes due to solar heating. (ii) Control of temperature in the storage of volatile raw materials. (iii) Tank insulation in the storage of volatile raw materials. (iv) Inventory management (v) Use of floating roof tanks in the storage of large quantities of volatile petroleum products. (vi) Use of vapour return transfer systems in the transfer of volatile fluids (e.g. from tank trucks to storage tank). (vii) Use of bladder roof tanks in the storage of liquid raw materials. (viii) Use of pressure/vacuum valves in tanks designed to withstand pressure fluctuations. (ix) Application of a release treatment (e.g. adsorption, absorption, condensation) in the storage of hazardous materials.	(i) Tanks/drums containing volatile raw materials (ammonia and caustic soda) are located inside of the building and are not exposed to temperature changes from solar heating. This will prevent diffuse gaseous emissions. (ii) Tanks/drums containing volatile raw materials (ammonia and caustic soda) are suitably designed for the storage of these materials with engineering controls to prevent diffuse gaseous emissions. (iii) All tanks containing potentially volatile raw materials (ammonia and caustic soda) are suitably insulated, as required. The caustic soda tank is double shelled. (iv) The installation will use good inventory management as part of the overall site management to prevent diffuse emissions. Site will use gas leak analyser on ducts to measure losses, the in-house maintenance team will complete regular checks which will be supported by 3-monthly checks. (v) Technique is not applicable (vi) The installation will use vapour return transfer systems as required, e.g. on the aqua ammonia tank. (vii) Technique is not applicable as storage silos are fixed volume (viii) The installation will include pressure relief/vacuum relief valves on storage tanks, as required. (ix) Technique is not applicable (x) Technique is not applicable as substances are not prone to foaming. Design of the	Yes

BREF Requirement	Proposed Arrangements	BAT?
(x) Application of subsurface filling in the storage of liquids that tend to foam	storage is so that the introduction of liquids flows along the shell of the tank and not straight down on to the liquid surface.	

Efficient Use of Water

The production process will use water for a number of processes including; emission control scrubbers and abatement systems, preparation of binder, equipment cleaning and cooling water. Water consumption will total approximately 268m³ per day, consisting of 258m³ non-potable consumption and 10m³ potable water consumption.

The design of the plant means that water will be recirculated in different process waters to avoid the discharge of wastewater as a liquid effluent. However, despite the extended water recirculation system in place, some small quantities of liquid effluent are unavoidable.

The primary liquid effluent is a small quantity (approximately 3m³) of effluent generated on a daily basis from the ion exchange regeneration within water softening equipment. Use of waste softening equipment reduces corrosion impacts within the installation. This will be captured within an effluent tank and the tank removed from the site by tanker transfer or removal.

A second liquid effluent is a small quantity (approximately 3m³) of effluent generated on a daily basis from the acid scrubber abatement system located upstream of the WESP. Use of this acid scrubber reduces the ammonia within the downstream emissions to air. Effluent from the WESP system will be transferred to a vacuum evaporator system to increase the concentration of non-volatile components and discharged to an effluent tank. This effluent will be captured within an effluent tank and the tank removed from the site by tanker transfer or removal.

Table 3.9 Water Treatment Materials Inventory

Water Treatment Material Name	CAS / EC Number	Storage Type	Storage Volume (m ³)	MSDS No.
Aquaserv C519 - corrosion inhibitor	n/a	Jerry can	<1	25
Sodium metabisulfite – dechloration agent	7681-57-4	Jerry can	<1	26
Sodium chloride – softening salt	7647-14-5	Bags	<1	27
Nalco 7330 – biocide (wash water)	n/a	IBC	1	28
Aquaserv TP – biocide (cooling water/cooling tower)	n/a	Barrel	<1	29
Caustic soda	1310-73-2	Tank	30m ³	30
Sulphuric acid (25%)	7664-93-9	Tank	30m ³	31

All water treatment raw materials are based on current knowledge and design information but subject to confirmation when the water treatment package system is fully defined. Raw material selection is subject to change, based on factors not limited to; water treatment system, supplier, availability of supply, sustainability factors and cost.

Recovery and Disposal of Waste

The installation will generate limited quantities of waste materials for recovery and disposal limited to:

- Waste packaging
- Waste pallets
- Waste oils/rags
- Food waste
- Dry recyclable waste
- Residual waste
- Waste Air Pollution Control Residues (APCR); and
- Wastewater (effluent)

The food waste which will be segregated in accordance with the simpler recycling requirements of business but is outside of the scope of the installation activities, arising in offices and staff welfare.

The production of solid waste from the installation is reduced by the recycling of production by-products within the manufacturing process.

Up to 34,320 tonnes of by-products will be consumed by the installation per annum (see 'Efficient use of Raw Materials' above).

Production of solid waste is also reduced by applying quality controls to the process for raw material inputs and online inspections of semi-finished and finished products, to avoid waste generation from poor quality inputs and outputs associated with the process.

Table 3.10 Estimated Solid Waste Generation

Type of Waste	Estimated Annual Quantity	Storage Type	Disposal Method
Production by-products (melt granulate, spinner waste, WESP filter waste, saw and grinding dust, scrap slabs and punking wastes)	<40,000 tonnes	Silo	n/a – reused within production
Plastic foils	< 200 tonnes	Commercial skip	Recycled off-site
Waste pallets (wood)	< 100 tonnes	Commercial skip	Recycled off-site
Waste oils/rags	< 30 tonnes	Clip-top drums / barrels	Recycled off-site or disposal off-site
Waste air pollution control residues	< 1,040 tonnes	Waste silo / Flexible IBC bulk bags	Landfill offsite

Type of Waste	Estimated Annual Quantity	Storage Type	Disposal Method
Residual waste	<100 tonnes	Commercial skip/ waste compactor	Energy recovery offsite or landfill offsite
Dry recyclable waste (including paper and cardboard)	<190 tonnes	Commercial skip/ waste compactor	Recycled off-site
Food waste	<10 tonnes	Wheeled bin	Recycled/recovered off-site

Table 3.11 Wastewater Generation

Type of Waste	Estimated Annual Volume	Storage Type	Disposal Method
Water softener flush water	<1,095 m ³	n/a	To be tankered off-site by an approved waste disposal contractor.
Acid scrubber effluent	<1,095 m ³	n/a	To be tankered off-site by an approved waste disposal contractor.

Table 3.12 BAT Requirements for waste from the glass manufacturing processes (from the Manufacture of Glass BREF, 2013)

BREF Requirement	Proposed Arrangements	BAT?
BAT 14. BAT is to reduce the production of solid waste to be disposed of by using one or a combination of the following techniques: (i) Recycling of waste batch materials, where quality requirements allow for it; (ii) Minimising material losses during the storage and handling of raw materials; (iii) Recycling of internal cullet from rejected production; (iv) Recycling of dust in the batch formulation where quality requirements allow for it; (v) Valorisation of solid waste and/or sludge through appropriate use on-site (e.g. sludge from water treatment) or in other industries;	(i) The installation recycles materials into the production of new RMW. (ii) Material losses from handling of raw materials is minimised by the use of bulk silos for storage of raw materials, mechanical handling using appropriate manual handling equipment (as required) and recovery of dusts from the silo exhaust air with the use of filters. Quality checks on inputs to the process minimises generation of solid waste. (iii) The installation recycles waste batch materials into the production of new RMW. (iv) The installation recycles dust in the production of new RMW. (v) Is not applicable to mineral wool manufacturing.	Yes

BREF Requirement		Proposed Arrangements	BAT?
(vi)	Valorisation of end-of-life refractory materials for possible use in other industries.	(vi) The SAF melter is designed to have a significantly greater lifespan compared to cupola, which generates less solid waste for refractory lining replacement.	
(vii)	Applying cement bonded briquetting of waste for recycling into hot blast cupola furnaces where quality requirements allow for it	(vii) Is not applicable to mineral wool manufacturing.	

4. Operations

The following Sections provide an overview of the operations and processes that are proposed to be undertaken by Knauf at the new RMW site at Shotton. The process description for operations at the Site can be split into the following six sub-sections

4.1 Batch preparation

Deliveries of raw materials are made to the site in bulk trucks (e.g. Heavy Goods Vehicles (HGVs)) which are fully laden (as permitted by vehicle size) carrying maximum permitted quantities of material at a time, the HGV is unloaded, and the material is stored on site. Raw materials consist of:

- Basalt
- BF slag
- EAF slag
- RMW waste and by-products (from internal and external sources)

Basalt and slag raw materials are unloaded and stored inside of the raw material building, in large storage bays. RMW wastes are unloaded / stored and milled (for size reduction purposes) if required, inside of the waste preparation building, using a rod mill which is located inside of a noise insulated location. Milled waste is stored within a large storage bay inside of the same building.

Raw materials are stored within large raw material silos and a batch is prepared by mixing specific proportions of the raw materials (from all sources) in the required quantities, up to approximately a total of 400 tonnes of all raw material per day. Depending upon the RMW insulation product being manufactured, combinations of the raw materials are weighed out and conveyed for temporary storage in day bin silos located above the melter in the batch house.

The batch preparation process areas contain two flues which combine into one common exhaust stack to form a single emission point: batch material unloading from the batching house generates dust which is evacuated and filtered by the infeed dust extraction system. Raw material silos are vented by a dust extraction system on the dosing and material transport system. Both exhausts come together in a single emission point, the common batch house exhaust stack. The common batch house exhaust stack uses a bag filter to remove dust and is monitored and subject to regular maintenance to ensure it is operating properly. The differential pressure across the filter is measured with the results displayed on the site SCADA to confirm normal operation and filters are replaced in line with manufacture recommendations.

4.2 Stone melting process

The pre-mixed batch of raw materials are conveyed from the day bin silos and is melted in a Submerged Arc Furnace (SAF) at a temperature of approximately 1,400°C. The SAF uses electrical energy only and energy is supplied to three graphite electrodes within the SAF. Pollutants within the waste gas from the SAF melter are typically from two sources; first from melting of the raw materials which can result in emissions of CO₂. Secondly, the presence of binder in any recycled RMW and RMW by-products which results in the generation of Volatile Organic Compounds (VOCs) due to incomplete oxidation of organic

compounds. The process also generates NO_x from both the atmospheric air within the SAF melter and any nitrogen compounds found within any of the raw materials. The exhaust gasses generated from the SAF are cooled by adding fresh air and extracted using a melter extraction fan. Cooled exhaust gas, now at approximately 450°C, is filtered to collect the melter dust using a ceramic filter before exhaust gas is subject to thermal treatment. Two ceramic filter units operate in parallel but can also operate using a single unit in the event of planned or un-planned maintenance on one unit. A ceramic filter is used due to the high operating temperature and durability of ceramic filters for this process, compared with bag filters. As required, hydrated lime can be dosed to the SAF melter exhaust gases from the hydrated lime storage silo to remove sulphur oxides in advance of the ceramic filters.

After dust removal, the remaining VOC emissions are oxidized in an electric-only regenerative thermal oxidiser (RTO). For energy efficiency purposes, the SAF melter exhaust gas is first pre-heated via a set of regenerative heat exchangers which use the returns from the RTO to pre-heat the incoming gas. Pre-heated exhaust gas then passes to the combustion chamber of the RTO.

Carbon Monoxide (CO) and VOCs (from binder within the RMW by-product) in the exhaust gas are oxidised within the RTO and converted (to carbon dioxide (CO₂) and water (H₂O)) using atmospheric air. The minimum required temperature within the incinerator is 850°C in order to comply with the Waste Incinerator Directive and temperatures within the incinerator are monitored by a SCADA system to ensure compliance. The RTO is electrically powered and there are no fossil fuel combustion processes within the RTO; it is possible under the right conditions, for the oxidation to provide sufficient heat from the exothermic reaction so that no additional energy is necessary from electrical heating elements to maintain the oxidation reaction. Exhaust gases then pass to the heat exchange to preheat the heat exchanger and pre-heat the incoming exhaust gas.

The final stage is to remove emissions of Nitrous Oxides (NO_x) and Sulphur Oxides (SO_x). Ammonia, from a silo, is injected into the exhaust gas to reduce and abate NO_x emissions to nitrogen and water. The optimum operating temperature is tested and balanced between energy consumption (CO₂ emission), oxidation of organics and reduction of NO_x. Return exhaust gas is cooled within the regenerative heat exchanger to about 200°C in order for the de-SO_x system to operate effectively.

Hydrated lime is supplied from a silo to remove the SO_x, hydrochloric acid (HCl) and hydrofluoric acid (HF). Spent hydrated lime is conveyed to a separate storage silo for later disposal. Both the silos are fitted with silo vents (emission points A8 and A9). Finally, the exhaust gas is passed through a bag filter to remove reacted and unreacted salt before the cleaned exhaust gas is discharged to air via the melter exhaust stack (at emission point A1). Unreacted salt from the bag filter is recirculated through the abatement plant and waste reagent is disposed of as a waste product to suitably permitted waste disposal facilities. The melter exhaust stack at emission point A1 is appropriately sized based on a BAT stack height assessment. The stack height will be 60m

BAT for dust emissions is to use either an electrostatic precipitator or a bag filter, so this choice of technique is compliant with BAT.

In the event of Other Than Normal Operating Conditions (OTNOC) or in an emergency, there is a melter emergency stack which can be used in exceptional situations or due to equipment failure. This is used to evacuate hot gases from the SAF melter, in order to prevent discharges into the installation building or to safely prevent emissions into the abatement system that could overheat it. Other scenarios when the melter emergency stack may be in operation are:

- During start-up of the SAF melter;
- During shut-down of the SAF melter;
- During a power failure; and
- Periods of maintenance of the abatement system.

These abnormal operations will only take place in a limited time per year. The melter emergency stack is fitted with a cap on the top of the stack that would automatically open and has a fail-safe counterweight to prevent its opening otherwise. Discharges to air via the melter emergency stack would take place at emission point A3. The emergency melter stack is appropriately sized based on a BAT stack height assessment and will be 40m.

Approximately once every three weeks (or as required), an iron 'tap out' procedure will need to be completed via an automatic process using a drill. Compared to a cupola furnace, which requires regular 'tap out' multiple times per day using a thermal lance to penetrate a clay plug, by utilising an SAF melter and an automatic drill, both the frequency and type/amount of fugitive emissions of smoke and odour will be significantly reduced at the Site.

4.3 Stonewool formation and curing

The molten flow of melted raw materials from the SAF melter is continuously poured on a set of rotating wheels, called the spinner, to produce the mineral fibres. A chemical binder, from the binder system, is sprayed onto the fibres and the fibres are blown towards a rotating drum with a perforated surface using air flow from a fan. Fibres are collected on the rotating drum and formed into a primary fleece by suction from inside the drum created by an extraction fan(s). The exhaust gas from the drum is now contaminated with fibre and binder and is therefore abated along with other downstream exhaust gases.

The primary fleece is formed into a secondary fleece by a pendulum conveyor which layers the thin primary fleece to form a continuous secondary mat. The linespeed, as one of the operating parameters on the line can be varied to optimise the process and vary the thickness and / or density of the product. If further cutting is required, the cutting saw dusts generated by this stage extracted, scrubbed and merged with other downstream sources.

The secondary fleece is then conveyed into a curing oven where the binder is cured and the thickness is set. The curing process binds the fibres together to meet the required properties of the RMW. The exhaust gas from the curing oven is extracted, scrubbed and merged with the gas extracted from upstream sources.

Exhaust gases are first pre-scrubbed with water scrubbers before it is subject to filtering via a wet electrostatic precipitator (WESP) and being discharged to air via the down-stream stack (at emission point A2). The WESP is a two-stage process consisting of an acid scrubber working in series with the WESP.

The pre-scrubbers use recirculated water from a closed-loop system which includes filtration and separation techniques to separate fibres and other solids from the water. Sulphuric acid is dosed into the scrubber water to achieve a concentration of 25% in order to reduce the amount of ammonia present within the down-stream emissions. This results in a chemical reaction taking place between the ammonia and the acid so as to achieve very low levels of ammonia in the emissions to air. This reduction is greater than what is required to achieve the Best Available Technique Associated Emission Limits (BAT-AEL) for ammonia in the Glass Manufacturing BREF. To achieve the maximum ammonia abatement, a

pH between 5.8 and 6.8 is required with the lower end achieving the best ammonia reduction. Scrubber water is periodically extracted to be used for binder make-up by purging water from the WESP tank. The process uses a vacuum evaporator system to increase the concentration of non-volatile components within the effluent. This effluent is then discharged from the vacuum evaporator system and subject to disposal as a liquid effluent. Following the pre-scrubber stage, saturated exhaust gases combine in the WESP which uses electrical forces to remove particulate matter (PM) and aerosols from exhaust gases. Downstream of the WESP, exhaust gas is discharged to air via a stack at emission point A2. The downstream stack is appropriately sized based on a BAT stack height assessment. The stack height will be 120m in order to achieve the optimal air quality impacts and mitigate the impacts on the environment.

The design of the abatement system which uses a wet scrubbing system prior to the WESP has been specified and included within the design of Knauf Shotton to reduce the point source emissions to air of ammonia. A wet scrubber is expected to prevent emissions of odour with greater efficacy than equivalent facilities which use dry systems that can be associated with elevated odour emissions. Because of the WESP, point source emissions of odour will be significantly reduced and are anticipated to be below BAT-AELs at all times.

4.4 Fabrication

The next stage in the process is the fabrication of RMW products. After the curing oven, the product is cooled down using ambient air and then processed to meet the customer requirements. Cooling air is scrubbed with water and merges with exhaust gas from the curing oven and is treated by the WESP (as above), with the treated cooling air discharged via the down-stream stack at emission point A2.

The cooled product is then subject to edge trimming, cutting, grinding (where necessary) to the required product size. The finished product is then passed into the packaging area where it is packaged, labelled and stored awaiting dispatch from the site. Dust generated during the cutting process is extracted via a de-dusting system and recycled back into the process. Air from the de-dusting system is filtered to remove fibres before the filtered air is either discharged to air via the de-dusting stack (at emission point A4) or returned to the production building, to avoid the discharge of warm air from the building during winter time. The de-dusting stack uses a bag filter to remove dust and is monitored and subject to regular maintenance to ensure it is operating properly. The differential pressure across the filter is measured with the results displayed on the site SCADA to confirm normal operation and filters are replaced in line with manufacture recommendations.

4.5 Recycling

The installation generates by-products from the manufacture of the RMW which can be collected at various stages in the process and recycled. This includes scrap products, spinner waste (shots), granulate, filter dusts and trimmings. By-products are collected, processed, mixed and returned to the raw material silos and re-introduced to the SAF melter at the beginning of the process. Alternatively, by-products coming from edge trimming saws and from the recycling hammer mill can be introduced into the collection drum. Air is used to pneumatically transport filter dusts to and from an intermediate fibre recycling storage silo and this transport air is subject to filtering before it is discharged to air via the fibre recycling exhaust, at emission point A5. The fibre recycling stack uses a bag filter to remove dust and is monitored and subject to regular maintenance to ensure it is operating properly. The differential

pressure across the filter is measured with the results displayed on the site SCADA to confirm normal operation and filters are replaced in line with manufacture recommendations.

Fibre dust generated from cutting and grinding is extracted using the de-dust system. Extracted air is filtered using a bag filter and the fibre dust is collected at the bottom of the filter and recycled back into the manufacturing process.

4.6 Binder, wash water and utilities

The production of RMW requires some associated processes including the preparation of binder from raw materials and storage of binder and constituent raw materials.

Raw materials are delivered to the site and stored within bulk silos or smaller IBCs depending on usage rate for use within the binder make-up system. Different types of binder solution are required depending on the RMW product being produced on the manufacturing line however only one binder is used at a time, up to approximately 60 tonnes per day. Different raw materials are diluted with non-potable water, including recycled water from the wash water system.

Softened water (from the water treatment process), equipment cooling water and compressed air are also required to maintain operations within the installation.

Utilities are provided to the installation by the local infrastructure including:

- Natural gas from the National Grid Gas.
- Electricity from the National Grid
- On-site sewage treatment within a packaged effluent treatment plant
- Water supply from the local water company supplier

Back-up electricity will be provided by an emergency generator to hydraulic systems, cooling water systems and control equipment to enable the installation to operate safely and protect against major damage, fire risk of other hazardous situations. The emergency generator will utilise diesel fuel and the electrical output will be <1 MWth.

4.7 Waste Pre-acceptance and Acceptance

The installation will accept a number of wastes for use within the RMW insulation manufacturing process at Knauf Shotton.

Waste materials received will have originated from Knauf Queensferry RMW facility and will consist of shots, cut-offs, scrap and filter dust. The waste from Knauf Queensferry will be transferred from the site using a licensed waste carrier and subject to duty of care requirements.

The site will also accept third-party construction and demolition waste in smaller quantities from pre-approved returns partners who are existing customers of Knauf Insulation and where the wastes will consist of products originally manufactured by Knauf. The composition and characteristic of this waste material will therefore be known to Knauf.

Alternatively, RMW by-products produced across the Knauf Shotton site will include shots, cut-offs, scrap and filter dust from material losses in the production of RMW will be subject to re-use. These by-

products are already characterised and known as to their composition and will be utilised as part of the feedstock to the Knauf Shotton process.

Table 4.1 below lists the relevant waste codes for acceptance and use on site.

Table 4.1 Types of Waste Accepted

EWC code	Description
10	Thermal Processes
10 02	Iron and steel industry
10 02 01	Wastes from the processing of slag
10 02 02	Unprocessed slag
10 09	Casting of ferrous pieces
10 09 03	Furnace slag
10 10	Casting of non-ferrous pieces
10 10 03	Furnace slag
17	Construction and demolition wastes (including excavated soil from contaminated sites)
17 06	Insulation materials and asbestos-containing construction materials
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03

Wastes will only be accepted on site if it conforms with the requirements of the waste pre-acceptance and waste acceptance instruction as detailed in the KIMS Waste Acceptance Procedure (see Appendix 7).

This procedure requires the following:

Waste Pre-acceptance:

- All waste producers must be from a pre-approved returns partner;
- The approved returns partner must complete a Knauf Insulation Pre-Acceptance Form detailing: the source of the waste; if the waste is clean and uncontaminated, or, if the waste is potentially contaminated with other substances (e.g. paints, adhesives); and, the estimated volume and frequency of the returns;
- The pre-approved returns partner must classify waste and provide additional details on the potential contaminant and any available analytical testing if classifying the waste as potentially contaminated;
- The pre-approved returns partner must package the waste appropriately for transportation and use a licensed waste carrier; and
- The pre-approved returns partner must provide a Waste Transfer Note (WTN) with each delivery to Knauf Shotton.

Waste Acceptance

- All deliveries of waste will be subject to initial acceptance inspection to visually confirm compliance with the returns partner's classification. Plant Operators at Knauf Shotton will be trained in this procedure and the necessary checks that need to be completed. Waste that fails the initial acceptance inspection is rejected and returned to the producer;
- All deliveries of waste will be subject to a document check to confirm the WTN is completed correctly and allows the information about the delivery to be logged on the Knauf waste management system;
- All deliveries will be weighed on acceptance and the weight recorded on the Knauf waste management system; and
- Accepted waste is segregated between waste types and stored on site in a designated area/bay of the raw material building.
- Waste that is accepted at the site but subsequently identified as non-conforming will be sent for off-site disposal at a licensed waste facility.

Received Waste Storage

- Conforming wastes accepted at the site will be stored within designated bays within a designated area of the site, located in the west of the installation.
- Designated bays will keep different waste types separate, in order to prevent cross-contamination and aligned to appropriate measures for waste.
- Waste will be stored for a minimal amount of time due to the continuous nature of the site operations.
- As required, wastes are weighed and conveyed for temporary storage within a day bin ahead of processing.

5. Emissions and Monitoring

This section identifies the emissions from the Site and describes the measures for managing and monitoring relevant emissions. The installation will have a limited number of emissions to air, water and land.

5.1 BAT-AELs

As identified within the process description above, operations at the new RMW manufacturing facility are designed to reduce waste gas emissions to air using a combination of best available techniques and abatement technologies. In specific circumstances, the design of the abatement equipment will go beyond what is required by the BAT conclusions for industrial emissions from the manufacture of glass. The following section of Chapter 5 identifies proposed point source emissions to air, parameters of the waste gas emissions, proposed limits (including units) and proposed monitoring.

For emissions of nitrogen (NO_x expressed as NO_2) and ammonia from the SAF melter and from the down stream final product formation and curing processes, the design of the facility will achieve emissions to air that are less than the typical upper limits of the BAT-AELs. This applies to emissions from the melting furnace in the mineral wool sector (Table 47 of the BAT conclusions) and from downstream processes in the mineral wool sector (Table 53 of the BAT conclusions). The aim is to achieve a high level of protection to the environment and to prevent deposition impacts.

The operator (in consultation with the supply chain) has considered what is technically and economically feasible for the entire BAT-AEL range for these two parameters. The limits presented represent the best performance achievable by the facility to enable operations at this location. This takes into consideration the range of raw material inputs needed by the facility to meet customer requirements, the contribution the new facility will make to local, regional and national objectives and the potential impacts on the local environmental conditions. The proposed limits are lower than the strictest limit of the BAT-AELs which would otherwise normally be specified by the regulator. Emissions lower than the proposed limits are not considered to be achievable on both a technically possible and economically viable basis.

5.2 Point Source Emissions to Air

There will be a total of 9 emission points within the facility constituting point source emissions. Each emission point will be fitted with appropriate abatement, depending on the nature of emissions.

Emissions to air will comprise the following stacks:

- Emissions to air from melter exhaust stack (A1);
- Emissions to air from the down stream stack (A2);
- Emissions to air from melter emergency stack (A3);
- Emissions to air from de-dusting stack (A4);
- Emissions to air from fibre recycling exhaust (A5);
- Emissions to air from common batch house (A6);
- Emissions to air from ammonia tank PRV (A7);
- Emissions to air from de-SO_x vent (fresh product) (A8); and

- Emissions to air from de-SO_x vent (reacted product) (A9)

An Air Emissions Risk Assessment was undertaken considering only those classed as point source emissions to air and considered only those parameters that were anticipated to be in the discharge.

Further detail on the emission points is included in the Table 5.1 below, highlighting key information such as the location of the release point, the nature of emissions, the form of abatement to be used and BAT Associated Emission Limits.

Table 5.1 Emissions to Air

Emission point reference	Source	Parameter	Limit	Unit	Reference Period	Monitoring Frequency	Monitoring Standard
A1 (NGR: SJ 310 704*)	Emissions to air from melter exhaust stack (A1)	Dust	20 (0.05)	mg/Nm ³ (kg/tonne melt)	-	Continuous	BS EN 13284-2. Permanent sampling to meet the requirements of TGN M1.
		Nitrogen Oxides	259 (0.648)	mg/Nm ³ (kg/tonne melt)	-	Continuous	BS EN 14792. Permanent sampling to meet the requirements of TGN M1.
		Sulphur Oxides	350 (0.9)	mg/Nm ³ (kg/tonne melt)	-	Continuous	BS EN 14791.
		Hydrogen Chloride (HCl)	30 (0.075)	mg/Nm ³ (kg/tonne melt)	Annual	Periodic	BS EN 1911
		Hydrogen Fluoride (HF)	5 (0.013)	mg/Nm ³ (kg/tonne melt)	Annual	Periodic	CEN TS 17340
		Hydrogen sulphide (H ₂ S)	2 (0.005)	mg/Nm ³ (kg/tonne melt)	Annual	Periodic	US EPA method 11
		Metals - Σ (As, Co, Ni, Cd, Se, Cr _{VI})	1 (0.0025)	mg/Nm ³ (kg/tonne melt)	Annual	Periodic	BS EN 14385

Emission point reference	Source	Parameter	Limit	Unit	Reference Period	Monitoring Frequency	Monitoring Standard
		Metals - Σ (As, Co, Ni, Cd, Se, Cr _{VI} , Sb, Pb, Cr _{III} , Cu, Mn, V, Sn)	2 (0.005)	mg/Nm ³ (kg/tonne melt)	Annual	Periodic	BS EN 14385
		Carbon Monoxide (CO)	100	mg/Nm ³	Annual	Periodic	BS EN 15058
		Ammonia (NH ₃)	5	mg/Nm ³	Annual	Periodic	EN ISO 21877
A2 (NGR: SJ 310 703*)	Emissions to air from the down stream stack (A2) (for combined forming, curing and cooling emissions).	Dust	20	mg/Nm ³	-	Continuous	BS EN 13284-2. Permanent sampling to meet the requirements of TGN M1.
		Phenol	10	mg/Nm ³	Annual	Periodic	CEN TS 13649 for sampling OSHA 32 or NIOSH 2546 for analysis
		Formaldehyde	5	mg/Nm ³	Annual	Periodic	CEN TS 17638
		Ammonia	5	mg/Nm ³	Annual	Periodic	EN ISO 21877
		Amines	3	mg/Nm ³	Annual	Periodic	CEN TS 13649 for sampling NIOSH 2002 and NIOSH 2010 for analysis
		Total VOC	30	mg/Nm ³	Annual	Periodic	EN 12619

Emission point reference	Source	Parameter	Limit	Unit	Reference Period	Monitoring Frequency	Monitoring Standard
A3 (NGR: SJ 310 704*)	Emissions to air from melter emergency stack (A3)	No parameter set	No limit set	n/a	n/a	n/a	n/a
A4 (NGR: SJ 312 704*)	Emissions to air from de-dusting stack (A4)	Dust	50	mg/Nm ³ (kg/tonne melt)	-	Periodic	BS EN 13284-1.
A5 (NGR: SJ 311 704)*	Emissions to air from fibre recycling exhaust (A5)	Dust	50	mg/Nm ³ (kg/tonne melt)	-	Periodic	BS EN 13284-1.
A6 (NGR: SJ 310 704*)	Emissions to air from common batch house exhaust stack (A6)	Dust	50	mg/Nm ³ (kg/tonne melt)		Periodic	BS EN 13284-1.
A7 (NGR: SJ 311 703*)	Emissions to air from ammonia tank PRV	No parameter set	No limit set	N/a	N/a	N/a	N/a
A8 (NGR: SJ 310 704*)	Emissions to air from de-SOx vent (fresh product)	No parameter set	No limit set	N/a	N/a	N/a	N/a

Emission point reference	Source	Parameter	Limit	Unit	Reference Period	Monitoring Frequency	Monitoring Standard
A9 (NGR: SJ 310 704*)	Emissions to air from de-SOx vent (reacted product)	No parameter set	No limit set	N/a	N/a	N/a	N/a
* National Grid References for Emission Points are provided to six-digits to allow for flexibility within final stage of design and will be updated.							

Table 5.2 details the BAT requirements for emissions to air from the manufacture of glass BAT conclusions and how the facility will meet these requirements.

Table 5.2 BAT Requirements for Emissions to Air from Manufacture of Glass BAT Conclusions

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 5. BAT is to reduce energy consumption and emissions to air by carrying out a constant monitoring of the operational parameters and a programmed maintenance of the melting furnace.	The process will have a SCADA based control or equivalent system. Knauf Insulation holds an organisational level energy management system certified to ISO 50001:2018. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will be extended to include Knauf Shotton once the site has become operational Although this BAT is applicable to regenerative, recuperative, and oxy-fuel fired furnaces whereas the installation will use a SAF melter, some techniques will apply. Depending on the composition of the input raw materials, different ratios of cooling and dilution air will be required although the melter uses electrical power only so there is no fuel input. Energy input is strictly monitored and controlled. Regular preventative maintenance will take place during planned downtime, including maintenance of the melter as per a maintenance strategy. This maintenance strategy takes into account manufacturer recommendations for maintenance schedules and inspections including regular visual inspections to determine the status of the melter lining. The melter includes multiple temperature sensors which allows process monitoring on the state and development of the refractory lining in real time and historically to minimise aging effects. The melter refractory is insulated by a combination of graphite plates and water cooling of the outer steel shell.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 6. BAT is to carry out a careful selection and control of all substances and raw materials entering the melting furnace in order to reduce or prevent emissions to air by using one or a combination of the following techniques (i) Use of raw materials and external cullet with low levels of impurities (e.g. metals, chlorides, fluorides) (ii) Use of alternative raw materials (e.g. less volatile) (iii) Use of fuels with low metal impurities	All raw materials are purchased in accordance with supply specifications. Internal recycled material will be based upon process material which was purchased to these specifications and subsequently used within the process. Other wastes used would be materials from another production facility at Queensferry which will be in accordance with known levels of impurities. (i) Raw materials used at the installation will be a combination of primary and secondary raw materials, sourced from approved suppliers and return partners. The KIMS includes procedures for checking the quality of raw material inputs to promote process control. Naturally occurring materials, e.g. basalt, may contain impurities at trace levels. The choice of input materials will be dependent on the products being made. The installation will use external material from a second Knauf installation as the first choice in order to control substances entering the melting furnace. Waste acceptance checks on secondary raw material arriving at the installation from pre-approved return partners are completed to identify any non-conforming raw materials before they are enter the melter in order to reduce emissions to air. (ii) The installation makes use of a number of different raw materials depending on the required product that is to be made. The main raw materials are all generally non-volatile. (iii) Technique not applicable but eliminating cokes and cement fuels eliminates two sources of sulphur in emissions to air when compared to a traditional cupola-type furnace.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 8. BAT is to operate the waste gas treatment systems during normal operating conditions at optimal capacity and availability in order to prevent or reduce emissions. Special procedures can be defined for specific operating conditions, in particular: (i) during start-up and shutdown operations (ii) during other special operations which could affect the proper functioning of the systems (e.g. regular and extraordinary maintenance work and cleaning operations of the furnace and/or of the waste gas treatment system, or severe production change) (iii) in the case of insufficient waste gas flow or temperature which prevents the use of the system at full capacity.	Waste gas systems will be operated at full capacity during normal operation. (i) The installation operates two waste gas treatment systems: one on the SAF melter emissions and a second system on downstream process emissions. The installation operates an emergency stack as an integral part of the installation to operate safely. This is used in exceptional situations or equipment failure only, including during start up and shut down operations. During start up and shutdown operations, the gases from the SAF melter will be discharged prior to the waste gas treatment systems. Emissions on downstream processes will only be generated during normal operations of the downstream processes. (ii) The installation operates an emergency stack as an integral part of the installation to operate safely. This is used in exceptional situations or equipment failure only, including in case of power failure, planned maintenance and during melter upset conditions to prevent overheating of the waste gas treatment system or discharge of waste gases into the main building. The installation will have a maintenance strategy including schedules of recommended maintenance and inspection programmes to minimise the risk of special conditions caused by extraordinary maintenance work. During these operations, the gases from the SAF melter will be discharged prior to the waste gas treatment systems. (iii) The waste gas treatment systems are designed to operate for a variety of operating scenarios including variable rates of recycling material inputs and combustion chamber temperatures. If operating conditions fall outside of these safe operating envelopes, then waste gases may be diverted to emergency systems including the emergency stack.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 9. BAT is to limit carbon monoxide (CO) emissions from the melting furnace, when applying primary techniques or chemical reduction by fuel, for the reduction of NO_x emissions Primary techniques for the reduction of NO_x emissions are based on combustion modifications (e.g. reduction of air/fuel ratio, staged combustion low-NOX burners, etc.). Chemical reduction by fuel consists of the addition of hydrocarbon fuel to the waste gas stream to reduce the NO_x formed in the furnace. The increase in CO emissions due to the application of these techniques can be limited by a careful control of the operational parameters	The site makes use of a submerged arc furnace which melts using electricity rather than fossil fuels and avoids emissions to air from this combustion. Some CO will be generated in the electric RTO which mainly combusts VOCs to carbon dioxide and water. NO_x can be generated as thermal NO_x but is controlled by process management and a de-NO_x system.	Yes
BAT 10. BAT is to limit ammonia (NH₃) emissions, when applying selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) techniques for a high efficiency NO_x emissions	The installation uses a SNCR de-NO_x system. The optimum temperature for de-NO_x, between 850°C and 950°C, will be tested and balanced between energy consumption, oxidation of organics and reduction of NO_x. Liquid ammonia, injected into the waste gas stream from a silo, will be used to decompose NO_x in the waste gases emitted to air.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 11. BAT is to reduce boron emissions from the melting furnace, when boron compounds are used in the batch formulation, by using one or a combination of the following techniques: (i) Operation of a filtration system at a suitable temperature for enhancing the separation of boron compounds in the solid state, taking into account that some boric acid species may be present in the flue-gas as gaseous compounds at temperatures below 200 °C, but also as low as 60 °C (ii) Use of dry or semi-dry scrubbing in combination with a filtration system (iii) Use of wet scrubbing The monitoring of boron emissions should be carried out according to a specific methodology which allows measurement of both solid and gaseous forms and to determine the effective removal of these species from the flue gases.	Technique is not applicable as boron compounds are not used in the batch formulation.	N/A
BAT 56. BAT is to reduce dust emissions from the waste gases of the melting furnace by applying an electrostatic precipitator or a bag filter system Filtration system: electrostatic precipitator or bag filter	Waste gases from the SAF melter are subject to filtration using a ceramic filter first to capture dust. Filtered gases are then subject to thermal treatment and abatement with reagent before passing through a bag filter.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 57. BAT is to reduce NO_x emissions from the melting furnace by using one or a combination of the following techniques: (i) Combustion modifications (a) Reduction of air/fuel ratio (b) Reduced combustion air temperature (c) Staged combustion: — Air staging — Fuel staging (d) Flue-gas recirculation (e) Low-NOX burners (f) Fuel choice (ii) Electric melting (iii) Oxy-fuel melting	The melting furnace will be a submerged arc furnace which utilises electric melting.	Yes
BAT 58. When nitrates are used in the batch formulation for glass wool production, BAT is to reduce NO_x emissions by using one or a combination of the following techniques: (i) Minimising the use of nitrates in the batch formulation the use of nitrates is applied as an oxidising agent in batch formulations with high levels of external cullet to compensate for the presence of organic material contained in the cullet (ii) Electric melting (iii) Oxy-fuel melting	Nitrates not used in the batch formulation. Furthermore, the melting furnace will be a submerged arc furnace which utilises electric melting.	N/A

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 59. BAT is to reduce SO_x emissions from the melting furnace by using one or a combination of the following techniques: (i) Minimisation of the sulphur content in the batch formulation and optimisation of the sulphur balance (ii) Use of low sulphur content fuels (iii) Dry or semi-dry scrubbing, in combination with a filtration system (iv) Use of wet scrubbing	(i) The batch formulation, depending on the product being made, minimises the sulphur content through raw material selection. Electric melting removes two sources of sulphur in the SAF exhaust gas (coke and cement). (ii) The installation uses electrical power in the melter and RTO. Electrical energy at point of use does not give rise to sulphur. (iii) The installation uses hydrated lime dry scrubbing, in combination with a filtration system to reduce SO_x emissions. (iv) Technique is not applicable to the melting furnace which uses a dry scrubbing system.	Yes
BAT 60. BAT is to reduce HCl and HF emissions from the melting furnace by using one or a combination of the following techniques: i) Selection of raw materials for the batch formulation with a low content of chlorine and fluorine (ii) Dry or semi-dry scrubbing, in combination with a filtration system	(i) The batch formulation, depending on the product being made, minimises the content of HCl and HF through raw material selection. By using a higher recycled content and minimising mineral stones, there will be a reduced amount of HCl and HF in emissions to air. (ii) The installation will use a dry system with hydrated lime powder injection to reduce emissions to air, including HCl and HF. This is followed a filtration system using bag filters to capture the reacted reagent and reduce emissions.	Yes
BAT 61. BAT is to reduce H₂S emissions from the melting furnace by applying a waste gas incineration system to oxidise hydrogen sulphide to SO₂	The melting furnace will be fitted with an electrically powered waste gas RTO for the oxidation of hydrogen sulphide.	Yes
BAT 62. BAT is to reduce metal emissions from the melting furnace by using one or a combination of the following techniques: (i) Selection of raw materials for the batch formulation with a low content of metals (ii) Application of a filtration system	(i) Selection of raw materials for batch formulation is dependent upon the final product being made. Where possible, materials with a low content of metals will be chosen although this may be limited when raw materials have a high recycled content. (ii) Emissions from the SAF melter are subject to ceramic filter prior to the RTO and subject to a bag filter after the RTO to reduce metal emissions to air.	Yes

Requirements	Proposed Arrangements	Appropriate Measure?
BAT 63. BAT is to reduce emissions from downstream processes by using one or a combination of the following techniques: (i) Impact jets and cyclones The technique is based on the removal of particles and droplets from waste gases by impaction/impingement, as well as gaseous substances by partial absorption with water. Process water is normally used for impact jets. The recycling process water is filtered before it is reapplied (ii) Wet scrubbers (iii) Wet electrostatic precipitators (iv) Stone wool filters It consists of a steel or concrete structure in which stone wool slabs are mounted and act as a filter medium. The filtering medium needs to be cleaned or exchanged periodically. This filter is suitable for waste gases with a high moisture content and particulate matter with an adhesive nature (v) Waste gas incineration	(i) Technique not applicable (ii) The installation will use a wet scrubber system upstream of a WESP on emissions to air from downstream processes. (iii) The installation will use a wet electrostatic precipitator (WESP) downstream of a wet scrubber system on emissions to air from downstream processes (iv) Technique is not used within the installation (v) Technique is not used within the installation	Yes

5.3 Emissions to Water

Emissions to water will comprise:

- Discharge of surface water run-off (W1).
- Discharge of surface water run-off (W2).

The key parameters for the emissions to water can be seen in Table 5.3.

Table 5.3 Emissions to Water

Emission point reference	Source	Parameter	Limit	Unit
W1 (NGR: SJ 312 702*)	Surface water run off	No parameter set	No limit set	n/a
W2 (NGR: SJ 313 702*)	Surface water run off	No parameter set	No limit set	n/a
* National Grid References for Emission Points are provided to six-digits to allow for flexibility within final stage of design and will be updated.				

Table 5.4 below outlines the appropriate measures that should be taken to control point source emissions to water and sewer.

Table 5.4 BAT Requirements for emissions to water from the Manufacture of Glass Bat Conclusions

BREF Requirement	Proposed Arrangements	BAT?
BAT 12. BAT is to reduce water consumption by using one or a combination of the following techniques: (i) Minimisation of spillages and leaks (ii) Reuse of cooling and cleaning waters after purging (iii) Operate a quasi-closed loop water system as far as technically and economically feasible	(i) The technique is generally applicable by the application of good housekeeping, maintenance and regular inspections on plant equipment as per the overall EMS. Operators will be suitably trained and competent in performing and transfer tasks involving water so as to minimise the risk of spillages occurring. A number of transfer operations within the installation will be completed automatically via pumps and controlled via PLC on a SCADA system (or similar). A maintenance strategy including schedules of recommended maintenance and inspection programmes will be used to reduce water consumption by looking for cooling water leaks and monitoring cooling water. (ii) The installation re-uses water to reduce water consumption through an extensive extended water recirculation system that enables process waters to be re-used in a lower grade. Some cooling water is lost to evaporation. Drum cleaning wash waters are reused within the binder preparation. (iii) The installation uses an extended water recirculation system that is closed loop as far as technically feasible but does require fresh water supplies to top-up evaporation losses. Drum cleaning requires fresh water which is re-used within the binder preparation system. There are no processes that discharge to sewer.	Yes

BREF Requirement	Proposed Arrangements	BAT?
BAT 13. BAT is to reduce the emission load of pollutants in the wastewater discharges by using one or a combination of the following wastewater treatment systems: (i) Standard pollution control techniques, such as settlement, screening, skimming, neutralisation, filtration, aeration, precipitation, coagulation and flocculation, etc. Standard good practice techniques to control emissions from storage of liquid raw materials and intermediates, such as containments, inspection/testing of tanks, overfill protection, etc. (ii) Biological treatment systems, such as activated sludge, biofiltration to remove/degrade the organic compounds (iii) Discharge to municipal wastewater treatment plants (iv) External reuse of waste waters	There are no processes within the installation that will discharge to sewer. This enables water to be re-used within a lower grade before it is consumed by the binder preparation system. As a result there is not a requirement to reduce pollutants and standard techniques do not apply. Standard good practices to control emissions from the storage of liquid raw materials do apply and the site makes use of suitable storage tanks, containers and silos which are fitted with protection measures to prevent overfilling and located within (or for smaller volume liquid containers, placed on) suitably sized bunds.	N/A

5.4 Emissions of Substances Not Controlled by Emission Limits (Fugitive Emissions)

Dust Mud and Litter

Table 5.5 below details the management measures in place for the control of dust, mud and litter in accordance with gov.uk web guidance Control and monitor emissions for your environmental permit.

Table 5.5 Guidance on Dust, Mud and Litter

Requirement	Proposed Arrangements	Appropriate Measure?
Site layout, housekeeping and operations Appropriate measures include: designing the layout of your site to prevent emissions and limit the emissions sensitive receptors are exposed to – for example homes, schools, hospitals or nursing homes, food preparation facilities or similar using good housekeeping practices to make sure your site is clear of dust, mud, litter and other debris using road sweepers to remove dust, mud, litter and other debris erecting litter fences or micro-netting around the site avoiding activities that could spread dust and particulates, mud or litter during high winds – for example, loading and unloading waste from vehicles outside buildings or treating waste materials outside buildings making sure treatment process parameters, such as temperature or moisture, are set at the right level making sure abatement systems are designed to treat and minimise releases – these systems must be monitored and maintained following the designer's or manufacturer's recommendations	There are no sensitive receptors in close proximity to the proposed site. Good housekeeping measures will be adopted at site to prevent issues with regards to dust, mud and litter. The site has developed a fugitive emissions management plan for this application which addresses dust. Road sweepers can be used as and when required. No treatment of waste taking place within the installation. Abatement systems are appropriately designed and maintained in accordance with manufacturer's recommendations.	Yes
Enclosure in buildings Appropriate measures include: carrying out operations inside buildings using negative pressure dust extraction systems whenever possible installing PVC strip curtains to reduce emissions through doorways installing automatic, fast-closing doors and designing doorways and openings in a way that prevents through-drafts enclosing conveyors and minimising drops, or using pneumatic or screw conveying systems installing filters to vents on silos, building extractors and conveying systems using abatement systems that are designed, monitored and maintained by qualified personnel	All production activities will take place within buildings and some process will operate under negative air pressure subject via automatic controlled extraction of air. Abatement systems are designed, monitored and maintained by qualified personnel. Doors into the production facility for vehicular movement will be fast-closing doors.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
Vehicle movement Appropriate measures include: using enclosed vehicles, skips or containers wherever possible, or covering them if this is not possible (unless they're empty) enforcing speed limits and reducing vehicle movements and idling on site minimising the number of access points to your site from public roads surfacing or paving your roadways suitably (ideally with concrete) to make them easy to clean making sure vehicles keep to paved roads regularly cleaning and dampening roadways using wheel wash systems to slow trucks – wash wheels and keep roadways damp making sure road-going vehicles do not enter unmade ground and muddy areas (including the tipping piles) to reduce muddy track-out	All internal roadways will be hardstanding. All vehicles will be enclosed for transporting materials to site or wastes from site. Speed limits will be enforced for all vehicles within the site. Road ways can be cleaned with road sweepers as and when required if considered to be dirty.	Yes
Dust suppression and monitoring Appropriate measures include: using appropriate dust suppression systems (such as mist sprays, bowzers, water cannons, chemical suppressants, heavy water and foam suppressants) at appropriate locations and times installing dust and particulate monitors with trigger alarms	The site is not for the treatment of waste. All measures for the control of dust are presented in the fugitive emissions management plan.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
Stockpiled wastes and open ground You must keep stockpile levels at least 0.5m below the top of structures holding the waste to minimise wind-whipping at all times. Other appropriate measures include: - controlling the moisture content of the material in the stockpile to prevent materials becoming friable - planting grass or trees on open ground to reduce dust (hydro-seeding can rapidly establish vegetation on waste tips, slag heaps or other apparently infertile ground) - not positioning stockpiles outdoors or leaving them uncovered If you cannot avoid positioning stockpiles outdoors, or leaving them uncovered, you should take steps to prevent material escaping from them. For example by: - using sprays and binders - appropriately positioning bay walls or windbreaks - making sure stockpiles do not face the direction of the prevailing wind - minimising waste storage heights and volumes - covering - minimising stockpile volumes	All waste materials delivered to site from Queensferry will be stored in an enclosed area. All measures for the control of dust are presented in the fugitive emissions management plan.	Yes
Emissions management plan for dust Waste management activities have the potential to produce dust pollution. You must provide a dust and emissions management plan if you are applying for a bespoke permit.	All waste materials delivered to site from Queensferry will be stored in an enclosed area. All measures for the control of dust are presented in the fugitive emissions management plan.	Yes

Fugitive Emissions to Water

Table 5.6 below details indicative BAT requirements for fugitive emissions from GOV.UK guidance:

Table 5.6 Fugitive Emissions to Water

Requirement	Proposed Arrangements	Appropriate Measure?
Make sure that your site surfaces, including roofs, hard standing, working areas, any containment structures required by your permit, such as bunds or other secondary containment measures, and your site drainage infrastructure will prevent pollution to surface water and groundwater. Consider collection capacities, surface thicknesses, strength and reinforcement, falls, materials of construction and permeability. You must make sure any rainfall collection systems are kept separate from areas of the site which are or may be contaminated. Make sure your surfaces and containment or drainage facilities are resistant to spilled chemicals. Your management system must include a plan about how you will inspect and maintain your surfaces and containment facilities. The following are needed to prevent contaminated runoff polluting groundwater or surface waters: ■ a waterproof surface ■ spill containment kerbs ■ sealed construction joints If you do not already have these things in place you must have a plan to show how and when you'll put them in place if they're needed. You may need to use extra measures to control risks in the meantime. Your permit may say you must have a connection to a sealed drainage system.	All process areas will be designed to prevent pollution by being suitably constructed hard standing for the activities to be undertaken. All surface water will be collected and discharged via point W1/W2 to the pond off-site. All rainfall collection systems will be kept separate from foul systems as detailed on the drainage plan. There are no process discharges associated with the facility. Bunded areas from site operations collect water and directs it for use within the extended water recirculation system. All areas where chemicals are handled and stored will be resistant to the chemicals. Roadways and operational areas will be fitted with appropriate containment kerbing.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
A sealed drainage system prevents water escaping from your operational area, and means any liquid used in your process will be stored in the system and collected for disposal elsewhere. You must: - collect any liquid that passes through your drainage system in a sealed sump (collection pool), unless you have a permit to discharge the liquid - dispose of collected liquid through a treatment facility or have it collected by a specialist waste disposal company If your operation causes pollution, you must: - clean up the pollution as soon as possible - stop the activity until you have changed your operation to prevent pollution in future tell the Environment Agency (your permit will tell you how to do this)		
Leaks from containers You must prevent leaks or accidental release of liquids that could cause pollution from tanks, sumps, containers and bunds. Bunds are walls built around tanks to capture anything that leaks from them.	All tanks will be appropriately bunded to prevent any release in the event of an accident. All bunds will be appropriately constructed and included within the site preventative maintenance programme.	Yes
Piping and drainage You must design your site so that leaks from underground structures are prevented and any leaks can be detected quickly. You must keep a record of the route of any underground drains or pipework on your site. If you use oil in your operations you must fit and maintain oil separators to surface water drainage systems to prevent discharges being contaminated by oil.	All subsurface drainage structures are included in the site drainage plan. Only surface water and some limited domestic effluent are below ground. Domestic effluent treated through a packaged effluent treatment plant.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
Containing emissions You must provide containment (bunding) for underground pipework, sumps and storage vessels. You may also need to fit a leak detection system, for example if you're carrying out your activity in a groundwater source protection zone. You must keep a list of any underground sumps or storage vessels. Your sumps and bunds must be: ■ waterproof ■ resistant to any materials you're going to store in them You must make sure sumps and bunds do not become contaminated or blocked as this may cause them to leak. You must: ■ check that sumps and bunds are working correctly, for example that there are no cracks ■ hydraulically test any sump or bund if you're worried it is not working correctly ■ fit a high-level probe to any sumps or bunds that you cannot check with an alarm to alert you before waste begins to escape containment Your bunds must also have a capacity larger than both of the following: ■ 110% of the largest tank the bund is protecting ■ 25% of the combined volume of all the tanks the bund is protecting ■ Use the maximum volume that a tank can physically hold when calculating capacity. Do not use the volume a tank is designed to hold. Your bunds must also: ■ have no outlets (for example drains or taps)	All above ground tanks, see Site Condition Report Section 5.1, will be bundled and will be designed to 110% of the largest tank or 25% of the total tankage. Pipework will be located within the bund and there will be no penetration of the bund walls. All bunds will be included within the infrastructure maintenance programme. All sumps will have a unique identifier and be included within the preventative maintenance programme. When operational all bunds and sumps will be subject to periodic visual inspection to ensure that they are clear and available for containment of any leaks/spills.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
■ drain to a blind (completely enclosed) collection point ■ have self-contained pipework that is separate from the container pipework Your bunds must have tanker connection points within the bund. If that's not possible, the tanker connections points must be contained to capture any leaks. If you need to use your bund to contain a leak you must make sure it's emptied to restore maximum capacity.		
Storage areas for intermediate bulk containers, drums, bags You must bund or kerb any area where environmentally harmful substances are stored (for example acids, chemical solvents, milk, lubricating oils and styrene). You must store substances separately if it may be risky to store them too near each other, for example because they're flammable or if 2 substances spilled and mixed could cause an explosion or harmful fumes. Do not use plastic intermediate bulk containers (medium-sized containers that can be moved easily and are made out of plastic or metal) to store flammable materials. You must also: - locate storage areas away from watercourses, sensitive groundwater areas such as Source Protection Zone 1, unprotected drainage systems and sensitive boundaries, for example near areas where people live or nature reserves - clearly mark your storage areas, and any containers and packages in them - define the maximum storage capacities for each of your storage areas and containers and stick to them - store containers, including empty containers, with lids, caps and valves secured and in place - inspect your containers, drums and small packages at least once a week to check they're not damaged or leaking and put a procedure in place to replace or repair damaged or leaking containers	All areas where raw materials are to be handled and stored will be secured with all lids and drains sealed or locked off. The areas where they will be handled and stored will be on hardstanding with appropriate bunding and kerbing. These storage areas will be included within daily site inspections and on the preventative maintenance programme.	Yes

Fugitive Emissions TO Air

Table 5.7 below details indicative BAT requirements for fugitive emissions from GOV.UK guidance:

Table 5.7 Fugitive Emissions to Air

Requirement	Proposed Arrangements	Appropriate Measure?
Volatile organic compounds (VOCs) Volatile organic compounds (VOCs) are substances with low boiling points that evaporate from solids or liquids used in industrial processes, for example formaldehyde evaporating from paint, or benzene from fuel. You must take the following steps to prevent emissions of VOCs: ■ enclose any containers on your site ■ fit equipment to capture VOCs on any vents on your site (such as scrubbers or filters) ■ install sealed transfer (vapour balance) systems ■ use sub-surface filling via (anti-syphon) filling pipes extended to the bottom of the container ■ use floating roof tanks and bladder roof tanks ■ use tank vent systems that minimise breathing losses, for example pressure or vacuum valves, and fit knock-out pots where necessary ■ If VOCs are released on your site, you must counter the release with techniques like adsorption (using a substance like a solid or liquid to absorb another substance, like a liquid or gas) or condensation (cooling or compressing a liquid to its saturation point) to capture the VOCs. You must also prevent vapour and fluid emissions by:	All containers for the storage of raw materials will be kept enclosed when not in use. All tanks, as detailed within Table 5.1 of the SCR, will be enclosed. Aqueous ammonia tank for the SNCR system will be fitted with a vapour line back to the tanker during filling operations. All tanks and above ground pipework included within the preventative maintenance programme.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
- managing inventories - preventing leaks from any pipework or fluid transport systems using white paint, insulation and active temperature controls to reduce the temperature in any storage tanks		

5.5 Odour

Odour is not expected to be an issue at receptors given the nature of the production activity and the fact that wastes received are insulation materials which are non-odorous and not organic or biodegradable. The process activities take place in an enclosed building and the nearest sensitive receptors are at a distance of over 1km from site. Table 5.8 below details appropriate measures for odour from GOV.UK guidance:

Table 5.8 Appropriate Measures for Odour

Requirement	Proposed Arrangements	Appropriate Measure?
You must prevent or, where that is not possible, minimise odour if you have a waste, mining waste or installation permit. To do this you must use all appropriate measures, normally including: - restricting raw materials that are likely to cause odour, like putrescible or already putrid biodegradable waste - minimising quantities and storage times for odorous or potentially odorous materials - managing materials and processes in ways which minimise the production of odorous chemicals - working within the effective operational capacity of your site - providing effective containment and abatement for odorous materials and activities You must respond effectively and proportionately to any process monitoring which indicates a problem, or reports from the community of odour pollution. Read the H4 odour guidance for detailed advice on how to manage odour.	Raw materials are not inherently odorous and the site does not receive any waste which is biodegradable as it is only insulation materials or such like from the Queensferry production facility. The process activities take place in an enclosed building and the nearest sensitive receptors are at a distance of over 1km from site	Yes
You must write an odour management plan that explains how you will prevent or minimise odour if your site causes odour pollution, or if you carry out: - landfilling of biodegradable waste - household, commercial and industrial waste transfer station activities - materials recycling and handle odorous inputs or reject streams (or both)	None of these activities take place within the installation therefore an odour management plan is not required.	N/A

Requirement	Proposed Arrangements	Appropriate Measure?
■ composting in open windrows ■ composting in vessels ■ mechanical biological treatment ■ sewage sludge treatment ■ clinical waste treatment ■ animal carcass incineration ■ mobile plant activities for landspreading, treatment of land for land reclamation, restoration or improvement and landspreading of sewage sludge ■ anaerobic digestion ■ mobile plant activities for the treatment of waste soils and contaminated material, substances or products manufacture, use or recovery of compounds containing sulphur, ammonia, amines and amides, aromatic compounds, styrene, pyridine and esters ■ intensive farming ■ abattoirs and rendering operations ■ food production involving any form of cooking or heating and brewing ■ refinery activities ■ distilling or heating of tar or bitumen		

5.6 Noise and vibration

The site is located within Deeside Industrial Park, close to the Tata Steel Shotton Steel Works complex. This location is industrial by nature of its associated former industrial processes and presence of former buildings and compounds. The operation of the site is likely to give rise to emissions of noise due to the industrial processes taking place at the site but is located away from noise sensitive receptors and there are a number of existing intervening commercial buildings located between potential sources of noise and receptors. Sources of noise are likely to come from tipping of raw materials from HGVs into storage bays, the operation of site vehicles which may move raw materials and finished products within the boundaries of the site and operation of industrial equipment e.g. cutting equipment.

The operation of the site may also give rise to operational vibration from the operation of industrial equipment e.g. rotary equipment and hydraulic presses. The sources of operational vibration will be located far away from vibration sensitive receptors whereas the impact of vibration is normally felt in close proximity to the source.

The closest noise and vibration receptors to the site are a residential development located approximately 1,250 meters to the southeast and recreational users of the Welsh Coast Path approximately 1,000 metres to the south of the site. A list of nearby receptors and their distance from the centre of the site is included in Table 5.9 below.

Table 5.9 Noise and Vibration Receptors

Receptor	Type	Direction	Distance from site
Welsh Coast Path	Recreation Route	South	1,000m
St Davids Court, Connahs Quay	Residential Development	South	1,500m
Corus Garden City - Ashberry Homes Development (Jubilee Place)	Residential Development	Southeast	1,250m
Corus Garden City - Bellway Homes Development (Airfield Road)	Residential Development	East	1,500m

A Noise Impact Assessment has not been completed as part of the Permit Application. Although the impacts of noise and vibration are not expected to be significant from the Site, and will not have an impact on offsite receptors, a number of standard measures will be used to prevent and reduce any sources.

Equipment used by Knauf will be designed to be low-noise and well maintained to prevent emissions caused by non-optimal operations.

Operations and equipment that give rise to emissions of noise are located inside of a building with suitable noise insulation, e.g. transfer of raw materials from HGVs to storage bays and milling of waste materials.

Where doors are provided to fully enclose buildings, these will be kept closed when not in use to reduce emissions of noise.

Although the site will operate 24/7, noise-generating activities such as the deliveries of raw materials will not occur late at night to further minimise potential impacts.

As required, reversing sounders can be turned off during night-time hours and the site will have a speed limit to reduce noise and vibration from vehicle movements.

In the event of a noise complaint, the complaint will be investigated in line with Knauf's management system and process for reporting and investigating incidents. If a complaint is substantiated, a Root Cause Analysis will be completed to prevent re-occurrence.

Table 5.10 below details appropriate measures for noise from GOV.UK guidance:

Table 5.10 Appropriate Measures for Noise

Requirement	Proposed Arrangements	Appropriate Measure?
When applying for a permit the Environment Agency may ask you to submit a noise and vibration management plan if: - we think there may be a risk of noise and vibration pollution beyond the site boundary - you have done a noise impact assessment as part of your risk assessment You must consider the findings from any noise impact assessment you do as part of your risk assessment.	A noise impact assessment has not been undertaken for the site as it is considered that the site is located away from noise sensitive receptors (1,250m to residential receptor) and there are a number of existing intervening commercial buildings located between potential sources of noise and receptors. The Environmental Risk Assessment associated with the application concludes that noise is considered to be insignificant.	Yes

5.7 Emissions monitoring

Table 5.11 details the BAT requirements for emissions monitoring from the manufacture of glass BAT conclusions and how the facility will meet these requirements.

Table 5.11 BAT Requirements for Emissions Monitoring from Manufacture of Glass BAT Conclusions

Requirement	Proposed Arrangements	Appropriate Measure?
BAT 5. BAT is to reduce energy consumption and emissions to air by carrying out a constant monitoring of the operational parameters and a programmed maintenance of the melting furnace.	The process will have a SCADA based control or equivalent system. Knauf Insulation holds an organisational level energy management system certified to ISO 50001:2018. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will be extended to include Knauf Shotton once the site has become operational Although this BAT is applicable to regenerative, recuperative, and oxy-fuel fired furnaces whereas the installation will use a SAF melter, some techniques will apply. Depending on the composition of the input raw materials, different ratios of cooling and dilution air will be required although the melter uses electrical power only so there is no fuel input. Energy input is strictly monitored and controlled. Regular preventative maintenance will take place during planned downtime, including maintenance of the melter as per a maintenance strategy. This maintenance strategy takes into account manufacturer recommendations for maintenance schedules and inspections including regular visual inspections to determine the status of the melter lining. The melter includes multiple temperature sensors which allows process monitoring on the state and development of the refractory lining in real time and historically to minimise aging effects. The melter refractory is insulated by a combination of graphite plates and water cooling of the outer steel shell.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
BAT 6. BAT is to carry out a careful selection and control of all substances and raw materials entering the melting furnace in order to reduce or prevent emissions to air by using one or a combination of the following techniques (i) Use of raw materials and external cullet with low levels of impurities (e.g. metals, chlorides, fluorides) (ii) Use of alternative raw materials (e.g. less volatile) (iii) Use of fuels with low metal impurities	All raw materials are purchased in accordance with supply specifications. Internal recycled material will be based upon process material which was purchased to these specifications and subsequently used within the process. Other wastes used would be materials from another production facility at Queensferry which will be in accordance with known levels of impurities. (i) Raw materials used at the installation will be a combination of primary and secondary raw materials, sourced from approved suppliers and return partners. The KIMS includes procedures for checking the quality of raw material inputs to promote process control. Naturally occurring materials, e.g. basalt, may contain impurities at trace levels. The choice of input materials will be dependent on the products being made. The installation will use external material from a second Knauf installation as the first choice in order to control substances entering the melting furnace. Waste acceptance checks on secondary raw material arriving at the installation from pre-approved return partners are completed to identify any non-conforming raw materials before they enter the melter in order to reduce emissions to air. (ii) The installation makes use of a number of different raw materials depending on the required product that is to be made. (iii) The main raw materials are all generally non-volatile. (iv) Technique not applicable but eliminating cokes and cement fuels eliminates two sources of sulphur in emissions to air when compared to a traditional cupola-type furnace.	Yes

Requirement	Proposed Arrangements	Appropriate Measure?
BAT 7. BAT is to carry out monitoring of emissions and/or other relevant process parameters on a regular basis, including the following: (i) Continuous monitoring of critical process parameters to ensure process stability, e.g. temperature, fuel feed and airflow (ii) Regular monitoring of process parameters to prevent/reduce pollution, e.g. O₂ content of the combustion gases to control the fuel/air ratio. (iii) Continuous measurements of dust, NO_x and SO₂ emissions or discontinuous measurements at least twice per year, associated with the control of surrogate parameters to ensure that the treatment system is working properly between measurements (iv) Continuous or regular periodic measurements of NH₃ emissions, when selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) techniques are applied (v) Continuous or regular periodic measurements of CO emissions when primary techniques or chemical reduction by fuel techniques are applied for NO_x emissions reductions or partial combustion may occur. (vi) Regular periodic measurements of emissions of HCl, HF, CO and metals, in particular when raw materials containing such substances are used or partial combustion may occur (vii) Continuous monitoring of surrogate parameters to ensure that the waste gas treatment system is working properly and that the emission levels are maintained between discontinuous measurements. The monitoring of surrogate parameters includes: reagent feed, temperature, water feed, voltage, dust removal, fan speed, etc	(i) The installation will have continuous monitoring of relevant parameters to ensure process stability via a SCADA system. All rotational equipment is installed with continuous monitoring as standard. Where parameters exceed specified limits within the system, operators will be alerted and take appropriate action. (ii) Technique not applicable as the melter uses electrical power only so there is no fuel input but the installation will monitor process parameters, as required to meet production of different products. (iii) Continuous monitoring of process emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (iv) The installation uses a SNCR de-NO_x system. Monitoring of NH₃ emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (v) Monitoring of CO emissions will be carried out in relation to process control using a CEMS (or similar) on melter stack emissions following combustion in the after burner. (vi) Continuous monitoring of process emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (vii) The afterburner (waste gas incinerator) will be closely controlled to minimise emissions as far as practicable whilst achieving its objectives of the destruction of organic substances within the melter gas stream. All emissions will be monitored in accordance with the environmental permit when issued either through continuous or periodic arrangements which will be in accordance with MCERTS.	Yes

6. Environmental Impact

An assessment of the environmental risks posed by the proposed development has been undertaken. In accordance with the EA's requirements for risk assessments (from GOV.UK guidance), the development has been assessed with regards to its potential to generate significant environmental consequences. Appendix 4 comprises a copy of the environmental risk assessment, which:

- Identifies and considers risks of the site and the sources of the risks;
- Identifies the receptors at risk from the site;
- Identifies the possible pathways from the sources of the risks to the receptors;
- Identifies appropriate risk management techniques to control the risks, as necessary; and
- Assesses the overall risks to determine if they can be screened out as significant.

Based on the risk assessment provided in Appendix 4.

The guidance also specifies that there are additional risk assessment requirements depending on:

- The activity the bespoke permit relates to; and
- Where substances are released or discharged into the environment.

6.1 Emissions To Water

Due to the nature of the planned emissions to water, a H1 Risk Assessment has not been conducted as the emissions will only consist of surface water run-off. Provisions will be in place across the facility to ensure that suitable storage of potential contaminants is maintained, to prevent contamination of the surface water run-off, but there will also be an oil interceptor installed prior to discharge from the installation.

There are also no discharges of process water from the installation as the site operates on a zero liquid discharge philosophy with wastewater used within the binder make up. Also, the reverse osmosis reject is collected in a tank for off-site disposal at an appropriately authorised waste treatment facility.

6.2 Emissions To Air

The emissions associated with the operation of the RMW facility recycling facility were input into the H1 Software tool to assess the potential impacts to air and whether further assessment via air dispersion modelling is required. There are 6 stack emission points namely A1 to A6. There are a further three process vents, but these have not been considered further as they are for silos.

The key characteristics of these stacks are also presented in Table 6.1 below.

Table 6.1 Emission Release Points and Key Characteristics

Release point code	Location or grid reference	Activity/Activities	Effective height (metres)	Dispersion factor (Long term)	Dispersion factor (short term)	Dispersion factor (monthly)	Efflux velocity (m/s)	Total flow (m3/h)
A1	331023, 370429	Melter	38	1,228	58.6	1,652	19.2	12204
A2	331015, 370360	Downstream	38	1,228	58.6	1,652	11	384012
A3	331044, 370393	Emergency	5	90	2240	281.35	11.37	3708
A4		De-dusting	0	148	3900	529	17	129996
A5		Fibre	0	148	3900	529	16	15012
A6		Batch	0	148	3900	529	18	39996

The concentration of release was based on the emission limit for each substance likely to have a permitted limit with the key parameters detailed in Table 6.2 below. As detailed within web guidance for air emissions risk assessments³ benzene has been used as a proxy for total VOCs. Also, each metal has been considered at the emission limits for total metals so as to consider the waste case potential release.

Table 6.2 Key Pollutants and Emission Rate by Stack

Release Point	Substance	Measurement method	Operating mode (%)	Long term conc (mg/m3)	Release rate g/s (Long term)	Measurement basis (Long term)	Short term conc (mg/m3)	Release rate g/s (short term)	Measurement basis (short term)	Annual rate (t/yr)	Long term PC (ug/m3)	Short term PC (ug/m3)	Total Flow (m3/h)
A1	Particulates (PM10)	Estimated	99%	20	0.07	20	20	0.07	20	2.11	2.05	2.34	12204.00
A1	Nitrogen dioxide	Estimated	99%	500	1.70	500	500	1.70	500	52.71	2.05	49.66	12204.00
A1	Sulphur dioxide (24 hr mean)	Estimated	99%	350	1.19	350	350	1.19	350	36.89	1.44	41.02	12204.00
A1	Hydrogen chloride	Estimated	99%	30	0.10	30	30	0.10	30	3.16	0.12	5.36	12204.00
A1	Hydrogen fluoride	Estimated	99%	5	0.02	5	5	0.02	5	0.53	0.03	0.99	12204.00
A1	Hydrogen sulphide	Estimated	99%	1	0.00	1	1	0.00	1	0.11	0.00	0.12	12204.00
A1	Carbon monoxide	Estimated	99%	100	0.34	100	100	0.34	100	10.54	0.41	13.31	12204.00
A1	Ammonia	Estimated	99%	30	0.10	30	30	0.10	30	3.16	0.12	5.36	12204.00
A2	Ammonia	Estimated	91%	60	6.40	60	60	6.40	60	183.67	7.15	375.05	384012.00
A2	Phenol	Estimated	91%	10	1.07	10	10	1.07	10	30.61	1.19	62.51	384012.00
A2	Formaldehyde	Estimated	91%	5	0.53	5	5	0.53	5	15.91	0.60	40.63	384012.00
A2	Benzene	Estimated	91%	30	3.20	30	30	3.20	30	91.84	3.58	110.64	384012.00
A3	Particulates (PM10)	Estimated	91%	2230	2.30	2230	2230	2.30	2230	20.73	97.27	161.19	129996.00
A4	Particulates (PM10)	Estimated	91%	20	0.08	20	20	0.08	20	2.39	11.23	191.90	15012.00
A5	Particulates (PM10)	Estimated	46%	20	0.22	20	20	0.22	20	3.22	15.13	511.28	39996.00
A6	Particulates (PM10)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Arsenic and compounds (as As)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Nickel and compounds (as Ni) except nickel carbonyl	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Cadmium and compounds (as Cd)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.23	12204.00
A1	Selenium and compounds (as Se)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Chromium (VI) compounds (as Cr)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Antimony and compounds (as Sb), except antimony trioxide	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Lead	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Chromium (III) compounds (as Cr)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Copper and compounds (as Cu)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Manganese and compounds (as Mn)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00
A1	Vanadium and compounds (as V)	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.23	12204.00
A1	Zinc oxide	Estimated	99%	2	0.01	2	2	0.01	2	0.21	0.01	0.40	12204.00

Taking the above data the H1 calculates the combined process contribution for each substance as can be seen in Table 6.3 below.

Table 6.3 Combined Long and Short term Contribution for Each Pollutant

Number	Substance	Long term EAL (ug/m3)	Long term PC (ug/m3)	Long term modelled PC	Short term EAL (ug/m3)	Short term PC (ug/m3)	Short term modelled PC
1	Particulates (PM10)	40	125.7748868		50	5402.894957	
2	Nitrogen dioxide	40	2.05231956		200	49.6635	
3	Sulphur dioxide (24 hr mean)	0	1.44		125	41.02	
4	Hydrogen chloride	0	0.12		750	5.96	
5	Hydrogen fluoride	16	0.03		160	0.99	
6	Hydrogen sulphide	140	0.00		150	0.12	
7	Carbon monoxide	0	0.41		10000	13.91	
8	Ammonia	180	7.28		2500	381.01	
9	Phenol	200	1.19		3900	62.51	
10	Formaldehyde	5	0.60		100	40.63	
11	Benzene	5	3.58		30	110.64	
12	Arsenic and compounds (as As)	0.006	0.01		0	0.40	
13	Nickel and compounds (as Ni) except nickel carbonyl	0.02	0.01		0.7	0.40	
14	Cadmium and compounds (as Cd)	0.005	0.01		0.03	0.23	
15	Selenium and compounds (as Se), except hydrogen selenide	2	0.01		0	0.40	
16	Chromium (VI) compounds (as Cr)	0.00025	0.01		0	0.40	
17	Antimony and compounds (as Sb), except antimony trioxide	5	0.01		150	0.40	
18	Lead	0.25	0.01		0	0.40	
19	Chromium (III) compounds (as Cr)	2	0.01		0	0.40	
20	Copper and compounds (as Cu)	0.05	0.01		0	0.40	
21	Manganese and compounds (as Mn)	0.15	0.01		1500	0.40	
22	Vanadium and compounds (as V)	0	0.01		1	0.23	
23	Zinc oxide	50	0.01		1000	0.40	

Using the data above the environmental assessment test 1 results can be seen in Table 6.4 below.

³ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#pc-dispersion-factor>

Table 6.4 Environmental Assessment Test 1 results

Number	Substance	Long term EAL (ug/m3)	Long term PC (ug/m3)	%PC of EAL (long term)	>1% of EAL? (long term)	Short term EAL (ug/m3)	Short term PC (ug/m3)	%PC of EAL (short term)	>10% of EAL? (short term)
1	Particulates (PM10)	40	125.7748868	314.44%	fail	50	5402.894957	10805.79%	fail
2	Nitrogen dioxide	40	2.05231956	5.13%	fail	200	49.6635	24.83%	fail
3	Sulphur dioxide (24 hr mean)	0	1.436623692			125	41.022051	32.82%	fail
4	Hydrogen chloride	0	0.123139174			750	5.55962	0.75%	pass
5	Hydrogen fluoride	16	0.0280014	0.18%	pass	160	0.99327	0.62%	pass
6	Hydrogen sulphide	140	0.004104639	0.00%	pass	150	0.11720586	0.08%	pass
7	Carbon monoxide	0	0.410463912			10000	13.90578	0.14%	pass
8	Ammonia	180	7.27523467	4.04%	fail	2500	381.01134	15.24%	fail
9	Phenol	200	1.192015916	0.60%	pass	3900	62.50862	1.60%	pass
10	Formaldehyde	5	0.596007958	11.92%	fail	100	40.630603	40.63%	fail
11	Benzene	5	3.576047748	71.52%	fail	30	110.6402574	368.80%	fail
12	Arsenic and compounds (as As)	0.006	0.008242582	137.38%	fail	0	0.397308		
13	Nickel and compounds (as Ni) except nickel c	0.02	0.008242582	41.21%	fail	0.7	0.397308	56.76%	fail
14	Cadmium and compounds (as Cd)	0.005	0.008242582	164.85%	fail	0.03	0.23441172	781.37%	fail
15	Selenium and compounds (as Se), except hyd	2	0.00832584	0.42%	pass	0	0.397308		
16	Chromium (VI) compounds (as Cr)	0.00025	0.008242582	3297.03%	fail	0	0.397308		
17	Antimony and compounds (as Sb), except ant	5	0.008242582	0.16%	pass	150	0.397308	0.26%	pass
18	Lead	0.25	0.008242582	3.30%	fail	0	0.397308		
19	Chromium (III) compounds (as Cr)	2	0.00832584	0.42%	pass	0	0.397308		
20	Copper and compounds (as Cu)	0.05	0.00832584	16.65%	fail	0	0.397308		
21	Manganese and compounds (as Mn)	0.15	0.008242582	5.50%	fail	1500	0.397308	0.03%	pass
22	Vanadium and compounds (as V)	0	0.008242582			1	0.23441172	23.44%	fail
23	Zinc oxide	50	0.008242582	0.02%	pass	1000	0.397308	0.04%	pass

Table 6.4 shows that particulate matter, NOx, ammonia, formaldehyde, benzene arsenic, nickel, cadmium, chrome VI, lead, copper, manganese fail the long-term criteria of >1% of the EAL. In addition, particulate matter, NOx, sulphur dioxide, ammonia, formaldehyde, benzene arsenic, nickel, cadmium and vanadium fail the short-term criteria of >10% of the EAL.

These substances then go on to Test 2 which includes background data. The results for Test 2 can be seen in Table 6-5 below.

Table 6.5 Environmental Assessment Test 2 results

Number	Substance	Long term EAL (ug/m3)	Long term PC (ug/m3)	Air Background conc (ug/m3)	%PC of headroom (long)	PEC Long term (ug/m3)	%PEC of EAL% (Long)	%PEC of EAL% 70%?	Short term EAL	Short term PC	%PC of the EAL-2*background	%PC of headroom
1	Particulates (PM10)	40	125.7748868	0.65	100%	126.42	316.06%	fail	50	5402.894957	11094.24%	fail
2	Nitrogen dioxide	40	2.05231956		5%	2.05	5.13%	pass	200	49.6635	24.83%	fail
3	Sulphur dioxide (24 hr mean)	0	1.436623692		100%	1.44			125	41.022051	32.82%	fail
8	Ammonia	180	7.27523467		4%	7.28	4.04%	pass	2500	381.01134	15.24%	pass
10	Formaldehyde	5	0.596007958		12%	0.60	11.92%	pass	100	40.630603	40.63%	fail
11	Benzene	5	3.576047748		72%	3.58	71.52%	fail	30	110.6402574	368.80%	fail
12	Arsenic and compounds (as As)	0.006	0.008242582		100%	0.01	137.38%	fail	0	0.397308		
13	Nickel and compounds (as Ni) except n	0.02	0.008242582		41%	0.01	41.21%	pass	0.7	0.397308	56.76%	fail
14	Cadmium and compounds (as Cd)	0.005	0.008242582		100%	0.01	164.85%	fail	0.03	0.23441172	781.37%	fail
16	Chromium (VI) compounds (as Cr)	0.00025	0.008242582		100%	0.01	3297.03%	fail	0	0.397308		
18	Lead	0.25	0.008242582		3%	0.01	3.30%	pass	0	0.397308		
20	Copper and compounds (as Cu)	0.05	0.00832584		17%	0.01	16.65%	pass	0	0.397308		
21	Manganese and compounds (as Mn)	0.15	0.008242582		5%	0.01	5.50%	pass	1500	0.397308	0.03%	pass
22	Vanadium and compounds (as V)	0	0.008242582		100.00%	0.008242582			1	0.23441172	23.44%	fail

Table 6.5 above shows that particulate matter, benzene, arsenic, cadmium and chrome VI fail the long-term criteria where the long-term PEC is less than 70% of the long-term environmental standards. Additionally, particulate matter, NOx, sulphur dioxide, formaldehyde, benzene, nickel, cadmium and vanadium fail the short-term criteria where the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.

Therefore, the H1 results demonstrate that the emissions from the RMW facility requires further assessment via air dispersion modelling.

6.2.1 Air Dispersion Modelling Results

Results from air dispersion modelling to be provided at a later date.

6.3 Consolidated Best Available Techniques (BAT) Assessment

BREF Requirement	Proposed Arrangements	BAT?
BAT 1. BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features: (i) commitment of the management, including senior management; (ii) definition of an environmental policy that includes the continuous improvement for the installation by the management; (iii) planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; (iv) implementation of the procedures paying particular attention to: (a) structure and responsibility (b) training, awareness and competence (c) communication (d) employee involvement (e) documentation (f) efficient process control (g) maintenance programmes (h) emergency preparedness and response (i) safeguarding compliance with environmental legislation. (i) checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the reference document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;	Knauf Insulation has a company-wide Management System (KIMS) which includes an EMS. Knauf Insulation holds an organisational level EMS certified to ISO 140001:2015. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will extend to include it in future. (i) Environmental management is a responsibility of Knauf Group CEO and Directors/Senior Vice Presidents/Vice Presidents (ii) The KIMS Policy document includes a commitment to continuous improvement with regards to environmental performance. Knauf's policy statement confirms this commitment and public facing sustainability strategies are available on the Knauf website. (iii) The KIMS includes procedures for planning and establishing objectives and targets as part of the Knauf business review cycle. (iv) The KIMS incorporates all of these features but is not limited to: (a) Structure and responsibilities are defined in the KIMS manual. Organisation charts are available. Responsibilities are defined within relevant procedures. (b) KIMS policy is for provision of appropriate resources, information and supervision. Competence is achieved via both clear job descriptions which identify the necessary skills and the company process for developing and training employees, including how to identify training needs. (c) sharing best practice and information via company-wide communication.	Yes

BREF Requirement	Proposed Arrangements	BAT?
(ii) review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; (iii) following the development of cleaner technologies; (iv) consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; application of sectoral benchmarking on a regular basis.	(d) KIMS Policy is for promotion of employee consultation, participation, engagement and communications within management system requirements. This includes providing staff with additional training. (e) Knauf maintains registers of legal and other requirements. Documents are stored within the Knauf Document Management System. Company-wide document coding is used for Knauf documents. (f) KIMS Policy is for prioritising procurement of suitable equipment to allow safe and efficient process control. Facilities are also designed to the highest standards with a focus on HSEEQ considerations. The Knauf Shotton Plant Manager has overall responsibility for process control as per the factory production control procedure. (g) a maintenance strategy including schedules of recommended maintenance and inspection programmes (h) The KIMS includes procedures for preparing for and responding to emergencies (KI_P_013). Site has an Emergency Response Plan which aligns to this procedure. (i) The KIMS includes procedures for compliance with legal and other requirements, including but not limited to environmental legislation. (v) The KIMS incorporates all of these features for checking performance but is not limited to: a. Monitoring and measuring of performance via continuous improvement to ensure stakeholder requirements are met.	

BREF Requirement	Proposed Arrangements	BAT?
	b. The identification of actions required when corrective or preventative action is needed. c. Knauf maintains registers of legal and other requirements. d. A framework for managing all audits, including internal and external second party and third party audits. (vi) Knauf's EMS is subject to internal audit and third party external audit as part of the review process. Procedures in the KIMS detail how and audit is report, communicated and when corrective action may be required. (vii) Knauf follows and implements cleaner technologies as part of the EMS and continuous improvements. Use of the SAF melter is an example of using cleaner technology. Use of automatic 'tap out' is an example of a cleaner technology. Staff are responsible for implementing changes to reduce environmental impacts and deliver Knauf's corporate sustainability objectives, e.g. carbon emissions. (viii) Design of this facility has considered impacts from eventual decommissioning. This includes minimising subsurface infrastructure and comprehensive plans for all components designed to support deconstruction in place of demolition at end of first life stages. (ix) Knauf regularly applies sectoral benchmarking including use of BREF, BAT and relevant sector guidance. This enables Knauf to identify suitable KPIs and compare these against sector benchmarks to identify performance gaps against the sector and establishes clear, measurable targets for continuous improvement. Knauf are members of relevant trade body associations.	
BAT 2. BAT is to reduce the specific energy consumption by using one or a combination of the following techniques	See Table 3.5 BAT Requirements for energy efficiency from the glass	Yes

BREF Requirement	Proposed Arrangements	BAT?
	manufacturing processes (from the Manufacture of Glass BREF, 2013)	
BAT 3 BAT is to prevent, or where that is not practicable, to reduce diffuse dust emissions from the storage and handling of solid materials by using one or a combination of the following techniques	See Table 3.8 BAT Requirements for materials storage and handling from the glass manufacturing processes	Yes
BAT 4 BAT is to prevent, or where that is not practicable, to reduce diffuse gaseous emissions from the storage and handling of volatile raw materials by using one or a combination of the following techniques	See Table 3.8 BAT Requirements for materials storage and handling from the glass manufacturing processes	Yes
BAT 5. BAT is to reduce energy consumption and emissions to air by carrying out a constant monitoring of the operational parameters and a programmed maintenance of the melting furnace. The technique consists of a series of monitoring and maintenance operations which can be used individually or in combination appropriate to the type of furnace, with the aim of minimising the ageing effects on the furnace, such as sealing the furnace and burner blocks, keep the maximum insulation, control the stabilised flame conditions, control the fuel/air ratio, etc.	The process will have a SCADA based control or equivalent system. Knauf Insulation holds an organisational level energy management system certified to ISO 50001:2018. Although this does not currently cover operations of this new RMW facility, the scope of the EMS will be extended to include Knauf Shotton once the site has become operational Although this BAT is applicable to regenerative, recuperative, and oxy-fuel fired furnaces whereas the installation will use a SAF melter, some techniques will apply. Depending on the composition of the input raw materials, different ratios of cooling and dilution air will be required although the melter uses electrical power only so there is no fuel input. Energy input is strictly monitored and controlled. Regular preventative maintenance will take place during planned downtime, including maintenance of the melter as per a maintenance strategy. This maintenance strategy takes into account manufacturer recommendations for maintenance schedules and inspections including regular visual inspections to determine the status of the melter lining. The melter includes multiple temperature sensors which allows process monitoring on the state and development of the refractory lining in real time and historically to minimise aging effects. The melter refractory is insulated by a combination of graphite plates and water cooling of the outer steel shell.	Yes

BREF Requirement	Proposed Arrangements	BAT?
BAT 6. BAT is to carry out a careful selection and control of all substances and raw materials entering the melting furnace in order to reduce or prevent emissions to air by using one or a combination of the following techniques. (i) Use of raw materials and external cullet with low levels of impurities (e.g. metals, chlorides, fluorides) Applicable within the constraints of the type of glass produced at the installation and the availability of raw materials and fuels (ii) Use of alternative raw materials (e.g. less volatile) (iii) Use of fuels with low metal impurities	All raw materials are purchased in accordance with supply specifications. Internal recycled material will be based upon process material which was purchased to these specifications and subsequently used within the process. Other wastes used would be materials from another production facility at Queensferry which will be in accordance with known levels of impurities. (i) Raw materials used at the installation will be a combination of primary and secondary raw materials, sourced from approved suppliers and return partners. The KIMS includes procedures for checking the quality of raw material inputs to promote process control. Naturally occurring materials, e.g. basalt, may contain impurities at trace levels. The choice of input materials will be dependent on the products being made. The installation will use external material from a second Knauf installation as the first choice in order to control substances entering the melting furnace. Waste acceptance checks on secondary raw material arriving at the installation from pre-approved return partners are completed to identify any non-conforming raw materials before they are enter the melter in order to reduce emissions to air. (ii) The installation makes use of a number of different raw materials depending on the required product that is to be made. The main raw materials are all generally non-volatile. Technique not applicable but eliminating cokes and cement fuels eliminates two sources of sulphur in emissions to air when compared to a traditional cupola-type furnace.	Yes
BAT 7. BAT is to carry out monitoring of emissions and/or other relevant process parameters on a regular basis, including the following:	(i) The installation will have continuous monitoring of relevant parameters to ensure process stability via a SCADA system. All rotational equipment is	Yes

BREF Requirement	Proposed Arrangements	BAT?
(i) Continuous monitoring of critical process parameters to ensure process stability, e.g. temperature, fuel feed and airflow. (ii) Regular monitoring of process parameters to prevent/reduce pollution, e.g. O₂ content of the combustion gases to control the fuel/air ratio. (iii) Continuous measurements of dust, NO_x and SO₂ emissions or discontinuous measurements at least twice per year, associated with the control of surrogate parameters to ensure that the treatment system is working properly between measurements (iv) Continuous or regular periodic measurements of NH₃ emissions, when selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) techniques are applied. (v) Continuous or regular periodic measurements of CO emissions when primary techniques or chemical reduction by fuel techniques are applied for NO_x emissions reductions or partial combustion may occur. (vi) Regular periodic measurements of emissions of HCl, HF, CO and metals, in particular when raw materials containing such substances are used or partial combustion may occur. Continuous monitoring of surrogate parameters to ensure that the waste gas treatment system is working properly and that the emission levels are maintained between discontinuous measurements. The monitoring of surrogate parameters includes: reagent feed, temperature, water feed, voltage, dust removal, fan speed, etc.	installed with continuous monitoring as standard. Where parameters exceed specified limits within the system, operators will be alerted and take appropriate action. (ii) Technique not applicable as the melter uses electrical power only so there is no fuel input but the installation will monitor process parameters, as required to meet production of different products. (iii) Continuous monitoring of process emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (iv) The installation uses a SNCR de-NO_x system. Monitoring of NH₃ emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (v) Monitoring of CO emissions will be carried out in relation to process control using a CEMS (or similar) on melter stack emissions following combustion in the after burner. (vi) Continuous monitoring of process emissions will be carried out in accordance with permit conditions using a CEMS (or similar) on melter stack emissions. (vii) The afterburner (waste gas incinerator) will be closely controlled to minimise emissions as far as practicable whilst achieving its objectives of the destruction of organic substances within the melter gas stream. (viii) All emissions will be monitored in accordance with the environmental permit when issued either through continuous or periodic arrangements which will be in accordance with MCERTS.	
BAT 8. BAT is to operate the waste gas treatment systems during normal operating conditions at optimal capacity and availability in order to prevent or reduce emission	Waste gas systems will be operated at full capacity during normal operation. (i) The installation operates two waste gas treatment systems: one on the SAF melter emissions and a second	Yes

BREF Requirement	Proposed Arrangements	BAT?
Applicability Special procedures can be defined for specific operating conditions, in particular: (i) during start-up and shutdown operations (ii) during other special operations which could affect the proper functioning of the systems (e.g. regular and extraordinary maintenance work and cleaning operations of the furnace and/or of the waste gas treatment system, or severe production change) in the case of insufficient waste gas flow or temperature which prevents the use of the system at full capacity	system on downstream process emissions. The installation operates a waste gas burner (emergency stack) as an integral part of the installation to operate safely. This is used in exception situations or equipment failure only, including during start up and shut down operations. During start up and shutdown operations, the gases from the SAF melter will be discharged prior to the waste gas treatment systems. Emissions on downstream processes will only be generated during normal operations of the downstream processes. (ii) The installation operates a waste gas burner (emergency stack) as an integral part of the installation to operate safely. This is used in exception situations or equipment failure only, including in case of power failure, planned maintenance and during melter upset conditions to prevent overheating of the waste gas treatment system or discharge of waste gases into the main building. The installation will have a maintenance strategy including schedules of recommended maintenance and inspection programmes to minimise the risk of special conditions caused by extraordinary maintenance work. During these operations, the gases from the SAF melter will be discharged prior to the waste gas treatment systems. (iii) The waste gas systems are designed to operate for a variety of operating scenarios including variable rates of recycling material inputs and combustion chamber temperatures. If operating conditions fall outside of these safe operating envelopes, then waste gases may be diverted to emergency systems including the waste gas burner.	
BAT 9. BAT is to limit carbon monoxide (CO) emissions from the melting furnace, when applying primary techniques or chemical	The site makes use of a submerged arc furnace which melts using electricity rather than fossil fuels and avoids emissions to air from this combustion.	N/A

BREF Requirement	Proposed Arrangements	BAT?
reduction by fuel, for the reduction of NO_x emission. Primary techniques for the reduction of NO_x emissions are based on combustion modifications (e.g. reduction of air/fuel ratio, staged combustion low-NOX burners, etc.). Chemical reduction by fuel consists of the addition of hydrocarbon fuel to the waste gas stream to reduce the NOX formed in the furnace. The increase in CO emissions due to the application of these techniques can be limited by a careful control of the operational parameters	Some CO will be generated by the electric RTO which mainly combusts VOCs to carbon dioxide and water. NO_x can be generated as thermal NO_x but is controlled by process management and a de-NO_x system.	
BAT 10. BAT is to limit ammonia (NH₃) emissions, when applying selective catalytic reduction (SCR) or selective non catalytic reduction (SNCR) techniques for a high efficiency NOX emissions reduction The technique consists of adopting and maintaining suitable operating conditions of the SCR or SNCR waste gas treatment systems, with the aim of limiting emissions of unreacted ammonia	The installation uses a SNCR de-NO_x system. The optimum temperature for de-NO_x, between 850°C and 950°C, will be tested and balanced between energy consumption, oxidation of organics and reduction of NO_x. Liquid ammonia, injected into the waste gas stream from a silo, will be used to decompose NO_x in the waste gases emitted to air..	Yes
BAT 11. BAT is to reduce boron emissions from the melting furnace, when boron compounds are used in the batch formulation, by using one or a combination of the following techniques: (i) Operation of a filtration system at a suitable temperature for enhancing the separation of boron compounds in the solid state, taking into account that some boric acid species may be present in the flue-gas as gaseous compounds at temperatures below 200 °C, but also as low as 60 °C (ii) Use of dry or semi-dry scrubbing in combination with a filtration system Use of wet scrubbing	Technique is not applicable as boron compounds are not used in the batch formulation.	N/A
BAT 12. BAT is to reduce water consumption by using one or a combination of the following techniques: (i) Minimisation of spillages and leaks (ii) Reuse of cooling and cleaning waters after purging	(i) The technique is generally applicable by the application of good housekeeping, maintenance and regular inspections on plant equipment as per the overall EMS. Operators will be suitably trained and competent in performing and transfer tasks involving water so as to	Yes

BREF Requirement	Proposed Arrangements	BAT?
(iii) Operate a quasi-closed loop water system as far as technically and economically feasible	minimise the risk of spillages occurring. A number of transfer operations within the installation will be completed automatically via pumps and controlled via PLC on a SCADA system (or similar). A maintenance strategy including schedules of recommended maintenance and inspection programmes will be used to reduce water consumption by looking for cooling water leaks and monitoring cooling water. (ii) The installation re-uses water to reduce water consumption through an extensive extended water recirculation system that enables process waters to be re-used in a lower grade. Some cooling water is lost to evaporation. Drum cleaning wash waters are reused within the binder preparation. The installation uses an extended water recirculation system that is closed loop as far as technically feasible but does require fresh water supplies to top-up evaporation losses. Drum cleaning requires fresh water which is re-used within the binder preparation system. There are no processes that discharge to sewer.	
BAT 13. BAT is to reduce the emission load of pollutants in the waste water discharges by using one or a combination of the following waste water treatment systems: (i) Standard pollution control techniques, such as settlement, screening, skimming, neutralisation, filtration, aeration, precipitation, coagulation and flocculation, etc. Standard good practice techniques to control emissions from storage of liquid raw materials and intermediates, such as containments, inspection/testing of tanks, overfill protection, etc. (ii) Biological treatment systems, such as activated sludge, biofiltration to remove/degrade the organic compounds (iii) Discharge to municipal wastewater treatment plants (iv) External reuse of waste waters	There are no processes within the installation that will discharge to sewer. This enables water to be re-used within a lower grade before it is consumed by the binder preparation system. As a result there is not a requirement to reduce pollutants and standard techniques do not apply. Standard good practices to control emissions from the storage of liquid raw materials do apply and the site makes use of suitable storage tanks, containers and silos which are fitted with protection measures to prevent overfilling and located within (or for smaller volume liquid containers, placed on) suitably sized bunds.	N/A

BREF Requirement	Proposed Arrangements	BAT?
BAT 14. BAT is to reduce the production of solid waste to be disposed of by using one or a combination of the following techniques:	See Table 3.12 BAT Requirements for waste from the glass manufacturing processes (from the Manufacture of Glass BREF, 2013).	Yes
BAT 15. BAT is to reduce noise emissions by using one or a combination of the following techniques: (i) Make an environmental noise assessment and formulate a noise management plan as appropriate to the local environment (ii) Enclose noisy equipment/operation in a separate structure/unit (iii) Use embankments to screen the source of noise (iv) Carry out noisy outdoor activities during the day Use noise protection walls or natural barriers (trees, bushes) between the installation and the protected area, on the basis of local conditions	The site location is industrial by nature with emissions of noise associated with industrial processes taking place at the site. The installation could be the source of noise and vibration from operations however there is an absence of noise sensitive receptors close to the installation. (i) Environmental noise will be managed using a number of standard measures to prevent and reduce any sources including enclosing operations within a building. The lack of nearby sensitive noise receptors means that a noise management plan is not appropriate at the current time. This will be subject to regular review during site operations. (ii) Operations and equipment that give rise to emissions of noise, e.g. milling of waste materials, are located inside of a building with suitable noise insulation. (iii) Tipping of raw materials takes place into large bays which operate with a freeboard between the top of the storage pile and the top of the storage. This will reduce noise emissions. Embankments which form the railway line to the east will provide screening between potential noise and residential receptors to the east. (iv) The site is designed to operate 24/7 and therefore it may not always be possible for noisy outdoor operations to take place during the day time. Vehicle movements associated with deliveries are expected to occur during the day so as to prevent sources of noise and good management practices will be implemented e.g. turning off noise sounders where possible outside of the normal day time hours. 1. The design of the site uses natural noise protection barriers such as trees and landscaping around the periphery of the site which will reduce noise impacts to offsite receptors.	Yes

BREF Requirement	Proposed Arrangements	BAT?
1.7. BAT conclusions for mineral wool manufacturing Unless otherwise stated, the BAT conclusions presented in this section can be applied to all mineral wool manufacturing installations.		
BAT 56. BAT is to reduce dust emissions from the waste gases of the melting furnace by applying an electrostatic precipitator or a bag filter system	Waste gases from the SAF melter are subject to filtration using a ceramic filter first to capture dust. Filtered gases are then subject to thermal treatment and abatement with reagent before passing through a bag filter.	Yes
BAT 57. BAT is to reduce NOX emissions from the melting furnace by using one or a combination of the following techniques: (i) Combustion modifications (a) Reduction of air/fuel ratio (b) Reduced combustion air temperature (c) Staged combustion: – Air staging – Fuel staging (d) Flue-gas recirculation (e) Low-NOX burners (f) Fuel choice (ii) Electric melting Oxy-fuel melting	The melting furnace will be a submerged arc furnace which utilises electric melting.	Yes
BAT 58. When nitrates are used in the batch formulation for glass wool production, BAT is to reduce NOX emissions by using one or a combination of the following techniques: (i) Minimising the use of nitrates in the batch formulation The use of nitrates is applied as an oxidising agent in batch formulations with high levels of external cullet to compensate for the presence of organic material contained in the cullet (i) Electric melting Oxy-fuel melting	Nitrates not used in the batch formulation. Furthermore, the melting furnace will be a submerged arc furnace which utilises electric melting.	N/A
BAT 59. BAT is to reduce SOX emissions from the melting furnace by using one or a combination of the following techniques:	(i) The batch formulation, depending on the product being made, minimises the sulphur content through raw material selection. Electric melting	Yes

BREF Requirement	Proposed Arrangements	BAT?
(i) Minimisation of the sulphur content in the batch formulation and optimisation of the sulphur balance (ii) Use of low sulphur content fuels (iii) Dry or semi-dry scrubbing, in combination with a filtration system (iv) Use of wet scrubbing	- removes two sources of sulphur in the SAF exhaust gas (coke and cement). (ii) The installation uses electrical power in the melter and RTO. Electrical energy at point of use does not give rise to sulphur. (iii) The installation uses hydrated lime dry scrubbing, in combination with a filtration system to reduce SO_x emissions. (iv) Technique is not applicable to the melting furnace which uses a dry scrubbing system.	
BAT60. BAT is to reduce HCl and HF emissions from the melting furnace by using one or a combination of the following techniques: (i) Selection of raw materials for the batch formulation with a low content of chlorine and fluorine Dry or semi-dry scrubbing, in combination with a filtration system	(i) The batch formulation, depending on the product being made, minimises the content of HCl and HF through raw material selection. By using a higher recycled content and minimising mineral stones, there will be a reduced amount of HCl and HF in emissions to air. 1. The installation will use a dry system with hydrated lime powder injection to reduce emissions to air, including HCl and HF. This is followed a filtration system using bag filters to capture the reacted reagent and reduce emissions.	Yes
BAT 61. BAT is to reduce H₂S emissions from the melting furnace by applying a waste gas incineration system to oxidise hydrogen sulphide to SO₂.	The melting furnace will be fitted with an electrically powered waste gas RTO for the oxidation of hydrogen sulphide.	Yes
BAT 62. BAT is to reduce metal emissions from the melting furnace by using one or a combination of the following techniques: (i) Selection of raw materials for the batch formulation with a low content of metals (ii) Application of a filtration system	(i) Selection of raw materials for batch formulation is dependent upon the final product being made. Where possible, materials with a low content of metals will be chosen although this may be limited when raw materials have a high recycled content. (ii) Emissions from the SAF melter are subject to ceramic filter prior to the RTO and subject to a bag filter after the RTO to reduce metal emissions to air.	Yes
BAT 63. BAT is to reduce emissions from downstream processes by using one or a combination of the following techniques:	(i) Technique not applicable (ii) The installation will use a wet scrubber system upstream of a WESP	Yes

BREF Requirement	Proposed Arrangements	BAT?
(i) Impact jets and cyclones (ii) Wet scrubbers (iii) Wet electrostatic precipitators (iv) Stone wool filters (v) Waste gas incineration	- on emissions to air from downstream processes. (iii) The installation will use a wet electrostatic precipitator (WESP) downstream of a wet scrubber system on emissions to air from downstream - Technique is not used within the installation (iv) Technique is not used within the installation	

6.4 Detailed Air Dispersion Modelling

See Appendix 9.

6.5 Site Condition Report

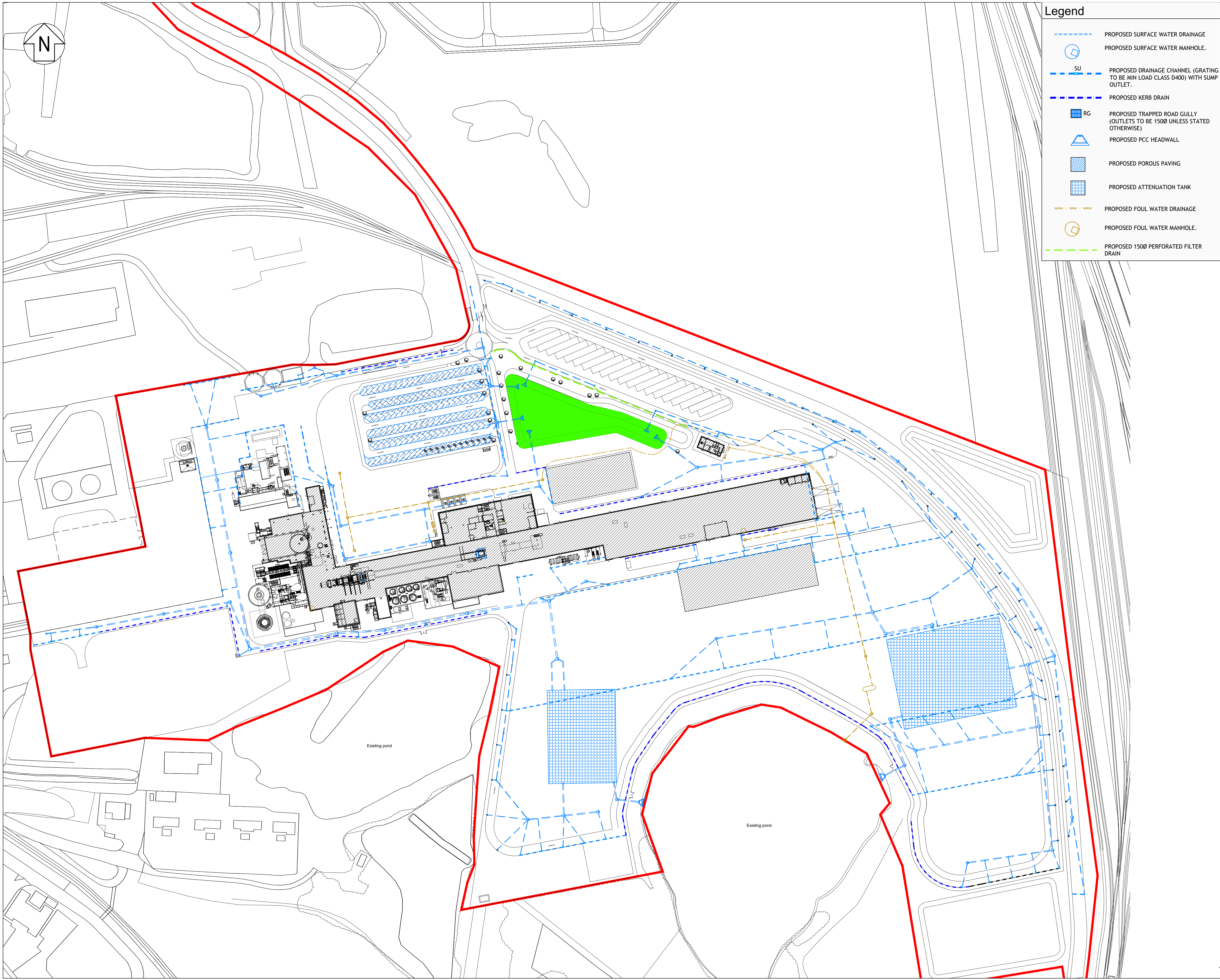
A Site Condition Report and Relevant Hazardous Substances Review has been completed for the site and can be found in Appendix 2.

Appendices

Appendix 1a – Knauf Shotton Site Boundary Plan and Emission Points



Appendix 1b – Knauf Shotton Drainage Plan



Legend

PROPOSED SURFACE WATER DRAINAGE

SU

PROPOSED SURFACE WATER MANHOLE.

PROPOSED DRAINAGE CHANNEL (GRATING TO BE MIN LOAD CLASS D400) WITH SUMP OUTLET.

PROPOSED KERB DRAIN

RG

PROPOSED TRAPPED ROAD GULLY (OUTLETS TO BE 1500 UNLESS STATED OTHERWISE)

PROPOSED PCC HEADWALL

PROPOSED POROUS PAVING

PROPOSED ATTENUATION TANK

PROPOSED FOUL WATER DRAINAGE

PROPOSED FOUL WATER MANHOLE.

PROPOSED 1500 PERFORATED FILTER DRAIN

- Notes
1.

THIS DRAWING IS THE COPYRIGHT OF TIER CONSULT GROUP AND CANNOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN CONSENT FROM THE COMPANY.
2.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S, ENGINEER'S AND SPECIALIST'S DRAWINGS TOGETHER WITH THE APPROPRIATE SPECIFICATION.
3.

ALL DIMENSIONS ARE IN MILLIMETRES UNO, FOR THE PURPOSES OF CONSTRUCTION THIS DRAWING MUST NOT BE SCALED AND ONLY WRITTEN DIMENSIONS USED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK ALL DIMENSIONS ON SITE PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES TO BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER IN WRITING.
4.

ALL LEVELS ARE IN METRES UNO & TO OS DATUM.
5.

THE WORKS SHALL BE IN ACCORDANCE WITH THE NATIONAL BUILDING SPECIFICATION.
6.

THE LOCATION LINE & LEVEL OF ALL KNOWN EXISTING DRAINAGE PIPEWORK INDICATED ON THE DRAWINGS ARE APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY.
7.

CONNECTION TO THE EXISTING PUBLIC SEWERS WILL BE SUBJECT TO THE RELEVANT APPROVALS FROM THE STATUTORY UNDERTAKER.
8.

IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THEIR EXACT LINE AND LEVEL, BY WAY OF HAND EXCAVATED TRIAL PITS, PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORKS ON SITE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS AND MAINTAIN THE STRUCTURAL INTEGRITY OF ALL ABOVE AND BELOW GROUND SERVICE INSTALLATIONS.
9.

THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN THROUGHOUT THE DURATION OF THE CONTRACT A FULL TRAFFIC MANAGEMENT SYSTEM TO ENSURE SAFE PASSAGE OF VEHICLES/PEDESTRIANS IN THE VICINITY OF THE WORKS. ALL TRAFFIC SIGNS, SIGNALS, BARRIERS ETC. SHALL BE IN ACCORDANCE WITH CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL.
10.

THE CONTRACTOR SHALL MAKE ADEQUATE PROVISION FOR DEALING WITH AND DISPOSING OF GROUND/SURFACE WATER ENCOUNTERED DURING EXCAVATIONS
11.

ALL SOFT / HARD PAVED AREAS AFFECTED BY THE WORKS SHALL BE FULLY REINSTATED FOLLOWING THE INSTALLATION OF ALL DRAINAGE WORKS. ALL SURFACE MARKINGS AFFECTED BY THE WORKS SHALL BE FULLY REINSTATED.
12.

ALL SURPLUS EXCAVATED MATERIAL SHALL BE DISPOSED IN A DESIGNATED AREA ON SITE.
13.

UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL PROVIDE AS BUILT SETTING OUT CO-ORDINATE AND LEVEL INFORMATION ALONG WITH A FULL CCTV REPORT AND LAYOUT.
14.

PIPEWORK WITH LESS THAN 900mm OF COVER IN TRAFFICKED AREAS TO BE CONCRETE ENCASED. (BEDDING CLASS 2)
15.

PIPEWORK WITH MORE THAN 900mm OF COVER TO HAVE CLASS S GRANULAR BED AND SURROUND.
16.

POLYPROPYLENE INSPECTION CHAMBERS OF 4500 >1.2m DEEP TO BE FITTED WITH A REDUCED ACCESS FITTING.
17.

SOIL STACKS - WHERE SOIL STACKS SERVE MULTIPLE STOREYS THE STACK REST BEND IS TO BE MINIMUM 750mm BELOW THE LOWEST BRANCH CONNECTION. WHERE SEPARATE STACKS ARE PROVIDED FOR GROUND FLOOR, REST BENDS MAY BE 450mm MINIMUM BELOW THE LOWEST CONNECTION.
18.

SVP CONNECTIONS TO BE 100mm DIA UNO.
19.

ALL FO AND RWP LOCATIONS TO BE TO BE COMPLETE WITH A LOW LEVEL ACCESS PLATE FOR RODDING.
20.

WHERE PROPOSED DRAINAGE PIPEWORK RUNS ARE IN CLOSE PROXIMITY TO THE NEW FOUNDATIONS, THE CONTRACTOR SHALL ALLOW FOR EXTENDING THE DEPTH OF NEW FOUNDATIONS IN LEAN MIX CONCRETE DOWN TO THE PROPOSED PIPE BEDDING LEVEL.
21.

THE HYDRAULIC DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH 'CIRIA REPORT C753 THE SuDS MANUAL' AND THE HYDRAULIC DESIGN OF PIPELINES AND OTHER CONDUITS HAS BEEN CARRIED OUT IN ACCORDANCE WITH 'BS EN 16933-2'.

T2	15.01.2025	SM	UPDATES TO TENDER	WNJ	PJB
T1	09.09.2025	SM	TENDER ISSUE	WNJ	PJB
P01	28.08.2025	SM	PRELIMINARY ISSUE	WNJ	PJB
Rev	Date	By	Description	Chk	App

Status

TENDER

TIER CONSULT GROUP

TIER CONSULT GROUP.

Unit 5 Office Village,
Sandpiper Court,
Chester Business Park,
Chester,
CH4 9QZ
T: 01244 684 900

Client:

KNAUF INSULATION

Project Title:

PROJECT PRINCE.
FLINTSHIRE KNAUF.

Drawing Title:

PROPOSED DRAINAGE LAYOUT
OVERVIEW SHEET

Drawing Scale:

1:500 @ A1

Drawn By:

S.MILLS

Drawing Start Date:

30.06.2025

TIER Project Number:

T_25_2933

Drawing No:

14173-TCG-XX-XX-DR-C-5500

Revision:

T2



Appendix 1c – Knauf Shotton Site Surfacing Plan



Appendix 2 Site Condition Report



Appendix 3 Dust Emissions Management Plan



Appendix 4 Environmental Risk Assessment



Appendix 5 Knauf Insulation ISO 140001 Certificate

Certificate

Management system as per
ISO 14001:2015



The Certification Body TÜV NORD CERT GmbH hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

KNAUF INSULATION S.P.R.L.
Rue de Maestricht 95
4600 Visé
Belgium

with the locations according to the annex

operates a management system in accordance with the requirements of ISO 14001:2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

**Design, Development, Production, Marketing & Distribution of
Insulation Materials and Systems**

Certificate Registration No. 44 104 190742
Audit Report No. 3534 7460

Valid from 2025-12-23
Valid until 2028-12-22
Initial certification 2010

Essen, 2025-12-19


Certification Body at TÜV NORD CERT GmbH



Visit our database to
verify the validity of
this certificate.

TÜV NORD CERT GmbH
Am TÜV 1, 45307 Essen
www.tuev-nord-cert.com

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D-ZM-12007-01-00

Annex

to Certificate Registration No. 44 104 190742
ISO 14001:2015

KNAUF INSULATION S.P.R.L.
Rue de Maestricht 95
4600 Visé
Belgium

Certificate Registration No.	Location	Scope
44 104 190742-001	KNAUF INSULATION S.P.R.L. Rue de Maestricht 95 4600 Visé, Belgium	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-002	KNAUF INSULATION D.O.O. Vipavska 4L 5270 Ajdovščina, Slovenia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-003	KNAUF INSULATION, INC. 1000E North ST MI 49224 Albion, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-004	KNAUF INSULATION GMBH Weststrasse 1 06406 Bernburg/Saale, Germany	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-005	KNAUF INSULATION LTD. A4051, Croesyceiliog Cwmbran, NP44 2YQ, United Kingdom	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-006	KNAUF INSULATION IZOLASYON SANAYİ VE TİCARET ANONİM ŞİRKETİ 75. Yıl Mahallesi 1. Cadde 1/G, Küçük Organize Sanayi 26250 Eskişehir, Turkey	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems

Annex

to Certificate Registration No. 44 104 190742
ISO 14001:2015

Certificate Registration No.	Location	Scope
44 104 190742-007	KNAUF INSULATION LANNEMEZAN SAS Megazone Départementale d'Ilange-Bertrange - D654 57970 Illange, France	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-008	KNAUF INSULATION, INC. 4812 Tabler Station Rd., WV 25428 Inwood, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-009	KNAUF INSULATION SPOL S.R.O. Industrial Park Krupka, Pod Dolni Drahou 110 41742 Krupka, Czech Republic	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-010	KNAUF INSULATION, INC. 3502 43rd Street SW AL 36863 Lanett, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-011	KNAUF INSULATION LANNEMEZAN SAS 501 Voie Napoleon III 65300 Lannemezan, France	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-012	KNAUF INSULATION S.R.O. Železničný rad 24 96814 Nová Baňa, Slovakia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-013	KNAUF INSULATION D.O.O. Varaždinska 140 Novi Marof, Croatia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-014	KNAUF INSULATION LTD. Queensferry Flintshire, CH5 2DA, United Kingdom	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems

Annex

to Certificate Registration No. 44 104 190742
ISO 14001:2015

Certificate Registration No.	Location	Scope
44 104 190742-015	KNAUF INSULATION, INC. 3100 Ashby Rd. Shasta Lake, CA 96019, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-016	KNAUF INSULATION, INC. 400 East Walker, Shelbyville Plant 1 IN.46176, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-017	KNAUF INSULATION, INC. 100 Knauf Dr., Shelbyville Plant 3 IN.46176, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-018	KNAUF INSULATION OPERATION GMBH Heraklithstrasse 8 84359 Simbach/Inn, Germany	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-019	KNAUF INSULATION D.O.O. Trata 32 4220 Skofja Loka, Slovenia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-020	KNAUF INSULATION GMBH Bahnhofstrasse 25 9356 St. Egidien, Germany	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-021	KNAUF INSULATION LTD. Stafford Road, St. Helens Merseyside, WA10 3NS, United Kingdom	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-023	KNAUF INSULATION D.O.O. BEOGRAD Naselje Belo Polje bb 17530 Surdulica, Serbia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems

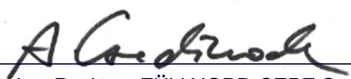
Annex

to Certificate Registration No. 44 104 190742
ISO 14001:2015

Certificate Registration No.	Location	Scope
44 104 190742-025	KNAUF INSULATION KFT. Ipartelep 8924 Alsonemesapati (Zalaegerszeg), Hungary	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-027	KNAUF INSULATION SDN. BHD. (201401006359) (1082442-W) Lot 157, Jalan Teruntum 4, Tanjung Langsat Industrial Complex 81700 / Pasir Gudang, Johor, Malaysia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-029	Knauf Insulation SRL Str. Armatei no.82, 545600 Tarnaveni, Romania	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 104 190742-030	KNAUF INSULATION, INC. 1 Knauf Drive, Shelbyville - Corporate Office IN.46176, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems

End of the List

Essen, 2025-12-19


 Certification Body at TÜV NORD CERT GmbH

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Appendix 6 Knauf Insulation ISO 50001 Certificate

Certificate

Management system as per
ISO 50001:2018



The Certification Body TÜV NORD CERT GmbH hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

KNAUF INSULATION S.P.R.L.
Rue de Maestricht 95
4600 Vise
Belgium

with the locations according to the annex

operates a management system in accordance with the requirements of ISO 50001:2018 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

**Design, Development, Production, Marketing & Distribution of
Insulation Materials and Systems**

Certificate Registration No. 44 764 190742
Audit Report No. 3534 7462

Valid from 2025-12-16
Valid until 2028-12-15
Initial certification 2013

Essen, 2025-12-19

Certification Body at TÜV NORD CERT GmbH



Visit our database to
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this certificate.

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D-ZM-12007-01-00

Annex

to Certificate Registration No. 44 764 190742
ISO 50001:2018

KNAUF INSULATION S.P.R.L.
Rue de Maestricht 95
4600 Visé
Belgium

Certificate Registration No.	Location	Scope
44 764 190742-001	KNAUF INSULATION S.P.R.L. Rue de Maestricht 95 4600 Visé, Belgium	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 764 190742-002	KNAUF INSULATION D.O.O. Vipavska 4L 5270 Ajdovščina, Slovenia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
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to Certificate Registration No. 44 764 190742
ISO 50001:2018

Certificate Registration No.	Location	Scope
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ISO 50001:2018

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44 764 190742-018	KNAUF INSULATION OPERATION GMBH Heraklithstrasse 8 84359 Simbach/Inn, Germany	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
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to Certificate Registration No. 44 764 190742
ISO 50001:2018

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44 764 190742-027	KNAUF INSULATION SDN. BHD. (201401006359) (1082442-W) Lot 157, Jalan Teruntum 4, Tanjung Langsat Industrial Complex 81700 / Pasir Gudang, Johor, Malaysia	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems
44 764 190742-030	KNAUF INSULATION, INC. 1 Knauf Drive, Shelbyville - Corporate Office IN.46176, United States	Design, Development, Production, Marketing & Distribution of Insulation Materials and Systems

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Essen, 2025-12-19



Certification Body at TÜV NORD CERT GmbH

Page **4** of **4**

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Appendix 7 KIMS Waste Acceptance Procedure

Waste Acceptance Procedure

Version 1 – 13th July 2025

Owner	Checker	Approver	Approver
<i>Date:</i>	<i>Date:</i>	<i>Date:</i>	<i>Date:</i>
<i>Signature:</i>	<i>Signature:</i>	<i>Signature:</i>	<i>Signature:</i>

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1. Scope of Process	3
2. Aim / Purpose	3
3. Definitions	3
4. Responsibilities	3
5. Process Description	4
5.1. XXX	Error! Bookmark not defined.
5.2. XXX	Error! Bookmark not defined.
5.3. XXX	Error! Bookmark not defined.
5.4. XXX	Error! Bookmark not defined.
5.5. XXX	Error! Bookmark not defined.
5.6. XXX	Error! Bookmark not defined.
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Waste Acceptance Procedure

1. Scope of Process

This Work Instruction shall apply to Knauf Insulation Shotton Mineral Wool Manufacturing Facility

This document remains unchanged in all projects and local organisations.

This procedure applies to all customers returning:

- Clean, uncontaminated mineral wool insulation off-cuts.
- Post-demolition mineral wool insulation, which may or may not be contaminated with substances such as adhesives, paints, or other construction residues.

2. Aim / Purpose

To establish a robust and environmentally compliant process for the acceptance of mineral wool insulation off-cuts and post-demolition mineral wool insulation, ensuring compliance with Welsh environmental legislation and Knauf's sustainability goals.

3. Definitions

Mineral Wool Insulation: A type of insulation material made from natural or synthetic minerals, such as stone wool or glass wool, commonly used in construction for thermal and acoustic insulation.

Clean, Uncontaminated Off-Cuts: Mineral wool insulation that has not been exposed to adhesives, paints, hazardous substances, or other contaminants and is generated during the installation process.

Post-Demolition Mineral Wool Insulation: Mineral wool insulation recovered from demolition or refurbishment projects, which may or may not be contaminated with substances such as adhesives, paints, or hazardous materials.

Contaminated Material: Insulation that has been exposed to or contains hazardous substances, such as asbestos, lead-based paints, or other regulated materials.

Waste Transfer Note (WTN): A legal document required for the transfer of waste, detailing the type, quantity, and origin of the waste, as well as the parties involved in the transfer.

European Waste Code (EWC): A standardized code used to classify waste types in the European Union. Relevant codes for this procedure include:

17 06 04: Insulation materials other than those mentioned in 17 06 01 and 17 06 03.

17 06 03: Insulation materials containing hazardous substances.

Natural Resources Wales (NRW): The environmental regulator for Wales, responsible for ensuring compliance with waste management legislation.

4. Responsibilities

With respect to our structure, all legal entities as well as functional responsible boards, managers and other executives (i.e., Plants, Central Functions and Regions) bear responsibility for the implementation and compliance of this procedure.

5. Activity Description

5.1. Pre-Acceptance Requirements

Before accepting any returns, the following pre-acceptance requirements must be met:

Customer Pre-Approval:

- Customers must register with Knauf as an approved return partner.
- Customers must complete a Pre-Acceptance Form detailing:
 - The source of the material (e.g., construction site, demolition project).
 - Confirmation of whether the material is clean or potentially contaminated.
 - Estimated volume and frequency of returns.

Material Classification:

Customers must classify the material as either:

- **Category A:** Clean, uncontaminated mineral wool insulation.
- **Category B:** Post-demolition mineral wool insulation that may or may not be contaminated.

For Category B materials, customers must provide:

- A description of potential contaminants (e.g., adhesives, paints, asbestos).
- Any available analytical test results for hazardous substances.

Packaging and Labelling:

Category A materials must be securely bagged or palletized to prevent spillage during transport.

Category B materials must be double-bagged in heavy-duty, sealed packaging to prevent the release of dust or contaminants.

Each package must be labelled with:

- Customer name.
- Date of packaging.
- Material classification (Category A or B).
- Declaration of cleanliness or potential contamination.

Transportation:

Customers must use a licensed waste carrier registered with Natural Resources Wales (NRW).

A Waste Transfer Note (WTN) must accompany each delivery, including:

- European Waste Code (EWC):
 - 17 06 04 for clean, uncontaminated insulation.
 - 17 06 03 for insulation containing hazardous substances.
- Description of the waste.
- Confirmation of material classification (Category A or B).

Waste Acceptance Procedure

5.2. Acceptance Procedure

Upon arrival at the Knauf facility, the following steps will be taken:

Initial Inspection:

Deliveries will be visually inspected to confirm compliance with the declared material classification.

Any material that does not meet the declared classification or packaging requirements will be rejected and returned to the customer at their expense.

Documentation Check:

The Waste Transfer Note (WTN) will be reviewed to ensure all required information is provided.

The delivery will be logged in Knauf's waste management system.

Weighing and Recording:

The material will be weighed, and the weight recorded for reporting and compliance purposes.

Segregation and Storage:

Category A materials will be stored in a designated, weatherproof area for reuse or recycling.

Category B materials will be stored in a separate, secure area to prevent environmental contamination and to await further assessment or processing.

5.3. Processing and Recycling

Category A materials will be processed for reuse or recycling in accordance with Knauf's sustainability initiatives:

Shredding and Recycling:

The clean mineral wool is shredded into smaller pieces if required to facilitate reuse or recycling.

Dust extraction systems must be in place to minimise airborne fibers during shredding.

The shredded material is fed into the melter to be melted with other batch materials and then fiberised and reintegrated into the production process for new mineral wool insulation products.

This closed-loop recycling reduces raw material consumption and waste.

Category B materials will be assessed for contamination. If hazardous substances are identified, the material will be treated or disposed of in compliance with Welsh environmental legislation.

Segregation:

Contaminated material is segregated from clean material to prevent cross-contamination.

Hazardous materials are handled in compliance with the Control of Substances Hazardous to Health (COSHH) Regulations.

Decontamination (if applicable):

If contamination is minor (e.g., surface adhesives), the material may undergo cleaning or decontamination processes.

Waste Acceptance Procedure

Heavily contaminated or hazardous material is sent to licensed facilities for safe disposal.

Shredding and Recycling:

Once decontaminated, the material is shredded and processed similarly to clean off-cuts.

If the material cannot be recycled, it is disposed of in compliance with the Hazardous Waste Regulations.

Health and Safety Requirements

To ensure the health and safety of workers and the environment during processing and recycling, the following measures must be implemented:

Personal Protective Equipment (PPE):

Workers must wear appropriate PPE, including:

- Respiratory protective equipment (RPE) to prevent inhalation of fibres or dust.
- Gloves, goggles, and protective clothing to minimize skin and eye contact.

Dust and Fiber Control:

Dust extraction and ventilation systems must be installed in processing areas to reduce airborne fibres.

Regular air quality monitoring must be conducted to ensure compliance with workplace exposure limits (WELs).

Training and Awareness:

Operators must receive training on the safe handling of mineral wool insulation, including the risks associated with airborne fibres and potential contaminants.

Training should also cover emergency procedures for spills or exposure incidents.

Safe Handling and Storage:

Material must be handled carefully to prevent the release of fibres.

Storage areas must be secure, weatherproof, and clearly labelled to prevent unauthorized access or environmental contamination.

Waste Management:

Any waste generated during processing (e.g., dust, contaminated material) must be disposed of in compliance with the Waste (England and Wales) Regulations.

Waste transfer notes must be maintained for all disposals.

Asbestos Management:

If asbestos contamination is suspected, the material must be handled by licensed asbestos contractors in compliance with the Control of Asbestos Regulations 2012.

Asbestos-contaminated material must be disposed of at licensed hazardous waste facilities.

Waste Acceptance Procedure

5.4. Non-Compliance

Deliveries that fail to meet the acceptance criteria will be rejected.

Repeat non-compliance by a customer may result in suspension of return privileges.

5.5. Record keeping and Reporting

All documentation, including Pre-Acceptance Forms, Waste Transfer Notes, and inspection records, will be retained for a minimum of two years in compliance with the Waste (England and Wales) Regulations.

Regular reports will be submitted to Natural Resources Wales (NRW) as required.

5.6. Customer Communication

Knauf will provide customers with a detailed guide on the return process, including packaging, labelling, and transport requirements.

A trained customer support team will be available to address any queries.

6. References / Annexes

Waste Acceptance Procedure

This procedure complies with the following legislation and guidance:

- 6.1. Environmental Protection Act 1990.
- 6.2. Waste (England and Wales) Regulations 2011.
- 6.3. Natural Resources Wales (NRW) Guidance on Waste Management.
- 6.4. European Waste Catalogue (EWC) Codes:
 - 17 06 04: Insulation materials other than those mentioned in 17 06 01 and 17 06 03.
 - 17 06 03: Insulation materials containing hazardous substances.

Related Documents

[KI Integrated Management System Policy](#)

[KI Integrated Management System Manual](#)

[Operational Procedures](#)

[Work Instructions](#)

[Guidance](#)

[Forms / Templates](#)

Environmental Compliance

All processing and recycling activities must comply with relevant environmental permits issued by Natural Resources Wales (NRW).

Regular audits and inspections should be conducted to ensure compliance with environmental and health and safety regulations.

SIPOC – “Name of Procedure”

7. Version

Version	Date	Reason for revision
Version 1	14 th July 2025	Initial Draft



Appendix 8 NRW Charge Tool



Appendix 9 Air Dispersion Modelling



Appendix 10 Habitats Regulation Assessment

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