Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Castle Cement Limited

Padeswood Cement Works
Padeswood
Mold
Flintshire
CH7 4HB

Permit number

EPR/BL1096IB

Final DRAFT Varied (CCS) Permit. Preparation of permit does not mean that we have decided to grant the variation while we advertise our draft decision

Principal changes from V021 are shown in Red Text

Padeswood Cement Works

Permit number EPR/BL1096IB

Introductory note

This introductory note does not form a part of the permit

The main features of the permit are as follows

DESCRIPTION OF THE PROCESS

The cement works at Padeswood manufactures cement from limestone, pulverised fuel ash ("PFA"), shale and sand, together with gypsum, and dispatches it in bulk tankers and as packed cement. The kiln is a modern design dry process kiln, with a nominal capacity of 750,000 tonnes per annum and includes a five-stage cyclone pre-heater and a pre-calciner. Its advanced technology reduces energy consumption and significantly reduces emissions to air. In addition, following variation the kiln is permitted to operate an integrated combined heat and power (CHP) plant, and a carbon capture plant (CCP). The CHP provides electricity and steam which is required within the CCP process and the CCP separates carbon dioxide (CO_2) from residual waste gases from both the cement kiln and CHP plant. CO_2 is transported from site via pipeline for geological storage, resulting in low greenhouse gas emission cement.

Manufacturing of cement at Padeswood involves four main steps:

Step 1: Crushing and blending of raw materials and additives to produce "raw meal". Limestone brought from the nearby Cefn Mawr quarry is delivered to a reception hopper in a purpose–built enclosure from where it is transferred to the Crane Store using a system of conveyor belts. The other raw materials are also stored here. From the Crane Store, all the raw materials (except gypsum) are taken by conveyor to the dry milling equipment.

Step 2a: Clinker Manufacture cement Kiln (Kiln 4).

The raw meal is transported to the top of the pre-heater tower cyclones. The mixture descends through the cyclones where it is pre-heated to a temperature of about 850°C using kiln exhaust gases and calciner fuels. This part of the process is called calcination, which is the breakdown of carbonates in the limestone to produce oxides. .

The calcined material then enters the rotating kiln where it is further heated by the main burner to produce clinker at a temperature of 1450°C. The clinker is cooled on a grate cooler to about 100°C before being discharged and belt-conveyed to a storage building.

Clinker is either milled on site (Step 4) or can be exported from site by lorries which are loaded in the clinker loading area.

Fuel is introduced to the process at two points; the calciner, and the kiln main burner. The calciner can be heated using coal/petcoke or Waste Derived Fuels ("WDFs") including but not limited to Profuel, Solid Recovered Fuel (SRF), meat and bone meal (MBM) and shredded tyres. In addition, hot gas from the kiln and the clinker cooler are added to assist combustion and reduce overall energy requirements. The kiln main burner can be fuelled by coal/petcoke mix, gas oil/kerosene or natural gas, and WDFs including but not limited to Cemfuel, Profuel, MBM and SRF.

Separately-milled shale is also introduced to the calciner, resulting in the burn off of volatile compounds within it, and elimination of a large range of potential emissions.

Clinker exhaust gases flow counter-direction to the solid materials described above. Heated air from the clinker cooler (secondary air) is used as combustion air for the main burner at the clinker discharge end of the rotary kiln. Gases flow up the kiln into the calciner, which is also supplied with additional heated combustion air from the clinker cooler (tertiary air). Using the exhaust gas

from the kiln in this way promotes energy efficient heat transfer and means that pollutants emitted from the kiln undergo gas/solid reactions as they pass through the calciner and many are reduced or incorporated into the clinker product. The combined kiln/calciner exhaust gas flow passes up through the pre-heater tower cyclones, and into the gas treatment plant, which consists of a bag filter equipped with lime and activated carbon injection. The bag filter removes solid-phase pollutants such as particulate matter, and the adsorbent injection promotes capture of gaseous pollutants including Hydrogen Chloride (HCl), Sulphur Dioxide (SO_2) and mercury (Hg). Treated waste gases may discharged via the dedicated 117m main kiln stack (A8,) stack, but in normal operations these pass via Step 2b (CHP) into Step 3, the carbon capture plant. Excess clinker cooler exhaust gas, which is not used in the clinker manufacturing process, is discharged to the atmosphere via a particulate bag filter and 35m stack.

To control clinker quality and minimise blockages in the preheater tower a kiln alkali bypass exhaust gas loop is used. A minor fraction of hot gas from the kiln to the calciner is extracted and passes through mixing chamber and heat exchanger before dedusting with a fabric filter. The bypass dust is collected for disposal while a portion of the cooled, dedusted gas is returned to undertake the initial quench of the kiln gases. This eliminates the need for fresh cold air making the kiln more efficient. The remainder is returned to the downdraft calciner to take advantage of NO_x reduction within the main calciner.

Kiln Fuels

Natural Gas, gas oil or kerosene is used to start up the kiln which is then fuelled by coal and petcoke until stability is achieved. The coal and petcoke are stored in a largely covered stockpile area. The coal and petcoke are transported to the Crane Store, then using a series of conveyor belts, taken to be milled to a fine powder to aid combustion. They are ground in a vertical spindle mill in dry air from the exhaust gas from the cyclone pre-heater. The exhaust air from the mill is passed through its own bag filter to atmosphere via the main stack. The CCP is fired on natural gas only.

Kiln Waste

Kiln alkali bypass dust is classified as hazardous waste and has to either be disposed of in a suitable facility or recovered in a waste management process. Kiln bag filter dust is recycled into the cement process, principally in the kiln raw meal and also via incorporation into the product via the milling process as a minor additive. Effluents from the carbon capture plant are utilised in the kiln cement production process in a closed-loop system that ensures the destruction of any organic contaminants, utilisation of valuable properties (e.g. calcium content) and appropriate disposal of residual waste. Other wastes produced at the Installation are stored in designated storage areas before being taken for recovery or disposal.

Kiln Alternative Fuels & Raw Materials

The Kiln is permitted to use up to 100% of a range of Waste Derived Fuels (WDFs). These include but are not limited to:

- Shredded used motor vehicle tyres which are delivered to the works by road. The tyres are taken directly from the delivery vehicle and fed by a conveyor into the top of the calciner. They are delivered to the calciner combustion chamber through a system of two screw conveyors and a chute.
- Cemfuel liquid fuel, manufactured to a detailed specification from a range of waste streams including spent solvents, paint and ink residues, spent carbon absorbers and waste oils. The Cemfuel is delivered by road and stored in steel tanks in bunded areas. The tanks are vented to atmosphere through an activated carbon filter system and fitted with level and overflow control systems. Cemfuel is used only in the kiln main burner and is not introduced into the calciner.
- Profuel, is manufactured from solid wastes, principally paper, plastics, fibre and textiles. Profuel may be used as a fuel for both the calciner and the kiln although it has only been used on the calciner thus far.

- SRF (Solid Recovered Fuel) is bio-degraded and shredded combustible waste mainly consisting of paper and plastics from household sources. SRF is similar to Profuel but reclaimed from 'black bag' waste and manufactured off-site using a form of MBT (Mechanical and Biological Treatment). Delivery to the works is by specially designed road vehicles. SRF is fed to the calciner using the same system as for chipped tyres and Profuel. SRF and Profuel are also pneumatically conveyed to the calciner.
- MBM (Meat and Bone Meal) is a non-hazardous bio-fuel produced by sterilising and grinding abattoir waste. MBM is delivered to site in special road vehicles and then transferred to a storage silo equipped with an activated carbon filter system. MBM may be used as a fuel for both the calciner and the kiln.

Each of the WDFs has a specification and are tested to ensure conformity with that specification and suitability for use.

The kiln is permitted to use Alternative Raw Materials ("ARMs") to substitute raw materials such as quarried limestone and to maintain cement chemistry. These waste materials are specified in the permit and include quench water from the CCP.

WDFs and ARMs must be used in accordance with the Mineral Product Association's' Code of Practice for the use of Waste Materials in Cement Manufacture.

Step 2b: Integrated combined heat and power plant providing services to the installation.

The CHP is fully integrated into the cement manufacturing process. Approximately half the kiln exhaust gas is used as preheated combustion air for the CHP, and is supplemented with additional ambient combustion air to meet the oxygen requirement. The balance of kiln gas bypasses the CHP burner stage and passes directly to the selective catalytic reduction bed (SCR) and then to the CCP. A natural-gas fired burner generates heat (approximately 130 MW_{th} net thermal input), which is supplied to a boiler for high pressure (HP) steam production. A back-pressure HP steam turbine generator is used to generate electricity (Approximately 22 MW_e) and low pressure (LP) steam (approximately 100 MW_{th} out), which are used within the installation (predominantly to meet the energy requirements of the CCP).

As a result of process integration, total gas volume and oxygen content to the CCP is reduced, while energy is conserved. The CHP boiler is considered under the Environmental Permitting Regulations (EPR) to be an integral part of the cement manufacturing process and thus sits within the Industrial Emissions Directive (2010/75/EU) Ch IV co-incineration plant envelope.

Step 3: Carbon dioxide (CO_2) capture plant (CCP).

The CCP serves the cement kiln / CHP unit and utilises proprietary amine solvent for CO_2 capture. CO_2 is separated from residual waste gases by reaction with the amine to form a CO_2 "rich" amine liquid in a wet scrubber absorber tower. The rich amine liquid passes to a separate regenerator tower, where it is heated to separate ("strip") the CO_2 from the amine. The resultant CO_2 is cleaned, compressed and exported via pipeline for geological storage, while the CO_2 "lean" amine is cooled and returned to the absorber tower for further capture reaction in a near-closed loop absorption-desorbtion cycle between the two towers.

The carbon capture plant is an integrated multi-step process, which briefly comprises:

- Inlet gas pre-treatment to ensure suitability for CO_2 capture step: -
  - selective catalytic NO_X reduction with supplementary SO_3 removal;
  - Flue gas temperature reduction using gas-gas heat exchanger;
  - Alkali quench cooling tower with outlet wet Electrostatic precipitator (wESP) for further temperature reduction, SO_X and particulate reduction.
- Main CO_2 absorption counter-current wet scrubber tower, paired with amine desorbtion tower. With recirculating aqueous amine solvent and temperature control (liquid-liquid heat exchangers and steam addition) to achieve effective absorption/desorbtion.

- 3-stage (water-water-water/acid) packed tower washing column for residual emitted flue gases following the absorber tower to minimise emissions of amine and related substances to atmosphere.
- Residual waste gas management and emission using gas to gas heat exchanger (coupled to inlet cooling) to raise emission temperature and improve dispersion, prior to emission via a second 117m stack (A17).
- CO_2 compression, cooling and cleaning (*oxygen removal via reaction with H_2 generated on site, and water removal via pressure swing absorption*) to provide CO_2 specification suitable for pipeline export.
- Amine solvent management processes including batch distillation reclaimer to maintain solvent integrity, break down heat stable salts, and remove solid contaminants.
- Advanced and integrated process control and monitoring throughout the whole system.

The CCP has no effluent discharges to the environment, with all byproducts/wastes being returned to the integrated cement making process in a way which ensures recovery of valuable constituents alongside destruction of any potentially harmful components (e.g. amine and related substances).

Step 4: Cement Milling.
Conveyor belts transfer the clinker from the storage facility to the feed hoppers on the cement mills, where it is mixed with gypsum and may be ground with additives such as fillers, grinding aids and strength enhancers to make the final cement product. The five cement mills each have fabric filters to minimise releases of dust to air. The cement produced is pneumatically conveyed to the bulk silos fitted with dust filters on the vents. From these storage silos cement is extracted either directly to bulk road and rail tankers or to the bagging plant.

Operating Modes and Emissions
Following commissioning of the CHP and CCP, in normal operation, all main parts of the integrated plant (Kiln, CHP, CCP) are fully operational although subsidiary processes (raw mill, coal mill etc) operation is determined by demand . For various reasons, individual parts of the integrated process may stop or work at reduced capacity for a period. These scenarios are detailed in an NNO (Not Normal Operation) Management Plan which. In normal operation, once the CCP is commissioned all kiln and CHP waste gases exhaust through the CCP stack (A17) following carbon capture, but in NNO, kiln gases may be emitted from the Kiln stack (A8), or any combination of CHP and kiln gases may be emitted via the CCP stack A17, but with the capture process bypassed using an appropriate combination of process control dampers. A17 may also be used to vent captured Carbon Dioxide (if required), but only in combination with process exhaust gases and reheating to ensure sufficient dispersion of the CO_2 plume. Until the newly permitted CCP is commissioned, process emissions will continue without carbon dioxide removal via A8.

Emissions Monitoring
Emissions from the cement mills and clinker cooler are monitored for total particulate matter. Emissions from the kiln stack A8 are continuously monitored (when it is in operation) for total particulate matter (TPM), carbon monoxide (CO), sulphur dioxide (SO_2), hydrogen chloride (HCl), oxygen (O_2), moisture (H_2O), nitrogen oxides (as NO_2), ammonia (NH_3) and volatile organic compounds (as TOC). In addition, spot samples may carried out twice per year for metals [cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) & vanadium (V)], dioxins and hydrogen fluoride (HF) as detailed in the permit, if operation without carbon capture exceeds set thresholds.

Emissions from the CCP stack are continuously and periodically monitored for the cement production pollutants exactly as detailed above for the kiln stack. In addition, pollutants potentially arising from the carbon capture process (amines, nitrosamines, aldehydes, ketones and total volatile organic compounds (TOC) are measured either periodically or continuously as detailed in the permit.

The status log of the permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	**Date**	**Comments**
Application BL1096	Received 29/08/01	
Notice requiring further information	Request sent 17/12/01	Consolidated application incorporating response received 05/06/02
Notice requiring further information	Request sent 11/04/03	Response received 06/06/03
Notice requiring further information	Request sent 17/07/03	Response dated 11/08/03
Additional information from Applicant: revised site plan and confirmation that landfill is not part of the installation	Received 24/10/03	
Additional information from applicant	Received 10/05/04	
Permit Determined BL1096	17/12/04	
Application for landfill variation	Received 15/04/05	
Notice requiring further information	Request sent 21/07/05	Response received 23/09/05 Response received 09/01/06
Notice requiring further information	Request sent 02/06/06	Response received 03/08/06 Response received 14/08/06 Response received 19/09/06
Variation Determined YP3438	08/11/07	
Application for MBM variation	Duly made 30/03/07	
Notice requiring further information	Request sent 27/06/07	Response received 20/07/07
Additional information from applicant	Received 20/12/07	
Request to amend fuel specification to Standard Waste Derived Fuel Specification for the Cement Sector	Received 21/02/07	
Additional information from applicant	Received 20/02/08	
Variation Determined KP3338UC	03/04/08	
Application for SRF variation	Received 03/07/07	
Notice requiring further information	Request sent 31/07/07	Response received 28/08/07
Additional information from applicant	Received 10/03/08	
Variation Determined AP3134UN	17/04/08	
Application for landfill variation	Duly made 27/05/08	

Status log of the permit		
Description	**Date**	**Comments**
Additional information from applicant	Received 21/08/08	
Variation Determined EA/EPR/BL1096IB/V005	09/10/08	
Partial surrender application	Received 18/12/09	
Variation Determined EA/EPR/BL1096IB/S007	06/04/10	Partial surrender of permit to remove the operation of a hazardous waste landfill from permit
Environment Agency Cement and Lime Sector Review Variation EPR/BL1096IB/V009	04/08/10	
Environment Agency Variation correcting errors EPR/BL1096IB/V010	15/12/10	
Variation Application EPR/BL1096IB/V011 received	03/05/13	Variation to reduce monitoring requirements following results of a public health study.
Variation Application EPR/BL1096IB/V011 issued	06/09/2013	Variation issued
Regulation 60(1) Notice of request for more information	06/03/14	Regarding Implementation of BAT conclusions under IED
Regulation 60(1) response received	30/01/15	Regarding Implementation of BAT conclusions under IED
Variation Application EPR/BL1096IB/V012	Duly made 23/02/15	Variation to add in 2 docking stations and pneumatic conveyer
Variation Application EPR/BL1096IB/V012 issued	09/06/15	Variation issued
Request for additional information to support Regulation 60(1) response	26/06/15	
Response to request for additional information received	29/07/15	Clarification on techniques employed in respect of the following BAT conclusions: 2, 5(g), 8, 9, 14, 15, 16, 19 and 20.
Additional information received	02/03/16	Updated site plan
Additional information received	14/03/16	Assessment of background ammonia emissions
Natural Resources Wales Cement Sector Review 2015 Permit EPR/BL1096IB Variation issued EPR/BL1096IB/V013	19/07/16	Varied and consolidated permit issued in modern IED condition format.
Application PAN- 001655 (EPR/BL1096IB/V014)	Duly made 16/06/17	Substantial variation application to add Cement Mill 5 and rail loading facility.
Additional information received	03/11/17	Response to Schedule 5 Notice sent 11th October 2017
Variation of permit determined	08/01/18	Consolidated Permit issued to Castle Cement Limited

Status log of the permit		
Description	**Date**	**Comments**
Application PAN- 002355 (EPR/BL1096IB/V015)	Duly Made 12/02/18	Duly Made 12/02/18
Variation and consolidation determined (EPR/BL1096IB/V015)	15/05/18	Variation and consolidation issued
Variation EPR/BL1096IB/V016	10/09/18	NRW led variation and consolidation
Application PAN-013925 (EPR/BL1096IB/V017)	Duly Made 16/09/21	Minor technical variation to make replacements on the bypass system
Variation determined (EPR/BL1096IB/V017)	22/10/21	Variation and consolidation permit issued
Variation application EPR/BL1096IB/V018 (PAN-019052)	22/08/2022	Variation to include use of Aluminium Oxide
Additional information received	Duly made 15/02/2023	Further information on the storage areas, extractive testing and odour assessment received.
Variation determined EPR/BL1096IB/V018	22/05/2023	Variation notice and consolidated permit issued
Variation application EPR/BL1096IB/V019(PAN-019893)	Received 14/11/22 Duly made 05/01/23	Minor technical variation to install a new SRF facility for transporting SRF into Kiln 4.
Additional information received EPR/BL1096IB/V019 (PAN-019893)	15/02/23 08/03/23	Response to Schedule 5 Notice information request (Noise Impact Assessment)
Additional information received EPR/BL1096IB/V019 (PAN-019893)	15/05/2023	Response to Schedule 5 Notice information request (dust bag filter emission point)
Additional information received EPR/BL1096IB/V019 (PAN-019893)	31/05/2023	Response to Schedule 5 Notice information request (addendum to BAT assessment)
Variation determined EPR/BL1096IB/V019	06/06/2023	Variation notice issued and operators registered address updated
Variation application EPR/BL1096IB/V020 (PAN-022273)	06/06/23	Minor technical variation to upgrade dust filter and monitoring equipment and to add a surface water emission point.
Additional information received EPR/BL1096IB/V020 (PAN-022273)	Duly made 03/08/23	Further information on BAT assessment and noise impact.
Variation determined EPR/BL1096IB/V020	24/10/23	Variation and consolidated permit issued
Variation application EPR/BL1096IB/V021 (PAN-026621)	First received 09/08/24 Duly Made 17/02/25	Substantial variation to add carbon capture (for geological storage) plant, and integrated combined heat and power plant to provide energy to the facility, plus other associated changes to operation.
Additional information received EPR/BL1096IB/V021 (PAN-026621)	Complete DD/MM/YY, parts provided 13/05/25, 22/05/25 11/06/25 23/06/25	Response to Schedule 5 Notice information request dated 06/05/2025 (Revised air quality assessment for atmospheric formation of amine breakdown products, additional noise baseline and revised impact assessment, secondary containment of liquids)

Status log of the permit		
Description	**Date**	**Comments**
	27/06/25 DD/MM/2025	
Variation determined EPR/BL1096IB/V021	xx/xx/25	Variation and consolidated permit issued

End of introductory note

Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number
EPR/BL1096IB

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/BL1096IB/V020 authorising,

Castle Cement Limited ("the operator")

whose registered office is

Second Floor
Arena Court
Crown Lane
Maidenhead
Berkshire
SL6 8QZ

company registration number **02182762**

to operate a regulated facility at

Padeswood Works
Padeswood
Mold
Flintshire
CH7 4HB

to the extent authorised by and subject to the conditions of this permit.

Signed	Date
Pending consultation outcome	DD/MM/2025

Authorised on behalf of Natural Resources Wales

Conditions

1 Management

1.1 General management

1.1.1 The operator shall manage and operate the activities:

(a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and

(b) using sufficient competent persons and resources.

1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.

1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

1.1.4 The Operator shall comply with the MPA code of practice, dated October 2014, or as otherwise agreed in writing with Natural Resources Wales.

1.2 Energy Efficiency

1.2.1 The operator shall:

(a) take appropriate measures to ensure that energy is used efficiently in the activities;

(b) Take appropriate measures to ensure the efficiency of energy generation at the permitted installation is maximised.

(c) review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and

(d) take any further appropriate measures identified by a review.

1.2.2 The operator shall review the viability of Combined Heat and Power (CHP) implementation at least every 4 years, or in response to any of the following factors, whichever comes sooner:

(a) new plans for significant developments within 15 km of the installation;

(b) changes to the Local Plan

(c) changes to the government UK CHP Development Map or similar;

(d) new financial or fiscal incentives for CHP

The results shall be reported to Natural Resources Wales within 2 months of each review, including where there has been no change to the original assessment in respect of the above factors.

1.3 Efficient use of raw materials

1.3.1 The operator shall:

(a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;

(b) maintain records of raw materials and water used in the activities;

(c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and

(d) take any further appropriate measures identified by a review.

1.4 Avoidance, recovery and disposal of wastes produced by the activities

1.4.1 The operator shall take appropriate measures to ensure that:

(a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and

(b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

(c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.

1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

2 Operations

2.1 Permitted activities

2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in red on the site plan at schedule 7 to this permit.

2.3 Operating techniques

2.3.1 (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by Natural Resources Wales.

(b) If notified by Natural Resources Wales that the activities are giving rise to pollution, the operator shall submit to Natural Resources Wales for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan , and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

2.3.2 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.

2.3.3 Waste shall only be accepted if:

(a) it is of a type listed in schedule 2 table S2.2; and

(b) it conforms to the description in the documentation supplied by the producer and holder or otherwise with prior written approval from Natural Resources Wales.

2.3.4 Waste paper, card, cartons, metal, plastic, glass, food, small electrical and electronic equipment or unsold textiles that has been separately collected for the purpose of preparing for re-use or recycling shall not be accepted. Waste from the treatment of these separately collected wastes shall only be accepted if incineration delivers the best environmental outcome in accordance with regulation 12 of the Waste (England and Wales) Regulations 2011.

2.3.5 Separately collected fractions other than those listed in condition 2.3.4 shall not be accepted unless they are unsuitable for recovery by recycling.

2.3.6 The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:

(a) the nature of the process producing the waste;

(b) the composition of the waste;

(c) the handling requirements of the waste;

(d) the hazardous property associated with the waste, if applicable; and

(e) the waste code of the waste.

2.3.7 The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.

2.3.8 The operator shall use only those wastes listed in table S2.2 of schedule 2 and within the specification ranges specified in table S2.1.

2.3.9 All waste derived fuels used at the installation are subject to the following conditions:

(a) No radioactive materials or radioactive wastes (as defined by EPR Schedule 23 – Radioactive substances activities shall be included).

(b) No substances with PCB concentrations greater than 10mg/kg shall be included.

(c) No substances with PCP concentrations greater than 100mg/kg shall be included.

(d) No pharmaceutical products, pesticide products, biocide products and iodine compounds shall be included except as constituents of other materials and at levels that are minimised as far as reasonably practicable.

(e) No dioxins or furans shall be included except as constituents of other materials and at levels that are minimised as far as reasonably practicable.

(f) No medical/clinical waste shall be included.

2.3.10 Any waste derived fuels not listed in Schedule 2 Table S2.2 shall not be used for the purposes of carrying out a feasibility trial without obtaining the prior written approval from Natural Resources Wales in each case. Any such feasibility trials will be limited to a maximum of 100 tonnes of the fuel and a maximum duration of 14 days.

2.3.11 Any waste raw material not listed in Schedule 2 Table S2.2 shall not be used without prior written approval from Natural Resources Wales.

2.3.12 The operator shall ensure that prior to accepting waste derived fuels subject to condition 2.3.2 at the site, it has obtained sufficient information about the wastes to be burned as fuel to demonstrate compliance with the characteristics described in condition 2.3.2.

2.3.13 The operator shall take representative samples of all waste derived fuels delivered to the site unless otherwise agreed in writing with Natural Resources Wales and test a representative selection of these samples to verify conformity with the information obtained as required by condition 2.3.9. These samples shall be retained for inspection by Natural Resources Wales for a period of at least 1 month after the material is burned and results of any analysis made of such samples will be retained for at least 2 years after the material is burned.

2.3.12 Waste derived fuels and wastes for disposal shall not be burned, or shall cease to be burned, if:

(a) the kiln is in start-up (or as otherwise agreed in writing with Natural Resources Wales); or

(b) the kiln is in the process of shutting down (or as otherwise as agreed in writing with Natural Resources Wales); or

(c) Kiln feed rate is less than 120 tonnes/hr; or

(d) the calciner temperature is below, or falls below, 850ºC when using non-hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%; or

(e) The kiln temperature is below, or falls below, 1100ºC when using hazardous waste where the content of halogenated organic substances (as chlorine) exceeds 1%; or

(f) any continuous emission limit value in schedule 3 table S3.1 is exceeded due to disturbances or failures of the abatement systems, other than under “Chapter IV abnormal operating conditions”; or

(g) monitoring results required to demonstrate compliance with any continuous emission limit value in schedule 3 table S3.1 are unavailable other than under “Chapter IV abnormal operating conditions”.

2.3.13 The operator shall record the beginning and end of each period of “Chapter IV abnormal operating conditions” and shall restore normal operation of the failed equipment or replace the failed equipment as rapidly as possible.

2.3.14 Where, during “Chapter IV abnormal operating conditions”, any of the following situations arise, the operator shall, as soon as is practicable, cease the burning of waste derived fuels until normal operation can be restored:

(a) continuous measurement shows that an emission exceeds any emission limit value in schedule 3 table S3.1 due to disturbances or failures of the abatement systems, or continuous emission monitor(s) are out of service, as the case may be, for a total of four hours uninterrupted duration;

(b) the cumulative duration of “Chapter IV abnormal operating conditions” periods over one calendar year exceeds 60 hours on each kiln.

2.3.15 The operator shall interpret the end of the period of “Chapter IV abnormal operating conditions” as the earliest of the following:

(a) when the failed equipment is repaired and brought back into normal operation;

(b) when the operator initiates a shutdown of the waste derived fuels, as described in the application or as agreed in writing with Natural Resources Wales;

(c) when a period of four hours has elapsed from the start of the “Chapter IV abnormal operating conditions”;

(d) when, in any calendar year, an aggregated period of 60 hours “Chapter IV abnormal operating conditions” has been reached.

2.3.16 Hazardous waste derived fuels containing more than 1% Halogenated organic substances (as chlorine) shall only be burnt in the main burner of the kiln.

2.3.17 Hazardous waste shall not be mixed, either with a different category of waste or with other waste, substances or materials, unless it is authorised by Schedule 1 table S1.1 and appropriate measures are taken.

2.4 Improvement programme

2.4.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by Natural Resources Wales.

2.4.2 Except in the case of an improvement which consists only of a submission to Natural Resources Wales, the operator shall notify Natural Resources Wales within 14 days of completion of each improvement.

2.5 Pre-operational conditions

2.5.1 The operations specified in schedule 1 table S1.4 shall not commence until the measures specified in that table have been completed.

3 Emissions and monitoring

3.1 Emissions to water, air or land

3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1, S3.2, S3.3 and S3.4.

3.1.2 The limits given in schedule 3 shall not be exceeded.

3.1.3 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.1.4 Process Wastes produced at the site shall, as a minimum, be sampled and analysed in accordance with schedule 3 table S3.6. Additional samples shall be taken and tested, and appropriate action taken, whenever:

(a) disposal or recovery routes change; or

(b) it is suspected that the nature or composition of the waste has changed such that the route currently selected may no longer be appropriate.

3.2 Emissions of substances not controlled by emission limits

3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.

3.2.2 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

3.3 Odour

3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.3.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to odour, submit to Natural Resources Wales for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

3.4 Noise and vibration

3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of Natural Resources Wales, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.4.2 The operator shall:

(a) if notified by Natural Resources Wales that the activities are giving rise to pollution outside the site due to noise and vibration, submit to Natural Resources Wales for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by Natural Resources Wales.

3.5 Monitoring

3.5.1 The operator shall, unless otherwise agreed in writing by Natural Resources Wales, undertake the monitoring specified in the following tables in schedule 3 to this permit:

(a) point source emissions specified in tables S3.1, S3.2 and S3.3;

(b) emissions to sewer as specified in S3.4;

(c) process monitoring specified in table S3.5;

(d) process waste monitoring as specified in table S3.6

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by Natural Resources Wales. Newly installed CEMs, or CEMs replacing existing CEMs, shall have MCERTS certification and have an MCERTS certified range which is not greater than 1.5 times the daily emission limit value (ELV) specified in schedule 3 table S3.1. The CEM shall also be able to measure instantaneous values over the ranges which are to be expected during all operating conditions. If it is necessary to use more than one range setting of the CEM to achieve this requirement, the CEM shall be verified for monitoring supplementary, higher ranges. Newly installed Data Acquisition and Handling System (DAHS), or DAHS replacing existing DAHS, shall have MCERTS certification.

3.5.4 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1, S3.2, S3.3 unless otherwise agreed in writing by Natural Resources Wales.

3.5.5 Where Continuous Emission Monitors are installed to comply with the monitoring requirements in schedule 3 table S3.1 the Continuous Emission Monitors shall be used such that;

(a) the values of the 95% confidence intervals of a single measured result at the daily emission limit value shall not exceed the following percentages:

- Carbon monoxide 10%
- Sulphur dioxide 20%
- Oxides of nitrogen (NO & NO_2 expressed as NO_2) 20%
- Particulate matter 30%
- Total organic carbon (TOC) 30%
- Hydrogen chloride 40%
- Ammonia 40%

(b) valid half-hourly average values shall be determined within the effective operating time (excluding the start-up and shut-down periods) from the measured values after having subtracted the value of the confidence intervals in condition 3.5.5;

(c) where it is necessary to calibrate or maintain the monitor and this means that data are not available for a complete half-hour period, the half-hourly average shall in any case be considered valid if measurements are available for a minimum of 20 minutes during the half-hour period. The number of half-hourly averages so validated shall not exceed 5 per day;

(d) daily average values shall be determined as the average of all the valid half-hourly average values within a calendar day. The daily average value shall be considered valid if no more than five half-hourly average values in any day have been determined not to be valid;

(e) no more than ten daily average values per year shall be determined not to be valid.

3.5.6 Where Continuous Emission Monitors are installed to comply with the monitoring requirements in schedule 3 table S3.1:

(a) a QAL2 test as specified in BS EN 14181 shall be performed at least every three years or whenever there are significant changes to either the process, the fuel used or to the CEMs themselves;

(b) an Annual Surveillance Test (AST) shall be performed at least annually, as specified within BS EN 14181;

(c) the operator shall have a procedure to apply the QAL3 requirements of EN 14181.

4 Information

4.1 Records

4.1.1 All records required to be made by this permit shall:

(a) be legible;

(b) be made as soon as reasonably practicable;

(c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and

(d) be retained, unless otherwise agreed in writing by Natural Resources Wales, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:

(i) off-site environmental effects; and

(ii) matters which affect the condition of the land and groundwater.

4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by Natural Resources Wales.

4.2 Reporting

4.2.1 The operator shall send all reports and notifications required by the permit to Natural Resources Wales using the contact details supplied in writing by Natural Resources Wales.

4.2.2 A report or reports on the performance of the activities over the previous year shall be submitted to Natural Resources Wales by 31 January (or other date agreed in writing by Natural Resources Wales) each year. The report(s) shall include as a minimum:

(a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;

(b) the performance parameters set out in schedule 4 table S4.2 using the forms specified in table S4.3 of that schedule;

(c) the functioning and monitoring of the plant involved with the burning of waste derived fuels, in a format agreed with Natural Resources Wales. The report shall, as a minimum requirement (as required by Chapter IV of the Industrial Emissions Directive (IED)) give an account of the running of the process and the emissions into air and water compared

with the emission standards in the IED.

(d) the functioning and monitoring of the carbon capture plant and all associated equipment, with the report scope and format agreed in writing with Natural Resources Wales. The report shall, as a minimum requirement give an account of the running of the process (including a summary of records of process monitoring requirements of table S3.5), the emissions into air compared with the emission limits in table S3.1, and details of the waste generated.

4.2.3 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by Natural Resources Wales, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:

(a) in respect of the parameters and emission points specified in schedule 4 table S4.1;

(b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.3 ; and

(c) giving the information from such results and assessments as may be required by the forms specified in those tables.

4.2.4 The operator shall, unless notice under this condition has been served within the preceding four years, submit to Natural Resources Wales, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.

4.2.5 Within 1 month of the end of each quarter, the operator shall submit to Natural Resources Wales using the form made available for the purpose, the information specified on the form relating to the site and the waste accepted and removed from it during the previous quarter, if during that quarter the total amount accepted exceeds 100 tonnes of non-hazardous waste or 10 tonnes of hazardous waste.

4.2.6 Within 1 month of the end of each quarter, the operator shall submit to Natural Resources Wales, using the form specified, the information specified on the form relating to the types of waste Alternative Raw Materials and Waste Derived Fuels that the Operator has used in that quarter.

4.3 Notifications

4.3.1 (a) In the event that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—

(i) inform Natural Resources Wales,

(ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and

(iii) take the measures necessary to prevent further possible incidents or accidents;

(b) in the event of a breach of any permit condition the operator must immediately—

(i) inform Natural Resources Wales, and

(ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;

(c) in the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.

4.3.2 Any information provided under condition 4.3.1 shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where Natural Resources Wales has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform Natural Resources Wales when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to Natural Resources Wales at least 14 days before the date the monitoring is to be undertaken.

4.3.4 Natural Resources Wales shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

(a) any change in the operator's trading name, registered name or registered office address; and

(b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

(a) any change in the operator's name or address; and

(b) any steps taken with a view to the dissolution of the operator.

In any other case:

(a) the death of any of the named operators (where the operator consists of more than one named individual);

(b) any change in the operator's name(s) or address(es); and

(c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

(a) Natural Resources Wales shall be notified at least 14 days before making the change; and

(b) the notification shall contain a description of the proposed change in operation.

4.3.6 Natural Resources Wales shall be given at least 14 days notice before implementation of any part of the site closure plan.

4.3.7 Where the operator has entered into a climate change agreement with the Government, Natural Resources Wales shall be notified within one month of:

(a) a decision by the Secretary of State not to re-certify the agreement;

(b) a decision by either the operator or the Secretary of State to terminate the agreement; and

(c) any subsequent decision by the Secretary of State to re-certify such an agreement.

4.3.8 Unless otherwise agreed in writing, the operator shall provide Natural Resources Wales with 7 days written notice prior to the introduction of a new waste derived fuel or raw material listed in the Mineral Products Association's Code of Practice. The introduction of a new waste derived fuel or raw material does not require prior consent from Natural Resources Wales.

4.4 Interpretation

4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.

4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "immediately", in which case it may be provided by telephone.

Schedule 1 - Operations

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity and WFD Annex I and II operations**	**Limits of specified activity and waste types**
AR1	S3.1 A(1)a	Producing cement clinker in a rotary kiln with a production capacity exceeding 500 tonnes per day. Operation of a co-incineration process. **R01** – Use principally as a fuel or other means to generate energy **R05** – Recycling / Reclamation of other inorganic materials **R11** – Use of waste obtained from any other operations numbered R01 – R10 **R13 –** Storage of wastes pending recovery operations R01 – R12 (excluding temporary storage, pending collection, on the site where it is produced). D10 Incineration on land	Receipt and storage of raw materials (including Alternative Raw Materials) through crushing, blending, other processing and feeding to the kiln system. Mixing of hazardous waste (approved alternative raw materials) with raw materials for the production of clinker. Receipt and storage of fuels (including Waste Derived Fuels) and feeding to the kiln system. This includes the use of coal and gas oil as a start-up & shutdown fuel. Disposal of wastes arising from the carbon capture plant only, as specified in Schedule 2 of the permit and in accordance with permit conditions 2.3.8 and 2.3.12. Waste types as specified in Table S2.2 of this permit. Discharge of clinker from the cooler to the clinker store or export facility and discharge of kiln emissions to downstream processes (CCP) and to atmosphere via process vents and when CCP is not operational.

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity and WFD Annex I and II operations**	**Limits of specified activity and waste types**
AR8	S1.1 A(1)(a)	Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts. As an integral part of the co-incineration process A1.	Integrated Combined Heat and Power Plant steam raising boiler (approximately 130 MW_{th} input, 22 MW_e, 100 MW_{th} steam output) which is fuelled on natural gas and using kiln exhaust as preheated combustion air, with supplementary ambient combustion air. Fully integrated into the cement kiln and carbon capture plant process and part of the IED Chapter IV activity, not to be operated independently of either other than under NNO. Activity authorised by permit variation V021, only operational once the CCP and CHP have been built and commissioned.
AR9	S6.10 A(1)(a)	Capture of carbon dioxide streams from an installation for the purposes of geological storage pursuant to Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide.	From receipt of waste gases from Cement Kiln A1 and/or CHP plant through integrated CCP treatment (*pre-treatment, abatement & cooling, CO_2 separation & amine regeneration/reclaim, wet scrubber amine abatement, exhaust gas heating*) to discharge of residual emissions to atmosphere, export of compressed, deoxygenated and dehydrated CO_2 via pipeline, and return of waste streams to the kiln. Only KS-21 solvent as described in Variation Application V021 shall be used as the capture agent. Authorised by permit variation V021, only operational once the CCP and CHP have been built and commissioned.

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity and WFD Annex I and II operations**	**Limits of specified activity and waste types**
AR10	S4.2 A(1)(a)	Producing inorganic chemicals such as— (i)gases …(**hydrogen**);	Production of hydrogen using an electrolyser in the CCP CO_2 purification stage, solely for use within the process for CO_2 deoxygenation prior to export. In accordance with regulatory guidance as demonstrated in response to PO 02 (V021). No more than 1 tonne of hydrogen will be stored within the facility. The electrolyser shall not produce more than 1 tonne of non-hazardous or 10kg of hazardous waste per day and shall not consume more than $20m^3$ of water per day
AR2	S3.1 A(2)(a)	Grinding cement clinker in cement mills 1, 2,3, 4 & 5	Receipt of clinker from the kiln and import facility through storage and transfer to the cement mills. Receipt, transfer and storage of minor additional constituent (flue gas cleaning residue) from the kiln bag filtration system to the blending, feeding and milling systems to discharge of cement to storage silos. Receipt, on site of all other raw materials (e.g. gypsum), through storage, blending and feeding, to the cement mills through to discharge of cement to storage silos. Emissions to air from process vents.
AR3	S3.1 part B (a)	Storing, loading or unloading cement or cement clinker in bulk prior to further transportation in bulk.	Cement & clinker storage, bulk loading, unloading and dispatch. Emissions to air from process vents.

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity and WFD Annex I and II operations**	**Limits of specified activity and waste types**
AR4	S3.1 part B (b)	Blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixtures, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.	Blending and bagging of cement products. Emissions to air from process vents.
Directly Associated Activity			
AR5	Waste storage and handling **R13 -** Storage of wastes pending recovery operations R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). **D15 -** Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced).		From waste generation, storage and monitoring to waste despatch.
AR6	1.925 MW Hot Gas Generator providing auxiliary heat to Mill 5.		Combustion of gas oil including release to air of combustion gasses through Mill 5 stack.
AR7	Rail loading facilities		Loading of cement products for dispatch
AR11	Water Treatment Plant (demineralised water preparation)		From receipt of raw water to dispatch of demineralised water and wastewater
AR12	High pressure compression of captured CO2		Within compressor building. From receipt of CO_2 from the regenerator tower to export via pipeline

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Consolidated response to Information Notice dated 17/12/01	Sections 2.1 to 2.11	05/06/02
Response to Information Notice dated 11/04/03	The response given to questions 6 to 18, 23, 25 to 29 & 39	06/06/03
Additional Information May 2004	Sections 3,4, 7 to 18	10/05/04
Variation Application KP3338UC	C2.1 to C2.9, C2.10 (except 2.10.17 to 2.10.20, 2.10.23 and table 2.10.2), C2.11	30/03/07
Response to Information Notice dated 27/06/07	The response given to questions 1,2 and 3	20/07/07
Variation Application AP3134UN	C2.1 to C2.9, C2.10 (except 2.10.18 to 2.10.21, 2.10.24 and table 2.10.2), C2.11	03/07/07
Response to information Notice dated 31/06/07	The response given to questions 1 & 4 to 7	28/08/07
Additional Information August 2008	Use of SNCR (selective non-catalytic reduction)	21/08/08

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Supporting information to variation application EA/EPR/BL1096IB/V012, document reference Pad1-2015	All	23/02/15
Information received in support of Natural Resources Wales Cement Sector Permit Review 2014	All parts of operator response to Regulation 60 (1) notice sent 06/03/14	30/01/15
Information received in support of Natural Resources Wales Cement Sector Permit Review 2014	All parts of operator response to Regulation 60 (1) notice sent 26/06/15	29/07/15
Application	Table 3a – technical standards , Part C3 of the application form Best available techniques as described in BAT conclusions under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions for the production of cement, lime and magnesium oxide	16/06/17
Application	Application for variation to Padeswood Works Permit Document Ref CM5	16/06/17
Response to Schedule 5 Notice dated 11/10/17	Response to question regarding BAT for Noise control at CM5	03/11/17
Mineral Products Association Code of Practice for the Use of Waste Materials in Cement and Dolomitic Lime Manufacture	All	06/03/2018
Application PAN-013925 (EPR/BL1096IB/V017)	Application supporting document: 'Installation of a replacement Bypass system'. Responses to application form Part C2 and Part C3.	20/04/2021
Application PAN-019052 (EPR/BL1096IB/V018)	Application supporting document 'Aluminium oxide and GBFS Variation Appendix 6 BFS Trial Procedure'	22/08/2022
Application PAN-019893 (EPR/BL1096IB/V019)	Application supporting document '5426-CAU-XX-XX-RP-V-0301.A0.C1 Op Tech & BAT (final)'	14/11/2022
Response to Schedule 5 Notice	'5426-CAU-XX-XX-RP-V-0304.A0.C1 Operating Techniques & BAT Review Report – Addendum'	31/05/2023
Application PAN-022273 (EPR/BL1096IB/V020)	Application supporting documents ref: 5426-CAU-XX-XX-RP-V-0302.A0.C1 and Operating Techniques & BAT Review Report 5426-CAU-XX-XX-RP-V-0303.A0.C1	03/08/2023

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Application PAN-026621 (EPR/BL1096IB/V021)	Application supporting documents concerning: • Technical description/summary (all parts) • Site and equipment layout (all parts) • BAT assessment (all parts) • Environmental risk assessment (all parts) • Containment of potentially polluting liquids (all parts)	09/08/24 and as updated during application
Emissions not controlled by limits: Dust management plan (company IMS procedure PG10) and monitoring plan (report NOR3030/DMP/001 Issue 2)	All parts – Dust Management Plan version 13, 13/12/24, monitoring plan dated March 2025, and as subsequently updated with agreement in writing from NRW	17/03/2025 (management plan) and 10/04/25 (monitoring plan)
Emissions not controlled by limits: Leak detection and repair (LDAR) procedure and associated fugitive emissions management plan (for substances other than dust)	Response to Pre-operational Condition PO 04 (V021) and as subsequently updated with agreement in writing from NRW	Upon completion of Pre-operational condition 04
NNO (Not Normal Operation) Management Plan	Response to Pre-operational Condition PO 04 (V021) and as subsequently updated with agreement in writing from NRW	Upon completion Pre-operational (PO 04)
Noise Management Plan	Response to Pre-operational Condition PO 09 and PO 10 (V021) and as subsequently updated with agreement in writing from NRW	Upon completion of Pre-operational condition PO 09 and as amended by completion of PO 10

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC1	Particulate emission data (Continuous Emissions Monitors) for emission points A3, A4, A5, A6 & A9 shall be corrected to standard reference conditions (as detailed in Schedule 6) from 09/04/17 onwards. Pre-determined correction factors for each emission point may be acceptable as an alternative to upgraded CEMS where the operator can demonstrate that these parameters are stable and consistent, providing historical data as evidence. In line with BS EN 15259, historic moisture and temperature measurements would need to be shown to not vary above or below 10%, (as a guide value), of the statistical mean from available data derived from periodic measurements. The Operator shall provide a report to Natural Resources Wales confirming (for agreement) how particulate emissions data will be corrected.	~~31/10/16~~ **Complete**

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC2	The Operator shall provide a written report detailing the proposed monitoring technique to be employed to demonstrate compliance with the particulate matter ELV of 10 mg/Nm3 at emission points A11 & A12. If the Operator proposes the use of an alternative technique (i.e. not extractive or continuous measurement in accordance with recognised standards), then evidence must be provided to prove the technique will demonstrate compliance with the ELV to an equivalent level of certainty.	~~31/10/16~~ **Complete**
IC3	In order for Natural Resources Wales to set the appropriate emission limit values, the Operator shall submit a report detailing the operational capability (expressed as mg/Nm3 of particulate released) of each bag filter plant associated with emission points A3, A4, A5, A6, A7 & A9. The report shall include: I. A statistical analysis of at least two years of particulate monitoring data for each emission point with supporting graphs demonstrating individual values, averages and standard deviations. II. Design specification of each bag plant. III. Details on all maintenance (including filter bag changes) carried out for each bag filter plant during the monitoring period, including dates and times of each maintenance	~~30/11/16~~ **Complete**

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC4	If storing Priority Hazardous Substances on site, the Operator must carry out the following assessments with reference to the Environment Agency's guidance "How to carry out a risk assessment if you're applying for a bespoke permit that includes discharging hazardous pollutants to surface water": Phase 1 Part A screening tests for mercury, cadmium, nickel, lead, benzene, polyaromatic hydrocarbons and any other relevant priority hazardous substances. Phase 1 Part B screening tests for mercury, cadmium, polyaromatic hydrocarbons and any other relevant priority hazardous substances. For any substance which is not screened out by the Phase 1 Part A or Part B screening tests the Operator will also need to carry out Phase 2 modelling, as described in "How to carry out a risk assessment if you're applying for a bespoke permit that includes discharging hazardous pollutants to surface water". The Operator must provide Natural Resources Wales with the results of the emissions monitoring, the results from the screening tests and the results from any Phase 2 modelling. The Operator may use the Environment Agency's H1 electronic screening tool to present the emissions data and to carry out the Phase 1 screening tests. Note: With regard to the Phase 1 Part A screening - a full list of priority hazardous substances is provided in the Environment Agency guidance "How to carry out a risk assessment if you're applying for a bespoke permit that includes discharging hazardous pollutants to surface water" under the section entitled "Screening test: priority hazardous pollutants". The Operator must review the list and carry out the screening for any substances, in addition to those specified above, that may be present in the installations discharges to surface water. With regard to the Phase 1 Part B screening for priority hazardous pollutants, the section entitled "Screening test: priority hazardous pollutants" provides a full list of relevant priority hazardous substances and their associated annual significant loads.	~~28/02/18~~ **Complete**
IC5	The Operator shall submit a report on the baseline conditions of soil and groundwater at the installation. The report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities provided for in Article 22(3) of the IED. The report shall contain information, supplementary to that already provided in the application Site Condition Report, needed to meet the information requirements of Article 22(2) of the IED.	~~31/03/18~~ **Complete**

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC6	The Operator shall submit the written protocol referenced in condition 3.1.3 for the monitoring of soil and groundwater for approval by Natural Resources Wales. The protocol shall demonstrate how the Operator will meet the requirements of Articles 14(1) (b), 14(1) (e) and 16(2) of the IED. The procedure shall be implemented in accordance with the written approval from Natural Resources Wales.	~~31/03/18~~ **Complete**
IC7	Given the difficulties of applying the BS 4142 assessment methodology to this specific situation as there are existing sources due to be removed which may be contributing to the background levels. A monitoring study should be carried out once Mill 5 is operational to validate the noise source assumptions and implementation of proposed mitigation measures. A report shall be submitted to Natural Resources Wales demonstrating the results of the monitoring exercise.	~~After 12 months of Mill 5 operating~~. **Complete**
IC8	The operator shall provide a report to Natural Resources Wales detailing the results of spot sampling of CO, NOx and SO2 emissions of the hot gas generator. The results shall be used to verify that the emissions are as predicted.	~~After 12 months of Mill 5 operating.~~ **Complete**
IC9a	Following successful commissioning and establishment of routine steady operation, the Operator shall undertake a noise impact assessment following BS4142:2014 and guidance set out in Noise and vibration management: environmental permits - GOV.UK (www.gov.uk). The assessment should include an objective assessment of narrow band (FFT) measurements to identify any tonal elements from on-site sources and off-site at sensitive receptors. The assessment should include consideration of the Welsh Government's Noise and soundscape action plan 2018-2023. Upon completion of the work, a written report shall be submitted to Natural Resources Wales for approval.	Within 9 months of commissioning the new SRF feed or as otherwise agreed by Natural Resources Wales
IC9b	Following completion of IC9a, should the written report indicate it is required, a Noise Management Plan shall be submitted to Natural Resources Wales detailing any required noise control. This should be completed in line with guidance set out in Noise and vibration management: environmental permits - GOV.UK (www.gov.uk)	Within 3 months completion of IC9a (if applicable) or as otherwise agreed by Natural Resources Wales
IC10a	Following successful commissioning and establishment of routine steady operation of filter at emission point A11 the Operator shall undertake a noise impact assessment following BS4142:2014 and guidance set out in Noise and vibration management: environmental permits - GOV.UK (www.gov.uk). The assessment should include an objective assessment of narrow band (FFT) measurements to identify any tonal elements from on-site sources and off-site at sensitive receptors. The assessment should include consideration of the Welsh Government's Noise and soundscape action plan 2018-2023. Upon completion of the work, a written report shall be submitted to Natural Resources Wales for approval	~~Within 9 months of commissioning the new filter and associated equipment or as otherwise agreed by Natural Resources Wales~~ **Complete**

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC10b	Following completion of IC10a, should the written report indicate it is required, a Noise Management Plan shall be submitted to Natural Resources Wales detailing any required noise control. This should be completed in line with guidance set out in Noise and vibration management: environmental permits - GOV.UK (www.gov.uk)	~~Within 3 months completion of IC10a(if applicable) or as otherwise agreed by Natural Resources Wales~~ **Complete**
IC11 (VO21)	**Emissions Monitoring Location (A17)** The Operator shall submit a written report to Natural Resources Wales for assessment and written approval on the assessment of air emissions monitoring location A17 during commissioning of the installation. The report shall include: • whether the air monitoring locations meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). • the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements. Where notified in writing by Natural Resources Wales that the requirements are not met, the Operator shall submit proposals or further proposals for rectifying this in accordance with timescale in the notification. Such proposals shall be implemented in accordance with Natural Resources Wales's written approval.	Prior to the CCP being commissioned.
IC12 (V021)	The Operator shall submit a written report to Natural Resources Wales for approval, concerning water discharge W4 monitoring and emission limits, including but not limited to: • Review of COD levels in influent site surface water, and proposing a final COD limit for emission point W4 (table S3.3 in this permit) to demonstrate that discharge is free from installation contamination.	Within 3 months of the CCP being commissioned.
IC13 (V021)	The Operator shall submit a written summary report to Natural Resources Wales to confirm that the performance of the Continuous Emission Monitors for parameters specified in Table S3.1 for Emission Point A17 complies with the requirements of EN 14181, specifically the requirements of QAL1, QAL2 and QAL3. The report shall include the results of calibration and verification testing.	Initial calibration report to be submitted to Natural Resources Wales within 3 months of the CCP being commissioned. Full summary evidence compliance report to be submitted within 18 months of the CCP being commissioned.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC14 (V021)	The Operator shall submit a written report to Natural Resources Wales, for approval, on the commissioning of the varied installation (including performance of CCP, CHP, kiln, and associated equipment). The operator shall propose the report scope to Natural Resources Wales in advance, and obtain their written approval, but it shall at least (unless otherwise agreed): • summarise the initial environmental performance of the plant as installed against the design parameters set out in the Application. • Include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions. Propose specifications for additional / amended reporting / monitoring parameters where required in V021 of the permit (*i.e. Table S2.1 CCP wastes, table S3.5 process monitoring requirements, table S3.6 process waste monitoring requirements*).	Agreement of report scope: within 1 month of the CCP being commissioned. Report: within 6 months of the CCP being commissioned.
IC15 (V021)	The operator shall carry out a programme of periodic formaldehyde, acetaldehyde, sulphur trioxide, amine, nitrosamine and nitramine monitoring over a period and frequency agreed in advance in writing with Natural Resources Wales and in accordance with the requirements of Table S3.1 of the permit. The operator shall submit a written report to Natural Resources Wales with an analysis of whether emissions of these can be considered to be low and stable.	Within 9 months of the CCP being commissioned.
IC16 (V021)	**Noise (existing operations):** The Operator shall undertake a BS 4142:2014+A1:2019 noise impact assessment (NIA) following .gov.uk guidance set out in Noise and Vibration Management: Environmental Permits and Method implementation document (MID) for BS 4142, to determine the noise impacts of existing site operations. This report shall take into account detailed NRW comments on Variation Application noise impact assessment reference 2060956-RSKA-RP-003-(04) dated 06/08/2025. This report may include noise impact of variation V021 (CCP) but shall clearly distinguish current site operational impact (including already consented developments up to V020- SRF- even if these are not yet operational) from future (V021) impact change. Upon completion of the work, a written report shall be submitted to Natural Resources Wales for approval and shall form the baseline for improvements required under PO 09. As such the report must clearly describe the status of existing site operations (e.g. what recent changes are in/excluded) to allow the NIA to be updated in respect of additional changes.	Within 6 months of issue of variation V021 and in any case before the sound source design of the CCP is finalised .

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC17 (V021)	**Noise: whole installation with CCP:** Following successful commissioning of the CCP, the Operator shall undertake a BS 4142:2014+A1:2019 noise impact assessment following .gov.uk guidance set out in Noise and Vibration Management: Environmental Permits and Method implementation document (MID) for BS 4142, to demonstrate that the noise impacts from the V021 variation do not exceed those specified in the Environmental Noise Impact Assessment produced in response to PO 10 and neither cause or contribute to a significant adverse impact. The wording "cause or contribute" reflects the requirement that where a significant adverse impact is indicated from the existing site, then the rating level from the variation sources (V021) will not increase the total site rating level. Where the existing site rating level is found to be an indication of adverse impact or lower, then the total site rating level (including variation sources V021) should not result in an indication of a significant adverse impact. Upon completion of the work, a written report shall be submitted to Natural Resources Wales for approval. If noise impacts are higher than predicted or are significant adverse, the report shall propose measures and timescales to further reduce noise impacts, and shall be implemented following agreement by Natural Resources Wales.	Within 9 months of the CCP being commissioned.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC18 (V021)	**CHP: Performance, BAT and Energy Efficiency** The Operator shall submit a written report to Natural Resources Wales, for approval, describing the performance of the CHP. The operator shall propose the report scope to Natural Resources Wales in advance, and obtain their written approval, but it shall at least include (unless otherwise agreed): • measurement of the CHP plant net total fuel utilisation ("*efficiency*"), and confirming whether the expected LCP BAT-AEEL of 78-95% is achieved (LCP BAT2, 40). The report shall necessarily provide the net rated thermal input and output for the CHP plant, supported by appropriate evidence. Should the BAT-AEEL performance not be demonstrated in line with permit application (80-85%) the operator shall provide an assessment of reasons for this, and a timetable of proposals for measures which will be taken to improve operation, to achieve at least BAT-AEEL performance. The report shall also confirm the CHP NNO parameters proposed in response to Pre-operational condition 04 : • the "minimum start up load" and "minimum shut-down load" (in MW and as a percent of rated power output), below which the plant is in NNO • the total output load (i.e. electricity and heat) (MW) • and the output load as a percentage of the rated thermal output of the combustion plant (%) • And/Or at least three criteria or parameters which can be met at the end of start-up or start of shut down as detailed in 2012/249/EU	Agreement of report scope: within 1 month of the CCP being commissioned.. Report within 9 months of the CCP being commissioned.
IC19 (V021)	The Operator shall submit a written report to Natural Resources Wales, for approval, on the implementation of its Environmental Management System (EMS) to the carbon dioxide capture activity. The report shall also contain a review of the CCP NNO management plan and describe any updates to the plan following the review. The report scope shall include all changes associated with Permit Variation V021, i.e. CCP, CHP and associated alterations to existing equipment/processes such as upgrades to the main bag filter.	Within 12 months of the CCP being commissioned.

IC20 (V021)	**Carbon Capture Plant performance** The Operator shall submit a written report to Natural Resources Wales, for approval, on the first 12 months of post- CCP commissioning operation of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters and BAT as set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit. In particular, the report shall include unless otherwise agreed (but is not limited to) a review of: • Annual CO_2 capture efficiency rate (actual and achievable), against the expected 95% rate (including normal operation and startup/shutdown, as described in the NNO management plan [see PO 04 and IC18 & 19] • Causes of any NNO or plant unplanned outage (kiln, CHP and CCP), their root causes, and methods of future prevention • Rate of solvent consumption and waste production against plan • Absorber solvent analysis, quality, degradation, and by-product formation, and changes to these parameters over an extended period. With reference to all relevant monitoring of solvent performance indicators during the period, including but not limited to the monitoring specified in table S3.5 of this permit. • plant performance changes over operational time with respect to key performance indicators including solvent composition/degradation and by-product concentration (above) and any other relevant operational parameters • The suitability of reporting/monitoring parameters developed in response to PO 06 and IC 14, and proposals for final requirements to be incorporated into the permit. • Pre-carbon capture abatement plant performance versus design expectations and effect on the carbon capture plant • The efficacy of the wash tower and demisters in preventing amine emission, and in particular via the prevention of aerosol formation and/or emission with specific reference to SO_3 measurements • Any other relevant matters notified to the operator by Natural Resources Wales, in writing Should any aspect of performance not meet design and permit application expectations, the report shall include: • an investigation into operational reasons for and effects of any changes from design performance (particularly in respect of solvent degradation) • a review of the options for optimising performance and minimising / mitigating events or processes that lead to performance deterioration	Within 15 months of the CCP being commissioned.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
	• Proposals, with timetable, for implementing appropriate measures identified in the review to restore performance. If required, such proposals shall be implemented in accordance with Natural Resources Wales's written approval.	
IC21 (V021)	**CCP system optimisation (other than carbon capture in IC13)** The Operator shall submit a written report to Natural Resources Wales describing the performance and optimisation of secondary aspects of the CCP process, including but not limited to: • The new SCR system and existing SNCR system for minimisation of NO_X, considering residual emissions to atmosphere of NO_X and NH_3, optimisation of the CO_2 capture plant (minimisation of Amine-NO_X degradation), and any other relevant factors including CO emission. • The bag filter plant lime injection and quench tower for minimisation of acid gas CCP inlet concentrations. • The changes to emissions of trace pollutants including mercury and dioxins, which may have changed as a result of the CCP variation. The report shall address the requirements of LCP BATc 7 and shall include an initial assessment of the level of NOx, and NH_3 emissions that can be achieved under optimum operating conditions, taking into account the primary and secondary NO_X controls, and ammonia abatement via the absorber tower mist eliminators. As determined to be necessary, it will include specific measurement campaigns, such as monitoring pollutant levels at the inlet/outlet of different stages of the integrated Kiln/CHP/SCR/CCP system, if continuous monitoring is not in place.	Within 15 months of the CCP being commissioned.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Due Date**
IC22 (V021)	**CCP Emissions Characterisation** The operator shall investigate, and report to Natural Resources Wales for approval, the options available for enhanced characterisation of emissions to air from the carbon capture process (as described in Table 1 of the variation application), noting the limitations of certified methods currently available and the need for method development work. The operator shall propose the investigation and final report scope to Natural Resources Wales in advance, and obtain their written approval. It shall propose a plan for (a) campaign(s) of enhanced (and possibly investigative) monitoring of emissions, to confirm that plant performance is in accordance with permit requirements, and to further the development of appropriate monitoring methods. Such development work may be collaborative across industry or trade bodies, and may include work undertaken at other "reference plant". Following approval of the plan, the operator shall implement a campaign of informative additional monitoring to confirm that the composition of the exhaust gas emissions to air from emission point A17 is reflected by the Emission Limit Values specified in Table S3.1, identifying all key components including, but not limited to: speciated aldehydes, ketones and alcohols, amines, nitramines, nitrosamines, and a comparison with measured total VOC. The results shall be reported in writing to Natural Resources Wales, both in terms of plant performance, and opportunities for developments of improved methods for CCP by-product monitoring.	Agreement of report scope: within 3 months of the CCP being commissioned. Report on results: Within 18 months of the CCP being commissioned.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
~~PO1~~ **(completed 06/06/2023)**	~~Use of SRF & Profuel® as alternative fuels on the main kiln burner~~	~~The Operator shall provide details of the transport system to the main burner and monitoring programmes for agreement by Natural Resources Wales.~~

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 2 (V021)	Operation of the carbon capture plant	At least 6 months prior to the commencement of commissioning of the CCP, the operator shall submit to Natural Resources Wales, a written summary of design final details, where these were not complete at permit determination. This report need not cover any matters subject to separate Pre-operational conditions but shall include at least unless otherwise agreed in writing, (although it is not limited to): • The equipment selection and design summary for the CO_2 compressor(s), and energy efficiency/heat recovery parameters associated with the selection. • The expected composition of circulating absorber solvent, and associated updates to environmental risk assessments, EMS, where breakdown products / byproducts affect the composition and hazard of the material. • Summary information on the selected hydrogen electrolyser equipment employed for deoxygenation of the captured CO_2, and demonstration of conformance with the "guidance on emerging techniques" performance requirements. • Confirmation of equipment selected for vapour treatment of KS-21 storage vessels and for dust abatement from silo storage, where required, and confirmation of conformance with requirements of the relevant Emission from Storage BAT conclusions. • The arrangements for continuous and periodic monitoring of emissions to air, to comply with regulatory guidance (formerly M1, M2 and M20), including: Plant and equipment details (including MCERTs accreditation), details of monitoring location (including design/specification to meet the requirements of EN 15259 and associated Method Implementation Document), access, and working platforms. • Any other matters communicated in writing to the operator by Natural Resources Wales for inclusion under this condition Should any updates constitute changes to design which would require permit variation, the operator shall apply for such variation following the standard regulatory requirements.
PO 3 (V021)	Operation of the carbon capture plant	At least 6 months prior to the commencement of commissioning of the CCP, the operator shall submit to Natural Resources Wales an updated written Site Condition Report that meets the requirements of our H5 guidance, and following the format of our H5 template, available at Natural Resources Wales / Horizontal guidance. This shall include any changes to the information on site condition (particularly in regard of the land on which the CCP is to be constructed) and a review of any "use, production and release of relevant hazardous substances" as required by the regulations.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 4 (V021)	Operation of the carbon capture plant	Following the completion of the final design of the Installation and at least 6 months prior to the commencement of commissioning of the CCP, the Operator shall send to Natural Resources Wales: • A summary of the site Environment Management System (EMS);and • A copy of the full site NNO management plan which shall be prepared with reference to relevant BAT conclusions (e.g. LCP BAT 10 & start-up/shut-down requirements of 2012/249/EU), waste incineration BAT 18, Guidance on Emerging techniques for Carbon Capture section 3.6) and shall include NNO scenarios for (as a minimum) the kiln, the CHP and the CCP, their interdependencies, internal and external causes. • The leak detection and repair (LDAR) and fugitive emissions minimisation and monitoring plans for the carbon capture plant (solvent, ammonia, hydrogen), and updated site-wide dust management plan to include changes associated with the CCP • The plan of site emission points, including small source release points / passive vents on the CCP as referenced in Table S3.1 of this permit And shall obtain our written approval to the EMS summary and the full plans as listed. The Operator shall make available for inspection all documents and procedures which form part of the EMS for the CCP (including CHP, changes to kiln e.g. bag filter lime/carbon injection). The EMS shall be developed in line with the requirements set out in Natural Resources Wales's "How To comply with your environmental permit" guidance and BAT 1 of both the Cement and lime and LCP BAT conclusions. The NNO management plan shall include definitions of NNO relating to the Kiln, the CHP, the CCP, and the CO_2 pipe network, providing a methodology for ensuring clarity as to which component is the cause of NNO, and which parts are then in NNO, for credible scenarios and for the purposes of determining applicable ELVs and CO_2 capture rate during CCP "normal operation". The EMS shall include the approved NNO management plan. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 5 (V021)	Operation of the carbon capture plant	At least 6 months prior to the commencement of commissioning, the operator shall submit to Natural Resources Wales, for approval, a written methodology for applying a correction to flue gas volume when determining and reporting pollutant emission concentrations for: *cadmium and thallium, dioxins (I-TEQ), HCl, HF, mercury, particulate matter, and Metals (sum of Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V)*. This is to ensure that Cement & Lime BAT-AEL performance is demonstrated and that "dilution" by additional air required for the CHP does not influence reported concentration. The requirement for this correction is referenced in Note 3 of Table S3.1 of the permit. The methodology shall ensure that the additional combustion air required for CHP is subtracted from the emitted gas volume for the purposes of determining the kiln pollutant concentrations identified above. It shall however also be acceptable to back-calculate CO_2 volume correction so that the operator ELV and BAT-AEL is not penalised for CO_2 removal from the gas volume. It is expected that the methodology may be applied within the CEMS data acquisition and handling system (particularly for HCl). While this is expected to be acceptable, sufficient demonstration calculations shall be provided in response to the pre-operational condition, to allow validation that the method proposed is robust and accurate. Should the operator wish to apply this correction factor to all other pollutants, for standardisation and clarity for reporting purposes, this would constitute a technical change requiring a permit variation, but not a review of ELVs set as they would be necessarily equivalent.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 6 (V021)	Operation of the carbon capture plant	Following the completion of the final design of the installation and at least 6 months prior to the commencement of commissioning, the Operator shall submit to Natural Resources Wales, and obtain Natural Resources Wales's written approval to it, a written report containing monitoring locations, measurement parameters and a protocol for: • Appropriate periodic and continuous monitoring of CCP waste arisings and composition, prior to return to the kiln for disposal or recovery As required in Table S2.1 "Waste Specifications" and Table S3.6 "Waste monitoring requirements" of this permit • Continuous process monitoring of the carbon capture plant, for process control, capture monitoring and optimisation, and solvent degradation monitoring and minimisation. • Periodic sampling and testing of solvent composition for the purposes of assessing the carbon capture system performance and accumulation of by-products as required in Table S3.5 " process monitoring" of this permit for kiln outlet, CHP inlet, and CCP inlet, as well as CCP solvent circuit. Monitoring, sampling and testing shall be carried out in accordance with the protocols as approved, and shall be deemed to be a requirement of Table S2.1, S3.5, and S3.6, respectively.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 7 (V021)	Operation of the carbon capture plant	**Commissioning plan** At least 3 months prior to the commencement of commissioning of the CCP, the Operator shall submit a written commissioning plan, including timelines for completion, for approval by Natural Resources Wales. The commissioning plan content shall be agreed in writing in advance with Natural Resources Wales and shall include (unless otherwise agreed), but not be limited to: • The timelines for the commissioning and the expected durations of these activities. • Robust definitions of the start, and end, of the commissioning process, including backstop provisions to conclude commissioning and commence plant operational phase within 2 years of commencement. • the expected emissions to the environment during the different stages of commissioning; the expected durations of commissioning activities and the actions to be taken to protect the environment and report to Natural Resources Wales in the event that actual emissions exceed expected emissions. • a methodology for approval to demonstrate the carbon capture efficiency of the plant. The approved methodology shall be used to demonstrate the carbon capture efficiency of the plant as part of the commissioning activities, and, after the commissioning phase, for process monitoring and reporting purposes in compliance with the conditions of the permit. • a methodology for approval for quantifying total mass of CO_2 emissions during short duration venting that may be required during plant commissioning and operational NNO. The commissioning activities shall be carried out in accordance with the commissioning plan approved by Natural Resources Wales. *By agreement in writing with Natural Resources Wales, the commissioning plan may be submitted and agreed in stages/parts to address the above requirements.*
PO 8 (V021)	Operation of the carbon capture plant	Prior to the completion of commissioning, the operator shall submit to Natural Resources Wales, and obtain Natural Resources Wales's written approval an annual update on the state of development of analytical and emissions monitoring methods (periodic and continuous) for substances relevant to carbon capture with amine solvents (amines, nitrosamines, nitramines, aldehydes etc). The report shall describe actions undertaken by the operator (as necessary in collaboration with other industrial operators or trade bodies) to support and develop research, innovation and improvement in methods to characterise emissions from the carbon capture process in order that performance specified in table S3.1 can be substantiated during operation with a high degree of accuracy and minimal uncertainty.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 9 (V021)	Operation of the carbon capture plant	Following completion of IC16 The Operator shall produce a written report that assesses site BAT for noise and proposes any necessary additional measures to prevent or where that is not practicable minimise noise impact at sensitive receptors from existing cement production operations (prior to V021) including SRF. This report shall be submitted to Natural Resources Wales for approval prior to any further mitigation works being carried out on site following the IC16 survey, and prior to commissioning of the carbon capture plant. The Operator shall consider NRW's Noise and Vibration Management: Environmental Permits guidance when producing this report, which shall include: • Assessment of noise sources (with reference to IC 16) • An appraisal demonstrating options for reducing the noise emissions from the existing site. • Justification of proposed measures with reference to BAT, to ensure that significant pollution is not caused. You must also provide an updated noise impact assessment undertaken to BS4142:2014 +A1:2019 standards incorporating the control measures and justifications recommended in the report. The result of this work shall be to reduce the existing site (pre V021) noise impact to a level in line with our permit requirements of BS4142 descriptors below a significant adverse impact, or if this is not possible, demonstrate that BAT measures have been applied to prevent or minimise polluting noise emissions. Upon approval the proposed measures shall be implemented on the existing site prior to operation of the carbon capture plant and their efficacy shall be assessed and reported to NRW in writing.

Table S1.4 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO 10 (V021)	Operation of the carbon capture plant	The Operator shall undertake a BS 4142:2014+A1:2019 noise impact assessment following .gov.uk guidance set out *in "Noise and Vibration Management: Environmental Permits"* and Method implementation document (MID) for BS 4142, to determine the noise impacts of New V021 (CCP) site operations. This report shall take into account detailed NRW comments on Variation Application noise impact assessment reference 2060956-RSKA-RP-003-(04) dated 06/08/2025. This report shall include updates to noise impact from the existing site required by PO 09 (preferably by measurement after measures have been implemented) and must clearly distinguish current site operational impact from future (V021) impact change. The operator shall also review equipment selection / mitigation measures as necessary to further mitigate new noise sources in light of changes to the NIA and improvements to existing site noise undertaken for PO 09 and provide an updated noise BAT assessment accordingly. The result of this work shall ensure that the noise impact of the V021 variation, after improvements required by PO09 to existing sources are completed, neither cause nor contribute to a significant adverse impact at receptors and BAT measures have been applied to prevent or minimise polluting noise emissions. The wording "cause or contribute" reflects the requirement that where a significant adverse impact is indicated from the existing site, then the rating level from the variation sources (V021) will not increase the total site rating level. Where the existing site rating level is found to be an indication of adverse impact or lower, then the total site rating level (including variation sources V021) should not result in an indication of a significant adverse impact. Upon completion of the work, a written report shall be submitted to Natural Resources Wales for approval. Upon approval, any proposed updated noise controls shall be incorporated into the V021 design plans.

Schedule 2 - Waste types, raw materials and fuels

Table S2.1 Raw materials and fuels (including wastes)

Parameters	Fuel	Waste Derived Fuels (WDF) Note 3							Alternative Raw Materials (ARM) other than CCP FGD waste water Note 2	ARM: CCP FGD waste water	CCP waste for disposal Note 4
	Coal/ Pet-coke	PSP	SRF	MBM	Tyres	WLF	RFO	Wood			
Units	mg/kg (unless stated otherwise)										
Gross Calorific Value (MJ/kg)	-	10-40	10-40	10-40	15-40	10-42	30-48	10-40	<10	Note 5	Note 5
Sulphur	5.00 %	≤2.00%	≤2.00%	≤2.00%	≤2.00%	≤2.00%	≤2.00%	≤2.00%	-	Note 5	Note 5
Chlorine	-	≤2.00%	≤2.00%	≤2.00%	-	≤2.00%	≤2.00%	≤2.00%	≤1% halogenated organic substances	Note 5	Note 5
Total Fluorine, Bromine & Iodine	-	-	≤1.50%	-	-	≤1.50%	-	≤1.50%	-	Note 5	Note 5
Mercury	-	≤10	≤10	-	-	≤20	≤10	≤10	≤2	Note 5	Note 5
Total Group II Metals (Cd & Tl)	-	≤30	≤30	-	-	≤40	≤40	≤30	≤50	Note 5	Note 5
Maximum replacement	-	-	-	-	-	40% Note 1	-	-	-	Note 5	Note 5
Minimum Mineral Content	-	-	-	-	-	-	-	-	80% dry weight (w/w)	Note 5	Note 5
Other	-	-	-	-	-	-	-	-	-	Note 5	Note 5

Note 1 Maximum thermal input as required by Article 46(2) of the Industrial Emissions Directive (2010/75/EU).

Note 2 No materials which are defined as carcinogens for the purposes of the COSHH Regulations 2002 (as amended) shall be used.

Note 3 Waste generated on-site in connection with the handling and storing of waste derived fuels must be burnt with 19 02 08 waste at a rate that constitutes less than 1.0% by mass of the 19 02 08 waste feed rate.

Note 4 Consisting of reclaimer waste, acid wash waste water, filtration unit waste, and condensate from the dehydration unit.

Note 5 Parameters as agreed by NRW in response to PO 06 (V021) and if relevant by IC14, as necessary specified per individual waste sub-stream.

Table S2.2 Permitted Wastes: Waste Derived Fuels, Alternative Raw Materials and wastes for disposal		
Waste code	**Description**	**WDF, ARM or Disposal**
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**	
01 01	**wastes from mineral excavation**	
01 01 01	wastes from mineral metalliferous excavation	ARM
01 01 02	wastes from mineral non-metalliferous excavation	ARM
01 04	**wastes from physical and chemical processing of non-metalliferous minerals**	
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07	ARM
01 04 09	waste sand and clays	ARM
01 04 10	dusty and powdery wastes other than those in mentioned in 01 04 07	Asphalt filler dust
01 04 13	wastes from stone cutting and sawing other than those mentioned in 01 04 07	ARM
02	**WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**	
02 01	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**	
02 01 04	waste plastics (except packaging)	WDF
02 01 07	wastes from forestry	WDF
02 02	**wastes from the preparation and processing of meat, fish and other foods of animal origin**	
02 02 03	materials unsuitable for consumption or processing	WDF
02 04	**wastes from sugar processing**	
02 04 01	soil from cleaning and washing beet	ARM
02 04 02	off-specification calcium carbonate	ARM
03	**WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD**	
03 01	**wastes from wood processing and the production of panels and furniture**	
03 01 01	waste bark and cork	WDF
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04	WDF
03 03	**wastes from pulp, paper and cardboard production and processing**	
03 03 01	waste bark and wood	WDF
03 03 05	de-inking sludges from paper recycling	WDF
03 03 07	mechanically separated rejects from pulping of waste paper and cardboard	WDF
03 03 08	wastes from sorting of paper and cardboard destined for recycling	WDF
03 03 09	lime mud waste	ARM
03 03 10	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation	WDF
04	**WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES**	
04 01	**wastes from the leather and fur industry**	
04 01 02	liming waste	ARM
04 01 09	wastes from dressing and finishing	WDF
04 02	**wastes from the textile industry**	
04 02 09	wastes from composite materials (impregnated textile, elastomer, plastomer)	WDF
04 02 21	wastes from unprocessed textile fibres	WDF
04 02 22	wastes from processed textile fibres	WDF

Table S2.2 Permitted Wastes: Waste Derived Fuels, Alternative Raw Materials and wastes for disposal		
Waste code	**Description**	**WDF, ARM or Disposal**
05	**WASTES FROM PETROLEUM REFINING, NATURAL GAS PURIFICATION AND PYROLYTIC TREATMENT OF COAL**	
05 06	**wastes from the pyrolytic treatment of coal**	
05 06 03*	other tars	WDF
06	**WASTES FROM INORGANIC CHEMICAL PROCESSES**	
06 09	**wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes**	
06 09 04	calcium-based reaction wastes other than those mentioned in 06 09 03	ARM
06 11	**wastes from the manufacture of inorganic pigments and opacifiers**	
06 11 01	calcium-based reaction wastes from titanium dioxide production	ARM
07	**WASTES FROM ORGANIC CHEMICAL PROCESSES**	
07 02	**wastes from the MFSU of plastics, synthetic rubber and man-made fibres**	
07 02 13	waste plastic	WDF
09	**WASTES FROM THE PHOTOGRAPHIC INDUSTRY**	
09 01	**wastes from the photographic industry**	
09 01 08	photographic film and paper free of silver or silver compounds	WDF
10	**WASTES FROM THERMAL PROCESSES**	
10 01	**wastes from power stations and other combustion plants (except 19)**	
10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)	ARM
10 01 02	coal fly ash	ARM
10 01 03	fly ash from peat and untreated wood	ARM
10 01 05	calcium-based reaction wastes from flue-gas desulphurisation in solid form	ARM
10 01 07	calcium-based reaction wastes from flue-gas desulphurisation in sludge form	ARM
10 01 15	bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14	ARM
10 01 16*	fly ash from co-incineration containing dangerous substances	ARM
10 01 17	fly ash from co-incineration other than those mentioned in 10 01 16	ARM
10 01 19	wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18; *waste from the co-located carbon capture plant only and consisting of FGD waste water, acid wash, and dehydration unit.*	FGD: ARM NOTE 1 All others: Disposal
10 02	**wastes from the iron and steel industry**	
10 02 10	mill scales	ARM
10 02 13*	sludges and filter cakes from gas treatment containing dangerous substances	ARM
10 09	**wastes from casting of ferrous pieces**	
10 09 06	casting cores and moulds which have not undergone pouring other than those mentioned in 10 09 05	ARM
10 09 08	casting cores and moulds which have undergone pouring other than those mentioned in 10 09 07	ARM
10 10	**wastes from casting of non-ferrous pieces**	
10 10 06	casting cores and moulds which have not undergone pouring, other than those mentioned in 10 10 05	ARM
10 10 08	casting cores and moulds which have undergone pouring, other than those mentioned in 10 10 07	ARM
10 11	**wastes from manufacture of glass and glass products**	
10 11 03	waste glass-based fibrous materials	ARM

Table S2.2 Permitted Wastes: Waste Derived Fuels, Alternative Raw Materials and wastes for disposal		
Waste code	**Description**	**WDF, ARM or Disposal**
10 12	**wastes from manufacture of ceramic goods, bricks, tiles and construction products**	
10 12 03	particulates and dust	ARM
10 12 06	discarded moulds	ARM
10 12 08	waste ceramics, bricks, tiles and construction products (after thermal processing)	ARM
10 13	**wastes from manufacture of cement, lime and plaster and articles and products made from them**	
10 13 01	waste preparation mixture before thermal processing	ARM
10 13 04	wastes from calcination and hydration of lime	ARM
10 13 06	particulates and dust (except 10 13 12 and 10 13 13)	ARM
10 13 11	wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10	ARM
10 13 12*	solid wastes from gas treatment containing dangerous substances	ARM
10 13 13	solid wastes from gas treatment other than those mentioned in 10 13 12	ARM
10 13 14	waste concrete and concrete sludge	ARM
12	**WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS**	
12 01	**wastes from shaping and physical and mechanical surface treatment of metals and plastics**	
12 01 05	plastics shavings and turnings	WDF
12 01 13	welding wastes	WDF
13	**OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)**	
13 07	**wastes of liquid fuels**	
13 07 01*	fuel oil and diesel	WDF
14	**WASTE ORGANIC SOLVENTS, REFRIGERANTS AND PROPELLANTS (except 07 and 08)**	
14 06	**waste organic solvents, refrigerants and foam/aerosol propellants**	
14 06 03*	other solvents and solvent mixtures; *only internal arisings from the carbon capture plant*	Disposal
14 06 05*	sludges or solid wastes containing other solvents; *only internal arisings from the carbon capture plant*	Disposal
15	**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**	
15 01	**packaging (including separately collected municipal packaging waste)**	
15 01 01	paper and cardboard packaging	WDF
15 01 02	plastic packaging	WDF
15 01 03	wooden packaging	WDF
15 01 05	composite packaging	WDF
15 01 06	mixed packaging	WDF
15 01 09	textile packaging	WDF
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**	
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**	
16 01 03	end-of-life tyres	WDF
16 01 19	plastic	WDF
16 01 22	components not otherwise specified	WDF

Table S2.2 Permitted Wastes: Waste Derived Fuels, Alternative Raw Materials and wastes for disposal		
Waste code	**Description**	**WDF, ARM or Disposal**
16 08	**spent catalysts**	
16 08 03	spent catalysts containing transition metals or transition metal compounds not otherwise specified	ARM
16 08 04	spent fluid catalytic cracking catalysts (except 16 08 07)	ARM
16 08 07*	spent catalysts contaminated with dangerous substances	ARM
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**	
17 01	**concrete, bricks, tiles and ceramics**	
17 01 01	concrete	ARM
17 01 02	bricks	ARM
17 01 03	tiles and ceramics	ARM
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	ARM
17 02	**wood, glass and plastic**	
17 02 01	wood	WDF
17 02 03	plastic	WDF
17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**	
17 05 04	soil and stones other than those mentioned in 17 05 03	ARM
17 05 06	dredging spoil other than those mentioned in 17 05 05	ARM
17 05 08	track ballast other than those mentioned in 17 05 07	ARM
17 08	**gypsum-based construction material**	
17 08 02	gypsum-based construction materials other than those mentioned in 17 08 01	ARM
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**	
19 01	**wastes from incineration or pyrolysis of waste**	
19 01 06*	aqueous liquid wastes from gas treatment and other aqueous liquid wastes	ARM
19 01 13*	fly ash containing dangerous substances	ARM
19 02	**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**	
19 02 03	premixed wastes composed only of non-hazardous wastes	ARM
19 02 04*	premixed wastes composed of at least one hazardous waste	ARM
19 02 08*	liquid combustible wastes containing dangerous substances	WDF
19 02 10	combustible wastes other than those mentioned in 19 02 08 and 19 02 09	WDF
19 08	**wastes from waste water treatment plants not otherwise specified**	
19 08 05	sludges from treatment of urban waste water	ARM
19 09	**wastes from the preparation of water intended for human consumption or water for industrial use**	
19 09 02	sludges from water clarification	ARM
19 12	**wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**	
19 12 01	paper and cardboard	WDF
19 12 04	plastic and rubber	WDF
19 12 07	wood other than that mentioned in 19 12 06	WDF
19 12 08	textiles	WDF
19 12 09	minerals (for example sand, stones)	ARM
19 12 10	combustible waste (refuse derived fuel)	WDF
19 12 11*	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances	ARM

Table S2.2 Permitted Wastes: Waste Derived Fuels, Alternative Raw Materials and wastes for disposal		
Waste code	**Description**	**WDF, ARM or Disposal**
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	ARM & WDF
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**	
20 01	**separately collected fractions (except 15 01)**	
20 01 01	paper and cardboard	WDF
20 01 10	clothes	WDF
20 01 11	textiles	WDF
20 01 38	wood other than that mentioned in 20 01 37	WDF
20 01 39	plastics	WDF

NOTE 1: For the purposes of acceptance, FGD water from the CCP is considered an internally arising “alternative raw material” based on its valuable water content, analogous to “mineral” content usually considered in defining ARM

Schedule 3 – Emissions and monitoring

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (including unit) NOTE 1	Reference period	Monitoring frequency	Monitoring standard or method NOTE 2
A8 on site plan in schedule 7 (kiln stack) Or A17 (carbon capture plant stack)	Cement kiln waste gases only when operating without carbon dioxide capture. Emitted either via dedicated kiln stack (A17) - Or Carbon Capture plant Main stack (A17) without carbon capture via bypass damper configuration.	Particulate matter	10 mg/Nm^3	Daily average	Continuous measurement	BS EN 14181
		Total Organic Carbon (TOC)	50 mg/Nm^3			
		Hydrogen chloride	10 mg/ Nm^3			
		Carbon monoxide	1200 mg/Nm^3			
		Oxides of Sulphur expressed as SO2	200 mg/Nm^3			
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	450 mg/Nm^3			
		Ammonia	70 mg/Nm^3			
		Hydrogen fluoride	1 mg/Nm^3	Periodic over minimum 30 minute, maximum 8-hour period	6 monthly until CCP has completed commissioning, and then if operation without carbon capture exceeds 20% of operational time, or 2 weeks continuously due to planned CCP outage	ISO 15713
		Cadmium & thallium and their compounds (total)	0.05 mg/Nm^3			BS EN 14385
		Mercury and its compounds	0.05 mg/Nm^3			BS EN 13211
		Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/Nm^3			BS EN 14385
		Dioxins / furans (I-TEQ)	0.1 ng/Nm^3	Periodic average value over minimum 6 hours, maximum 8 hour period.		BS EN 1948 Parts 1, 2 and 3

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
	Limits apply when carbon capture is unavailable but cement plant operating normally.	Dioxins / furans (WHO-TEQ Humans / Mammals / fish / birds)	No limit set	Periodic average value over sample period of between 6 and 8 hours.		BS EN 1948 Parts 1, 2 and 3
A17 - Carbon capture plant on site plan in schedule 7 Other than when operating without carbon capture (above)	Carbon capture plant stack, operating in "capture" mode (supplied with waste gases from cement Kiln, and/or natural gas - CHP) Limits only apply once CCP has been constructed and commissioned	Particulate matter	10 mg/Nm^3 NOTE 3	Daily average	Continuous measurement	BS EN 14181
		Total Organic Carbon (TOC)	30 mg/Nm^3			
		Hydrogen chloride	10 mg/ Nm^3 NOTE 3			
		Carbon monoxide	400 mg/Nm^3			
		Oxides of Sulphur expressed as SO_2	50 mg/Nm^3			
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	200 mg/Nm^3			
		Ammonia	30 mg/Nm^3			
		Hydrogen fluoride	1 mg/Nm^3 NOTE 2	Periodic over minimum 30 minute, maximum 8-hour period	6 monthly	ISO 15713
		Cadmium & thallium and their compounds (total)	0.05 mg/Nm^3 NOTE 3			BS EN 14385
		Mercury and its compounds	0.05 mg/Nm^3 NOTE 3			BS EN 13211
		Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/Nm^3 NOTE 3			BS EN 14385

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
		Dioxins / furans (I-TEQ)	0.1 ng/Nm^3 NOTE 3	Periodic average value over minimum 6 hours, maximum 8 hour period.		BS EN 1948 Parts 1, 2 and 3
		Dioxins / furans (WHO-TEQ Humans / Mammals / fish / birds)	No limit set	Periodic average value over sample period of between 6 and 8 hours.		BS EN 1948 Parts 1, 2 and 3
		Sulphur trioxide (SO_3)	No limit set	Periodic over minimum 30 minute, maximum 8-hour period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	US EPA Method 8 (which measures sum of SO_3, SO_2 and H_2SO_4)

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
		Total amines Note 4 As the sum of the 13 individual amines listed below: Methylamine (CAS 74-89-5) Ethylamine (CAS 75-04-7) Monoethanolamine (CAS 141-43-5) N,N-dimethylethylenediamine (CAS 108-00-9) Dimethylamine (CAS 124-40-3) Diethylamine (CAS 109-89-7) Ethylmethylamine (CAS 624-78-2) Diethanolamine (CAS 111-42-2) N-(2-hydroxyethyl)acetamide (CAS 142-26-7) N-(2-hydroxyethyl)formamide (CAS 693-06-1) Ethylethanolamine (CAS) (CAS) 110-73-6 Piperazine (CAS 110-85-0) Ethyldiethanolamine (CAS 139-87-7)	3.2 mg/Nm^3 as the sum of all the 13 individual compounds identified, the individual concentrations of which are also to be reported separately	Average over the sampling period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	Isokinetic impinger method based on EN ISO 21877 or other improved method to be agreed with the NRW in writing in accordance with IC 22 NOTE 5

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
		Total nitrosamines. As the sum of the 8 individual nitrosamines listed below N-Nitrosodimethylamine (NDMA) (CAS 62-75-9 N-Nitrosodiethylamine (NDEA) (CAS 55-18-5) N-Nitrosomethylethylamine (NMEA) (CAS 10595-95-6) N-Nitrosodiethanolamine (NDELA) (CAS 1116-54-7) N-Ethyl-N-(2-hydroxyethyl)nitrosamine (EHEN) (CAS 13147-25-6) 1-Nitrosopiperazine (NPZ) (CAS 5632-47-3) 1,4-Dinitrosopiperazine (DNPZ) (CAS 140-79-4) N-Nitrosomorpholine (CAS 59-89-2)	4.8 µg/Nm^3 as the sum of all the 8 individual compounds identified, the individual concentrations of which are also to be reported separately	Average over the sampling period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	Isokinetic impinger method with absorption in 0.1M sulphamic acid and based on Environment Agency guidance or other improved method to be agreed with the NRW in writing in accordance with IC 22 NOTE 5
		Total nitramines. As the sum of the 2 individual nitramines listed below: 2-(ethylnitroamino)ethanol (CAS 217089-38-8) 1-nitropiperazine (CAS 42499-41-2)	0.4 µg/Nm^3 as the sum of the two individual compounds identified, the individual concentrations of which are also to be reported separately	Average over the sampling period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	Isokinetic impinger method with absorption in 0.1M sulphamic acid and based on Environment Agency guidance or other improved method to be agreed with the NRW in writing in accordance with IC 22 NOTE 5

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
		Formaldehyde	2. mg/Nm^3	Average over the sampling period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	Isokinetic CEN TS 17638
		Acetaldehyde	10 mg/Nm^3	Average over the sampling period	Monthly for at least the first 6 months of operation and until the requirements of IC15 have been agreed in writing with Natural Resources Wales, and if notified by Natural Resources Wales that a return to monthly sampling is required. Otherwise 6-monthly	Isokinetic based on CEN TS 17638
		Carbon Dioxide	No limit set	daily average	Continuous	EN 14181 and EN 17255
		Exhaust gas temperature	No limit set	Daily average	Continuous	Traceable to national standards
		Exhaust gas pressure	No limit set	Daily average	Continuous	Traceable to national standards
		Exhaust gas flow	No limit set	Daily average	Continuous	EN 16911-2
		Exhaust gas Oxygen content	No limit set	Daily average	Continuous	EN 14181 and EN 17255

Table S3.1 Kiln, integrated Combined Heat and Power and Carbon Capture Plant Exhaust Emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit) NOTE 1**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method NOTE 2**
		Exhaust gas water vapour content (unless gas is dried before analysis of all other emissions)	No limit set	Daily average	Continuous	EN 14181 and EN 17255
CHP and carbon capture plant vents other than A8 and A17, as identified in response to PO 04	Small sources of particulate matter or TOC (<10,000 Nm^3/hr) from CHP and/or CCP operations other than cooling and the main emission points e.g. silo and tank vents	Particulate Matter	10 mg/Nm^3	The frequency of measurements or performance checks shall be based on a maintenance management system.		
		Total Organic Carbon (TOC)	If required and as determined in response to PO 04	Frequency, standard and method if required, and as determined in response to PO 04		

Note 1 Where daily averages, calculated in accordance with condition 3.5.5, necessarily comprise of periods of normal operation both with the CCP operational, and non-operational (emission via A8 or A17), then the effective daily ELV shall be taken as the weighted average of the number of half-hours operation in CCP-active mode, and in non-CCP mode.

Note 2 If CEN (EN, BS EN) standards are not available, ISO standards, national or international standards which will ensure the provision of data of an equivalent scientific quality shall be used, as agreed in writing with Natural Resources Wales.

Note 3 In accordance with the methodology agreed in response to PO 05, the operator shall apply a correction to ensure that the additional combustion air required for CHP is subtracted from the gas volume for the purposes of determining kiln pollutant concentrations for cadmium and thallium, dioxins (I-TEQ), HCl, HF, mercury, particulate matter, and Metals (sum of Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V) to ensure that BAT-AEL performance is maintained and that dilution does not influence ELV compliance. It shall however be acceptable to back-calculate CO_2 volume correction so that the operator ELV and BAT-AEL is not penalised for CO2 removal from the gas volume. As part of the Annual Report on CCP operation, the operator shall assess whether the correction meets the requirements of IED article 15(3) in demonstrating that BAT-AELs have been met, via the setting of modified reference conditions.

Note 4: For the purposes of reporting, “amines” includes amines, alkalonamines, amides and formides as identified specifically.

Note 5: Monitoring stack emissions: carbon capture plants with solvent-based abatement - GOV.UK provides guidance on monitoring emissions from solvent-based carbon capture. Methods which comply with this guidance are taken to be agreed by NRW unless notified otherwise.

Table S3.2 Non-kiln point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A3 on site plan in schedule 7 Note 2	Cement Mill 1	Particulate matter	10 mg/Nm^3	Daily average	Continuous measurement	BS EN 14181 Note 1
A4 on site plan in schedule 7 Note 2	Cement Mill 2	Particulate matter	10 mg/Nm^3			
A5 on site plan in schedule 7 Note 2	Cement Mill 3	Particulate matter	20 mg/Nm^3			
A6 on site plan in schedule 7 Note 2	Cement Mill 4	Particulate matter	10 mg/Nm^3			
A7 on site plan in schedule 7 Note 2	Cement Mill 4 Classifier	Particulate matter	20 mg/Nm^3			
A9 on site plan in schedule 7	Kiln 4 cooler Exhaust	Particulate matter	20 mg/Nm^3			
A10 on site plan in schedule 7	MBM Storage Vessel Bag Filter	Particulate matter	10 mg/Nm^3	The frequency of measurements or performance checks shall be based on a maintenance management system.		
A11 on site plan in schedule 7	Clinker Transport to Storage Filter	Particulate matter	10 mg/Nm^3	Periodic over a minimum 30 minute period	Quarterly for the first year, 6 monthly thereafter.	BS EN 13284-1
A12 on site plan in schedule 7	Arodo Packer Filter	Particulate matter	10 mg/Nm^3	Indicative Monitoring	Continuous Measurement	Triboelectric Probe
A13 on site plan in schedule 7	Ammonia Storage Tank Scrubber	No Parameters set	None Set	-	-	-
A14 on site plan in schedule 7	Cemfuel tanks carbon adsorbers.	No Parameters set	None Set	-	-	-
A15 on site plan in schedule 7	Cement Mill 5	Particulate matter	10 mg/Nm^3	Periodic over a minimum 30 minute period	Quarterly for the first year, 6 monthly thereafter.	BS EN 13284-1
		Carbon monoxide	None Set	-	-	-
		Oxides of Sulphur expressed as SO_2				

Table S3.2 Non-kiln point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Oxides of nitrogen (NO and NO_2 Expressed as NO_2)				
A16 on site plan in schedule 7	Kiln SRF Feed Bag Filter	Particulate matter	10 mg/Nm^3	The frequency of measurements or performance checks shall be based on a maintenance management system.		
Vents including but not limited to those listed in document reference: Hanson Cement Padeswood Works Regulation 60 BAT Conclusions notice 2 Response.	Small sources of particulate matter <10,000 Nm^3/hr) from dusty operations other than cooling and the main milling processes e.g. silo vents and conveyer lines	Particulate Matter	10 mg/Nm^3	The frequency of measurements or performance checks shall be based on a maintenance management system.		

Note 1 The principles of EN 14181 shall be applied (subject to agreement with Natural Resources Wales). See NRW Guidance Note "Application of BS EN 14181 to CEMs on non-IED Installations" for further information.
Note 2 For A3 – A7, Temperature shall be corrected automatically to 273K using in situ thermocouples. Correction to standard reference pressure (101.3 kPa) shall be calculated using the rolling mean of the pressure recorded during the last 5 periodic (extractive) samples. Correction to dry gas shall be calculated using the rolling mean of the moisture content recorded during the last 5 periodic (extractive) samples.

Table S3.3 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
W1 on site plan in schedule 7	Site surface water drainage via the settlement lagoon	Total Suspended solids as defined by Directive 91/271/EEC	50 mg/l	Spot sample	Monthly	BS EN 872
		pH	6 min 9 max	Instantaneous	Continuous Note 1	MCERTS approved instrumentation

Table S3.3 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Temperature	23 ºC	Instantaneous	Continuous Note 1	MCERTS approved instrumentation
		Oil or grease	None visible	Spot sample	Weekly	Visual Check
W2 Western Outfall WC01/ Grid reference SJ288622	Uncontaminated site surface water drainage.	No Parameters set	No limit set	-	-	-
W3 on site plan in schedule 7	Uncontaminated site surface water drainage	No parameters set	No limit set	-	-	-
W4 batch discharge from holding pond in carbon capture plant facility on site plan in Schedule 7	Uncontaminated site surface water drainage via oil and silt interceptor to holding pond. Including accumulated water from bunded areas, pumped to drainage system after being confirmed contamination free.	Total Suspended solids as defined by Directive 91/271/EEC	50 mg/l	Spot sample	Monthly / when discharging	BS EN 872
		pH	6 min 9 max	Instantaneous	Continuous Note 1	MCERTS approved instrumentation
		Oil or grease	None visible	Spot sample	Weekly	Visual Check
		Chemical Oxygen Demand (COD)	50 mg/l above site surface water background concentration, or suitable alternative limit as agreed in writing by NRW in response to IC12.	Spot sample	Monthly / when discharging	BS ISO 15705

Note 1 Continuous monitoring during discharge.

Table S3.4 Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
S1 on drawing number 401.00-11-0016-P.00	Vehicle wash water via catch pit and oil/water separator	No parameters set	No limit set	-	-	-

Table S3.5 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Cement Plant				
Weather Station cement silo 6	Wind speed and direction	Continuous	-	-
Calciner	Temperature	Continuous	Traceable to National Standards	-
A8 (Kiln stack)	Temperature, pressure, oxygen and water vapour content	Continuous	As described in the application	-
Kiln exhaust (close to the combustion chamber inner wall)	Temperature	Continuous	Traceable to National Standards	-
A11 Clinker Transport to Storage Filter	Filter performance	Continuous	-	-
A15 Cement Mill 5	Filter Performance	Continuous	-	-
CHP plant				
CHP Plant	Net total fuel utilisation ("energy efficiency")	Within 6 months of completion of commissioning of CCP and then within 6 months of any modification that significantly affects energy efficiency	Performance test at full load or other method as agreed in writing with Natural Resources Wales and to satisfy the requirements of Large Combustion Plant BAT conclusion 2.	LCP BATc 40 requires that a net utilisation of 78-95% is achieved. As detailed in IC 18

Table S3.5 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Exhaust gases exiting the kiln, prior to the CCP inlet	As defined in the application and agreed with NRW in response to PO 06 / IC14, including but not limited to mercury analyser, particulates, flow, temperature, pressure and O_2, and gas composition (species as defined by operator)	Continuous	As agreed in writing with Natural Resources Wales	Monitoring location (upstream or downstream of CHP) to be confirmed in writing with NRW
CHP inlet gases	As defined in the application and in response to PO 06 / IC14, including but not limited to kiln flue gas flow and O_2, additional combustion air flow, temperature, pressure	Continuous	As agreed in writing with Natural Resources Wales and suitable for burner management system	
CHP outlet exhaust gases	As defined in the application, and in response to PO 06 / IC14, including but not limited to O_2, CO_2, NO_X, SO_X concentrations and flow, also temperature, pressure and water vapour	Continuous	As agreed in writing with Natural Resources Wales and suitable for burner management system	Unless agreed otherwise in writing with Natural Resources Wales, the operator shall include VOC monitoring at the CHP outlet as part of comprehensive process monitoring
CHP steam generation	Steam inlet pressure to the Steam turbine generator	Continuous	As required for process control	
Carbon dioxide capture plant Note 1				
Capture plant and circulating solvent	As determined in response to PO 06 / IC14 to ensure process efficacy and solvent stability. NOTE 2…	Continuous (process parameters), and periodic (solvent composition)	As determined in response to PO6 and as necessary updated by agreement in writing with Natural Resources Wales	Note 2

Table S3.5 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Inlet monitoring of pollutants	As defined in the application and in response to PO 06 / IC14, including any further parameters not captured under “kiln exhaust, CHP inlet, CHP outlet” as defined above	Continuous	As agreed in writing with Natural Resources Wales	
Water / Acid wash stages	As defined in the application and in response to PO 06 / IC14, including proxy measures for amine (etc) loading: pH, conductivity and/or other suitable parameters	Continuous	As agreed in writing with Natural Resources Wales	As agreed in writing with Natural Resources Wales
Note 1. Annual report for CCP required under condition 4.2.2 shall include review of all relevant process monitoring data (including but not limited to that listed in the permit) to determine the efficiency and operational performance of the plant, and any indicators of changes to performance characteristics. Note 2. Unless other parameters are proposed by the operator and agreed by Natural Resources Wales in accordance with PO 06 / IC14, it is expected that Percentage Active Solvent (effective concentration), carbon dioxide loading (rich amine), heat stable salts loading, soluble iron concentration (rich amine) and lean amine, solvent colour/opacity, and degradation product analysis (amines, nitrosamines, nitramines in circulating solvent pre- and post- reclaim) would be measured at appropriate intervals by the operator.				

Table S3.6 Process Waste monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Cement Kiln by-pass dust.	Total soluble fraction for free lime content and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds	Before use of a new disposal or recycling route	Environment Agency ash sampling protocol for cement	-
	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds	6 Monthly	Environment Agency Ash Sampling Protocol for Cement	-
	Dioxins/furans and dioxin-like PCBs			
	Halides (chloride, bromide and fluoride)			
Cement Kiln Main bag filter dust (removed fraction not returned for clinker manufacture)	Total soluble fraction for free lime content and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds	Before use of a new disposal or recycling route	Environment Agency Ash Sampling Protocol for cement	-

Table S3.6 Process Waste monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds	Monthly in the first year of operation. Then 6 Monthly	Environment Agency Ash Sampling Protocol for Cement	-
	Dioxins/furans and dioxin-like PCBs			
CCP FGD waste water return to the raw mill	Flow (m3/h)	Continuous	As agreed in writing with NRW in response to PO 06 and IC14	
Reclaimer waste solvent effluent to the calciner	Flow (m3/h)	Continuous	As agreed in writing with NRW in response to PO 06 and IC14	
	Composition	Monthly	Species to be monitored, and associated standards/methods as agreed in writing with NRW in response to PO 06 and IC14	
Solvent/solids waste from the filtration unit to the calciner	Flow (m3/h)	Continuous	As agreed in writing with NRW in response to PO 06 and IC14	
	Composition	Monthly	Species to be monitored, and associated standards/methods as agreed in writing with NRW in response to PO 06 and IC14	
Waste water from the acid wash unit to the calciner	Flow (m3/h)	Continuous	As agreed in writing with NRW in response to PO 06 and IC14	
	Composition	Monthly	Species to be monitored, and associated standards/methods as agreed in writing with NRW in response to PO 06 and IC14	

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data

Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Emissions to air Parameters as required by condition 3.5.1	A3, A4, A5, A6, A7, A8, A9, A11, A15 & A17	Continuous monitoring: Every 3 months	1 January, 1 April, 1 July, 1 October
	A8, A11, A12, A15 & A17	Periodic: Every 6 months	1 January, 1 July
	Process vents as identified in Table S3.1 and S3.2	Every 12 months	1 January
Functioning and monitoring of the plant involved in the burning of waste derived fuels, as required by condition 4.2.2	As required by condition 4.2.2	Every 12 months	1 January
Function and monitoring of the CCP and associated equipment as required by condition 4.2.2	As required by condition 4.2.2	Every 12 months	1 January
Emissions to water Parameters as required by condition 3.5.1	W1, W4	Every 3 months	1 January, 1 April, 1 July, 1 October
Process Waste Parameters as required by condition 3.5.1	Cement Kiln by-pass dust and main bag filter removed dust	Every 6 months	1 January, 1 July
Process Waste Total soluble fraction for free lime content and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds	Cement Kiln by-pass dust and main bag filter removed dust	Before use of a new disposal or recycling route	-

Process Waste Parameters as required by condition 3.5.1	Wastes from the carbon capture plant to the cement kiln (flow and composition parameters as specified in Table S3.6)	Monthly for the first 6 months, then every 6 months	1 January, 1 July
Waste ARM and Waste Derived Fuel Parameter required by condition 1.1.4	List of ARM and WDF permitted at the installation under the COP.	Every 3 months	1 January, 1 April, 1 July, 1 October

Table S4.2 Performance parameters

Parameter	Frequency of assessment	Units
Total Waste Derived Fuels burned	Annually	Tonnes
Total hazardous Waste Derived Fuels burned	Annually	Tonnes
Water usage (potable, non-potable, and internally recovered)	Annually	m^3
CHP Electricity generated	Annually	GWhr output for site use
CHP heat generated	Annually	GWhr output for site use
CHP natural gas consumption	Annually	GWhr
Annual operating hours for Kiln, CHP and CCP (Normal, NNO, and for kiln Ch IV abnormal operation)	Annually	Hours per plant/component
CO_2 capture efficiency	Annually	Percentage over normal operation and all operational hours
CO_2 capture plant availability	Annually	Percentage CCP availability as a % of kiln availability
Total CO2 captured	Annually	Tonnes
Total CO2 separated and subsequently vented to atmosphere	Annually	Tonnes
Total (thermal and electrical) energy used per tonne of CO_2 captured (CCP)	Annually	Kw/Tonne CO_2 exported
Amine solvent usage	Annually	Tonnes
Total captured CO_2 subsequently vented via A17	Annually	Tonnes and number of hours of venting undertaken

Table S4.3 Reporting forms		
Media/parameter	**Reporting format**	**Date of form**
Air: six monthly periodic monitoring for A8 and A17	Form air 1 or other form as agreed in writing by Natural Resources Wales	Date of permit variation V021 issue
Air: Continuous monitoring for A8 and A17	Form air 18 – Air n or other form as agreed in writing by Natural Resources Wales	Date of permit variation V021 issue
Air: Continuous monitoring of particulate matter for A3	Form air 9 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Continuous monitoring of particulate matter for A4	Form air 10 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Continuous monitoring of particulate matter for A5	Form air 11 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Continuous monitoring of particulate matter for A6	Form air 12 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Continuous monitoring of particulate matter for A7	Form air 13 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Continuous monitoring of particulate matter for A9	Form air 14 or other form as agreed in writing by Natural Resources Wales	19/07/16
Air: Periodic monitoring of particulate matter for A15	Form air 16 or other form as agreed in writing by Natural Resources Wales	08/01/18
Air: Periodic monitoring of particulate matter for A11	Form air 17 or other form as agreed in writing by Natural Resources Wales	24/10/23
Water: pH, Temperature, & Suspended Solids for W1	Form: M / W1	19/07/16
Water: pH, Temperature, Suspended Solids, COD for W4	W2	Date of permit variation V021issue
Other performance indicators	Form performance 1 or other form as agreed in writing by Natural Resources Wales	19/07/16
Process Waste	Form: Process Waste 1 or other form as agreed in writing by Natural Resources Wales	19/07/16
Waste subject to Condition 4.2.5	Waste tonnage return form from the Natural Resources Wales website or other form as agreed in writing by Natural Resources Wales	N/A
Waste Derived Fuel	Form WDF Usage1	15/05/18
Alternative Raw Materials	Form ARM Usage1	15/05/18

Schedule 5 - Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Regulated Facility	
Time and date of the detection	

(a) Notification requirements for any activity that gives rise to an incident or accident which significantly affects or may significantly affect the environment	
To be notified within 24 hours	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a permit condition	
To be notified within 24 hours	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) In the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment:	
To be notified immediately	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B - to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the regulated facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 - Interpretation

"abatement system" means equipment dedicated to the removal of polluting substances from releases from the installation to air.

"accident" means an accident that may result in pollution.

"Annex I" means Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"Annex II" means Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"*annually*" means once every calendar year.

"application" means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

"ARM" means Alternative Raw Materials (waste derived materials that replace virgin materials in the manufacture of clinker)

"authorised officer" means any person authorised by Natural Resources Wales under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

"background concentration" means such concentration of that substance as is present in:

for emissions to surface water, the surface water quality up-gradient of the site;

"*BAT*" *means Best Available Techniques*, as applicable to the installation, and as described at UK BAT - GOV.UK. BAT-AEL is a BAT-associated emission limit, and BAT-AEEL is a BAT-associated energy efficiency level. "BAT#" refers to the specific numbered point in the stated BAT conclusions.

"CCP" *means carbon (dioxide) capture plant; principally the absorber/regenerator towers for separation of CO_2 from flue gases with amine solvent, for compression, transportation and geological storage. Also incorporating all post-kiln abatement plant changes and auxiliary equipment authorised by Variation V021 of this permit.*

"CEN" means Commité Européen de Normalisation.

"Chapter IV abnormal operating conditions" means any technically unavoidable stoppages, disturbances, or failures of the abatement systems or the measurement devices, during which the concentrations in the discharges into air or waste water of the regulated substances may exceed the normal emission limit values, IED article 45 1(f).

"combined heat and power" (CHP) or Cogeneration means the simultaneous generation in one process of thermal energy and electrical or mechanical energy.

"daily average" unless otherwise specified within the permit, for releases of substances to air means the average of valid half-hourly averages over a calendar day during normal operation.

"dioxin and furans" means polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans.

"disposal". Means any of the operations provided for in Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"emissions to land" includes emissions to groundwater.

"EP Regulations" means The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

"emissions of substances not controlled by emission limits" means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.

"FGD waste water" means flue gas desulphurisation waste water (primarily condensate) arising from the flue gas desulphurisation stage of the cement kiln prior to the carbon capture plant.

"GET" means Guidance on Emerging Techniques, specifically the techniques relating to post-combustion carbon dioxide capture Post-combustion carbon dioxide capture: emerging techniques - GOV.UK

"groundwater" means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

"Group II Metals" means Cadmium (Cd) and Thallium (TI).

"Group III Metals" means Antimony (Sb), Arsenic (As), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Nickel (Ni) & Vanadium (V).

"Hazardous Waste" has the meaning given in the Hazardous Waste (England & Wales) Regulations 2005 (as amended)

"Improvement Condition (IC)" means a numbered improvement condition as defined in Table S1.3 of this permit

"Industrial Emissions Directive" means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions

"ISO" means International Standards Organisation.

"LCP" means Large Combustion Plant, and LCP BAT means the BAT conclusions relating to Large Combustion Plant.

"MCERTS" means the Environment Agency's Monitoring Certification Scheme.

"MBM" means Meat and Bone Meal. It is produced at animal rendering plants during the high temperature processing of animal remains comprising mainly abattoir waste arising in the course of preparing meat for consumption. It is a granular solid residue that is left after extracting fat (tallow) during the rendering process. The waste for rendering may contain Specified Risk Material (SRM) such as brain and spinal cords from animals. MBM is classified as a non-hazardous waste by the waste code 02 02 03, defined as "Wastes from the preparation and processing of meat, fish and other foods of animal origin" and the sub-clause "Materials unsuitable for consumption or processing". MBM cannot contain raw or unprocessed meat, bones or animal parts, or any other waste of agricultural, horticultural or industrial origin.

"*MPA Code of Practice*" means the Mineral Products Association Code of Practice for the use of waste materials in Cement and Dolomitic Lime Manufacture.

"Natural gas" means naturally occurring methane with no more than 20% by volume of inert or other constituents.

"NNO" means Not Normal Operation (or Non-Normal Operation) and as defined in response to PO 04. Following commissioning of the CCP It includes (but is not limited to) start up and shut down of any part of the integrated Kiln-CHP-CCP installation, Kiln chapter 4 "abnormal operation", and reduced/suspended carbon capture as a result of internal (plant) or external (transportation/storage) factors. The plant is regarded as operating normally unless within a defined NNO management plan mode.

"*PCB*" means Polychlorinated Biphenyl

"*PCP*" means Pentachlorophenol

"*permitted installation*" means the activities and the limits to those activities described in Table S1.1 of this Permit.

"*PFA*" means Pulverised Fuel Ash and is the fine ash recovered from the gas stream from combustion of pulverised coal in coal fired power stations.

"*Pre-operational Condition*" (pre-op, PO) means a numbered pre-operational condition as defined in table S1.4 of this permit

"*PSP*" means Processed Sewage Pellets.

"*quarter*" means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

"*recovery*" means any of the operations provided for in Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

"*RFO*" means Recovered Fuel Oil.

"*shutdown*" means (a) any period when the kiln is being returned to a non-operational state and no waste is being

burned. Emission limit values do not apply during shutdown once the raw meal feed rate falls below 120 tonnes per hour, or (b) as otherwise agreed in writing with Natural Resources Wales.

"*Six monthly periodic monitoring*" means periodic monitoring in each 6 month period, January to June & July to December with at least 4 months between sampling dates.

"*SRF*" means Solid Recovered Fuel

"start-up" means (a) the process of bringing the kiln, CHP and CCP into normal operation. Unless otherwise agreed in writing with Natural Resources Wales, kiln start-up commences when raw meal is introduced into the kiln and may continue until the kiln feed rate reaches 120 tonnes per hour and the kiln is stable. On commencing kiln operation the first continuous monitoring daily average can be calculated from the 24 hour period starting from the time that kiln startup completed. Subsequent daily averages will be based on a 24 hour period commencing at midnight following the kiln startup. Or (b) as otherwise agreed in writing with Natural Resources Wales and including definitions of CHP and CCP start-up/shut-down, including in response to PO 04/IC18 & 19.

"*TOC*" means Total Organic Carbon. In respect of releases to air, this means the gaseous and vaporous organic substances, expressed as TOC.

"*Waste code*" means the six digit code referable to a type of waste in accordance with the list of wastes established by Commission Decision 2000/532/EC as amended from time to time (the "List of Wastes Decision") and in relation to hazardous waste, includes the asterisk.

"*Waste Framework Directive*" or "WFD" means Waste Framework Directive 2008/98/EC of the European Parliament and of the Council on waste.

"*WLF*" means Waste Liquid Fuels

"*year*" means calendar year ending 31 December.

Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:
(a) in relation to emissions from the kiln and the carbon dioxide capture plant, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 10% dry for all fuels;

(b) in relation to emissions from non-kiln sources, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with no correction for oxygen.

For dioxins/furans and dioxin-like PCBs the determination of the toxic equivalence concentration (I-TEQ, & WHO-TEQ for dioxins/furans, WHO-TEQ for dioxin-like PCBs) stated as a release limit and/ or reporting requirement, the mass concentrations of the following congeners have to be multiplied with their respective toxic equivalence factors before summing. When reporting on measurements of dioxins/furans and dioxin-like PCBs, the toxic equivalence concentrations should be reported as a range based on: all congeners less than the detection limit assumed to be zero as a minimum, and all congeners less than the detection limit assumed to be at the detection limit as a maximum. However the minimum value should be used when assessing compliance with the emission limit value in table S3.1.

When reporting on measurements of amines, nitrosamines and nitramines, the total concentrations should be reported as a range based on: all individual compounds less than the detection limit assumed to be zero as a minimum, and all individual compounds less than the detection limit assumed to be at the detection limit as a maximum. However the minimum value should be used when assessing compliance with the emission limit value in table S3.1.

TEF schemes for dioxins and furans				
Congener	**I-TEF**	**WHO-TEF**		
	1990	**2005**	**1997/8**	
		Humans / Mammals	Fish	Birds
Dioxins				
2,3,7,8-TCDD	1	1	1	1
1,2,3,7,8-PeCDD	0.5	1	1	1
1,2,3,4,7,8-HxCDD	0.1	0.1	0.5	0.05
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.01	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01	0.001	<0.001
OCDD	0.001	0.0003	-	-
Furans				
2,3,7,8-TCDF	0.1	0.1	0.05	1
1,2,3,7,8-PeCDF	0.05	0.03	0.05	0.1
2,3,4,7,8-PeCDF	0.5	0.3	0.5	1
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,4,6,7,8_HpCDF	0.01	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	0.01
OCDF	0.001	0.0003	0.0001	0.0001

TEF schemes for dioxin-like PCBs			
Congener	**WHO-TEF**		
	2005	**1997/8**	
	Humans / mammals	Fish	Birds
Non-ortho PCBs			
3,4,4',5-TCB (81)	0.0001	0.0005	0.1
3,3',4,4'-TCB (77)	0.0003	0.0001	0.05
3,3',4,4',5 - PeCB (126)	0.1	0.005	0.1
3,3',4,4',5,5'-HxCB(169)	0.03	0.00005	0.001
Mono-ortho PCBs			
2,3,3',4,4'-PeCB (105)	0.00003	<0.000005	0.0001
2,3,4,4',5-PeCB (114)	0.00003	<0.000005	0.0001
2,3',4,4',5-PeCB (118)	0.00003	<0.000005	0.00001
2',3,4,4',5-PeCB (123)	0.00003	<0.000005	0.00001
2,3,3',4,4',5-HxCB (156)	0.00003	<0.000005	0.0001
2,3,3',4,4',5'-HxCB (157)	0.00003	<0.000005	0.0001
2,3',4,4',5,5'-HxCB (167)	0.00003	<0.000005	0.00001
2,3,3',4,4',5,5'-HpCB (189)	0.00003	<0.000005	0.00001

Schedule 7 - Site plan

End of Permit