

Environment Agency

Review of an Environmental Permit for an Installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2016 (as amended)

Decision document recording our decision-making process following review of a permit

The Permit number is: EPR/BS3590IE
The Operator is: Sabic UK Petrochemicals Limited
The Installation is: Wilton Olefins Installation
This Variation Notice number is: EPR/BS3590IE/V015

Consultation commenced on: 15 December 2021
Consultation ended on: 17 January 2022

What this document is about

Article 21(3) of the Industrial Emissions Directive (IED) requires the Environment Agency to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication by the European Commission of updated decisions on Best Available Techniques (BAT) Conclusions.

We have reviewed the permit for this installation against the revised BAT Conclusions for the Large Volume Organic Chemicals (LVOC) industry sector published on 07 December 2017 in the Official Journal of the European Union.

Where appropriate, we also considered other relevant BAT Conclusions published prior to this date but not previously included in a permit review for the installation:

- Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW), published 09 June 2016.
- Large Combustion Plants (LCP), published 17 August 2017.

In this decision document, we set out the reasoning for the consolidated variation notice that we have issued.

It explains how we have reviewed and considered the techniques used by the operator in the operation and control of the plant and activities of the

installation. This review has been undertaken with reference to the decision made by the European Commission establishing BAT Conclusions (BATc) for Production of LVOCs, CWW and LCPs as detailed in document references C(2017) 7469, C(2016) 3127 and C(2017) 5225 respectively. It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position. It also provides a justification for the inclusion of any specific conditions in the permit that are in addition to those included in our generic permit template.

As well as considering the review of the operating techniques used by the operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issue. Where this has not already been done, it also modernises the entire permit to reflect the conditions contained in our current generic permit template.

The introduction of new template conditions makes the permit consistent with our current general approach and with other permits issued to installations in this sector. Although the wording of some conditions has changed, while others have been deleted because of the new regulatory approach, it does not reduce the level of environmental protection achieved by the permit in any way. In this document we therefore address only our determination of substantive issues relating to the new BAT Conclusions and any changes to the operation of the installation.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future.

How this document is structured

1. Our decision
2. How we reached our decision
3. The legal framework
4. Annex 1– Decision checklist regarding relevant BAT Conclusions
5. Annex 2 – Assessment, determination and decision where an application(s) for derogation from BAT Conclusions with associated emission levels (AEL) has been requested
6. Annex 3 – Improvement conditions
7. Annex 4 – Advertising and consultation on the draft decision
8. Annex 5 – Review and assessment of changes that are not part of the BAT Conclusions derived permit review

1 Our decision

We have decided to issue the variation notice to the operator. This will allow them to continue to operate the installation, subject to the conditions in the consolidated variation notice that updates the whole permit.

As part of our decision we have decided to grant the operator's request for a derogation from the requirements of BAT Conclusion 12 as identified in the CWW BAT Conclusions document. The way we assessed the operator's requests for derogation and how we subsequently arrived at our conclusion is recorded in Annex 2 to this document.

This BAT Conclusion is linked to a number of 'narrative' BAT Conclusions which will be non-compliant until the improvements are implemented: LVOC BAT Conclusion 14 and CWW BAT Conclusions 3, 7, 9 to 11, 14 and 21.

We consider that, in reaching our decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The consolidated variation notice contains many conditions taken from our standard environmental permit template including the relevant annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our permit template provides two or more options.

2 How we reached our decision

2.1 Requesting information to demonstrate compliance with BAT Conclusion techniques

We issued a Notice under regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 04 May 2018 requiring the operator to provide information to demonstrate where the operation of their installation currently meets, or how it will subsequently meet, the revised standards described in the relevant BAT Conclusions document. The notice required that where the revised standards are not currently met, the operator should provide information that:

- Describes the techniques that will be implemented before 07 December 2021 which will then ensure that operations meet the revised standard, or
- justifies why standards will not be met by 07 December 2021, and confirmation of the date when the operation of those processes will cease within the installation or an explanation of why the revised BAT standard is not applicable to those processes, or
- justifies why an alternative technique will achieve the same level of environmental protection equivalent to the revised standard described in the BAT Conclusions.

Where the operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions document, the Regulation 61 Notice required that the operator make a formal request for derogation from compliance with that AEL (as provisioned by Article 15(4) of IED). In this circumstance, the Notice identified that any such request for derogation must be supported and justified by sufficient technical and commercial information that would enable us to determine acceptability of the derogation request.

The Regulation 61 Notice response from the operator was received on 26 October 2018.

We considered that the response did not contain sufficient information for us to commence determination of the permit review. We therefore issued a further information request to the operator 06 July 2020. Suitable further information was provided by the operator on 27 August 2020 which replaced the 2018 submission.

Regulation 61 Notice sent 04 May 2018	Response received 26 October 2018
Request for further information sent 06 July 2020	Response received 27 August 2020 Replaces original submission

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review but not that it necessarily contained all the information we would need to complete that determination, refer to section 2.3 below.

The Operator made no claim for commercial confidentiality. We have not received any information in relation to the Regulation 61 Notice response that appears to be confidential in relation to any party.

Commercial confidentiality was claimed for certain aspects of the derogation request. Refer to Annex 2 of this document.

2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document

Based on our records and previous experience in the regulation of the installation we consider that the operator will be able to comply with the techniques and standards described in the BAT Conclusions other than for those techniques and requirements described in BAT Conclusions (refer to Annex 1 below):

LVOC BAT Conclusions 1, 2 and 20

LVOC BAT Conclusion 14 (linked to the derogation request)

CWW BAT Conclusion 4

CWW BAT Conclusion 12 derogation request

CWW BAT Conclusions 3, 7, 9, 10, 11, 14 and 21 (linked to the derogation request)

In relation to these BAT Conclusions, we do not fully agree with the operator in respect of their current stated capability as recorded in their Regulation 61 Notice response. We have therefore included improvement conditions in the consolidated variation notice to ensure that the requirements of the BAT Conclusions are delivered.

2.3 Requests for further information during determination

Although we were able to consider the Regulation 61 Notice response generally satisfactory, we did in fact need more information in order to complete our permit review assessment, and issued further information requests as follows:

Request for information sent 21 January 2021	Response received 22 January 2021 LVOC BAT Conclusion 1 and CWW BAT Conclusion 12
Request for information sent 28 January 2021	Response received 04 February 2021 LVOC BAT Conclusion 20
Request for information sent 03 February 2021	Response received 04 February 2021 LCP 648 primary fuel
Request for information sent 10 February 2021	Response received 02 March 2021 LVOC BAT Conclusion 1
Request for information sent 24 February 2021	Response received 31 March 2021 Continuous emissions monitors (CEMs)
Request for information sent 03 March 2021	Response received 29 April 2021 LCP 648, VMR furnaces, process heaters (periodic monitoring)
Request for information sent 17 March 2021	Response received 31 March 2021 Correlation between oxygen and NO _x produced by the VMR burners
Request for information sent 04 May 2021	Response received 14 May 2021 Temporary platforms and EN 15259 compliance for VMR furnaces
Request for information sent 25 October 2021	Response received 29 October 2021 LVOC BAT Conclusions 2 and 20
Information received 24 and 29 November 2021	Section 4 of the Wood report (ref: 38454/C001/003, dated November 2018) - compliance pre and post effluent treatment
Information received 24 November 2021	Updated site plan with emission point A4a removed
Information received 29 November 2021	Hazardous pollutants
Information received 03 December 2021	Start-up date definition

A copy of each further information request and response was placed on our public register.

We have consulted on our draft decision from 15 December 2021 to 17 January 2022. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 4 of this document.

2.4 Condition of Soil and Groundwater

Articles 16 and 22 of the Industrial Emissions Directive (IED) require that a quantified baseline is established for the level of contamination of soil and groundwater with hazardous substances, in order that a comparison can be made on final cessation of activities.

We have used the LVOC permit review to regulate against the above IED requirements. Our Regulation 61 Notice required operators, where the activity of the installation involved the use, production or release of a relevant hazardous substance (as defined in Article 3(18) of the (IED)), to carry out a risk assessment considering the possibility of soil and groundwater contamination at the installation with such substances. Where any risk of such contamination was established we requested that the operator either:

- prepare and submit a baseline report containing information necessary to determine the current state of soil and groundwater contamination; or
- provide a summary report referring to information previously submitted where they were satisfied that such information represented the current state of soil and groundwater contamination so as to enable a quantified comparison to be made with the state of soil and groundwater contamination upon definitive cessation the activity.

Where operators concluded that there were no risks of soil or groundwater contamination (due to there not being any release of hazardous substances), they were required to provide a copy of the risk assessment.

The operator confirmed that a baseline report was submitted as part of the original permit application (EPR/BS3590IE/A001) in 2003. The baseline report described the state of soil and groundwater beneath the installation. Ongoing periodic monitoring is specified in the current permit.

We are satisfied that the necessary measures are in place so that a comparison of soil and groundwater can be made on final cessation of activities.

2.5 Surface Water Pollution Risk Assessment

As part of our delivery of the Water Framework Directive (WFD) requirements, we need to identify and assess the impact of all sources of hazardous pollutants to surface waters from regulated industry. We use the term 'hazardous pollutants' to collectively describe substances covered by the EQSD¹ (priority hazardous substances, priority substances and "other pollutants"). It also applies to the specific pollutants listed in the 2015 Directions², and substances which have operational (non-statutory) Environmental Quality Standards (EQS).

¹ Environmental Quality Standards Directive (EQSD) (2008/105/EC, as amended by 2013/39/EU)

² The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

The lists of hazardous chemicals and elements (the new term for hazardous pollutants) are on .gov.uk at the following link:

<https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit>

For all installations with discharges to surface water and/or sewer we required the operator, via our Regulation 61 Notice, to provide a summary report of the current hazardous pollutant releases referring to the series of screening tests, which are described in our H1 risk assessment guidance, which would allow us to assess whether the emissions of hazardous pollutants from the installation are significant.

The operator confirmed that H1 assessment tools have been completed and submitted to the Environment Agency as part of the relevant plant EPR applications. They also refer to their response to CWW BAT Conclusion 14 regarding a waste water treatment plant, see below. The last H1 submission for emissions to water was made in 2003. The H1 methodology (screening tests) have changed significantly since 2003.

The relevant hazardous pollutants were identified in Section 4 of the Wood report (ref: 38454/C001/003, dated November 2018) - compliance pre and post effluent treatment which was resubmitted 29 November 2021. This may form the basis of the improvement condition submission (see below).

We have set an improvement condition requiring the submission of an updated H1 risk assessment, refer to Annex 3 of this document. This is required to assess the significance of emissions of hazardous pollutants from the installation at emission point W1.

3 The legal framework

The consolidated variation notice is issued under Regulations 18 and 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* as described by the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, in issuing the consolidated variation notice, it will ensure that the operation of the installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

We have set emission limit values (ELVs) in line with the BAT Conclusions (except for total organic carbon (TOC) and adsorbable organically bound halogens (AOx)), unless a tighter, i.e. more stringent, limit was previously imposed and these limits have been carried forward.

For TOC and AOx at emission point W1, we have set time limited higher ELVs in accordance with the approved derogation. Refer to Annex 2 of this document.

For emissions to each relevant environmental receptor (i.e. air, or surface water), the emission limits and monitoring requirements have been incorporated into the consolidated variation notice via tables in Schedule 3 of the permit – Emissions limits and monitoring requirements.

- a) the existing ELVs and monitoring requirements which are effective from the date of issue of the notice; and
- b) amended ELVs where a BAT AEL is specified in the BAT Conclusions, and any associated monitoring requirements which will take effect following commissioning of the Olefins 6 cracker. A definition of commissioning is provided in Schedule 6 of the permit.

Annex 1: decision checklist regarding relevant BAT Conclusions

BAT Conclusions for the Large Volume Organic Chemicals (LVOC) industry sector were published by the European Commission on 07 December 2017.

There are 19 General BAT Conclusions and a further 71 BAT Conclusions in 10 subsector-specific sections.

Where appropriate, we also considered other relevant BAT Conclusions published prior to this date but not previously included in a permit review for the installation:

23 BAT Conclusions for Common Waste Water and Waste Gas Treatment (CWW)/Management Systems in the Chemical Sector; and

17 general and a further 58 fuel-specific BAT Conclusions for Large Combustion Plants (LCP).

This annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the consolidated variation notice.

The overall status of compliance with the BAT Conclusion is indicated in the table as:

NA	Not applicable
CC	Currently compliant
FC	Compliant in the future (within 4 years of publication of LVOC BAT Conclusions)
NC	Not compliant

BAT Conclusion No	Summary of BAT Conclusion requirement for Production of Large Volume Organic Chemicals	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
GENERAL BAT CONCLUSIONS			
1	Monitor channelled emissions to air from process furnaces/heaters in accordance with the described standards and minimum frequencies	NC	Refer to Key issues section below. We agree with the operator's stated current compliance of NC as BAT will not be achieved by 07 December 2021.
2	Monitor channelled emissions to air other than from process furnaces/heaters in accordance with the described standards and minimum frequencies	NA NA NC	The operator confirmed that: For benzene this is NA as there is no cumene oxidation unit present and there are no other point source releases. For all other parameters (except carbon monoxide (CO) and dust) they confirm NA as they are not present. For CO and dust they confirm NC as air emission contractors are unable to provide accredited methods or accredited equipment to condition the emission such that a representative sample and reliable monitoring results can be obtained. There isn't an EN standard to advise how to

			<p>sample for CO or dust to provide meaningful results. The European Ethylene Producers Committee (EEPC) is currently developing guidance to obtain information in a more consistent manner but it will not define how to carry out the monitoring. They confirm that they have been playing an active role in this work.</p> <p>Refer to Key issues section below.</p> <p>Also refer to BAT Conclusion 20 and Key issues below.</p> <p>We have set an improvement condition to address this, refer to Annex 3 of this document.</p> <p>We agree with the operator's stated compliance as the requirements will not be achieved by 07 December 2021.</p>
3	Ensure optimised combustion from process furnaces/heaters to reduce emissions to air of CO	CC	<p>The operator confirmed that:</p> <p>There are well documented procedures that state the optimum air register settings for the burners, the optimum oxygen operating composition in the convection section to ensure complete combustion and the optimum draft settings. The furnaces operate on automated draft control with online draft and oxygen measurements to control the combustion. Other fired equipment such as the super-heaters have local draft control and measurements however this equipment operates in a more static window with stable conditions and therefore require less frequent optimisation.</p>

			We agree with the operator's stated compliance.
4	Reduce NO _x emissions from process furnace/heaters by using one or a combination of the described techniques	<p>CC</p> <p>CC</p> <p>NA</p> <p>NA</p> <p>CC</p> <p>NA</p> <p>NA</p> <p>NA</p>	<p>The operator confirmed that:</p> <p>a. choice of fuel - gaseous fuels are used as opposed to liquid or solid fuels which contain nitrogen.</p> <p>b. staged combustion - used as part of the Low NO_x burner design.</p> <p>c. flue gas recirculation (external) - not applicable to existing crackers.</p> <p>d. flue gas recirculation (internal) - not applicable to existing crackers.</p> <p>e. Low-NO_x burner (LNB) or ultralow-NO_x burner (ULNB) - BAT is achieved by the use of LNBs which have already been installed on all the Olefins 6 furnaces as part of a feed conversion project. This was completed in early 2017.</p> <p>f. use of inert diluents – not used as the design does not allow this.</p> <p>g. SCR (applicability may be restricted by space availability) – not used as there is restricted space in existing equipment.</p> <p>h. SNCR – response as for SCR above.</p> <p>BAT is to use one or a combination of the techniques.</p> <p>We agree with the operator's stated compliance.</p>
5	Prevent or reduce dust emissions from process furnace/heaters by using one or a combination of the described techniques	<p>CC</p> <p>NA</p> <p>NA</p>	<p>The operator confirmed that:</p> <p>a. choice of fuel - gaseous fuels are used.</p> <p>b. atomisation of liquid fuels – not applicable as gaseous fuels only.</p> <p>c. Fabric, ceramic or metal filter - not applicable for gaseous fuels.</p>

			We agree with the operator's stated compliance.
6	Prevent or reduce SO ₂ emissions from process furnace/heaters by using one or a combination of the described techniques	CC NA	<p>The operator confirmed that:</p> <ul style="list-style-type: none"> a. choice of fuel - gaseous fuels. b. caustic scrubbing (applicability may be restricted by space availability) - not used as there is restricted space in existing equipment. <p>BAT is to use one or both techniques.</p> <p>We agree with the operator's stated compliance.</p>
7	To reduce emission of ammonia optimise design/operation of SCR/SNCR	NA	<p>The operator confirmed that there is no SCR or SNCR employed on the installation.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>
8	Increase resource efficiency/reduce the pollutant load on final waste gas treatment by using one or a combination of the described techniques on process off-gas streams (8a/b take precedence over 9)	CC CC NA	<p>The operator confirmed that:</p> <ul style="list-style-type: none"> a. recovery and use of excess or generated hydrogen – excess hydrogen is used in the fuel gas as there is no local demand for it. b. recovery and use of organic solvents and unreacted organic raw materials - all unreacted raw materials are recycled back to the cracking furnaces via compressors. c. use of spent air - not applicable as there are no available uses for low-purity nitrogen which do not compromise process safety.

		<p>NA</p> <p>NA</p> <p>NA</p>	<p>d. recovery of HCl by wet scrubbing for subsequent use - applicability restricted due to low HCl loads.</p> <p>e. recovery of H₂S by regenerative amine scrubbing for subsequent use – not applicable as there is no refinery located nearby.</p> <p>f. techniques to reduce solids and/or liquids entrainment - not applicable, gases only.</p> <p>BAT is to use an appropriate combination of techniques.</p> <p>We agree with the operator's stated compliance.</p>
9	Increase energy efficiency/reduce the pollutant load on final waste gas treatment by sending process off-gas streams of sufficient calorific value to a combustion unit	CC	<p>The operator confirmed that:</p> <p>All routinely generated hydrocarbon is fed into the fuel gas system and re-used. The plant is designed so that all by-product / off-gas streams that are continuously produced, have significant calorific value and cannot be recycled to the process stream, are routed into the fuel gas system so that they can be combusted to produce useful energy and thereby reduce the import of natural gas. Examples are recycle streams from LDPE polymer plant and fuel gas from Olefins 6 caustic effluent fuel gas stripper.</p> <p>We agree with the operator's stated compliance.</p>
10	Reduce channelled emissions of organic compounds to air by using one or a combination of the described techniques.	NA	<p>The operator confirmed that there are no channelled emissions of organic compounds to air. All routine vents of organic emissions are sent to the fuel gas system and re-used.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at</p>

			the installation.
11	Reduce channelled dust emissions to air, by using one or a combination of the described techniques.	NA	<p>The operator confirmed that the only channelled dust emissions are from decoke vents. These are covered in LVOC BAT Conclusion 20.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>
12	Reduce emissions to air of sulphur dioxide and other acid gases (e.g. HCl), by using wet scrubbing.	NA	<p>The operator confirmed that this BAT Conclusion is not applicable to the activities carried out at the installation. The fuel is free of sulphur, refer to BAT Conclusion 1 in the Key issues section below.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>
13	Reduce NO _x , CO and SO ₂ emissions from thermal oxidisers by using a combination of the described techniques	NA	<p>The operator confirmed that this BAT Conclusion is not applicable to the activities carried out at the installation as there is no thermal oxidiser.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>
14	Reduce the waste water volume, the pollutant loads discharged to a suitable final treatment (typically biological treatment), and emissions to water, by using appropriate techniques based on the information provided by the inventory of waste water streams specified in the CWW BAT conclusions.	NC Refer to derog ation	<p>The operator confirmed that:</p> <p>Work is currently under way to explore the implementation of a third party waste water treatment facility to comply with this requirement. Various solutions are being investigated to achieve compliance.</p> <p>This will extend beyond the 07 December 2021 BAT Conclusions implementation date.</p>

			<p>Refer to annex 2 of this document for our assessment of the derogation request.</p> <p>We agree with the operator's stated compliance.</p>
15	Increase resource efficiency when using catalysts by using a combination of the described techniques.	<p>CC</p> <p>a. catalyst selection - they adopt all of the four techniques to increase resource efficiency when utilising catalysts in the process. When a catalyst is to be changed there is a full technical evaluation and the technology team are engaged in the process to ensure that catalyst vendor claims about their products can be appropriately scrutinised and tested. The aim of this process is to ensure that any new catalyst purchased is the best value option and any risks associated with the change are understood and mitigated. On occasion, in-house laboratory trials have been conducted to compare catalyst vendor offerings and provide data to inform the final decision.</p> <p>CC</p> <p>b. catalyst protection - two main systems to prevent poisons from reaching the catalyst:</p> <ul style="list-style-type: none"> • Feedstocks procured to a certain specification for known poisons and analysed before being transferred from the supplier into the process. • A caustic wash system is a key operating part of Olefins 6 and removes acid gases such as hydrogen sulphide (H₂S) or carbon dioxide (CO₂) before they reach downstream catalysts. <p>CC</p> <p>c. process optimisation - catalyst systems have extensive instrumentation and continuous on-line analysis for measuring temperatures, flows, pressures and gas composition. This enables automated control and emergency response as well as longer term</p>	<p>The operator confirmed that:</p>

		CC	<p>performance monitoring to be deployed. d. monitoring of catalyst performance - performance monitoring is undertaken (e.g. bed temperature).</p> <p>BAT is to use a combination of the techniques.</p> <p>We agree with the operator's stated compliance.</p>
16	Increase resource efficiency by recovery and reuse of organic solvents.	NA	<p>The operator confirmed that this BAT Conclusion is not applicable to the activities carried out at the installation. Solvent extraction is used on the butadiene 3 plant; however this is not in the scope of the LVOC Bref.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>
17	Prevent, or where not practicable reduce, waste for disposal by using a combination of the described techniques.	<p>CC</p> <p>NA</p> <p>NA</p> <p>CC</p> <p>NA</p>	<p>The Operator confirmed that:</p> <p>a. addition of inhibitors to distillation systems – additives are used to optimise the process.</p> <p>b. minimisation of high- boiling residue formation in distillation systems – not applicable as it only applies to new distillation units or major plant upgrades.</p> <p>c. material recovery (e.g. by distillation, cracking) – not applicable as there are no available uses for these materials.</p> <p>d. catalyst and adsorbent regeneration - thermal regeneration using steam.</p> <p>e. use of residues as a fuel (applicability may be restricted by the presence of certain substances in the residues, making them unsuitable to use in a combustion unit and requiring disposal) – all combustion units on site are gas fired which makes residues unsuitable.</p>

			<p>BAT is to use a combination of the techniques.</p> <p>We agree with the operator's stated compliance.</p>
18	Prevent or reduce emissions from equipment malfunctions, by using all the described techniques.	<p>CC</p> <p>CC</p> <p>NA</p>	<p>The operator confirmed that:</p> <p>a. identification of critical equipment – this forms part of the protection of the environment and human health, safety and security (EHSS).</p> <p>b. asset reliability programme for critical equipment - assets undergo criticality assessment and highly ranked assets undergo further proactive study to determine the optimum maintenance strategy. Once operational, analysis is undertaken to understand the risks. Where failure or deviation is discovered, root cause analysis (RCA) is applied.</p> <p>c. back-up systems for critical equipment (Not applicable if appropriate equipment availability can be demonstrated using technique b.) – there aren't any back up vent gas systems or alternative abatement units.</p> <p>We agree with the operator's stated compliance.</p>
19	Prevent or reduce emissions to air and water occurring during other than normal operating conditions, by implementing measures commensurate with the relevance of potential pollutant releases for: i) Start-up and shut-down operations ii) Other circumstances	CC	<p>The operator confirmed that:</p> <p>Procedures are in place to manage pollutants, maximise product recovery, minimise flaring duration and recycle liquid materials following shut-down.</p> <p>Procedures are in place to manage pollutants that can be processed via effluent or sent off-site for waste management as appropriate. For</p>

			<p>effluent, activated carbon filtration is applied on-site to minimise pollutant loads.</p> <p>For air, there are management procedures and associated start-up and shut-down procedures to sequence activities to minimise flaring. Optimised supplementary steam availability to minimise flaring during start-up.</p> <p>We agree with the operator's stated compliance.</p>
BAT CONCLUSIONS FOR LOWER OLEFINS PRODUCTION			
-	<p><u>Emissions to air</u> BAT AELs for the lower olefins cracker furnace, set out in table 2.1.</p>	CC	<p>The operator referred to the pollution inventory and periodic returns which support the fact that current performance is compliant with the new BAT AEL for NOx.</p> <p>In addition, the current permit limits for NOx emissions from the furnaces are 180 mg/Nm³ which is lower than the BAT AEL of 200 mg/Nm³.</p> <p>Refer to Key issues section below.</p> <p>We agree with the operator's stated compliance.</p>
20	<p><u>Emissions to air</u> In order to reduce emissions to air of dust and CO from the decoking of the cracker tubes, BAT is to use an appropriate combination of the techniques to reduce the frequency of decoking and one or a</p>	CC/NC	<p>Refer to Key issues section below.</p>

	combination of the abatement techniques.		
<u>Emissions to water</u>			
21	In order to prevent or reduce the amount of organic compounds and waste water discharged to waste water treatment, BAT is to maximise the recovery of hydrocarbons from the quench water of the primary fractionation stage and reuse the quench water in the dilution steam generation system.	CC	<p>The operator confirmed that:</p> <p>Recovery of hydrocarbons from the quench water of the primary fractionation stage is maximised through detailed operating procedures of the primary gasoline separator via procedure and plant controls. The quench water is reused in the dilution steam generation system.</p> <p>We agree with the operator's stated compliance.</p>
22	In order to reduce the organic load discharged to waste water treatment from the spent caustic scrubber liquor originating from the removal of H ₂ S from the cracked gases, BAT is to use stripping.	CC	<p>The operator confirmed that a caustic stripper is in use on the plant.</p> <p>A purge stream from the caustic treatment system to remove H₂S is routed via a fuel gas stripper before the stream leaves the site as liquid effluent. This fuel gas stripper removes benzene, toluene and xylene from the spent caustic stream. The benzene toluene and xylene are mixed with the fuel gas system and re-used on site.</p> <p>We agree with the operator's stated compliance.</p>
23	In order to prevent or reduce the amount of sulphides discharged to waste water treatment from the spent caustic scrubber liquor originating from the removal of acid gases from the cracked gases, BAT is to use one or a combination of the techniques.	CC NA	<p>The operator confirmed that:</p> <p>a. use of low-sulphur raw materials in the cracker feed - purchase specifications ensure low sulphur raw materials.</p> <p>b. maximisation of the use of amine scrubbing for the removal of acid gases - not applicable as the lower olefin cracker is located far away</p>

		NC	<p>from a sulphur recovery unit (SRU).</p> <p>c. oxidation – refer to BAT Conclusion 14 – the waste water treatment project carried out substantial biological treatment trials with third party vendors to identify if there were any biological inhibitors as part of the project due diligence.</p> <p>No issues were identified that required end-of-pipe treatment on the site prior to biological treatment. The design also includes diversion storage to segregate if there are any issues that impact biological treatment.</p> <p>BAT is to use one or a combination of the techniques.</p> <p>We agree with the operator’s stated compliance.</p>
-	BAT Conclusions that are not applicable to this installation	NA	<p>The following LVOC BAT Conclusions are not applicable to the activities carried out at the installation:</p> <p>24 to 30 inclusive - there is no production of aromatics.</p> <p>31 to 44 inclusive - there is no production of ethylbenzene and styrene monomer.</p> <p>45 to 47 inclusive - there is no production of formaldehyde.</p> <p>48 to 55 inclusive - there is no production of ethylene oxide and ethylene glycols.</p> <p>56 to 60 inclusive - there is no production of phenol.</p> <p>61 to 63 inclusive - there is no production of ethanolamine.</p> <p>64 to 74 inclusive - there is no production of toluene di-isocyanate (TDI) and methylene diphenyl di-isocyanate (MDI).</p> <p>75 to 85 inclusive - there is no production of ethylene dichloride and vinyl chloride monomer.</p> <p>86 to 90 inclusive - there is no production of hydrogen peroxide.</p>

Key Issues

BAT Conclusion 1 – monitoring of emissions to air from process furnaces

This BAT Conclusion specifies monitoring frequencies for process furnaces/heaters as follows:

Thermal input MWth	Frequency
10 to <50	Once every three months Note 4 to this BAT Conclusion states that 'The minimum monitoring frequency for periodic measurements may be reduced to once every 6 months, if the emission levels are proven to be sufficiently stable.'
≥ 50 MW	Continuous

The operator confirmed that they operate 17 furnaces that fall under the definition of a process furnace/heater set out in this BAT Conclusion:

Furnace type	Number	Emission point	Thermal input MWth
USC ^{Note 1}	14	A1	45
VMR ^{Note 2}	3	A2 & A3	57.5
Note 1: USC - Ultra Selective Coil, designed to crack liquid feed. Note 2: VMR - Vapour Mixed Recycle, designed to crack gas and liquid feeds.			

They confirm that data from August 2019 to August 2020 demonstrates the VMRs over an annual average are operated below 50 MWth, each with short periodic operation above 50 MWth. The % operation of the VMRs **below** 50 MWth is as follows:

VMR	% operation <50 MWth
B1702A	74%
B1702B	80%
B1702C	99%

They also confirm that this data is consistent with the 2018 data, where the VMR's operated below the 50 MWth threshold for 78% of their time online. They also predict that with the future anticipated plant configuration, the VMR furnace predicted heat loads from furnace datasheets give heat loads between 45.8 and 46.7 MWth. These are predicted values and are dependent on the cracked feed rate and the furnace ethane conversation rate.

Restrict VMR furnace rate

The operator has considered restriction of the VMR furnace thermal rated input to <50 MW so that continuous monitoring would no longer be required. However, the VMR furnaces are specifically designed for the dominant feed that is predicted for the foreseeable future. They are more energy efficient than the USC design for the same annualised feed-rate. De-rating the three VMR furnaces will simply transfer feed to the fourteen USC furnaces and consequently lead to increased overall annual emissions. On this basis they conclude that this option is not viable or logical.

Continuous emissions monitoring system (CEMS) vs periodic monitoring for VMRs

They have already installed Low NOx burners on all the Olefins 6 furnaces as part of a feed conversion project in 2017. This has resulted in a reduction in NOx emissions.

NOx /oxygen correlation

The manufacturers have provided a correlation between measured oxygen and NOx produced by the burners. The operator provided a graph based upon real furnace monitoring.

CEMS and costs

They confirm that retrofitting CEMS on the three VMR furnaces is estimated to cost £3.5 million +/- 40%, which they conclude is disproportionately high compared with any envisaged environmental benefits gained. The CEMS package and stack costs were based on actual prices from the previous installation on the B1703E (LCP 648) boiler.

Installation of CEMS on these furnaces is challenging due to the design of the current stacks which do not meet the M1 standard for either sample point geometry or access arrangements.

These costs assume that a new stack is required on B1702C as the furnace structure does not allow for extension of the existing stack, so a new ground-located 45m stack is the most practical option.

In the case of B1702A and B1702B, new stacks are not proposed. They conclude that whilst the sample point layouts cannot be modified to achieve full compliance, velocity profiling during manual emissions testing has shown that the flow regime is close to compliant. Significant structural modifications would still be required to achieve M1 compliant access for maintenance and manual testing whilst maintaining safe operational access.

In the event that a new stack is required on all three furnaces the estimated cost is £4.1 million +/- 40%.

They propose to undertake quarterly monitoring on both the USC and VMR furnaces due to the significant costs associated with retrofitting CEMS to the VMR furnaces.

Proposed alternative monitoring system for VMRs

They propose to follow an "equivalent" approach to CEMS for monitoring carbon monoxide (CO) and oxygen (O₂) on the VMRs to monitor the combustion conditions in the convection section of the furnace. A report describing this approach and how this supports control of NO_x emissions has been submitted to us, 'Proposal for an alternative to CEMS to monitor NO_x and CO on Olefins 6 VMR furnaces. 29 May 2020'.

They propose to upgrade the VMR furnace flue gas oxygen analysers by replacing the three existing oxygen analysers with oxygen and incombustibles analysis using tunable diode laser absorption spectroscopy. These will measure O₂ and CO continuously across each VMR furnace at the inlet of the convection bank (emission points A2 and A3).

They conclude that implementation of these analysers therefore meet the requirement for continuous measurement of CO; however this would not be to the required BS 14181 standard.

The operator's proposed alternative monitoring system, which relies on a predictive emission monitoring system (PEMS) is not compliant with the requirements of this BAT Conclusion. We have therefore set an improvement condition (refer to Annex 3 of this document) to address the requirements of this BAT Conclusion which follows a stepwise approach (a to d) as follows:

a) Assess current VMR monitoring locations for homogeneity

- The operator shall confirm if modifications to the temporary platforms and sampling ports are required for the one-off homogeneity testing.
- The operator shall make any identified modifications to the monitoring location to enable EN 15259 homogeneity testing or install the proposed BS EN 15259 compliant stacks.

b) Continuous monitoring

- The operator shall submit proposals for continuous monitoring. Where the proposals are not finalised, the operator shall submit progress reports as notified by this improvement condition.
- Where CEMS are proposed, the operator shall submit the details of the CEMS to be installed, including timescales for installation and commissioning.
- Where predictive emission monitoring systems (PEMS) are proposed, the operator shall submit the details of the PEMS, confirm they meet EN/TS 17198, including certification and timescales for installation and commissioning.

c) BS EN 15259 compliance

- After start-up of the installation, the operator shall carry out tests to assess whether the proposed air monitoring location(s) meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID).
- A written report shall be submitted for approval setting out the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements.
- Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the timescale in the notification.
- The proposals shall be implemented in accordance with the Environment Agency's written approval.

d) Calibration

- The operator shall carry out the initial calibration of the CEMS or PEMS and submit the calibration report to the Environment Agency.
- Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals for rectifying this in accordance with the timescale in the notification.
- The proposals shall be implemented in accordance with the Environment Agency's written approval.

Monitoring locations can be assessed for homogeneity and proposals can be provided for continuous monitoring, prior to start-up of the installation in accordance with parts a) and b) of the improvement condition.

Submission of the information for BS EN 15259 compliance and calibration will take place following start-up of the facility, in accordance with parts c) and d) of the improvement condition.

The operator will be NC with the continuous NOx monitoring requirements. The installation is currently mothballed so the outcome of the improvement condition will not be known by 07 December 2021.

This BAT Conclusion specifies monitoring for the following parameters:

Parameter	Applicability
CO	Yes
Dust	Not applicable as the units are combusting exclusively gaseous fuels, see note 5 to this BAT Conclusion.
Ammonia (NH ₃)	Not applicable as there is no selective non catalytic reduction (SNCR) or selective catalytic reduction (SCR), see note 6 to this BAT Conclusion.
Oxides of nitrogen (NO _x)	Yes
Sulphur dioxide (SO ₂)	Not applicable as fuels are free of sulphur (see below).

Sulphur dioxide (SO₂)

Note 7 to this BAT Conclusion states that in the case of process furnaces/heaters combusting gaseous fuels and/or oil with a known sulphur content and where no flue-gas desulphurisation is carried out, continuous monitoring can be replaced either by periodic monitoring with a minimum frequency of once every three months or by calculation ensuring the provision of data of an equivalent scientific quality.

The plant requires sulphur free fuel to operate. Not one of the documented fuel composition options for the plant operating regime include sulphur. Fuels are analysed weekly to monitor this; downstream catalyst is poisoned by sulphur so this is a key plant operating parameter.

Most of the fuel (98.5% by weight) for the fired heaters / furnaces is internally generated as a by-product of the chemical plant process. Sulphur removal is a key unit operation of the plant (via the caustic scrubber). Volatile sulphur species that could be present in the fuel gas stream are continuously monitored by on-line analysers to confirm control systems are working. Sulphur breakthrough leads to other significant operational problems so it would be evident when it occurs. Weekly fuel gas samples are taken and analysed. Data for 2019 demonstrates a 0.00 % Mole result for each weekly sample. Document "Copy of Olefins 6 Fuel Gas 2019" was provided as evidence.

We have set monitoring for the relevant parameters as set out in the table below.

Furnace	Monitoring frequency		
	CO	NOx	SO ₂
USC x 14 (emission point A1)	once every six months ^{Note 1}	once every six months ^{Note 1}	concentration by calculation, once every six months
VMR x 3	Continuous ^{Note 3}	Note 2	concentration by calculation, once every six months
<p>Note 1: The permit contains provision for a reduction in monitoring frequency to once every six months, if the emission levels are proven to be sufficiently stable. The operator provided further information 29 April 2021 demonstrating that emissions are sufficiently stable.</p> <p>Note 2: Based on the outcome of IC34 in table S1.3 of the permit.</p> <p>Note 3: Continuous monitoring is not currently undertaken to the BS 14181 standard. We have therefore linked this monitoring requirement to IC34.</p>			

BAT AELs for emissions to air from a lower olefins cracker furnace – Table 2.1

Emissions to air and the emission limits applied to the plant (emission points A1 to A3)

The monitoring requirements are set out by BAT Conclusion 1, see above.

A number of general principles were applied during the permit review. These included:

- The upper value of the BAT AELs ranges specified were used unless use of the tighter limit was justified.
- The principle of no backsliding where if existing limits in the permit were already tighter than those specified in the BREF, the existing permit limits were retained.
- Where AELs are indicative in the BAT Conclusions, these were applied unless adequate justification was provided by the operator to demonstrate that an alternative limit was more appropriate.

The following tables set out the limits that have been incorporated into the permit for emission points A1 to A3. The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K, pressure of 101.3 kPa and 3% volume reference oxygen

concentration in flue gases. The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

Table 2.1 of the BAT Conclusions sets a BAT AEL for NO_x of 200 mg/Nm³ and an indicative CO limit of 50 mg/Nm³. These apply to the lower olefin cracker furnace. Refer to BAT Conclusion 1 above for monitoring frequency.

Limits for NO_x have been set lower than the BAT AEL on the principle of no backsliding.

The permit will contain provision for CO limits to be set based on the outcome of a note to the relevant table and an improvement condition.

NO _x limits (mg/Nm ³) – daily average (continuous monitoring) or average over the sampling period					
Emission point	Existing	BREF (Table 2.1 BAT-c)	Permit review limits	Basis	Monitoring
A1	180	200	180	IED	Once every six months
A2	180	200	180	IED	Note 1
A3	180	200	180	IED	Note 1
Note 1: The monitoring requirements shall be based on the outcome of improvement condition IC34 in table S1.3 of the permit.					

CO limits (mg/Nm ³) – daily average (continuous monitoring) or average over the sampling period					
Emission point	Existing	BREF (Table 2.1 BAT-c)	Permit review limits ^{Note 1}	Basis	Monitoring
A1	-	50	Note 2	BREF	Once every six months
A2	-	50	Note 2	BREF	Continuous
A3	-	50	Note 2	BREF	Continuous
Note 1: Refer to note 3 of table 2.1 to the BAT Conclusions for the 50 mg/Nm ³ indicative limit. Note 2: As the Olefins 6 cracker is currently mothballed, the operator cannot commit to meeting the indicative CO limit. We have included a note to the table and an improvement condition confirming that as an indication, the CO limit shall be 50 mg/Nm ³ expressed as a daily average or an average over the sampling period. If a higher limit is required, then a site specific justification shall be provided in accordance with the improvement condition.					

BAT Conclusion 2 – monitoring of emissions to air other than from process furnaces (de-coking)

This BAT Conclusion requires monitoring of CO and dust during decoking once a year, or once during decoking if less frequent.

It is the operator's understanding that the Technical Working Group associated with this BREF agreed that it was not possible to define a BAT AEL for decoke emissions until such time that a protocol for monitoring and reporting emissions during decokes was in place. This BAT Conclusion states that there is currently no EN standard available for measuring CO and dust. Footnotes state that EN15058 for CO and EN13284-1 for dust need adaptation so that the measured values are representative for the whole decoke cycle.

They confirm that they cannot define arrangements to comply with this BAT Conclusion until:

- BAT Conclusion 20 has been complied with and abatement equipment has been installed (see below).
- The standard for monitoring and reporting emissions has been defined including the BAT AEL. This is a complex activity which has been ongoing for a number of years, the conclusion of which is not yet certain. Further details can be found in their report 'SABIC UK Petrochemicals' position regarding LVOC BAT 2 and BAT 20 - Decoke monitoring and abatement, dated December 17 2020.

BAT Conclusion 20 – Reduce emissions to air of dust and CO from decoking

This BAT conclusion specifies the following techniques:

Technique	Operator's response	Status
Techniques to reduce the frequency of decoking		
a. tube materials that retard coke formation	Current metallurgy is 35% content chrome, 45% content nickel which is adequate in terms of coil longevity. Trials have been undertaken on aluminium containing alloys, which would provide greater resistance to coke formation. There may be other risks associated with these alloys, so 35 chrome and 45 nickel continue to be used. There remains scope to investigate further aluminium containing alloys.	CC
b. doping of the raw material feed with sulphur compounds	Dimethyl disulphide (DMDS) is added to the furnace before the start of a run to pre-sulphide the furnace cracking tubes and also during the run for feed stocks that are low in sulphur. There is a procedure in place that states the flow rate of DMDS to be added for different feed stocks and different feed flow rates.	CC
c. optimisation of thermal decoking	Temperature and steam flow rates are monitored throughout the various stages of the decoke operation.	CC
Abatement techniques		
d. wet dust scrubbing	See below.	NC
e. dry cyclone	See below.	NC
f. combustion of decoking waste gas in process	See below.	NC

furnace/heater (applicability may be restricted by pipe-work system design or fire duty restrictions)		
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Techniques to reduce the frequency of decoking

BAT is to use an appropriate combination of techniques to reduce the frequency of decoking. We agree that the operator is compliant.

Abatement techniques

In their report 'SABIC UK Petrochemicals' position regarding LVOC BAT 2 and BAT 20 - Decoke monitoring and abatement, dated December 17 2020, the operator confirmed that:

A number of technologies were assessed:

Wet cyclone with additional water spray to entrain very small particles - most suitable technology to meet expected future particle limits during decoke operations.

Dry cyclone to entrain small particles – not likely to be able to achieve the required separation of very small particles generated during ethane cracking.

Combustion of the decoke in the firebox of the furnace - not suitable due to technical limitations of the existing design.

They confirm that in the absence of a BAT AEL there isn't a performance specification against which technology providers can design the required abatement system to, and as such they risk installation of abatement that may not meet the future BAT AEL.

Despite this risk, they intend to progress the wet cyclone option in 2021, with a Front End Engineering Design (FEED) anticipated by mid-2022. This timetable illustrates, however, that the abatement cannot be installed by 07 December 2021 when implementation of the LVOC requirements is required.

In parallel, they will play a role in the collection of reliable data in support of the European Ethylene Producers Committee (EEPC) initiative. EEPC will analyse data from across its membership and share this with the expectation that a BAT AEL will be published in the future.

For the reasons set out above, the operator seeks an agreement with us to extend the requirement to install abatement technology for decokes. This was initially until the end of 2025, however in their submission received 29 October 2021 they propose that we do not set an end date. This is due to the potential rework of the design due to the publication of a BAT AEL which may cause delays with any re-design that may be required to ensure that the technology allows the BAT AEL to be met.

BAT is to use one or a combination of the abatement techniques. We agree that the operator is not compliant.

We have set an improvement condition for the operator to fully address the abatement requirements associated with this BAT Conclusion within the third calendar year following the publication of the relevant BAT AELs.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
1	To improve overall environmental performance implement and adhere to an EMS incorporating all the described features in (i) to (xiv).	<p>CC</p> <p>CC</p> <p>CC</p> <p>CC</p> <p>NA</p> <p>CC</p> <p>CC</p> <p>CC</p>	<p>The operator confirmed that:</p> <p>(i) to (vi), (viii) - comprehensive Environmental Health, Safety, Security & Quality (EHSSQ) system is in place that is certified to the RC14001 technical standard, which incorporates ISO 14001.</p> <p>(vii) - member of relevant industry groups and attendance at conferences.</p> <p>(ix) - participates in benchmarking exercises using recognised industry approaches.</p> <p>(x) - well established site waste management system in place.</p> <p>(xi) – applicable to multi operator sites, this is not a multi operator installation.</p> <p>(xii) – control of major accidental hazards (COMAH) safety report.</p> <p>(xiii) – odour management plan in place and incorporated into table S1.2 of the permit (operating techniques).</p> <p>(xiv) – noise management plan in place and incorporated into table S1.2 of the permit (operating techniques).</p> <p>We agree with the operator’s stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
2	To facilitate reduction of emissions to water and air and water usage, establish and maintain an inventory of waste water and waste gas streams as part of BAT1 EMS incorporating all of the described features.	CC	<p>The operator confirmed that:</p> <ul style="list-style-type: none"> (i) information about the chemical production processes, including: <ul style="list-style-type: none"> (a) chemical reaction equations, also showing side products; (b) simplified process flow sheets that show the origin of the emissions; (c) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances. <p>The operator confirmed that the Olefins production area holds records detailing the processes being operated, much of which is included in the site COMAH report. The reactions that take place within the process are well understood.</p> <p>Simplified diagrams of the process are available within the site EMS. Process flow sheets are readily available in this system and detail sources of emissions from the process.</p> <p>The techniques used to minimise the emissions to the environment are</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		CC	<p>numerous.</p> <p>For emissions to air these include low NOx burners in the furnaces and fuel gas re-circulation.</p> <p>For emissions to water these include the use of oil water separators, continuous monitoring of emissions, recirculation of process water streams and bunding.</p> <p>All of these processes are detailed in the relevant procedures in the site EMS.</p> <p>(ii) information, as comprehensive as is reasonably possible, about the characteristics of the waste water streams, such as:</p> <p>(a) average values and variability of flow, pH, temperature, and conductivity;</p> <p>(b) average concentration and load values of relevant pollutants/parameters and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, salts, specific organic compounds);</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		CC	<p>(c) data on bio-eliminability (e.g. BOD, BOD/COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. nitrification))</p> <p>The operator confirmed that comprehensive sampling of wastewater streams has been completed.</p> <p>(iii) information, as comprehensive as is reasonably possible, about the characteristics of the waste gas streams, such as:</p> <ul style="list-style-type: none"> (a) average values and variability of flow and temperature; (b) average concentration and load values of relevant pollutants/parameters and their variability (e.g. VOC, CO, NOx, SOx, chlorine, hydrogen chloride); (c) flammability, lower and higher explosive limits, reactivity; (d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust). <p>The operator confirmed that they have a spreadsheet describing the flow, typical concentrations, species and permit limit for all continuous</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>emission points specified in the permit. Similar data exists for intermittent and fugitive sources specified in the permit. Data such as temperature and moisture is available from the periodic third party stack monitoring reports.</p> <p>BAT is to incorporate all of the described features.</p> <p>We agree with the operator's stated compliance.</p>
3	For relevant emissions to water monitor key process parameters at key locations.	NC	<p>The operator confirmed that:</p> <p>Refer to BAT Conclusion 14 of the LVOC BAT Conclusions.</p> <p>Continuous monitoring will be required for key process parameters which will include flow, pH and temperature.</p> <p>We agree with the operator's stated compliance.</p> <p>We have set an improvement condition to ensure that the requirements</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			of this BAT Conclusion are met in accordance with the BAT Conclusion 12 derogation.
4	Monitor emissions to water in accordance with the described standards and minimum frequencies.	See below	Refer to Key issues section below.
5	Periodically monitor diffuse VOC emissions to air from relevant sources using a combination (or for large amounts – all) of the described techniques.	CC	<p>The operator confirmed that:</p> <p>There is a management procedure and a well-established Leak Detection and Repair (LDAR) system in place. All three approaches I, II and III are already practised. They refer to permit application part 2.10 Emissions Monitoring, Section 2.10.1.1.3 Fugitive Emissions of VOCs.</p> <p>I – Sniffing methods - Leaks are monitored as detailed in US EPA Method 21, US EPA Protocol for Equipment Leak Emission Rates, EPA-453/R-95-017 and US EAP 40 CFR 60, 63 and 65. Mass emission factors are calculated using industry standard correlation factors.</p> <p>II – Optical gas imaging - Optical gas imaging using an IR camera US EPA 40 CFR 60, 63 and 65.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>III – Calculation of emissions based on emissions factors, periodically validated (e.g. once every two years) by measurements - Monitoring every 12 to 48 months depending upon species. Optical gas imaging every six months.</p> <p>We agree with the operator’s stated compliance.</p>
6	Periodically monitor odour emissions from relevant sources using the described standards.	NA	<p>The operator confirmed that there is no evidence that nuisance from odours occurs.</p> <p>Applicability is restricted to cases where odour nuisance can be expected or has been substantiated.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation; however it may become applicable in the future if effluent treatment is in place.</p>
7	Reduce usage of water and the generation of waste water, by reducing the volume	CC	The operator confirmed that:

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	and/or pollutant load of waste water streams, enhancing the reuse of waste water within the production process and recovery and reuse of raw materials.		<p>Various studies have been undertaken to assess the feasibility of several options to reduce or re-use water. Most were rejected on technical and cost benefit grounds.</p> <p>If the future plan for the site is to redevelop, then the requirements of this BAT Conclusion would need to be re-assessed.</p> <p>We agree that the operator is CC; however we have set an improvement condition for the requirements to be addressed as necessary.</p>
8	Prevent the contamination of uncontaminated water reduce emissions to water, by segregating uncontaminated waste water streams from waste water streams that require treatment.	NA	<p>The operator confirmed that this is an existing collection system.</p> <p>This BAT Conclusion confirms that the segregation of uncontaminated rainwater may not be applicable in the case of existing waste water collection systems.</p> <p>We agree that this BAT Conclusion is NA to the activities carried out at the installation.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
9	Prevent uncontrolled emissions to water by providing an appropriate buffer storage capacity for waste water incurred during other than normal operating conditions based on a risk assessment, and taking appropriate further measures.	NC	<p>The operator confirmed that they are none compliant and to refer to the response to LVOC BAT Conclusion 14. The design includes buffer and diversion storage to account for high rainfall and out-of-specification effluent to ensure the third party biological treatment will achieve the BAT AELs.</p> <p>We have set an improvement condition, refer to Annex 3 of this document.</p> <p>We agree with the operator's stated compliance.</p>
10	Reduce emissions to water, by using an integrated waste water management and treatment strategy that includes an appropriate combination of the described techniques (in the priority order given).	CC CC	<p>The operator confirmed that:</p> <p>a. process integrated techniques – to prevent or reduce the generation of water pollutants – recovery of cooling water, also see BAT Conclusion 7.</p> <p>b. recovery of pollutants at source – recover pollutants prior to their discharge to the waste water collection system - oil water separator on the main outfall, oils and polymer separated upstream and banded storage.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<p>CC</p> <p>NC</p>	<p>c. waste water pre-treatment – to abate pollutants before the final waste water treatment, can be carried out at source or in combined streams - E1725 stripper column, ‘end-of-pipe’ treatment of catalyst regeneration flow, also see BAT Conclusion 7.</p> <p>d. final waste water treatment – e.g. preliminary and primary treatment, biological treatment, nitrogen/phosphorus removal and/or final solids removal techniques before discharge to a receiving water body – refer to LVOC BAT Conclusion 14.</p> <p>We have set an improvement condition to address the requirement to implement final waste water treatment, refer to Annex 3 of this document.</p> <p>We agree with the operator’s stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
11	Reduce emissions to water, by pre-treating waste water that contains pollutants that cannot be dealt with adequately during final waste water treatment using appropriate techniques as part of an integrated waste water management and treatment strategy.	NC/NA	<p>The operator confirmed that many of the requirements are not relevant and referred to LVOC BAT Conclusion 14.</p> <p>They confirm that the waste water treatment project carried out substantial biological treatment trials with the third party vendors to identify if there were any biological inhibitors as part of the project due diligence. No inhibitors were identified that required end-of-pipe treatment on the site prior to biological treatment.</p> <p>Also the design includes diversion storage to segregate if there are any issues that impact biological treatment.</p> <p>Whilst the operator is not compliant with this BAT Conclusion they highlight that it may no longer be relevant once waste water treatment is in place. We have set an improvement condition to track this, refer to Annex 3 of this document.</p> <p>We agree with the operator's stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
12	Reduce emissions to water, by using an appropriate combination of the described final waste water treatment techniques.	NC	Refer to Key issues section below.
13	Prevent or, where this is not practicable, reduce the quantity of waste being sent for disposal by setting up and implementing a waste management plan as part of the environmental management system (see BAT 1) that, in order of priority, ensures that waste is prevented, prepared for reuse, recycled or otherwise recovered.	CC	The operator confirmed that there is a management procedure in place. We agree with the operator's stated compliance.
14	Reduce the volume of waste water sludge requiring further treatment or disposal, and reduce its potential environmental impact, by using one or a combination of the described techniques.	NA	The operator confirmed that this BAT Conclusion is not applicable to the activities carried out at the installation. Refer to our conclusion for BAT Conclusion 12. We agree that this BAT Conclusion is NA to the activities currently carried out at the installation; however it is likely to become applicable in

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>the future when effluent treatment is in place.</p> <p>We have set an improvement condition to track this, refer to Annex 3 of this document.</p>
15	Facilitate the recovery of compounds and the reduction of emissions to air, by enclosing the emission sources and treating the emissions, where possible.	CC	<p>The operator referred to LVOC BAT Conclusion 9: The plant is designed so that all by-product / off-gas streams that are continuously produced, have significant calorific value and cannot be recycled to the process stream, are routed into the fuel gas system so that they can be combusted to produce useful energy and thereby reduce the import of natural gas. Examples are recycle streams from LDPE polymer plant and fuel gas from the caustic effluent fuel gas stripper.</p> <p>We agree with the operator's stated compliance.</p>
16	Reduce emissions to air, by using an integrated waste gas management and treatment strategy that includes process-integrated and waste gas treatment techniques.	CC	<p>The operator confirmed that:</p> <p>There is integration of off-gases as fuel. Flue gas recirculation in one of the boiler reduces NOx; the plant is heavily heat integrated; recovery of off gases to maximise product yield and reduce flaring.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			We agree with the operator's stated compliance.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
17	Prevent emissions to air from flares, by using flaring only for safety reasons or non-routine operational conditions (e.g. start-ups, shutdowns) using one or both of the described techniques.	NA CC	<p>The operator confirmed that:</p> <ul style="list-style-type: none"> a. correct plant design – Not applicable as existing plant b. plant management - The Olefins 6 plant utilises plant automation and advanced process control to optimise plant conditions whilst achieving consistent product specification to minimise flaring. The advanced process control scheme continually monitors key plant operating parameters and adjusts plant conditions to maximise production and efficiency of the unit. The plant also utilises a supervisory layer which identifies to the operating team internal non-conformances to ensure the plant is operating in its most efficient and cost effective position and this includes the fuel gas balance. Flaring is minimised by ensuring all non-saleable products, e.g. hydrogen, are continually fuelled without the need for excessive use of external fuel gas supplies. <p>We agree with the operator's stated compliance.</p>
18	Reduce emissions to air from flares when flaring is unavoidable, by using one or both of the described techniques.	CC	<p>The operator confirmed that:</p> <ul style="list-style-type: none"> a. correct design of flaring devices – Flare is designed to manage the

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		FC	<p>flare flow/load and managed accordingly in major maintenance turnarounds to ensure continued performance per design.</p> <p>b. monitoring and recording as part of flare management – continuous monitoring of the gas sent to the flare, measurements of flow and estimations of other parameters (e.g. composition, heat content, velocity, pollutant emissions) – Not all parameters are continuously monitored. The flare system includes continuous monitoring of gas flow-rate and some gas composition sent to the flare tip is measured directly by the flow-meter and gas chromatograph. This is an EUETS obligated emission point. Other parameters such as heat content and pollutant emissions are calculated along with NOx, and uncombusted hydrocarbons (VOC's including butadiene as a separate species) and these currently appear in the Pollution Inventory. Heat content and velocity could be calculated.</p> <p>We do not agree with the operator's stated compliance of partially compliant and have changed the status to FC.</p> <p>We have included an improvement condition and an annual reporting</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			requirement in the permit performance parameters table of the permit. The improvement condition addresses an assessment of installing a flare recovery system which is only required once. The performance parameters incorporate the annual reporting requirements.
19	Prevent or, where that is not practicable, reduce diffuse VOC emissions to air, by using a combination of the described techniques.	<p>CC</p> <p>CC</p> <p>CC</p> <p>CC</p>	<p>The operator confirmed that:</p> <p><u>Plant design</u></p> <p>a. limit the number of potential emission sources - welded lines where appropriate, open end procedure and pump seal improvements to minimise emissions.</p> <p>b. maximise process-inherent containment features - refuelling of undesirable product streams back into the process or recycling by cracking of un-cracked raw material.</p> <p>c. select high integrity equipment – for example double seal to floating roof naphtha tanks.</p> <p>d. facilitate maintenance activities by ensuring access to potentially leaky equipment - appropriate temporary access would be constructed / utilised where permanent access is not available.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<p>CC</p> <p>CC</p> <p>CC</p> <p>CC</p> <p>CC</p>	<p><u>Plant construction, assembly and commissioning</u></p> <p>e. ensure well-defined and comprehensive procedures for plant /equipment construction and assembly. This includes using the designed gasket stress for flanged joint assembly - training procedures in place to ensure joint making standards are maintained.</p> <p>f. ensure robust plant/equipment commissioning and handover procedures in line with the design requirements – procedures in place</p> <p><u>Plant operation</u></p> <p>g. ensure good maintenance and timely replacement of equipment – comprehensive maintenance system in place and asset life time planning etc.</p> <p>h. use a risk based LDAR programme – LDAR scheme in place.</p> <p>i.as far as it is reasonable, prevent diffuse VOC emissions, collect them at source and treat them - quality joint making, LDAR and a maintenance system. Diffuse emissions are minimised to support inherent safety management.</p> <p>We agree with the operator’s stated compliance.</p>
20	Prevent or, where that is not practicable, reduce odour emissions, by setting up,	NA	The operator confirmed that this BAT Conclusion is NA to the activities carried out at the installation.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	implementing and regularly reviewing an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the described elements:		<p>Applicability is restricted to cases where odour nuisance can be expected or has been substantiated.</p> <p>We agree that this BAT Conclusion is NA to the activities currently carried out at the installation.</p>
21	Prevent or, where that is not practicable, reduce odour emissions from waste water collection and treatment and from sludge treatment, by using one or a combination of the described techniques.	<p>NA</p> <p>NA</p> <p>NA</p> <p>NC</p> <p>NC</p>	<p>The operator confirmed that:</p> <p>a. minimise residence times – They refer to LVOC BAT Conclusion 14. The waste water treatment project design evaluated the odour of the effluent to the buffer storage of the third party biological treatment facility. The design has incorporated the findings from the odour assessment. Currently waste water is not stored so this is not currently applicable</p> <p>b. chemical treatment</p> <p>c. optimise aerobic treatment – third party treatment will be adopted</p> <p>d. enclosure - refer to LVOC BAT Conclusion 14</p> <p>e. end-of-pipe treatment - refer to LVOC BAT Conclusion 14</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>Whilst this BAT Conclusion is not currently applicable to the activities carried out at the installation (also refer to CWW BAT Conclusion 12 and LVOC BAT Conclusion 14), it will apply in the future in accordance with the derogation, see Annex 2 of this document.</p> <p>We have set an improvement condition to ensure that the requirements are addressed, refer to Annex 3 of this document.</p>
22	Prevent or, where that is not practicable, reduce noise emissions, by setting up and implementing a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the described elements:	CC	<p>The operator confirmed that there is a noise monitoring plan in place plus a procedure.</p> <p>We agree with the operator's stated compliance.</p>
23	Prevent or, where that is not practicable, reduce noise emissions, by using one or a combination of the described techniques.	CC	<p>The operator confirmed that:</p> <p>a. appropriate location of equipment and buildings – restrictions for existing plant - insufficient space on the land owned by the operator to</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<p>CC</p> <p>CC</p> <p>CC</p> <p>NA</p>	<p>build embankments. Some key items of equipment are within acoustic enclosures. Other items are unsuitable for enclosure due to their duty.</p> <p>b. operational measures – maintenance and inspection programmes are established, staff are trained and noisy equipment is located outdoors for safety reasons.</p> <p>c. low-noise equipment – applicable where equipment is new or replaced – included in purchasing approach</p> <p>d. noise control equipment – restrictions for existing plant – partial compliance with some enclosures in place. Safety issues restrict enclosure of certain plant areas/structures.</p> <p>e. noise abatement - due to the extensive noise monitoring history demonstrating low noise environment and records of complaints (only for major upsets); the installation of obstacles is not regarded as appropriate.</p> <p>We agree with the operator's stated compliance.</p>

Key Issues

BAT Conclusion 4 – monitoring of emissions to water

Substance/parameter emission point W1

The operator confirmed the following:

Parameter	Current requirements	BAT Conclusion 4 requirements	Status
TOC	Daily	Daily	CC
COD	Note 1	Daily ^{Note 1}	NA
Total suspended solids (TSS)	Daily	Daily	CC
Total nitrogen (TN)	-	Daily ^{Note 2}	FC
Total inorganic nitrogen (N _{inorg})	-	Daily ^{Note 2}	FC
Total phosphorus (TP)	-	Daily	FC
AOX ^{Note 3}	-	Monthly	FC
Metals: Cr, Cu, Ni, Pb, Zn, (other metals, if relevant)	Monthly ^{Note 4}	Monthly	FC ^{Note 4}

Note 1: TOC monitoring is the preferred option and monitored daily. COD is measured monthly by a third party. The existing permit does not require COD monitoring. Note 3 of this BAT Conclusion confirms that TOC monitoring and COD monitoring are alternatives. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.

Note 2: More frequent nitrogen monitoring is being carried out to assess whether this is appropriate. If this is the case daily monitoring will be introduced. The permit contains provision for monitoring frequency to be reduced if the data clearly demonstrates sufficient stability. In addition the permit highlights that these parameters are only required where the emission has undergone biological treatment in accordance with CWW BAT Conclusion 12.

Note 3: Adsorbable organically bound halogens

Note 4: The existing permit requires Cd, Hg and Zn. The operator confirmed that the full list plus cadmium and mercury are analysed monthly. As the existing permit does not require monitoring for all of the metals, we have changes the status from CC to FC.

We agree with the operator's stated compliance for TOC, COD and TSS in the table above.

For the remaining parameters in the table above we changed the CC to FC. We did not consider it necessary to set an improvement condition as table S3.2a in the variation will secure compliance.

Toxicity at emission points W1, W2 and W3

An appropriate combination of the methods can be used – frequency to be decided based on a risk assessment, after an initial characterisation.

Parameter	Justification	Status
Fish eggs (Danio rerio)	Direct toxicity assessment (DTA) determined waste water is not toxic	NA
Daphnia (Daphnia magna Straus)	DTA determined waste water is not toxic	NA
Luminescent bacteria (Vibrio fischeri)	DTA determined waste water is not toxic	NA
Duckweed (Lemna minor) EN	DTA determined waste water is not toxic	NA
Algae	DTA determined waste water is not toxic	NA

The operator confirmed that the DTA was covered by improvement condition 21. "The Operator shall undertake a direct toxicity assessment of direct releases to controlled waters from release points, W1, W2 and W3 or otherwise demonstrate to the Agency's satisfaction that the installation does not give rise to acute toxic effects in controlled waters"

The DTA study was carried out and a report was submitted to us in 2005. The improvement condition was subsequently closed.

We agree with the operator's stated compliance.

Discharge points W2 and W3

The operator confirmed that these discharge points serve two geographically separate locations from W1 (refer to existing permit boundary diagram). W2 (Wilton Ethylene Control (WEC) area) and W3 (Central Control (CC) area) serve logistics areas, whereas W1 serves the chemical manufacture area.

The permit was varied to remove limits for benzene toluene and xylenes from W2 and W3 to reflect the reduced risks to the environment from these discharge points based upon the activities taking place. The existing permit imposes no limits on W2 or W3.

As far as monitoring capability is concerned, total nitrogen, total inorganic nitrogen and total phosphorus can be monitored at W2 and W3, however the operator questions the value in doing so.

Based upon recent monitoring, W1 is compliant with the proposed BAT AEL's for total nitrogen, total inorganic nitrogen and total phosphorus. Industrial inputs to W2 and W3 are much lower in comparison to W1.

The operator suggested that we consider the requirement to implement daily monitoring frequencies for W2 and W3 and whether this is appropriate (too frequent) based upon the available data which supports compliance with the BAT AELs at W1.

The operator confirmed that there is only gas storage at the WEC and CC areas.

We have retained the existing monitoring requirements on the basis of no backsliding; however we have included provision for the daily monitoring frequency to be reduced if the data demonstrates sufficient stability.

BAT Conclusion 12 – reduce emissions to water by treatment

This BAT Conclusion sets out appropriate waste water treatment techniques depending on the pollutant as follows:

Preliminary and primary treatment	Status
a. equalisation – all pollutants	NC
b. neutralisation – acids and alkalis	NC
c. physical separation, e.g. screens, sieves, grit separators, grease separators or primary settlement tanks – suspended solids, oil/grease	NC
Biological treatment (secondary treatment)	
d. activated sludge process – biodegradable organic compounds	NC
e. membrane bioreactor	NC
Nitrogen removal	
f. nitrification / denitrification – total nitrogen, ammonia - may not be	NC

applicable in case of high chloride concentrations (i.e. around 10 g/l) – not applicable when the final treatment does not include a biological treatment.	
Phosphorus removal	
g. chemical precipitation - phosphorus	NC
Final solids removal	
h. coagulation and flocculation – suspended solids	NC
i. sedimentation – suspended solids	NC
j. filtration (e.g. sand-, micro- and ultra-filtration) – suspended solids	NC
k. flotation – suspended solids	NC

The operator confirmed that the Olefins 6 plant discharges to the Wilton site drains operated by Sembcorp. Effluent from other Wilton site operators mixes with this effluent. The Wilton site drains flow into Dabholme Gut which in turn flows into the River Tees. There isn't any treatment of this effluent.

They refer to the response for LVOC BAT Conclusions 11 and 14.

Refer to Annex 2 of this document for our assessment of the derogation.

We have set an improvement condition to track this, refer to Annex 3 of this document.

We agree with the operator's stated compliance.

BAT AELs

There is a direct emission to water from the installation and the BAT AELs set out in Tables 1 to 3 apply to this release.

	Parameter	BAT AEL (yearly average)	Condition	Status
Table 1	TOC	33 mg/l	BAT AEL applies if the emission exceeds 3.3 t/yr.	NC Note 1
	COD	100 mg/l	BAT AEL applies if the emission exceeds 10 t/yr.	NA See above
	TSS	35 mg/l	BAT AEL applies if the emission exceeds 3.5	CC

			t/yr.	
Table 2	TN	25 mg/l	BAT AEL applies if the emission exceeds 2 t/yr.	NA Note 2
	N _{inorg}	20 mg/l	BAT AEL applies if the emission exceeds 3.5 t/yr.	NA Note 2
	TP	3 mg/l	BAT AEL applies if the emission exceeds 300 kg/yr.	CC
Table 3	AOx	1 mg/l	BAT AEL applies if the emission exceeds 100 kg/yr.	NC Note 1
	Cr	25 µg/l	BAT AEL applies if the emission exceeds 2.5 kg/yr.	CC
	Cu	50 µg/l	BAT AEL applies if the emission exceeds 5 kg/yr.	CC
	Ni	50 µg/l	BAT AEL applies if the emission exceeds 5 kg/yr.	CC
	Zn	300 µg/l	BAT AEL applies if the emission exceeds 30 kg/yr.	CC
<p>Note 1: Refer to Annex 2 of this document for an assessment of the derogation request.</p> <p>Note 2: Note 2 to the BAT Conclusion confirms NA when no biological treatment. These limits will apply once effluent treatment is in place.</p>				

The operator has applied for a derogation for TOC and AOx, refer to Annex 2 of this document.

We agree with the operator's stated compliance and have set the applicable limits in Schedule 3 of the permit.

BAT AELs are flow-weighted yearly averages of 24-hour flow proportional composite samples. Time proportional sampling can be used provided that sufficient flow stability is demonstrated. The operator confirmed that they currently carry out time proportional sampling. We have included a note to the relevant table in Schedule 3 to allow time proportional sampling if sufficient flow stability can be demonstrated.

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<p>The requirements of the LCP BAT Conclusions were addressed by permit variation EPR/BS3590IE/V011. This variation was for new boiler plant (B1703E), with a net thermal input of 85 MW, which means that it is LCP under chapter III of the IED and is referred to as LCP 648. This new boiler is cited in the location previously occupied by boiler B1703A which has been demolished.</p> <p>We have only repeated key points in this table for clarity.</p>			
	General BAT Conclusions		
1	Improve the overall environmental performance by implementing and adhering to an environmental management system (EMS) that incorporates all of the described features	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Refer to the response under BAT Conclusion 1 above for the CWW.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator's stated compliance.</p>
2	Determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the	CC	The operator confirmed that they are currently compliant.

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	gasification, IGCC and/or combustion units by carrying out a performance test at full load, according to the described standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit.		<p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>Existing permit improvement condition IC31 was set to address the requirements of this BAT Conclusion.</p> <p>We agree with the operator's stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement												
3	<p>Monitor key process parameters relevant for emissions to air and water including those described below.</p> <table border="1" data-bbox="259 738 875 1161"> <thead> <tr> <th>Stream</th> <th>Parameter(s)</th> <th>Monitoring</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Flue-gas</td> <td>Flow</td> <td>Periodic or continuous determination</td> </tr> <tr> <td>Oxygen content, temperature, and pressure</td> <td rowspan="2">Periodic or continuous measurement</td> </tr> <tr> <td>Water vapour content ⁽³⁾</td> </tr> <tr> <td>Waste water from flue-gas treatment</td> <td>Flow, pH, and temperature</td> <td>Continuous measurement</td> </tr> </tbody> </table>	Stream	Parameter(s)	Monitoring	Flue-gas	Flow	Periodic or continuous determination	Oxygen content, temperature, and pressure	Periodic or continuous measurement	Water vapour content ⁽³⁾	Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement	<p>CC</p> <p>NA</p>	<p>The operator confirmed that they are currently compliant.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>For emissions to air, the current permit requires oxygen, water vapour and volume flow to be measured periodically.</p> <p>The relevant key process parameters are included in schedule 3 of the permit.</p> <p>We agree with the operator's stated compliance.</p> <p>Waste water parameters are not applicable as there is no flue gas treatment (see BAT Conclusion 15 below). We have changed the compliance status from CC to NA.</p>
Stream	Parameter(s)	Monitoring													
Flue-gas	Flow	Periodic or continuous determination													
	Oxygen content, temperature, and pressure	Periodic or continuous measurement													
	Water vapour content ⁽³⁾														
Waste water from flue-gas treatment	Flow, pH, and temperature	Continuous measurement													

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
4	Monitor emissions to air in accordance with the described standards and minimum frequencies.	<p>CC</p> <p>CC</p> <p>CC</p> <p>CC</p>	<p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>The operator confirmed that:</p> <p><u>Natural gas and process fuels from the chemical industry</u></p> <p>NOx - existing permit requires continuous measurement (no change).</p> <p>CO – existing permit requires continuous measurement (no change).</p> <p>We agree with the Operator’s stated compliance.</p> <p><u>process fuels from the chemical industry</u></p> <p>SO₂ - existing permit requires continuous measurement, retained on the basis of no backsliding.</p> <p>HCl & HF – existing permit requires monitoring each time that a change of the fuel characteristics may have an impact on the emissions. This is</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		<p>CC</p> <p>CC</p> <p>CC</p>	<p>based on there being no chlorine or fluorine containing compounds.</p> <p>We agree with the operator's stated compliance.</p> <p>Dust - existing permit requires continuous measurement (no change).</p> <p>We agree with the operator's stated compliance.</p> <p>TVOC – existing permit requires at least every 12 months, or each time that a change of the fuel characteristics may have an impact on the emissions. This requirement has been retained in the permit.</p> <p>We agree with the operator's stated compliance.</p> <p>Dioxins and furans (PCDD/F) – no requirement to monitor in the existing permit on the basis that there are no chlorinated substances in the fuel, see note 22 of this BAT Conclusion:</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>(22) In the case of process fuels from the chemical industry, monitoring is only applicable when the fuels contain chlorinated substances.</p> <p>We agree with the operator's stated compliance.</p>
5	Monitor emissions to water from flue-gas treatment in accordance with the described standards and minimum frequencies.	NA	<p>The operator confirmed that they are currently compliant.</p> <p>There is no flue gas treatment associated with the LCP so we conclude that this BAT Conclusion is NA to the activities undertaken at the installation.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p>
6	To improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, ensure optimised combustion and by using an appropriate combination of the described techniques.	NA CC	<p>Refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011 which addresses the techniques below.</p> <ul style="list-style-type: none"> a. fuel blending and mixing b. maintenance of the combustion system

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
		CC CC CC	c. advanced control system d. good design of the combustion system e. fuel choice Regarding e. for fuel choice, they confirm that Olefins 6 generated fuel gas (process generated off-gas) is the primary fuel that LCP 648 is fired on. The approximate yearly split is typically 99% Olefins 6 generated fuel gas and 1% natural gas. We agree with the operator's stated compliance.
7	Reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions, by optimising the design and/or operation of SCR and/or SNCR.	NA	The operator confirmed that they are currently compliant. There is no SCR or SNCR associated with the LCP so we conclude that this BAT Conclusion is NA to the activities undertaken at the installation.

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
8	Prevent or reduce emissions to air during normal operating conditions, by ensuring, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	NA	<p>The operator confirmed that they are currently compliant.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We do not agree with the operator's stated compliance as abatement systems are not required or seen as appropriate for the LCP boiler. We have changed the status to NA.</p>
9	To improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, include the described elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1)	CC	<p>The operator confirmed that they are currently compliant.</p> <p>BAT 9 requires the operator to carry out fuel characterisation.</p> <p>We consider that for plants which burn natural gas from the National Grid as a fuel that it is not necessary for the operator to replicate the testing carried out by the National Grid.</p> <p>The LCP also uses process off-gas as a fuel. Refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011 which addresses</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>the techniques below and the relevant substances.</p> <p>(i) Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality;</p> <p>(ii) Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);</p> <p>(iii) Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 8.1 of the BAT Conclusions)).</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>Substances subject to characterisation for process fuels from the chemical industry⁽¹⁾</p> <p>Br, C, Cl, F, H, N, O, S Metals and metalloids (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Tl, V, Zn)</p> <p>(1)The list of substances/parameters characterised can be reduced to only those that can reasonably be expected to be present in the fuel(s) based on information on the raw materials and the production processes.</p> <p>We agree with the operator's stated compliance.</p>
10	Reduce emissions to air and/or to water during other than normal operating conditions, by setting up and implementing a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator's stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	includes the described elements		
11	Appropriately monitor emissions to air and/or to water during other than normal operating conditions.	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator's stated compliance.</p>
12	Increase the energy efficiency of combustion, gasification and/or IGCC units operated $\geq 1\,500$ h/yr, by using an appropriate combination of the described techniques.	CC	<p>The operator confirmed that they are currently compliant with all techniques below.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <ul style="list-style-type: none"> a. combustion optimisation b. optimisation of the working medium conditions c. optimisation of the steam cycle d. minimisation of energy consumption

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<ul style="list-style-type: none"> e. pre-heating of combustion air f. fuel pre-heating g. advanced control system (generally applicable to new units) h. feed-water preheating using recovered heat (applicability to existing units may be limited by plant configuration) i. heat recovery by CHP (applicable within the constraints of local power demand) j. CHP readiness (only applicable to new units) k. flue-gas condenser (generally applicable to CHP units) l. heat accumulation (only applicable to CHP plants) m. wet stack (units fitted with FGD) n. cooling tower discharge (units fitted with FGD) o. fuel pre-drying (combustion of biomass and/or peat) p. minimisation of heat losses (only applicable to solid-fuel fired combustion units and to gasification/IGCC units) q. advanced materials (only applicable to new plants) r. steam gas turbine upgrades

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>s. supercritical and ultra-supercritical steam conditions (only applicable to new units)</p> <p>We don't agree that they are CC with all of the techniques as a number of these don't apply to this LCP. We are however satisfied that an appropriate combination of techniques are in place.</p>
13	Reduce water usage and the volume of contaminated waste water discharged, by using one or both of the described techniques.	<p>CC NA</p>	<p>The operator confirmed that they are currently compliant with both techniques.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>a. water recycling b. dry bottom ash handling (only applicable to combustion of solid fuels)</p> <p>We agree that the operator are CC with water recycling.</p> <p>Dry bottom ash handling is NA as there is no combustion of solid fuels.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
14	To prevent the contamination of uncontaminated waste water and to reduce emissions to water, segregate waste water streams and treat them separately, depending on the pollutant content.	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Refer to the response under BAT Conclusion 8 above for the CWW.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator's stated compliance.</p>
15	Reduce emissions to water from flue-gas treatment, by using an appropriate combination of the described techniques and using secondary techniques as close as possible to the source in order to avoid dilution.	NA	<p>The operator confirmed that this BAT Conclusion is NA to the activities carried out at the installation as there is no flue gas treatment.</p> <p>We agree with this as there is no flue gas treatment associated with emissions from the LCP.</p> <p>We agree that this BAT Conclusion is not applicable to the activities carried out at the installation.</p>
16	To reduce the quantity of waste sent for	NA	The operator confirmed that there is no waste produced from

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	disposal from the combustion and/or gasification process and abatement techniques, organise operations so as to maximise the described objectives, in order of priority and taking into account life-cycle thinking by implanting and appropriate combination of the described techniques.		<p>combustion of gaseous fuels.</p> <p>We do not agree with the operator's stated CC and have changed this to NA.</p>
17	Reduce noise emissions, by using one or a combination of the described techniques.	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Refer to the response under BAT Conclusions 1 and 22 above for the CWW.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator's stated compliance.</p>
<p>The following LCP BAT Conclusions are not applicable to the activities carried out at the installation: 18 to 23 inclusive – for the combustion of coal and/or lignite</p>			

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
<p>24 to 27 inclusive – for the combustion of solid biomass and/or peat 28 to 35 inclusive – for heavy fuel oil (HFO) and/or gas fired boilers and engines 36 to 39 inclusive – gas oil fired gas turbines 40 to 45 inclusive - for the combustion of natural gas 46 to 51 inclusive – for the combustion of iron and steel process gases 52 to 54 inclusive – for offshore platforms</p>			
<p>Multi-fuel fired plants BAT conclusions for the combustion of process fuels from the chemical industry</p>			
55	<p>To improve the general environmental performance of the combustion of process fuels from the chemical industry in boilers, by using an appropriate combination of the described techniques in this BAT Conclusion and BAT Conclusion 6.</p>	CC	<p>The operator confirmed that they are currently compliant.</p> <p>Also refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>We agree with the operator’s stated compliance.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
56	To prevent or reduce NOx emissions to air while limiting CO emissions to air from the combustion of process fuels from the chemical industry, by using one or a combination of the described techniques.	CC	<p>The operator did not provide a response to this BAT Conclusion.</p> <p>Refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>BAT is to use one or a combination of techniques. The operator uses the following:</p> <ul style="list-style-type: none"> a. low NOx burners c. fuel staging d. flue-gas recirculation f. fuel choice g. advanced control system <p>We conclude that the operator is CC with the requirements of this BAT Conclusion.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>The setting of BAT AELs is detailed in Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>Also refer to Key issues section below.</p> <p>The limits set in the permit are in accordance with the BAT AELs associated with this BAT Conclusion.</p>
57	Reduce SO _x , HCl and HF emissions to air from the combustion of process fuels from the chemical industry in boilers, by using one or a combination of the described techniques.	CC	<p>The operator did not provide a response to this BAT Conclusion.</p> <p>Refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>BAT is to use one or a combination of techniques. The only applicable option is fuel choice i.e. to recover the process gas which would otherwise be flared. The fuel is free from sulphur, chlorine and fluorine so no other option is required.</p> <p>We conclude that the operator is CC with the requirements of this BAT</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>Conclusion.</p> <p>The setting of BAT AELs is detailed in Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>Also refer to Key issues section below.</p> <p>The limits set in the permit are in accordance with the BAT AELs associated with this BAT Conclusion.</p>
58	Reduce emissions to air of dust, particulate-bound metals, and trace species from the combustion of process fuels from the chemical industry in boilers, by using one or a combination of the described techniques.	CC	<p>The operator did not provide a response to this BAT Conclusion.</p> <p>Refer to Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>BAT is to use one or a combination of techniques. The only applicable option is fuel choice as all the fuel types are gaseous and have been filtered at the burner gas train inlet.</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>We conclude that the operator is CC with the requirements of this BAT Conclusion.</p> <p>The setting of BAT AELs is detailed in Annex 1 of the decision document for variation EPR/BS3590IE/V011.</p> <p>Also refer to Key issues section below.</p> <p>The limits set in the permit are in accordance with the BAT AELs associated with this BAT Conclusion.</p>
59	Reduce emissions to air of volatile organic compounds and polychlorinated dibenzo-dioxins and -furans from the combustion of process fuels from the chemical industry in boilers, by using one or a combination of the described techniques given in this BAT Conclusion and BAT Conclusion 6.	FC	<p>The operator did not provide a response to this BAT Conclusion.</p> <p>Refer to the assessment of BAT Conclusion 4 in this table.</p> <p>For dioxins and furans, the BAT AELs only apply where the process fuels are from chemical processes involving chlorinated substances. We</p>

BAT Conclusion No	Summary of BAT Conclusion requirement for Large Combustion Plant	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			<p>agree that this isn't applicable to the activities carried out at the installation.</p> <p>For VOCs, the BAT AEL is only applicable where 100% process fuels are used.</p> <p>Refer to Key issues section below.</p> <p>We have set the compliance status to FC.</p>
<p>The following LCP BAT Conclusions are not applicable to the activities carried out at the installation: 60 to 71 inclusive – for the co-incineration of waste 72 to 75 inclusive – for gasification</p>			

Key Issues

LCP BAT Conclusion 56 – NOx, CO

Emissions to air and the emission limits applied to the plant

A number of general principles were applied during the permit review. These included:

- The upper value of the BAT AELs ranges specified were used unless use of the tighter limit was justified.
- The principle of no backsliding where if existing limits in the permit were already tighter than those specified in the BREF, the existing permit limits were retained.
- Where a limit was specified in both IED Annex V and the BAT Conclusions for a particular reference period, the tighter limit was applied and in the majority of cases this was from the BAT Conclusions.
- Where AELs are indicative in the BAT Conclusions, these were applied unless adequate justification was provided by the operator to demonstrate that an alternative limit was more appropriate.

LCP 648

LCP 648 is an 85 MWth boiler B1703E fuelled by process gas which is a by-product of the cracking process. The fuel is supplemented with natural gas as required.

The plant was put into operation after IED came into force and therefore the existing limits in the permit are from Part 2 of IED Annex V applicable to new plant.

The ELVs and AELs are based on unlimited hours operation.

The following tables outline the limits that have been incorporated into the permit for LCP 648, where these were derived from and the reference periods at which they apply. The emission limits refer to concentrations, expressed as mass of emitted substance per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K, pressure of 101.3 kPa and 3% volume reference oxygen concentration in the flue gases. The emission limits and monitoring requirements have been incorporated into Schedule 3 of the permit.

NOx limits (mg/Nm ³)						
Averaging	BREF (Table 34 BAT-c)	Limits set by V011	Limits set by V015	Basis	Limits apply	Monitoring
Annual	80	80	80	BREF	MSUL/MSDL to baseload	Continuous
Monthly	None	100	100	IED	MSUL/MSDL to baseload	
Daily	100	100	100	BREF	MSUL/MSDL to baseload	
95 th %ile of hr means	None	200	200	IED	MSUL/MSDL to baseload	

CO limits (mg/Nm ³)						
Averaging	BREF (Table 34 BAT-c)	Limits set by V011	Limits set by V015	Basis	Limits apply	Monitoring
Annual	30	None	30	BREF	MSUL/MSDL to baseload	Continuous
Monthly	None	100	100	IED	MSUL/MSDL to baseload	
Daily	None	110	110	BREF	MSUL/MSDL to baseload	
95 th %ile of hr means	None	200	200	IED	MSUL/MSDL to baseload	

Variation EPR/BS3590IE/V011 did not set an LCP BAT indicative limit for CO. LCP BAT Conclusion 56 states that as an indication, the yearly average CO emissions levels for this type of plant are 5-30 mg/Nm³.

The yearly average is defined as the ‘average over a period of one year of valid hourly averages obtained by continuous measurements.’

The operator analysed historical CEMS data to assess the ability to comply with this annual average CO limit of 30 mg/Nm³. The average of the hourly emissions data during 2019 was 4.4 mg/Nm³. In 2020, up to 15th October (when the boiler came off line) the average of the hourly data was 1.8 mg/Nm³.

We have set the upper limit in the permit compliant with this BAT Conclusion.

LCP BAT Conclusion 57 – SO₂, HCl, HF

SO ₂ limits (mg/Nm ³)						
Averaging	BREF (Table 35 BAT-c)	Limits set by V011	Limits set by V015	Basis	Limits apply	Monitoring
Annual	10-110	10	10	IED	MSUL/MSDL to baseload	Continuous
Monthly	None	35	35	IED	MSUL/MSDL to baseload	
Daily	200	70	70	IED	MSUL/MSDL to baseload	
95 th %ile of hr means	None	70	70	IED	MSUL/MSDL to baseload	

Variation EPR/BS3590IE/V011 confirms that as SO₂ emissions are negligible, permit emission limits were set in line with the lower range of BAT Conclusion 57 requirements, i.e. yearly average of 10 mg/Nm³. However, there was a need to go beyond the LCP BAT for the daily mean as the IED hourly limit is just 70 mg/m³, and the daily limit cannot be higher than this.

Variation EPR/BS3590IE/V011 confirms that as hydrogen chloride (HCl) and hydrogen fluoride (HF) emissions are negligible, permit emission limits were set in line with the lower range of BAT Conclusion 57 requirements (table 36), i.e. yearly average of 1 mg/Nm³ with monitoring required each time that a change of the fuel characteristics may have an impact on the emissions.

LCP BAT Conclusion 58 – Dust

Dust limits (mg/Nm ³)						
Averaging	BREF (Table 37 BAT-c)	Limits set by V011	Limits set by V015	Basis	Limits apply	Monitoring
Annual	2-5	2	2	IED	MSUL/MSDL to baseload	Continuous
Monthly	None	2	2	IED	MSUL/MSDL to baseload	
Daily	2-10	2	2	IED	MSUL/MSDL to baseload	
95 th %ile of hr means	None	4	4	IED	MSUL/MSDL to baseload	

Variation EPR/BS3590IE/V011 confirms that as dust emissions are expected to be close to zero, permit emission limits were set in line with the lower range of BAT Conclusion 58 requirements, i.e. yearly and daily average of 2 mg/Nm³.

This BAT Conclusion sets BAT AELs that are relevant to mixtures of gases and liquids. We interpret this as applying to the combustion of any process fuels individually or in combination with other fuels in the chemical industry in boilers.

BAT Conclusion 4 requires continuous monitoring for process gases.

LCP BAT Conclusion 59 – TVOC

Variation EPR/BS3590IE/V011 did not set a limit for TVOC.

The operator confirmed that based upon one spot sample per year that a limit of 12 mg/Nm³ is achievable, with TVOC concentrations ranging from 1.6 to 2.6 mg/Nm³ from 2018 to 2020.

We have set a limit of 12 mg/Nm³ in accordance with table 38 of this BAT Conclusion.

Annex 2: Assessment, determination and decision where an application(s) for Derogation from BAT Conclusions with associated emission levels (AEL) has been requested.

Article 15(4)

The IED enables a competent authority to allow derogations from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4):

‘By way of derogation from paragraph 3, and without prejudice to Article 18, the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques (BAT) as described in BAT Conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:

(a) the geographical location or the local environmental conditions of the installation concerned; or

(b) the technical characteristics of the installation concerned.

Cost Benefit Analysis

If a derogation is applicable under Article 15(4) of the IED, then Cost Benefit Analysis (CBA) is undertaken. The CBA allows calculation to indicate whether the costs of compliance are greater or less than the environmental benefits.

It essentially groups all the costs on one side, with all the benefits, as far as possible, on the other side. It then includes the effect of time on the value of those costs and benefits in order to produce a Net Present Value (NPV).

This gives an indication of whether those costs are disproportionate or not, but there are many sensitivities in the analysis and many aspects of the environment that cannot yet be monetised.

Where the NPV is positive, this indicates that the cost of compliance with the BAT AEL(s) does not outweigh the environmental benefits.

Where the NPV is negative, this indicates that the costs of compliance with the BAT AEL(s) outweigh the environmental benefits.

Annex to the variation notice/permit

The applicability of Article 15(4), results of our assessment and justification for permit conditions imposed are documented in an annex to the variation notice/permit in accordance with the requirement of IED Article 15(4) as described above.

Regulation 61 response and additional derogation submissions

As part of their Regulation 61 Notice response (received 26 October 2018), the operator requested a derogation from compliance with the AEL values included in BAT Conclusion 12.

Information provided in their response was insufficient to allow us to commence assessment of the derogation request.

The derogation was resubmitted 30 April 2021, superseding the initial submission.

The cost benefit analysis (CBA) tools were provided 13 May 2021.

The impact assessment information was provided 25 May 2021.

Although we were able to consider the response generally satisfactory, we did in fact need more information in order to complete our assessment, and issued further information requests as follows:

Request for information sent 03 June 2021	Responses received: 18 June 2021 24 June 2021 (item 6) 29 October 2021 (item 1) 11 November 2021 item 1 amended
Request for information sent 29 June 2021 - CBA tool	Weighted average cost of capital (WACC) information received 14 July 2021 CBA tools received 28 July 2021
Clarification on project timeline requested 29 June 2021	Confirmed 30 June 2021
Request for information on historic improvement conditions I.C.15 and I.C.20 sent 13 July 2021	Response received 14 July 2021
Clarification on National Water Environment Benefit Survey (NWEBs) values provided	28 July 2021
Explanation of operational expenditure (OPEX) and capital expenditure (CAPEX) CBA figures	06 August 2021
Proposed annual average TOC limit (reduced)	07 September 2021
Request for information sent 29 September 2021 – CBA tool queries	Responses received 08 October 2021 and 29 October 2021
Request for information sent 10 November 2021 – Segregation and granulated activated carbon (GAC) treatment	Response received 10 November 2021

Commercial confidentiality

The operator claimed that certain information was commercially confidential and should be withheld from the public register. We considered this request and determined that this was relevant to the following information:

- Derogation covering letter dated 30 April 2021;
- Appendix B (cost benefit) dated April 2021 and received 30 April 2021 (and any subsequent amendments received after this date);
- CBA tools received 13 May 2021 (and any subsequent amendments received after this date).

Confidentiality claim relates to commercially sensitive information relating to investment, timing of investment and available suppliers (prior to formal tender).

Apart from the information just described, we have not received any information in relation to the Regulation 61 Notice response that appears to be confidential in relation to any party.

Derogation from TOC and AOX CWW BAT Conclusion 12 BAT AELs

Background

The Olefins 6 cracker is currently mothballed and has not operated since the end of September 2020. A decision on the future of the site (i.e. closure or redevelopment) was announced by the operator 10 November 2021. This announcement confirmed that the future of the site is to redevelop with implementation of the Teesside Improvement Project (TIP).

The TIP will result in a new configuration, with a reduced throughput, which will result in the removal of some units and furnaces and consequently a reduction in the impacts. The operator has submitted a variation (EPR/BS3590IE/V016) to implement these changes, however this will be determined separately based on its own merits.

At the time of the derogation submission in April 2021 the future of the site was unknown so the derogation was assessed on this basis. The announcement to redevelop does not result in any changes to our assessment or alter the conclusions that we have drawn.

CWW BAT Conclusion 12

To reduce emissions to water BAT is to use an appropriate combination of final waste water treatment techniques to meet the relevant BAT AELs for direct waste water discharges to receiving waters from the activities. BAT AELs are listed in tables 1 to 3 of this BAT Conclusion.

The operator requested a time limited derogation against the following BAT AELs:

Total organic carbon (TOC) in table 1 [10 to 33 mg/l]; and
Adsorbable organically bound halogens (AOX) in table 3 [0.2 to 1.0 mg/l].

Part 1: First stage assessment

Description of the derogation request

Nature of request

Time limited derogation until 07 December 2025 then BAT AEL compliant.

Derogation request

The operator is undertaking a **fundamental business review** of the facility by the end of 2021 with a view to:

- (i) **Closure** of the facility; with this option it would not be appropriate to invest and the operator would provide a timeline for closure which would be no later than **07 December 2025**; or
- (ii) **Redevelop** the facility resulting in significant changes to those parts of the facility that produce the waste water. This option would require a period of operation to confirm the effect of the redevelopment on the waste water discharge. Confirmation October - December of 2022 and in a position to review the derogation by January - March of 2023. The nature of the waste water discharges is likely to materially change and may require the application of different solutions than those identified in this derogation request. Enhanced pre-application has been provided for this option. They still commit to the 07 December 2025 timeline.

TOC and AOX limits will be higher than the BAT AEL limits (annual average) of TOC 10 - 33 mg/l and AOX 0.2 - 1.0 mg/l until either closure or redevelopment of the facility which shall not extend beyond **07 December 2025**. The proposed limits (which are based on time proportional samples) are:

TOC 60 mg/l and AOX 3.0 mg/l.

BAT AEL limits apply to flow-weighted yearly averages of 24-hour flow proportional composite samples. Time proportional sampling can be

used provided that sufficient flow stability is demonstrated. The permit includes a note to the table to implement these requirements.

Request criterion

Technical Characteristics

The operator is currently involved in a transformative process that will lead to significant changes to the technical characteristics of the site.

At the end of September 2020 the site entered its major six year shut-down and a project is ongoing looking at the viability of moving from a mixed feedstock to a single (ethane) feedstock. This will be completed by the end of 2021 at which point a business decision will be made about permanent closure or a new phase of construction to fully convert the plant to a single feedstock with it re-opening at the end 2022 / beginning 2023. This will be at a reduced throughput, which will result in the removal of some units and furnaces and consequently a reduction in the impacts.

The timing of the derogation coincides with business review activities at the site, which will affect the requirement for effluent treatment and the long-term viability of the waste water treatment project. Consequently it is not currently possible to specify with certainty the treatment capacity and capability the plant will be required to achieve under any new configuration.

We agree that it would not be practical or sensible to implement the necessary changes to treat effluent based on a configuration which is anticipated to change. We agree that the redevelopment will lead to changes in the technical characteristics of the installation.

We are satisfied that it is necessary for the operator to address a combination of plant changes as part of the redevelopment of the facility, that could lead to changes in both water abstraction / usage and effluent volume, as well as changes in the concentration of TOC and AOX in the discharge. This may then require the application of different solutions to those identified in this derogation proposal.

Since submission of the derogation, the operator has submitted a variation application for the redevelopment of the site, known as the Teesside Improvement project (TIP). The project will convert the cracker to use ethane only as feed-stock. The project will reduce the plant capacity and substantially simplify the process, resulting in a reduction in storage tanks and the associated systems required to support the installation. There will also be a reduction in raw materials requirement, resulting in an associated reduction in the effluent generated.

Pursuing any one measure in isolation could result in detrimental impacts from the facility as a whole. As such, the operator needs time to make the changes and review the impacts as they work through their project.

We agree that firm proposals are not possible until the future of the facility is known; however for the purpose of the derogation the proposal is based on the current site configuration.

If the business review results in site closure then the intended remaining operational life-time of the facility as a whole or of the part giving rise to the waste water emissions would apply, where the operator is prepared to commit to a timetable for closure.

If the business review results in site closure then the DEFRA derogation guidance allows for this, i.e. *where the intended remaining operational life-time of the facility as a whole or of the part giving rise to the waste water emissions would apply, where the operator is prepared to commit to a timetable for closure.*

We are satisfied that the implementation of waste water treatment for a limited time period of approximately two years (i.e. before the next BREF review) is not an option for consideration. Making investments ahead of plant closure, for plant that has a limited life, will have minimal environmental benefits.

We are also aware that investing in new technology when the whole plant has a very limited life may inadvertently cause more pollution e.g. increasing raw materials use; noise; energy requirements; CO₂ emissions; and we would not wish to encourage this. However, where there is an overriding environmental benefit we would expect investment to be made. We have therefore scrutinised the CBA (refer to the Stage 2 assessment below).

It should also be recognised that closure may well be sooner than 07 December 2025. It may also be that the plant does not come back into operation.

We accept that the closure of the plant on or even before 07 December 2025 would prevent significant capital investment being realistic.

Local environmental conditions

In addition, the local environmental conditions are a valid secondary criteria. The water abstracted from the Tees and used at the site contains high levels of TOC, equating to ~79% of the TOC discharged at emission point W1. This is based on analysis of a small dataset of 23 samples collected over a six week period from 5 September to 20 October 2020 ranging from 9 to 84 mg/l, with an average of 29 mg/l.

We conclude that the conclusions drawn are based on analysis of a small dataset of 23 samples collected over a six week, which wouldn't account for natural and seasonal variation. Further monitoring has not been carried out as the site has been mothballed and has not operated since the end of 2020. In any event, our approach for this parameter is not based on 'net' contribution.

Even if the site were to use mains water, this would not change the concentration of TOC already flowing down the River Tees. On this basis we have not explored the possibility of the facility using a potable water supply.

Emission Limit Values (ELV's)

The derogation request includes proposed ELVs with a timescale of 07 December 2025. The Operator has proposed ELVs compared to the BAT AEL values as set out below, applicable until 07 December 2025. After this date effluent treatment will be in place (unless the business review results in permanent site closure) and the operator has proposed to be compliant with the BAT AELs. The derogation will not extend beyond the next BREF cycle.

The Operator has proposed ELVs compared to the current ELVs and BAT AEL values as set out below.

ELV comparison table				
Parameter	Current (kg/day)	Operator Proposed (kg/day)	BAT AELs to be achieved from 07 December 2025 Notes 1 & 2 (mg/l)	Operator proposed limits until 07 December 2025 (mg/l)
TOC	1,400	1,300	10 – 33 Note 3	60 Note 3
AOX	-	-	0.2 - 1.0 Note 4	3.0 Note 4
<p>Note 1: Our approach to setting limits is to use the upper value of the BAT AEL range specified, unless use of the tighter limit is justified.</p> <p>Note 2: Limit applies to a flow-weighted yearly average. Time proportional sampling can be used provided that sufficient flow stability is demonstrated. The permit includes a note to the table to implement these requirements.</p> <p>Note 3: 24 hour time proportional sample collected daily.</p> <p>Note 4: 24 hour time proportional sample collected monthly.</p>				

Current ELVs

The basis for setting of the current ELVs was based on internal agreements between the operator and Sembcorp, recorded in the decision document for the permit issued 19 November 2003.

BAT AELs

The BAT AELs are set out in Tables 1 and 3 of the BAT Conclusion. Footnote 2 to Table 1 is applicable to the installation, where TOC is preferred to COD because monitoring does not rely on the use of very toxic compounds.

Proposed ELVs

TOC

The proposed limit of 60 mg/l was calculated based on two approaches:

The first approach employed time weighted average TOC concentrations over five years (average of 44 mg/l from 2015 to 2019) and then applied three standard deviations around the mean (13 mg/l). The value of 57 mg/l was rounded up to 60 mg/l.

The second approach applied a 99% confidence limit to the 2018 data. The 2018 data was considered to be the most representative as it is based on the current feedstock. This generated a mean of 50.97 mg/l, with a range of 48.37 to 53.56 mg/l.

An 8% reduction in the daily load (kg/day) has been proposed.

AOX

This proposal is more difficult as there is only a small data set available which does not include the autumn period. The autumn period is the peak for cooling water dosing and leads to increased AOX emissions. Work is ongoing looking at cooling water dosing. The proposed limit of 3.0 mg/l is based on a 24 hour time proportional sample.

Options considered

Seven options were reviewed with six going forward for disproportionality assessment using cost benefit analysis (CBA). The disproportionality assessment also includes a business as usual (BAU) option, where the plant will continue to operate without any final effluent treatment. For BAU the BAT AELs will not be met.

Option	Technique description	CBA
<p><u>Option A</u> Off-site treatment of 350 m³/hour at third party 1 effluent treatment works (sewage undertaker)</p> <p>BAT achieved 07 December 2025</p>	<p>Partial treatment of effluent off-site by a third party. ^{Note 1}</p> <p>Build buffer tanks and ~ 3km pipeline to third Party 1.</p> <p>Segregation of other discharges and recycling (450m³/h) to allow granulated activated carbon (GAC) treatment on site before discharge to the Wilton Drain.</p> <p>Effluent will be segregated into two streams. Stream 1 will be effluent suitable for GAC treatment e.g. contaminated steam condensate. Following GAC treatment, this would be discharged via the existing Wilton drains. Stream 2 will be transferred to buffer tanks (that will need to be constructed) and then pumped to the third party effluent treatment plant.</p> <p>This option includes BAT Conclusion 10 techniques a) to d) / BAT Conclusion 12 techniques a, b, c, d, h and i.</p>	<p>Yes</p>

<p><u>Option B</u> Off-site treatment of 570 m³/hour at third party 1 effluent treatment works (sewage undertaker)</p> <p>BAT achieved 07 December 2025</p>	<p>Partial treatment of effluent off-site by a third party. ^{Note 1}</p> <p>Build buffer tanks and ~ 3km pipeline to third Party 1.</p> <p>Segregation of other discharges and recycling (230m³/h) to allow GAC treatment on site before discharge to the Wilton Drain.</p> <p>Effluent will be segregated into two streams. Stream 1 will be effluent suitable for GAC treatment e.g. contaminated steam condensate. Following GAC treatment, this would be discharged via the existing Wilton drains. Stream 2 will be transferred to buffer tanks (that will need to be constructed) and then pumped to the third party effluent treatment plant.</p> <p>This option includes BAT Conclusion 10 techniques a) to d) / BAT Conclusion 12 techniques a, b, c, d, h and i.</p>	<p>Yes</p>
<p><u>Option C</u> (proposed derogation) Off-site treatment of 800 m³/hour at third party 1 effluent treatment works (sewage undertaker)</p> <p>BAT achieved 07 December 2025</p>	<p>Full treatment of effluent off-site by a third party. ^{Note 1}</p> <p>Build buffer tanks and ~ 3km pipeline to third Party 1.</p> <p>No segregation of current pipe network required.</p> <p>This option includes BAT Conclusion 10 technique d) / BAT Conclusion 12 techniques a, b, c, d, h and i.</p>	<p>Yes</p>
<p><u>Option D</u> (proposed derogation) Treatment on the Wilton site of 800 m³/hour by third party 2</p> <p>BAT achieved 07 December 2025</p>	<p>Full treatment of effluent on the Wilton site, but outside of installation boundary.</p> <p>Third party 2 to build new waste water treatment facility on the Wilton site.</p> <p>This option includes BAT Conclusion 10 technique d) / BAT Conclusion 12 technique a, b, c, d, h and i.</p>	<p>Yes</p>

<p><u>Option E (BAT AEL)</u> Temporary closure Cease operation of the facility until effluent treatment is in place</p> <p>Expect BAT compliant operation to start in October - December of 2025</p>	<p>Turn off facility from 07 December 2021, until October - December 2025, until upgrade and waste water treatment plant is built</p>	<p>Yes</p>
<p><u>Option F (permanent site closure)</u></p> <p>BAT achieved 07 December 2025</p>	<p>The site would close with effluent discharges ceasing by 07 December 2025 – no changes to the existing effluent treatment</p>	<p>Yes</p>
<p><u>Tankering to third party 1</u></p>	<p>Tankering the water to third party 1, rather than building buffer tanks and pipeline.</p> <p>Assumption of 30 m³ tankers</p> <p>This option is not considered feasible:</p> <p>This would require a number of truck movements which would not be feasible given the site location.</p> <p>A total of 19 trucks/hour would be required for 570m³/hour and then 26 trucks/hour for 800m³/hour and the requirement of storage tanks to facilitate.</p>	<p>No</p>
<p>Note 1: The operator has commissioned laboratory-scale and pilot-scale trials to investigate the efficacy of co-treatment of its wastewater with municipal wastewater by third party 1. For the proposed derogation option C, the anticipated chemical oxygen demand (COD) removal, i.e. the sewage treatment reduction factor (STRF) is 70 – 80 %. Option C meets the upper thresholds of the annual average BAT AELs for TOC, COD, AOX and total suspended solids (TSS) at full scale.</p>		

Summary of the first stage assessment

The operator has supplied a valid derogation request against BAT Conclusion 12 of the CWW BAT Conclusions. The derogation request is based on the technical characteristics of the facility, with the local environmental conditions being a valid secondary criteria.

The operator has described seven relevant options for achieving the BAT AEL and justified the screening out of one of these options. Six options were taken forward to conduct a CBA, together with the BAU option (doing nothing).

TOC and AOX limits will be higher than the BAT AEL limits (annual average) of TOC 10 - 33 mg/l and AOX 0.2 - 1.0 mg/l until either closure or redevelopment of the facility which shall not extend beyond **07 December 2025**. The proposed limits are: TOC 60 mg/l and AOX 3.0 mg/l.

Part 2: Second stage assessment - Demonstrating disproportionality of costs and benefits

Costs

The Operator has satisfactorily demonstrated that the stated criterion would result in disproportionate costs for achieving the BAT AEL compared to the environmental impacts.

CBA

The CBA has been reviewed and considered to support the derogation request. We transferred the information from the operator's tool (version 6.17, 29 September 2017) to the latest tool (version 6.22, 17 September 2021); however this did not change any of the conclusions. Key points from the CBA are summarised below.

Two versions of the CBA tool were provided as there were two proposed derogation options:

Version 1 - considering the option of treating all the effluent by third party 1 (sewage undertaker) (Option C); and

Version 2 – considering the option of treating all the effluent by third party 2 (effluent treatment plant to be built on the Wilton site) (Option D).

Data input - general

The weighted average cost of capital (WACC) is NOT consistent with what we would expect for the sector. We have carried out sensitivity analysis using the WACC values for the chemical sector, see below. The lifetime of the technology and the appraisal period are based on the equipment being operational for 25 years i.e. assumption that equipment is operational by 2022, for 25 years until the end of 2046. This is a reasonable assumption for this industry sector.

Key data input for individual options

We are satisfied with the operator's approach and justification for the data input for each of the options.

The evidence as described in the submission and the CBA tool was reviewed and considered to be applicable and correct and should be considered as part of the derogation request. The basis of some cost assumptions were challenged and considered reasonable or didn't change the outcome / conclusions.

The costs have been compared using the Environment Agency CBA tool V 6.22, which is based on HM Treasury's Green Book guidance. The results are summarised in terms of NPV. The costs of meeting the BAT AEL outweigh the monetised benefits in comparison to the proposed derogation (i.e. NPV < 0).

BAT AEL

The CBA using central assumptions shows negative NPVs for the BAT AEL for the proposed derogation options C and D and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

Other options

For the proposed derogation option C case, the costs of the other options were disproportionate compared to the environmental benefit achieved, with negative NPVs.

For the proposed derogation option D case, the costs of the other options **(except treatment at 570 m³/hour (option B), see below)** were disproportionate compared to the environmental benefit achieved, with negative NPVs.

Treatment at 570 m³/hour (option B)

With option D, option B has a positive NPV as it is more favourable than the proposed derogation, option D. However, it is not as favourable as option C. Comparing options C and D cases; in the summary table for CBA options C

and D, the difference in the central value for the BAT AEL is carried across all options in the CBA option D tool. The outcome of this is option B becomes positive. This suggests that the order of options is C, B and D.

We ran the CBA tool with option B as the proposed derogation, with option C replacing option B. Option C is still the favoured option.

The operator confirmed that caution should be exercised when comparing costs of options A and B with options C and D. The costs associated with options A and B were based upon +/- 40% estimates, whereas the costs for C and D are the output of FEED so +/- 10% estimates.

Sensitivity analysis

For the proposed derogation option C, the lowest negative NPV for the BAT AEL is caused by high operating costs; and the highest negative NPV for the BAT AEL is caused by low operating costs.

For the proposed derogation option D, the lowest negative NPV for the BAT AEL is caused by high upfront investment costs; and the highest negative NPV for the BAT AEL is caused by low upfront investment costs.

Manual sensitivity checks

Option C

For the proposed derogation option C, we carried out manual sensitivity checks on specific parameters: WACC, lost revenue and capital costs. This did not result in any changes to the conclusions.

Option D

For the proposed derogation option D, we carried out manual sensitivity checks on specific parameters: WACC, lost revenue and capital costs. This resulted in some changes to the conclusions as set out below.

WACC

We changed this in accordance with the chemicals and oil sector values (lower 4.5%, central 7.2% and high 9.8%), which are lower than the operator's values.

Option A (treatment at 350 m³/hour) and option B (treatment at 570 m³/hour, using central case assumptions have positive NPVs. This means they are more favourable than the proposed derogation.

The proposed derogation option D is based on the existing site configuration. The operator has recognised that it is not currently possible to specify with certainty the treatment capacity and capability the plant will be required to achieve under any new configuration and hence there is scope for the effluent treatment solution to change. Any permit issued will include an improvement condition to address any changes to the effluent treatment proposals.

Lost revenue

For the BAT AEL option we halved the cost of non-operation from 2022 to 2025. The BAT AEL option becomes positive. We are satisfied with the justification of costs provided by the operator; however this does demonstrate how the outcome can be changed.

The pivot point at which the BAT AEL option becomes positive is 85% of the cost of non-operation from 2022 to 2025.

Capital costs

For each option capital costs were reduced by 50%.

Option A (treatment at 350 m³/hour) and option B (treatment at 570 m³/hour), using central case assumptions have positive NPVs. This means they are more favourable than the proposed derogation.

The proposed derogation option D, to build a new waste water treatment plant, is based on the existing site configuration. The operator has recognised that it is not currently possible to specify with certainty the treatment capacity and capability the plant will be required to achieve under any new configuration and hence there is scope for the effluent treatment solution to change. Any permit issued will include an improvement condition to address any changes to the effluent treatment proposals.

Summary of the second stage assessment

The operator has provided a credible argument that the increased costs linked to the technical characteristics are disproportionate for achieving the BAT AEL. An appropriate range of options were reviewed and those identified as technically viable were considered further.

Viable options were taken forward for CBA, were adequately described in the CBA and the cost of the BAT AEL option was confirmed as disproportionate compared to the environmental benefits. The CBA using central assumptions shows negative NPVs for the BAT AEL for options C and D and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

Whilst option B is more favourable than option D, it is not as favourable as option C. This suggests that the order of options is C, B and D.

The proposed derogation options C and D are based on the existing site configuration. The operator has recognised that it is not currently possible to specify with certainty the treatment capacity and capability the plant will be required to achieve under any new configuration and hence there is scope for the effluent treatment solution to change. Any permit issued will include an improvement condition to address any changes to the effluent treatment proposals.

Risks of allowing the derogation

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved.

Annual emissions

There have been no emissions from the Olefins 6 cracker since September 2020 as the site is mothballed. Annual emissions of TOC from the activity prior to mothballing were 589 kg/day. This would reduce to 372 kg/day (a difference of 217 kg/day) if the BAT AEL was met in accordance with the timeline set by the IED.

The plant is not expected to operate until September 2022, which means that there will have been no emissions for two years.

The operator's proposal will mean that the higher discharge will be permitted for the duration of the time limited derogation.

For AOX, data is only available for 2020 as there was never a requirement to monitor for this parameter. The average emissions were 1.08 mg/l, which is only marginally above the BAT AEL of 1.0 mg/l. Refer to the predicted impact below

Predicted impact

TOC

The untreated effluent from the Wilton Site drains is discharged to the River Tees via the Dabholm Gut. The water framework directive (WFD) requirements of the River Tees are not failing due to TOC.

In most recent years, the yearly average TOC emissions have been between **36.68** and **42.85** mg/l, which is not significantly above the BAT AEL of **33** mg/l. The derogated limit of **60** mg/l is calculated based on five years of data (2015 to 2019) to allow some flexibility.

The Olefins 6 cracker hasn't operated since September 2020 and it is not likely to operate in the configuration that existed before mothballing. **There have been no releases to water during this time.**

The derogation is **time limited to 07 December 2025**. Even if the facility were to come back into operation in 2022, this would mean that TOC releases would be only slightly above the BAT AEL for three years.

There is an intent to come back into operation in 2022 under the new configuration. This will be at a reduced throughput, which will result in the removal of some units and consequently **a reduction in the impacts**. The operator has submitted a variation to implement these changes via the Teesside Improvement Project (TIP). This represents the scenario for redevelopment of the facility. **It is therefore anticipated that the yearly average TOC emissions will be lower than those reported above and hence nearer to the BAT AEL.**

If the facility were to come back into operation under the current configuration the existing limit of 1,400 kg/day would be reduced to 1,300 kg/day, i.e. 8% reduction.

The TIP will give rise to a reductions in the pollutant loads to water, resulting in a **betterment of the environmental baseline**. In the absence of new point source releases water, they considered that there was no requirement to provide updated Environmental Risk Assessments for these emissions. For these reasons, there will be reduced effects on the conservation interests for these sensitive receptors.

The permit will include an ELV for TOC at 60 mg/l for the duration of the derogation (07 December 2025). From 08 December 2025 the limit will reduce to the BAT AEL of 33 mg/l for TOC (following off-site effluent treatment).

The permit will include an improvement condition(s) requiring the operator to monitor and report on progress with the works required for the proposed phased derogation, to ensure that the programme of work is carried out to the committed timescales.

There will also be an improvement condition requiring a review of the concentration/impact of TOC once operation has started to verify the impacts.

For the reasons set above, we have not pursued the requirement for an updated environmental risk assessment, which would require modelling.

AOX

For AOX, data is only available for 2020 as there was never a requirement to monitor for this parameter. The average emissions were 1.08 mg/l, which is only marginally above the BAT AEL of 1.0 mg/l.

This proposal is more difficult as there is only a small data set available which does not include the autumn period. This autumn period is the peak for cooling water dosing and leads to increased AOX emissions. Work is ongoing looking at cooling water dosing. The proposed limit is 3.0 mg/l.

Based on the information set out for TOC (non-operation of the Olefins 6 cracker and the TIP project), we would expect a similar reduction in AOX emissions.

There also remains a question over the requirement for a derogation in the first place; however collection of additional data has not been possible as the facility is mothballed.

There are difficulties and complexities assessing the impact from this parameter; however given the operational status and future planned changes at the facility, it is unlikely that there will be any significant impacts.

Approach a – allow derogation

The permit will include an ELV for AOX limit of 3.0 mg/l for the duration of the derogation (07 December 2025). From 08 December 2025 the limit will reduce to the BAT AEL of 1.0 mg/l for AOX (following off-site effluent treatment).

The permit will include an improvement condition(s) requiring the operator to monitor and report on progress with the works required for the proposed phased derogation, to ensure that the programme of work is carried out to the committed timescales.

Approach b – additional monitoring (derogation may not be required)

An improvement condition will be set requiring additional monitoring of AOX to be carried out.

For the reasons set out above, we have not pursued the requirement for an updated environmental risk assessment, which would require modelling.

We have decided to implement 'approach a' by allowing the derogated AOX limit. If monitoring indicates that a lower limit, or even that the BAT AEL can be achieved, then we can reduce the limit via an Environment Agency initiated variation.

Scale of impact

The Environment Agency water quality data measurements for the Tees estuary does not include any information on the TOC concentrations found in the estuarine waters. Likewise, industries in the Tees area do not hold any TOC measurements for the estuary:

Other potential environmental impacts

We did not consider it necessary for the operator to carry out an assessment of the impact at habitats sites due to the betterment of the environmental baseline.

Summary of the risks of allowing a derogation

We are satisfied that the operator has demonstrated that the proposed derogation options achieve the best overall environmental outcome and we have no concerns regarding the ongoing BAU impact on the River Tees for the duration of the time-limited derogations.

Final considerations

Permit conditions: The permit will include an ELV for TOC at 60 mg/l and an AOX limit of 3.0 mg/l for the duration of the derogation (07 December 2025).

From 08 December 2025 the limits will reduce to the BAT AELs of 33 mg/l for TOC and 1.0 mg/l for AOX (following off-site effluent treatment).

The permit will include an improvement condition requiring the operator to monitor and report on progress with the works required for the proposed phased derogation, to ensure that the programme of work is carried out to the committed timescales.

The permit will include an improvement condition requiring an assessment of the impact of TOC and AOX within 9 months of start-up of the Olefins 6 cracker to validate the predicted impacts. Step 5) of this improvement condition will include the resubmission of Section 4 of the Wood report (ref: 38454/C001/003, dated November 2018) - compliance pre and post effluent treatment.

Annex 3: Improvement Conditions

Based on the information in the operator’s Regulation 61 Notice response and our own records of the capability and performance of the installation at this site, we consider that we need to set improvement conditions so that the outcome of the techniques detailed in the BAT Conclusions are achieved by the installation. These improvement conditions are set out below - justifications for them is provided at the relevant section of the decision document (Annex 1 or Annex 2).

We also consider that we need to set improvement conditions relating to changes in the permit not arising from the review of compliance with BAT Conclusions. The justifications for these are provided in Annex 5 of this decision document.

If the consolidated permit contains existing improvement conditions that are not yet complete or the opportunity has been taken to delete completed improvement conditions then the numbering in the table below will not be consecutive as these are only the improvement conditions arising from this permit variation.

Reference	Requirement	Date
IC34	<p><u>LVOC BAT Conclusion 1 – CEMS on VMR furnaces (emission points A2 and A3)</u></p> <p>The operator shall submit, for approval by the Environment Agency, reports setting out progress to achieving the ‘Narrative’ BAT for BAT Conclusion 1 for the <u>Production of LVOC</u> (continuous monitoring of VMR furnaces (≥ 50 MWth)), where BAT is currently not achieved.</p> <p>Methodology for achieving BAT, is set out in IC34a to IC34d below:</p>	As set out in IC34a to IC34d in this table
IC34a	<p><u>Assess current VMR monitoring locations for homogeneity</u></p> <ul style="list-style-type: none"> • The operator shall confirm if modifications to the temporary platforms and sampling ports are required for the one-off homogeneity testing. • The operator shall make any identified modifications to the monitoring location to enable EN 15259 homogeneity testing or install the proposed BS EN 15259 compliant stacks. 	Progress report by: 07/06/2022 and then at six monthly intervals

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
IC34b	<p><u>Continuous monitoring</u></p> <ul style="list-style-type: none"> • The operator shall submit proposals for continuous monitoring. Where the proposals are not finalised, the operator shall submit progress reports as notified by this improvement condition. • Where CEMS are proposed, the operator shall submit the details of the CEMS to be installed, including timescales for installation and commissioning. • Where predictive emission monitoring systems (PEMS) are proposed, the operator shall submit the details of the PEMS, confirm they meet EN/TS 17198, including plans for certification and timescales for installation and commissioning. 	<p>Progress report by: 07/06/2022 and then at six monthly intervals</p>
IC34c	<p><u>BS EN 15259 compliance</u></p> <ul style="list-style-type: none"> • After start-up of the installation, the operator shall carry out tests to assess whether the proposed air monitoring location(s) meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). • A written report shall be submitted for approval setting out the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements. • Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the timescale in the notification. • The proposals shall be implemented in accordance with the Environment Agency's written approval. 	<p>Within 3 months of start-up of the VMR furnaces</p>

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
IC34d	<p><u>Calibration</u></p> <ul style="list-style-type: none"> The operator shall carry out the initial calibration of the CEMS or PEMS and submit the calibration report to the Environment Agency. Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals for rectifying this in accordance with the timescale in the notification. The proposals shall be implemented in accordance with the Environment Agency's written approval. 	Within 7 months of the use of the CEMS or PEMS
IC35	<p><u>LVOC BAT Conclusions 2 and 20 – emissions from de-coking</u></p> <p>The operator shall submit, for approval by Environment Agency, a report setting out progress to achieving the 'Narrative' BAT where BAT is currently not achieved. The report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> Methodology for achieving BAT. Associated targets / timelines for reaching compliance. Any alterations to the initial plan (in progress reports). <p>The report shall address the following BAT Conclusions:</p> <ul style="list-style-type: none"> <u>Production of LVOC:</u> <ul style="list-style-type: none"> BAT Conclusion 2 (monitor emissions to air (carbon monoxide (CO) and dust) <u>other than</u> from process furnaces/heaters); and BAT Conclusion 20 (reduce emissions to air of dust and CO from decoking). <p>Refer to BAT Conclusions for a full description of the BAT requirement.</p>	Progress report by: 07/06/2022 then at six monthly intervals until compliance is reached, which shall be within the third calendar year following the year of publication of the relevant BAT AELs

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
IC36	<p><u>CWW BAT Conclusion 12 (waste water treatment) derogation at emission point W1</u></p> <p>The operator shall submit, for approval by the Environment Agency, a report setting out progress to achieving the BAT Conclusion AELs where a derogation has been applied for and granted. The report shall include, but not necessarily be limited to, the following:</p> <ol style="list-style-type: none"> 1) Current performance against the BAT Conclusion AELs. 2) An assessment of the concentration of relevant parameters in the effluent at emission point W1 under the new installation configuration, following a representative period of operation. 3) Methodology for reaching the AELs. 4) Associated targets / timelines for reaching compliance by 07 December 2025, time limited date in granted derogations for TOC and AOX at water emission point W1. 5) Any alterations to the initial plan (in progress reports). <p>The report shall address the following BAT Conclusion:</p> <ul style="list-style-type: none"> • CWW BAT Conclusion 12, Table 1 (compliance with TOC BAT AEL) and Table 3 (compliance with AOX BAT AEL) at emission point W1. <p>Refer to BAT Conclusions for a full description of the BAT requirement.</p>	<p>Progress report by: 07/06/2022 then at six monthly intervals until compliance is reached, which shall be no later than 07 December 2025</p>
IC37	<p><u>Assessment of TOC and AOX impacts from emission point W1</u></p> <p>The operator shall investigate and submit for approval by the Environment Agency, a report that reviews the impact of emissions of TOC and AOX from emission point W1 to the receiving water body.</p> <p>The investigation shall encompass the following:</p> <ol style="list-style-type: none"> 1) Shall follow a minimum of three 	<p>Within 9 months of the start-up date ^{Note 1} of the Olefins 6 cracker</p>

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	<p>representative months of sampling.</p> <p>2) For the purpose of this IC, a more frequent sampling frequency for AOX than that defined in table S3.2a of this permit, shall be agreed with the Environment Agency.</p> <p>3) Shall review TOC and AOX in the abstracted/raw water.</p> <p>4) Shall review potential sources of TOC and AOX via raw material inputs and process chemistry.</p> <p>5) The output from the sampling programme shall be used to assess the impact of emissions to the receiving water body from TOC and AOX in accordance with Environment Agency guidance <u>Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk)</u>.</p>	
IC38	<p><u>LVOC BAT Conclusion 14 and CWW BAT Conclusions 3, 7, 9, 10, 11, 14 and 21 (linked to BAT Conclusion 12 derogation)</u></p> <p>The operator shall submit, for approval by Environment Agency, a report setting out progress to achieving the 'Narrative' BAT where BAT is currently not achieved. The report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> • Methodology for achieving BAT. • Associated targets / timelines for reaching compliance. • Any alterations to the initial plan (in progress reports). <p>The report shall address the following BAT Conclusions:</p> <ul style="list-style-type: none"> • <u>LVOC</u>: BAT Conclusion 14 (reduce emissions to water, effluent treatment). • <u>CWW</u>: BAT Conclusion 3 (monitor key process parameters for emissions to 	<p>Progress report by 07/06/2022 then at six monthly intervals until compliance is reached, which shall be no later than 07 December 2025</p>

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	<p>water);</p> <p>BAT Conclusion 7 (reduce water usage and generation of waste water);</p> <p>BAT Conclusion 9 (buffer storage capacity for waste water);</p> <p>BAT Conclusion 10 (reduce emissions to water);</p> <p>BAT Conclusion 11 (pre-treating waste water);</p> <p>BAT Conclusion 14 (waste water sludge); and</p> <p>BAT Conclusion 21 (reduce odour emissions from waste water collection and treatment and from sludge treatment)</p> <p>Refer to BAT Conclusions for a full description of the BAT requirement.</p>	
IC39	<p><u>CWW BAT Conclusion 18</u></p> <p>The operator shall submit, for approval by the Environment Agency, a report on their management of flaring in order to minimise emissions to air in accordance with CWW BAT Conclusions 17 and 18.</p> <p>This shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> • An assessment of the feasibility of installing a flare gas recovery system to minimise baseline flaring, or any other possible improvements. • A timetable for implementation of any improvements planned. • Progress against any improvement proposals identified in previous reports. 	<p>Within 18 months of the start-up date ^{Note 1} of the Olefins 6 cracker</p>

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
IC40	<p><u>Emissions to air from Olefins 6 cracker furnaces</u></p> <p>For emission points A1 to A3 in Schedule 3 of this permit, where the indicative limit for carbon monoxide (CO) of 50 mg/Nm³ (expressed as a daily average or an average over the sampling period) cannot be met, then the operator shall provide a site specific justification for a higher CO limit to be approved in writing by the Environment Agency.</p>	<p>Within 9 months of the start-up date ^{Note 1} of the Olefins 6 cracker</p>
IC41	<p><u>Performance of effluent treatment</u></p> <p>The operator shall review the performance of the effluent treatment against the conditions of this permit and verify that they have control over their effluent quality following the improvements at the installation under IC36 and IC38 in this table.</p> <p>The operator shall submit a report on the findings of the review, with details of procedures developed during the improvements for achieving and demonstrating satisfactory process control and timescales to implement any remedial actions to maintain compliance with the relevant BAT Conclusions.</p> <p>The operator shall implement the actions as approved in writing and from the date approved by the Environment Agency.</p>	<p>Within 12 months of the achievement of the BAT AELs and no later than 07 December 2026</p>
IC42	<p><u>Surface water pollution risk assessment</u></p> <p>The operator shall submit a surface water pollution risk assessment to the Environment Agency for approval, which shall assess the impact of discharges of hazardous pollutants to surface water from the installation at emission point W1 following off-site effluent treatment. The risk assessment shall include, but not be limited to the following:</p>	<p>Within 12 months of the achievement of the BAT AELs and no later than 07 December</p>

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	<p>a) representative emissions data for the relevant hazardous pollutants; and any other relevant substances discharged from the installation. Any emissions monitoring required should be carried out using the methods and standards described in Environment Agency guidance “Monitoring discharges to water” on .gov.uk;</p> <p>b) a risk assessment in accordance with the screening procedures in Environment Agency guidance <u>“Surface water pollution risk assessment for your environmental permit”</u> on .gov.uk, using the representative emissions data obtained in (a) above; and</p> <p>The results of the assessment shall be used to determine the requirement for any additional control measures together with a timetable for implementation of any proposed measures for approval by the Environment Agency.</p>	2026
<p>Note 1: Refer to Schedule 6 - Interpretation of this permit for the definition of “start-up date”.</p>		

Annex 4: Advertising and Consultation on the draft decision

This section reports on the outcome of the public consultation on our draft decision carried out between 15 December 2021 and 17 January 2022.

The draft decision record and associated draft consolidated variation notice was published and made available to view on .Gov website between the dates detailed above.

We received no responses to the public consultation on our draft decision.

Annex 5: Review and assessment of changes that are not part of the BAT Conclusions derived permit review.

Table/condition	Justification
<p>3.1.3 to 3.1.6 deleted</p>	<p>3.1.3 - <i>Emissions to the Wilton Drainage System sewer from the specified emission points in table S3.3 shall only arise from the sources specifies in that Table. There shall be no release from the permitted process into any public sewer.</i></p> <p>The requirements of this condition are covered by permit condition 3.1.1.</p>
	<p>3.1.4 - <i>The operator shall notify the Agency in writing if any known introduction or material change in respect of operations on site, occurs that may increase or introduce in to the emissions to the sewer any “dangerous substance” included in List I and List II and in the list of Dangerous Substances (as updated by the Environment Agency from time to time, and notified to the operator in writing), included in this permit, or any other substance considered by the operator as having or likely to have a significant effect on the receiving waters (controlled water receiving effluent form the Wilton Site outfall).</i></p> <p>Any such change would require an application to vary the permit.</p>
	<p>3.1.5 - <i>The operator shall ensure that all emissions from the permitted site, including those listed in table S3.3 do not cause a Water Resources Act Discharge Consent compliance failure for the Wilton Site outfall to controlled waters – (consent Ref. No. QR.25/04/15258 or its successor) or be the cause of a non-consented release to controlled waters above background concentration levels.</i></p> <p>These requirements have been replaced by the Water Framework Directive which is delivered by a permit improvement condition.</p>
	<p>3.1.6 - <i>The operator shall record the occasions when, and the reasons for, diversion of the Wilton Drainage System to the Buffer Tanks is made due to abnormal operation</i></p>

	<p><i>occurring on its installation.</i></p> <p>The requirements of this condition are covered by table S3.5, Process monitoring requirements.</p>
3.1.7 deleted (existing 3.1.8 becomes 3.1.7)	To ensure consistency across the LCP sector permits. This site specific requirement for visible smoke is covered by the operator's EMS.
3.5.1 amended	To reference new table S3.5 for process monitoring which is a requirement of the LCP BAT Conclusions. This is required to demonstrate that efficiency levels are maintained following any significant overhauls of equipment in order to fulfil the requirement of LCP BAT Conclusion 2.
3.6.7 amended	To include the 'yearly average' which is a requirement of the LCP BAT Conclusions.
	Paragraph (e) amended to delete '40 minutes' which is consistent with other LCP sector permits.
Table S1.1 amended	To update activity reference AR2. 'Gas fired process heaters' was replaced with: 14 USC furnaces B1701A-P. 3 VMR furnaces B1702A-C. 3 super-heaters B1704A-C.
	To amend the 2 x 5 MWth gas-oil boilers (added by variation EPR/BS3590IE/V014) from a directly associated activity to a Section 1.1 Part A(1)(a) activity. This is consistent with our approach for combustion plant, where the Section 1.1 listed activity includes all combustion plant with no de-minimus.
	To include the flares as a directly associated activity (AR5).
Table S1.2 amended	To update the reference to 4.2 Waste Management.
	To amend date received for EPR/BS3590IE/V014 from 21/07/2020 to 14/09/2020, consistent with the duly made date.

Table S1.3 amended	IC31 confirmed as complete as recorded in Environment Agency Compliance Assessment Report (CAR) form, Report ID: BS3590IE/0411641.
	IC32 amended to change the date to within 6 months of the start-up date of the Olefins 6 cracker. The cracker is currently mothballed. Noise data has already been collected representing a baseline with the site not operating.
	IC39 added to validate the predicted impacts from TOC and AOX at emission point W1.
	IC41 added to validate the performance of effluent treatment.
	IC42 added for surface water pollution risks from hazardous pollutants.
	Table S3.1 amended
To include 'MSUL/MSDL to base load' for LCP 648 limits, applicable to LCP boilers.	
To include the indicative CO limit for LCP 648 which is a requirement of LCP BAT Conclusion 56.	
To include the TVOC limit for LCP 648 which is a requirement of LCP BAT Conclusion 59.	
The operator confirmed that for LCP 648 oxygen is measured continuously. We have amended oxygen measurement from periodic to continuous.	
Emission points A14 (F1961 pyrolysis gasoline tank), A18 (Bf5 naphtha tank), A19 (Nf1 & Nf3 raw C5s tanks), Nf24 and Nf29 (2 x Nf24, Nf29 P-xylene) deleted as sources have been removed from the installation.	
A note to the table was added to confirm that the 14 USC and the three VMR furnaces each vent through their own stack equipped with monitoring ports. Emission points will be updated by variation EPR/BS3590IE/V016.	

Table S3.2 amended	<p>Table S3.2 for emissions to water updated to include the information from table S3.3 for emissions to sewer. There are <u>no emissions to sewer</u>, see below.</p> <p>There are <u>direct emissions to water</u> from the installation. The Olefins 6 plant discharges to the Wilton site drains operated by Sembcorp. Effluent from other Wilton site operators mixes with this effluent. The Wilton site drains flow into Dabholme Gut which in turn flows into the River Tees. There isn't any treatment of this effluent.</p> <p>Note 1 to the table deleted (Limits for cadmium, mercury and zinc are expressed as the respective total metals) as there are no limits for these parameters.</p>
Table S3.3 amended	To remove all information, see table S3.2 above.
Table S3.4 amended	Changed to annual limits to 'water' from annual limits to 'sewer'. Note 1 added for limits to be reviewed in accordance with permit improvement condition IC42.
Table S3.5 added	Refer to '3.5.1 amended' above.
Table S4.1 amended	To include annual reporting for CO.
Table S4.3 amended	To remove reporting of BOD and COD. There are no monitoring requirements for these parameters.
Table S4.4 amended	To update LCP forms and to replace form sewer 1 with water 1.
Schedule 6 Interpretation	Definition for "start-up date" added.