

Planning Application Representation:  
Deadline 6 Representation from Biofuelwatch

Proposed Development:  
Drax Bioenergy with Carbon Capture and Storage Project

Proposed Location:  
Drax Power Station, North Yorkshire

Applicant:  
WSP UK Limited

Examining Authority Ref:  
EN010120

Registration Identification Ref:  
20032287  
May 2023

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## The Applicant’s Response to Biofuelwatch’s Deadline 2 Submission

Biofuelwatch submits comments on the applicant’s response to Biofuelwatch’s Deadline 2 Submission [REP2-073] contained in section 9 of “Applicant’s Responses to Issues Raised at Deadline 2 (Updated)” [REP4-020]. These comments are shown in the following two sections:

1. Comments on what the applicant said in their response.
2. Important matters that the applicant did not address in their response to Biofuelwatch’s Deadline 2 Submission [REP2-073].

### Comments on Section 9 of [REP4-020]

The issues have been colour coded to show matters that Biofuelwatch consider resolved (**Green**) and those where one or more issues remain (**Red**).

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
57	9.8 (57 – 58)	<p>The applicant’s response, which refers to EA Guidance, does not address the concern that the location with the largest nitrosamine concentrations may not even be on figure 6.8 [APP-075]. Biofuelwatch notes that the Environment Agency was unable to confirm whether the applicant’s approach is correct in their response to the ExA’s questions (AQ.1.4 of [REP2-076]). The applicant’s response says photolytic degradation of the nitrosamines has not been taken into account in the amine chemistry modelling, which will lead to overestimation of pollutant concentrations at distance from the stack. Any such overestimation may, however, not be significant at this geographical scale because of the stability of nitrosamines in the atmosphere (see paragraph 72 of Biofuelwatch’s deadline 2 submission [REP2-073]) and because photolytic degradation requires sunlight (and therefore will not occur at night and will be greatly reduced when the sun is obscured by clouds). Biofuelwatch also notes the applicant did not comment on the findings of the Norwegian Institute for Air Research and the Norwegian Institute for Water Research (in collaboration with the Norwegian Institute of Health and others) that reported significant nitrosamine concentrations over considerable distances (considered in paragraph 68 of Biofuelwatch’s deadline 2 submission).</p> <p>Biofuelwatch requests that the ExA requires the applicant to carry out modelling that shows, beyond doubt,</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>the location with the predicted highest nitrosamine concentration together with one or more supporting diagrams to show the full extent of the geographical spread of nitrosamine concentrations. Biofuelwatch also requests diagrams showing the cumulative modelled nitrosamine impact with other consented plants to aid the assessment of cumulative impacts.</p>
59	9.9 (59 – 74)	<p>The modelling assumes both no existing amine/nitrosamine emissions and no background amines/nitrosamines. Biofuelwatch is not aware of any existing monitoring equipment, but existing emissions levels and environmental levels must be measured and included in the assessment. The applicant's response acknowledges the possibility of amine emissions from biomass combustion and goes on "Drax's current permit to operate makes no reference to any requirement to either control or monitor emissions of amines". This is then followed by the incorrect conclusion that "it is logical to conclude that the impacts of amines from the biomass combustion are not of environmental concern". This is flawed:</p> <ul style="list-style-type: none"> <li>• because amines clearly are of environmental concern (as shown by the applicant's proposal and the EALs defined by the EA)</li> <li>• because the proposal will increase amines and nitrosamines</li> <li>• because it assumes that all matters of environmental concern are regulated by permit to prevent environmental impacts. This is clearly not the case with impacts of non-threshold pollutants are inevitable regardless of whether they are measured and regulated.</li> </ul> <p>Without an assessment of existing emissions, the cumulative impact of the proposal cannot be properly assessed. It should be noted that the applicant has included existing emissions of other pollutants in its assessment, so it is Biofuelwatch's position that it must do so for amines and nitrosamines.</p>
61	9.9 (59 – 74)	<p>The applicant's response says " the location of maximum ground level impact as a function of distance from the stacks would also need to coincide" and considers the chance of this occurring to be "vanishingly small". However, short-term impacts can occur without maximum ground level impacts coinciding. The short-term impacts need to be modelled because nitrosamines formation depends on both amine concentrations and other pollutants (such as NOx), so the combined modelled short-term concentration could easily exceed the maximum ground level impact from one plant even if maximum ground level pollution concentrations from two plants do not coincide. A range of meteorological conditions is likely to exist under which such less-than-maximum ground level impacts combine. Biofuelwatch notes that the Environment Agency was</p>

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	Biofuelwatch's Comments on Applicant's Response
		unable to confirm the applicant's approach was correct in their response to the ExA's questions [REP2-076].
65	9.9 (59 – 74)	<p>The applicant responded "Firstly, the contribution of Drax and Keadby to total NOx concentrations is significantly lower than the background contribution to these pollutants, whether taken alone or cumulatively." Whilst background levels exceed Drax's long-term contribution to NOx concentrations, Drax can be expected to make a very significant contribution to the level of NOx within the plume. These high NOx levels within the plume will coincide with high amine concentrations. The applicant's approach to cumulative emissions does not take this variability of NOx concentrations into account. The applicant has also not justified the use of background NOx levels in the model of nitrosamines concentrations rather than peak plume NOx levels.</p> <p>The applicant responded "Secondly, there remains a significant excess of these pollutants in the air, implying that adding a minor contribution from another source will not significantly affect reaction rates." Whilst there may remain a "significant excess of these pollutants in the air" for complete breakdown of amines, this does not mean that the breakdown <i>rate</i> of amines is not dependent on NOx concentrations. The equations used by the ADMS chemistry module in the ADMS chemistry module user guide show reaction rates to be dependent on NO and NO<sub>2</sub> concentrations. This is also confirmed by the applicant's response which said "the "[modelled] formation of nitrosamines was higher with the Hull Freetown background concentrations (NOx annual mean ~38µg/m<sup>3</sup> in 2016) than alternative rural sites such as at Ladybower in Derbyshire (NOx annual mean ~9µg/m<sup>3</sup> in 2016)". Increased reaction rates will lead to higher levels of nitrosamines near the plant and would be likely to increase peak nitrosamine levels.</p> <p>The applicant has provided insufficient evidence that the assumptions the applicant considers to be "conservative" are sufficient to outweigh the non-conservative assumption implicit in the applicant's approach including that the increased air pollutants (such as NOx and ozone) from multiple sources will not increase the reaction rate of nitrosamine production. The applicant has not shown that the resulting environment levels cannot exceed the sum of the predicted nitrosamine levels modelled from each independent pollution source and there is the further concern that the level used by the applicant's model does not reflect the higher NOx levels that can be expected within the plume.</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
66 c	9.9 (59 – 74)	The applicant considers regulation of amines in biomass burning and says “it is logical to conclude that the impacts of amines from the biomass combustion are not of environmental concern”. It is, however, clear that amines (and their breakdown products) are of great environmental concern. Whilst the concentrations of amines released from biomass combustion have not historically received much consideration, they deserve careful consideration when assessing the cumulative impact of the proposed emissions which include significant amine emissions arising from the carbon capture plant. The applicant has not assessed these cumulative impacts nor provided sufficient information to support their view that they do not “warrant inclusion in the assessment of impacts”.
66 d, 188-190	9.9 (59 – 74)	The applicant has said “those such as domestic wood burning etc are not affected by the Proposed Scheme and therefore do not require inclusion in the assessment.” It is appropriate for background pollution levels to be considered. The applicant has not satisfactorily assessed the background levels of amines and nitrosamines arising from domestic wood burning. It is also appropriate to consider the impact of domestic wood burning emissions combined with other emissions from the proposed facility. An appropriate assessment should be made of environmental concentrations that take into account the domestic wood burning emissions to ensure that the proposal cannot result in environmental concentrations that exceed safe levels. Biofuelwatch requests that environmental concentrations (the background concentrations) are determined prior to the planning and permitting assessments being made because without such concentrations it is impossible to determine cumulative impacts of both amines and nitrosamines.
66 e, 188-190	9.9 (59 – 74)	The EA has said “background concentrations for amine and degradation products are unavailable for the study area” but this does not mean that a robust assessment can be made without determining background concentrations. The applicant has said “impacts from amines being screened as negligible irrespective of the background concentration” but, as considered elsewhere, there is concern over the level of amines emitted. Also, since amines result in the atmospheric formation of nitrosamines, which are not predicted to be negligible, the applicant has provided insufficient evidence that amine emissions (and the resulting nitrosamines) are negligible irrespective of the background concentrations of amines and nitrosamines. Other sources of environmental amines and nitrosamines, such as naturally occurring amines and nitrosamines, should be included in the assessment. Biofuelwatch requests that environmental concentrations (the background concentrations) are determined prior to the planning and permitting

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		assessments being made because without such concentrations it is impossible to determine cumulative impacts of both amines and nitrosamines.
	9.9 (59 – 74)	The applicant's response concludes "it can be robustly concluded that the addition of maximum to maximum impacts is indeed conservative". Biofuelwatch considers the applicant's assessment of cumulative impacts to be neither conservative nor robust. Biofuelwatch notes that the EA have also been unable to confirm that the applicant's assessment of cumulative impacts is conservative and robust [REP2-076] but Biofuelwatch is concerned that the EA may accept the applicant's approach that considers background amine and nitrosamine concentrations to be zero (apparent EA agreement with Section 6.7, with associated limitations and assumptions provided in paragraph 6.5.54, of ES Chapter 6 (Air Quality) [APP-042] as shown by [REP5-016]). Biofuelwatch requests the ExA to ask the EA if it is confident that background amine levels and nitrosamine levels are so low that they can be excluded from an assessment of the Predicted Environmental Concentrations of amines and their breakdown products, and, if it is confident background levels can be excluded, why it is confident when natural processes and domestic wood burning both emit amines and when a study by Ge et al. <sup>1</sup> noted 154 amines occurring in the atmosphere.
67	9.9 (59 – 74)	The applicant's response says "Reference is made within the report to aldehydes in the emissions from carbon capture plants rather than as degradation products in ambient air. It is, therefore, entirely appropriate to consider primary emissions of aldehydes only in the Applicant's air quality impact assessment." but this does not address the concern raised that environmental aldehyde concentrations can be expected to exceed those modelled by the applicant because the emissions result in the atmospheric formation of aldehydes as a degradation product. Biofuelwatch does not consider the applicant's modelling of aldehydes to be adequate when it does not consider a potentially significant source of aldehydes, i.e. aldehydes arising from the atmospheric breakdown of amines. Biofuelwatch requests the ExA require the applicant to include consideration of the atmospheric formation of aldehydes in its consideration of environmental aldehyde concentrations so that the impact of the proposal on aldehyde concentrations (and so human

<sup>1</sup> Xinlei Ge, Anthony S. Wexler, Simon L. Clegg, Atmospheric amines – Part II. Thermodynamic properties and gas/particle partitioning, Atmospheric Environment, Volume 45, Issue 3, 2011, Pages 561-577, ISSN 1352-2310, <https://doi.org/10.1016/j.atmosenv.2010.10.013>. (<https://www.sciencedirect.com/science/article/pii/S1352231010008757>)

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		health and the environment) can be appropriately assessed.
69-70, 215	9.23 (214 –217)	<p>The response says “The identification (pre-mitigation) of the potential for effects significant at ‘up to an international scale’ reflects the relative importance of the receptors in line with a defined geographical context, as per the CIEEM guidelines; not that the impacts would have a transboundary, international, impact. The Applicant wishes to clarify that this does not mean that significant effects would occur across an internationally significant area, or that direct air quality impacts of Drax could be significant at International scale.” The Imperial College and the Norwegian Institute for Public Health study reported concerns over cumulative impacts when plants are located hundreds of kilometres apart. The applicant considers “These are theoretical studies that do not reflect the specific impacts of Drax and the dispersion of pollutants from a main stack that is 259m tall.” Biofuelwatch considers the Imperial College and Norwegian Institute for Public Health study to be relevant because it shows the considerable distances over which combined impacts can be expected to endanger human health. Drax points out the height of the stack. Higher stacks can be expected to <i>increase</i> the distance pollutants travel and therefore have the potential to increase the distance at which harmful cumulative impacts may occur.</p> <p>It is therefore appropriate to consider that the plant has the potential for impacts at international scale (beyond impacts on sites of international ecological importance). France and the Netherlands are less than 400 km away from the Drax site and the Drax stack height may be higher than that assumed by the Imperial College study potentially leading to pollutants travelling greater distances. The proposal may therefore result in elevated nitrosamines concentrations in other countries so the potential for such impacts should be assessed to inform a decision on whether international consultation on the proposal is appropriate.</p>
84	9.10 (75 – 84)	<p>The applicant responded “An assumption that the non-BECCS units do not operate at all in the future is unrealistic and irrelevant and would require a wholesale change in government policy.” Biofuelwatch disagrees. Market conditions may change to make it uneconomic to operate the non-BECCS units in future. Accidents or unforeseen technical difficulties may also mean that the non-BECCS units cease to operate either for a time or permanently. Regulations may change which could also make the non-BECCS units uneconomic in the future. The applicant said “It is wholly incorrect to assert that the impacts on nitrosamine concentrations may be significantly higher than predicted” but the applicant predicts aldehyde and</p>



<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>nitrosamine concentrations from the BECCS units would decrease when the non-BECCS units operate continuously so, if the non-BECCS units cease operation (or only operate occasionally), nitrosamine concentrations can be expected to be significantly higher than predicted. The safety of the proposal must not be dependent on the dubious assumption that the non-BECCS units will remain operational.</p> <p>Biodfuelwatch therefore requests that the ExA require the applicant to model the impacts with a scenario where the non-BECCS units are not operating.</p>
88-90	9.11 (85 – 106)	<p>The applicant responded “The modelling was undertaken using v5.2.4. The software version naming convention is such that where a model is named X.Y.Z, major changes to the software warrant an update to the number X, minor changes update number Y and number Z updates are minor patches. The model validation studies undertaken for ADMS version 5 will be applicable to all versions starting with number 5.” Each version of ADMS is different software and so may produce different results. It is not the case that validation tests made with version 5.0 will necessarily produce the same results as tests made with 5.2.4. CERC validation documents show that ADMS 5.2 was a significant change from ADMS 5.1 and results in different environmental predictions – sometimes very significantly different (e.g. the Millhouse power plant and Warehouse fire windtunnel scenarios). The applicant may consider the model validation studies for ADMS version 5 to be applicable to all versions starting with number 5, but assessment of uncertainties based on validation studies made against a different version has limited usefulness because different versions of ADMS can, and do, produce different results. Minor version changes typically correct software bugs and such changes also have the potential to impact predictions and may also introduce new bugs. Bugs and errors in some such complex modelling systems are to be expected, but the potential consequences of such software bugs and errors have not been quantified nor have the modelling predictions been compared with results from other modelling software systems. The modelling uncertainty remains unquantified.</p>
91-94	9.11 (85 – 106)	<p>The applicant's response considers that “the idealised wind tunnel and field studies used for model validation are directly applicable to the Applicant's modelling.” Wind tunnel studies do not use data obtained from actual plant emissions and so are highly unlikely to reflect all the complexities of atmospheric dispersion. An idealised environment will provide more predictable results than true atmospheric dispersion</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>so is not a reliable guide to the levels of uncertainties to be expected from a real-world scenario. There also appears to be a lack of consideration of whether validation scenarios with a single point source accurately reflect emissions from a stack with multiple flues. The applicant's response has given no evidence that uncertainties in a validation scenario with flat terrain and no coastal effects would accurately reflect the uncertainties in the Drax scenario when Drax is near an estuary and has terrain that is not flat within the distance modelled. The applicant still has not quantified the uncertainties that can be expected, but, the uncertainties in the modelling results can be expected to be greater (and in Biofuelwatch's estimation, <i>considerably</i> greater) than those in a validation scenario with flat terrain and without coastal effects especially when the validation scenario was known to the developer during development of the modelling software system.</p>
96-97	9.11 (85 – 106)	<p>The applicant's response says "The ADMS suite of models is the most widely used dispersion model in the UK." Biofuelwatch repeats that it does not question the appropriateness of the software used by the applicant for pollutants such as NOx, SO<sub>2</sub> and particulates but that the uncertainties remain unquantified. The applicant's response also illustrates the lack of differentiation between the modelling software system (ADMS) and any model created using this modelling software system. As stated in Biofuelwatch's deadline 2 submission [REP2-073], both the uncertainties in the modelling software system itself and the model created using that modelling system have to be considered. The applicant's response does not clearly differentiate between these two sources of uncertainty and does not quantify either.</p>
100	9.11 (85 – 106)	<p>The applicant's response says "in the meteorological data used for the air quality assessment, calm conditions account for less than 0.7% of hours in the year and these differences are, therefore, insignificant within the context of the assessment of the Proposed Scheme." Biofuelwatch disagrees. The applicant's assessment predicts short-term NO<sub>2</sub> impacts based on the 99.79<sup>th</sup> %ile of hourly values. Conditions for 0.7% of hours have the potential to impact such predictions and should be assessed, especially with the research by M. Theobald et al showing large differences in peak hourly concentrations between the two most widely used air dispersion modelling systems under calm conditions. Modelling predictions made with a model that essentially removes calm periods from the assessment is not sufficiently robust and potentially subject to very significant error.</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
102	9.11 (85 – 106)	<p>The applicant's response says "Biofuelwatch note that the EfW at Kirk Sandall has been modelled without buildings. This is correct but this has no significant impact on the conclusions of the assessment. The primary impact of buildings on dispersion is to rapidly mix pollutants from lofted plumes down to ground level due to enhanced turbulence in the wake of the building. However, once a plume has become well mixed with the atmospheric boundary layer, as happens with distance downwind from a source, the impact of any enhanced mixing near the source is much reduced. Kirk Sandall EfW lies 20km south-south-west of the Drax power station and where there is potential for cumulative impacts between the Proposed Scheme and Kirk Sandall, the influence of near source building effects will, therefore, be negligible."</p> <p>However, the applicant's own figures show peak nitrosamine impacts occur at distances at or in excess of 15km with impacts extending an unknown maximum distance. Nitrosamine concentrations arising from Drax's emissions will combine with Kirk Sandall emissions and impact nitrosamine concentrations near Kirk Sandall. There is therefore the potential for significant underprediction of environmental nitrosamine concentrations near Kirk Sandall since buildings near Kirk Sandall have not been modelled.</p>
105-106	9.11 (85 – 106)	<p>The applicant's concluding response on uncertainty says:</p> <p>"... the Applicant's treatment of uncertainty in the modelling has been:</p> <ul style="list-style-type: none"> <li>● to use a well validated dispersion model (ADMS);</li> <li>● to ensure that model inputs parameters are set at their worst case e.g. emission rates, where there is potential variability;</li> <li>● to undertake sensitivity testing including for meteorological conditions; and</li> <li>● to assess the Proposed Scheme against the maximum modelled concentrations over all model scenarios." <p>Biofuelwatch's concluding comments on this response from the applicant are:</p> <ul style="list-style-type: none"> <li>● Whilst a previous version of ADMS was validated by the developer, the version of ADMS used by the applicant has not been validated</li> </ul> </li></ul>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		<ul style="list-style-type: none"> <li>● The validation carried out was not independent and it can be expected that the software will have been built and tested to perform at its best under validation scenarios with no assessment made of its likely performance in other situations. Biofuelwatch do not consider dispersion modelling software should be considered “well validated” without independent validation. Biofuelwatch do not consider a dispersion modelling software version to be well validated when not even the developer has published validation data for that particular software version.</li> <li>● The applicant has not shown that all model inputs are worst case with no response to the detailed issues raised on these matters and the lack of compliance with ADMLC Guidelines</li> <li>● Whilst some sensitivity analysis has been carried out, this is limited and does not include all important parameters, nor has there been any quantification of the resulting cumulative uncertainty</li> <li>● An assessment against the “maximum modelled concentrations over all model scenarios” does not give reassurance that the actual environmental concentrations could not exceed those modelled for all the reasons given in Biofuelwatch’s submission.</li> </ul>
108-109	9.12 (107 – 115)	<p>The applicant’s response says “ the environment at Drax is well represented in the model i.e. there is only a single source – the main stack ...” but saying Drax has been “well represented” is not the same as saying Drax has been “accurately represented”. The applicant’s response says “Widely available images of the plumes at Drax show the gases from individual flues merging rapidly on exit from the stack.” Current emissions from individual flues have similar characteristics such as temperature. It is not surprising that such emissions mix well, but this gives no assurance that emissions from flues with very different characteristics will mix so quickly that it is appropriate to model them as a single source. The response gives insufficient indication that the potential complexities and impact of multiple flues within the Main Stack have been considered nor whether the validation scenarios considered by the developer of the ADMS modelling system reflect such a potentially complex scenario. Incomplete mixing of the plumes has the potential to significantly impact environmental concentrations.</p>

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	Biofuelwatch's Comments on Applicant's Response
110-115	9.12 (107 – 115)	<p>The applicant's response says "In relation to the sulphur dioxide concentrations within the BECCS and non-BECCS units, the proposed mitigated concentrations will be adopted and secured via the permitting process. ... it is proposed that sulphur emissions are reduced not increased in the future. The flue gas cooler system also known as the quench column uses a water fed spray system to cool the flue gas down. The water used in the quench column can be adjusted for pH to augment the removal of the SO<sub>2</sub> in the flue gas to meet the proposed reduction in emissions. Furthermore, it is emphasised that the carbon capture technology has been optimised for the Drax exhaust specifications and the modelled emission limits for nitrosamines and amines take account of the performance of the unit under Drax-specific conditions." Whilst the applicant shows the methods by which it may be possible to reduce SO<sub>2</sub> for permit compliance, the applicant has not commented on the potential impact of SO<sub>2</sub> on the complex chemistry of atmospheric nitrosamine formation. There are no robust predictions of the impact of SO<sub>2</sub> and particulates on nitrosamine formation. The applicant's response gives no assurance that SO<sub>2</sub> concentrations will not result in higher nitrosamine concentrations than those modelled at permit compliance levels.</p>
116-118	9.13 (116 – 118)	<p>The applicant responded "The regulation of the Drax power plant is a matter for the Environment Agency and the permitting regime, and not a matter for consideration within the DCO." Whilst Biofuelwatch agrees that regulation of the Drax power plant is a matter for the Environment Agency (see paragraph 180 of Biofuelwatch's deadline 2 submission <a href="#">[REP2-073]</a>), Drax disagrees that consideration of the permitting regime is not also an important matter for the ExA. Biofuelwatch considers that the ExA must consider how the plant will be regulated, and the implications of that regulation, in order to assess the appropriateness of the proposal in land use terms. Regulation of the plant allows exceedances of emissions limits without regulatory intervention and the EA considers it necessary to permit such exceedances (page 125 of EA decision document for permit application EPR/SP3609BX/A001).</p> <p>The applicant considers " it is unnecessary and unrealistic to model the impacts of the plant at levels that would invoke regulatory intervention since by definition these emissions would be promptly rectified via the</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		<p>permitting process”. Biofuelwatch maintains that since emissions exceedances do not necessarily invoke regulatory intervention, the permitting process will be unlikely to rectify them and even more unlikely to rectify them promptly. As shown in the example in Biofuelwatch’s representation, such exceedances could be 169% of the limit. Higher uncertainty in measurements than considered by Ricardo in its example would, of course, lead to the potential for even higher exceedances without regulatory intervention. Regulated plants can, and do, operate near to regulatory limits. As an example, the Annual Performance Report 2021 for Lakeside EFW Ltd<sup>2</sup> shows the annual mean NOx emissions exceeded 90% of the ELV. Biofuelwatch considers the potential for exceedances to be more than just “hypothetical”. This is, of course, just one of many examples where the applicant’s predictions are based on assumptions that are not worst case.</p>
119-120	9.14 (119–123)	<p>The applicant’s response includes “Emissions from the Keadby plant and the Proposed Scheme should not be compared since different technology providers are used in each case.” It remains unclear to Biofuelwatch why Drax is confident that its plant, using a different technology provider, will result in more carbon dioxide capture with just 6% of the amine emissions. The applicant has provided insufficient evidence to justify the carbon capture efficiency and amine emissions.</p>
121-123	9.14 (119–123)	<p>The applicant has responded “The exhaust conditions, including temperature and flow, reflect the expected conditions based on the actual biomass combustion flue gas conditions and changes to the gas stream for capture units the associated with the operation of the technology. Emission monitoring including peripherals such as velocity and flow are regulated under the permit.” Emission monitoring of emissions temperature and flow velocity is not the same as emissions regulation. Biofuelwatch’s request to the ExA with questions for the Environment Agency remain for the reasons given in paragraph 123 of our submission.</p>

<sup>2</sup> <https://ukwin.org.uk/library/127-AnnualPerformanceReport-2021.xlsm>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
124-130, 200-204	9.15 (124 – 139)	<p>The applicant has responded “Biofuelwatch suggest that the Environment Agency derived EALs are inadequate for nitrosamines” but the summary provided by the applicant of the process undertaken by the EA does not address Biofuelwatch’s concerns. The concern that the Environment Agency’s EALs may not prevent harm to health is raised in the context of the proposal under consideration which assesses nitrosamine impacts (including the health impact) by comparison of modelling predictions with the EALs. The ExA should not be surprised by the possibility that the defined EAL may not prevent harm to health; the government recognises other existing EALs are inadequate to prevent a significant health burden (see paragraph 47 of Biofuelwatch’s deadline 2 submission [REP2-073]) and there is very little information on which to set an EAL. Biofuelwatch requests that the ExA considers the risk that the EALs are not adequate to protect human health because insufficient health-related data is available.</p> <p>The applicant's response said “UKHSA is satisfied that the applicant’s risk assessment for amine emissions from the proposed post-combustion carbon capture plant is appropriately conservative and in-line with the current knowledge base relating to nitrosamines and nitramines”. Biofuelwatch notes that UKHSA view [REP2-097] was based on the applicant’s statement that “the assessment is based on worst case, conservative, assumptions” [AS-038] but, as Biofuelwatch has pointed out, the modelling predictions are neither worst case nor conservative. Biofuelwatch is concerned that the UKHSA’s satisfaction was based on an incorrect understanding of the applicant’s assessment.</p> <p>The wording of UKHSA’s response is also of concern. The UKHSA may be satisfied that the risk assessment of the amine emissions themselves may be appropriate but that does not necessarily mean that the UKHSA is satisfied that the risk assessment of nitrosamines and nitramines is appropriately conservative.</p> <p>Biofuelwatch request the ExA to ask UKHSA why it considers the applicant’s assessment to be appropriately conservative when:</p>

[REP2-073] Paragraph	[REP4-020] Reference	Biofuelwatch's Comments on Applicant's Response
		<ol style="list-style-type: none"> <li>1. the applicant's modelling predictions are not worst case</li> <li>2. cumulative uncertainties have not been quantified</li> <li>3. N-nitrosamines and N-nitramines can accumulate in the environment,</li> <li>4. there is considerable uncertainty regarding the atmospheric chemistry</li> <li>5. there is considerable uncertainty regarding interactions with other pollutants</li> <li>6. there is considerable uncertainty regarding toxicity</li> <li>7. little or no consideration appears to have been given to the potential for other health impacts such as endocrine disruption and the potential worsening of diabetes (Tong, M., Longato, L. &amp; de la Monte, S.M. Early limited nitrosamine exposures exacerbate high fat diet-mediated type 2 diabetes and neurodegeneration. BMC Endocr Disord 10, 4 (2010). <a href="https://doi.org/10.1186/1472-6823-10-4">https://doi.org/10.1186/1472-6823-10-4</a>), and when the applicant's consideration of health impacts in [AS-038] on which UKHSA satisfaction appears to be based does not consider non-cancer health impacts, and</li> <li>8. when the novel solvents proposed by the applicant remain unpublished and with potentially even higher levels of toxicity, chemistry, accumulation and interaction uncertainties.</li> </ol> <p>Biofuelwatch request the ExA to ask the UKHSA why it is confident in the likely EA approach of reliance on unvalidated chemical transformation dispersion modelling predictions with unquantified uncertainties to ensure compliance against an environmental threshold which has considerable uncertainty and was set after relaxing lifetime risk by an order of magnitude.</p>
124-133	9.15 (124 – 139)	<p>The applicant said "The Applicant has shared details of the Technology Supplier's derivation of process-specific EALs with Environment Agency for review. The methodology follows the Environment Agency's methodology and has made the EALs more stringent for amines. The revised EALs have been applied conservatively." The applicant's assessment of impacts, and therefore the application being assessed by the ExA, depends on these EALs. For the public consultation to be meaningful, the information and evidence behind these EALs must be released by the applicant so it is available for public</p>



<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		scrutiny and comment before the ExA makes its decision. Biofuelwatch requests that the ExA requires the applicant to release this information and provides sufficient time for comment.
138	9.15 (124 –139)	The applicant supplied the missing reference.
139-144	9.16 (140 – 179)	The applicant said “Detailed information on the proprietary amine solvents and their degradation products have been shared with the Environment Agency. The carbon capture plant has been designed to align with the Drax emissions profile.” Biofuelwatch continues to consider the use of supplier-derived EALs for undisclosed chemicals to be unacceptable. Such crucial information must be disclosed so there is an opportunity to comment on the toxicity data used to inform the EALs. Without this it is impossible to properly comment on and assess the risks. The lack of full disclosure of these chemicals calls into question the legitimacy of the public consultation.
158	9.16 (140 – 179)	The applicant’s response says “Taking into account the low concentrations of the degradation products and potentially confounding impacts from other sources of nitrosamines, it is, in practical terms, impossible to validate the chemistry module in field trials.” Biofuelwatch is glad to see the applicant confirm Biofuelwatch’s concern that validation of the chemistry module has not been done and perhaps cannot be done. The applicant says “the model developer has undertaken extensive testing of the module using the data and conclusions of the Atmospheric Degradation of Amines (ADA) project (Nielson et al, Atmospheric Degradation of Amines. Summary Report: Photooxidation of Methylamine, Dimethylamine and Trimethylamine. Climit project no. 201604. Norwegian Institute for Air Research. January, 2011).” Such data obtained from a simulation chamber whilst primarily aiming to study photo-oxidation impacts, does not provide sufficient data to robustly validate the performance of the ADMS Chemistry in atmospheric conditions especially when the research reported “major uncertainties”. The applicant’s assessment is

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>based on the use of modelling software that is unvalidated and potentially impossible to validate with field trials.</p> <p>It is similarly concerning that the applicant says “The compound specific reaction rates used in the Drax application of the CERC amine chemistry module were provided by the technology supplier” but have given no reviewed scientific research to support the technology supplier’s figures. Not only are the predictions being made with unvalidated software (confirmed by the EA’s Air Quality Modelling and Assessment Unit guidance “AQMAU recommendations for the assessment and regulation of impacts to air quality from amine-based post-combustion carbon capture plants” reference AQMAU-C2025-RP01), even if the software was validated the validation would not give assurance that the chemistry module is appropriate for modelling the breakdown of the particular amines proposed.</p> <p>The proposal has the potential for profound long-term impacts on health and the environment. Biofuelwatch considers the applicant’s predictions are far from being adequately robust to support the proposed location of the plant near homes and important ecological sites.</p>
164-166	9.16 (140 – 179)	<p>The applicant’s response says “Biofuelwatch make reference to statements about the application of the ADMS chemistry module to MEA. As stated in the air quality assessment, the assessment of impacts is based on the technology specific compounds and not MEA. These comments are not, therefore, relevant.” The comments from Biofuelwatch on MEA were made because the applicant commented that “a stable nitrosamine is not formed from MEA in the atmosphere” [APP-127]. Biofuelwatch does not understand why the applicant includes comments on MEA and the breakdown of MEA in its application if, in fact, the applicant considers MEA to be irrelevant.</p> <p>Biofuelwatch requests the application documents be updated so they properly reflect and disclose the chemicals that the applicant intends to use. A consultation providing information on solvents that the</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>applicant does not intend to use, whilst also refusing to disclose the solvents that the applicant does intend to use, is not a meaningful consultation.</p> <p>Biofuelwatch also notes that the applicant has said that the ADMS chemistry module was based on results from the Nielson et al study (applicant's response 9.11 (85 – 106)) which considered the photooxidation of Methylamine (MEA), Dimethylamine and Trimethylamine. Even though the ADMS chemistry module was based on the chemistry of MEA, the ADMS chemistry module does not model the degradation of MEA to nitrosamines which is known to occur. With such significant concerns over the modelling of the simplest of amines remaining unanswered (with the ADMS chemistry module not including all reactions that are known to lead to nitrosamines), any predictions made using the ADMS chemistry module for the modelling of different amines should be considered subject to very great and unknown levels of uncertainty. With the potential impacts so great, an assessment made based on such a tool cannot, with the current level of development and validation, be considered sufficiently robust.</p>
167-168	9.16 (140 – 179)	<p>The applicant has said “the ozone concentrations used in the ADMS chemistry module have been taken from hourly sequential data from the Hull Freetown AURN station and have been applied on a year specific basis”. Biofuelwatch does not understand why the applicant has applied ozone concentrations on an annual basis when the ADMS Chemistry Module user guide says “It is strongly recommended to use hourly varying background values”. Biofuelwatch asks the ExA to consider the potential impact on modelling predictions of the unvalidated ADMS Chemistry Module that has not been used as recommended by the provider and developer.</p>
	9.16 (140 – 179)	<p>The applicant has said “The compound specific reaction rates used in the Drax application of the CERC amine chemistry module were provided by the technology supplier.” The applicant has provided no details</p>

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	Biofuelwatch's Comments on Applicant's Response
		of how the applicant determined the reaction rates. There is no indication that the reaction rate determination was independently peer-reviewed.
178-179	9.16 (140 – 179)	<p>The applicant has responded to concerns about nitrosamine uncertainties with “Detailed information on the proprietary amine solvents and their degradation products have been shared with the Environment Agency.” This is not an adequate response to the concerns raised which impact the ExA's assessment, not just the Environment Agency's regulation of the plant. An appropriate land-use assessment requires an understanding of the residual risks and, without much more information from the applicant, there are huge uncertainties with correspondingly high levels of risk. The plant's location, near residential areas and important ecological sites, is not appropriate for a proposal with such high levels of prediction uncertainties and risk. Biofuelwatch therefore requests the ExA ask the applicant to respond in detail to the concerns raised.</p> <p>The applicant has also said “UKHSA is satisfied that the applicant's risk assessment for amine emissions from the proposed post-combustion carbon capture plant is appropriately conservative and in-line with the current knowledge base relating to nitrosamines and nitramines.” The applicant puts considerable weight on this response from UKHSA, mentioning it four times in their response to Biofuelwatch's representation. Such a brief, one sentence response does not address Biofuelwatch's detailed concerns about the adequacy of the applicant's risk assessment. Further comments on UKHSA's satisfaction are considered in this document with reference to 9.15 (124 – 139) of <a href="#">[REP4-020]</a></p>
191-195	9.19 (191 – 195)	The applicant responded “In the first instance, it is reiterated that the DCO application relates to the installation of a carbon capture plant and not to the use of biomass as a fuel. The Applicant has a permit to operate biomass units and this permit does not require continuous monitoring of Dioxin emissions and this has never been raised as a concern by Environment Agency.”

[REP2-073] Paragraph	[REP4-020] Reference	Biofuelwatch's Comments on Applicant's Response
		<p>Dioxin emissions are likely to occur from the existing plant. The proposal can be expected to prolong the burning of biomass at Drax. Since dioxins are persistent in the environment, prolonging biomass burning can be expected to result in higher environmental levels of dioxins in soils, animals and humans around the plant. The applicant has also not shown that the proposed changes cannot result in increased dioxin formation to levels that are a risk to human health.</p> <p>The applicant also said "Notwithstanding this, the reference identified by Biofuelwatch (Zhang et al, Emission characteristics of polychlorinated dibenzo-p-dioxins and dibenzofurans from industrial combustion of biomass fuels, 2022.) relates to the combustion of biomass in industrial boilers used for heat production in China. It is not relevant to the combustion of biomass in large combustion plant subject to regulation under the Industrial Emissions Directive, including stringent controls on emissions of particulate matter." The paper by Zhang et al. is sufficient to show biomass combustion can produce dioxins. Simple internet searches show other peer-reviewed papers to be in agreement that combustion of biomass produces dioxin. The applicant points out that the plant is regulated under the Industrial Emissions Directive including stringent controls on emissions of particulate matter. Control of particulates is not, however, control of dioxins with dioxins of concern from plants that have particulate abatement.</p> <p>The EA does not require monitoring of dioxins from the Drax plant but that does not mean dioxin emissions from Drax are within safe levels - only that they remain unmonitored and unregulated. Unfortunately, there are many examples of inadequate EA regulation and investigation. The widely reported failure by the EA to adequately regulate sewage in UK rivers is an example of inadequate regulation. Many would consider the EA's finding of "puzzling" and elevated levels of dioxins found near UK incinerators in 2007 (EA 2007 UK Soil and Herbage Pollutant Survey UKSHS Report No. 10) but failing to investigate further (<a href="https://www.whatdotheyknow.com/request/uk_soil_and_herbage_pollutant_su?nocache=incoming-1989594#incoming-1989594">https://www.whatdotheyknow.com/request/uk_soil_and_herbage_pollutant_su?nocache=incoming-1989594#incoming-1989594</a>) to be another example of inadequate regulation.</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		<p>The ExA should also consider that regulation under the Industrial Emission Directive appears insufficient to prevent dioxin contamination. For example, levels of dioxins near regulated plants in Paris have been found to be nearly 50 times regulatory limits with health authorities there advising residents not to consume eggs from locally reared hens<sup>3</sup>.</p> <p>Biofuelwatch therefore continues to request that the Examining Authority requires:</p> <ul style="list-style-type: none"> <li>● an assessment of the risks to human health from dioxins (and dioxin-like compounds), and</li> <li>● continuous measurement and control of dioxin emissions to ensure the limits assumed by the assessment are not exceeded.</li> </ul>
196-199	9.20 (196 – 199)	<p>The applicant’s response refers to the requirement for “a leak detection and repair programme that is appropriate to the solvent composition” and a “hazard assessment and mitigation for the plant must consider the risks of accidental releases to environment.” The applicant has not addressed the concern that there is no quantification of the potential environmental concentrations that may arise from fugitive emissions nor any assessment of the potential significant impact that any fugitive emissions of CO<sub>2</sub> may have on the efficiency of the plant.</p>
205-208	9.22 (205 – 211)	<p>The applicant’s reply considers that “The detailed air quality assessment submitted in support of the DCO application demonstrates that no significant air pollution will arise as a result of the Proposed Scheme” but the applicant’s reply has not addressed the detailed concerns outlined in paragraphs 205-208 that show the risk of significant pollution.</p>

<sup>3</sup> Press release on 19 April by Agence Régionale de Santé Ile de France, <https://www.iledefrance.ars.sante.fr/polluants-organiques-persistants-lagence-recommande-titre-conservatoire-de-ne-pas-consommer-les>

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		<p>Furthermore, the permitting process assesses impacts using EALs that are known to be inadequate for the protection of human health. The use of inadequate EALs that do not prevent harm to human health is not sufficient to prevent significant pollution.</p> <p>The applicant said that “the parallel permitting process will ensure that the plant will operate within the parameters assessed within the DCO ES”. Unfortunately, the permitting process does not ensure the plant will operate within the parameters assessed within the DCO ES. An example of this is the plant’s emissions which may exceed the emissions modelled because of measurement uncertainties (paragraphs 116-118 of Biofuelwatch’s deadline 2 submission <a href="#">[REP2-073]</a>). Another example is the use of parameters used for the modelling, such as surface roughness, which are not worst case and not measured by the EA. The permitting process does not require the plant to be operated with a particular surface roughness nor is it clear how it could do so, making it essential that a precautionary worst-case surface roughness (and other modelling parameters) should be used. Yet another example is the temperature of the emissions which, whilst monitored, are not typically controlled by EA permits (paragraph 101 of Biofuelwatch’s deadline 2 submission <a href="#">[REP2-073]</a>). It is therefore not the case that the permitting process ensures that the plant will be operated within the parameters assessed within the DCO ES. It is therefore necessary for the ExA to satisfy itself that each of the parameters used by the applicant in the DCO ES (including the parameters that underpin the modelling) will be controlled (not just measured) so as to ensure modelling predictions cannot be exceeded.</p> <p>Even if the EA regulates such parameters, the ExA should consider that the EA often relaxes regulatory permit requirements without consideration of land use impacts. There are many examples of the EA allowing, for example, permit variations for increased combustion feedstock - increases that inevitably also increase emissions. If minded to permit the proposal, the ExA needs to be confident that the pollution considered in its land-use assessment will not be exceeded and therefore needs to obtain assurances from the EA on each parameter on which the ExA’s assessment depends. Alternatively, the ExA needs to apply</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		conditions to the proposal to ensure the pollution levels assumed in its land use assessment will not be exceeded.
211	9.22 (205 – 211)	The applicant's response agrees that "it is doubtful that it would be practical to install equipment to measure nitrosamine concentrations at a large number of locations". With so much uncertainty regarding predicted environmental levels and with measurement of pollution concentrations subject to so much uncertainty, the applicant's response confirms Biofuelwatch's concern that it will be difficult, perhaps impossible, to assess the health impact of the proposal. The location is inappropriate for a proposal whose impact is subject to such considerable uncertainties and when it is unlikely to be practical to measure environmental levels to detect environmental levels likely to cause unacceptable health impacts.
212	9.23 (214 – 217)	The applicant's response says they could not obtain a copy of the referenced paper but the findings of Karl et al. should not be dismissed just because the applicant could not obtain the paper. The applicant has instead used the critical loads in the Matthias et al. task paper - critical loads which are based on an unlikely "homogeneous distribution over a length of 10m (depth of soil)" (quote from Matthias et al.). A critical load derived from such large soil depths is not precautionary and amines are unlikely to be distributed homogeneously as assumed. SEPA's August 2015 paper "Review of amine emissions from carbon capture systems" recognises the impact of amines on ecosystems that are "already under pressure from acid and nutrient nitrogen (N) deposition and above or close to their critical load" (which is the case for many protected ecological environments around Drax). SEPA recognises "amines may also cause corrosive damage themselves" and that "more research is required into the multiple and complex effects of amines and their reaction products on the environment".
215-216	9.23 (214 – 217)	The applicant's response says "No impacts are predicted to European Sites or other important ecological features outside the UK and the Applicant therefore considers no international consultation is required" but



<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>since the applicant has not modelled or assessed the impact at sites outside the UK it is not surprising that the applicant considers that no impacts are predicted. The applicant's response also says "In relation to paragraphs 215 to 216, impacts are predicted at an 'international geographical scale' in terms of the importance of the ecological features being assessed" but, with the hundreds of kms that amine breakdown products can travel (see paragraph 70) impacts on an international geographical scale should only be ruled out after proper assessment. Furthermore, impacts on migratory birds are also impacts of international importance because the birds migrate internationally.</p>
218-224	9.24 (220 – 224)	<p>The applicant's response says "Emissions from the site are monitored and will have to comply with limits set by the Environment Agency assuming that the Environment Agency agrees that there is a realistic possibility of emission and at a level which will require monitoring and reporting. Concentrations of amines entering aquatic habitats are believed to be below levels which represent any risk to aquatic ecosystems, however, again emissions will be monitored where required and reported through the Environmental Permit." There has been extensive press coverage that Environment Agency regulation gives inadequate protection to aquatic habitats. Harm to aquatic environments has been widely reported as occurring throughout the UK with no river being considered good in overall health. The Wildlife and Countryside Link warns that the water quality of rivers in England is the worst in Europe. It is clear that the EA regulation alone provides inadequate protection of aquatic environments making it important that the ExA gives full consideration to potential impacts on the aquatic environment from the proposal. If EA regulation could protect aquatic environments, it can be assumed that the EA would have acted to prevent the harm that is clearly occurring across the UK.</p> <p>The applicant's response also says "the risk of deposition impacts is low, due to the inherently low amine and nitrosamine emissions, and their efficient dispersion resulting from the stack height, exit velocity and plume temperature. This is however a matter that will be dealt with in the Environmental Permit that will set parameters for emissions from the operational phase of the Proposed Scheme." Deposition impacts are an</p>

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	<b>Biofuelwatch's Comments on Applicant's Response</b>
		important matter for the ExA because of the predicted critical load/level exceedances at protected sites. Such impacts are relevant to the consideration of whether the site is an appropriate location for the proposal. Setting of parameters for emissions will not address the concerns over modelling of deposition impacts, uncertainties of deposition impacts and the harmful impacts of such depositions.
225	9.25 (225)	<p>The applicant's response draws attention to updated modelling predictions. Whilst the predicted ammonia level at Thorne Moor has been reduced, the applicant is still predicting resulting environmental concentrations in excess of twice the critical level and the applicant's assessment of ammonia levels do not consider important sources of uncertainty such as the uncertainties inherent in the modelling software system. The applicant's modelling predictions still show an exceedance of the nitrogen deposition and acid deposition critical loads at Thorne Moor and a significant exceedance of the maximum cumulative acid deposition impact for Lower Derwent Valley SAC and Ramsar site.</p> <p>The applicant considers that "a number of elements of conservatism have been embedded into the dispersion modelling, which demonstrate the precautionary and conservative approach that has been taken during modelling and assessment of operational air quality effects" but, as pointed out in Biofuelwatch's submission, not all aspects are precautionary, uncertainties have not been quantified (and remain unquantified) and so there can be no assurance that actual environmental concentration will not be significantly worse than the modelling predictions.</p> <p>By definition of critical loads and critical levels, increases above critical loads and critical levels can be expected to cause ecological harm. Even based on the applicant's predictions, which are not worst case predictions, ecological harm is to be expected.</p>
	9.25 (225)	The applicant's response says "a number of elements of conservatism have been embedded into the dispersion modelling" but the applicant has provided no quantified data to demonstrate that conservative

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>elements outweigh elements that are not conservative and precautionary. The result is a modelling prediction that is an unknown point on the risk profile. Biofuelwatch considers such an assessment is not sufficiently robust.</p>
235-242	9.26 (242 (a - d))	<p>The applicant has not answered the questions in paragraph 242 a-c. Instead the applicant has said “However, the assumption that the dry deposition behaviour of amines and nitrosamines is akin to ammonia is appropriate since the high solubility of these pollutants directly affects its uptake by plants even when deposited by ‘dry deposition’.” The applicant may consider the value “appropriate” but that does not make it precautionary or worst case. As identified in Biofuelwatch’s submission, the depositions used by Karl are little more than an educated guess. The applicant has used an argument based on water solubility to support the deposition velocity used, but HCl is also readily soluble and [APP-127] shows the applicant has used a dry deposition velocity for HCl in long vegetation that is twice the value the applicant has used for amines. As stated in Biofuelwatch’s submission, the considerable uncertainty regarding deposition is widely recognised. Biofuelwatch considers that insufficient evidence has been provided to demonstrate that the deposition velocities used are sufficiently precautionary.</p> <p>In response to 242 d for nitrosamines, the applicant has said “uncertainties in the deposition velocity will not impact on this conclusion” but the context in the applicant’s response suggests this comment relates only to nitrosamines. The applicant has provided no evidence that uncertainties in nitrogen deposition, acid deposition and amine distribution will be unaffected by the considerable deposition uncertainties (up to a factor of ten based on the referenced EA science report).</p>
243-244	9.27 (243 – 244)	<p>Biofuelwatch appreciate the confirmation that “the potential contribution of amines, nitramines, and nitrosamines to Proposed Scheme nitrogen deposition has been included within the dispersion (air quality) modelling reported in the ES Air Quality chapter (APP-042) and all subsequent iterations of the dispersion</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>modelling". Can the applicant also confirm that the potential contribution of amines, nitramines and nitrosamines has been included in the mitigation model scenarios and the cumulative impact scenarios too?</p> <p>The applicant's response claims to respond to paragraph 244, but the applicant has made no comment on "If precautionary deposition velocities were to be used for nitrogen (including amines, nitrosamines and nitramines), there is the likelihood that the predictions would show nitrogen deposition poses an unacceptable risk to other ecological sites too."</p>
246-247	9.28 (246 – 247)	<p>The applicant's response refers to REP2-107 and REP3-009 but REP2-107 does not consider acid impacts and REP3-009 is focussed on determining applicable critical loads. The concern remains that the significant critical load exceedance means acidic pollution is likely to cause significant ecological harm.</p>
248 a	9.29 (248)	<p>The applicant's response acknowledges the river level fluctuations. The response repeats the applicant's view that "the high acid neutralising capacity of the river means the minor in-combination acid deposition that would occur would not trigger Likely Significant Effects (LSE) to the riverine habitats present, regardless of the proportion of riverine vegetation that is above or below the surface of the water at any given time" but the response provided no evidence that lichens, bryophytes, plants, invertebrates, amphibians and floating vegetation (identified as a feature) will not be adversely affected. All of these are potentially vulnerable to acidic air pollutants directly rather than through river water or soils. The applicant's response recognises the presence of alluvial woodland but not other alluvial vegetation (which is a protected feature and may be exposed more at times of low water level) and not the lichens and bryophytes that are part of the overall alluvial woodland habitat and have the potential for being impacted by acidic pollution.</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
248 b	9.29 (248)	<p>The Applicant's response says the woodland in proximity to the River Derwent SAC and SSSI is primarily 'alluvial woodland'. Whilst the SAC citation refers to alluvial forests as a designated feature, this does not mean that riverine woodland is not also present nor that it is not of significant importance to the river's ecology. Aerial images show there to be riverine woodland. It is highly likely that riverine woodland is vital to the ecosystem including important habitat for species such as otters. The impact on riverine woodland, and any other species it supports, including lichens and bryophytes, should be assessed.</p> <p>The applicant's response considers the applicant's revised ammonia predictions and reports these as under the screening threshold for Lower Derwent Valley but these predictions do not take significant uncertainties into account, such as the uncertainties inherent in the modelling software system and measurement uncertainties. These cumulative uncertainties must be quantified in order to ensure the ammonia screening threshold is unlikely to be exceeded at Lower Derwent Valley and other important ecological sites.</p>
248 c	9.29 (248)	<p>The applicant's response does not show beyond doubt that acidic air pollutants will not cause harm to habitats and protected species.</p>
260-261	9.30 (260 – 261)	<p>The applicant's response points out that the nitrogen levels considered by the referenced study are large compared to the predicted increased nitrogen from the proposal. The reference was included to show that the species is sensitive to nitrogen. Just because the study considered larger nitrogen levels does not mean that smaller increases in nitrogen will not harm the rare orchids that are present. The applicant considers that "there is no prospect of operational nitrogen deposition impacts, including cumulatively with other plans and projects, detrimentally affecting the green-winged orchid population" but has not shown that the expected nitrogen increases will not harm this rare orchid perhaps as a result of other species out-competing this rare orchid for habitat. Biofuelwatch requests that the ExA require the applicant to</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		provide supporting evidence for their claim that “there is no prospect of operational nitrogen deposition impact ... affecting the green-winged orchid population”.
262-264	9.31 (262 – 264)	<p>The applicant's response includes “A number of the bird species were recorded in areas that were relevant to the assessment of ecological effects when the Drax Jetty was part of the Proposed Scheme, but were not recorded in areas that are relevant to the assessment of effects of the Proposed Scheme following removal of the Drax Jetty. These include for example marsh harrier, which was only recorded adjacent to the River Ouse, in excess of 2 km from the Proposed Scheme current Order Limits.”</p> <ol style="list-style-type: none"> <li>1. Strandberg et al. “Complex Timing of Marsh Harrier <i>Circus aeruginosus</i> Migration Due to Pre- and Post-Migratory Movements” found Migrating Marsh Harrier (<i>Circus aeruginosus</i>) make substantial post-migration movements (up to 632 km) after arriving at wintering grounds. Biofuelwatch asks the applicant why marsh harriers found nearby cannot be impacted by the proposal.</li> <li>2. Whilst “a number” of the bird species were recorded in areas relevant when the Drax Jetty was part of the scheme, others were not. Does the applicant accept that the proposal is likely to impact some of the protected and notable species identified in the applicant's ecology report?</li> </ol> <p>The applicant considers it wants to “correct the record” in relation to paragraph 264 saying “the paragraph being quoted refers to Nationally, not Internationally important sites”. Biofuelwatch would point out that the listed sites include sites that also have SAC status and therefore are of international importance.</p>
275-276, 394-397	9.4 (Paragraphs 394 to 397)	The applicant considers that a drainage strategy will be in place for the containment of leaks (e.g. 9.4 in response to paragraphs 394-397). The applicant has not responded to how daily checks will be done to detect potential pollutants that may be harmful to the environment in quantities that observation may be unable to detect.

<a href="#">[REP2-073]</a> Paragraph	<a href="#">[REP4-020]</a> Reference	Biofuelwatch's Comments on Applicant's Response
		<p>Drax's fire prevention plans have not prevented the significant fires that have occurred at Drax. Biofuelwatch is concerned that the applicant's drainage strategy will be similarly unable to protect the plant from leaks and accidents of the proposed chemicals - including chemicals with extremely high toxicity to aquatic systems. The widely reported pollution of rivers throughout the UK shows EA regulation to provide inadequate protection.</p>
284-286	9.32 (284 to 286)	<p>The applicant considers the need for a sett exclusion/disturbance licence to be an "unlikely event" but since monitoring of badgers has not been carried out to identify the status of badgers and setts prior to the application, the application lacks evidence to support the view that such a licence would be "unlikely". Biofuelwatch notes that the applicant has said " that no further badger surveys have been completed by the Applicant since the surveys that informed the Environmental Statement were completed and does not intend to complete further surveys at any point during Examination of the Proposed Scheme." (4.10 of <a href="#">[REP4-020]</a>). Biofuelwatch considers such a survey should be done prior to the application being determined so the ExA can properly consider the impact of the proposal on badgers.</p> <p>Natural England receives a licence fee for the issue of licences for the closure of badger setts. An independent observer may consider the conflict of interest that arises from the receipt of fees for issuing such a licence compromises Natural England's independence on this matter. Badger setts may "regularly" be closed under such licences, as indicated in the applicant's response, but the regularity of an event is not a satisfactory justification for harm to a protected species.</p> <p>The applicant says "unnecessary closures of badger setts should always be avoided where practicable". Biofuelwatch agrees. Biofuelwatch considers the proposal to be unnecessary because there are better ways to decarbonise the electricity supply with less environmental impact, risk and cost. Biofuelwatch considers any risk of closure of badger setts to be unnecessary and avoidable.</p>

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>Biofuelwatch's request remains that the ExA asks Natural England why it might be "satisfied" that the destruction of badger setts would not adversely affect the nationally protected badger.</p> <p>Without further surveys there are no assurances that badgers will not be impacted.</p>
387	9.1 (Paragraph 387)	<p>The applicant has responded that "a temporary / construction phase drainage system will be implemented (REAC [WE8] ([REP2-053], to be updated at deadline 3) this will prevent an increase in contaminants (particularly silt and gravel) being discharged to the Carr Dyke and River Ouse". This is welcome, but the response does not confirm a risk assessment will be included.</p>
390	9.2 (Paragraph 390)	<p>Drax's response considers only the process wastewater treatment plant and gives no consideration to the possibility that the wastewater treatment plant will not be 100% effective nor the possibility of other leaks/discharges of amines.</p>
392	9.3 (Paragraph 392)	<p>Drax's response says "the Proposed Scheme does not affect the baseline position in relation to drought" but it remains the case that the applicant's assessment does not give consideration to the ecological impact of water abstraction in a period of drought. Drax's response says "it is also worth recognising that the River Ouse is tidal at the point of abstraction and hence a drought affecting the river would be extremely unlikely" but the applicant has provided no evidence that tidal characteristics make it "extremely unlikely" that a drought would not affect the river.</p>
399	9.5 (Paragraphs 399 to 401)	<p>The applicant's response says Drax Power Station is required to comply with specific requirements and operates a Major Accidents Prevention Policy (MAPP). The response considers the risks associated with the various substances onsite are carefully assessed and controlled. Since the applicant claims to carefully assess and control risk, will the applicant explain why its application did not identify important risks identified</p>



<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch's Comments on Applicant's Response</b>
		<p>in Biofuelwatch's representation such as the risk of explosion resulting in a major release of the amine based solvent? If risks have been assessed "carefully", the applicant is yet to explain why the "Significance" of fires is considered "Not Significant" even though risks from fire can be very large. Drax has clearly not prevented fires from occurring and yet the pollution emitted from fires is not included in the applicant's list of pollution incidents. It is difficult to have confidence in the applicant's risk assessments when important risks are not included or the potential significance of them not recognised.</p> <p>The applicant's response does not address the inconsistency between the assessment of risk as "low" and the significant fires that have occurred. The applicant's response that the "risk of these events has been considered 'low' due to the existing regulatory mechanisms that are in place" only serves to emphasise the inadequacy of the "existing regulatory mechanisms" which have clearly not prevented significant fires from occurring. Biofuelwatch submits that fires that have occurred shows the applicant's confidence in fire protection and detection standards is misplaced and asks the ExA to give consideration to the failure of these standards to prevent previous fires. Biofuelwatch also asks the ExA to give consideration to the increased potential harm to human health and the environment that would arise from the proposal, with the toxic pollution in the event of a fire. Biofuelwatch considers these risks have not been adequately addressed.</p> <p>The applicant's response shows Drax considers itself to be a "competent and responsible operator". Since the applicant's competence and responsibility has not prevented significant fires, Biofuelwatch assumes that the applicant considers such fires to be unavoidable. Biofuelwatch asks the ExA to consider whether the site is appropriate for the proposal when the potential risks include the potential for major unavoidable fires of flammable and toxic solvents with the potential for huge ecological and human health harm.</p>
400	9.5 (Paragraphs 399 to 401)	In response to Biofuelwatch questioning the likelihood of many events associated with a changing climate assessed by the applicant as low, the applicant only responded with "With regard to climate events, the

<b>[REP2-073] Paragraph</b>	<b>[REP4-020] Reference</b>	<b>Biofuelwatch’s Comments on Applicant’s Response</b>
		Proposed Scheme will be constructed using materials that comply with current UK Building Regulations and BE EN codes. Where no BS EN code exists, the Eurocodes and ISO standards will be adopted.” This does not adequately address the specific risk assessment examples raised.
404	9.6 (Paragraph 404)	The applicant considers that “The use of ‘reasonable’ or ‘realistic’ worst-case is EIA standard practice and refers to the “Rochdale envelope” and refers to PINS advice note 9. However, PINS 9 quotes Judge (Sullivan J. (as he then was)) in Milne (No. 2) (“the Judgment”) and says “It is important that these should be adequate to deal with the worst case ...”. The applicant’s ‘reasonable worst-case’ is not adequate to deal with the worst case and the applicant has not assessed the “likely significant’ effects should the worst case occur. Biofuelwatch considers the applicant’s use of ‘reasonable worst case, ‘realistic worst-case’ and ‘a worst-case’ to be insufficiently precautionary for the assessment of impacts on important ecological sites and insufficiently precautionary for the protection of human health.

### Important Matters Unaddressed By Drax’s Response

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
8-14	Burning Trees to Generate Electricity is Not Sustainable.	Drax’s Independent Advisory Board H2 2022 update <sup>4</sup> said ‘Drax should reassess its criteria for determining carbon neutrality. For example, Drax should move away from saying “carbon stocks are increasing/stable” and stating biomass is carbon neutral.’ Given the need (as expressed by Drax’s own advisors) for Drax to

<sup>4</sup> [https://www.drax.com/wp-content/uploads/2023/03/IAB-HY-update\\_HY2-2022\\_Final.pdf](https://www.drax.com/wp-content/uploads/2023/03/IAB-HY-update_HY2-2022_Final.pdf)

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
		<p>cease stating biomass is carbon neutral and the need for Drax to cease saying carbon stocks are increasing/stable, it is clear that Drax’s combustion of trees for electricity should not be considered sustainable.</p> <p>The applicant says in [REP4-020] “The Applicant’s position is that biomass is zero rated at the point of combustion, not that it is carbon neutral.” There clearly are considerable carbon emissions from combustion. This zero rating is effectively an accounting trick that shifts Drax’s emissions to the forestry sector because the increase in forestry sector emissions arising from Drax has not been determined. Biofuelwatch argues that such emissions are considerable because, as Drax’s scientific advisors point out, carbon stocks are not stable. The applicant considers its approach “aligns to guidance from the IPPC, the GHG protocol and the UK Environmental Reporting Guidelines for quantifying emissions of GHG from biogenic sources, such as biomass, where emissions are rated as zero” but Biofuelwatch submit that none of these bodies, and specially not the IPCC, would support overall increased greenhouse emissions from a failure to consider the full impacts of a plant. The applicant says nothing about the IPCC’s warning that the use of bioenergy can increase emissions.</p> <p>Carbon stocks are not stable and Drax’s combustion of biomass is not carbon neutral. Such a development is not sustainable. The ExA may consider that the proposal could achieve carbon neutrality (or perhaps be carbon negative), but this is far from certain because of the huge uncertainties in the proposal itself, the failure of similar plants elsewhere to live up to expectations,</p>

<a href="#">[REP2-073]</a> Paragraph	Issue	Additional Comments from Biofuelwatch
		and because the proposal is dependent on other components outside the scope of the DCO (such as the pipeline and carbon storage). Furthermore, since carbon stocks are not stable, the continued unsustainable removal of biomass from the environment shows Drax cannot be considered sustainable regardless of any assessment of the greenhouse gas emissions. (Please also see separate our submission with further details on Drax's Advisory Board's recommendations)
15-21	Conformity with Government Policy	Since the statement from Drax's scientific advisors shows carbon stocks are diminishing (or likely diminishing) and that the combustion of trees is not carbon neutral, the proposal should not be considered to be "renewable". The proposal will reduce available energy generating capacity, has significant risk and so should be considered neither renewable nor sustainable.
22-32	Air Quality as an Examining Authority Consideration	
39-40	The predicted more than doubling of existing peak short-term contributions to NO <sub>2</sub> at many of the studied locations and Drax's consideration that such dramatic adverse impacts are "negligible"	
41	Biofuelwatch consider that the worsened air quality arising from the predicted amine and nitrosamine pollution has greater impact than the applicant's assessment of "slight adverse"	
42	Biofuelwatch's outline of the important matters for consideration	
43-49	The proposal will result in pollutants toxic to human health for which there is no known safe level. Environmental level	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	increases of such pollutants inevitably harms human health, increases the harm to human health that the plant already causes and that such pollution causes “a significant burden”.	
50-53	Current regulations and air quality standards, as currently implemented, do not prevent harm to health and have not prevented Drax from contributing to that harm over a large area (because of its high stack).	Drax’s response to Biofuelwatch’s submission 2 representation [REP2-073] mentions matters that it considers to be matters for the Environment Agency and the permitting regime, but this does not address the concern that the Environment Agency and the permitting regime do not prevent harm to health. The Environment Agency may say it will not permit “significant” pollution, but the EA’s use of the word “significant” does not appear to be the normal English language use of this word because the government accepts that pollution, which is permitted by the EA, already causes a “significant burden” and harm to health. Such a “significant burden” should be considered significant pollution by the ExA and the ExA cannot assume the Environment Agency is able to prevent such significant pollution.
54	The government-recognised Air Quality Health Emergency	
58	That figures be provided to show the sensitivity analysis results for nitrosamine and the cumulative nitrosamine concentrations	Many uncertainties in the predicted nitrosamine concentrations have not been assessed nor the cumulative impact of all these uncertainties nor the potential cumulative nitrosamines contractions taking all uncertainties into consideration.
60	Biofuelwatch asks that, as a precautionary approach, the modelling assumes that emissions are already at the maximum level that may go undetected with existing monitoring equipment.	The modelling assumes no existing nitrosamine emissions but this is unlikely. The modelling also assumes no existing background nitrosamines. Biofuelwatch is not aware of any existing monitoring equipment, but existing emissions levels and environmental levels must be measured and included in the assessment. There may already be significant levels of

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
		nitrosamines so the applicant has provided insufficient information to demonstrate that the proposal will not result in exceedances of EALs. Furthermore, the applicant's reply recognises the difficulties of environmental nitrosamine measurement so Biofuelwatch requests the ExA give consideration to the high level of risk that is likely (assuming EA regulation) and the inappropriateness of the location given such a high level of risk.
63	Annual average environmental concentrations from just Keadby 3 are predicted to be up to 54% of the EAL, with 47% of the EAL at one of the studied sensitive receptors. Uncertainties make these figures even higher with the Keadby 3 applicant showing exceedances of the EAL by a factor of 5 in some scenarios	Whilst the applicant's reply gives some consideration to cumulative impacts, it makes no mention of the predicted levels from Keadby 3 that are already a high percentage of the EAL and, in some scenarios, already very significantly exceed the EALs. Biofuelwatch does not understand how the applicant can consider <i>any</i> further increase in such levels to be acceptable.
66 f	Biofuelwatch considers that predictions should be made of the cumulative harmful amine breakdown products (such as nitrosamines) to account for: ... Amine breakdown chemistry (and uncertainties of that chemistry).	There remains no consideration of the potential cumulative uncertainty that takes uncertainties in the amine breakdown chemistry into account.
73-74	Biofuelwatch requests that the Examining Authority gives consideration to the very limited number of such plants that the area will be able to support if pollution is not to exceed safe levels. This very limited capacity for the local area to support carbon capture plants should be seen as a valuable resource, especially with the proposed pipeline in the area and the considerable pipeline extension costs that would be incurred if plants were to be located further away. Efficient use of limited resources is an important planning consideration ...	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
79-81	The cumulative nature of uncertainties and the way uncertainties are usually quantified.	The applicant has not responded. Biofuelwatch requests that ExA ask the applicant why they have not quantified uncertainties with 95% or 99% confidence interval bounds. Biofuelwatch is concerned that the uncertainties are so great that the applicant is unable to quantify them.
86, 98	There is a lack of independent validation from which to reliably and accurately estimate the uncertainty arising from these modelling tools. The validation done by the developers uses scenarios known to the developers when the modelling tools were created, so it is not surprising that the tools have been created to perform well for the validation scenarios. It can be expected that errors in other situations will exceed those used for validation.	Whilst the applicant has responded with some consideration of validation (considered in the previous subsection), the applicant has not responded to the concern that the knowledge the developers have of the validation scenarios during software development and testing means the tools can be expected to be less accurate in non-validation scenarios.
99	The two most widely used modelling software systems can produce very different results this shows that the predictions can be subject to considerable uncertainty just from the software systems themselves.	
101	ADMLC says an extended section on modelling input data, possibly with many sub-sections should be provided and lists many matters that should be provided. ADMLC guidance says the model will be sensitive to mass emission rates, efflux velocity, efflux temperature, terrain, buildings - but it is unclear whether these uncertainties have been considered and how they may affect the results. There are also important modelling parameters used by ADMS such as “surface roughness”, modelling grid size and others which can impact the results. To consider just one such parameter, “surface roughness”, the applicant has selected a “surface roughness” value of 0.2 that	The applicant has not responded to these points. Biofuelwatch remains concerned that the air quality assessment does not appear consistent with ADMLC guidance nor does it appear to have used worst-case values for important modelling parameters such as surface roughness.

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	<p>corresponds to a minimum surface roughness for agricultural use. Agricultural land can, however, have a higher surface roughness. The immediate vicinity of the emissions is also far from purely agricultural. The site itself is a large and complex industrial site and the surrounding area has trees and other buildings. Biofuelwatch has not found an assessment of the uncertainties arising from the applicant's selection of "surface roughness" in the applicant's Environment Statement.</p>	
<p>103-104</p>	<p>The applicant's assessment is not to the standard required by the EA which says: "You must show that you have estimated the level of uncertainty in your predictions." An estimate of the uncertainty of prediction should be considered essential for any application of predictions for the assessment of health or ecological risk.</p>	<p>Despite the applicant's response to the concerns about uncertainty, there is still no quantified estimation of the cumulative uncertainty. It is difficult to see how the ExA can weigh the health and ecological risk of the proposal when uncertainties remain quantified.</p>
<p>131</p>	<p>If the applicant considers Karl 2009 authoritative for the consideration of deposition, it appears inconsistent to use an alternative [higher] threshold level for human health.</p>	
<p>132-136</p>	<p>The recognised need for EAL revision and updated regulation.</p>	<p>Biofuelwatch does not understand how the ExA can consider the proposal adequately safe when the application attempts to assess the proposal using an assessment framework (such as EALs) and regulatory framework that is recognised as inadequate and in need of updating.</p>
<p>145-150</p>	<p>Biofuelwatch is concerned that the application lacks evidence for the efficiency figures and remains concerned that the applicant has not carried out "realistic pilot or full scale tests using fully representative or actual flue gases" as required by the EA Guidance. Biofuelwatch remains concerned that the solvent's</p>	<p>Biofuelwatch does not consider that the ExA can adequately assess the appropriateness of the proposal at the location when so much information is missing and when the proposal cannot be compared to alternatives (such as a process using different solvents). Biofuelwatch does not consider a consultation that</p>



<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	behaviour, particularly with regard to nitrosamine formation, could be very different when used on a woody-biomass power plant which has a significantly different emissions profile than a comparatively-clean gas-fired plant. Biofuelwatch remains concerned that the application lacks information on how the formation of nitrosamines using this solvent compare with other choices and how the toxicity of the particular nitrosamine products with the proposed solvent compare with alternatives.	does not include such important information to be a meaningful consultation.
154	The ES is not in accordance with SEPA recommendation and gives insufficient detail for the pollution impacts to be fully and accurately assessed.	
155	The considerable uncertainties are compounded further still, when, as in the case with this proposed development, the solvents themselves are claimed to be proprietary and details of the formulation have been withheld. This makes it impossible to robustly assess the health impacts of the proposed development.	
156	There are no real world examples on which to assess the release of amine degradation products from BECCS with woody biomass. Drax admits this is the first project of its kind globally. Since scientific understanding of the chemistry is still poor, there is the possibility of much greater impacts arising from the use of woody biomass than with fossil fuels. This could result in higher levels of nitrosamines than expected or, potentially, compounds with increased toxicity. Biofuelwatch considers these uncertainties have not been adequately considered.	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
157	The applicant's predictions are made using the ADMS Amine Chemistry Module. This module was produced in 2016 and aims to simulate reactions shown in a 2011 report. Biofuelwatch has found no updates to the module to account for results of pilot carbon capture installations or recent research. The ADMS predictions may therefore not reflect the latest scientific understanding of nitrosamine formation and dispersion.	Whilst recognising there may not be other commercially available modelling software for amines and amine breakdown products, the applicant does not appear to have given considerations to whether the predictions may not reflect the latest scientific understanding of nitrosamine formation and dispersion.
159-163	The comments from Alun Roberts-Jones on behalf of the EA show the considerable uncertainties regarding the assessment method.	The applicant has made no response to these comments. The uncertainties in the nitrosamine modelling approach remain unquantified.
177	Biofuelwatch requests the applicant provides additional explanation to support the modelling assumptions. Why was the initial design mass emission data provided by MHI no longer representative of the proposed BECCS plant? What has changed?	
182-187	DEFRA considers PM <sub>2.5</sub> modelling inadequate for the assessment of environmental targets yet the application is using modelling to assess health and ecological impacts when the modelling of amines and amine breakdown products is subject to considerably more uncertainty than PM <sub>2.5</sub> .	The applicant has not explained why modelling results, which Defra considers inadequate for the assessment and enforcement of environmental targets, are adequate to assess the proposal's impacts and provide protection of human health and the environment.
214	The breakdown rate also depends on the source with synthetic amines taking longer to breakdown. Consideration must be given to whether the breakdown figures used reflect the proprietary solvent used.	.
215	Biofuelwatch considers the applicant has provided insufficient evidence and especially insufficient consideration of	Biofuelwatch is unaware of any amendment to the ecology assessment or the HRA that takes the cumulative uncertainty of

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	uncertainties and the limitations of current scientific knowledge, to be confident that such impacts are of “minor magnitude” and “reversible”	the applicant’s modelling predictions into consideration.
217	There is a risk that chemically produced N-nitrosamines and N-nitramines can accumulate in the surrounding environment and endanger human health. It is therefore unclear that air dispersion modelling alone (even if the chemistry and the solvents under consideration were fully understood) would be able to fully assess the risks to human health and the environment.	
226-234	The proposal can be expected to harm Thorne Moor and other important ecological sites (evidence given)	
231	The consideration of impacts of the applicant’s ecology report does not appear to have been based on cumulative impacts with the section on cumulative effects limited to just one paragraph. The cumulative impacts are greater than considered in the ecology report and shown above. However, despite this, the ecology report still considers that the proposed mitigation does not bring all impacts below the insignificance threshold.	
245	In Landelijke Vereniging tot Behoud van de Waddenzee v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (Case C-127/02) [2005] 2 CMLR 31, the Grand Chamber of the European Court of Justice considered that the Habitats Directive must be interpreted in accordance with the Precautionary Principle. Harris & Anor v Environment Agency [2022] EWHC 2264 (Admin) (06 September 2022) established that the Habitats Directive has continuing “direct effect” meaning that it continues	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	to stand independently of the Conservation of Habitats and Species Regulations 2017. Biofuelwatch considers that the applicant’s air quality predictions are not sufficiently precautionary for compliance with the Habitats Directive. Biofuelwatch requests that all sources of uncertainty are listed and quantified to support a quantified estimate of the cumulative uncertainty of the modelling predictions.	
249-256	Non-Statutory Designated Sites	The applicant has made no comment on the likely impact on non-statutory designated sites nor the lack of protection provided by the Environment Agency and Natural England to such sites.
257-259, 265-269	Impact on Protected and Notable Species	
270-273	The need for new surveys rather than the outdated surveys used.	
274	As many of these species are mobile, there are concerns that the development could impact in some cases on populations of local or county value and the mitigation proposed may not be sufficient for all species.	
277, 292	The proposal will lead to the disturbance and degradation of vital habitats and so risk harming a wide range of protected species. The proposal is therefore not a sustainable development as defined by the National Planning Policy Framework. The proposal is also not a sustainable development as defined by the National Planning Policy Framework because it fails to protect the natural environment or enhance biodiversity by “minimising impacts on and providing net gains for biodiversity,	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	including by establishing coherent ecological networks that are more resilient to current and future pressures.”	
277-278, 293	<p>It fails to protect the natural environment or to enhance biodiversity, and is incompatible with:</p> <ul style="list-style-type: none"> <li>a. Commitments made in the Environment Act 2021 to support the “conservation and enhancement of biodiversity in England”</li> <li>b. The aims of the Defra Nature Recovery Green Paper (March 2022) “to address the drivers of nature’s decline including habitat deterioration, loss and fragmentation”.</li> </ul> <p>The proposed development will adversely impact nationally- and internationally- designated areas that cannot be adequately mitigated or compensated for.</p>	
280	<p>In reference to 2.1.4 Table 12.6 Surface Water Features within the study area that have the Potential to be Affected by the Proposed Scheme, we echo concerns raised by the EA regarding the recorded presence of Great Crested Newt, a protected species and therefore a ‘sensitive receptor’ in contrast to Drax’s statement that these ponds are not considered ‘sensitive receptors’. We are concerned about this downgrading of habitat for protected species, and would welcome comments from the Wildlife Trust on this issue.</p>	

<a href="#">[REP2-073]</a> Paragraph	Issue	Additional Comments from Biofuelwatch
281	Biofuelwatch concur with the points made in Part 1 of the Natural England response. In particular the lack of certainty as to impacts on Internationally and Nationally Designated sites due to loss of functionally connected land and potential impacts due to traffic emissions.	
282	Natural England requested “Clarification on scenarios used to assess the impacts from aerial emissions”. An updated comment/detailed advice from Natural England on aerial emissions does not appear to be available.	
283	Paragraph 2.1.3 of “Natural England’s comments in respect of Drax Bioenergy with Carbon Capture and Storage Project, promoted by Drax Power Limited” (5 Sep 2022) <a href="#">[AS-011]</a> is missing, raising the concern that important comments from Natural England may have been accidentally omitted.	
287-293	Expected impacts and incompatibility with policies.	
296-318	Climate Change Policy Framework	
319-323	Implications of the Emissions Trading Scheme	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
324-328	Examples of other plants	
329-344	Lack of Evidence to Support CO2 Removal Performance using BECCS	
345-350	Calculation of Emissions Associated with Production of Chemicals	
351-365	Greenhouse Gas Emissions - Inaccuracies and Omissions in the Application	
366-377	Importance of Other Sustainability Factors	
378-381	Summary of Greenhouse Gas Impacts	
382-385	Flood Risk	
386	Within table 12.2 of the Environment Statement <a href="#">[APP-048]</a> , Elements Scoped Out of the Assessment it is stated that for Foul Water Treatment: No discharge to Yorkshire Water sewers during construction and / or operational phases is proposed. As the EA notes in paragraph 2.1.2 of <a href="#">[RR-051]</a> , this is in conflict with document 3.1 Draft Development Consent Order Schedule	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
	1 [AS-076] - Work No. 1 (f) (viii) Work No. 1D “common supporting infrastructure including – (aa) a wastewater treatment plant”. We agree with the EA that Drax should not be allowed to scope out the drains listed in 2.1.3 of [RR-051].	
388	In reference to 2.1.5 of [RR-051], section 12.9 [APP-048] Preliminary Assessment of Likely Impacts and Effects should clarify why from the surface water receptors identified as ‘sensitive’, only three are assessed in relation to increased pollution from silt and sediments	
389	We echo the EA in asking for clarity as to whether Drax is implying that none of the other waterbodies will be affected, or they are omitted because they have not been assessed. Moreover, the changing weather patterns already experienced through climate change mean that extreme rainfall events are more intense, more protracted and increasingly frequent. Risk assessment of the site run-off needs to model widely anticipated extreme weather events and flooding around the site. Prolonged heavy rain could easily carry toxic matter or contaminated water between drains. We are currently not confident that the site bunds are sufficient to isolate the site from flooding from the Ouse and Aire river systems between now and 2050.	



<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
391	No reference in Drax’s application to occupational exposure (either by water, aerosol or air) to amines and its degradation products.	
398	Some desiccants are extremely reactive and toxic. Further information is needed on the desiccant and any potential risks arising from its delivery, use and destruction.	
401 a, 402-403	Biofuelwatch asks the Examining Authority to give consideration to: ... a. whether the applicant’s assessment of risks arising from increased temperatures and weather events have been appropriately assessed and considered given the high temperatures recorded in 2022	
401 b	Biofuelwatch asks the Examining Authority to give consideration to: ... b. Whether sufficient consideration has been given to the mitigation of these risks, for example, the “Increased wind loading on Main Stack compromising the structural integrity” is considered a “Significant” risk but no mitigation appears to be stated. The Scoping Opinion specifically mentioned that if “further works/mitigation would be required” then these should “be described in the ES and cross-reference provided to any relevant documents, including to where they are secured”	

<b>[REP2-073] Paragraph</b>	<b>Issue</b>	<b>Additional Comments from Biofuelwatch</b>
405	Biofuelwatch notes Drax has been accused of health and safety breaches which raises questions over whether operational procedures, and governance are adequate to protect human health. It is alleged that these breaches occurred over an extended period,. Since HSE brought the case against Drax, it would appear that the HSE must consider that regulation, and how it is enforced, did not (and perhaps could not) prevent ongoing breaches over many years.	Whilst Biofuelwatch understands HSE have now dropped the case, the concerns remain over whether operational procedures, and governance are adequate to protect human health.
406-408	Assessment of risks	
409-410	Weighing benefits against the risk of adverse impacts	