WEST CUMBRIA MINING

19

Woodhouse Colliery

Planning Application 4/17/9007 Environmental Statement

Chapter 19 Greenhouse Gas Emissions

April 2020

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INTRODUCTION AND PROJECT OVERVIEW

1. This is an additional chapter to the Environmental Statement.

2. WCM submitted its original request for a scoping opinion on 4 February 2016. Given that the request for a scoping opinion was submitted before the commencement of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ("the 2017 Regulations"), the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 ("the 2011 Regulations") continue to apply to this application in accordance with the transitional provisions.[1]

3. In contrast to the 2017 Regulations,[2] there is no express specific requirement for an environmental statement prepared under the 2011 Regulations to include information on the nature and magnitude of greenhouse gas emissions.

4. The 2017 Regulations, which transpose the consolidated requirements of Directive 2014/52/EU ("the 2014 Directive") into domestic legislation, introduced a specific requirement to include a description of the likely significant effects of the development on the environment resulting from the impact of the project on the climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.[3] As the introduction to the 2014 Directive explains,[4] these additional requirements were introduced because of the increasing importance of climate change over the last decade and the need to ensure that the impact of projects on the climate (including, for example, greenhouse gas emissions) are assessed and taken into account in the decision-making process. However, the introduction to the 2014 Directive also confirms that, in accordance with the principles of legal certainty and proportionality, transitional measures are required to ensure that the regulatory environment in relation to environmental impact assessment is not altered where any procedural steps have already been initiated under the existing regime.

5. The Council has adopted a scoping opinion on 1 June 2016 ("the Scoping Opinion"). Amongst other things, this stated that:

> *"3.67 The ES should include detailed information about the nature of the coking coal, the carbon implications of its extraction and utilisation, including any assessment that may be required with regards to climate change, and the current and anticipated future outlook in respect of demands/markets. The transport implications in respect of likely markets should be considered and impacts upon the lifespan of the mine (if demand is higher or lower than stated in the Scoping Report) should be addressed."*

6. These matters were addressed in Chapters 3 and 5 of the original ES under the heading of sustainability.[5] The assessment explained that the coal produced by WCM would replace an equivalent volume of coal that is used in the UK and Europe which is currently being imported primarily from the east coast of the USA. It also set out the estimated CO_2 reductions that would result from the significantly reduced transport distances. Finally, consideration was given to the steps that would be taken to ensure energy efficiency and a reduction of emissions during the mining operation. It is considered that this information, which was produced having regard to current knowledge and methods of assessment at the time of its preparation, was sufficient to meet the requirements of the 2011 Regulations and the Scoping Opinion.

   A number of updates are being made to the ES to take into account some changes proposed to the internal coal processing. This means that consideration of the proposed development will in any event return to relevant committee of the minerals planning authority for consideration. In addition judicial review proceedings have been brought (claim number CO/4880/2019) against the Council's previous resolution to grant consent to the proposed development. Permission to proceed with those proceedings has been granted by the court by order dated 4 February 2020 but as of yet, no date has been set for a substantive hearing. Both the Council and WCM are defending

[1] Per regulations 76 of the 2017 Regulations.
[2] See paragraph 5(f) of Schedule 4 to the 2017 Regulations.
[3] See paragraph 5(f) of Schedule 4 to the 2017 Regulations.
[4] See paragraphs 7, 13 of the introduction to the 2014 Directive.
[5] See paras. 4.2.8 – 4.2.33 of Chapter 4 and 5.5.8 – 5.5.12 of Chapter 5.

the proceedings and consider the challenge has no merit. However, notwithstanding and without prejudice to the parties respective positons the high court practice requires parties to consider whether there are alternative ways in which their disputes can be addressed outside the court. Accordingly, given the above circumstances, and without prejudice to WCM's position in those proceedings the opportunity has been taken to provide further updates and clarification on greenhouse gas emissions amongst other things in order to help to eliminate, or in any event, minimise areas of possible dispute.

7. Appended to this Chapter (Appendix 2) is a report, prepared by AECOM,that has been commissioned to assess the impact of the Proposed Development on the climate as a result of greenhouse gas emissions. This report also incorporates and addresses the updated, and additional, requirements of the 2017 Regulations[6] for this section of the ES even though, for the reasons already set out above, the assessment is lawfully required only to meet the requirements of the 2011 Regulations, which continue to apply to the consideration of this application. Its inclusion is therefore without prejudice to the fact that the ES in this respect and as a whole in this case is required to only meet the requirements of the 2011 Regulations.

8. Amongst other things the AECOM Report assesses the greenhouse gas emissions that are calculated to be caused by the construction, operation and de-commissioning of the Proposed Development.

9. The AECOM Report makes clear that for the purpose of EIA Directive assessment it does not consider the greenhouse gas emissions caused by using the coal that is produced by the Proposed Development, or its onward transport beyond the first point of distribution,to be environmental effects which are required to be included in the EIA Directive assessment.

10. As stated above GHG emissions caused by the use of WCM coal in steelworks, are not considered to be indirect (or secondary) effects for the purposes of the EIA Directive for the reasons summarised in (i) below (see further e.g. Section 3 of the AECOM Report) . However, notwithstanding those reasons, AECOM has also addressed the matter on the basis that they are capable of being indirect effects for the purpose of the EIA Directive, but, for the reasons summarised at (ii) below, consider that they would not amount to any GHG emissions that would be significant or materially different to the existing baseline:

    i. Environmental impacts caused by the use of coal produced by the Proposed Development are not an effect (whether direct, indirect, or secondary) of the development that is required to be assessed by the EIA Directive. In other words, the use of metallurgical coal as part of the manufacturing process of steel, is not an "indirect effect" (or "secondary effect") of the Proposed Development - i.e. the extraction of coal process. By contrast for example the consumption of electricity or other materials with embedded emissions by the Proposed Development are capable of being direct or indirect effects). Nonetheless any resulting environmental effects or reduction in such effects caused, for example, by the transportation and incineration by steel plants may be capable of being a material consideration in respect of this Proposed Development.

    ii. In any event and without prejudice to the above even if the use of coal produced at the WCM coal mine at Steel works were capable of giving rise to "indirect or secondary effects" which needed to be considered under the EIA Directive, in this case the use of the WCM coal produced by the Proposed Development would not, as assessed by AECOM, give rise to any additional environmental impacts above the existing baseline (of "Do Nothing") , because as explained in the AECOM Report (also evidenced elsewhere in the application documentation) it would simply be replacing coal that is already being used in existing steel works or else would otherwise be supplied from existing sources elsewhere for any future steel works. Based upon the evidence before it and upon the professional judgement of AECOM,[7] the Proposed Development would not give rise to any additional effects as a result of its coal being burnt at steel plants. Any such effects would not be significant or materially different from the existing baseline should the proposed development not be granted planning permission (the "Do Something" scenario in the AECOM Report).

[6] Regarding the assessment of GHG emissions.
[7] Which take into account amongst other things the expert opinion of Dr. Bristow (see Appendix 1)

11. The direct and indirect/secondary effects from GHG emissions of onward transportation and distribution have been assessed as follows:A proportionate approach has been taken in order to ensure that the assessment captures the direct and indirect (and secondary) effects of the GHG emissions caused by the onward transportation of coal produced by the Proposed Development. This has been achieved by taking into account GHG gas emissions generated from transportation from the Development Site to the point of first distribution. This includes the GHG emissions of all rail transportation of coal from the Rail Loading Facility to UK Steelworks (at Port Talbot and Scunthorpe) or the Port at Redcar. As a matter for professional judgement, rail journeys from the RLF are considered to be an indirect effect of the operation of the Development, whereas further onward distribution beyond those rail journeys are not. This acknowledges the need to transport coal away from the Development site, whilst recognising that onward distribution beyond the point of first distribution (e.g. international shipping) should properly be regarded as the indirect GHG emissions of another development (e.g. the port) and/or the upstream indirect effects of the development (e.g. Steel works) where the actual consumption of the product for energy as part of the production of steel takes place

12. The source of these emissions in this particular case also coincide with GHG emissions that would contribute towards the UK's "carbon budgets", although that is not the rationale for identifying the Proposed Development's indirect effects. GHG emissions which take place outside of the UK in this case are unlikely to be capable of being indirect effects of the development in question (for EIA purposes). It should be noted that as with the use of coal, subsequent transportation of that coal beyond the first point of distribution may still be capable of being a material consideration. Whilst not an "indirect effect" or "secondary effect" of the purposes of EIA, this subsequent distribution may nonetheless be capable of being a material planning consideration..

13. Without prejudice to the above approach , and in any event, AECOM has nonetheless examined the "Do Nothing" and "Do Something" scenarios on the basis that the onward transportation beyond the first point of distribution is an indirect effects. Based upon the evidence before it and professional judgement the Report concluded that since WCM coal will be replacing coal that is already imported into the European Union from further afield, the transportation of WCM coal will not result in a material or significant increase in GHG effects and indeed it is actually likely to result in a global reduction of GHG emissions arising from the transportation of coal. Therefore, even if there was a requirement to take shipping emissions into account, the Proposed Development will certainly not cause any additional GHG emissions. Accordingly, the adoption of this approach to GHG emissions generated by the onward transportation of coal beyond the point of first distribution, which excludes the emissions of international shipping, is likely to represent a worst-case scenario for EIA Directive purposes since it does not take into account the significant reduction in GHG emissions from shipping that is considered likely to arise as a result of the Development.[8] Therefore, it incorporates a precautionary and robust approach to GHG emissions for the purposes of EIA caused by onward transportation.

14. This Chapter describes the definition and origins of greenhouse gas emissions, and aspects of the UK regulatory framework designed to reduce these emissions. This Chapter then uses information provided by in-house experts and a leading independent coal and steel expert to describe the role of metallurgical coal in steel making, and the importance of producing this coal locally to the point of its end use, and the likelihood of product substitution. Finally, this Chapter includes an independent assessment of the direct and indirect/secondary greenhouse gas emissions resulting from the Proposed Development, which has been carried out on a precautionary basis.

This Chapter contains five main parts and two appendices:

- Part 1: Explanation of greenhouse gases, including definition, impacts and likely sources.
- Part 2: Information on metallurgical coal markets and the likelihood of substitution.
- Part 3: Approach to indirect effects of coal mining
- Part 4: A summary of the methods and findings of an independent assessment of greenhouse gas emissions of the proposed mine.
- Part 5: Conclusions

[8] As is explained in the planning statement, and above when considering the baseline.

- Appendix 1: Independent Expert Statement Relating to Coal and Steel Markets and the likely market effects of extracting metallurgical coal in the UK at the Proposed Development, produced by Dr Bristow from H & W Worldwide Consulting Pty Ltd, a consultancy with extensive technical expertise and knowledge of international coal mining, coal and steel making methods, markets, and predictions.
- Appendix 2: Independent Assessment of Greenhouse Gas Emissions, Woodhouse Colliery, carried out by AECOM. AECOM is a global multi-disciplinary infrastructure engineering and environmental consultancy, with world-leading expertise in, amongst others, environmental disciplines.

PART 1. GREENHOUSES GASES: DEFINITION, IMPACTS, SOURCES AND CONTROLS

15. This Part of the Chapter provides an overview of the impacts of Greenhouse Gases (GHGs), sources and control measures. The objective is to provide context for the rest of the Chapter.

Definition of Greenhouse Gases

16. The impacts of anthropogenic activity on the natural environment have been documented for many decades, with environmental science emerging and developing at pace since the 1960s. As this field of science and research develops, the understanding of the impacts of human activity on different aspects of the Earth's systems has become detailed and sophisticated.

17. One of these systems, the atmosphere, has been the topic of advances in modelling and understanding since the first suggestions in the 1970s and 1980s that anthropogenic activity might be having an impact on the Earth's climate. Together, researchers from various fields including physics, chemistry and biology, investigated and described the mechanisms and complexities of the Earth's climate. Whilst there is far from complete understanding of the Earth's climate, and what drives it, the consensus view is that certain constituent gases in the atmosphere, when present in different concentrations, can impact the Earth's climate. These gases include:

- carbon dioxide (CO_2),
- methane (CH_4);
- nitrous oxide (N_2O);
- sulphur hexafluoride (SF_6);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- nitrogen trifluoride (NF_3).

18. A combination of historical evidence and computer modelling show that the effect of increased concentrations of these gases in the Earth's atmosphere is an overall planetary warming. This resulted in an interpretation of the warming effect becoming known as the "greenhouse effect", and the contributory gases becoming known as "greenhouse gases", or GHGs.

Impacts of Greenhouse Gases

19. The impacts of increased concentrations of GHGs in the atmosphere upon the Earth's climate are the subject of scientific research and, as a result, governments and industry across the world are working to find ways to reduce GHG emissions in order to reduce the effects of a changing climate upon the Earth and its inhabitants.

Sources of Greenhouse Gases

20. GHG emissions arise from a range of processes and activities including power generation, industrial activity, domestic heating and lighting, and transport. Power generation throughout the world largely relies on the use of so-called fossil fuels - hydrocarbon based fuels including refined oil and gas. When used, these fuels are a significant source of greenhouse gas emissions.

21. The likely major sources of GHG emissions from West Cumbria Mining's operations will be emissions linked to the consumption of electricity and fuel at the mine, as well as the release of methane from the coal.

22. The proposed use of the coal produced by West Cumbria Mining is for steel making, a process which gives rise to greenhouse gas emissions. These particular emissions will take place when the steel making companies, to whom WCM have sold the coal, use the coal as part of the steel works making process comprising a separate development. At full annual production, WCM will produce and sell 2.78mtpa of coal for steel making, of which 2.42mt is destined for European steel makers, and the remaining 360,000t is destined for use in the UK steel industry.

23. European (including UK) steel makers currently use an estimated 40 - 44mt of metallurgical coal per annum, predominately imported from the USA. This trade route has been established for decades, and if the WCM mine does not go ahead, European (including UK) steel makers will most likely indeed almost certainly continue to source their metallurgical coal requirements mainly from the USA. Therefore, regardless of whether or not the WCM mine is operational, the emissions generated by European steel makers will still take place. In this way, emissions generated in the steel making process by coal coming from WCM are not classed as 'additional' emissions, and in accordance with international GHG assessment standards and guidelines, such emissions are not included in the GHG assessment, as they will occur anyway. More detail on the methodology is given in Parts 3 and 4 of this document, and also in the GHG Assessment at Appendix 2.

24. There is currently no legal restriction on steel works using metallurgical coal, and no plans to introduce such a restriction. Furthermore, any such plans for such legislation would seem to be most unlikely (see the Expert Statement of Dr Bristow). The position can be contrasted to coal fired power stations, which are to be phased out in the UK by 2024. Accordingly, if WCM is not granted planning permission, the UK steel works will continue to use metallurgical coal, sourced from other countries.

Controls

25. There are mature measuring, monitoring and reduction systems for GHG emissions in the UK, in part because of its membership of the European Union (EU) and associated emissions regulations. This measuring and monitoring is expected to be continued by the UK once the transition period for its departure from the European Union is over because of the statutory commitments under the Climate Change Act 2008 (as amended). There are clear commitments by the UK government for the current parliament to be the cleanest, greenest ever, and there is legislation in the UK which requires certain industries to report upon and reduce their GHG emissions. This legislation includes:

- The Climate Change Act 2008: provides a framework for the UK to meet its GHG emission reduction goals through legally binding national carbon emission caps within five-year periods. This Act relates to UK emissions only. The Act was amended in 2019 to revise the existing 80% reduction target and legislate for a net zero emissions from UK sources by 2050 (2050 Target Amendment, Order 2019) (UK Government, 2019). Emissions caps are set with reference to a series of carbon 'budgets' which cover 5-year periods. The UK has declared its 5th carbon budget up until 2032 (Committee on Climate Change, 2017). As a result of the amended 2050 carbon reduction target to net zero carbon, the Committee on Climate Change announced it will review the current carbon budgets. The results of this review will be published in early 2021 along with the 6th carbon budget.
- The Greenhouse Gas Emissions Trading Scheme Regulations 2012: sets out the UK law relating to the EU Directive relating to greenhouse gas emission allowance trading.
- Energy Savings Opportunity Scheme (ESOS) Regulations 2014: for large companies (or 'undertakings') in the UK it has been mandatory since 2014 to complete an assessment of energy consumption, appoint an independent assessor, and identify energy saving opportunities.
- Streamlined Energy and Carbon Reporting (SERC) Regulations 2018: requires quoted companies to measure and report energy use and carbon emissions and KPIs to reduce energy use.

26. The UK participates in the EU Emissions Trading Scheme (ETS), which, since 2005, has seen qualifying industries in the UK and Europe reduce their GHG emissions by around 20%. It is expected that the UK will either continue in this scheme, or introduce its own equivalent, once the current transitionary arrangements with the EU end. The objectives of the ETS are to continue emissions reductions in qualifying industries, which includes steel making.

27. Electricity generation in the UK is moving towards renewable sources (in a process known as decarbonisation of the grid), and vehicles which use diesel and petrol are becoming more efficient over time, as well as being replaced with electric and hybrid vehicles. The UK is committed to net zero emissions by 2050, which means that any residual GHG emissions at that time will have to be offset via equivalent emissions capture or other strategies, such as regeneration of the natural environment to sequester an equivalent amount of CO^2.

28. Regulations pertaining to environmental improvement and control measures are more stringent in the UK than, for example, the USA, where it is apparent that the current administration is relaxing environmental legislation. President Trump has given notice that the USA will no longer participate in the 2015 Paris Agreement on climate change mitigation. The UK has given no such notice and remains committed to the terms of the Paris Agreement. Indeed, Prime Minister Johnson, in December 2019, undertook to make Britain the "cleanest, greenest" country on earth.[9] This is in stark contrast to the objectives of the USA. It is therefore reasonable to conclude that coal mined in the UK will contribute less to GHG emissions than an equivalent operation in the USA or any other country where coal mining and industry have far lower levels of environmental regulation. For example, Indonesia, where it was announced in February 2020 that coal mines will be subjected to a reduced level of environmental regulation, to relax the rules surrounding mining and encourage investment in the coal mining industry there.[10]

29. WCM is committed (and obliged by planning condition) to install a methane capture and drainage system at the mine, in order to avoid the uncontrolled release of methane. Methane is a naturally occurring gas trapped in the coal, and is released upon mining of the coal. Methane is many times more potent as a greenhouse gas than CO_2 - its impacts are 34 times greater than CO_2 over a 100 year period.[11] The capture and drainage system will ensure that the methane released from the coal is reduced and mitigated. Instead it will be put to beneficial use, as it is an asset as an energy source for the mine, with no atmospheric impact. Methane capture and use is not widely used in mining, and indeed, recent research has shown that methane from coal mines in the USA is a significant factor in the USA's GHG emissions.[12]

30. As part of the controls of GHG emissions in the UK, mechanisms to establish the likely emissions impacts of proposed developments have been established in national planning policy (the National Planning Policy Framework), and adopted into local plans. Legislation applying to certain types of proposed development is covered by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, which replaced the 2011 version of these Regulations. As is set out above, one of the changes caused by these amendments is a more specific requirement for an assessment of the greenhouse gas emissions of a proposal. Whilst the 2017 Regulations do not formally apply to this application, WCM has sought to provide additional information that is consistent with the spirit of these additional requirements.

PART 2: INFORMATION ON METALLURGICAL COAL MARKETS AND THE LIKELIHOOD OF SUBSTITUTION

31. This part of the Chapter is intended to provide detailed information relating to GHG from metallurgical coal during its production and shipping, as well as information relating to the drivers behind the destinations of, and demand for, this coal, which are relevant to the baseline against which the effects of this development should be considered.

32. Linked to this is information relating to the steel industry - including steel making methods and the drivers for steel making, and the future of metallurgical coal in steel making.

33. It is important to consider these factors due to the proposed operational life of the mine, which is 50 years. The mine will be operating as the UK moves closer towards its net zero emissions goal, therefore it is essential to consider how the use of metallurgical coal produced in Cumbria for use in the UK and European steel making industries can, and will, contribute to emissions reductions as compared with the current situation of metallurgical coal being imported for use in the UK and Europe from the USA.

[9] https://www.energylivenews.com/2019/12/13/boris-johnson-pledges-to-make-britain-cleanest-greenest-country-on-earth/
[10] https://steelguru.com/auto/indonesia-plans-to-relax-environmental-rules-for-coal-mining/556120?type=coal
[11] https://unfccc.int/news/new-methane-signs-underline-urgency-to-reverse-emissions
[12] https://www.theguardian.com/environment/2019/nov/15/methane-emissions-from-coal-mines-could-stoke-climate-crisis-study

34. This part of the chapter will show that Cumbrian metallurgical coal will continue to have a role in a lower carbon future requiring green infrastructure which is made of steel, including wind turbines, railways, and other low carbon forms of transport.

35. As is set out above, there is no requirement to describe and assess the magnitude of GHG emissions under the 2011 Regulations. Furthermore, since it was considered that WCM coal would be likely to substitute coal that would otherwise be extracted elsewhere, it was not considered that the Proposed Development would result in any additional GHG emissions that would be likely to have a significant effect on the environment.

36. Further information on the international metallurgical coal and steel markets has been provided by Dr Bristow, who is an international expert on this subject. Dr Bristow's evidence is set out in Appendix 1 to this Chapter. However, the key points are summarised below. In part this addresses some of the misunderstandings present in objections to the economics behind this approach some of which are contained in the claim for judicial review in the high court challenge to the resolution to grant consent for the Proposed Development. As well as being in accordance with the principles of judicial review being a last resort and the encouragement of resolving disputes out-with litigation , it is also entirely in keeping with the iterative approach encouraged by the EIA process.

Substitution of Coal

37. Metallurgical coal is a grade of coal that, due to its physical and chemical properties, can be used in the production of good quality coke. Coke is one of a number of ingredients used to make liquid iron, which is the primary constituent of steel. A good quality coke will help to make a good quality steel.

38. Metallurgical coal is relatively rare compared to thermal coal, and is therefore classed as a Critical Resource by the European Union, because the largest known reserves of it are in the USA, China and Australia.

39. The European Union is a significant producer of steel, and European (including UK) steel makers currently import 40 - 44 million tonnes of metallurgical coal per annum, principally from the USA. This trade route has been established for decades, and if the WCM mine does not go ahead, European (including UK) steel makers will continue to source their metallurgical coal requirements from the USA.

40. Metallurgical coal is mined on demand. If a better or equivalent grade coal can be mined from a closer location at a similar price, that coal will replace the coal that is currently being imported from further afield. This is because coal buyers prefer to order a product that can arrive at the steel plants in a matter of hours or days (as it will from Cumbria), as opposed to a matter of weeks (in the case of transport times from the USA). Shorter travel distances also de-risk the supply of a product from impacts such as delays due to bad weather. In the present case, WCM coal will substitute the equivalent volume of USA coal that is currently being exported to Europe by being shipped across the Atlantic. This is further evidenced by expressions of interest for WCM coal received from UK steel makers.

41. Metallurgical coal degrades once it has been mined and exposed to the air and weather. Stockpiling this coal would cause it to degrade to such an extent that the properties which make it desirable for the steel making market will have deteriorated so that it can only be classed as a much lower grade with a considerably reduced value. For this reason, stockpiling of metallurgical coal is not common practice in the industry.

42. The USA would not continue to mine the same grade of coal for sale to other countries because there is no proven market for them to do that, and also because shipping to alternative major steelmaking countries in Asia and India involves such high transport costs that could render it economically unviable.

43. The most likely outcome of product substitution is therefore that there would be a corresponding reduction in the extraction of coal in the USA, which is currently mined for importation into Europe.

USA coal and WCM coal: comparative GHG emissions

44. The substitution of US coal with coal produced by the Proposed Development is not likely to result in an increase in GHG emissions because: (i) environmental regulation is generally stricter in the UK than the USA; and (ii) because there would be a significant reduction in GHG emissions from transportation.

Demand for coal and steel

45. WCM coal would be competitive on cost, when compared with an equivalent grade of coal from the USA, which would encourage its substitution for imported coal. However, its production will not affect global metallurgical coal prices, because even at full production the output from WCM represents a fraction of global metallurgical coal output. Furthermore, any cost savings that do arise in relation to WCM coal would be unlikely to affect the cost of steel production, or the demand for steel. This is because there are many variable components in steel production, and because steel consumption is driven by demand for it from the market (rather than its availability or price).

Decarbonisation of the steel industry

46. Despite increases in the use of electric arc furnaces to recycle steel from scrap steel, there will still be continued demand for primary steel making using metallurgical coal until nearer the end of this century. This is because of limited availability of scrap steel, and the continued need for high grade steel for some industries, which cannot usually be made from recycled steel.

47. Other alternative mechanisms of steel production, such as Direct Reduced Iron (DRI), are unlikely to be commercially viable for large-scale steel production for several decades. Furthermore, there are very significant incentives for the steel industry to work towards de-carbonisation, and the availability of WCM coal will not have any material effect on this process due to its insignificant market share.

48. Therefore, there is a very high likelihood of continued demand for metallurgical coal for steel-making in Europe throughout the life-span of the Proposed Development and it is not credible to suggest that the development proposal will in any way dis-incentivise investment in the decarbonisation of the steel industry.

Summary

49. For these reasons, it is considered that:
    i. There will continue to be a demand for metallurgical coal in Europe throughout the lifetime of the Proposed Development;
    ii. Coal produced by the Proposed Development is likely to substitute coal that would otherwise have been extracted in the USA and exported to Europe;
    iii. The effect of this substitution is that there is unlikely to be a global net increase in GHG emissions as a result of the Proposed Development.

50. Nevertheless, in the event that the Council takes a different view in respect of any of these matters, and to avoid any uncertainty and ensure that the consideration of potential GHG emissions has been undertaken on a precautionary basis, an independent assessment of the direct and indirect GHG emissions resulting from the Proposed Development has also been undertaken.

PART 3: SCOPE OF INDIRECT AND SECONDARY EFFECTS RESULTING FROM THE DEVELOPMENT

51. The first Part of this Chapter explains the relevant scope of indirect and secondary effects resulting from the Proposed Development, in the context of the EIA Directive and EIA Regulations.

52. Under the 2011 Regulations, an environmental statement is required to include *"such of the information referred to in Part 1 of Schedule 4 as is reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile".*

53. The information referred to in Part 1 of Schedule 4 includes:

> *"4. A description of the likely significant effects* ***of the development*** *on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects* ***of the development, resulting from—***

(a) the existence of the development;
(b) the use of natural resources;
(c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant or appellant of the forecasting methods used to assess the effects on the environment." [13] *[Emphasis added]*

54. The correct interpretation of the scope of indirect effects that are required to be assessed under the EIA Directive has not been subjected to any direct judicial consideration. In H J Banks v SSHCLG [2018] EWHC 3141 (Admin), which concerned the development of an open cast coal mine, it is recorded at [69] that counsel for the Claimant mining company conceded:

> "**For the purposes of this case**...that GHG emissions from burning coal for power generation **were capable** of being a **material planning consideration** even though the generation took place off-site and at a power station which would be subject to other controls." [Emphasis added]

55. The first point to note is that the limited concession in this case was that GHG emissions from burning coal were *capable of being a material planning consideration,* not that it was capable of being (or was in fact) an indirect effect of the development for EIA purposes. If it was applied to the scope of "indirect effects" for EIA purposes, it would appear to represent a departure from the approach taken in similar decisions regarding fracking. In R *(Friends of the Earth Ltd) v North Yorkshire County Council* [2016] EWHC 3303 (Admin), Lang J. held at [37] – [39] that a local planning authority had been entitled to conclude that an assessment of the environmental impacts of burning gas from the development site at a nearby power station was not required:

> *"37. The Claimants submitted that the ES was defective because of the omission of any assessment of the environmental impacts of burning gas from the KMA well site at Knapton, which were either part of the direct effects of the project or part of its indirect, secondary or cumulative effects.*
>
> *38. I do not consider that the Claimants' submissions were well-founded, and I accept the submissions of the Council and Third Energy on this point. In my judgment, the Council was entitled, in the exercise of its judgment, to conclude that an assessment of the environmental impacts of burning gas from the KMA well site at Knapton was not required, for the following reasons.*
>
> *39. The application for planning permission did not include any development at Knapton. Knapton already had planning permission and it was already authorised by the Environment Agency to burn gas from existing well sites, thus generating potentially harmful emissions, including carbon dioxide. No increase in capacity at Knapton was sought as part of this proposal. Any gas produced from the KMA well site and piped to Knapton would be within the existing limits of the permits already conferred by the Environment Agency. Paragraph 122 of the National Planning Policy Framework ("NPPF") advises planning authorities that they should focus on whether the development is an acceptable use of land, rather than on control of processes or emissions where these are subject to approval under pollution control regimes, and it should be assumed that those regimes will operate effectively. The gas supply from KMA would be indistinguishable from the gas piped from other well sites, and so its environmental impact could not be separately quantified. The argument that the proposed development was an integral part of a more substantial project which included Knapton was rightly abandoned by the First Claimant. Applying the guidance given in Hardy and Blewett, I do not consider that the Claimants have established any defect in the ES or any error of law in the Council's reliance upon it."*

56. A similar approach was also taken in *Preston New Road v SSCLG* [2017] Env LR 33, per Dove J. at [128]. Whilst these fracking decisions support the view that the environmental effects caused by burning gas or coal at another site should not be regarded as indirect or secondary effects of the development that causes the extraction of that product in the first place, the conclusions were reached as a matter of judgement having regard to the facts of each case. Accordingly, these court judgments do not directly address the question of whether, as a matter of

[13] This wording mirrors the requirement in para. 4 of Annex IV to the 2011 Directive.

legal interpretation as then applied as mater of judgement, such environmental effects are capable of amounting to indirect or secondary effects such that a local planning authority is *required* to take them into account for EIA purposes when considering an application for a mining consent.

57. The correct interpretation of the requirements of the 2011 Regulations is ultimately a matter of law, although as stated above its application may be a mixture of law and fact which may involve professional judgement. The wording of both the regulations and the directive require assessment of the environmental effects of the development/project respectively. The wording confirms that this is not limited to direct effects, and should include:

> *"any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects, resulting from—*
> *(a) the existence of the development;*
> *(b) the use of natural resources;*
> *(c) the emission of pollutants, the creation of nuisances and the elimination of waste,"*

58. Indirect or secondary effects would typically include off-site effects relating to, or caused by, the development. For example, GHG emissions caused by an increased demand for energy from the development, or a deterioration in air quality as a result of increased trips to and from the development. However, those effects are still related to the development in some way, albeit indirectly. That is conceptually distinct from the environmental effects of the ultimate use to which items produced by the development are put, which has no relationship with the development itself. For the same reason, onward transportation from the first point of distribution, and forever thereafter, cannot sensibly be regarded as an indirect effect of the development and assessed as such. It is part of the process of other developments, and would no doubt be considered in the assessment of those developments.

59. This interpretation is consistent with the approach adopted in the guidance produced by EU Commission. The EU Commission has produced *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*, dated 2013. The glossary to this document provides the following definitions:

> ***"Direct effects:** Environmental effects directly caused by the preparation, construction or operation of a project in a particular location.*
>
> ***Indirect effects/impacts:** Effects/impacts that occur away from the immediate location or timing of the proposed action, e.g. quarrying of aggregates elsewhere in the country as a result of a new road proposal, or as a consequence of the operation of the project (see also secondary effects).*
>
> ***Secondary effects:** Effects that occur as a consequence of a primary effect or as a result of a complex pathway (see also indirect effects)."*

60. Section 4.1.2. of the guidance provides the following examples of how a project may lead to GHG emissions that need to be taken into account:

> *"*
> - *a direct increase in GHG emissions;*
> - *an increase in energy demand leading to an indirect increase in GHG emissions;*
> - *embedded GHG emissions, e.g. due to energy use in material production, transport, etc.;*
> - *loss of habitats that provide carbon sequestration, (e.g. through land-use change)."*

61. This guidance provides no reference to GHG emissions caused by the onward distribution and use of a product produced by a project, no doubt recognising the fact that, adopting the approach set out above, those emissions will be taken into account as embedded emissions by those other developments further down the production chain.

62. More recently, the European Commission has produced *Guidance on the preparation of Environmental Impact Assessment Report*, dated 2017. When considering impacts related to climate change, this distinguishes between: climate change mitigation (the impact the Project will have on climate change, through greenhouse gas emissions primarily); and climate change adaptation (the vulnerability of the Project to future changes in climate). The guidance cross-refers to the more detailed 2013 document, before providing the following advice in respect of climate change mitigation:

"Most Projects will have an impact on greenhouse gas emissions, compared to the Baseline [see the section on Baseline], through their construction and operation and through indirect activities that occur because of the Project. The EIA should include an assessment of the direct and indirect greenhouse gas emissions ***of the Project,*** *where these impacts have been deemed significant:*

- *direct greenhouse gas emissions generated through the Project's construction and the operation of the Project over its lifetime (e.g. from on-site combustion of fossil fuels or energy use)*
- *greenhouse gas emissions generated or avoided as a result of other activities encouraged by the Project (indirect impacts) e.g.*
  - *Transport infrastructure: increased or avoided carbon emissions associated with energy use for the operation of the Project;*
  - *Commercial development: carbon emissions due to consumer trips to the commercial zone where the Project is located.*

The assessment should take relevant greenhouse gas reduction targets at the national, regional, and local levels into account, where available. The EIA may also assess the extent to which Projects contribute to these targets through reductions, as well as identify opportunities to reduce emissions through alternative measures." [emphasis added]

63. The guidance produced by the European Commission supports the interpretation regarding the scope of indirect effects that is set out above, particularly in the context of the assessment of GHG emissions. The guidance encourages assessments to take into account indirect effects that will arise because of the development and operation of the project, including energy consumption, embedded emissions in materials used by the development, and transport emissions associated with the development. However, it does not provide any guidance on the need to assess GHG emissions arising from the subsequent use of products produced by the Project, or their onward transportation beyond the first point of distribution, as part of a separate development. For example, it is not suggested that an EIA of a factory producing cars would need to assess the emissions caused by each of the cars that it produces, or the further GHG emissions that the use of those cars may facilitate. The correct interpretation of the requirement to assess indirect effects must be capable of consistent application to a number of different developments producing different products, which may in turn be used in different ways.

64. Applied to the present case, it would be necessary to assess the GHG emissions caused by the materials and energy required to construct the mine, and support its continued operation and de-commissioning. It would also be necessary to consider the transportation effects arising from these activities, including the indirect effects of transportation of coal from the rail loading facility to the first point of distribution. However, there is no requirement to assess any GHG emissions that may be caused by any further onward distribution of coal, or the subsequent use that it is put to in another development/project. These activities are not related to the Proposed Development or project which is to be subject to EIA in accordance with the Directive. In this respect, it is also worth noting that the wording of the 2011 Regulations and the 2011 Directive specifically indicates that the Environmental Statement should include an assessment of indirect effects resulting from the existence of the development, use of natural resources, and the emission of pollutants or the elimination of waste. However, there is no reference to the subsequent use of products created by the development being regarded as indirect effects.[14]

65. For the avoidance of doubt the onward distribution and use of coal (e.g. in steel works) may be capable of being a material planning consideration. In the present case, this chapter has explained why GHG emissions caused by the subsequent use of WCM coal at a steel works will simply be replacing coal from an alternative source that would otherwise be burnt at that steel works. In addition, such steel works will already be subject to separate environmental regulation, including the EU emissions trading scheme. (see further the updated Planning Statement) Similarly, the onward distribution of WCM coal (e.g. shipping emissions) may be capable of being a material planning consideration. As explained elsewhere shipping distances (and therefore consequential GHG emissions) are likely to be reduced as a result of the development, which will provide a more local source of metallurgical coal to Europe. (see further the updated Planning Statement).

[14] Cf. the approach recommended to take into account pollutants and waste arising from the development.

66. In any event, without prejudice to the foregoing, and as stated above, even if greenhouse gas emissions caused by using metallurgical coal in steelworks are capable of being an indirect or secondary effect of a metallurgical coal mine, it is not considered that they would be likely to result in any material or significant increase in GHG emissions. This is because coal mined by the Proposed Development will simply replace other coal that is currently being imported into Europe to be burned in UK and European steel works. Therefore, the Proposed Development will not have any material effect on the existing baseline so as to be likely to give rise to any significant environmental impacts as a result of additional GHG emissions.

67. Given the very strong likelihood of such substitution, it is very unlikely that any significant environmental impacts from additional GHG emissions caused by shipping would occur as a result of shipping WCM coal to Europe.

PART 4: SUMMARY OF THE METHODS AND FINDINGS OF AN INDEPENDENT ASSESSMENT OF GREENHOUSE GAS EMISSIONS OF THE PROPOSED MINE.

68. This Part of the Chapter discusses the methods and findings of the independent assessment of greenhouse gas emissions from the mine undertaken by AECOM . These findings are then discussed in a wider context.

GHG Assessment Methodology

69. West Cumbria Mining commissioned AECOM to undertake an independent calculation of greenhouse gas emissions from the mine, and an assessment of their significance. The assessment was based upon information supplied by West Cumbria Mining in the Environmental Statement, which included annual mining tonnages, equipment and personnel requirements, transport distances and proposed building sizes. The full report is attached at Appendix 2. A precautionary approach has been adopted for the assessment which, in this case, includes assuming that methane emissions from the mine are to be unabated & released into atmosphere, that all electricity for the mining operations will be purchased from the grid and that the energy generation for the grid will not reduce its emissions any further than it has done to date.

70. The independent calculation and assessment of GHG emissions followed internationally accepted methodologies, including:
    - Institute of Environmental Management and Assessment (2017). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.
    - World Resources Institute and World Business Council for Sustainable Development (2011) Corporate Value Chain (Scope 3) Accounting and Reporting Standard.
    - World Resources Institute and World Business Council for Sustainable Development (2015). The GHG Protocol. A Corporate Accounting and Reporting Standard. Revised Edition.

71. Reference was made in the assessment to data and standards, including:
    - British Standards Institution (2011). PAS 2050:2011. Specification for the assessment of the life cycle greenhouse gas emissions of goods and services.
    - Carbon Trust (2016). PAS 2080 Carbon Management in Infrastructure.
    - CIBSE (2008). Energy Benchmarks. TM46:2008.
    - Committee on Climate Change (2017). UK Carbon Budgets.
    - Department of Energy and Climate Change (DECC) (2013). Guidance on Annual Verification for emissions from Stationary Installations.
    - Department for Environment, Food and Rural Affairs (DEFRA) (2019) Greenhouse Gas Reporting: Conversion Factors.
    - Discover Water (2019). Amount We Use.
    - European Commission (2010). Commission Decision of 10 June 2010 on Guidelines for the Calculation of Land Carbon Stocks for the Purpose of Annex V to Directive 2009/28/EC.
    - European Commission (2019). Municipal Waste Statistics.
    - Intergovernmental Panel on Climate Change (IPCC) (2003) Good Practice for Land Use, Land Use Change and Forestry.
    - Intergovernmental Panel on Climate Change (IPCC) (2019) Emissions Factor Database.
    - University of Bath (2019) Inventory of Carbon and Energy (ICE) Database.

72. The assessment of GHG emissions from the mine included the construction, operation and decommissioning periods, and covered energy and fuel use at the mine in all three phases, as well as all other aspects of the operation of the mine.

GHG Assessment Findings

73. In order to provide some reasonable contextualisation of the significance of the predicted GHG emissions, these were assessed against the UK's carbon budgets (as described earlier, under the Climate Change Act 2008 (as amended)), and any impact that the Proposed Development may have on the ability of the UK government to meet its carbon budgets. This method of determining impact is in accordance with the Institute of Environmental Management and Assessment (IEMA) guidance of 2017, which acknowledges that there is no agreed method to evaluate levels of GHG significance and that professional judgement is required to contextualise the emissions impacts of a project or activity by reference to the carbon budgets.

74. Both the Department of Energy and Climate Change (2013) and the PAS 2050 Specification (British Standards Institution, 2011) allow emissions sources of <1% contribution to be excluded from emission inventories, and these inventories to still be considered complete for verification purposes. This exclusion of emission sources that are <1% of a given emissions inventory is on the basis of a very minor contribution.

75. Therefore, emissions considered to give rise to a 'high' magnitude of significance are considered as those that equate to equal or more than 1% of total emissions across the relevant 5 year UK carbon budget. Low magnitudes of impact are those where emissions equate to less than 1% of total emissions across the relevant 5 year UK carbon budget period. All GHG emissions have been are classed as being capable of being significant. However in order to try to get meaningful assessment of the extent to which such emissions are significant the level of significance has been assessed against the amount by which those emissions exceeds 1% of the relevant carbon budget at the time of the emissions. If the emissions are less than 1% of the relevant carbon budget, the impact is considered to be of minor adverse significance.

76. It was found in the independent assessment of GHG emissions from the mine that the predicted emissions from the construction, operation and decommissioning of the mine would be 'minor adverse'; i.e. that they fall significantly below the 1% threshold of current and future published carbon budgets to 2032. The magnitude of the impact of GHG emissions from the mine was therefore found to be of minor adverse significance. To meet the 2050 net zero target, GHG reduction measures will be required in conjunction with offsetting in the future. A review mechanism is also proposed to be secured through a section 106 planning obligation, to ensure that the significance of GHG emissions from the Proposed Development is reviewed at agreed points in the future in line with reducing Carbon Budgets, and to ensure that GHG emissions can continue to be reduced as far as possible in line with any developments in carbon reduction technology.

Global GHG Emissions Context and Potential for Cumulative Effects

77. WCM have considered the potential for GHG emissions from its mining operations to interact with other GHG emissions and cause a cumulative effect. Whilst the GHG emissions predicted from WCM's mining operations are considered to be of minor adverse significance, they represent less than 1% of the UK's carbon budget up until the year 2032. Therefore, WCM's contribution to UK emissions is very low indeed. Overall, however, the use of coal from Cumbria in UK and European steel plants will, as has been set out in other places, very likely lead to a corresponding reduction in the importation of an equivalent grade and volume of coal for these plants from much more distant coal mines. Therefore the net cumulative effect is minimal.

78. The finding that the projected GHG emissions from the WCM operation will be significantly less than 1% of the UK's carbon budget as currently published means that the WCM operation will be an almost unmeasurably small fraction of global GHG emissions, which are many times greater than UK emissions.

79. Other EU countries, in common with the UK, have a similar approach to carbon measuring and reduction, via carbon budgets and, as such, emissions arising from the use of WCM coal in European countries is not included in the assessment here for the reasons explained above in connection with them not being Indirect or Secondary Effects of the Proposed Development. Additionally, even if contrary to the foregoing such emissions were considered to

be indirect effects or secondary effects of the Proposed Development based upon the best evidence which can be reasonably obtained having regard to the carbon budgets for the various EEA states it is not considered that such emissions would amount to "significant environmental effects on the environment of that country (underlining added)" so as to trigger the transboundary notification requirements.

80. Furthermore, even if this were incorrect that such emisisons would be included in the carbon budgets of the particular country to include emissions from the use of WCM's coal in other countries would therefore represent a 'double counting' of those emissions and would likely to be inaccurate in any event.

81. Furthermore, if WCM was not supplying coal to European steel makers, those companies would simply continue to source their coal from other countries predominantly the USA in exactly the same way that they do now and have done for decades. So the GHG emissions from steel makers - both in Europe and the UK - will take place whether or not the WCM project goes ahead, for the reasons set out in more detail above.

82. Future projections of emissions figures should be subject to reductions in calculations as countries move towards 'net zero'; i.e. proportions of future emissions will need to be offset as processes become more efficient, and as carbon capture and emissions offset schemes are introduced. Therefore, emissions figures for processes taking place today will look significantly different in the future as emissions are reduced and offset.

83. Indeed, WCM is likely to further contribute to global GHG emissions reductions through the reduction in transport distances of an equivalent amount of metallurgical coal from the USA to Europe, which WCM's coal will replace once its mine is operational. This is recognised in Sections 7 and 10 of Appendix 2.

84. Additionally, the WCM mine will install methane capture and use technology at the Whitehaven mine, a technology which is not used in open cast mining in the USA, and which is only rarely used at underground mines in the USA because there is no legislative requirement for it to be used.

PART 5: CONCLUSIONS

85. This Chapter has identified and defined what greenhouse gases are, and their sources and impacts. It has also discussed the regulatory requirements in the UK for the measuring, monitoring, control and reduction of greenhouse gases.

86. Using information on metallurgical coal, its production, uses and market outlook, as well as an explanation of the steel market, steel uses, and steel making methods, this Chapter has explained why there will continue to be a demand for metallurgical coal for the steel industry for many decades to come, and the way in which this steel can, in turn, contribute towards green infrastructure required to reduce global GHG emissions. More specifically, this chapter has identified how the West Cumbria Mining project can contribute to those emissions reductions through the substitution of coal that is currently imported from the USA.

87. The Chapter has explained why the use of metallurgical coal in steelworks should not be regarded as an indirect or secondary effect of the Development for EIA purposes and why, even if it is considered as an indirect effect, it already forms part of the existing baseline and should therefore not be regarded as an additional environmental effect that is caused by the project.

88. Finally, this Chapter has also provided an independent calculation and assessment of impact of the predicted GHG emissions from WCM's proposed operation, which has been undertaken on a precautionary basis. It has contextualised those emissions taking into account nationally accepted guidelines and internationally accepted standards, and concluded that the magnitude of impact of the emissions from WCM's operations will be considered of minor adverse significance against the current UK carbon budgets. This is at a level that will not materially adversely affect the ability of the UK to meet its carbon budgets. Beyond the year 2050, the significance of emissions from the mine is likely to increase, assuming the 'net zero' target deadline of 2050 remains the same and, as discussed above, a mechanism can be secured by way of a section 106 planning obligation by which GHG emissions may be reviewed so that its ongoing significance can be assessed at agreed points in the future.

89. In any event this Chapter concludes in summary that:

i. The use of WCM coal at steel works should not be regarded as an indirect effect resulting from the Proposed Development for EIA purposes. However, and in any event, even if it was regarded as an indirect effect, the Proposed Development will not result in any additional GHG emissions through the use of coal at steel works because that use already forms part of the baseline. This will not change as a result of the Proposed Development because the production of steel is led by the demand for steel and not the supply of coal.

ii. In any event notwithstanding the above in the 'do nothing' scenario, without the WCM project, steel makers in the UK and Europe will continue exactly as they are today, and have done for decades before - to source their High Vol A metallurgical coal from distant countries, predominantly the east coast of the USA. Over the 50-year life of the mine, this will generate approximately 5 million tonnes of CO_2 emissions which can be significantly reduced if the WCM project goes ahead.

iii. Even upon the predicted worst case scenario that has been assessed, GHG emissions from the WCM mine will not compromise the ability of the UK to meet its carbon budgets, which are based on emissions from UK sources. The contribution to the UK's carbon budgets by the WCM project are calculated to be minor adverse, at significantly less than 1% per annum.

Judged against this very minor contribution to the UK's emissions budget, the predicted emissions from WCM are so small as to not be required to be included in the UK emissions inventories, at least up until the year 2032.

iv. A mechanism can be secured by way of a section 106 planning obligation by which GHG emissions may continue to be reviewed and assessed at agreed points in the future together with any necessary mitigation measures as and if appropriate.

Appendix 1 - Expert evidence of metallurgical coal and steel markets

1 INTRODUCTION

I have been asked to summarise key features of the metallurgical coal and steel markets, and provide my expert opinion on future trends in these markets. This includes giving my opinion on the likely effect that extracting metallurgical coal in the UK at the proposed new mine at Whitehaven Coillery would have on these markets.

2 STATEMENT

This expert statement comprises my professional views. It is prepared on the basis that I have a duty of impartiality regardless of the interests of my clients and a wider duty to the planning authority and the public at large to provide independent expert evidence within my area of competence and expertise.

3 AUTHOR: QUALIFICATIONS AND EXPERIENCE

My name is Dr Neil Bristow and for the last 30 years I have developed expertise in the steel, iron ore, coal (metallurgical and thermal), coke, and ferro-alloy markets and business research and analysis, strategy development, and competitor analysis.
I hold the following Memberships and Committee positions:

- Member of American Iron and Steel Association; (AISI serves as the voice for the USA steel industry);
- Associate Fellow of Australian Institute of Management;
- Member, Advisory Committee of Met Coke International Coke Conference, USA; (International Coke Conference provides senior decision makers from the USA and global coke, coal and steel markets to hear the latest market trends, as well as technical and operational developments within the industry);
- Member, Advisory Committee of Euro Coke International Coal Conference, Europe; (The Eurocoke Summit provides senior decision makers from the global coke, coal and steel markets to hear the latest market trends, as well as technical and operational developments within the industry); and,
- Member, Steering Committee of International Coal, Coke and Carbon Forum (the most influential annual forum for the steel commodities market comprising a unique group of senior leaders in both the steel and coal industry).

I have developed a particular specialism in forecasting accuracy, market analysis, strategy development, innovation and insightful scenario thinking, technical trends and raw materials technology development. This specialism has been widely acknowledged "Dr Bristow is an internationally recognized industry expert[1] in areas of steel and steelmaking raw materials, long term trends and scenarios"[2].

I have led numerous major research studies and have chaired and presented at a wide range of international meetings and conferences, across iron ore, coking and thermal coal, and coke. I have authored numerous market and technical papers.

4 METALLURGICAL COAL

Metallurgical Coal: Uses and Availability

Over several centuries, coal has been mined and used for a variety of purposes, ranging from a simple source of heat and power generation ("thermal" coal), which exploits the calorific value of coal, to more specialist applications. It is found that coal exists in a range of forms, differentiated by its physical and chemical properties. These different forms, or grades, of coal, mean that coal can be mined, processed and put to a range of different end uses that are appropriate for its grade.

One of these grades of coal is metallurgical coal. Metallurgical coal is a grade of coal that, due to its physical and chemical properties, can be used in the production of good quality coke. Coke is one of a number of ingredients used to make liquid iron, which is the primary constituent of steel. A good quality coke will help to make a good quality steel. By contrast, the lower grade thermal coal does not produce coke when it is heated.

Metallurgical coal is relatively rare compared to thermal coal, and is therefore classed as a Critical Resource by the European Union,[3] because the largest known reserves of it are in the USA, China and Australia. The European Union is a significant producer of steel, and it recognises that this relative scarcity of metallurgical coal within its borders gives rise to potential risks in the supply, supply security, and geopolitical factors relating to obtaining sufficient metallurgical coal to keep its steel industry functioning. Metallurgical coal like other minerals can only be worked where it is found. A number of reasonably obvious consequences arise for example in terms of implications for the location of mining facilities and transportation.

[1] Exclusive Interview: Dr. Neil Bristow Explains That Yes, There Is Life Left In Coke!
[2] https://www.metcokemarkets.com/eurocoke-summit/advisory-board
[3] https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en.

Metallurgical Coal: Production

Metallurgical coal is also mined in response to demand for the coal by the steel making industry. Coal mining is highly capital intensive, and it therefore requires relatively fast returns on the investment made in the cost of the mining and processing operations.

Well established market evidence demonstrates that if there is no market for metallurgical coal it is not mined, because mining companies will not incur the expense of mining a product if they cannot achieve the required rate of return upon the sale of the product. The return required will not be achieved if the product is not sold. Therefore, it simply is not viable to mine metallurgical coal in order to then place it in a stockpile with uncertainty around a future buyer.

To mine a product without a buyer and place it in a stockpile whilst it awaits the possibility of buyer interest incurs a great loss through product degradation. The longer the metallurgical coal product is exposed to air and weather, the more it degrades. Stockpiling would therefore cause it to degrade to such an extent that the properties which make it desirable for the steel making market will have deteriorated so that it can only be classed as a much lower grade with a considerably reduced value. Consequently, it is simply not a viable industry practice or viable business model.

Metallurgical coal is mined on demand. If better or equivalent grade coal can be mined from a closer location at a similar price, that coal will replace the coal that is currently being exported from further afield. In the present case, the WCM coal will substitute the equivalent volume of USA coal that is currently being exported to UK and Europe by being shipped across the Atlantic.

In my judgement, the USA would not continue to mine the same grade of coal for sale to other countries because there is no proven market for them to do that, and also because shipping to alternative major steelmaking countries in Asia and India involves such high transport costs that it is less economically viable. Instead, the most likely outcome is that there would be a corresponding reduction in the extraction of this coal in the USA.

Indeed, the closure or scaling back of mines in the USA as a result of reduced demand from Europe was recently highlighted in the Argus blog[4]. Additionally, the Chief Executive of Glencore stated in February 2020 that: "We don't want to dig the material out of the ground if it's not required in the market".[5] This related specifically to demand for thermal coal, however the same argument holds true for metallurgical coal - if the demand is not there, the material will not be mined. In the mining industry, when the market is not there, mining rates are adjusted accordingly.

It is reported in market research that "the revival of the metallurgical coal industry was driven by an increase in world steel demand.",[6] meaning that metallurgical coal mining is dependent upon demand from the steel industry.

Further market insight reports that, "Met [metallurgical coal] pricing is usually tied to global economic growth because an expanding economy means more construction which means more steel which in turn means more met coal demand", according to Jude Clemente, a widely published expert in natural resources markets[7]

Mining is an operation which involves considerable cost and capital outlay. Accordingly, the maintenance of a sufficient cashflow is an essential part of securing the economic viability of mining operations. If faced with a market downturn, mining companies stop production to avoid incurring the costs of mining in the absence of achieving a return on those costs. Therefore, stockpiling mined coal to await an upturn in business is not financially viable and hence is not common industry practice.

The economic profitability of a mine is linked to its production costs, known as FOB costs. These are the costs associated with the mining, processing, transport, port charges and royalties of the coal. Mines that sell coal above their FOB costs produce a profit; those that sell below their FOB costs produce a negative return. My expertise in this industry enables comment to be made on the likely profitability of the WCM mine, comparing it with mines producing similar grades of coal across the world.

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[4] Argus is an independent media organisation with offices in the world's principal commodity trading and production centres and produces price assessments and analysis of international energy and other commodity markets https://www.argusmedia.com/en/news/2080089-several-us-coking-coal-mines-cut-output-in-4q.

[5] https://uk.advfn.com/stock-market/london/glencore-GLEN/share-news/Glencore-Swings-to-Loss-Amid-Lower-Commodity-Price/81786915.[3] https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en.

[6] Metal Bulletin Research, 2010, "Coking Coal: A Strategic Market Outlook to 2020".

[7] https://www.forbes.com/sites/judeclemente/2018/08/12/the-one-market-thats-sure-to-help-coal/#57dec2696f6e

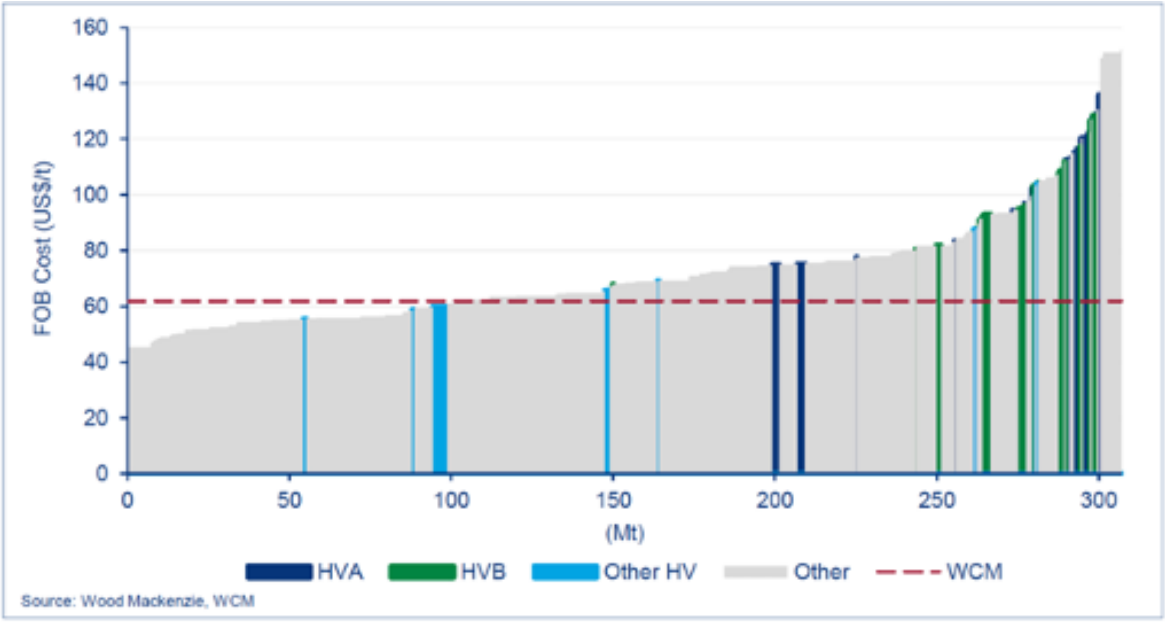
This is explained below.

The projected FOB cost bases of the WCM mine to other mines producing metallurgical coal in the rest of the world have been compared. It was found that the FOB cost bases of the WCM mine are advantageous compared to other world mines producing a similar grade of coal for several reasons. First, the UK operates one of the most attractive royalty regimes when compared with the rest of the world. Secondly, salaries for miners are lower than for other countries

WCM's predicted operating costs in steady state production are lower than around 75% of other world hard coking coal mines, due to lower cost bases and significantly lower transportation costs.

Independent market analysis proves this point. Figure 1 below shows the FOB costs for world exports of metallurgical coal in the year 2016, and compares these with the projected FOB costs for the WCM mine. Figure 1 shows that the projected FOB costs of the WCM mine are lower than around three quarters of other world metallurgical coal producers.

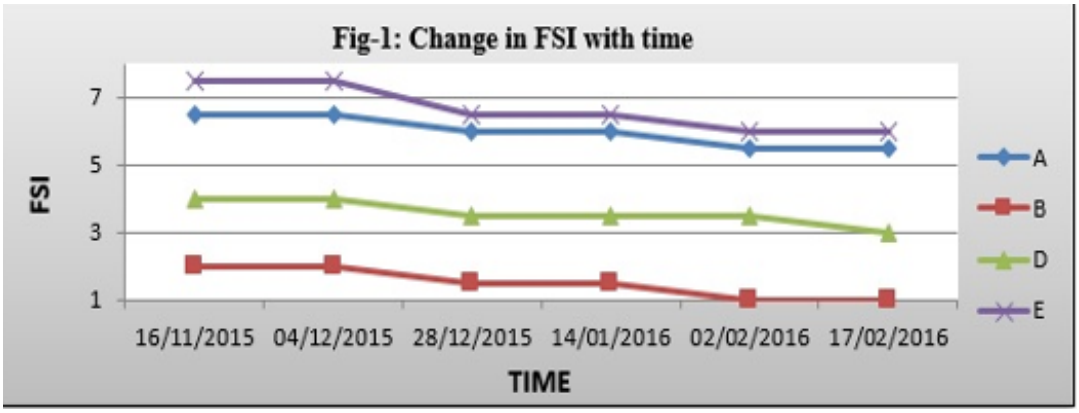
Figure 1. Export Metallurgical Coal Cost Curve (FOB) where the x-axis is the total annual quantity of export metallurgical coal globally, and the y-axis is the range of FOB cost of the various producers going from lowest (left) to highest cost producers (right).



Metallurgical coal is a premium product attracting a high price due to its specific properties. Weathering of metallurgical coal starts as soon as the coal is mined, and it will continue until it is charged in the coke oven to produce coke. In mines, coal exists in a water-saturated, oxygen-free environment. Any disturbance of this environment such as a change in the temperature, moisture content or oxygen partial pressure, results in changes of chemical properties and physical stability. This dynamic behaviour of coal is termed 'weathering' and includes the aerial oxidation of the organic and mineral matter (chemical weathering), the microbial oxidation of pyrite (biological weathering) and changes in the moisture content that result in particle size degradation (physical weathering). During transportation and stockpiling, coal is in contact with air for periods of time that may exceed 6 months. During this time, reaction with oxygen in the presence of water, sunlight and possibly elevated temperatures may take place. Different coals follow different trends during weathering. The weathered coal affects its beneficiation process as, due to oxidation, the coal's surface property gets changed and the coal surface becomes more hydrophilic. Therefore, the sooner the mined coal reaches its intended destination for use in steel making, the better the retained quality of this coal - meaning that less time spent in transit is advantageous for steel makers.

For example, one of the key differentiators in terms of the price for metallurgical coal is its Free Swelling Index (FSI). FSI is a measure of a coal's swelling properties when heated under prescribed conditions without physical restrictions. As FSI reduces purchasers will apply a 'penalty' to the selling price. Figure 2 below shows test results which evidence the fact that the FSI is significantly reduced over time.

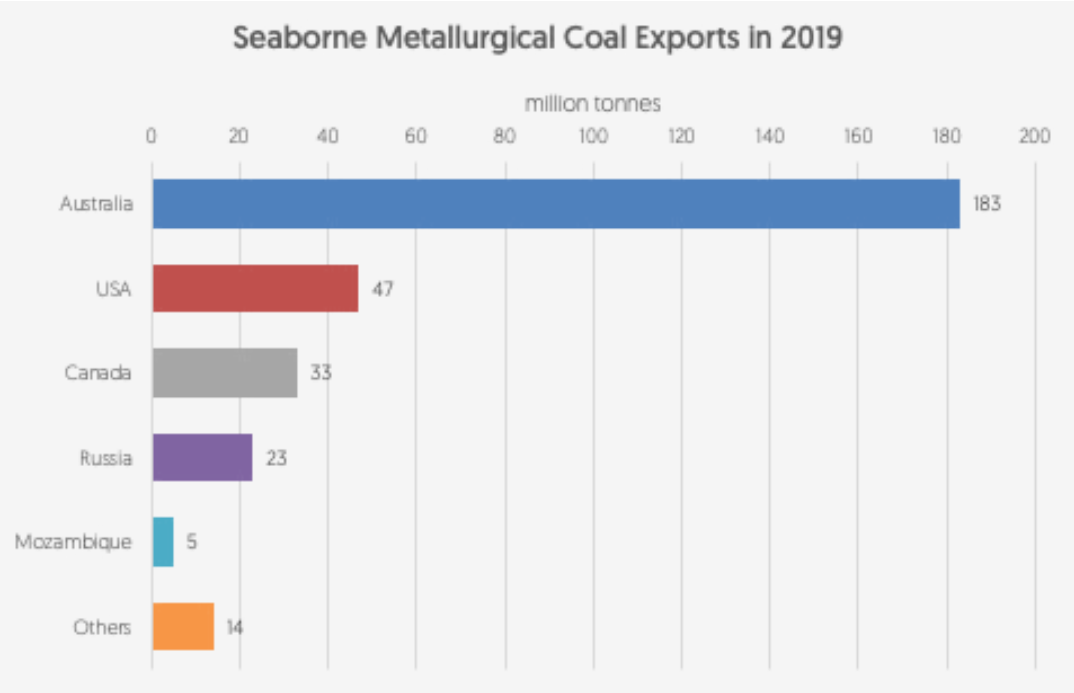
Figure 2. The deterioration of FSI in coal over time.



The cumulative effect over time is such that the value of the coal is significantly reduced as its suitability for steel making is eroded.

WCM coal will be classed as a 'High Volatile A' coal, due to its specific characteristics. This is a high-quality hard coking coal (HCC) used for steel making. The USA is currently the major source of a similar grade of coal for the European steel making market and exported 47million tonnes of metallurgical coal in 2019, with around 60% of this being High Volatile A, as per Figure 3 below.

Figure 3. The total seaborne exports in 2019



The primary reason that production from Cumbria will very likely result in an equivalent decrease in production in the USA is economic - Cumbrian coal will be significantly more cost competitive than the USA coal due to lower operational coal production and transportation costs. Many USA mines are now mining thinner seams which are more difficult and as a result expensive to operate and mine efficiently.

The operating costs of the Cumbrian mine will be much lower than the majority of other mines producing HCC coal and this cost advantage is of significant interest to steel makers. I consider that the WCM mine will be more cost-competitive than over 75% of USA mines producing a similar grade of coal, as shown in Figure 3 and explanatory text above.

This cost advantage is coupled with another significant advantage that Cumbrian coal has over the USA HCC producers; significantly less transport costs. USA HCC mines are several hundreds of miles distant from shipping ports, involving lengthy rail journeys to take the product to the ports. The east coast of the USA is several thousands of miles distant from Europe, therefore transport costs of HCC coal from the USA mines to Europe are significantly higher than the transport costs of Cumbrian HCC coal to Europe.

At least 50% of the USA coal mines are described as "marginal producers", which means that they operate with high levels of production costs (due to various factors including the distances and costs involved in transportation) and are only able to make profits when the coal selling price is high (typically above US$140/t). Indeed, recent evidence shows that high cost coal mines in the USA are closing down due to falling coal prices.[8]

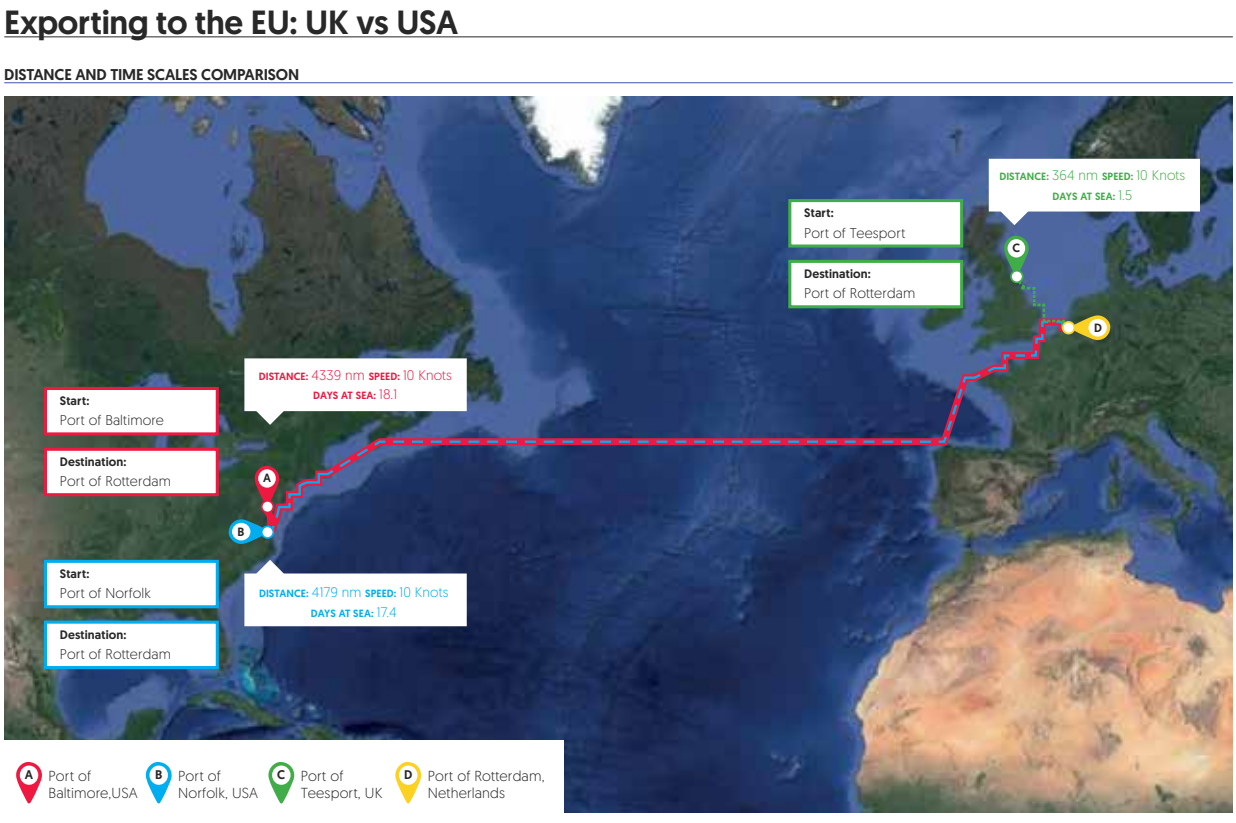
If USA mines were to try to compete on cost against WCM, they would simply become uneconomic - these established mines have fixed operating costs, which would make it very difficult for them to compete. Indeed, to undertake such measures to compete for such a small fraction of the market that WCM will hold is highly likely to be unattractive to those operators, whose most economic route would simply be to scale back production or close the mine.

Target customers in the UK and Europe all source the majority of their High Vol A metallurgical coal from the east coast of the USA, as there are presently no other more cost-effective sources. Reliance on one geographical source presents risks arising from transport delays, geo-political or tariff changes, and supply security. As a result, these customers are continuously seeking to diversify their supply sources to de-risk the supply of the raw materials required particularly for scarce High Vol A premium coking coals.

Cumbrian produced coal will be available to the UK and European market in a matter of hours, rather than weeks, and this has significant advantages for steel producers, including significantly reduced shipping costs, significantly shorter lead-in times from order to delivery, and the ability therefore to be much more responsive to last-minute demand, with better coal quality due to less degradation caused by coal being transported in a ships' hold for long periods as it crosses the Atlantic.

The largest producing area of metallurgical coal that would compete with coal produced by WCM in the USA is central Appalachia, which is rail linked over distances of, on average, 600km, to ports at Norfolk, Virginia and Baltimore, Maryland. Coal is shipped primarily to Rotterdam from these locations, over distances of 7,738 km (4179 nautical miles) from Norfolk, and 8,035 km (4339 nautical miles) from Baltimore. Comparing the travel distances for coal from West Cumbria Mining operations to Rotterdam, the rail route from Pow Beck valley to Redcar is 215 km and the shipping distance from Redcar (Port of Teeside) to Rotterdam is 674 km (364 nautical miles). This is demonstrated by Figure 4 below.

Figure 4: Shipping distances from WCM as compared to coal imported from USA



[8] https://www.argusmedia.com/en/news/2080089-several-us-coking-coal-mines-cut-output-in-4q

In my judgement based upon my experience of the market it is unrealistic to conceive that UK and European steel makers would continue to buy USA High Vol coal over and above Cumbrian High Vol coal when the Cumbrian coal is significantly cheaper, much more readily available, has better retained quality due to shorter shipping distances, and has fewer upstream carbon emissions arising from transport of the product due to far shorter travelling distances. This is further supported by information that I understand has been obtained by WCM from the UK and EU steelmakers, including two separate letters of support from British Steel and Tata Steel UK, signalling strong interest in a UK produced coal for sustainability reasons.

Steel makers will not simply buy more High Vol A metallurgical coal than they need once Woodhouse Colliery comes on stream, because High Vol A metallurgical coal is only one of several ingredients required in steel making.

Cumbrian High Vol A metallurgical coal is therefore most likely also be preferred by UK and European steel makers because of its significantly reduced travel distances, and consequent reductions in transport related environmental emissions. This has been most recently confirmed in discussion between WCM and one of Europe's largest steel producers, Tata Steel, and it is these factors that are the fundamental aspects of WCM's business case for investors in developing the mine.

WCM has undertaken market research over the last 5 years to demonstrate these principles, using industry experts and trade bodies. From this, it is clear that there is a very high level of interest from UK and European steel makers, who are interested because of the proximity of this resource so close to their plants.

Metallurgical Coal: Market

There is currently no viable and scaleable alternative to metallurgical coal in the steel making process. This factor differentiates metallurgical coal from thermal coal, the latter being much more readily available, and which is gradually being replaced by proven and scaleable alternative technologies for power generation, such as wind, solar and hydroelectric power.

Due to this, it is forecast that there will be strong demand for metallurgical coal until at least the end of this century. This demand will be driven partly by increased demands for steel as the less developed nations of the world accelerate their journeys into the provision of improved infrastructure, and improved lifestyles which demand more steel in domestic goods and transport.

The predicted continued demand for steel is also partly driven by a need for the world to reduce its emissions under the requirements of the United Nations Framework Convention on Climate Change Paris Agreement on climate change (which is signed by almost 200 countries). Emissions reductions will result in a significantly increased demand for alternative energy technologies including wind, solar, and hydroelectric. Decarbonisation of the transport system will require more trains, and electric cars will replace fossil fuelled cars. All of these applications are dependent upon steel - for example, a wind turbine is made predominantly of steel. It is fair to say that without steel there would be no green infrastructure, because there are no equivalent alternative materials to steel.

WCM's place in the global metallurgical coal market will be small. It is proposed that, at maximum output, WCM will mine 2.78 million tonnes per annum of HVA HCC metallurgical coal for a period of 45 years. The target markets for this coal are steel makers in the UK (primarily Tata at Port Talbot, and British Steel at Scunthorpe, now owned by the Jingye Group), and the European steel making industry. These steel makers currently import an equivalent grade of coal from the east coast of the USA, and would continue to do this if the WCM mine did not open. There are currently around 300 million tonnes of metallurgical coal exports around the world per annum, of which WCM's coal would comprise around 0.26%.

Since it represents such a tiny proportion of global production, the output from WCM's mine will have no measurable bearing on the price of coal in the remaining 99.74% of the world's metallurgical coal producers and markets. Since output from the WCM mine will be almost identical in grade to the current imports to the UK and Europe of this material from the east coast of the USA, it is reasonable for WCM to assume that its output will substitute for an equivalent tonnage of an equivalent grade of coal from the USA, and this is fundamental to WCM's business case, developed by market-leading experts.

WCM's coal will be significantly more cost-competitive to the equivalent grade of coal from the east coast of the USA, or anywhere else in the world, primarily due to significantly reduced shipping costs. Since coal is just one of a number of ingredients in steel making, this will not make the overall price of steel cheaper. As is set out above, the shipping distances alone from the USA to Europe are around 11 to 13 times greater than the UK to Europe. When UK and European steelmakers select British-produced premium metallurgical coal, they will not only be buying a cost-competitive product, but also one which reduces emissions from shipping transport by a factor of up to 13 when compared with an equivalent product from the east coast of the USA.

The production of coal in Cumbria will not cause a dip in global metallurgical coal prices, because its contribution to the market place would be so small as to be unnoticeable. In any event, as a start-up mine that requires full investment to build, it would be counter-productive of WCM to seek to disrupt world metallurgical coal pricing - even if it could, this would not be favourable to WCM's business case for investors. WCM, in common with any other business, is seeking to maximise returns via a high coal selling price, rather than minimise returns via disrupting the metallurgical coal market and reducing selling prices.

The competitive pricing of Cumbrian coal compared to its USA equivalent will have no impact on the price of steel, because metallurgical coal is just one of a number of ingredients in the steel making process, as described below.

5 STEEL MAKING

Steel Making: Methods, Uses and Future Outlook

Methods

Over 75% of steel is made using a sequence of three processes involving a wide range of raw materials including limestone, iron ore, coal and other minerals. These processes are coke making, iron making and, finally, steel making. The raw materials have to be mined and transported, often over large distances to the steel making plants. Therefore, minimising transport distances of raw materials minimises the GHG emissions generated from this transport.

Each step in these steel making processes is described in more detail below.

Coke making

Coking (metallurgical) coal is converted to coke by heating the coal in a coke oven. This drives off volatile materials to leave almost pure carbon. The physical properties of coking coal cause the coal to soften, liquefy and then re-solidify into hard but porous lumps when heated in the absence of air.

This process takes between 12 to 36 hours. Once removed from the oven, the hot coke is then quenched with either water or air to cool it before storage or is transferred directly to the blast furnace for use in iron making.

The coke making process releases gases which contain a high degree of energy. These gases are captured and then recycled in other parts of the steel making operations as a fuel. This reduces the amount of energy required from the grid in steel production, which in turn lowers total greenhouse gas emissions arising from this process.

Iron making

A blast furnace is fed with iron ore, coke and small quantities of fluxes (minerals such as limestone, which are used to react with impurities in the iron ore and coke). Air which is heated to about 1,200°C is blown into the furnace through nozzles in the lower section. The air causes the coke to burn, producing carbon monoxide at around 2,100°C, which reacts with the iron ore, as well as heat to melt the iron. Finally, the tap hole at the bottom of the furnace is opened and molten iron and slag (impurities) are drained off.

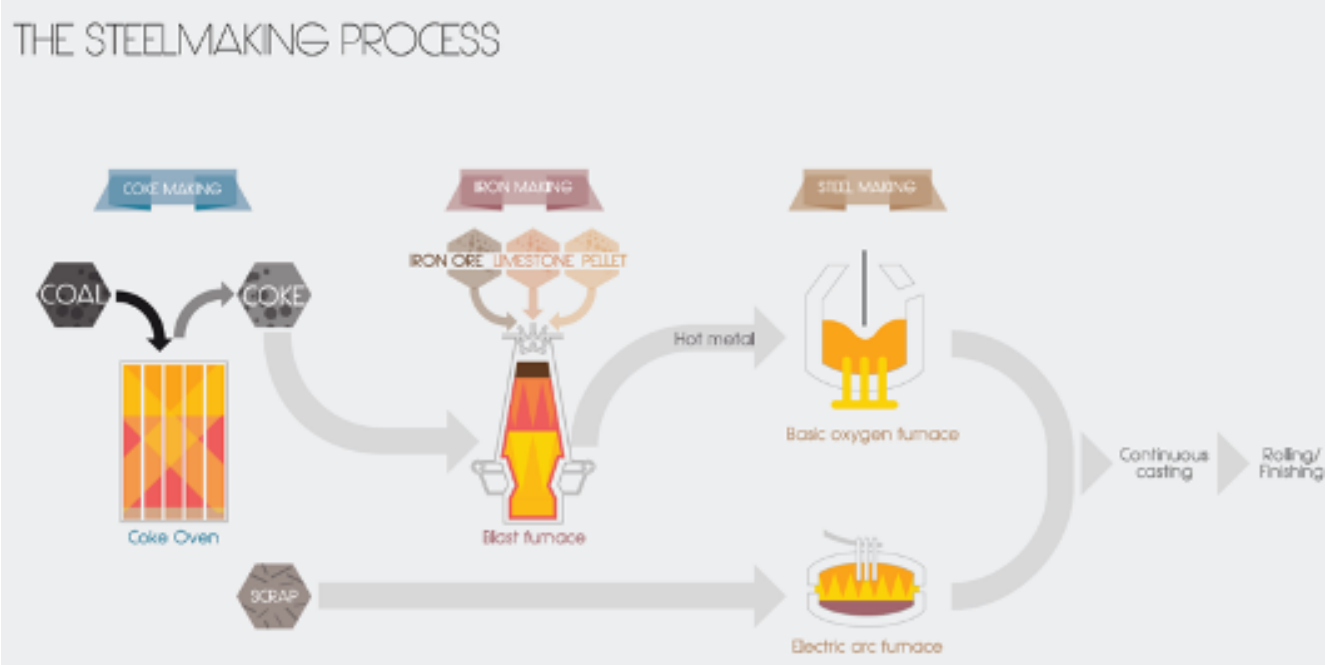
Steel making

Steel is most commonly made in a basic oxygen furnace. In the basic oxygen furnace, iron is combined with varying amounts of steel scrap (less than 30%) and small amounts of flux. A lance is introduced into the vessel and blows 99% pure oxygen causing a temperature rise to 1,700°C. The scrap melts, impurities are oxidised, and the carbon content is reduced by 90%, resulting in liquid steel.

Other processes can follow, called secondary steelmaking processes, where the properties of steel are determined by the addition of other elements, such as boron, chromium, manganese and molybdenum, amongst others. These secondary processes create the required grade and quality of steel.

Optimal operation of the blast furnace demands the highest quality of raw materials; the carbon content of coke therefore plays a crucial role in terms of its effect in the furnace and on the hot metal quality. A blast furnace fed with high quality coke requires less coke input, results in higher quality hot metal and better productivity, together with a lower blast furnace fuel rate, i.e. lower carbon emissions.

Figure 5: Below shows the steel making process in graphic form



It takes up to 770 kg of coal to produce 1 tonne of steel through this production route.

The remaining 15% of steel making is using scrap steel as a primary ingredient in an electric arc furnace. Scrap steel is usually only able to produce relatively low grade long steel products, for example construction products such as reinforcement bar or steel mesh. This is because recycled steel contains impurities such as copper and tin, which are difficult to fully remove in the recycling process, and make the resulting steel unsuitable for high grade applications. High grade steel, for aviation, domestic and medical applications, for example, requires a much lower, or zero, presence of such impurities, and therefore it can only be produced at scale using the blast oxygen furnace route.

Around 85% of scrap steel in Europe is already recycled. The ability to recycle scrap steel depends upon the quality of the scrap steel and its intended use following recycling. Prior to use, the scrap steel needs to be cleaned of the contamination caused by its previous use before being heated at a high temperature in order to reduce it to a molten state and drive off remaining contaminants. The processing and cleaning of scrap is itself energy intensive, resulting in GHG and other emissions.

The market for recycled steel products is heavily constrained by the availability of scrap steel to feed into the recycling process. Around 51% of all steel made is 'locked in' within infrastructure, for example bridges, tunnels and buildings, which typically has a long lifetime before it will be decommissioned and demolished. Other medium to long term uses of steel include rail lines, engines, aerospace uses etc. Steel only becomes scrap once it, or the structures it supports, have reached the end of its useful life. Arcelor Mittal, one of the world's largest steel producers, published a report in 2019.[9] Arcelor Mittal provide commentary on the availability and use of scrap steel. Arcelor Mittal's Report (page 2) states that there is, "not enough scrap

[9] Arcelor Mittal (2019) Climate Action Report

available in the world to make all steel through the electric arc furnace"; and at page 10 that, "the strong demand for steel in the developing world means that end-of-life scrap is only sufficient for a modest share (approximately 22%) of metallic input for global steel production.", and that, "the availability of end-of-life scrap lags demand for steel by several decades, typically 10-50 years or more after production depending upon application. This means the world will still be reliant on primary steel making from iron ore until nearer the end of this century." At page 12, the Arcelor Mittal Report states, "As living standards improve and infrastructure across the globe matures, demand for steel will eventually plateau. After that, enough end-of-life scrap will be available to meet the bulk of steel demand, leading to a fully circular steel value chain. Since this transition is unlikely to become reality much before the end of the century, iron and steelmaking from iron ore will continue to play an important role in meeting global steel demand well beyond 2050."

Uses of Steel

Steel is used in a very wide variety of applications - from domestic (cookers, fridges, kettles, saucepans), to aerospace, defence, medical, construction, industrial, shipping, automotive, power generation and transmission, medical and infrastructure provision. Steel is a vital material in green infrastructure - it is the primary material used for wind turbines, rail lines, bicycles, and is used in solar power equipment. Therefore, not only is steel recyclable, and therefore highly sustainable, it forms a significant part of green infrastructure for which there is no alternative material.

Future Outlook for Steel Use

In February 2020 the British Government launched its hugely ambitious plans for the 'COP 26' UN climate conference which it will host in 2021 (delayed after the Covid-19 outbreak). This will be a major event and could lead to a new global agreement to speed up carbon emission reductions. The path to significantly reducing global emissions can only be achieved if new low carbon technologies are built and deployed around the world. This will require the mass manufacture and construction & installation of renewable technologies as well as other low carbon power generation on a scale never before witnessed.

On 2 March 2020 the Prime Minister, Mr Boris Johnson, announced a change in UK energy generation policy, reversing what was effectively a moratorium on onshore wind turbines announced by a previous Conservative administration. This will generate an increased demand for wind turbines and the associated infrastructure required to install and operate them. With the takeover of British Steel in Scunthorpe completed on 9 March 2020, the future for the British steel making industry looks positive.

To achieve the green infrastructure, low emissions vision, the world will require high grade steel which cannot currently be produced from recycled steel, due to the issues raised by the presence of impurities in scrap steel, as discussed earlier. Manufacturing of one wind turbine of 1MW capacity requires around 200 tonnes of coking coal.

Additionally, global demand for steel will increase as less developed countries, for example India, improve their infrastructure and standard of living, requiring steel containing products from railways to bicycles and construction and domestic appliances.

Drivers for Steel Making

Demand for steel is driven by a country's economic outlook and Gross Domestic Product (GDP) growth. Stronger economies with GDP growth generate infrastructure spending and improved quality of life, which in turn increases steel demand. This requires an increase in iron production, which requires coking coal.

Steel makers make steel to order. The process of making steel is expensive and energy intensive, so for manufacturers to make it without a market for it would result in the need for steel to be stockpiled. Stockpiled steel degrades over time by processes including age hardening and rusting, which results in a devalued product, or, in the worst case, a product which may need reprocessing before it can be sold. The money invested by the manufacturers in making it is then lost.

The Future of Coal in Steel Making and Recycled Steel

A combination of market knowledge, industry forecasts, and the requirements for a move to green infrastructure, lead to the conclusion that steel is a critical material in the future. Not only will it allow less developed countries to 'catch up' with the infrastructure and goods enjoyed by developed countries, it will also allow the roll-out of green infrastructure, including power generation.

These conclusions are supported by environmental scientists, whose research shows that in order to move away from using oil and gas for electricity consumption (the most significant source of global GHG emissions), that 1,500 wind turbines would need to be built every day for the next 30 years just to keep the lights on as gas and coal power stations are closed. This

is not accounting for the proportion of the world's population that does not yet have good or reliable access to power, so it is reasonable to assume that power demand will increase beyond this. Further, the significant amount of wind and solar renewable energy needs a source of significant concentration of energy, for example coking coal, to produce steel required for wind and solar power infrastructure.

One of the primary authors of the 3rd Assessment of the Intergovernmental Panel on Climate Change (IPCC) recently stated in an interview recently that fossil fuels are a necessary part of the future, in conjunction with carbon capture and emissions reductions in order to achieve a 'net zero' balance of GHG emissions.[10]

The European steel making industry has made significant advances in emissions reductions. Emissions reductions will continue in the future. Such an approach will almost certainly require forms of technology which are being tested by steel makers, including carbon capture and storage, as well as carbon offsetting. Research is also being conducted by steel makers into methods of steel making which do not use coal, or which use less coal - such as the Electric Arc Furnace method, or Direct Reduced Iron. However, these processes are still energy intensive and use other fossil fuels.

It must be remembered that the recycling of steel using the electric arc furnace demands very significant quantities of electricity and cannot produce high grades of steel which are required for specific purposes and uses. This is due to the relatively low quality of the steel which is recycled in this method (it contains copper and tin), and the resulting steel is of similarly low quality, and is therefore only capable of being used for general construction purposes (for example, reinforcement bar in concrete buildings and structures). High grade steel is produced from raw materials, rather than recycled scrap. Thus, even if scrap steel availability were to increase dramatically, it would still not be able to meet the considerable demand for new higher-grade steel.

The Direct Reduced Iron (DRI) method relies on natural gas or coal, and is typically used in countries with large domestic reserves of steam coal or natural gas. Therefore there are still GHG emissions from this technology.[11] Over the coming decades, as steel making methods are refined to use less metallurgical coal, there will be a per tonne reduction in the amount of metallurgical coal required for steel making. However, the current alternative methods are not yet commercially tested or viable, and are certainly several decades away from being a meaningful competitor to the blast furnace method. 20% of the current ~100Mtpa production of DRI uses coal as the reductant, mostly in India. Most other production is centred on countries where gas is very low cost, i.e. Iran and Russia.[12]

It is my clear opinion that metallurgical coal will continue to play an important role in the steel industry for a considerable period of time. During this period, the availability of WCM coal will have no material impact on steel industry or other research initiatives to become more efficient, nor will it have any materially adverse effect on incentives to de-carbonise the steel industry.

6 SUMMARY AND CONCLUSION

For the reasons that I have set out above, from my experience in the metallurgical coal and steel-making industry I would draw the following conclusions on likely future market trends, having regard to any possible effects caused by the availability of WCM coal as summarised below:

i. The European Union is a significant producer of steel, and European (including UK) steel makers currently import 40-44 million tonnes of metallurgical coal, principally from the USA. This trade route has been established for decades, and if the WCM mine does not go ahead, European (including UK) steel makers will continue to source their metallurgical coal requirements from the USA.

ii. Metallurgical coal is mined on demand. If better or equivalent grade coal can be mined from a closer location at a similar price, that coal will replace the coal that is currently being exported from further afield. In the present case, WCM coal will effectively substitute the equivalent volume of USA coal that is currently being exported to Europe by being shipped across the Atlantic. This is further evidenced by expressions of interest for WCM coal received from UK steel makers.

[10] Professor Myles Allen, a physicist who has spent 30 years studying global climate change, and is a former lead author of the 3rd Assessment of the Intergovernmental Panel on Climate Change in 2001, stated in interview that fossil fuels are a necessary part of the future, albeit that carbon capture and/or emissions reductions are essential https://www.bbc.co.uk/sounds/play/m000fgcn

[11] World Coal Institute (2009) Coal and Steel

[12] https://www.midrex.com/wp-content/uploads/Midrex_STATSbookprint_2018Final-1.pdf

iii. Metallurgical coal degrades once it has been mined and exposed to the air and weather. Stockpiling this coal would cause it to degrade to such an extent that the properties which make it desirable for the steel making market will have deteriorated so that it can only be classed as a much lower grade with a considerably reduced value. For this reason, stockpiling of metallurgical coal is not common practice in the industry For this reason, stockpiling of metallurgical coal is not common practice in the industry or generally regarded as a sensible business model.

iv. The USA would not continue to mine the same grade of coal for sale to other countries because there is no proven market for them to do that, and also because shipping to alternative major steelmaking countries in Asia and India involves such transport costs that its economical viability would be questionable. The most likely outcome of product substitution is therefore that there would be a corresponding reduction in the extraction of coal in the USA, which is currently mined for importation into Europe.

v. WCM coal would be competitive on cost, which would encourage its substitution for imported coal. However, its production will not affect global metallurgical coal prices. Furthermore, any cost savings that do arise in relation to WCM coal would be unlikely to affect the cost of steel production, or the demand for steel. This is because there are many variable components in steel production, and because steel consumption is driven by demand for it from the market (rather than its availability or price).

vi. Despite increases in the use of electric arc furnaces to recycle steel from scrap steel, there will still be continued demand for primary steel making using metallurgical coal until nearer the end of this century. This is because of limited availability of scrap steel, and the continued need for high grade steel for some industries, which cannot usually be made from recycled steel.

vii. Other alternative mechanisms of steel production, such as Direct Reduced Iron (DRI), are unlikely to be commercially viable for large-scale steel production for several decades. Furthermore, there is also very significant incentives for the steel industry to work towards de-carbonisation, and the availability of WCM coal will not have any material effect on this process.

viii. There is likely to continue to be a demand for metallurgical coal for steel-making in Europe throughout the life-span of the Proposed Development.

Signed  Dr Neil J Bristow

Dated 5/5/2020

Appendix 2 - Independent Assessment of GHG Emissions

Cumbria Metallurgical Coal Project

GHG Assessment

West Cumbria Mining

6 May 2020

Cumbria Metallurgical Coal Project

Quality information

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Revision History

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Table of Contents

Figures

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Abbreviations and Acronyms

Abbreviation or Acronym	Definition
BREEAM	Building Research Environmental Assessment Method
BSI	British Standards Institution
CIBSE	Chartered Institution of Building Services Engineers
CO_2	Carbon Dioxide
Defra	The Department for Environment, Food and Rural Affairs
e	Equivalent
EIA	Environmental Impact Assessment
ESD	Effort Sharing Decision
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse Gas
Ha	Hectare
ICE	Inventory of Carbon and Energy
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
M	Mega
NPPF	National Planning Policy Framework
RLF	Rail Loading Facility
t	Tonnes
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

1. Introduction

Project Description

1.1 The Proposed Development is a new underground metallurgical coal mine and associated development that includes the following infrastructure elements:

- the refurbishment of two existing drifts;
- coal storage and processing buildings;
- an office and change building;
- an access road;
- ventilation, power and water infrastructure;
- security fencing, lighting and landscaping;
- an outfall to sea;
- a surface water management system and landscaping at the former Marchon site (High Road) Whitehaven;
- a new coal loading facility and railway sidings linked to the Cumbrian Coast Railway Line with adjoining office/welfare facilities;
- extension of railway underpass;
- construction of a temporary development compound;
- associated permanent access on land off Mirehouse Road, Pow Beck Valley, south of Whitehaven;
- a new underground coal conveyor to connect the coal processing buildings with the coal loading facility; and
- occupation of an offsite materials depot.

Overview and Approach

1.2 This Report presents an assessment of the impacts of the Proposed Development on the climate as a result of greenhouse gas emissions (GHGs) arising during construction, operation and decommissioning. It defines the study area; the approach to identifying the effects, the methodology used for developing the baseline and impact assessment; provides a description of the baseline environment in relation to climate; and presents the findings of the impact assessment.

1.3 The Environmental Statement has been prepared under the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended) ("the 2011 Regulations"), which continue to apply to the determination of this application in accordance with the transitional provisions in the Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ("the 2017 Regulations"). However, insofar as GHG emissions are concerned, notwithstanding the application of the 2011 Regulations, this assessment has sought to incorporate the stricter requirements of 2017 Regulations and to take into account the guidance from the Institute of Environmental Management and Assessment (IEMA) for climate change mitigation (IEMA, 2017).

1.4 The Proposed Development is also considered in the context of the UK carbon budgets and the impact it may have on the UK government's ability to meet its carbon reduction targets.

2. Legislation, Policy and Guidance

2.1 This Section identifies and briefly describes the legislation, policy, and guidance of relevance to the assessment of potential climate impacts associated with the construction, operation and eventual decommissioning of the Proposed Development.

2.2 Legislation, policy and other relevant guidance has been considered on an international, national and local level. The following is relevant to the GHG assessment as it has either influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the assessment.

International Legislation

Kyoto Protocol

2.3 The Kyoto Protocol is an international treaty which extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC) that commits state parties to reduce greenhouse gas emissions, based on the scientific consensus that global warming is occurring and that it is extremely likely that human-made CO_2 emissions have predominantly caused it. Under Article 4 of the Kyoto Protocol, the EU created an Effort Sharing Regulation that requires the setting of individual binding GHG emission reduction targets for each of its Member States. The current Effort Sharing Decision (ESD) commits the UK to a 37% reduction in GHG emissions for the period 2021 to 2030 (Official Journal of the European Union, 2018).

Paris Agreement

2.4 The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020. It requires all signatories to strengthen their climate change mitigation efforts to keep global warming to below 2°C this century (UNFCCC, 2016).

European Legislation

EU EIA Directive

2.5 The EIA Directive 2011/92/EU sets out the requirement to undertake an Environmental Impact Assessment (EIA). Directive 2011/92/EU was amended by Directive 2014/92/EU. The amendments included the introduction of an express requirement to describe the likely significant effects resulting from the impact of the project on climate change.

2.6 The amendments introduced by Directive 2014/92 do not apply to applications where the initial scoping request was submitted before 16 May 2017, per the transitional provisions of Article 3 of that Directive. Therefore, the requirements of Directive 2011/92/EU as un-amended continue to apply to the determination of this application.

EU Emissions Trading System

2.7 Directive 2003/87/EC (as amended). The EU Emissions Trading System (EU ETS) is a GHG trading scheme that covers industrial installations with a net excess of 20 megawatts. Participating installations work under a ‘cap and trade’ principle that sets maximum allowances for GHG emissions. Unused allowances can be traded, whilst installations that go over their limit must purchase allowances from others. From 2020, the emissions cap will reduce by an annual rate of 1.74%.

National Legislation

The Climate Change Act

2.8 The Climate Change Act 2008 (UK Government, 2008) (hereafter referred to as the 'Act') provides a framework to meet its GHG emission reduction goals through legally binding national carbon emission caps within five-year periods. The Act was amended in 2019 to revise the existing 80% reduction target and legislate for a net zero emissions by 2050 (2050 Target Amendment, Order 2019) (UK Government, 2019). The UK has declared its 5th carbon budget up until 2032 (Committee on Climate Change, 2017). As a result of the amended 2050 carbon reduction target to net zero carbon, the Committee on Climate Change announced it will review the current carbon budgets. The results of this review will be published in autumn 2020 along with the 6th carbon budget.

2.9 This Act defines 'net zero' carbon as "the amount of net UK emissions of targeted greenhouse gases for a period adjusted by the amount of carbon united, credited or debited for the year 2050". This means that by 2050 emissions will have to be avoided completely or offset by removal from the atmosphere and/or traded in carbon units.

EIA Regulations

2.10 The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 and Town and Country Planning Environmental Impact Assessment) Regulations 2017.

2.11 These regulations transpose the EIA Directive into domestic legislation. This application is governed by 2011 Regulations in accordance with the transitional provisions set out in regulation 76 of the 2017 Regulations.

National Policy

The National Planning Policy Framework

2.12 The revised National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) sets out the Government's planning policies for England. Policies of relevance to climate change and sustainability assessment as presented herein include those achieving sustainable development and meeting the challenge of climate change.

Local Policy

Climate Emergency Declaration

2.13 Cumbria County Council declared a climate emergency in September 2019 and committed to working with the six district councils (including Copeland) to become carbon neutral (Cumbria County Council, 2019).

Cumbrian Climate Change Strategy

2.14 This Strategy (Cumbria Strategic Partnership, 2008) details their target of annual reductions of 210,000 tonnes of carbon emissions, their associated strategy and action plan across various sectors of the county. Recommendations made for industry include improvements to energy efficiency to reduce carbon emissions from all its operations from procurement, staff commuting and products.

Guidance and Information Sources- International and National Guidance

Intergovernmental Panel on Climate Change

2.15 Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003) and the current IPCC Emission Factor Database (2019) also provide relevant guidance for the assessment.

European Commission

2.16 Guidance for the Calculation of Land Carbon Stocks (European Commission, 2010) provides a calculation methodology for calculating carbon stocks from land use.

2.17 Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013).

2.18 Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017).

Department for Environment, Food and Rural Affairs

2.19 The Department for Environment, Food and Rural Affairs (Defra) provide GHG emission factors for UK-based organisations (2019).

British Standards

2.20 The British Standards Institution (BSI) BS EN ISO 14064-1:2019 and 14064-2:2019 (BSI, 2019 and b, respectively) provides specifications for organisational-level and project-level guidance for the quantification and reporting of GHG emissions and removals.

The Planning Inspectorate

2.21 Using the Rochdale Envelope: Advice Note Nine: Rochdale Envelope (July 2018).

Guidance and Information Sources - Professional Bodies

Institute for Environmental Management and Assessment

2.22 In the absence of any widely accepted guidance on assessing the significance of the impact effect of GHG emissions, EIA Guidance published by IEMA in 2017 has been taken into account. This provides a framework for the consideration of greenhouse gas emissions in the EIA process, in line with the 2014 EU Directive. Amongst other things, the guidance sets out how to:

- identify the greenhouse gas emissions baseline in terms of GHG current and future emissions;
- identify key contributing GHG sources and establish the scope and methodology of the assessment;
- assess the impact of potential GHG emissions and evaluate their significance; and
- consider mitigation in accordance with the hierarchy for managing project related GHG emissions (avoid, reduce, substitute, and compensate).

The World Resources Institute and World Business Council for Sustainable Development

2.23 The World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) GHG Protocol (WRI & WBCSD, 2015) provides overarching guidance on developing GHG inventories and reporting standards (WRI & WBCSD, 2015).

British Standards Institute

2.24 Publicly Available Specification (PAS) 2080 (BSI, 2016): Carbon Management in Infrastructure provides specific guidance on measuring and managing GHGs from infrastructure.

University of Bath

2.25 The Inventory of Carbon & Energy (ICE) Database (University of Bath, 2019) has been used to source appropriate carbon factors to estimate the embodied carbon of materials used for construction of the Proposed Development. ICE uses some material property data from the Chartered Institution of Building Services Engineers (CIBSE).

3. GHG Assessment Methodology

3.1 This Section sets out:

- The methodology that has been applied to assess the impact of the project on the climate. It provides criteria for determining the sensitivity of the receptor and the magnitude of change from the existing 'baseline' condition;
- An explanation as to how the identification of effects and assessment of potential impacts on the climate has been reached; and
- The significance criteria and terminology for the assessment of residual effects.

Overview

3.2 The GHG assessment has identified the likely effects, identified whether there are likely to be any additional effects as a result of the Proposed Development, and assessed their significance over its lifetime.

Determination of Assessment Scenarios

3.3 The GHG assessment of the Proposed Development has identified the likely effects of the Proposed Development and has then also gone onto address two scenarios: a baseline scenario; and a project scenario. The baseline scenario is a 'Do Nothing' scenario where the Proposed Development does not go ahead. The baseline comprises existing carbon stock and sources of GHGs within the boundary of the existing Site. The alternative is a 'Do Something' scenario associated with the delivery of the Proposed Development, which includes the construction, operation and decommissioning paired with activities that will reduce or no longer occur because of the Proposed Development. The 'Do Something' assessment examines whether, and to what degree, it would result in additional effects by way of GHG emissions over and above the baseline scenario of do nothing. In addition to the assessment carried out of environmental effects for the purpose of EIA Directive, this Report also goes on to consider the impact of the practice of importing metallurgical coal to the UK and Europe from sources located within the United States of America (USA), which currently occurs in the absence of the operation of the Proposed Development.

Study Area

3.4 The GHG study area considers all direct GHG emissions that arise as a result of the Proposed Development including construction, operation and decommissioning from within the red line boundary area. It also considers indirect emissions arising as a result of the Proposed Development from off-site activities such as transport of materials, waste disposal and embedded carbon in construction materials and products.

3.5 The scope and boundary for the assessment has been determined taking in account the principles of the GHG Protocol (WRI & WBCSD, 2015), British Standard EN ISO 14064-1:2019 Greenhouse Gas Reporting, and PAS 2080: Carbon Management in Infrastructure (BSI 2016).

Sensitive Receptors

3.6 The identified receptor for GHG emissions is the global climate. As the effects of GHGs are not geographically constrained, all GHG emissions have the potential to result in a cumulative effect in the atmosphere. In order to assess the impact of GHG emissions from Proposed Development, UK Carbon Budgets have been used as a reasonable proxy for the climate.

GHG Calculation Methodology

3.7 In line with British Standard ISO14064, principles of the GHG Protocol (2011) and Defra reporting guidance (2019), the GHG emissions have been calculated by multiplying activity data by its relevant emission factor:

Activity data x GHG emissions factor = GHG volume

3.8 Activity data is a quantifiable measure of activity, such as operating hours or volumes of fuels used. Emission factors convert the activity data into GHG volumes. Activity data has been sourced from client data. Where specific data is not available, a mix of assumptions and industry benchmarks have been used to fill data gaps. Where this is not possible, then a qualitative approach to assessing the GHG impacts has been followed, in line with the IEMA guidance (2017).

3.9 Emission factors have been sourced from publicly available sources, such as Defra (2019), IPCC, the Bath University ICE (2019) and EcoInvent database version 3.6.

3.10 In line with the British Standard ISO14064 and the principles of the GHG Protocol (WRI & WBCSD, 2015), when calculating GHG emissions, the seven Kyoto Protocol GHGs have been considered, specifically:

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- sulphur hexafluoride (SF_6);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- nitrogen trifluoride (NF_3).

3.11 These gases are broadly referred to in this report under an encompassing definition of 'GHGs', with the unit of tCO_2e (tonnes CO_2 equivalent) or $MtCO_2e$ (mega tonnes of CO_2 equivalent).

3.12 A lifecycle approach has been used to calculate the GHGs associated with the Proposed Development. This approach considers specific timescales and direct and indirect emissions from different lifecycle stages of the development, such as product and material manufacture, site enabling and construction, operations and decommissioning. Only indirect emissions arising as a result of the Proposed Development are considered. Emissions arising from the combustion of the coal from the Proposed Development in steelworks are not considered to be indirect emissions as a result of the Proposed Development for the purpose of this assessment. Activities to be included in the GHG assessment have been scoped on the basis of their presence and materiality, and in line the requirements of the PAS 2080.

GHG Significance Criteria

3.13 IEMA (2017) guidance states that there are currently no agreed methods to evaluate levels of GHG significance and that professional judgement is required to contextualise the projects emission impacts.

3.14 In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets (IEMA, 2017). In the absence of sector-based or local emissions budgets, the UK Carbon Budgets can be used to contextualise the level of significance, and this approach has been adopted in the present case as a cogent and reasonable basis.

3.15 Both the Department of Energy and Climate Change (2013) and the PAS 2050 Specification (British Standards Institution, 2011) allow emissions sources of <1% contribution to be excluded from emission inventories, and these inventories to still be considered complete for verification purposes. This exclusion of emission sources that are <1% of a given emissions inventory is on the basis of a '*de minimis*' (relatively minimal) contribution.

3.16 On this basis, where GHG emissions from the Proposed Development are equal to or more than 1% of the relevant annual UK Carbon Budgets, the impact of the Proposed Development on the climate is considered to be of high significance. This is summarised in Table 3.1.

Table 3.1: Magnitude criteria for GHG emissions

Magnitude	Magnitude Criteria Description
High	Estimated GHG emissions from the Proposed Development equate to equal to or more than 1% of total emissions across the relevant 5-year UK Carbon Budget period in which they arise
Low	Estimated GHG emissions from the Proposed Development equate to less than 1% of total emissions across the relevant 5-year UK Carbon Budget period in which they arise

3.17 There is currently no published standard definition for receptor sensitivity of GHG emissions. All GHG emissions are classed as being capable of being significant on the basis that all emissions contribute to climate change (IEMA (2017) guidance). The global climate has been identified as the receptor for the purposes of the GHG assessment. The sensitivity of the climate to GHG emissions is considered to be 'high'. The rationale supporting this includes:

- GHG emission impacts could compromise the UK's ability to reduce its GHG emissions and therefore the ability to meet its future carbon budgets;
- The need to reduce GHG emissions to reduce the risks and impacts of climate change, as broadly identified by the climate science community and by the Paris Agreement which aims to keep global temperature rise this century below two degrees above pre-industrial levels, (Framework Convention on Climate Change (FCCC/CP/2015/10Add.1), UNFCCC, 2016). Additionally, a recent report by the IPCC highlighted the importance of limiting global warming below 1.5°C (IPCC, 2018); and
- A disruption to global climate is already having diverse and wide-ranging impacts to the environment, society, economic and natural resources. Known effects of climate change include increased frequency and duration of extreme weather events, temperature changes, rainfall and flooding, and sea level rise and ocean acidification. These effects are largely accepted to be negative, profound, global, likely, long-term to permanent, and are transboundary and cumulative from many global actions.

3.18 This method to determine the significance of GHG emissions are summarised in Table 3.2.

Table 3.2: Significance of GHG Emissions

		Sensitivity of Receptor
		High
Magnitude of GHG emissions (Table 3.1)	**High**	Major adverse significance
	Low	Minor adverse significance

UK Carbon Budgets

3.19 The UK carbon budgets are in place to restrict the amount of greenhouse emissions the UK can legally emit in a five-year period (Committee on Climate Change, 2017). The Carbon Budgets do not currently include emissions from international shipping (House of Commons Library, 2019).The UK is currently in the 3rd carbon budget period, which runs from 2018 to 2022, as detailed in Table 3.3. The current Carbon Budgets reflect the previous 80% reduction target by 2050, rather than the current target of net zero emissions by 2050. As the Proposed Development will be operating past 2050, we have therefore also compared the emissions against net zero in 2050.

3.20 The Committee on Climate Change, the body responsible for setting the UK carbon budgets, is currently reviewing the budgets with consideration of the net zero carbon target and will publish their outcome later in 2020 along with the sixth carbon budget. The carbon budgets are reducing to meet the legislated 2050 net zero commitment. This means that any source of emissions contributing to the UK's carbon inventory will have a greater impact on the UK carbon budgets in the future.

Table 3.3: UK Carbon Budgets

UK Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018-2022)	2,544
4th (2023-2027)	1,950
5th (2028-2032)	1,725

3.21 Construction of the Proposed Development is likely to intersect the 3rd and 4th Carbon Budget. The operations will then continue through the 4th and 5th Carbon Budgets and intersect the net zero target in 2050.

General Limitations and Assumptions

3.22 The GHG assessment presented in this document has been based on all currently available data that can be reasonably obtained. As a result, some data is not available to provide a fully quantified assessment of the GHGs from the construction, operation and decommissioning of the Proposed Development. Specific inclusions and exclusions of data, and scenario assumptions are discussed in Sections 4, 6, 7 and 8.

3.23 Where appropriate estimates and approximations have been used based on professional judgement and publicly available information. Maximum parameters (sometimes referred to as 'the Rochdale envelope' (The Planning Inspectorate, 2018), after the judgment of Sullivan J – as he then was - in R. v Rochdale MBC, *ex parte* Tew [1999] and R. v Rochdale MBC, *ex parte* Milne (No. 2) [2000]) have been adopted where relevant, as a worst case.

4. Baseline Environment

4.1 As discussed in Section 3, the baseline environment assesses the 'Do Nothing' scenario where the Proposed Development does not go ahead. Although not part of the assessment under the EIA Directive, it is nonetheless material to note that , metallurgical coal which would otherwise be replaced by coal produced by the Proposed Development will continue to be shipped from sources outside of Europe and transported to UK and EU-based steel works, as illustrated in Figure 4.1, with consequential effects (H&W Worldwide Consulting Ltd, 2020).

4.2 The Site is currently an unoccupied brownfield industry site of a former coal mine, anhydrite mine and chemical works for the manufacture of detergents. The 23-hectare (ha) Site consists of approximately 14 ha 'rank grassland and limited scrub regeneration', and 9 ha of disused concrete footings and hardstanding. There are no current activities at the proposed Site.

4.3 Using the Guidance for the Calculation of Land Carbon Stocks (European Commission, 2010), classification of the climate region is "cool temperate, moist", the grassland is "species poor semi-improved grassland" and soils are "high activity clay soils".

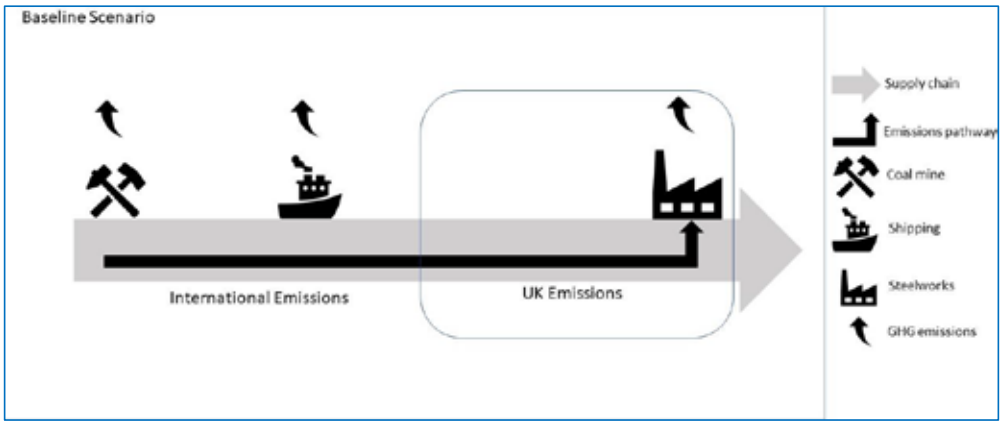

Figure 4.1: Illustrated Baseline Scenario Emissions Pathways

4.4 As detailed in the Revised Environmental Statement and Planning Statement (West Cumbria Mining, 2018a and b, respectively), there are no sources of metallurgical coal in the UK. This type of coal is used and required in steel manufacture and is primarily shipped to the UK from Baltimore or Norfolk, USA. There are no legal restrictions on steelworks using metallurgical coal or any known plans to introduce such legislation. Metallurgical coal from the USA is the main source for steel works in both the UK and Europe and this will continue if the Proposed Development is not permitted to operate.

4.5 If this Proposed Development is not permitted, these shipments will continue to meet the demand from the UK as well as elsewhere in the EU steel industry (H&W Worldwide Consulting Ltd, 2020).Any GHG emissions at the steel works from the combustion of coal mined from the Proposed Development would therefore not be additional as these will occur whether or not the Proposed Development is permitted to operate.

4.6 Using the equivalent coal tonnage from the Proposed Development, the GHG emissions associated with the current shipments from the USA to the UK and EU was calculated as an estimated 107,430 tonnes CO_2 per annum, or 5,371,515 tonnes CO_2 over the 50-year lifespan of the Proposed Development.

5. Scope of Impact Assessment

5.1 Table 5.1 summarises which activities will be included in the GHG assessment.

5.2 The assessment includes direct, indirect and secondary GHG emissions resulting from the Proposed Development that fall within the scope of the assessment.

5.3 Direct GHG emissions are those emissions generated at the development Site during the lifetime of the development (i.e. its construction, operation and decommissioning).

5.4 Indirect GHG emissions are those generated (or avoided) away from the Development Site as a result of the Development, such as the generation of electricity and the manufacture of materials (embedded emissions) used by the Development, transportation associated with the Development, and the disposal of waste.

Table 5.1: Scope of GHG assessment

Lifecycle stage	Activity	Emissions source	Direct/Indirect
Construction (including enabling works)	Construction activities	GHG emissions from fuel used in plant, vehicles and temporary accommodation	Direct
	Construction materials	Embedded GHG emissions in materials used for the construction of the Proposed Development	Indirect
	Transportation of construction materials	GHG emissions from the transportation	Indirect
	Transportation of construction workers	GHG emissions from the fuel used for the transportation of workers to/from site	Indirect
	Construction waste	GHG emissions from the transportation and treatment of waste	Indirect
Operation	Mine operation	GHG emissions from the use of grid electricity during mine operations	Direct
	Fugitive emission	Fugitive methane emissions	Direct
	Vehicles	GHG emissions from vehicles used on site	Direct
	Waste	GHG emissions from the transportation and disposal of operational waste	Indirect
	Worker transportation	GHG emissions from the fuel used for the transportation of workers to/from site	Indirect
	Materials	GHG emissions from the transportation of materials for operation to site	Indirect
	Transportation	GHG from the rail transportation of coal from the Rail Loading Facility at the Proposed Development to the primary point of onward distribution.	Indirect
Decommissioning	Decommissioning activities	GHG emissions from fuels used by plant, vehicles and temporary accommodation	Direct
	Waste and materials	GHG emissions from the transportation and disposal of waste and other materials.	Indirect

5.5 GHG emissions caused by using coal produced by the Proposed Development (e.g. at steelworks in the UK or Europe) are not direct or indirect/secondary effects of the Proposed Development. The use of coal produced by the Development is not an effect (whether direct, or indirect/secondary) caused by any phase of the development and therefore there is no requirement to take it into account under the EIA Directive. Nonetheless, for the sake of prudence this assessment has asked whether, if such emissions were an indirect effect, the 'Do Something' scenario would result in any additional or material increase in GHG emissions. The answer is no. The use of coal already forms part of the baseline (as is explained Section 4)

and would be likely to continue at the same level irrespective of whether the Proposed Development proceeds (H&W Worldwide Consulting Ltd, 2020).

5.6 A proportionate approach has been taken in order to ensure that the assessment captures the direct and indirect (and secondary) effects of the GHG emissions caused by the onward transportation of coal produced by the Proposed Development. This has been achieved by taking into account GHG emissions generated from transportation from the Development Site to the point of first distribution. This includes the GHG emissions of all rail transportation of coal from the Rail Loading Facility (RLF) to UK steelworks (at Port Talbot and Scunthorpe) or the Port at Redcar. As a matter for professional judgement, rail journeys from the RLF are considered to be an indirect effect of the operation of the Development, whereas further onward distribution beyond those rail journeys are not. This acknowledges the need to transport coal away from the Development site, whilst recognising that onward distribution beyond the point of first distribution (e.g. international shipping) should properly be regarded as the indirect GHG emissions of another development (e.g. the port) and/or the upstream indirect effects of the development (e.g. steel works) where the actual consumption of the product for energy as part of the production of steel takes place.

5.7 Furthermore, and in any event, the adoption of this approach to GHG emissions generated by the onward transportation of coal, which excludes the emissions of international shipping, is likely to represent a worst-case scenario for assessment for the purposes of the EIA Directive since it does not take into account the significant reduction in GHG emissions from shipping that is considered likely to arise as a result of the Proposed Development (The Planning Inspectorate, 2018). Therefore, it incorporates a precautionary and robust approach to GHG emissions caused by onward transportation for the purposes of EIA assessment.

5.8 These activity types are in line with that described in the GHG Protocol (WRI & WBCSD, 2015) and PAS 2080. Any carbon offsets and land use change will also be considered in the GHG assessment.

Transboundary Effects

5.9 It is not considered that any transboundary effects are likely to arise for the purposes of the EIA Directive as a result of the construction, operation and decommissioning of the Proposed Development (see above, paragraph 5.5). Additionally, even if contrary to the foregoing such emissions were considered to be indirect effects of this development based upon the best evidence which can be reasonably obtained having regard to the carbon budgets for the various European Economic Area states it is not considered that such emissions would amount to “significant environmental effects on the environment of that country” [underlining added] so as to trigger the transboundary notification requirements.

5.10 It is also to be noted that the planning application and the environmental statement for the Proposed Development have been supplied to the Secretary of State. The Secretary of State issued an Article 31 direction (Town and Country Planning (Development Management Procedure) (England) Order 2015) and gave obvious careful consideration to the Proposed Development. Following consideration of the Proposed Development, the Secretary of State lifted the Article 14 direction. That decision was not challenged. It can therefore be presumed that the Secretary of State did not consider that the transboundary requirement of the EIA Directive had been triggered. It is not considered that the proposed variation of the application has materially altered the position. Furthermore, Paragraph: 049 Reference ID: 4-049-20170728 of the National Planning Practice Guidance advises that (UK Government, 2019c):

“*As a proportion of all planning applications, the number of developments in England that are likely to have significant effects on the environment of another country will be small. However, should they occur, the Secretary of State must send information about the development to the government of the affected country, and invite them to participate in the consultation procedures, determining with them a reasonable timescale to allow them to do so. In such a case, the Secretary of State may direct (Article 31(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2015) that planning permission may not be granted until the end of such time as may be necessary for consultations with that government….”.*

6. Enabling Works and Construction GHG Impacts

Overview of Stage Activities

6.1 As described in the Revised Environmental Statement and Planning Statement (West Cumbria Mining, 2018a and b, respectively), the construction stage is anticipated to take two years and includes initial site remediation from historical activities, manufacture of construction materials, driving underground tunnels (also known as drifts) to access the underground coal measures), above ground landscaping, and construction of onsite buildings.

GHG Emissions

6.2 In order to assess the magnitude of the impact of the Proposed Development on the climate, GHG emissions associated with the enabling works and construction of the Proposed Development have been calculated based on the methodologies discussed in Section 3.

6.3 As is usual with projects of this nature, a detailed design of the enabling works and construction activities has not been undertaken for this stage of design, the GHG calculations are based on the following conditions using a mixture of existing Proponent (West Cumbria Mining) data and information, industry benchmarks and professional judgement. The following assumptions, inclusions and exclusions, made on a precautionary basis, have been used in this calculation:

- Construction activities will take two years with approximately 626 working days. This figure is based on construction activities being undertaken from Monday to Saturday;
- At peak construction 310 staff will work at the main mine site. Daily construction staff averages for each month of construction are in line with that described in the Project Description of the Environmental Statement (West Cumbria Mining, 2018a);
- Construction staff commute in single occupancy vehicles, from destinations in accordance with the Road Transport Assessment of the Environmental Statement (West Cumbria Mining, 2018a). However, in reality, shuttle buses will be provided during construction that will reduce per person emissions. All commutes include a return trip;
- Incoming materials and consumables required during construction have been assumed to be available on average of 84 km from the Site. This distance is the average from Carlisle and Lancaster where HGVs are expected to be travelling to and from;
- Uses of grid electricity are likely to include workshops and welfare facilities. Usage has been conservatively estimated on continuous use during construction hours using CIBSE Energy Benchmarks (2008) and includes that for the main site and at the materials depot. However, in reality electricity use is likely to be intermittent;
- Fuel usage onsite has been based on the plant and machinery list detailed in the Noise and Vibration Assessment of the Environmental Statement (West Cumbria Mining, 2018a). Power ratings for these items these equipment items are based upon published construction equipment suppliers. All plant and machinery are assumed to use diesel;
- Waste volumes are based upon current project estimates and include the disposal or treatment of potentially contaminated soil, wastewater, municipal waste and estimates of construction waste;
- Suitable waste receiving facilities have been assumed to be available on average of 84 km from the Site. This distance is the average from Carlisle and Lancaster where HGVs are expected to be travelling to and from;
- An average 57 daily HGV trips to and from Site are expected, of which 50 are assumed to be incoming materials and the remainder for outgoing wastes;

- UK per person averages have been used for mains water usage (Discover Water, 2019) and municipal waste creation (EU Commission, 2019). Mains water will only be used to meet human welfare requirements.
- A bill of quantities for the construction materials is not available. Estimates of materials have been made of the buildings, rail line, the concrete culvert and concrete hardstanding, the water tank and the car park. These estimates have been based on dimensions detailed within the Project Description of the Environmental Statement (West Cumbria Mining, 2018a). As other building and infrastructure elements have not yet been designed, this is only a partial calculation; and
- 12 company-owned vehicles are expected to be active over the course of the construction period.

6.4 As detailed in Table 6.1, the total GHGs estimated to be emitted from the enabling works and construction associated with the Proposed Development have been calculated to be 85,105 tCO_2e over the course of the two-year period. The majority of emissions (90%) are associated with electricity purchase and the embodied carbon of purchased materials used to construct the buildings and infrastructure. Average annual emissions are therefore expected to be approximately 42,553 tCO_2e.

6.5 All these emissions are considered 'additional' and are included in the impact assessment of the Proposed Development. They are defined as additional as they are considered new and would not occur if the Proposed Development did not go ahead.

Table 6.1: Estimated Enabling Works and Construction GHG Emissions

Project Activity/ Emission Source	Emissions (tCO_2e)	Percentage of Stage Emissions
Fuel Usage Onsite	2,857	3%
Company Vehicle Usage	49	0%
Electricity Purchase	31,330	37%
Purchase Goods and Services	45,318	53%
Upstream Transportation and Distribution	3,314	4%
Waste Generated in Operations	917	1%
Employee Commuting	1,316	2%
Total construction stage emissions	**85,105**	
Total emissions per annum	**42,553**	

Significance of GHG Emissions

6.6 As stated in Section 3, all emissions are considered to be significant. To contextualise the level of significance, these emissions have been compared to corresponding UK carbon budgets (Table 6.2). Using the estimated annual emissions from the construction period (42,553 tCO_2e), this is compared to the percentage contribution of the annual budget within each Carbon Budget.

6.7 The timing of construction is dependent upon amongst other things the date by which planning permission is obtained, however, if a year of construction began in 2021 during the 3rd UK Carbon Budget, it will contribute to 0.0017% of this budget. If the following year of construction then occurs during the 4th UK Carbon Budget, it will contribute to 0.0022% of this budget. Emissions from the construction of the Proposed Development do not contribute to more than 1% of any Carbon Budget.

6.8 The magnitude of impact during construction is therefore considered 'low'. As per Table 3.2, the significance of effects is considered as 'minor adverse'. As such, the construction of the Proposed Development is not expected to affect the UK in meeting its Carbon Budgets.

Table 6.2: Contribution to the Construction Emissions to the UK Carbon Budgets

UK Carbon Budget	Total Budget ($MtCO_2e$)	Potential Project Emissions ($MtCO_2e$)	Percentage Contribution of Construction Emissions
3rd (2018-2022)	2,544	0.043	0.0017%
4th (2023-2027)	1,950	0.043	0.0022%

7. Operational GHG Impacts

Overview of Stage Activities

7.1 As described in Revised Environmental Statement and Planning Statement (West Cumbria Mining, 2018a and b, respectively), the operations involve mining and transport of metallurgical coal to steel manufacturers in Port Talbot and Scunthorpe. Steel manufacturers in Port Talbot and Scunthorpe will each receive approximately 180,000 tonnes of metallurgical coal per annum at full production. The remainder of the coal (2.42 million tonnes per annum at full production) will be transported to the Port of Redcar for onward shipping to Europe (most likely the Port of Rotterdam) for onward distribution to European steel manufacturers.

GHG Emissions

7.2 In order to assess the magnitude of the impact of the Proposed Development on the climate, GHG emissions associated with the operations of the Proposed Development have been calculated based on the methodologies discussed in Section 3. Emissions that are considered 'additional' are included in the impact assessment of the Proposed Development. Any emissions arising as a result of the Proposed Development, and that would not have occurred anyway, are considered to be additional. For example, even if it was capable of comprising an indirect effect of the Proposed Development (contrary to the judgement set out above), GHG emissions from the use of coal in the steel making process will occur in the future either with or without the Proposed Development being permitted. This is the same for steel manufacturers in Europe who are likely to use the coal from the Proposed Development rather than sources from the USA.

7.3 Emissions from the use of the coal extracted from the Proposed Development are therefore not considered additional and have been excluded from the impact assessment on this basis as well. The emissions that are defined as additional are illustrated in Figure 7.1.

7.4 GHG Emissions generated from the onward transportation of coal beyond the first point of distribution (e.g. international shipping) have not been taken into account because, as a matter of judgement, these are not considered to be an indirect effect of the Proposed Development. Furthermore, and in any event, it is not considered that this would result in any additional GHG emissions due to the likely reduction in shipping distances.

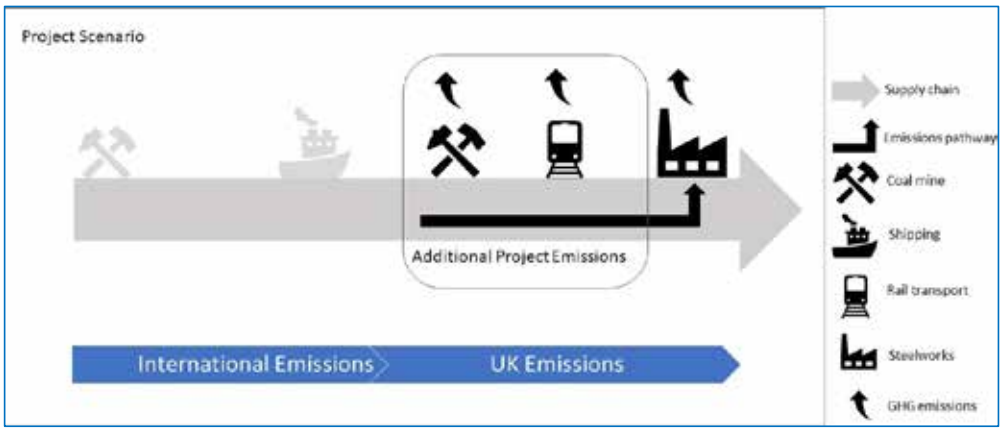

Figure 7.1: Illustrated Project Scenario Emissions Pathways

7.5 This Proposed Development will not lead to a change in the activity levels of the steel manufacturers, having regard inter alia to the expert evidence of Dr Bristow in relation to the operation of metallurgical coal and steel markets. If the Proposed Development does not go ahead, steelmakers will continue to ship the metallurgical coal from sources in the USA. Further, participating steelmakers in Europe are regulated by

the EU ETS where emissions are capped and there are financial disadvantages if their emission limits are breached. The EU ETS emissions cap will reduce by an annual rate of 1.74%.

7.6 GHG calculations are based on the following conditions using a mixture of existing Proponent (West Cumbria Mining) data and information, industry benchmarks and professional judgement. The following assumptions, inclusions and exclusions, made on a precautionary basis, have been used in this calculation:

- Operational activities will be undertaken 24 hours a day, 7 days per week for 50 years;
- Staffing numbers at the main site are in accordance with that detailed in the Road Transport Assessment of the Environmental Statement (West Cumbria Mining, 2018a);
- Operational staff commute in single occupancy vehicles, from destinations in accordance with the Road Transport Assessment of the Environmental Statement (West Cumbria Mining, 2018a). In reality, many staff will commute by other means such as public transport, cycling or walking. All commutes include a return trip;
- Incoming materials and consumables required during construction have been assumed to be available on average of 84 km from the Site. This distance is the average from Carlisle and Lancaster where materials are expected to be sourced;
- Uses of grid electricity are likely to include workshops and welfare facilities at the main site and the offsite depot. Usage has been conservatively based on continuous use during operational hours using Proponent estimates and CIBSE Energy Benchmarks (2008). Emissions calculations have not included grid decarbonisation over the 50-year period or any potential carbon displacements (discussed in Section 9) and therefore represents a worst-case emissions estimate from electricity usage;
- Fuel usage onsite has been based on Proponent estimates for annual diesel usage for backup generators and plant and machinery;
- UK per person averages have been used for mains water usage (Discover Water, 2019) and municipal waste creation (EU Commission, 2019). Mains water will only be used to meet human welfare requirements, and water needed for processing will be sourced from ingress into the mine;
- Suitable waste receiving facilities have been assumed to be available on average of 84 km from the Site. This distance is the average from Carlisle and Lancaster where HGVs are expected to be travelling to and from;
- An average six daily HGV trips to and from Site to the materials depot are expected;
- A bill of quantities of operational materials in not available. The most significant material requirement during operations is steel roof bolts. Estimates of the embodied carbon for these have been estimated. As other building and infrastructure elements have not yet been designed, this is only a partial calculation;
- 12 company-owned vehicles are expected to be active over the course of the operational period;
- Transportation and distribution of coal will be undertaken by rail primarily to Redcar, with smaller volumes to Port Talbot and Scunthorpe;
- The target metallurgical coal is known to contain methane that will be released once the coal is exposed and processed. Fugitive methane emissions for the full operational period have been included as a precaution, however, it is expected that from the fifth year of operations, a methane capture and utilisation plant will be installed at the Site as soon as methane volumes become viable for the plant. The emission volumes are based on an upper range of 6 m^3 of methane per tonne of coal mined but could be as low as 2 m^3 per tonne of coal mined. This plant will reduce or eliminate the need for grid electricity at the main Site; however, electricity consumption has been calculated on the basis of grid use for 50 years. The design and specifications of the methane capture plant are not known, and the associated embodied carbon of those materials are therefore not included;
- Revegetation including 1.5 ha of ‘broadleaved plantation forest less than 20 years old’ and 9.5 ha of ‘improved grassland’; and
- Operational carbon offsetting could not be calculated at this stage of the design (carbon displacements are described in Section 9).

7.7 As detailed in Table 7.1 the total GHGs estimated to be emitted from the operations associated with the Proposed Development have been calculated to be 18,328,183 tCO_2e over the course of the fifty-year period. The majority of emissions (73%) are associated with fugitive methane emissions, however, as stated previously, methane emissions are likely to be captured and utilised from the fifth year of operation. Average annual emissions are therefore expected to be approximately 366,564 tCO_2e. These calculations include a change in land use by revegetation prior to the start of operations.

Table 7.1: Estimated Operational GHG Emissions over the course of the mine's life

Project Activity/ Emission Source	Emissions (tCO_2e)	Percentage of Stage Emissions
Fuel Usage Onsite	4,897	0%
Company Vehicle Usage	1,215	0%
Fugitive Emissions	13,588,440	74%
Electricity Purchase	2,410,309	13%
Purchase Goods and Services	2,583	0%
Upstream Transportation and Distribution	3,509	0%
Waste Generated in Operations	4,213	0%
Employee Commuting	100,358	1%
Onward rail transportation and Distribution of Sold Products	2,214,049	12%
Land use change	-1,399	
Total operational stage emissions	18,328,183	
Operational emissions per annum	366,564	

Shipping Emissions

7.8 As detailed in Section 4, the current baseline scenario is that there are no sources of metallurgical coal in the UK and that the UK and EU steel industry ships the coal from sources on the east coast of the USA (H&W Worldwide Consulting Ltd, 2020). If this Proposed Development goes ahead, then it is assumed that there will be reduced shipping of metallurgical sources of coal from the USA as the coal can now be sourced from within Europe.

7.9 The emissions associated with shipping the same volumes of coal have been calculated as an estimated 107,430 tonnes CO_2 per annum, or 5,371,515 tonnes CO_2 over the 50-year lifespan of the Proposed Development. These emission volumes do not include any further associated emissions through mining and transportation to port.

7.10 To put this into context, approximately 2.4 million tonnes of coal from the Proposed Development may be shipped from Redcar to Rotterdam per annum. GHG emissions from this activity is estimated to be approximately 9,089 tonnes CO_2 per annum, or 454,475 tonnes CO_2 over the 50-year life. This equates to approximately 8% of the emissions currently arising from the shipping of coal from the US to the UK. Net shipping emissions displaced over 50 years as a result of the Proposed Development are therefore likely to be around 4,917,040 tonnes CO_2. This figure alone is of a similar magnitude to the project-related emissions.

7.11 However, for the reasons set out above, and adopting a precautionary approach, the displaced GHG emissions from reduced shipping are not included in this calculation and significance test.

Significance of GHG Emissions

7.12 As stated in Section 3, all GHG emissions are considered to be significant. In order to provide a reasonable basis to contextualise the level of significance, these emissions are compared to corresponding UK carbon budgets (Table 7.2) as well as in the context of net zero by 2050. Using the estimated annual emissions from the operational period (366,564 tCO_2e), this is compared to the percentage contribution of the annual budget within each Carbon Budget.

7.13 The mining operation is expected to commence in 2024 during the 4th UK Carbon Budget period and will contribute to 0.075% of this budget. Five years of further operations will then occur during the 5th UK Carbon Budget, contributing to 0.104% of this budget. The operations period goes beyond the current published Carbon Budgets. Emissions from the operations of the Proposed Development do not contribute to more than 1% of any published Carbon Budget, however, operations will intersect steeply reducing future Carbon Budgets and the net zero emissions target of 2050 (2050 Target Amendment, Order 2019) (UK Government, 2019). Emissions from this Proposed Development are therefore likely to become significant without an emissions reduction strategy. To meet the UK's net zero target, GHG reduction measures will be considered and are discussed in Section 9.

7.14 The magnitude of impact during operations is therefore considered 'low'. As per Table 3.2, the significance of effects is considered as 'minor adverse'. As such, the operations of the Proposed Development are not expected to affect the UK in meeting its Carbon Budgets.

Table 7.2: Contribution to the Operational Emissions to the UK Carbon Budgets

UK Carbon Budget	Total Budget ($MtCO_2e$)	Potential Project Emissions ($MtCO_2e$)	Percentage Contribution of Operational Emissions
4th (2023-2027)	1,950	1.466 (four years)	0.075%
5th (2028-2032)	1,725	1.833 (five years)	0.104%

8. Decommissioning GHG Impacts

Overview of Stage Activities

8.1 The Environmental Statement (West Cumbria Mining, 2018a) provides an indicative timeframe and description of the decommissioning process. At the end of the 50-year operational life span, it is proposed that all above ground buildings are removed, and the landscape reinstated for ecological and recreational use.

GHG Emissions

8.2 In order to assess the magnitude of the impact of the Proposed Development on the climate, GHG emissions associated with the decommissioning of the Proposed Development have been calculated based on the methodologies discussed in Section 3. All emissions are considered additional and are therefore included in the assessment.

8.3 GHG calculations are based on the following conditions using a mixture of existing Proponent (West Cumbria Mining) data and information, industry benchmarks and professional judgement. The following assumptions, inclusions and exclusions, made on a precautionary basis, have been used in this calculation:

- Decommissioning will take one year with activities undertaken Monday to Saturday;
- Total workdays during the decommissioning stage are assumed to be half of that during the construction stage;
- Decommissioning staff commute in single occupancy vehicles, from destinations in accordance with the Road Transport Assessment of the Environmental Statement (West Cumbria Mining, 2018a). All commutes include a return trip;
- Uses of grid electricity are likely to include workshops and welfare facilities. Usage has been conservatively estimated on continuous use during construction hours using CIBSE Energy Benchmarks (2008) and includes that for the main site and at the materials depot. The estimate has not included grid decarbonisation over the 50-year period or any potential carbon displacements (discussed in Section 9) and therefore represents a worst case emissions estimate from electricity usage;
- Fuel usage onsite has been based on the plant and machinery list detailed in the Noise and Vibration Assessment of the Environmental Statement (West Cumbria Mining, 2018a) and reduced to reflect the shorter duration. Power ratings for these equipment items are based upon published construction equipment suppliers. All plant and machinery are assumed to use diesel;
- Waste volumes are based upon current project estimates that have been marked up and additional volumes added;
- Suitable waste receiving facilities have been assumed to be available at an average of 84 km from the Site. This distance is the average from Carlisle and Lancaster where HGVs are expected to be travelling to and from;
- An average 57 daily HGV trips to and from Site are expected;
- UK per person averages have been used for mains water usage (Discover Water, 2019) and municipal waste creation (EU Commission, 2019). Mains water will only be used to meet human welfare requirements.
- 12 company-owned vehicles are expected to be active over the course of the decommissioning period; and
- Vegetation including 1.5 ha of ‘broadleaved plantation forest more than 20 years old’ and 21.5 ha of ‘improved grassland’.

8.4 As detailed in Table 8.1 the total GHGs estimated to be emitted from the decommissioning associated with the Proposed Development have been calculated to be 17,907 tCO_2e over the course of a one year period. The majority of emissions (87%) are associated with electricity purchase and treatment and disposal of

wastes. These calculations include a change in land use by revegetation of any areas previously under hardstanding.

Table 8.1: Estimated Decommissioning GHG Emissions

Project Activity/ Emission Source	Emissions (tCO_2e)	Percentage of Stage Emissions
Fuel Usage Onsite	2,032	10%
Company Vehicle Usage	24	0%
Electricity Purchase	15,665	75%
Purchase Goods and Services	2	0%
Waste Generated in Operations	2,529	12%
Employee Commuting	658	3%
Landscaping	-3,004	
Total decommissioning stage emissions	**17,907**	

Significance of GHG Emissions

8.5 As stated in Section 3, all emissions are considered to be significant. GHG emissions during decommissioning will intersect the UKs net zero emissions target of 2050 (2050 Target Amendment, Order 2019) (UK Government, 2019). To meet this target, GHG reduction measures will be considered and are discussed in Section 9. It is not considered emissions from decommissioning will be material in the overall context of the UK achieving net zero.

9. Carbon Displacements and Offsets

9.1 As the design life of the plant goes beyond 2050, the Proposed Development is expected to be operating in a net zero GHG emissions environment after 2050. This Section discusses a number of activities that are under consideration by the Proponent (West Cumbria Mining) in order to operate in this context.

9.2 These activities are in addition to standard resource efficiency measures within the Environmental Statement (West Cumbria Mining, 2018a), such as provision and encouragement of group transport, building insulation, energy efficient lighting, selection of electrically powered mine machinery over diesel-powered, rainwater harvesting, and building design in accordance with the Building Research Environmental Assessment Method (BREEAM) principles.

Electricity Grid Decarbonisation

9.3 The UK Government plans to continue its progressive grid decarbonisation in the UK. Planned national reductions in fossil-fuel based power stations paired with increases in low carbon and renewable energy will progressively reduce the emissions intensity of electricity generation. Any indirect emissions produced from grid electricity will progressively decrease through grid decarbonisation

Methane Capture and Utilisation Plant

9.4 Proponent sampling and analysis of the coal seam deposits have shown a methane release range of between 2 and 6 m^3 per tonne of coal mined. During the ramp up stage towards full production, detailed design of a methane capture and utilisation plant will begin once viable volumes are confirmed. This will potentially eliminate the majority of fugitive emissions and provide a source of electrical power for the Site that will further reduce the need for grid electricity. This will be assumed to be operating from the 5th year of operations for another 45 years.

Carbon Credits

9.5 In support of the UKs net zero emissions target of 2050 and any future legislative forces, the Proponent will consider carbon offsetting credits using an accredited carbon offsetting scheme and/or carbon permit trading for any remaining GHG emissions once other measures have been undertaken.

10. Summary GHG Emissions and Impacts

10.1 Using the currently available data and information, the GHG emissions associated with the construction, operations and decommissioning of the Proposed Development have been calculated. A summary of these emissions are detailed in Table 10.1.

10.2 The total emissions associated with additional activities (activities that will occur if the Proposed Development goes ahead) have been calculated as 18,431,196 tCO_2e.

Table 10.1: Total Proposed Development GHG emissions

Lifecycle stage	Total stage GHG emissions (tCO_2e)	Emissions per annum (tCO_2e)
Construction	85,105	42,553
Operation	18,328,183	366,564
Decommissioning	17,907	17,907
Total emissions	**18,431,196**	

10.3 Emissions associated with each stage of the Proposed Development were examined for their significance against the UK Carbon Budgets. Combined emissions for these stages are detailed in Table 10.1..

10.4 This assumes one year of construction during the 3rd Carbon Budget, one year of construction and four years of operation in the 4th Carbon Budget, and five years of operations during the 5th Carbon Budget. The percentage contribution of emissions from the Proposed Development to the respective Carbon Budgets are 0.002%, 0.077% and 0.104%, respectively.

10.5 The magnitude of impact of the Proposed Development is therefore considered 'low' against the current UK Carbon Budgets. As per Table 3.2, the significance of effects is considered as 'minor adverse'. As such, the operations of the Proposed Development are not expected to affect the UK in meeting its current Carbon Budgets. However, the operations and decommissioning activities will intersect steeply reducing future Carbon Budgets and the net zero emissions target of 2050. Emissions from this Proposed Development are therefore likely to become significant without an emissions reduction strategy after the year 2050.

10.6 Across the 53-year full design life of the Proposed Development (total of construction, operations and decommissioning), the average annual GHG emissions are calculated as 347,758 tCO_2e.

Table 10.1: Total Emissions to the UK Carbon Budgets

UK Carbon Budget	Total Budget ($MtCO_2e$)	Potential Project Emissions ($MtCO_2e$)	Percentage Contribution of Emissions (Construction and Operations)
3rd (2018-2022)	2,544	0.043 (one year of construction)	0.002%
4th (2023-2027)	1,950	1.509 (one year of construction plus four years of operations)	0.077%
5th (2028-2032)	1,725	1.833 (five years operations)	0.104%

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