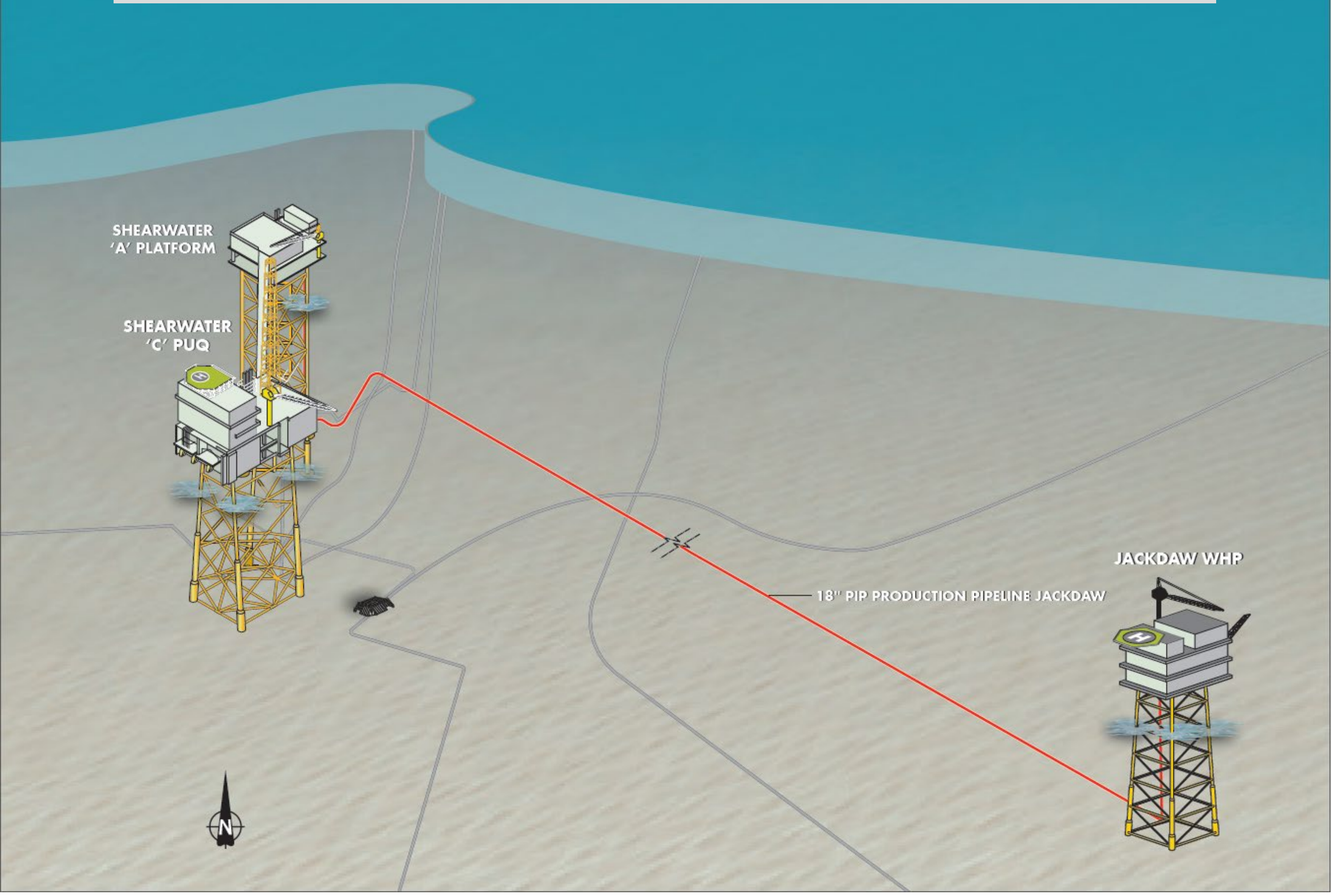
Jackdaw Field Development

Further Information required under DESNZ Regulation 12(1) Notices dated 21st July and 22nd September 2025

Part 1: Scope 3 Emissions Assessment

November 2025

ES Ref: D/4260/2021 (February 2022)



Cautionary Note

The companies in which Shell plc directly and indirectly owns investments are separate legal entities. In this document "Shell", "Shell Group" and "Group" are sometimes used for convenience to reference Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. ''Subsidiaries'', "Shell subsidiaries" and "Shell companies" as used in this document refer to entities over which Shell plc either directly or indirectly has control. The terms "joint venture", "joint operations", "joint arrangements", and "associates" may also be used to refer to a commercial arrangement in which Shell has a direct or indirect ownership interest with one or more parties. The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

Shell's net-zero emissions target

Shell's operating plan and outlook are forecasted for a three-year period and 10-year period, respectively, and are updated every year. They reflect the current economic environment and what we can reasonably expect to see over the next three and ten years. Accordingly, the outlook reflects our Scope 1, Scope 2 and NCI targets over the next 10 years. However, Shell's operating plan and outlook cannot reflect our 2050 net zero emissions target, as this target is outside our planning period. Such future operating plans and outlooks could include changes to our portfolio, efficiency improvements and the use of carbon capture and storage and carbon credits. In the future, as society moves towards net-zero emissions, we expect Shell's operating plans and outlooks to reflect this movement. However, if society is not net zero in 2050, as of today, there would be significant risk that Shell may not meet this target.

STANDARD INFORMATION SHEET

Project Name	**Jackdaw Field Development**			
OPRED Reference No	D/4260/2021			
Shell Contact Details	*Contact Name*		*Contact Title*	
Developer	UK North Sea Limited Withheld		Jackdaw Opportunity Manager	
Further Information Contact	Withheld		Projects Environmental Specialist.	
Further Information Preparation	*Job Title*		*Relevant Qualification/Experience*	
Shell U.K. Limited	Withheld		17 years' working in oil and gas.	
	Withheld		>20 years' working in environment/oil and gas.	
Genesis Energies Consultants	Withheld		>20 years' working in environment/oil and gas.	
	Withheld		8 years' working in environment/oil and gas.	
Licence Nos	licences P.98, P.111 and P.672.			
Licensees/ Owners	UK North Sea Limited 100% holding.			
Short Description	Jackdaw is a gas condensate field that will be developed with a not permanently attended Wellhead Platform and drilling of four wells. Jackdaw produced fluids will be exported via a subsea pipeline to the Shearwater platform where these will be processed before onward export via the Fulmar Gas Line and the Forties Pipeline System. The proposed development may be summarised as follows: ▪ Installation of a new Well head Platform; ▪ Drilling of four production wells; ▪ Installation of a new approximately 31 km pipeline from the Jackdaw WHP to the Shearwater platform; ▪ Processing and export of the Jackdaw hydrocarbons via the Shearwater host platform; and ▪ First production expected between Q3 - Q4 2026.			
Quadrant/Block Nos.	Blocks 30/02a, 30/03a DEEP, and 30/02d			
Platform Location	Latitude	56° 54' 01.37" N (WGS84)	Longitude	02° 22' 45.45" E (WGS84)
Pipeline **Start**	Latitude	56° 54' 01.37" N (WGS84)	Longitude	02° 22' 45.26" E (WGS84)
End	Latitude	57° 01' 53.57" N (WGS84)	Longitude	01° 57' 13.71" E (WGS84)
Distance to UK	Approximately 250 km to Aberdeen, Scotland.			
Distance to Median Line	Approximately 5 km from UK/Norway median line.			
Previous Applications	N/A (No previous Downstream Scope 3 Emissions Assessment submitted).			

ABBREVIATIONS

%	Percent	**IEMA**	Institute of Environmental Management and Assessment
APS	Announced Pledges Scenario (IEA)	**IPCC**	Intergovernmental Panel on Climate Change
AR6	Annual Report 6 [IPCC]	**ISEP**	Institute of Sustainability & Environmental Professionals
CCC	Climate Change Committee	**km**	Kilometre
CCS	Carbon Capture and Storage	**LNG**	Liquified Natural Gas
COP	Conference of the Parties	**$MtCO_2e$**	Million Tonnes Carbon Dioxide Equivalent
CO_2	Carbon Dioxide	**m^3/d**	Cubic Metre per Day
CO_2/boe	CO_2 Per Barrel of Oil Equivalent	**NDC**	Nationally Determined Contributions
CO_2e/ CO_2eq	Carbon Dioxide equivalent	**NGL**	Natural Gas Liquids
EDGAR	Emissions Database for Global Atmospheric Research	**NOAA**	National Oceanic and Atmospheric Administration
EF	Emission Factor	**NSTA**	North Sea Transition Authority
EIA	Environmental Impact Assessment	**NZE**	Net Zero Emissions Scenario (IEA)
ERAP	Emission Reduction Action Plan	**OPRED**	Offshore Petroleum Regulator for Environment and Decommissioning
ES	Jackdaw Environmental Statement (D4260/2021) (Shell UK, 2022) submitted in February 2022 for which the Secretary of State agreed to the grant of a production consent for the Jackdaw project in May 2022	**ppm**	Parts Per Million
ESOS	Energy Saving Opportunity Scheme	**SEGAL**	Shell Esso Gas and Associated Liquids System
EU	European Union	**Sm^3/d**	Standard cubic metre per day
FDP	Field Development Plan	**tCO_2e**	Tonnes Carbon Dioxide equivalent
FEP	Fife Ethylene Plant	**t/yr**	Tonnes per Year
FGL	Fulmar Gas Line	**UK**	United Kingdom

FNGL	Fife Natural Gas Liquids Plant	**UKCS**	United Kingdom Continental Shelf
GEC	IEA Global Energy and Climate model	**UKOPA**	United Kingdom Onshore Pipeline Operators' Association
GHG	Greenhouse Gas	**UNFCCC**	United Nations Framework Convention on Climate Change
Gt	Gigatonne	**WTT**	Well-to-tank
IEA	International Energy Agency		

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EXECUTIVE SUMMARY

This document is an assessment of the effects of downstream Scope 3 emissions from the Jackdaw project on climate and is provided as Part 1 of the response to OPRED's Regulation 12(1) Notice dated 21st July 2025[1] ("OPRED's Regulation 12(1) July Notice") and OPRED's subsequent Regulation 12(1) Notice dated 22nd September 2025[2] ("OPRED's Regulation 12(1) September Notice"). The assessment follows OPRED's supplementary guidance published on 19th June 2025[3]

The document follows the structure of an Environmental Impact Assessment (EIA), per EIA guidance[4] and the steps outlined in the Institute of Environmental Management & Assessment[5] (IEMA – now known as the Institute of Sustainability & Environmental Professionals (ISEP)).

The baseline scenario is described through a realistic and reasonable description of the current state of the environment, environmental protection objectives and future estimates of global emissions.

Jackdaw Scope 3 emissions are calculated using existing established and accepted methodologies and the impact of Jackdaw Scope 3 emissions are assessed against International Energy Agency (IEA) global future emission estimates described in the IEA Net Zero by 2050 (NZE) and IEA Announced Pledges (APS) scenarios[6] that are both aligned to the more ambitious goals of the Paris Agreement.

The highest anticipated Jackdaw Scope 3 emissions comprise 0.015% against the global baseline of the IEA APS scenario and 0.020% against the global baseline of the IEA NZE scenario for the year 2030.

The global assessment of the likely significant effects of Jackdaw Scope 3 emissions is minor adverse and not significant, per IEMA definitions, as Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of states to meet global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C.

Most of the Jackdaw products are likely to be consumed in the UK, e.g. gas in power stations generating electricity or providing heat to homes or fuel consumed whilst driving cars. When the highest anticipated Jackdaw Scope 3 emissions are compared against national UK carbon targets, they comprise 1.89% of the total UK Nationally Determined Contribution (NDC) emission target for 2030[7]. The NDCs are set by the UK Climate Change Committee (CCC) and are in line with the Paris Agreement. Therefore, from a national perspective, Jackdaw Scope 3 emissions are also not considered to have a likely significant effect on the ability of the UK to meet UK's Paris-aligned carbon targets that limit warming to 1.5°C.

Jackdaw is a gas condensate field development that is expected, at peak, to contribute around 6.5% of UK Continental Shelf gas production, which will produce an amount of energy equivalent to heating over 1.4 million homes[8]. Jackdaw is a major project with distinct work streams and involves over 1,000 people across 30 companies to design, build and integrate the different components of the project to deliver gas to the UK. Shell has invested over £1 billion in Jackdaw to date and the project is now approximately 90% through the execution

[1] Regulation 12(1) Notice dated 21st July 2025
[2] Regulation 12(1) Notice dated 22nd September 2025
[3] Supplementary guidance for assessing the effects of downstream scope 3 emissions on climate from offshore oil and gas projects.
[4] The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 – A Guide.
[5] IEMA - Assessing Greenhouse Gas Emissions and Evaluating their Significance.
[6] IEA World Energy Outlook 2024.
[7] The Seventh Carbon Budget – Advice for the UK Government.
[8] Jackdaw Environmental Statement (D/4260/2021) February 2022.

plan. Jackdaw is critical to sustaining UK strategic energy infrastructure. Its gas will help keep the Shearwater hub, St Fergus terminal, and the SEGAL system operational—key infrastructure that processes around one-third of UK gas demand.

1. INTRODUCTION

This document is an assessment of the effects of downstream Scope 3 emissions from the Jackdaw project on climate and is provided as Part 1 of the response to OPRED's Regulation 12(1) July Notice and OPRED's Regulation 12(1) September Notice.

Scope 3 emissions from the use of oil and gas are global consumer emissions, which are driven by energy demand (e.g. from consumers using energy products, such as heating their homes or driving their cars).

In June 2024, the UK's Supreme Court concluded in the Finch ruling[9] that a decision to grant planning permission for an onshore oil development project at a site in Surrey was unlawful, because downstream GHG emissions from combustion of the oil produced were not assessed in the Environmental Impact Assessment as part of the planning decision This ruling was based on the Supreme Court's interpretation of the requirement in Article 3 of the Directive 2011/92/EU[10] of the European Parliament and of the Council ("the EIA Directive") to identify, describe and assess the direct and indirect significant effects of a project.

The Supreme Court's interpretation of the EIA Directive is also applicable to offshore developments which are subject to the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020[11] ("the Regulations").

On 19 June 2025 OPRED published its supplementary guidance for assessing the effects of downstream scope 3 emissions on climate from offshore oil and gas projects[3] (the "Supplementary Guidance'). Subsequently, OPRED's Regulation 12 (1) July Notice[1] was served on the Jackdaw project, followed by OPRED's Regulation 12(1) September Notice[2] (together, the "Requests for Further Information"). This document responds to the Requests for Further Information and follows the Supplementary Guidance.

The document follows the structure of an Environmental Impact Assessment (EIA) and the steps outlined in the Institute of Environmental Management & Assessment (IEMA – now known as the Institute of Sustainability & Environmental Professionals (ISEP)) guide on Assessing Greenhouse Gas Emissions and Evaluating their Significance[5]:

- Set the scope and boundaries of the GHG assessment – see Section "4.1 Goal, Scope and Boundaries of the Assessment
- Develop the baseline – see Section 3 "Determination of the Baseline".
- Decide upon the emissions calculation methodologies – see Section 4.3 "Calculating GHG Emissions Inventory".
- Data collection – see Section 4.2 "Data Collection - Production Profiles for Scope 3 Assessment".
- Calculate/determine the GHG emission inventory – see Section 4.3 "Calculating GHG Emissions Inventory
- Consider mitigation – see Section 5.4.3 "Mitigation".

[9] R (on the application of Finch on behalf of the Weald Action Group) (Appellant) v Surrey County Council and others (Respondents)
[10] EU Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
[11] The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020.

The Jackdaw Scope 3 emissions are calculated using existing established and accepted methodologies and the impact of the Scope 3 emissions is assessed against global and national future emission estimates.

This document does not consider the potential environmental effects of the GHG emissions arising from the construction and operational activities of the Jackdaw project ('Scope 1'[12] and 'Scope 2'[13]), as these were comprehensively assessed in the ES. Item 2 of OPRED's Regulation 12(1) July Notice requested 'a revised and updated assessment of the likely significant effects of the project on the environment that is not limited to downstream scope 3 emissions', which is presented as a separate document, "Part 2: Updated Assessment of the Project".

Item 3 of OPRED's Regulation 12(1) July Notice further stated that Shell may wish to provide 'relevant information for the Secretary of State to consider when reaching a decision on whether or not to agree to the grant of consent'. Shell has provided information relating to the role of Jackdaw gas in the context of the UK's energy security and the energy transition, as well as the role of Shell's UK businesses in these, in a separate document, "Part 3: Relevant Information to the Project".

Finally, in the context of the Shell U.K. Limited and Equinor Production UK Limited transaction to form Adura and, following NSTA consent on 1 October 2025 to the assignment of interests in the Jackdaw field and the Licences from BG International Limited to UK North Sea Limited (Company number 16203210), as of 1 November 2025, UK North Sea Limited is now the Jackdaw developer for the purposes of the Jackdaw Environmental Statement (ES Ref: D/4260/2021).

[12] Direct emissions from operations that are owned or controlled by the reporting company (GHG Protocol, 2001).
[13] Indirect emissions from the generation of purchased or acquired electricity, steam, hearing, or cooling consumed by the reporting company' (GHG Protocol, 2001).

2. PROJECT DESCRIPTION

Jackdaw is a gas condensate field development that is expected, at peak, to represent around 6.5% of United Kingdon Continental Shelf (UKCS) gas production, which produces an amount of energy equivalent to heating over 1.4 million homes.

The Jackdaw development comprises a 'not permanently attended' wellhead platform with four wells, connected via an approximately 31 km subsea pipeline to the existing Shell UK operated Shearwater hub, where the Jackdaw gas will be processed and sent onshore to the St Fergus Gas Plant via the Fulmar Gas Line (FGL), both also operated by Shell UK (Figure 2-1). Following onshore processing, the gas enters the National Gas Transmission network supplying homes and businesses across the UK. The remaining NGLs are routed via pipeline to the Mossmorran Natural Gas Liquids Plant, where components are separated at the Shell Fife Natural Gas Liquids Plant (FNGL). Ethane is fed to the Fife Ethylene Plant (FEP) operated by ExxonMobil and some ethylene products are routed to the United Kingdom Onshore Pipeline Association (UKOPA) ethylene pipeline network. The remaining liquids from FNGL are sent via pipeline to Braefoot Bay before being exported by ship.

Jackdaw is critical to sustaining strategic UK energy infrastructure. The Jackdaw field will sustain production through its host platform, Shearwater, which in turn helps sustain UK infrastructure necessary for a balanced and orderly UK energy transition, e.g. the St Fergus Gas Plant and the SEGAL system, which processes around one-third of UK gas demand.

Jackdaw is a major project with distinct work streams and involves over 1,000 people across 30 companies to design, build and integrate the different components of the project to deliver gas to the UK. Shell has invested over £1 billion in Jackdaw to date and the project is now approximately 90% through the execution plan.

Key elements of project progress to date include:

- The steel jacket structure, which sits on the North Sea seabed, was installed in August 2023 and the topsides were installed in early October 2025.
- The four High Pressure/High Temperature wells are at an advanced stage of drilling by the Valaris V122 drilling rig, which has specialist equipment and crew onboard to manage this complex drilling operation. These wells are amongst the highest-pressure highest temperature wells in the UK.
- The approximately 31 km pipeline from Jackdaw to Shearwater was laid in July 2024.
- Modifications to Shearwater to receive and process Jackdaw gas are currently in progress.

Shell UK Upstream Operations

MAP FOR ILLUSTRATIVE PURPOSES ONLY

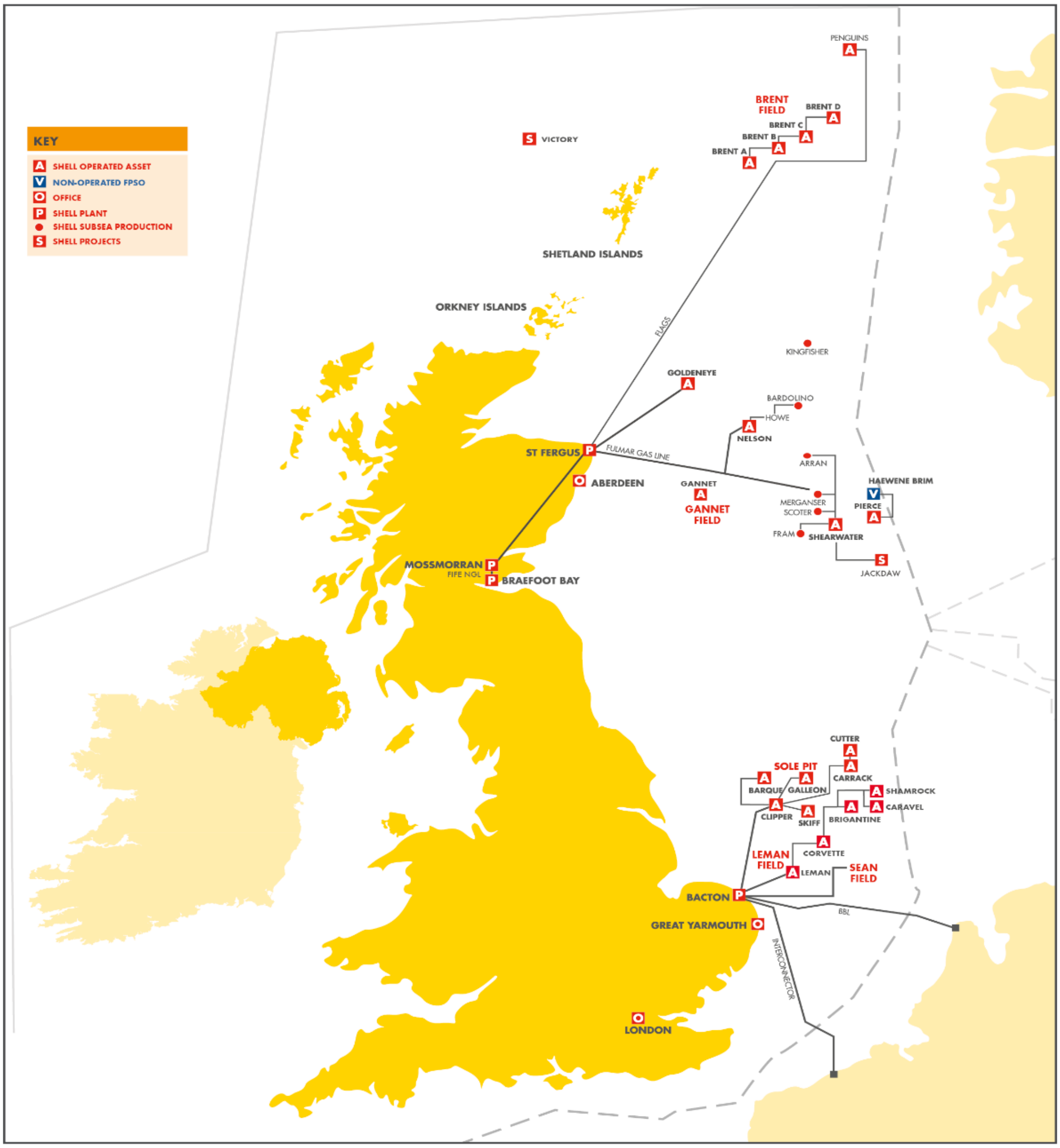

Figure 2-1 Shell's offshore operations in the UK

3. DETERMINATION OF THE BASELINE

3.1. Introduction

This section, in accordance with the Supplementary Guidance and Schedule 6(3) of the Regulations describes the determination of the baseline against which the Jackdaw Scope 3 emissions will be assessed.

The Supplementary Guidance[3] states "*it is accepted that GHGs have a global effect on climate. Therefore, when determining the baseline scenario for scope 3 emissions, the location of the emissions is not relevant and a global baseline scenario of GHGs must be considered in the ES*". In addition, the IEMA guidance[5] defines the baseline for GHG assessments as a "*reference point against which the impact of a new project can be compared against*". This assessment will therefore be evaluated in the context of a global baseline scenario of GHGs.

The Supplementary Guidance[3] further states both "*A realistic and reasonable description of the current state of the environment (baseline scenario) should be presented in the ES*" and "*a reasonable future estimate of global GHGs affecting climate over the lifetime of a project needs to be considered as part of the baseline scenario*". Consequently, the baseline considered will include both a current state of the environment and a future estimate of global GHGs as described below:

- **Current State of The Environment**: This section provides an overview of the current state of the environment highlighting how human activities over the past century have contributed to increased greenhouse gases (GHGs), particularly carbon dioxide (CO_2) and a rise in global temperatures.
- **Environmental Protection Objectives**: The global and domestic legal and policy commitments guiding environmental protection, which aim to keep global temperature rises within acceptable levels, are described and used as a basis for a reasonable future estimate of global GHGs.
- **Future estimates of Global Emissions**: This section describes how future emissions are assessed against forward-looking CO_2 reduction pathways such as those developed by international organisations like the Intergovernmental Panel for Climate Change (IPCC), the International Energy Agency (IEA) and by the UK Climate Change Committee (CCC). It also describes how these various global and national emissions pathways and budgets are related.
- **Cumulative Effects**: The Supplementary Guidance requires that the assessment considers the cumulative effects of the Jackdaw Scope 3 emissions with emissions arising from other existing and planned future projects in a global context.

3.1.1. Current State of the Environment

This section, in accordance with the Supplementary Guidance and Schedule 6(3) of the Regulations, discusses the current state of the environment, i.e. the climate.

The IPCC is the international body for assessing the science related to climate change. The IPCC was set up to "*provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation*".

IPCC assessments provide a scientific basis for governments at all levels to develop climate related policies. The assessments present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options.

The IPCC Annual Report 6 (AR6)[14] Working Group I states that it is "*unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.*"

Human activities have contributed to significant changes in the environment over the past century. One of the most notable indicators is the rising concentration of CO_2 in the atmosphere.

Recent measurements indicate that atmospheric CO_2 has surpassed 420 parts per million (ppm). This represents approximately a 46% increase since pre-industrial times, primarily driven by fossil fuel combustion, deforestation, and industrial processes. Seasonal variations are also observed: CO_2 levels tend to rise during winter and spring in the Northern Hemisphere and decrease in summer and early autumn due to increased plant photosynthesis. Despite these seasonal fluctuations, the overall trend is a consistent increase in atmospheric CO_2 over time[15].

Global monitoring stations, such as the Mauna Loa Observatory in Hawaii and the NOAA, continuously track these concentrations to assess trends and guide efforts to reduce GHG emissions. The World Data Centre for Greenhouse Gases compiles data from various sources to estimate global GHG levels[15].

Over the past century, global temperatures have risen significantly, largely due to increased GHG emissions. Currently, the Earth's average surface temperature is approximately 1.2°C higher than pre-industrial levels (see Figure 3-1)[15]. Temperature data collected worldwide indicate this warming trend.

Figure 3-1 illustrates the correlation between atmospheric CO_2 levels and the global mean temperature[15]. This relationship highlights temperature as a key climate indicator. Recent years have been among the warmest on record; notably, 2024 was the warmest year to date, with an estimated global near-surface temperature about 1.55 °C ± 0.13 °C above the 1850–1900 baseline[16].

According to the IPCC[14] "*global net anthropogenic GHG emissions were 59 Gt CO_2eq 15 (+/- 6.6 Gt CO_2eq) in 2019*", with "*the largest share and growth in gross GHG emissions occurring in CO_2 from fossil fuels combustion and industrial processes, followed by methane*". Furthermore, the IPCC[14] state that "*in 2019, approximately 79% of global GHG emissions came from the sectors of energy, industry, transport and buildings together and 22% from agriculture, forestry and other land use*";

More recently updated GHG emission estimates indicate that total global GHG emissions were 55.4 GtCO_2eq (+/- 5.1 GtCO_2) in 2023, of which CO_2 emissions from fossil fuel combustion and industry contributed 37.8 GtCO_2eq (+/- 3.0 GtCO_2)[17].

[14] IPCC AR6 Synthesis Report.
[15] Met Office Climate Dashboard.
[16] World Meteorological Organisation Global Annual to Decadal Climate Update 2025-2029.
[17] Forster, P. M., Smith, C., Walsh, T., Lamb, W. F., Lamboll, R., Cassou, C., Hauser, M., Hausfather, Z., Lee, J.-Y., Palmer, M. D., von Schuckmann, K., Slangen, A. B. A., Szopa, S., Trewin, B., Yun, J., Gillett, N. P., Jenkins, S., Matthews, H. D., Raghavan, K., Ribes, A., Rogelj, J., Rosen, D., Zhang, X., Allen, M., Aleluia Reis, L., Andrew, R. M., Betts, R. A., Borger, A., Broersma, J. A., Burgess, S. N., Cheng, L., Friedlingstein, P., Domingues, C. M., Gambarini, M., Gasser, T., Gütschow, J., Ishii, M., Kadow, C., Kennedy, J., Killick, R. E., Krummel, P. B., Liné, A., Monselesan, D. P., Morice, C., Mühle, J., Naik, V., Peters, G. P., Pirani, A., Pongratz, J., Minx, J. C., Rigby, M., Rohde, R., Savita, A., Seneviratne, S. I., Thorne, P., Wells, C., Western, L. M., van der Werf, G. R., Wijffels, S. E., Masson-Delmotte, V., and Zhai, P.: Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence, Earth Syst. Sci. Data, 17, 2641–2680.

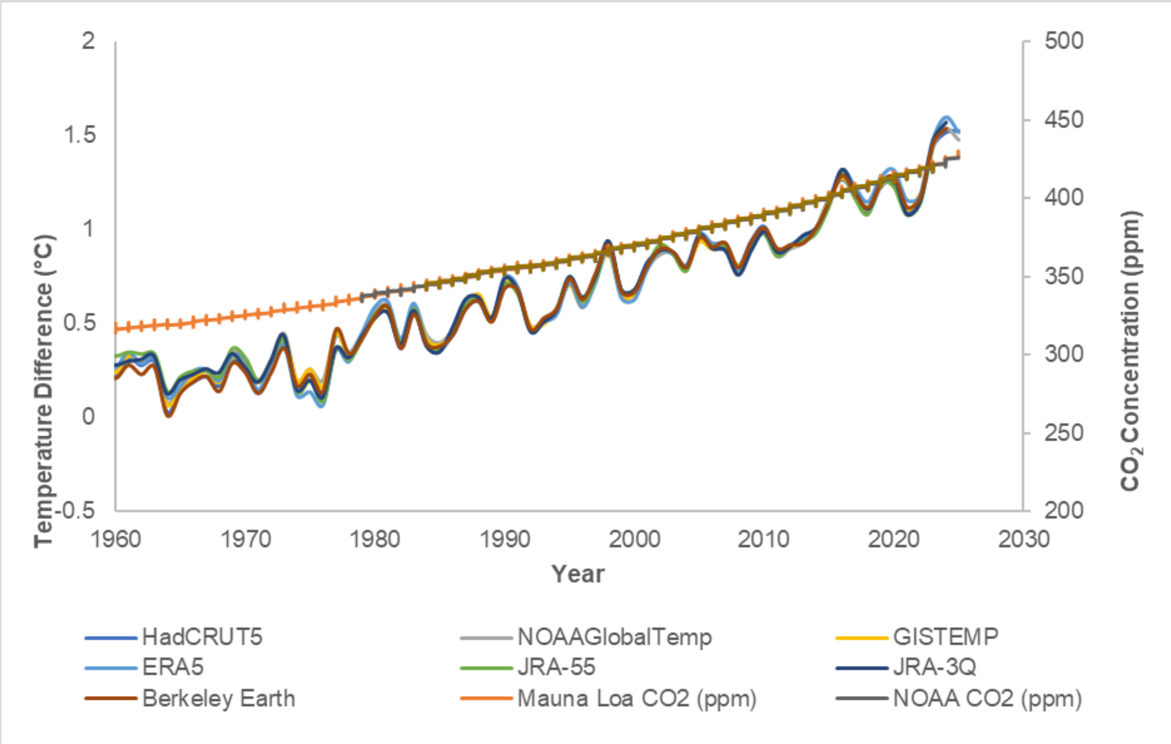

Figure 3-1: Correlation between carbon dioxide concentrations in the atmosphere and annual global mean temperature difference from pre-industrial conditions [Extrapolated[15]]

The Emissions Database for Global Atmospheric Research (EDGAR) provides country by country estimates of GHG emissions (excluding land use, land use change, and forestry) from 1990 to 2024[18]. EDGAR estimates that total global GHG emissions during this period have risen by 65%. Furthermore, EDGAR provides estimates of country by country fossil fuel based CO_2 emissions from 1990 to 2024. During this period, global fossil fuel-based CO_2 emissions have risen by 75%.

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6)[14] confirms a "*near-linear relationship between cumulative CO_2 emissions and global temperature rise*." If current trends continue, warming will persist, potentially exceeding 2°C above pre-industrial levels.

3.1.2. Environmental Protection Objectives

Schedule 6(5)(d) of the Regulations requires the assessment of likely significant effects of a project to '*take in to account environmental protection objectives established in retained EU law or at national level*'. As stated in the Supplementary Guidance, "*Environmental effects from scope 3 emissions from downstream activities largely relate to the impacts on climate from the release of GHGs.*" The key environmental protection objectives relevant to GHG emissions, at both an international and national level, are set out below.

[18] EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database, a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version EDGAR_2025_GHG (2025) European Commission, JRC (Datasets).
IEA-EDGAR CO2, a component of the EDGAR (Emissions Database for Global Atmospheric Research) Community GHG database version EDGAR 2025 GHG (2025) including or based on data from IEA (2024) Greenhouse Gas Emissions from Energy, www.iea.org/data-and-statistics, as modified by the Joint Research Centre.

Following its introduction at the 1992 Earth Summit in Rio, the **UN Framework Convention on Climate Change ("UNFCCC")**[19] entered into force in 1994. Within the framework of the UNFCCC, contracting states meet regularly at the Conference of the Parties ("COP") to discuss climate change. These COPs have resulted in subsequent international instruments including the Kyoto Protocol in 1997 and the **Paris Agreement** in 2015 (COP21).

In the Paris Agreement, states agreed to *"Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"*[20]

In order to meet this objective, the focus of the Paris Agreement is on the mitigation of GHG emissions, adaptation measures to address the adverse effects of climate change that cannot be avoided through mitigation, and the provision of support – in terms of finance, technology and capacity building – to enable developing states to meet their commitments. The international commitment to the objectives of the Paris Agreement, and the collective role of society in reaching those goals, was confirmed in 2021 in the Glasgow Climate Pact, which requires signatory countries to increase climate action toward reducing reliance on fossil fuels.

The Paris Agreement contains both a collective objective to be pursued by all states, and individual obligations by which each state is obliged to contribute to that collective objective. Thus, the Paris Agreement: (a) establishes a collective objective that states act to hold "the increase in global average temperature to well below 2°C above pre-industrial levels and [to pursue] efforts to limit the temperature rise to 1.5°C"; and (b) establishes an individual obligation on each state to, among other things, submit a pathway for their own emissions reductions in the form of Nationally Determined Contributions (NDCs). It is through their NDCs that states communicate the pathway they will take to reduce their GHG emissions in pursuit of the collective objective of the Paris Agreement.

Following the adoption of the Paris Agreement, international organisations such as the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) have developed various emissions reduction scenarios, based on scientific research and analysis. These scenarios translate the goals of the Paris Agreement into what is required, practically, to meet these goals and to aid government climate policy. Notably, the IPCC published (i) IPCC SR1.5 in October 2018, (ii) the Sixth Assessment Report (Working Group I contribution) in August 2021, and (iii) the Sixth Assessment Report (Working Group II contribution) in February 2022.

At the national level, the **UK's Climate Change Act (2008)**[21] is the principal legislative mechanism for reducing UK GHG emissions. The Act sets the framework to address climate change mitigation and adaptation, including end user emissions. It requires the UK government to propose regular, legally binding milestones on the way to achieving Net Zero GHG emissions, known as carbon budgets.

As highlighted earlier, NDCs are one of the primary instruments for countries achieving the aims of the Paris Agreement. Based on the advice from the CCC, in preparation for the 7th Carbon Budget, the UK published its NDC target to reduce all GHG emissions by at least 81% by 2035, compared to 1990 levels (excluding international aviation and shipping emissions)[22].

The UK CCC balanced pathway is the UK Carbon Budget emissions reduction pathway from 2025 to Net Zero by 2050, with each specific carbon budget spanning a 5-year period with a maximum GHG emission target. The UK CCC published its seventh Carbon Budget in February

[19] UN Framework Convention on Climate Change.
[20] The Paris Agreement (Article 2(1)(a)).
[21] The Climate Change Act 2008.
[22] Climate Change Committee Advice om the UK's 2035 Nationally Determined Contribution.

2025[7], which limits the UK's GHG emissions to 535 MtCO_2e over the five-year period 2038 to 2042.

3.1.3. Future Estimates of Carbon Emissions

A baseline acts as the reference point against which the impacts of a new project can be compared[5], and the Supplementary Guidance requires that Jackdaw emissions will be "*presented in the ES against a no project ('do nothing') scenario*". Comparisons with a 'do nothing' scenario enable all Scope 3 emissions associated with the project to be evaluated and can be considered as the worst-case scenario within the assessment.

The Supplementary Guidance also requires that the baseline reflects '*a reasonable future estimate of global GHGs affecting climate over the lifetime of a project'* and that this baseline needs to be linked to the current state of the environment (as presented in Section 3.1.1).

International organisations have developed scenarios depicting how the climate might evolve in the future. This section describes a range of future climate scenarios (future baseline) which outline the climate's likely evolution without implementation of the Jackdaw project (e.g. the 'do nothing' scenario).

The IPCC[14], the IEA[6] and the UK CCC[7] have developed GHG emissions reductions pathways, which are aligned with the Paris Agreement, that aim to keep global temperature rise well below 2°C and pursue efforts to limit it to 1.5°C. IPCC presents global emissions reduction pathways; IEA present energy sector emissions reduction pathways and UK CCC presents the country-level emissions reduction pathway.

The "*IPCC modelled scenarios and pathways are used to explore future emissions, climate change, related impacts and risks, and possible mitigation and adaptation strategies and are based on a range of assumptions, including socio-economic variables and mitigation options*"[14]. These modelled scenarios have been used to develop a range of categories (derived from multiple IPCC scenarios) that model future warming trajectories. Of these IPCC categories, C1 and C2 relate to scenarios that lead to at least a 50% chance of limiting the temperature rise to 1.5 °C in 2100 and align with the Paris Agreement.

The IPCC defines a range of further categories that limit increasing temperatures where C3 limits warming to 2°C (67%) up to C8 that exceeds warming of 4°C (≥50%). Unlike the C1 and C2 scenarios these are not aligned with the Paris Agreement goal of "*Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change*."

The IEA's World Energy Outlook[6] provides authoritative global energy analysis and long-term projections for energy supply and demand and explores the potential for global future energy requirements through various scenarios. IEA scenarios focus solely on the energy sector, hence they do not include emissions estimated from agriculture, forestry, and land use. These IEA scenarios, which primarily focus on energy markets, technology developments and policy pathways to meet global energy and climate goals, are used for energy sector planning and policy analysis. Future CO_2 emissions estimations are included in each of the scenarios.

The IEA scenarios that are aligned with the more ambitious goals of the Paris Agreement are as follows:

- The Net Zero Emissions (NZE) scenario, a highly ambitious normative scenario, assumes a pathway to net zero CO_2 emissions for the global energy system by 2050;
- The Announced Pledges Scenario (APS) assumes that governments will meet their GHG and net zero targets on time and in full but that there will still be residual emissions in 2050. This scenario incorporates the UK NDC and Carbon budget targets.

The IEA have compared the APS and NZE (energy sector-specific) scenarios to the IPCC C1 and C2 (global) scenarios as shown in Figure 3-2.

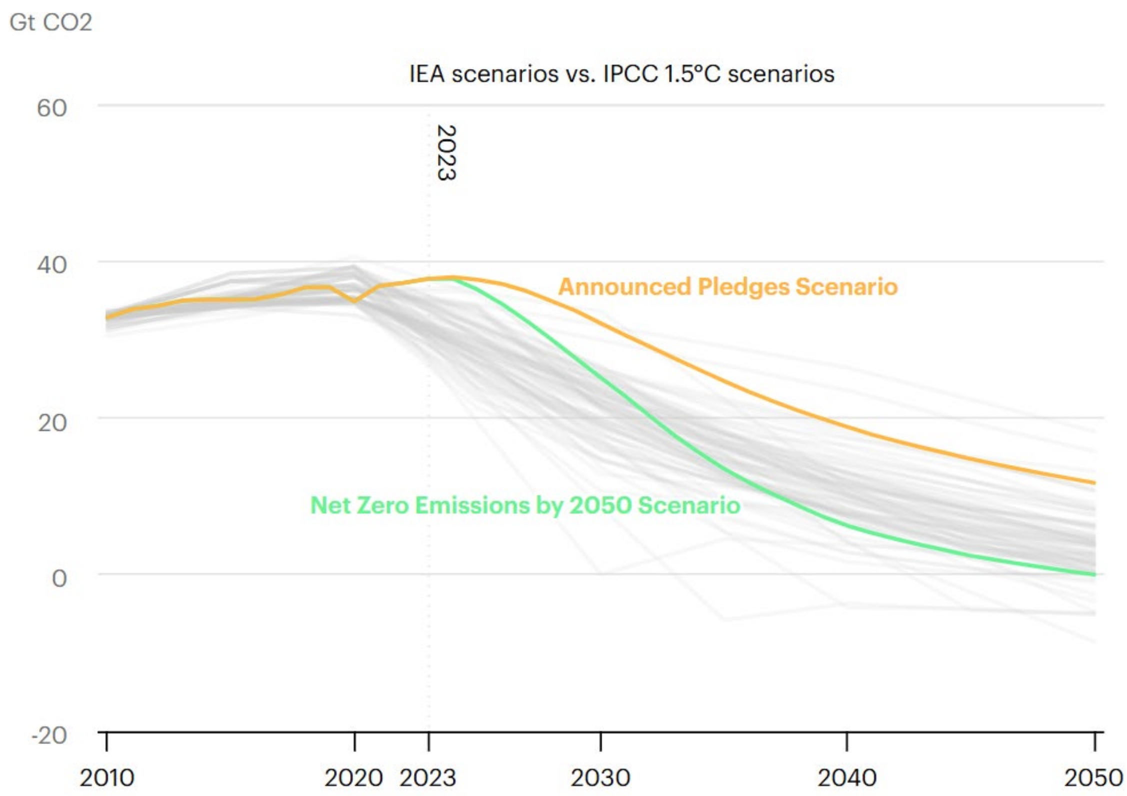

Figure 3-2 IEA APS and NZE scenarios in relation to the IPCC C1 and C2 scenarios[23]

Figure 3-2 shows that the majority of the IPCC C1 and C2 scenarios are between the APS and NZE scenarios. This means that the APS and NZE scenarios are reasonable examples of the range of the IPCC C1 and C2 scenarios which, as highlighted above, lead to at least a 50% chance of limiting the temperature rise to 1.5 °C in 2100. Therefore, for this assessment, the IEA APS and NZE scenarios are used as reasonable future estimates of global GHGs affecting climate over the lifetime of the Jackdaw project as part of the baseline scenario. Other IPCC categories have not been used in this assessment.

The UK carbon budget prepared by the UK CCC will also be used as a baseline from a national context. The UK NDCs used to derive the carbon budget are included in the IEA APS scenario and are aligned with the Paris Agreement.

3.1.4. Cumulative Effects

All released GHG emissions are cumulative, contributing to the overall concentration of GHG in the atmosphere, regardless of where the emissions are released. Hence Scope 3 emissions are not geographically limited and have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned.

[23] Understanding GEC Model scenarios – Global Energy and Climate Model – Analysis - IEA

There is no correlation between where GHG emissions occur and where the effect of rising concentration of atmospheric emissions occurs, i.e. the area that is impacted by the release of Scope 3 emissions is not restricted to the Jackdaw project location and immediate surrounding area.

The Supplementary Guidance further states that "*an assessment of scope 3 emissions in relation to the current state of climate and global emission-reduction pathways is more likely to support a reasoned conclusion on significance*" and that if "*global reduction pathways are used to contextualise magnitude of emissions as above, this approach should be inherently cumulative as these pathways take into account a wide range of existing and planned projects and other activities*".

"*The IEA is the most authoritative global source of energy analysis and projections. It identifies and explores the biggest trends in energy demand and supply, as well as what they mean for energy security, emissions and economic development*"[24]. The IEA Global Energy and Climate (GEC) model[25] is the principal tool used to generate detailed sector-by-sector and region-by-region long-term scenarios and is a highly data-intensive model covering the whole global energy system. The GEC projects the level of oil and gas supply and demand for the next two and a half decades which relies on:

- Standard production profiles and estimates of decline rates at field and country levels derived from IEA detailed field-by-field analysis.
- An extensive survey of upstream projects sanctioned, planned and announced over the short term in both Organization of the Petroleum Exporting Countries (OPEC) and non-OPEC countries, including conventional and non-conventional reserves, as performed by the IEA Oil Market Report team; this is used to derive production over the projection period to 2030.

This assessment therefore considers Jackdaw Scope 3 emissions in the context of future CO_2 emissions estimations for oil and gas combustion from the IEA APS and NZE scenarios. As described above, these scenarios inherently include existing and planned hydrocarbon projects thereby ensuring that this assessment is cumulative.

The UK Carbon Budget also includes national future estimates of hydrocarbon production and demand and will be used as a baseline against which to assess UK cumulative impacts of the Jackdaw Scope 3 emissions.

[24] IEA World Energy Outlook 2024 website.
[25] IEA Global Energy and Climate Model.

4. ESTIMATING SCOPE 3 EMISSIONS

This section describes the Scope 3 emissions assessment undertaken which has been prepared in accordance with the Supplementary Guidance and follows the structure of an Environmental Impact Assessment (EIA) as provided under the Regulations and associated Guidance and the steps outlined in the IEMA guide on Assessing Greenhouse Gas Emissions and Evaluating their Significance[5] (namely, defining the scope and boundaries of the Scope 3 emissions assessment, developing the baseline, deciding upon calculation methodologies, data collection and then calculating the emissions).

4.1. Goal, Scope and Boundaries of the Assessment

Scope 3 are the emissions of end-users who emit CO_2 by using hydrocarbons (e.g. by heating homes or power plant electricity generation). The goal of this assessment is to estimate the Scope 3 emissions associated with the consumer usage of hydrocarbons produced as a result of the Jackdaw project. The magnitude of the Scope 3 emissions can then be used to place the Jackdaw project in the context of global and UK carbon baselines.

Ultimately, most, if not all, hydrocarbons produced from fossil fuel projects will be combusted. Therefore, this assessment includes an 'End Use' assessment (Method 1) of the downstream emissions that presumes all produced hydrocarbons over the lifetime of the project will eventually be combusted (i.e. Scope 3, Category 11 of the Greenhouse Gas Protocol[26].

However, before final combustion/end use by the consumer, hydrocarbons from fossil fuel projects will be processed throughout the project downstream value chain (Jackdaw's downstream value chain is described in section 2), resulting in further Scope 3 emissions. Therefore, a 'Life Cycle Well-to-tank (WTT)' calculation is used to estimate these value chain emissions. These Life Cycle WTT Scope 3 emissions are then combined with the End Use Scope 3 emissions to estimate the full Life Cycle Scope 3 emissions (Method 2).

Both methods are described in further detail below.

- **Method 1: 'End Use'** (Scope 3 emissions, Category 11 under the GHG Protocol): under this approach only emissions related directly to the combustion of the Jackdaw products by customers, e.g. households and power plants, are considered (as shown in Figure 4-1). This method derives Scope 3 emissions by using emission factors for fuels (natural gas and 100% mineral petrol) published by the UK Government for GHG reporting[27] and applying them to the liquids and gas produced by the Jackdaw project. Under this approach, it has been assumed that the gas will enter the National Transmission System for use in homes or industry and the liquids produced from the Jackdaw field, known as natural gas liquids (NGL) and condensate, will be refined into petrol and then eventually combusted in vehicles.
- **Method 2: 'Life Cycle'** (Well-to-tank (WTT) + End Use Scope 3 emissions)': under this approach the full value chain emissions as shown in Figure 4-1 are considered. It uses standard emission factors to estimate the emissions associated with getting a product to its end users, known as well-to-tank emissions factors. These factors are published by the UK Government for GHG reporting[27] and account for emissions associated with the production, transportation and storage of fuels before they are combusted. Combined with the 'End Use' figures estimated by Method 1, the total value chain emissions can be estimated.

[26] Technical Guidance for Calculating Scope 3 Emissions (v.1) – The Greenhouse Gas Protocol.
[27] UK Government GHG Conversion Factors for Company Reporting (2025), Department for Energy Security and Net Zero (DESNZ) & Department for Environment Food and Rural Affairs (DEFRA).

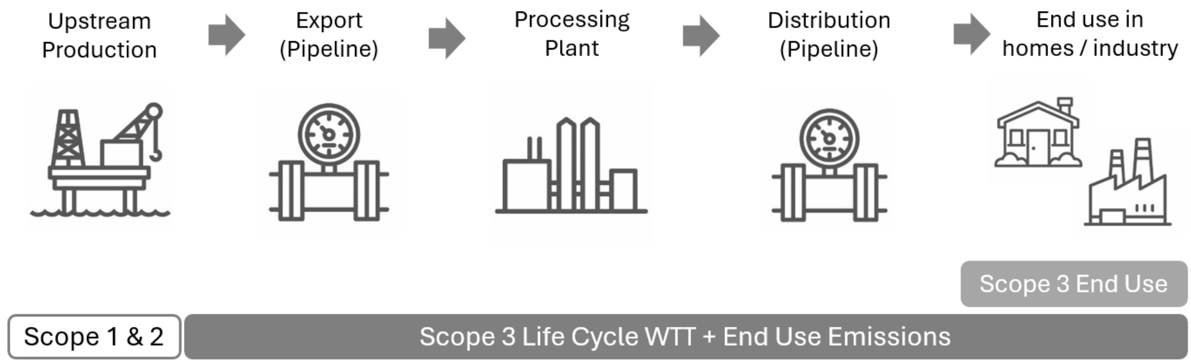

Figure 4-1: Simplified diagram of Jackdaw Scope 3 Emissions Assessment methodologies for Methods 1 and 2.

4.2. Data Collection - Production Profiles for Scope 3 Assessment

In oil and gas production, production profiles are forecasts that show the amount of hydrocarbons (liquids and/or gases) a field or project could produce over time. To account for the many variables associated with producing hydrocarbons, multiple profiles are produced by operators which assume a range of outlooks reflecting the likelihood of exceeding expected production levels. For example, in a P10 profile, there is a 10% chance of the production levels being exceeded. Whereas, for a P50 case there is a 50% chance of the production levels being exceeded. In this assessment the P50 and P10 production forecasts from the Jackdaw Field Development Plan (FDP) have been used to estimate the gas and liquids that could be produced, sold to consumers and ultimately combusted.

For this assessment the P50 case is estimated to be the likely production volumes expected from the Jackdaw project while the P10 case is estimated to be the maximum production expected. Additionally, the Scope 3 emissions assessment timeline is based directly on the number of years of production from the Jackdaw field. This is 8 years for the P50 case and 11 years for the P10 case. The P10 case is the highest anticipated production level specified in the application for consent submitted to the NSTA and would result in the highest anticipated Scope 3 emissions associated with the Jackdaw project, due to the increased production forecast which involves Jackdaw operating for longer compared to the P50 case. Therefore, as per the Supplementary Guidance, the P10 case is considered to represent the 'highest anticipated hydrocarbon production' scenario for this assessment.

The ES assessed potential impacts based on a start-up of production in mid-2025. Production forecasts remain unchanged compared to the ES, except that production is anticipated to start in mid-2026, a one-year delay. Whilst the conclusions of the ES remain unchanged by this one-year delay, for the purposes of this Scope 3 assessment a mid-2026 start-up is assumed. Jackdaw Production Profiles are given in Appendix A.

4.3. CALCULATING GHG EMISSIONS INVENTORY

4.3.1. Method 1: End Use

Method 1 End Use Scope 3 emissions are the emissions related directly to the combustion of the Jackdaw gas by customers, e.g. households and power plants, and the combustion of liquids produced from the Jackdaw field (NGL and condensate) assuming the liquids are refined into petrol which is then combusted in vehicles.

Method 1 End Use Scope 3 emissions are calculated using the following formula:

$$\textit{Scope 3 emissions} = \textit{Product}_{flow} \times \textit{Emission Factor}_{product}$$

Where:

$\textit{Product}_{flow}$ = Product flow (gas, NGL, condensate) in metric tonnes per year.

$\textit{Emission Factor}_{product}$ = Emission Factor (EF) of end-product (gas, petrol) produced from product in tonnes CO_2 equivalent (CO_2e) per metric tonnes of end-product. The factors used are taken from the UK GHG Inventory[27] and are shown in Table 4-1. For gas, the EF used was "Natural gas (100% mineral blend)". NGL and condensate were assumed to be converted into petrol as the end product. The EF of "Petrol (100% mineral petrol)" was used for both NGL and condensate.

For all three products (gas, NGL, condensate) it is assumed that they are energy products which will be combusted.

Table 4-1: End product emission factors (DESNZ)[27].

PRODUCT	EMISSIONS FACTOR (tCO_2e/t)
Gas	2.60330441
NGL	3.15408213
Condensate	3.15408213

4.3.2. Method 2: Life Cycle (Well-to-tank + End Use)

Under method 2 Scope 3 emissions associated with the end use through combustion of the Jackdaw gas are combined with emissions associated with the production, transportation and storage of fuels before they are combusted, with Scope 3 emissions derived directly from the use of fuel Well-To-Tank (WTT) emission factors as published by the UK Government for GHG reporting[27]. The WTT emission factors are based on estimates of emissions arising from the upstream, midstream, and downstream segments of the value chain. Emissions from the upstream segment comprise emissions from exploration and field development and emissions from production and topside processing[28]. Hence the Scope 1 emissions reported in the ES would be included in the WTT proportion of the Scope 3 emissions estimate and double

[28] Study on actual GHG data for diesel, petrol, kerosene and natural gas. Exergia 2015.

counting would occur. To mitigate double counting, the Scope 1 emissions are therefore deducted from the total (the Jackdaw Project does not have any Scope 2 emissions).

Method 2 scope 3 emissions are calculated using the following formula:

$$\boldsymbol{Scope\ 3\ emission} = \boldsymbol{Product_{flow}} \times \left(\boldsymbol{Emission\ Factor_{product}} + \boldsymbol{WtT\ Emission\ Factor_{product}}\right) - \boldsymbol{Scope\ 1\ emissions}$$

Where:

$\boldsymbol{Product_{flow}}$ = Product flow (gas, NGL, condensate) in metric tonnes per year.

$\boldsymbol{Emission\ Factor_{product}}$ = Emission Factor (EF) of end-product (gas, petrol) produced from product in tonnes CO_2 equivalent (CO_2e) per metric tonnes of end-product as outlined similarly in Section 4.3.1 with EFs used shown in Table 4-1.

$\boldsymbol{WtT\ Emission\ Factor_{product}}$ = Emission Factor (EF) associated with upstream processing of end-product (gas, petrol) produced from product in tonnes CO_2 equivalent (CO_2e) per metric tonnes of end-product.

$\boldsymbol{Scope\ 1\ emissions}$ = project scope 1 emissions as reported in the ES.

The factors used are taken from the UK GHG Inventory[27] and are shown in Table 4-2.

Table 4-2: WTT emission factors (DESNZ)[27].

PRODUCT	EMISSIONS FACTOR (tCO_2e/t)
Gas	0.42316368
NGL	0.81593523
Condensate	0.81593523

4.4. Results

The results from each of the methods used are presented in turn in this section for both the P50 and P10 production profiles. Calculations are presented in Appendix B. Jackdaw emissions are expressed in CO_2e which is a more comprehensive view of the total emissions as it includes other greenhouse gases, such as methane and nitrous oxide, alongside CO_2 emissions. As a result, CO_2e is considered more conservative than CO_2 as CO_2e values generally exceed CO_2 emissions alone.

4.4.1. Method 1: End Use

Table 4-3 below summarises the calculated total Scope 3 End Use emissions (tCO_2e) for method 1, as described in Section 4.3.1, for both the P50 and P10 production profiles, for the full lifetime for the project.

Table 4-3: P50 and P10 total Scope 3 emissions (tCO_2e) calculated for Method 1 'End Use' approach, for the full lifetime of the Jackdaw project.

METHOD 1 – END USE APPROACH	P50 CASE (LIKELY PRODUCTION)	P10 CASE (MAX PRODUCTION)
Total Scope 3 End Use emissions, tCO_2e (End Use, Scope 3 category 11)	20,178,580	30,504,574

4.4.2. Method 2: Life Cycle (Well-to-tank (WTT) + End Use)

Table 4-4 below summarises the calculated total Scope 3 Life Cycle emissions (tCO_2e) for method 2, as described in Section 4.3.2 for both the P50 and P10 production profiles, for the full lifetime of the project, and shows that the End Use, Scope 3 category 11 emissions form the majority (85%) compared to the WTT Scope 3 emissions (15%).

Table 4-4: P50 and P10 total emissions (tCO_2e) calculated for Method 2 'Life Cycle WTT + End Use' approach, for the full lifetime of the Jackdaw project.

METHOD 2 – LIFE CYCLE WTT + END USE APPROACH	P50 CASE (LIKELY PRODUCTION)	P10 CASE (MAX PRODUCTION)
Total Scope 3 Life Cycle emissions, tCO_2e (WTT + End Use)	23,558,112	35,823,281
% of Jackdaw Life Cycle Scope 3 emissions resulting from End Use (tCO_2e)	85%	85%
% of Jackdaw Life Cycle Scope 3 emissions resulting from WTT emissions (tCO_2e)	15%	15%

As the P10 case of the Life Cycle WTT + End Use approach (method 2) represents the high-case assessment of Jackdaw's Scope 3 emissions this total will be carried through to the assessment phase.

This approach does not account for the future impact of emission reduction initiatives being implemented as a result of Emission Reduction Action Plans (ERAPs) and/or the Energy Saving Opportunity Scheme (ESOS), in line with commitments to the NSTA and other stakeholders. By not accounting for such emissions reduction initiatives, this results in an inherently conservative, highest anticipated approach to the life cycle emissions.

5. EVALUATING SIGNIFICANCE OF THE LIKELY EFFECTS

The Supplementary Guidance requires "*An ES for an offshore oil and gas production project must include an assessment of the significance of the likely effects of scope 3 emissions. The ES, when evaluating the significance of likely effects of the project on the environment must also consider and contain information on cumulative effects*."

This section discusses the likely impact, receptor sensitivity, magnitude and cumulative effects whilst assessing the significance of the likely effects of Jackdaw Scope 3 emissions.

5.1. Likely Impact

The correlation between CO_2 emissions and global mean temperatures, as illustrated in Figure 3-1 demonstrates that GHG emissions from any source are likely to contribute to global temperature change. Therefore the impact of Jackdaw Scope 3 emissions on the climate is considered "likely".

5.2. Receptor Sensitivity

The Supplementary Guidance states that "*Given the global effect of GHG emissions, the current state of the climate and the concentration of carbon dioxide and other GHGs in the atmosphere, the expectation is that the sensitivity level will be high*" therefore this assessment will consider the receptor sensitivity of the global climate as high.

5.3. Evaluation of Magnitude

This section addresses the requirement of Schedule 6(4)(f) of the Regulations to assess "*the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions)*…..".

5.3.1. Global emissions

5.3.1.1. Global Future Estimates of Carbon Emissions

Global CO_2 projected emissions from the IEA APS and NZE scenarios are shown in Table 5-1. Jackdaw Scope 3 emissions per year can be found in Appendix B. It should be noted that Jackdaw Scope 3 emissions are based on an unabated case, i.e. all oil and gas products are assumed to be combusted and the emissions released to the atmosphere.

Table 5-1: Jackdaw Scope 3 emissions as a proportion of the IEA APS and NZE scenarios.

TARGET	GLOBAL CO_2 EMISSIONS IEA ANNOUNCED PLEDGES SCENARIO (APS)			GLOBAL CO_2 EMISSIONS IEA NET ZERO BY 2050 SCENARIO (NZE)		
	2030	2035	2050*	2030	2035	2050*
Annual global emissions for IEA scenarios(MtCO_2)	32,056	24,678	11,711	25,112	13,485	6,221
P10 Jackdaw Emissions(MtCO_2e)**	5.0	1.4	N/A	5.0	1.4	N/A
Jackdaw proportion (P10)	0.015%	0.005%	N/A	0.020%	0.010%	N/A

*Jackdaw will have ceased production by 2050. **CO_2e considered more conservative than CO_2.

Figure 3-2 demonstrated that the IEA APS and NZE scenarios are reasonable examples within the range of the IPCC C1 and C2 scenarios which, lead to at least a 50% chance of limiting the temperature rise to 1.5 °C in 2100. Table 5-1 shows that when assessed against the IEA APS and NZE scenarios, Jackdaw Scope 3 emissions represent a very small proportion of the projected global emissions in 2030 and 2035 and will have ceased production by 2050. Therefore, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of States to meet global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C.

5.3.1.2. Global Cumulative Assessment

The Supplementary Guidance states that "*an assessment of scope 3 emissions in relation to the current state of climate and global emission-reduction pathways is more likely to support a reasoned conclusion on significance*" and that if "*global reduction pathways are used to contextualise magnitude of emissions as above, this approach should be inherently cumulative as these pathways take into account a wide range of existing and planned projects and other activities*".

The inherent global CO_2 emission estimates resulting from combustion of oil and gas, within the IEA APS and NZE scenarios (based on IEA GEC) are shown in Table 5-2. These global oil and gas combustion emissions estimates (being a proportion of the total emissions as presented in Table 5-1) are compared with Jackdaw Scope 3 emissions for the years 2030, 2035 and 2050. As explained in Section 3.1.4, the IEA APS and NZE scenarios inherently include existing and planned oil and gas projects thereby ensuring that this assessment is cumulative.

Table 5-2: Jackdaw Max Production Case contribution to world oil and gas emissions scenarios.

TARGET	GLOBAL CO_2 EMISSIONS IEA ANNOUNCED PLEDGES SCENARIO (APS)			GLOBAL CO_2 EMISSIONS IEA NET ZERO BY 2050 SCENARIO (NZE)		
	2030	2035	2050*	2030	2035	2050*
Global Oil & Gas emissions ($MtCO_2$)	17186	14504	8302	14381	8921	1269
Jackdaw (P10) Scope 3 emissions ($MtCO_2e$)**	5.0	1.4	N/A	5.0	1.4	N/A
Jackdaw Proportion (%)	0.029	0.009	N/A	0.035	0.016	N/A

*Jackdaw will have ceased production by 2050. **CO_2e considered more conservative than CO_2.

Table 5-2 demonstrates that there is continued oil and gas combustion estimated in both the IEA APS and NZE scenarios for the duration of the Jackdaw P10 production period. When assessed against these oil and gas emission estimates from the IEA APS and NZE scenarios, Jackdaw Scope 3 emissions represent a very small proportion of the cumulative future global emissions for oil and gas combustion in the relevant years. Therefore, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of States to meet global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C

5.3.2. Jackdaw Scope 3 Emissions in a National Context

The UK's share of global CO_2 emissions has fallen from 2.3% since 1990 and now accounts for 1%[7]. Therefore, comparing any UK project in isolation to global CO_2 emissions will always result in the individual project being a small proportion of those emissions.

Jackdaw Scope 3 emissions arise from the use of sold products and the emissions associated with getting those products to their point of end use. Most of the products are likely to be consumed in the UK, e.g. gas in power stations generating electricity or providing heat to homes or fuel consumed whilst driving cars. Thus, Jackdaw's Scope 3 emissions can be considered as contributing to the UK's net GHG emissions.

5.3.2.1. National Future Estimates of Carbon Emissions

The UK's target of Net Zero by 2050 is consistent with IPCC scenarios that limit warming to 1.5°C. NDCs are derived to achieve the UK's target of Net Zero by 2050 and these NDCs and carbon budget targets from the CCC 7th carbon budget report[7] are shown in Table 5-3 where they have been compared to the Jackdaw average annual Scope 3 emissions from Jackdaw for the relevant production periods, with the 5th carbon budget representing the highest period of Jackdaw production.

Table 5-3: Jackdaw emissions as a proportion of average annual emissions ($MtCO_2e$) targets from the CCC 7th carbon budget report[7].

TARGET	2030 UK NDC	2035 UK NDC	4th CARBON BUDGET (2023-2027)	5th CARBON BUDGET (2028-2032)	6th CARBON BUDGET (2033-2037)
Annual UK emissions ($MtCO_2e$)	259.8	154.9	390.0	345	188.8
Annual P10 Jackdaw Scope 3 Emissions averaged per budget year ($MtCO_2e$)	5.0	1.4	3.5	4.5	1.3
Jackdaw proportion (%)	1.89	0.86	0.89	1.3	0.69

Table 5-3 demonstrates that Jackdaw Scope 3 emissions represent a very small proportion of UK carbon budget emissions in 2030 and 2035 and by 2050 Jackdaw will have ceased production. Therefore, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its NDCs and carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C.

Additionally, Jackdaw's Scope 3 emissions have been compared against the total emissions from the 4th, 5th, 6th and 7th carbon budgets and to the total emissions over the relevant years of Jackdaw production for the Maximum Production Case. These are shown in Table 5-4.

Table 5-4: Total budgeted emissions targets from the CCC 7th carbon budget report[7] over the period that Jackdaw produces hydrocarbons assuming the Maximum Production Case.

TARGET	Full Fourth to Seventh Carbon Budget Periods (2023-2042)	Relevant Carbon Budget for the High Case Production Period (Q3/Q4 2026 - Q1/Q2 2037)
Carbon Budget ($MtCO_2e$)	5152.0	2769.6
Jackdaw Max Production Case Emissions ($MtCO_2e$)	35.8	35.8
Jackdaw Proportion (%)	0.70	1.29

Table 5-4 demonstrates that Jackdaw Scope 3 emissions represent a very small proportion of UK carbon budget emissions in the budget period when Jackdaw is producing. As they are emissions from hydrocarbon use, they can be considered as being included in the UK carbon budget, and as being accounted for within the UK Government's net-zero aligned projections. Therefore, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of the UK to meet its carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C.

5.3.2.2. National Cumulative Assessment

UK emissions from Oil & gas combustion have been estimated in the 7th carbon budget. These emissions are compared in Table 5-5 with Jackdaw Scope 3 emissions (P10) for the years 2030, 2035 and 2050. This table shows that Jackdaw Scope 3 emissions are a small proportion of the UK oil and gas emissions associated with the forecasted oil and gas demand.

Table 5-5: Jackdaw Maximum Production case contribution to UK oil and gas emissions scenarios from the CCC 7th carbon budget report[7]

TARGET	UK Emissions from Oil & Gas combustion from the 7th Carbon Budget		
	2030	**2035**	**2050***
UK Oil & Gas Use Emissions ($MtCO_2e$)	117.35	79.65	27.29
Jackdaw (P10) Scope 3 emissions ($MtCO_2e$)	5.0	1.4	N/A
Jackdaw Proportion (%)	4.26	1.76	N/A

*Jackdaw will have ceased production by 2050.

Table 5-5 further demonstrates that there is continued oil and gas use in the UK carbon budgets for the duration of the Jackdaw P10 production period. When assessed against the 2030 and 2035 UK carbon budgets, Jackdaw Scope 3 emissions represent a small proportion of the cumulative UK oil and gas emissions. Jackdaw production will have ceased by 2050. Therefore, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C.

5.4. Evaluation of Significance

5.4.1. Methodology

The Supplementary Guidance states "*The expectation is that assessment methodologies will use a form of matrix that combines sensitivity of the receptor against magnitude of the impact to determine a level of significance associated with scope 3 emissions*."

As described in Section 5.2 highlighting the relevant section from the Supplementary Guidance, the receptor sensitivity of the global climate is considered high whilst both the global and national magnitude of Jackdaw Scope 3 emissions are estimated in Sections 5.3.1 and 5.3.2 respectively.

IEMA[5] provides definitions on how to determine significance depending on a project's whole life GHG emissions as illustrated in Figure 5-1. IEMA states "*The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". This approach together with the project's sensitivity and magnitude assessment have been combined to determine a significance matrix for assessing the likely significant effect of the Jackdaw Scope 3 emissions as shown in Table 5-6. Whilst the IEMA definitions are based on UK carbon budgets aligning project emissions with a 1.5°C compatible trajectory, and achieving net zero by 2050, they are also comparable with global IEA APS and NZE scenarios trajectories.

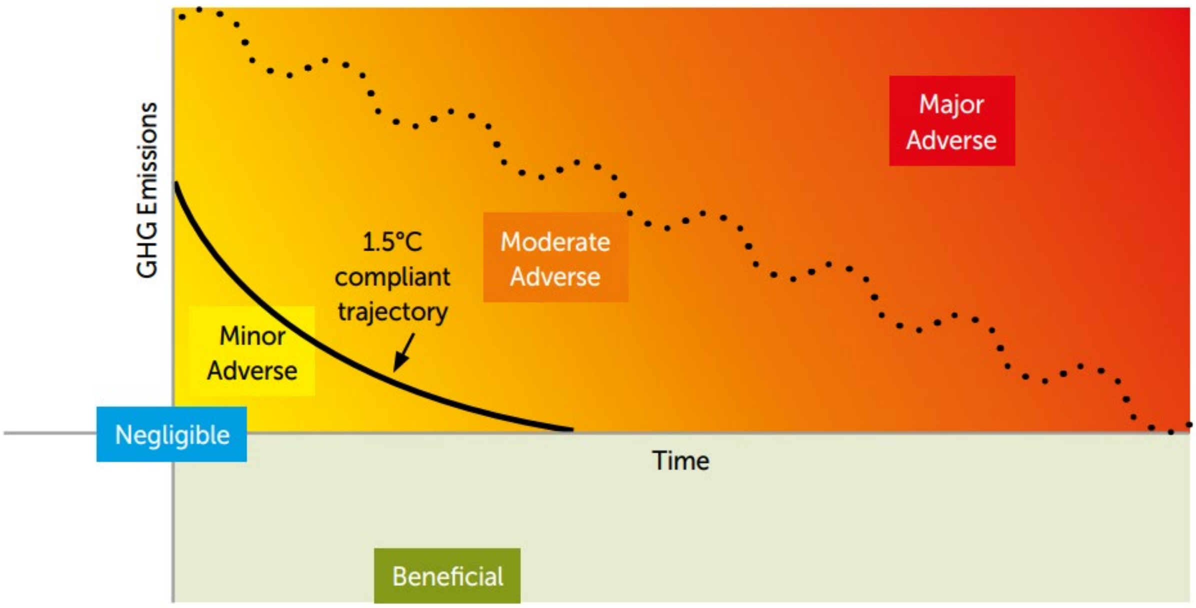

Figure 5-1 Different levels of significance plotted against the UK's net zero compatibility trajectory[5].

Table 5-6: Significance Matrix.

		Significance Criteria	SENSITIVITY(1)
			High
Magnitude	Beneficial	Net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. **A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.**	Beneficial
	Negligible	GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. **A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.**	Not Significant
	Minor Adverse	GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. **A project with minor adverse effects is fully in line with measures necessary to achieve a trajectory towards net zero.**	Not Significant
	Moderate Adverse	GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. **A project with moderate adverse effects falls short of fully contributing to a trajectory towards net zero.**	Significant
	Major Adverse	GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. **A project with major adverse effects is locking in emissions and does not make a meaningful contribution to a trajectory towards net zero.**	Significant
Notes	1)As per OPRED guidance "Evaluating significance…." The expectation is that the sensitivity level will be high.		

5.4.2. Significance Assessment of Jackdaw emissions

5.4.2.1. Global Future Estimates of Carbon Emissions

Figure 3-2 shows that the majority of the IPCC C1 and C2 scenarios are between the IEA APS and NZE scenarios. The IEA APS scenario outlines a trajectory for the energy sector if all national energy and climate pledges, including long-term net zero emissions goals, are met on time and in full whilst the IEA NZE scenario portrays a pathway in which the energy sector achieves net zero CO_2 emissions globally by 2050.

Future global emissions from the IEA APS and NZE are shown in Table 5-1. Jackdaw P10 Scope 3 emissions contribute 0.015% and 0.020% respectively to the IEA APS and NZE scenarios in 2030, which are very small proportions of these Paris-aligned forward-looking global baselines.

Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of states to meet global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C. and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).

5.4.2.2. Global Cumulative Assessment

Cumulative effects refer to the combined environmental impact of multiple activities or projects over time and space. Assessing these effects requires consideration of both the proposed project and other existing, planned, or foreseeable activities. For this assessment, the CO_2 emissions from oil and gas combustion in the IEA APS and NZE scenarios (IEA GEC) are shown in Table 5-2 and are used to evaluate cumulative global impacts.

Table 5-2 demonstrates that there is continued global oil and gas combustion in both the APS and NZE scenarios for the duration of the Jackdaw P10 production period. When assessed against the IEA APS and NZE scenarios in 2030, Jackdaw Scope 3 emissions represent 0.029% and 0.035% respectively, which are a very small proportion of the cumulative future global emissions for oil and gas combustion.

The IEA[29] states a global average emissions intensity of approximately 43 kg CO_2eq/boe for upstream gas extraction and processing. Analysis by the NSTA demonstrates that in 2024, the average emissions intensity of producing and processing UK domestic gas was 28 kgCO_2e/boe, approximately a third less of the global average. The 28 kgCO_2e/boe comprised an emissions intensity of 18 kgCO_2e/boe for upstream operations and 10 kgCO_2e/boe for transport and processing. The 2022 Jackdaw ES estimated upstream operations emissions intensity, in the P10 maximum production case, of approximately 8.5 kgCO_2e/boe[30]. This is less than half the average emissions intensity of UK upstream operations of 18 kgCO_2e/boe.

Taking into account the continued global demand for gas, the low carbon intensity of Jackdaw gas and the small proportion attributable to Jackdaw of the cumulative emissions from oil and gas within the IEA APS and NZE scenarios, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).

5.4.2.3. National Future Estimates of Carbon Emissions

The UK's share of global CO_2 emissions has fallen from 2.3% since 1990 and now accounts for 1%[7]. Therefore, comparing any UK project in isolation to global CO_2 emissions will always result in the individual project being a small proportion of those emissions.

Jackdaw Scope 3 emissions arise from the use of sold products and the emissions associated with getting those products to their point of end use. Most of the products are likely to be consumed in the UK, e.g. gas in power stations generating electricity or providing heat to homes or fuel consumed whilst driving cars. Thus, Jackdaw's Scope 3 emissions can be considered as contributing to the UK's net GHG emissions.

Future UK emissions from the UK carbon budgets are shown in Table 5-3 which demonstrates that Jackdaw Scope 3 emissions represent 1.89% and 0.86% of the UK NDCs in 2030 and 2035

[29] IEA – The Oil and Gas Industry in Net Zero Transitions.

[30] ES estimated 0.0625 teCO_2e/te in the P10 high production case. The conversion factor of 7.38 BOE per tonne of hydrocarbons is derived from standard energy equivalence assumptions used in upstream oil and gas reporting.

and 0.89%, 1.3% and 0.69% of the 4th, 5th, and 6th carbon budgets respectively. By 2050 Jackdaw will have ceased production.

Furthermore Table 5-4 demonstrates that Jackdaw Scope 3 emissions represent a small proportion, 1.29%, of the 5th carbon budget period (2028-2032) when Jackdaw production is anticipated to be at its highest. As these are emissions from hydrocarbon use, they are included in the UK carbon budget, and accounted for within the UK Government's net-zero aligned projections. Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).

5.4.2.4. National Cumulative Assessment

Future UK emissions from oil & gas production within the UK carbon budgets are shown in Table 5-5 These budgets predict continued oil and gas use in the UK for the duration of the Jackdaw P10 maximum production period.

The UK carbon budget assumes ongoing demand for, and use of, oil and gas to meet energy needs, and that demand will be met by either domestic production, such as Jackdaw, or imports. According to the CCC's 7th carbon budget report, UK gas demand during Jackdaw's expected production period will exceed domestic supply.

Figure 5-2 plots domestic gas production forecast (NSTA), forecasted gas demand (DESNZ Net Zero Scenario) and anticipated gas demand (CCC 7th carbon budget). This demonstrates that gas will continue to play a critical role and gas demand will continue to be greater than domestic gas production at least until 2050[31].

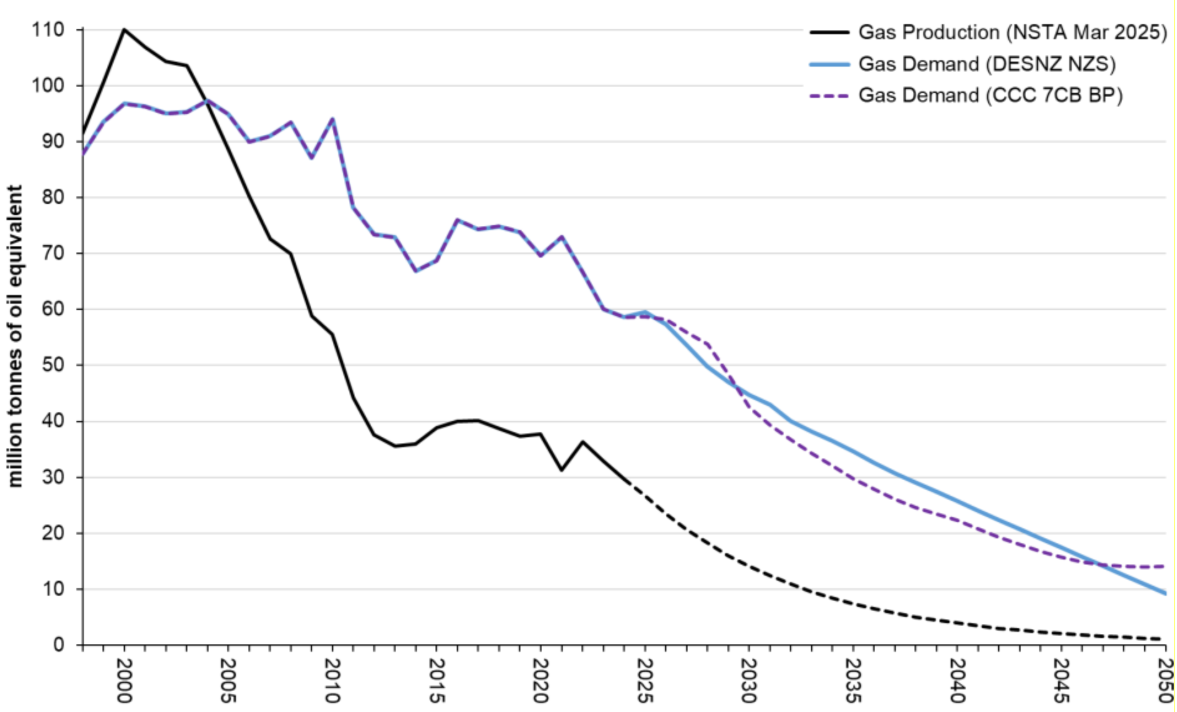

Figure 5-2 UK Gross Gas: DESNZ Net Zero Strategy and CCC 7th Carbon Budget & Demand and NSTA Production Predictions[31].

[31] UK Gross Gas: DESNZ NZS and CCC CB7 Demand and NSTA Production Projections.

Given the above projections, it can be observed that:

- Projected UK gas production follows a declining trend, consistent with historical patterns and field maturity in the UKCS.
- In contrast, projected UK demand for gas (under the CCC 7th carbon budget) persistently and materially exceeds projected UK gas production.
- The UK will therefore continue to need to import gas in order to meet demand, at an annual average of around 31 mtoe per annum.
- Per the 2022 Jackdaw ES "at its peak, Jackdaw is expected to deliver an estimated 6.5% of UKCS gas production."

Table 5-5 demonstrates that Jackdaw Scope 3 emissions represent a small proportion, 4.26%, of the cumulative UK oil and gas emissions from the 5th carbon budget period (2028-2032) when Jackdaw production is anticipated to be at is highest (Jackdaw production will have ceased by 2050).

Analysis by the NSTA demonstrates that in 2024, the average emissions intensity of producing and processing UK domestic gas was 28 $kgCO_2e$/boe, approximately a third less of the global average.

The UK average comprised an emissions intensity of 18 $kgCO_2e$/boe for upstream operations and 10 $kgCO_2e$/boe for transport and processing. The 2022 Jackdaw ES estimated upstream operations emissions intensity, in the P10 maximum production case, of approximately 8.5 $kgCO_2e$/boe[30]. This is less than half the average emissions intensity of UK upstream operations of 18 $kgCO_2e$/boe.

Furthermore, imported LNG has an average emissions intensity of 85 $kgCO_2e$/boe, which is primarily due to emissions associated with liquefaction, shipping to the UK and regasification.

Therefore the Jackdaw project can contribute to ongoing UK demand whilst emitting lower emissions from comparable UK offshore production and significantly less than comparable imported LNG production based on UK averages.

Taking into account the UK's continued demand for gas, the low carbon intensity of Jackdaw gas and the small proportion attributable to Jackdaw of the cumulative emissions from oil and gas within the carbon budgets, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets or global Paris Agreement-aligned emissions pathways that limit warming to 1.5°C and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).

5.4.3. Mitigation

The Supplementary Guidance notes that where the assessment of GHG emissions identifies a likely significant adverse effect from a proposed project, consideration must be given by the developer to identifying suitable mitigation measures. Shell's assessment does not identify a likely significant adverse effect of the Jackdaw project on the environment as the effect is assessed to be Minor Adverse and therefore Not Significant.

Some mitigation measures may be possible in the future for some projects, for example if there is a functioning market (including at consumer level) for carbon capture and storage (CCS) and sufficient demand for hydrogen. Measures such as these to effectively tackle Scope 3 emissions require progressive government policy, supported by effective collaboration between policymakers, customers, and private organisations.

The UK is currently implementing measures to support initial deployment, with the aim of becoming 'a competitive market by the middle of the next decade'. Shell, for example, is partnering with others in the carbon capture and storage (CCS) Acorn Project which aims to provide the transport and storage infrastructure that will help Scottish industry decarbonise, aiming to store up to 10 million tonnes of CO_2 every year.

6. CONCLUSION

In this document the effects of Scope 3 emissions of the Jackdaw project have been assessed. Scope 3 emissions occur when the Jackdaw energy products, predominantly natural gas, are ultimately combusted by consumers.

The Scope 3 assessment has followed the principles outlined in the IEMA guidance, summarising the key messages below:

Baseline determination

- The IPCC AR6 confirms a "near-linear relationship between cumulative CO_2 emissions and global temperature rise", with temperature highlighted as the key climate indicator.
- The IPCC has defined a range of categories that limit temperature increases. Of these categories, the more ambitious C1 and C2 categories relate to scenarios that lead to at least a 50% chance of limiting the temperature rise to 1.5 °C in 2100 and are aligned with the Paris Agreement.
- For this assessment, the future CO_2 emissions estimates of the IEA energy sector APS and NZE scenarios have been used as reasonable future estimates of global emissions affecting climate over the lifetime of the Jackdaw project as part of the baseline scenario. These scenarios align with the more ambitious goals of the Paris Agreement and with the IPCC C1 and C2 categories.
  - The NZE scenario, a highly ambitious normative scenario, assumes a pathway to net zero CO_2 emissions for the global energy system by 2050;
  - The APS scenario assumes that States will meet their GHG and net zero targets on time and in full but that there will still be residual emissions in 2050. This scenario incorporates the UK NDC and carbon budget targets.

Calculation of Jackdaw Scope 3 emissions

- Two calculation methodologies have been used:
  - Method 1, the 'End Use Scope 3 emissions' relate to the emissions that arise from the combustion of Jackdaw gas by customers, e.g. households and power plants, and the combustion of Jackdaw liquids (NGL and condensate), assuming the liquids are refined into petrol which is then combusted in vehicles.
  - Method 2, the 'Life Cycle Scope 3 emissions' include the full value chain emissions for Jackdaw: the end use emissions, as per method 1, and also the emissions related to downstream processing of Jackdaw products, before they reach the consumer.
- The highest anticipated Jackdaw Scope 3 emissions based on the highest anticipated production levels using the Life Cycle Scope 3 emissions method are estimated to be 35.8 M tCO_2e over the full lifetime of the project (2026-2037).

Evaluation of the significance of the likely effects

- **Likelihood and Sensitivity**: As set out in Section 5.1, Jackdaw Scope 3 emissions are assessed as having a likely impact on climate. The sensitivity of the climate receptor is considered to be high (Section 5.2).

- **Global Future Estimates of Carbon Emissions**: As set out in Section 5.3.1.1, Jackdaw Scope 3 emissions are within the Paris-aligned IEA APS and NZE scenarios. Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of States to meet global Paris-aligned emissions pathways that limit warming to 1.5°C. and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).
- **Global Cumulative Emissions**: As set out in Section 5.4.2.2, Jackdaw Scope 3 emissions are within the Paris-aligned IEA APS and NZE scenarios. Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the ability of States to meet global Paris-aligned emissions pathways that limit warming to 1.5°C. and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).
- **National Future Estimates of Carbon Emissions**: As set out in Section 5.4.2.3, Jackdaw Scope 3 emissions are within the UK Government's net-zero aligned projections set out in the 7th carbon budget. Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets and are therefore assessed as minor adverse and not significant in accordance with the significance matrix (Table 5-6).
- **National Cumulative Emissions**: As set out in Section 5.4.2.4, Jackdaw Scope 3 emissions are aligned with the emissions from cumulative oil and gas within the UK carbon budgets, Jackdaw Scope 3 emissions are not considered to have a likely significant effect on the UK's ability to meet its carbon budget targets and are therefore assessed as minor adverse and not significant in accordance with the significance matrix ((Table 5-6).

Overall Conclusion

The conclusion is, therefore, that in global and national Paris-aligned emissions pathways, the effect of Jackdaw Scope 3 emissions on climate is not significant.

A. APPENDIX A – PRODUCTION PROFILES

The Jackdaw gas and condensate production forecasts "wellhead" flow rates directly correspond to the gas and condensate sales volumes quoted in the Jackdaw Field Development Plan (FDP) and are shown in Tables A-1 to A-3 below.

The wellhead rates are used to define the requirements for the regulatory ES requirements as inputs into the assessment of potential environmental effects. Conversion of the modelled Jackdaw "wellhead rates" into the FDP sales volumes takes into account fluids composition and pressures and the complex topside and pressure system that will exist for Jackdaw, through Shearwater and into SEGAL/Flags Pipeline System for onshore processing. See Section 2 for more details of the production system.

The ES assessed potential impacts based on a start-up of production in mid-2025. Production forecasts remain unchanged compared to the ES, except that production is anticipated to start in mid-2026 (1 year delay). Whilst the conclusions of the ES would remain unchanged by this change, for the purposes of this Scope 3 assessment a mid-2026 start-up is assumed.

Table A-1: Forecast condensate production profiles sales volumes from the Jackdaw field

Year (revised)	Year (as per ES)*	P50 CASE (LIKELY PRODUCTION)		P10 CASE (MAX PRODUCTION)	
		Thousand t/d	t/yr*	Thousand t/d	t/yr*
2026**	2025	0.251	45,808	0.471	85,958
2027	2026	1.023	373,395	1.089	397,485
2028	2027	0.945	344,925	1.029	375,585
2029	2028	0.684	249,660	0.968	353,320
2030	2029	0.445	162,425	0.838	305,870
2031	2030	0.250	91,250	0.535	195,275
2032	2031	0.184	67,160	0.423	154,395
2033	2032	0.118	43,070	0.303	110,595
2034	2033	0.078	14,235	0.211	77,015
2035	2034	-	-	0.173	63,145
2036	2035	-	-	0.128	46,720
2037**	2036	-	-	0.102	18,615

Note * Thousand t/d is multiplied by 365 to give t/yr.
Note ** Production in 2026 is in Q3/Q4 and Q1/Q2 for 2037 so t/yr is divided by 2.

Table A-2: Forecast gas production profiles sales volumes from the Jackdaw field.

Year (revised)	Year (as per ES)*	P50 CASE (LIKELY PRODUCTION)		P10 CASE (MAX PRODUCTION)	
		Thousand sm³/d	t/yr*	Thousand sm³/d	t/yr*
2026**	2025	950.4	126,617	1,688.2	224,910
2027	2026	3,981.1	1,060,764	3,980.3	1,060,551
2028	2027	3,836.0	1,022,102	3,940.8	1,050,026
2029	2028	3,119.8	831,271	3,917.8	1,043,898
2030	2029	2,490.0	663,461	3,576.9	953,065
2031	2030	1,584.9	422,297	2,628.9	700,470
2032	2031	1,194.6	318,301	2,298.7	612,489
2033	2032	753.6	200,797	1,774.6	472,842
2034	2033	486.3	64,787	1,297.4	345,692
2035	2034	-	-	1,086.9	289,605
2036	2035	-	-	785.9	209,403
2037**	2036	-	-	620.6	82,679

Note * Thousand sm^3/d is multiplied by the Unisim model output for Jackdaw St Fergus facility outlet gas density of 0.73 kg/m^3 and then by 365 days.
Note ** Production in 2026 is in Q3/Q4 and Q1/Q2 for 2037 so t/yr is divided by 2.

Table A-3: Forecast NGL production profiles sales volumes from the Jackdaw field.

Year (revised)	Year (as per ES)*	P50 CASE (LIKELY PRODUCTION)		P10 CASE (MAX PRODUCTION)	
		Thousand sm³/d	t/yr*	Thousand sm³/d	t/yr*
2026**	2025	0.323	30,063	0.573	53,332
2027	2026	1.352	251,675	1.352	251,675
2028	2027	1.303	242,553	1.339	249,255
2029	2028	1.06	197,319	1.331	247,766
2030	2029	0.846	157,483	1.215	226,172
2031	2030	0.538	100,149	0.893	166,232
2032	2031	0.406	75,577	0.781	145,383
2033	2032	0.256	47,654	0.603	112,248
2034	2033	0.165	15,357	0.441	82,092
2035	2034	-	-	0.369	68,689
2036	2035	-	-	0.267	49,702
2037**	2036	-	-	0.211	19,639

Note * Thousand sm³/d is multiplied by the Unisim model output for Jackdaw St Fergus facility outlet NGL density of 510 kg/m³ and then by 365 days.
Note ** Production in 2026 is in Q3/Q4 and Q1/Q2 for 2037 so t/yr is divided by 2.

B. APPENDIX B – SCOPE 3 EMISSIONS METHODOLOGIES CALCULATIONS

METHOD 1 – END USE CALCULATIONS

Table B-1: P10 Method 1 calculations

Production Year	Dry gas available for sale (P10)			NGL available for sale (P10)			Condensate available for sale (P10)			Annual Total (P10)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	(c+f+i)
2026	224,910	2.60330441	585,509	53,332	3.15408213	168,214	85,958	3.15408213	271,117	1,024,841
2027	1,060,551	2.60330441	2,760,937	251,675	3.15408213	793,804	397,485	3.15408213	1,253,700	4,808,441
2028	1,050,026	2.60330441	2,733,537	249,255	3.15408213	786,171	375,585	3.15408213	1,184,626	4,704,334
2029	1,043,898	2.60330441	2,717,584	247,766	3.15408213	781,474	353,320	3.15408213	1,114,400	4,613,459
2030	953,065	2.60330441	2,481,118	226,172	3.15408213	713,365	305,870	3.15408213	964,739	4,159,222
2031	700,470	2.60330441	1,823,537	166,232	3.15408213	524,309	195,275	3.15408213	615,913	2,963,759
2032	612,489	2.60330441	1,594,495	145,383	3.15408213	458,550	154,395	3.15408213	486,975	2,540,020
2033	472,842	2.60330441	1,230,952	112,248	3.15408213	354,039	110,595	3.15408213	348,826	1,933,817

Production Year	Dry gas available for sale (P10)			NGL available for sale (P10)			Condensate available for sale (P10)			Annual Total (P10)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	(c+f+i)
2034	345,692	2.60330441	899,942	82,092	3.15408213	258,925	77,015	3.15408213	242,912	1,401,778
2035	289,605	2.60330441	753,930	68,689	3.15408213	216,651	63,145	3.15408213	199,165	1,169,745
2036	209,403	2.60330441	545,140	49,702	3.15408213	156,764	46,720	3.15408213	147,359	849,263
2037	82,679	2.60330441	215,239	19,639	3.15408213	61,943	18,615	3.15408213	58,713	335,895
TOTAL	7,045,631	-	18,341,920	1,672,185	-	5,274,209	2,183,978	-	6,888,444	**30,504,574**

Note * For Emissions factors refer to Table 4-1.

Table B-2: P50 Method 1 calculations

Production Year	Dry gas available for sale (P50)			NGL available for sale (P50)			Condensate available for sale (P50)			Annual Total (P50)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	(c+f+i)
2026	126,617	2.60330441	329,623	30,063	3.15408213	94,821	45,808	3.15408213	144,482	568,926
2027	1,060,764	2.60330441	2,761,492	251,675	3.15408213	793,804	373,395	3.15408213	1,177,718	4,733,014
2028	1,022,102	2.60330441	2,660,843	242,553	3.15408213	765,032	344,925	3.15408213	1,087,922	4,513,797
2029	831,271	2.60330441	2,164,051	197,319	3.15408213	622,360	249,660	3.15408213	787,448	3,573,860
2030	663,461	2.60330441	1,727,191	157,483	3.15408213	496,714	162,425	3.15408213	512,302	2,736,207
2031	422,297	2.60330441	1,099,368	100,149	3.15408213	315,878	91,250	3.15408213	287,810	1,703,056
2032	318,301	2.60330441	828,634	75,577	3.15408213	238,376	67,160	3.15408213	211,828	1,278,839
2033	200,797	2.60330441	522,736	47,654	3.15408213	150,305	43,070	3.15408213	135,846	808,887
2034	64,787	2.60330441	168,660	15,357	3.15408213	48,437	14,235	3.15408213	44,898	261,996
TOTAL	4,710,396	-	12,262,597	1,117,831	-	3,525,728	1,391,928	-	4,390,255	**20,178,580**

Note * For Emissions factors refer to Table 4-1.

Method 2 - Life Cycle (Well-to-tank (WTT) + End Use) Calculations

Table B-3: P10 Method 2 calculations

Production Year	Dry gas available for sale (P10)			NGL available for sale (P10)			Condensate available for sale (P10)			End Use Method 1 (P10)	Annual Total (P10)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	j	(c+f+i)+j
2026	224,910	0.42313638	95,168	53,332	0.81593523	43,515.46	85,958	0.81593523	70,136	1,024,841	1,233,660
2027	1,060,551	0.42313638	448,758	251,675	0.81593523	205,350.50	397,485	0.81593523	324,322	4,808,440	5,786,871
2028	1,050,026	0.42313638	444,304	249,255	0.81593523	203,375.94	375,585	0.81593523	306,453	4,704,334	5,658,467
2029	1,043,898	0.42313638	441,711	247,766	0.81593523	202,161.01	353,320	0.81593523	288,286	4,613,457	5,545,617
2030	953,065	0.42313638	403,276	226,172	0.81593523	184,541.70	305,870	0.81593523	249,570	4,159,223	4,996,610
2031	700,470	0.42313638	296,394	166,232	0.81593523	135,634.55	195,275	0.81593523	159,332	2,963,760	3,555,120
2032	612,489	0.42313638	259,166	145,383	0.81593523	118,623.11	154,395	0.81593523	125,976	2,540,019	3,043,786
2033	472,842	0.42313638	200,077	112,248	0.81593523	91,587.10	110,595	0.81593523	90,238	1,933,819	2,315,719
2034	345,692	0.42313638	146,275	82,092	0.81593523	66,981.75	77,015	0.81593523	62,839	1,401,779	1,677,874
2035	289,605	0.42313638	122,542	68,689	0.81593523	56,045.78	63,145	0.81593523	51,522	1,169,745	1,399,855

Production Year	Dry gas available for sale (P10)			NGL available for sale (P10)			Condensate available for sale (P10)			End Use Method 1 (P10)	Annual Total (P10)
	t/yr	EF*	tCO2e	t/yr	EF*	tCO2e	t/yr	EF*	tCO2e	tCO2e	tCO2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	j	(c+f+i)+j
2036	209,403	0.42313638	88,606	49,702	0.81593523	40,553.61	46,720	0.81593523	38,120	849,263	1,016,543
2037	82,679	0.42313638	34,984	19,639	0.81593523	16,024.15	18,615	0.81593523	15,189	335,895	402,092
SUBTOTAL	7,045,631	-	2,981,262	1,672,185	-	1,364,394.65	2,183,978	-	1,781,985		**36,632,216**
SCOPE 1 (ES pp 7-20)											**808,935**
TOTAL ((c+f+i)+j) - Scope 1											**35,823,281**

Note * For Emissions factors refer to Table 4-2.

Table B-4: P50 Method 2 calculations

Production Year	Dry gas available for sale (P50)			NGL available for sale (P50)			Condensate available for sale (P50)			End Use Method 1 (P50)	Annual Total (P50)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	j	(c+f+i)+j
2026	126,617	0.42313638	53,576.26	30,063	0.81593523	24,529	45,808	0.81593523	37,376	568,925	684,407
2027	1,060,764	0.42313638	448,847.84	251,675	0.81593523	205,350	373,395	0.81593523	304,666	4,733,013	5,691,877
2028	1,022,102	0.42313638	432,488.54	242,553	0.81593523	197,908	344,925	0.81593523	281,436	4,513,798	5,425,631
2029	831,271	0.42313638	351,741.00	197,319	0.81593523	161,000	249,660	0.81593523	203,706	3,573,859	4,290,306
2030	663,461	0.42313638	280,734.49	157,483	0.81593523	128,496	162,425	0.81593523	132,528	2,736,205	3,277,964
2031	422,297	0.42313638	178,689.22	100,149	0.81593523	81,715	91,250	0.81593523	74,454	1,703,054	2,037,912
2032	318,301	0.42313638	134,684.73	75,577	0.81593523	61,666	67,160	0.81593523	54,798	1,278,839	1,529,988
2033	200,797	0.42313638	84,964.52	47,654	0.81593523	38,883	43,070	0.81593523	35,142	808,887	967,876
2034	64,787	0.42313638	27,413.74	15,357	0.81593523	12,530	14,235	0.81593523	11,615	261,998	313,557
SUBTOTAL	4,710,396		1,993,140.33	1,117,831		912,077	1,391,928		1,135,723		**24,219,518**
SCOPE 1 (ES Table 7-13)											**661,406**

Production Year	Dry gas available for sale (P50)			NGL available for sale (P50)			Condensate available for sale (P50)			End Use Method 1 (P50)	Annual Total (P50)
	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	t/yr	EF*	tCO_2e	tCO_2e	tCO_2e
	(a)	(b)	(c=axb)	(d)	(e)	(f=dxe)	(g)	(h)	(i=gxh)	j	(c+f+i)+j
TOTAL ((c+f+i)+j) - Scope 1											**23,558,112**

Note * For Emissions factors refer to Table 4-2.