NORTH LONDON WASTE AUTHORITY

REPORT TITLE: CARBON CAPTURE AND STORAGE PROJECT UPDATE

REPORT OF: MANAGING DIRECTOR

FOR SUBMISSION TO: AUTHORITY MEETING

DATE: 30 JULY 2024

SUMMARY OF REPORT:

This report provides an overview of the Strategic Assessment study for the North London Carbon Capture Project. Specifically, the report provides:

1. A market update including an overview of the call for evidence concerning non-pipeline transport and cross border CO_2 Networks;
2. An update on stakeholder engagement activities;
3. A summary of the main findings and recommendations for each of the five business cases under the Strategic Assessment; and
4. An overview of the proposed activities for Stage 1 Strategic Outline Case.

RECOMMENDATIONS:

The Authority is recommended to:

A. Note the findings of the Strategic Assessment and recommendations to be taken forward as part of the Strategic Outline Case.
B. Agree to commence the next stage of the business case development work referred to as Stage 1 Strategic Outline Case. This would be within the financial limit of £3.2 million, expected to be delivered over a period of 3 years. Expenditure and extent of work for each year would be approved by Members as part of the annual budgeting process.

SIGNED: ..... Managing Director

DATE: 18 July 2024

1. INTRODUCTION

1.1. This report provides an update on the outcome of the Strategic Assessment stage including recommendations for further areas of research during the next stages. The report requests agreement from Members to proceed to Stage 1 to develop the Strategic Outline Case.

2. PROJECT BACKGROUND

2.1. At the September 2021 Programme Committee meeting, Members agreed to the Carbon Capture and Storage (CCS): Outline Strategy. The Outline Strategy set out the Authority's ambition to deliver a carbon capture solution at the EcoPark as soon as practicable in the 2030s.

2.2. To progress the Authority's ambition to implement a full chain carbon capture solution, a team of advisers was appointed with expertise covering project management, technical and engineering, environmental planning and financial advisory services. The North London Carbon Capture Project (NLCCP) commenced in summer 2023 and follows HM Treasury Guidance for developing the project business case, which is based on the Treasury Green Book and sets out best practice in terms of appraising and managing major projects.

2.3. As reported to Members during the February Authority meeting, the then-Government had published its Carbon Capture, Utilisation and Storage (CCUS) Vision Statement in December 2023, which provided a blueprint for establishing the carbon capture industry. The Vision Statement signalled a move away from a government-led cluster sequencing approach to a market which is gradually free of government support by the mid-2030s, when capture volumes are estimated to be around 50–60 million tonnes annually.

2.4. Government has said that it recognises there is a need for its continued role in relation to the strategic coordination of a national CO_2 transport network and committed to consulting how it envisages non-pipeline transport being delivered in the UK. A consultation addressing non-pipeline transport was published in May 2024 and is discussed further in Paragraph 3.6.

2.5. In line with HM Treasury guidance a 'Strategic Assessment' is undertaken prior to developing a business case. As per the guidance, a strategic assessment was carried out with key findings and recommendations discussed in Section 4.

2.6. The Strategic Assessment (included as an appendix) concludes that there is a strong case for developing the NLCCP considering the scheme's strong alignment with policies to tackle climate change at international, national, regional, and local level. It is recognised that the NLCCP would address the challenges the Authority would otherwise face in terms of CO_2 emissions, potential charges under the UK Emissions

Trading Scheme (ETS), and the fact it is unable to significantly alter the nature of the fuel for the Energy Recovery Facility (ERF), i.e. residual waste that cannot be recycled.

2.7. The assessment further concluded that there are no project 'show-stoppers', and recommends that the NLCCP should progress to the next stage i.e. the Strategic Outline Case (referred to as Stage 1). This stage will culminate in the production of a shortlist of potential solutions and a preferred way forward. An overview of the Stage 1 key activities and deliverables are set out in Section 6.

2.8. A detailed technical analysis of the potential transport routes has not been carried out as part of the Strategic Assessment. A number of potential CO_2 transport scenarios were identified based on market insights as well as geographical proximity to the EcoPark and were used to inform overall levelised costs. This initial analysis has informed the detailed scoping of the required technical studies which will be undertaken as part of the Strategic Outline Case.

3. EXTERNAL STAKEHOLDER ENGAGEMENT

3.1. The NLCCP faces a number of risks, both internal, i.e. those directly within the Authority's control, and external, for example, emerging Government policy relating to Transport and Permanent Storage (T&S) and wider market developments, such as the establishment of the carbon capture clusters. The Authority has put in place a range of actions to mitigate these risks, including a Market and Stakeholder Development (MSD) workstream to gain a fuller understanding of the emerging carbon capture and storage market, understand the T&S challenges, and also a programme of advocacy on key government policies.

3.2. The Authority has and continues to engage with stakeholders representing different parts of the value chain including T&S companies (T&SCo) responsible for the permanent storage of CO_2, intermediate transport providers and industry bodies such as those representing rail and road operators.

3.3. Engagement to date has seen widespread interest in the NLCPP particularly due to the scale and quality of the CO_2. However, there is acknowledgement of the challenges faced by the NLCCP in transporting the CO_2 from the urban location of EcoPark.

3.4. Early discussions have uncovered that although some stakeholders have indicated tentative willingness to 'aggregate' CO_2 from multiple installations, there is some reluctance due to the dispersed nature of the site and perceived difficulties with sharing a transport system. Some T&SCo have expressed an interest in managing the NLCCP's CO_2 if transport to the Thames Estuary could be arranged, whereas others expressed a reluctance to collect CO_2 from the Thames area and would prefer the CO_2 to be transported to their boundary.

3.5. Although at the current stage the potential for aggregations involving multiple emitters in the same area as the EcoPark is confirmed as a challenge, the Authority will continue to engage the industry where economies of scale could be beneficial. All forms of transport modes are also still being explored for the NLCCP, which are at different points of maturity, for example, Non-Pipeline Transport (NPT) such as shipping is expected to evolve significantly over the next 10 years.

Non-Pipeline Transport and Cross Border CO_2 Networks – Call for Evidence

3.6. NPT projects will be eligible to apply for Government support via the cluster sequencing programme from 2025. On 7 May 2024 the then-Government published a call for evidence on non-pipeline transport and cross border CO_2 networks. The Authority responded to the call for evidence, which closed on 16 July 2024.

3.7. In the CCUS Vision published in December 2023, Government stated a desire to transition from a market creation phase (between now and 2030) to a market transition phase (2030 to 2035), and it is expected that NPT projects will be deployed during the market transition phase. However, the Government anticipated in its 2023 Vision that its involvement within the CCS markets would reduce substantially during this time, with it only intervening where necessary.

3.8. The Authority's view, as set out in its response, is that there is a significant risk that if Government withdraws from the NPT market too soon, transport provision for CO_2 may not materialise as anticipated or be cost competitive. This is because NPT faces the same risks and barriers to market entry as the first CO_2 pipeline projects, including substantial initial capital investments with increased levels of risk, a restricted number of users and challenges connected to establishing a market in its infancy. It is a concern that if the Government does not adequately support the NPT market, this will not only affect the NLCCP but would significantly constrain the country's ability to achieve net zero carbon emissions.

3.9. Strong strategic direction is required from Government to incentivise the development of CO_2 hubs such as rail heads and ports. Such interventions need to happen in a timely manner ahead of the transition period.

4. STRATEGIC ASSESSMENT OVERVIEW

4.1. HM Treasury Guidance on developing the business case sets a solid framework which ensures project plans are based on sound policy and follow a thorough appraisal process. The initial stage, known as the Strategic Assessment stage, is the first step in developing the business case and outlines the rationale and strategic case for the project.

4.2. The Strategic Assessment highlights the importance of maintaining strong strategic coherence as the project develops and the business case matures. Central to the HM Treasury framework is the five case business model:

4.2.1. **Strategic Case:** This chapter sets out the strategic context against which the NLCCP is being developed, the issues that the Authority would face without the NLCCP and those drivers that make developing it attractive.

4.2.2. **Economic Case:** This chapter seeks to evaluate the societal benefits of delivering the NLCCP set out in the Strategic Case and weighs these against the societal costs, thus providing a clear view on the likely societal value of the scheme.

4.2.3. **Commercial Case:** This chapter sets out the potential procurement and contracting approaches.

4.2.4. **Financial Case:** This chapter provides an initial view as to the likely capital costs of delivering the NLCCP, and those associated with operating the carbon capture plant once complete.

4.2.5. **Management Case:** This chapter sets out possible delivery timescales, project management, assurance and risk management governance structures, as well as key stakeholders that would need to be engaged.

4.3. In future stages of the business case more detailed information should enable an informed process to down-select a long list of project options to a viable short list. This down-selection would be conducted based on the strategic objectives and critical success factors developed earlier on in the business case process.

4.4. The key findings from each of the cases are set out below and associated recommendations are set out in Section 5.

Strategic Case

4.5. The Strategic Case sets out a robust case for change highlighting the market enablers and investment drivers that emerge primarily through the Government's cluster sequencing programme and the expansion of the ETS to the energy from waste sector.

Screening Project Options

4.6. An initial set of strategic objectives as well as project specific critical success factors were identified. The strategic objectives aim to maximise the volume of CO_2 captured thereby lessening the impact from the ERF while creating opportunities for high quality jobs supporting the economy's transition to a low carbon economy.

4.7. The objectives will be underpinned by the critical success factors which will be necessary to ensure the project will succeed, ensuring the project is value for money and affordable. These factors will be further developed in later stages as the project matures and will ultimately be used to screen a longer list of potential project options down to a shorter list of options before a preferred option is selected during the Outline Business Case (Stage 2).

Technology Screening

4.8. A screening assessment was undertaken to make an initial assessment of suitable carbon capture technology. Post-combustion carbon capture using either Amines or Hot Potassium Carbonate (HPC) solvents were identified as the most promising options at this early stage. As the project progresses, the technology options will be continuously reviewed, taking account of market developments over the coming years.

4.9. A mass and energy balance study was carried out, which identified that there would be a substantial reduction in the net power output of the ERF for both Amines and HPC solvents (up to 45MW). For Amines this can be mitigated through the installation of a 'topping turbine' which would generate additional power (potentially up to 14MW). This means there would be sufficient power available to simultaneously power the carbon capture plant, supply sufficient heat to the district heating network and provide power to the various private wire users.

CO_2 Transport Challenges

4.10. The key risks, dependencies and constraints that the NLCCP is likely to face were explored and ranked, taking note of risks which are within the control of the Authority (internal risks) and those outside the control of the Authority (external risks). The highest-ranking risk at this stage is that a viable CO_2 transport solution does not materialise in a timeframe which enable operations in the mid-2030s.

4.11. The NLCCP is not seen as an 'anchor emitter', which is a large emitter that provides a significant proportion of the CO_2 in a CCS cluster or hub. Therefore, the onus will most likely be on the Authority to procure its own transport for the movement of captured CO_2 to a cluster or T&S network.

4.12. All forms of transport modes are also still being explored for the NLCCP, which are at different points of maturity. Shipping especially in the European market is expected to evolve significantly over the next 10 years with estimates of up to 39.5 million tonnes of CO_2 being transport by ship by 2030 (up from around 600,000 tonnes of CO_2 transported annually today). Engagement with a shipping company highlighted that while marine transport will offer greater opportunities for T&S solutions, the CO_2 shipping market is at a very nascent stage. Officers will continue

to monitor developments and engage further with the market as part of more detailed technical work to be carried out in Stage 1.

4.13. Based on market insights and proximity to the EcoPark, nine different CO_2 transport scenarios were developed including a 'do nothing' scenario. These scenarios were used to inform the economic and financial case and are discussed in more in detailed in below.

Economic Case

4.14. The purpose of the economic case is to demonstrate value for money by determining the costed benefits to society from the scheme compared to the overall project cost on a whole life basis. This is referred to as the Benefits Cost Ratio (BCR) and is a value for money indicator used in HM Treasury Green Book Guidance.

4.15. The benefits to society of the options have been calculated based on avoided greenhouse gas emissions over the lifetime of the project, representing the monetary value that society places on one tonne of CO_2 equivalent.

4.16. When evaluating projects, a BCR of 2 to 4 is considered by Government to be 'high' and a BCR of 2 can be a threshold when applying for government funding. An initial BCR analysis was undertaken by evaluating the nine different transport scenarios considering the lifetime benefits of installing the carbon capture plant while taking account of the indicative CO_2 impacts of the various transport routes and assumed transport modes.

4.17. All options showed a benefit to society over the 'do nothing' scenario, which varied depending on the transport mode and overall costs. Each of the scenarios demonstrated a BCR greater than 2 (ranging from 2.29 for a pipeline to the Isle of Grain and onward shipping to a store, and 2.65 for transport by trucks to a port in the Thames estuary).

4.18. Assigning a value to carbon helps to ensure that project choices are made in a transparent and consistent way which support the UK's net zero targets. The 'do nothing' scenario relative to options which include carbon capture will result in a more negative climate impact. Therefore, from a social perspective and regardless of the BCR score achieved, all options would be preferable to not building the carbon capture plant.

4.19. As one of the aims of the Strategic Assessment is to identify the solution which offers the Authority the best value for money, the current uncertainty regarding specific aspects of the technology and transport and storage options will require further detailed assessment throughout the Business Case development process.

Commercial Case

4.20. The commercial case explored the potential procurement and contracting approaches. An outline Indicative Plan to Operations (the Plan) was developed to understand what project delivery risks might arise in achieving the Authority's strategic ambition to deliver an operational carbon capture plant at the EcoPark by around the mid-2030s.

4.21. The Plan highlighted key strategic programme challenges encompassing commercial, contractual and procurement risks, which will need to be addressed in detail during the next stage. Some of the key risks highlighted include:

4.21.1. **Multiple Front-End Engineering Design (FEED) studies prior to contractor selection:** These are studies in the development of a project which help to prepare for the potential challenges of construction. At present, most technology providers and construction contractors within the carbon capture industry expect pre-FEED or FEED studies to be conducted by them before bidding into a contract to develop the infrastructure. As such, there may be a requirement to procure at least two FEED studies from different technology providers at a cost to the Authority.

4.21.2. **Aligning FEED contracts with planning and permitting:** The Plan assumed planning and permitting activities are pursued in parallel to when the carbon capture FEED studies are undertaken. This approach is taken on the basis that sufficient design information will be produced during FEED to enable a planning application to be pursued including environmental impact assessment. This further assumes that a Development Consent Order (DCO) submission could be drawn sufficiently widely to encompass all design eventualities.

4.21.3. **Interdependency of multiple procurements:** The timing and alignment of carbon capture technology and separate CO_2 transport procurements as well as their interplay will need to be carefully considered as part of the procurement strategy. This becomes more complex when considering the need to align multiple FEED studies as well as accounting for planning and permitting requirements.

4.21.4. **Reluctance towards fixed price engineering, procurement and construction contracts:** The contracting market for carbon capture plants is relatively immature and there is no standardised approach. Currently, contractors are willing to engage in contracts that have variable price conditions with a percentage of the contract price fixed and the rest with variable price elements.

4.22. As a preferred transport options emerges in the next stage these considerations will be assessed in detail to determine project specific implications.

Financial Case

4.23. A financial model was developed to assess the levelised costs for each of the nine scenarios (i.e. the average cost per tonne of residual waste, spread over the lifetime of the carbon capture plant). The analysis did not attempt conclusively to determine the most advantageous transport route; rather, the purpose of the exercise was to identify the most cost-effective options from a levelised cost perspective. The transport costs are subject to a high degree of uncertainty at this early stage. A detailed technical study will be required in the next stage to narrow down the preferred routes and transport modes to refine the costs further.

4.24. The assessment explored exporting CO_2 either directly to a T&SCo CO_2 gathering hub such as the Bacton gas terminal or indirectly via an intermediate transport hub or port terminal, which could facilitate onward shipping of the CO_2 to the final T&SCo gathering hub. Two intermediate transport locations were assumed along the Thames estuary. One location in the inner Thames estuary and another potential terminal in the outer Thames (Isle of Grain, Kent) as indicated in Figure 1 below.

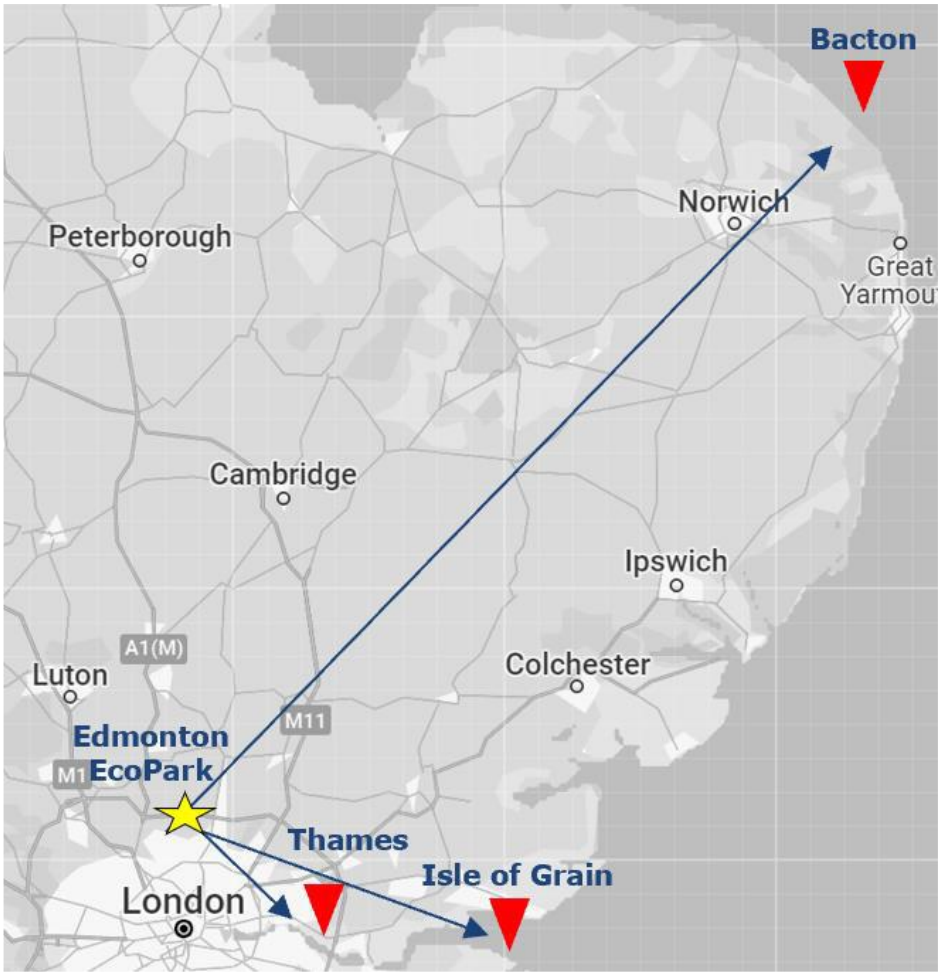

Figure 1: CO2 gathering hubs and intermediate transport nodes

4.25. The analysis demonstrated that the levelised costs ranged from £120 to £139 per tonne of waste depending on the transport solution for CO_2 export. These figures include annualised operational costs for the carbon capture plant, CO_2 export including transport, T&SCo charges and capital repayments and financing costs. It may be possible to reduce costs further to around £115 per tonnes of waste by using shared infrastructure through a cluster approach.

4.26. When income from the sale of negative emission credits is accounted for, the levelised costs could range from £59 up to £84 per tonne of waste. The analysis highlighted the importance of Government allowing the sale of emissions credits for non-fossil CO_2. Government has indicated an appetite for this, but no firm details have been released to date.

Management Case

4.27. The purpose of the management case is to demonstrate that arrangements are put in place for the successful delivery, monitoring and evaluation of the project as it matures. This case also highlights areas which will require closer management as the project matures, including planning and permitting.

4.28. There is clear national, regional and local policy support for the principle of a CCS facility at the EcoPark, which would play an essential role in supporting the transition to a net zero economy.

4.29. A review of relevant planning policy highlighted potential implications for different CO_2 transport modes. The review identified that for transport via rail, inland freight barge and shipping there is strong regional and local policy support. Furthermore, the review identified that there is no policy presumption against the use of road for freight transport; however, there is policy presumption in favour of using alternatives to road. Local policy supports the use of low carbon vehicles and freight intensive uses in areas with good access to the strategic road network, particularly strategic industrial sites in the Upper Lee Valley.

4.30. A road-based solution would need to consider network/junction capacity, air quality and noise implications, while a rail, pipeline and barge/marine solution would need to consider ecology, noise, air quality, visual and recreational considerations. In the next stage it is proposed to undertake a more detailed planning assessment of the emerging CO_2 transport routes and modes to support the identification of potentially viable CO_2 transport solutions.

4.31. Two potential land use planning consenting routes are available: a planning application under the Town and Country Planning Act 1990 or a DCO. Whilst a recent precedence has been set by other similar developments taking the DCO route, for example, the Cory Riverside Recovery Facility, this was the subject of a specific request under Section 35 of the Planning Act 2008. There are also examples of CCS projects taking the Town and Country Planning Act route, like the Suez Tees Valley Site.

4.32. At this stage, officers consider that there is potential for either planning route to be taken. Once a preferred CO_2 transport route is identified, a more complete planning route assessment can be undertaken at a later stage.

5. STRATEGIC ASSESSMENT RECOMMENDATIONS

5.1. The project scope is still at an early stage and more detailed technical studies will be required to establish a full chain solution. Under the Strategic Case it is recommended that identification of the optimal carbon capture technology will be required during the Stage 1 as well as preferred CO_2 transport routes and modes.

5.2. Under the economic case it is recommended to continue to explore opportunities for greater usage of shared transport modes with a view to realising economies of scale. Further work will be undertaken to determine in greater detail the likely benefits as well as costs of the different options.

5.3. Under the financial case it is recommended that further financial modelling is undertaken following a refinement of the costs, which should be informed by more detailed technical studies as part of the prefeasibility work in Stage 1.

5.4. In relation to the commercial case, it is recommended to explore in more detail what an appropriate contracting and procurement strategy might be given the relative immaturity of the market and the relatively high demand for carbon capture services.

5.5. Under the management case it is recommended that the Authority should continue to consider the appropriate planning pathways for the NLCCP. It is recommended that project management and assurance controls are scaled up as the project matures.

6. STAGE 1: STRATEGIC OUTLINE CASE

6.1. Following the Strategic Assessment HM Treasury Guidance sets out three stages to developing the business case:

6.1.1. Stage 1: Scoping the scheme and preparing the Strategic Outline Case

6.1.2. Stage 2: Planning the scheme and preparing the Outline Business Case

6.1.3. Stage 3: Procuring the solution and preparing the Full Business Case

6.2. Members agreed to commence the Strategic Assessment Stage within the financial limit of £2.5 million. The actual spend for the Strategic Assessment Stage was £1.4 million. The budget for Stage 1 is estimated at £3.0 million to £3.2 million, and it is expected to take around three years to complete. The annual spend would be agreed with Members as part of the overall Authority budget for each year. This would ensure that the pace of work and cost reflect Members' expectations and take account of external factors such as Government developments.

6.3. The expected duration has increased from an original estimate in 2022 of two years. This is due to slower progress on the Government's clustering sequencing programme, as reported to Members in February 2024. In addition, there is uncertainty with the Government's approach to NPT. As such, the extended duration is to keep pace with Government programmes and policies. An overview of the main activities to develop the Strategic Outline Case are set out below.

6.4. The Strategic Assessment established a baseline of market information and insights across all key elements of the value chain including carbon capture technologies and integration, potential transport modes and routes and T&SCo network (including long term storage). Based on these insights, a long list of potential scenarios were developed.

6.5. The objective of Stage 1 is to further develop this knowledge through more targeted studies and to establish the most appropriate and deliverable combinations, producing a short list of options. These will then be further evaluated to determine if there should be a single option, or sub-options, known as the 'preferred way forward' in the HM Treasury guidance. This preferred way forward is then considered further, being developed into an outline solution in subsequent stages.

6.6. To establish a short list of options and a preferred way forward a detailed screening study will be conducted to examine the viability of each identified route. As discussed in Paragraph 4.24, indicative CO_2 transport routes were identified as part of the Strategic Assessment. The screening exercise will consider elements along the identified routes for example cost, schedule, health and safety, environmental, planning and permitting, land ownership and market maturity.

6.7. To support the technical aspects of screening exercise, a detailed study, known as a pre-FEED study, will examine site-specific considerations which could indicate the viability and complexity of a given route or mode of transport. In addition, the study will consider the onsite infrastructure requirements, including integration with the ERF and the wider EcoPark.

6.8. As a more detailed understanding of the specific routes emerge, the screening exercise will be used to support in determining the preferred way forward, which will form the basis of the Outline Strategic Case. As reflected above, possible transport routes and modes have the highest degree of uncertainty at this time and will be a primary area for review during Stage 1. The areas listed below will be explored in more detail:

6.8.1. **Carbon capture technologies:** Carbon capture is still a maturing technology. As such, a watching brief on technology developments and emerging projects will be carried out to inform the preferred way forward.

6.8.2. **Intermediate transport modes and routes:** A detailed routing study will be undertaken building on the routes identified as part of the strategic assessment. This study will explore loading and logistical requirements, identify any potential route restrictions and investigate land ownership and site-specific planning requirements.

6.8.3. **T&S:** The likely points of entry to the T&SCo network will be explored as well as any requirements concerning imported CO_2 quality. Following the successful initial carbon storage licensing round in 2022, there are now over 21 offshore carbon storage licences in the UK continental shelf. A due diligence exercise will be undertaken on potential stores as results emerge from ongoing T&SCo sub-sea CO_2 storage appraisal studies.

6.8.4. **Planning and permitting:** To inform the assessment of specific transport routes a detailed planning study to explore route and mode specific impacts will be undertaken. This will include a traffic and transport study and a strategic amenity analysis exploring potential noise and air quality issues.

6.8.5. **Market and external stakeholder development:** Continued engagement with the market will underpin the technical studies in particular routing and transport mode studies. Engagement will continue with all key stakeholders and in particular those who could support specific transport routes such as intermediate transport operators and asset owners.

6.8.6. **Strategic Outline Case:** To develop the Strategic Outline Case the cost and affordability model will be refined with updated cost information where available. The business case will explore commercial and procurement options and refine the programme for delivery.

7. EQUALITIES IMPLICATIONS

7.1. There are no implications relating to the Equality Act 2010 arising from this report or the Procurement Strategy.

8. COMMENTS OF THE LEGAL ADVISER

8.1. The Legal Adviser has been consulted in the preparation of this report.

9. COMMENTS OF THE FINANCIAL ADVISER

9.1. The Financial Adviser has been consulted in the preparation of this report and comments have been incorporated.

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APPENDIX A NORTH LONDON CARBON CAPTURE PROJECT STRATEGIC ASSESSMENT