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4.0 PROPOSED DEVELOPMENT

4.1 Introduction

4.1.1 The Proposed Development comprises the construction, operation (including maintenance where relevant) and decommissioning of up to 1.2-Gigawatt Thermal (GWth) Lower Heating Value (LHV) Carbon Capture (CC) enabled Hydrogen Production Facility (the 'Hydrogen Production Facility') located in Teesside, along with the pipeline infrastructure required to supply hydrogen (H_2) to offtakers (customers) and the necessary utility connections. Carbon dioxide captured by the Proposed Development will be transported by pipeline to the separately consented Northern Endurance Partnership infrastructure on the adjacent Net Zero Teesside site for high-pressure compression and offshore transport and underground storage.

4.1.2 This chapter is supported by Figures 4-1 to 4-8 (ES Volume II, EN070009/APP/6.3) which show the components of the Proposed Development, including the Main Site and the Connection Corridors. The 'Work Nos.' referred to in this Chapter are the corresponding work numbers in Schedule 1 of the Draft DCO (EN070009/APP/4.1), as shown on the Works Plans (EN070009/APP/2.4).

4.2 Proposed Development Overview

4.2.1 The Hydrogen Production Facility (Hydrogen Production Facility, Work No. 1) is an up to 1.2 GWth LHV (Phase 1, 600-Megawatt thermal (MWth) LHV and Phase 2, 600 MWth LHV) Carbon, Capture and Storage (CCS) enabled Hydrogen Production Facility located in the Teesside industrial cluster area (Work Nos. 1A.1 and 1A.2 respectively).

4.2.2 Work No. 1 also contains:

- Water connections and effluent treatment plants for Work Nos. 1A.1 and 1A.2 (Work No. 1B.1 and Work No. 1B.2 respectively), each comprising :
  - process water treatment plant;
  - demineralisation plant;
  - bio-treatment plant;
  - effluent treatment plant; and
  - water networks, pipework, cables, racks, infrastructure, instrumentation and utilities.
- Above ground pressurised hydrogen storage including high pressure compression and let down facilities (Work No. 1C);
- Administration, control room and stores (Work No. 1D), including:
  - administration and control buildings; and
  - workshop and stores buildings.

- Connections and ancillary works in connection with Work Nos. 1A.1 and 1A.2 (Work No. 1E.1 and Work No. 1E.2 respectively), including:
  - above ground installations;
  - ancillary plant, buildings, enclosures and structures;
  - pipework, pipe runs and pipe racks;
  - firefighting equipment, buildings and distribution pipework;
  - lubrication oils storage facilities;
  - permanent plant laydown area for operation and maintenance activities;
  - flare;
  - chemical storage; and
  - mechanical, electrical, gas, telecommunications and water networks, pipework, cables, racks, infrastructure, instrumentation and utilities,
  - other utilities connections, telecommunications, and other associated and ancillary infrastructure.
- if required, an Air Separation Unit (ASU) (located on the Main Site) to supply oxygen (O_2) and nitrogen (N_2) for the H_2 production process (Oxygen and Nitrogen, Work No 1F.1).

4.2.3 In addition to the Hydrogen Production Facility, the Proposed Development includes the following:

- a natural gas supply connection for the supply of natural gas to the Hydrogen Production Facility (Natural Gas Connection Corridor, Work No. 2A) including:
  - a new underground high-pressure gas supply pipeline of (up to 600 millimetres) nominal bore diameter connecting to National Transmission System;
  - cathodic protection posts;
  - marker posts; and
  - underground electrical supply cables, transformers and control systems cables.
- associated Above Ground Installations (AGIs) (Work No. 2B) including:
  - a compound for National Grid Gas plc's apparatus, comprising:
    - an offtake connection from the National Transmission System;
    - above and below ground valves, flanges and pipework;
    - remotely operated valve and valve bypass;
    - an above or below ground pressurisation bridle;
    - instrumentation and electrical kiosks; and

    - telemetry and communications equipment;
  - compounds for the undertaker's apparatus, comprising:
    - above and below ground valves, flanges and pipework;
    - isolation valves;
    - pipeline inline gauge launching facility;
    - instrumentation and electrical kiosks; and
    - telemetry and communications equipment.
  - access works, vehicle parking, electrical and telecommunications connections, surface water drainage, security fencing and gates, closed circuit television cameras and columns.
- an electrical grid connection to provide electricity to the Proposed Development (Electrical Connection Corridor, Work No. 3);
- water supply infrastructure to provide cooling and make up water to Work nos. 1B.1 and 1B.2, comprising up to two water pipelines of up to 1100 millimetres nominal bore diameter from the existing raw water main (Water Supply Corridor, Work No. 4);
- wastewater disposal works infrastructure (Wastewater Disposal Corridor, Work No. 5) including: a new wastewater discharge pipeline connecting to NZT infrastructure and a tie-in connection for the foul water to Brand Sands via South Tees Development Corporation (STDC) infrastructure;
- Hydrogen Pipeline Corridor underground and overground pipelines to transport hydrogen gas to various potential offtakers in Teesside (Hydrogen Distribution Network, Work No. 6);
- carbon dioxide (CO_2) compression facilities and a connection to the Northern Endurance Partnership (NEP) CO_2 gathering pipeline network for transportation of captured CO_2 to permanent storage (CO_2 Export Corridor, Work No. 7), including:
  - Work No. 7A - an overground and underground pipeline of [up to 800 millimetres nominal bore diameter] and associated power and fibre-optic cables; and
  - Work No. 7B - a high pressure carbon dioxide compression station, comprising:
    - inlet metering;
    - compression facilities;
    - electrical connection and substation; and
    - mechanical, electrical, gas, telecommunications, pipework, cables, racks, infrastructure, instrumentation and utilities, including connections between Work No. 7 and Work Nos. 1A.1 and 1A.2.

- O_2 and N_2 supply pipelines (as an alternative to the proposed ASU) to supply O_2 and N_2 for the H_2 production process, from an existing nearby third-party ASU (Oxygen and Nitrogen, Work No. 8);
- seven temporary construction compounds, comprising hardstanding, laydown and open storage areas, construction compounds and staff welfare facilities, gatehouse and weighbridge, vehicle parking and cycle storage facilities, internal roads and pedestrian and cycle routes, security fencing and gates, external lighting including lighting columns, and, closed circuit television cameras and columns (Temporary Construction Compounds, Work No. 9);
- Access and Highway Improvements, comprising works to create, improve, repair or use and maintain streets, roads, haul roads and access points (Access and Highway Improvements, Work No. 10);
- Use of land currently in agricultural use on the northern side of the A1185 adjacent to Cowpen Bewley Woodland Park as replacement for woodland lost in Work No 6 (Replacement Land, Work No. 11); and

4.2.4 The Hydrogen Production Facility will be located on the 'Main Site', as referred to in this Environmental Statement (ES).

4.2.5 Demand for H_2 produced by the Proposed Development will come from multiple end users, including supporting fuel switching from natural gas to H_2 within process heat, steam raising and power generation applications, and therefore reducing CO_2 emissions from these industries.

4.2.6 The proposed capture technology uses an amine-based solvent to absorb CO_2 produced by the H_2 production process, with an anticipated design carbon capture rate of at least 95%. This process is also known as 'pre-combustion amine-based absorption regeneration'. The design capture rate will be included in the Environmental Permit that will be required to operate the Proposed Development. The Hydrogen Production Facility will connect via the short CO_2 Export Corridor to the NEP compression and pipeline infrastructure on the adjacent Net Zero Teesside (NZT) site. The Proposed Development is estimated to have a capacity to export approximately 1.4 megatonnes (Mt) of dehydrated and compressed CO_2 per year per phase, i.e. approximately 2.8 Mt/year once both phases are operational (100% utilisation) to NEP for offshore underground storage. No temporary CO_2 storage is required on site.

4.2.7 At this stage in the design of the Proposed Development, there are still some options being considered for various components. Due to the First of a Kind nature of the plant, the design of the Proposed Development incorporates a necessary degree of flexibility of the layout at the Main Site, as well as the routing of the hydrogen pipeline and other connections. This will evolve as design and commercial agreements progress.

4.2.8 In order to ensure a robust assessment of the likely significance of the environmental effects of the Proposed Development, the EIA is being undertaken adopting the principles of the 'Rochdale Envelope' as set out in Section 2.4: Study

Areas – Spatial Scope of Assessment, in Chapter 2: Assessment Methodology (ES Volume I, EN070009/APP/6.2) where appropriate in line with the Planning Inspectorate's ('the Inspectorate's') Advice Note 9 (The Inspectorate, 2018). This involves assessing the maximum (or where relevant, minimum) / realistic worst-case parameters for the elements where flexibility needs to be retained (building dimensions or operational modes for example). Where this approach is being applied in the assessment, this is confirmed within the relevant chapters of this ES. Justification for the need to retain flexibility in certain parameters is also outlined in Section 4.6: Design Parameters in this chapter. As such, this ES represents a reasonable worst-case assessment of the potential impacts of the Proposed Development at its current stage of design.

4.2.9 The following Sections describe the Proposed Development in more detail as required for the purposes of this ES and provide where possible a brief description of any optionality still being considered by the Applicant for each element.

4.3 Components of the Proposed Development

Hydrogen Production Facility

Overview

4.3.1 The Hydrogen Production Facility will be designed taking account of Best Available Techniques (BAT) as set out in the UK Government's Guidance on Emerging Techniques for H_2 Production with Carbon Capture (Environment Agency, 2023). There is currently no guidance on BAT for H_2 production with carbon capture. The design will take into account BAT as set out in existing BREFs and follow Article 14(6) of the Industrial Emissions Directive (IED).

4.3.2 The Hydrogen Production Facility will utilise natural gas as the feedstock. The natural gas will be converted to a synthesis gas (syngas) over a catalyst in a Gas Heated Reformer (GHR) – Autothermal Reformer (ATR) combination process that recovers most of the heat and hence produces minimal amount of steam. The steam demand is supported by a continuously operating auxiliary boiler, with a capacity not exceeding 77 MW for both phases. Electrical power will be imported from the national electricity grid, as discussed below. There will be no electricity generation as part of the Proposed Development.

4.3.3 The Proposed Development will utilise Johnson Matthey's (JM's) Low Carbon Hydrogen (LCH) blue hydrogen technology which surpasses the efficiency of the conventional ATR thereby requiring comparatively lower natural gas feed to achieve the design hydrogen export capacity.

4.3.4 Although the syngas from the GHR – ATR combination process is rich in H_2, it also contains high concentrations of carbon monoxide (CO). Therefore, this syngas will be further reacted in water-gas shift reactors to convert the CO using steam into H_2 and CO_2. The low-carbon H_2 rich stream will be purified to >98 purity mol% H_2[1] and

[1] Molar percentage (mol%) represents the proportion of a specific component in a mixture in terms of the number of moles of that component per 100 total moles of the mixture. This level of purity implies that out of every 100 moles of the substance, 98 moles are hydrogen molecules.

compressed and conditioned before being exported to offtakers located in the Teesside region via the proposed Hydrogen Pipeline Corridor.

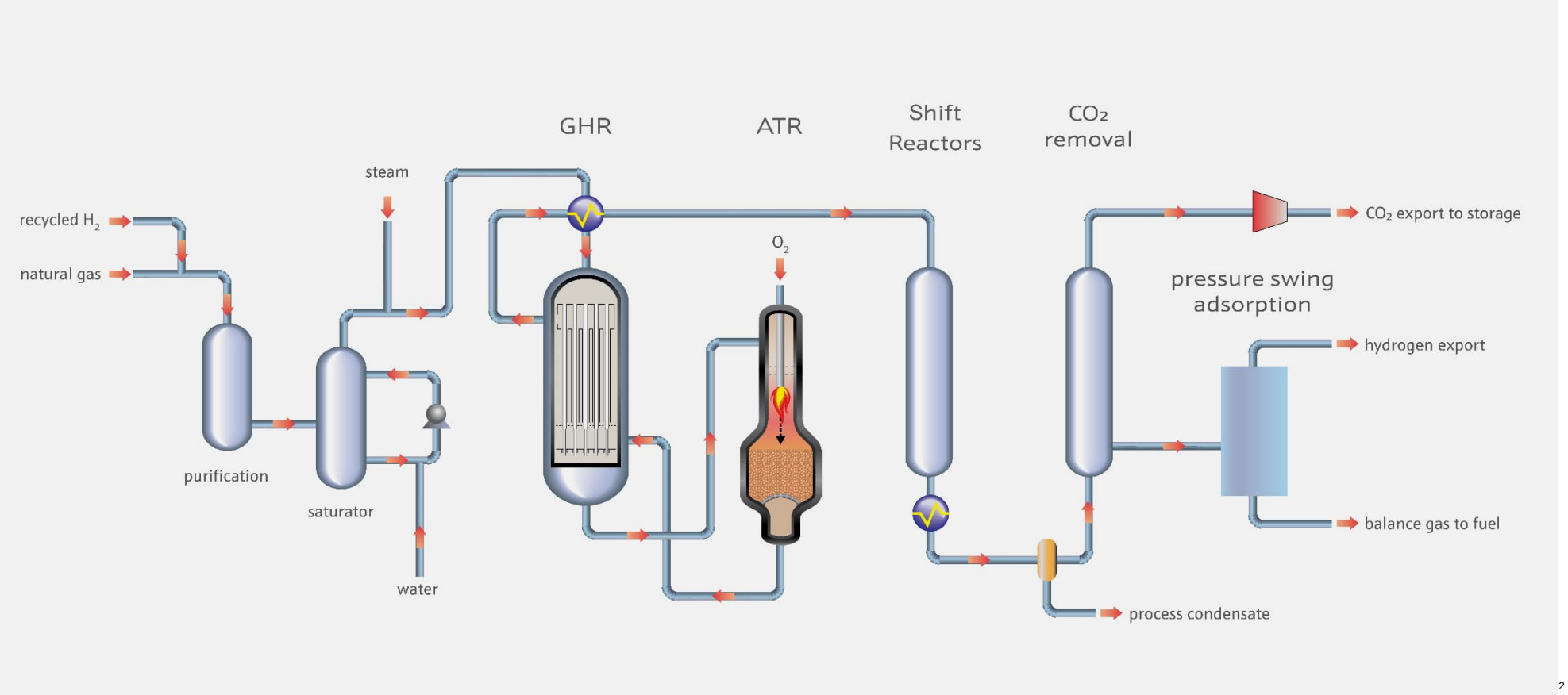
4.3.5 The CO_2 produced will be removed from the gas via contact with an amine-based solvent, which will absorb (capture) the CO_2. The solvent will then be further regenerated to yield a CO_2 stream that will be compressed to medium pressure, dehydrated, and then exported to the NEP compression infrastructure on the NZT site to the east of the Main Site.

4.3.6 In the event that venting of CO_2 from carbon capture units is required during maintenance or repair, it will be discharged to atmosphere to a safe location through a dedicated vent stack.

Production Capacity

4.3.7 Hydrogen production is expected to increase during the initial 12 to 18 months of operation in line with increasing offtaker demand. The peak H_2 export rate for each phase is expected to be 600 MWth LHV (or approximately 22.2 tonnes/hr at 98% H_2) with the associated peak CO_2 export rate being around 160,000 kg/hr. For Phases 1 and 2 in combination this equates to up to 1.2 GWth LHV (44.35 tonnes/hr) peak H_2 production and export and around 320,000 kg/hr CO_2 export.

4.3.8 Once Phase 1 is commissioned and operational, the Hydrogen Production Facility will be designed to operate twenty-four hours per day, seven days per week (including when Phase 2 is under construction, commissioned and in operation) until decommissioning, with brief exceptions for planned outages such as for maintenance and repair.



[2]

Plate 4-1: Schematic of the Hydrogen Production Process

[2] The GHR pre-heats and reforms purified natural gas before it enters the ATR reactor. In the GHR's initial stage, 30% of total hydrocarbons react with steam, producing synthesis gas (a mixture of carbon monoxide (CO) and hydrogen (H2)). In the subsequent ATR stage, oxygen is introduced to combust some partially-reformed gas, elevating the process gas temperature to approximately 1,000°C. The resulting gas then undergoes further reforming within the same reactor using a steam reforming catalyst. Operating at high temperature and steam flows is crucial for minimising methane content and, consequently, reducing overall carbon dioxide emissions. The hot gas exiting the ATR circulates back to the GHR, supplying the heat needed for the reforming reaction in the GHR tube side.

Process Infrastructure

4.3.9 An outline description of the process infrastructure required for the operation of the Hydrogen Production Facility is presented below:

- a new Above Ground Installation (AGI) on the Main Site to receive natural gas which is common to both Phase 1 and Phase 2
- a new AGI on the Main Site at the point of export of CO_2 which is common for both Phase 1 and Phase 2;
- a Hydrogen Production Unit in each phase where the main process of reforming occurs (see Plate 4-1). Reforming is the reaction of hydrocarbons with water (steam) to produce hydrogen. Each Hydrogen Production Unit includes the following components:
  - inlet natural gas compression;
  - pre-treatment to remove sulphur species;
  - pre-reformer to reform longer hydrocarbons to methane, H_2, CO and CO_2;
  - shift reactors for conversion of H_2, CO and CO_2 and heat recovery in the form of steam for reuse in the process;
  - CO_2 absorber to separate the CO_2 from the syngas mixture to achieve 95% capture rate;
  - compressors to increase the pressure of the CO_2 prior to drying (dehydration);
  - compressor where H_2 is recycled for input back into the natural gas feed for pre-treatment; and
  - a Pressure Swing Adsorber (PSA) where H_2 is further purified and dehydrated and prepared for export to the pipeline networks, after passing through a compressor to achieve the required pipeline pressure of 40 barg and cooled to 30^{o}C for export.

4.3.10 In addition, the following ancillary infrastructure may be required for the Proposed Development:

- ASUs for the compression and separation of air, which is passed through a rectification column to produce O_2 for use in the GHR – ATR combination process. It also includes provision of liquid O_2 and liquid N_2 storage on site for back up. As an alternative, options to utilise O_2 and N2 from a nearby supplier which would remove the requirement for an onsite ASU and onsite liquid storage are being investigated. This is subject to further discussions with the O_2 and N_2 provider and detailed design work, therefore the construction of new O_2 and N_2 ('Other Gases') pipelines to that potential supplier is included within the Proposed Development, as described below.
- Cooling Water Circulation System including cooling water towers, pumps and circuit piping to supply cooling water where it is needed throughout the

Hydrogen Production Facility. This will require topping up with water from time to time due to losses from evaporation, drift and blowdown. Detail regarding the options for sourcing of water is included under 'Water Connections', below.

- Auxiliary Boiler to raise steam using an H_2 rich fuel fitted with SCR and in continuous operation.
- A Process Water-treatment Plant will be used to treat water from the Northumbrian Water raw water supply prior to the demineralisation stage and may include Dissolved Air Flotation (DAF), Ultrafiltration (UF) (for removal of fine solids), reverse osmosis (RO) for removal of ions or other suitable pre-treatment technologies. This plant may be operated by the Applicant or another party. Any solids will be sent off site for disposal. The utilisation of raw water from the River Tees will fall within the scope of the existing NWL abstraction licence. Further details on this can be found in Chapter 21: Materials and Waste (ES Volume I, EN070009/APP/6.2).
- A Demineralisation Plant to be used to treat water supplied to the Hydrogen Production Facility and also for stripped process condensate, flare knockout liquid and steam condensate from blowdown. This process would produce demineralised water (DMW) which will be pumped to all locations where it is required within the Hydrogen Production Facility, including for boiler feed water; therefore, this water will be used to produce H_2 and make up losses from the steam system.
- A Bio-treatment Plant, which will treat process condensate to reduce nitrogen concentration using nitrification and denitrification. The treated process condensate will then be reused as makeup water in a Process Water Treatment Plant. Any solids will be sent off site, further details on this can be found in Chapter 21: Materials and Waste (ES Volume I, EN070009/APP/6.2).
- An Effluent Treatment Plant (ETP), which will consist of an oily water separator, neutralisation sump, storm water sump and any other suitable treatment to meet agreed discharge standards. All oily water effluents produced by the Hydrogen Production Facility will be sent to the oily water separator. For post separation, there are currently two options considered where the liquid effluent will be sent. The first option is to send liquid effluent to Minimum Liquid Discharge Plant (MLD) on the main site, that may consist of ultrafiltration and Closed-Circuit Reverse Osmosis (CCRO). This plant will produce a stream of clean water that will be reused in the hydrogen production plant and a brine stream that will be tankered from site to a suitable third-party disposal site. The second option is to treat this effluent to an appropriate level associated with the use of BAT and disposed of via the NZT outfall that is to be built as part of the Net Zero Teesside DCO development. Any solids will be sent for disposal offsite. Further details on this can be found in Chapter 21: Materials and Waste (ES Volume I, EN070009/APP/6.2).
- Flare, any fluid released from Hydrogen Production Facility during an emergency will be collected in the flare header system and sent to the flare

drum where any liquid associated with the gas is separated. The gas from the flare drum will be sent to the flare system where it will be safely disposed by combustion. The liquid collected in the drum will be pumped by the flare pump to the ETP.

- A Fire Water System consisting of fire water store on site (supplied by grey or raw water), pumps and firefighting system.
- Emergency Diesel Generator, emergency diesel generator which would be operated in the event of emergency to support safe shutdown of the plant and will be intermittently energized for periodic testing purpose.
- Chemical Storage for additives and fuel such as aqueous ammonia (NH_3), amines and diesel, which are imported by tanker.
- Above ground pressurised hydrogen storage shared between each phase, including high pressure compression and let down facilities.

4.3.11 The proposed approach for water supply and management is summarised under 'Water Connections', below.

4.3.12 In addition to the above, the following components and facilities will be incorporated into the layout of the Main Site as required:

- Main Site entrance (main access with gated entry) as well as a secondary access point(s) and emergency access;
- electrical buildings;
- internal access roads;
- vehicle turning areas;
- internal and external storage areas;
- workshop and maintenance stores;
- a control room and administration buildings;
- lighting;
- car parking; and
- lorry holding and security inspection areas.

4.3.13 The Hydrogen Production Facility will be fenced securely with some internal operations having further internal fencing installed around them as required.

CO_2 Export Corridor

4.3.14 The captured CO_2 will be further conditioned and compressed after analysing and metering, and transported to the NEP CO_2 gathering network on the adjacent NZT site via a CO_2 export connection pipeline of up to 20" diameter at a Maximum Operating Pressure (MOP) of 28 barg. There will be an AGI at each end of the connection pipeline for metering, analysing and pigging. This export connection including the two AGIs is part of the Proposed Development and is being consented

under this DCO. From the AGI's location within the Main Site the CO_2 pipeline will be routed east along the south perimeter of the site fence line to the NEP Site. The pipeline will be up to 22" in diameter and approximately 1 km long.

4.3.15 The land required for the CO_2 Export Corridor for the Main Site and indicative pig launching location is shown on Figure 4-3: CO_2 Export Corridor (ES Volume II, EN070009/APP/6.3). The CO_2 export connection will either be above or below ground or a combination of the two. The CO_2 pipeline will be entirely located on private land.

4.3.16 NEP will compress the CO_2 to high pressure ("dense phase") for transportation by pipeline to the Endurance underground store, located approximately 145 km to the east/south-east of the Proposed Development Site beneath the North Sea. The onshore infrastructure required for compression and export (the high-pressure compression plant and CO_2 export pipeline) is subject to a separate consent, through the DCO for the NZT DCO Project granted by the Secretary of State for DESNZ on 16 February 2024. The offshore elements (below Mean High Water Springs) will also be separately consented under the Energy Act 2008 (HM Government, 2008) and the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 (HM Government, 2020). Offshore CO_2 transportation and geological storage will be managed and operated by NEP.

Natural Gas Connection Corridor

4.3.17 Natural gas feedstock for the hydrogen production process will be imported from the National Gas Grid to the Hydrogen Production Facility for use in the reforming process. The exact pipeline routeing of this connection within the Natural Gas Connection Corridor is subject to ongoing design. A natural gas pipeline up to 24" diameter will connect the Hydrogen Production Facility at the Main Site to an existing gas pipeline with AGIs at each end.

4.3.18 The area required for the Natural Gas Connection Corridor is shown in Figure 4-5: Natural Gas Connection Corridor (ES Volume II, EN070009/APP/6.3).

4.3.19 The Natural Gas Connection Corridor will either be above or below ground or a combination of the two.

Hydrogen Pipeline Corridor

4.3.20 A gaseous phase hydrogen pipeline network (Hydrogen Pipeline Corridor) is required to connect the Hydrogen Production Facility at the Main Site to various potential industrial offtakers across the Tees Valley, as shown on Figure 4-4: Hydrogen Pipeline Corridor (ES Volume II, EN070009/APP/6.3).

4.3.21 Once processed to the required specification and compressed at the Main Site, H_2 would be exported using the proposed Hydrogen Pipeline Corridor. The Hydrogen Pipeline would require a crossing under the River Tees to export to offtakers located to the northern side of the river. The hydrogen pipelines would commence and finish at AGIs including metering and pigging skids and tie-in points with the relevant offtaker. The latter are likely to be, but not necessarily having to be, within

the offtakers' site boundaries. Any connection works beyond these AGIs and tie-in points will be progressed and consented separately by the relevant offtaker.

4.3.22 The diameter of hydrogen pipelines will range from 6" to up to 24", with the largest easement width reaching up to 12 metres, namely, 6 metres on either side of the pipeline centreline with a Maximum Allowable Operating Pressure (MAOP) of up to 55 barg.

4.3.23 The Hydrogen Distribution Network is also being routed to provide connections to the existing Gas Transmission System and Gas Distribution Network to enable blending and connection to the future hydrogen transmission system. Various routeing and connection options are being explored to enable these connections and the final routeing and connection decision will be made in collaboration with the relevant transmission system and distribution network operators. The alternative connection locations being explored are:

1) Cowpen Bewley Woodland Park natural gas AGI; and

2) Northern Gas Networks AGI off the A178 Seaton Carew Road at Saltholme.

Owing to the different requirements of transmission and distribution system connections, two combinations of these locations are being explored as options for the scheme. These include: Option A (comprising a connection at Location 1, at Cowpen Bewley) and Option B (comprising a connection at Location 2, AGI off Seaton Carew Road at Saltholme). These are shown in Figure 4.2 (ES Volume II, EN070009/APP/6.3).

Electrical Connection Corridor

4.3.24 Various options are being considered for electricity supply which include a connection to proposed 66 kilovolts (kV) substations at STDC (planning permission for which STDC has obtained) or a connection to NZT's electrical network within the Electrical Connection Corridor. There is also potential to connect at other substations, operated locally by Northern Power Grid, such as Lackenby and/or Grangetown 66 kV substations. The final decision on substation/connection choice will be subject to design development and further work based on constructability and electrical network resilience and capacity.

4.3.25 The land required for all options for the Electrical Connection Corridor is shown on Figure 4-6: Electrical Connection Corridor (ES Volume II, EN070009/APP/6.3). It is expected that cables will be installed underground – this is discussed further in Chapter 6.

Water Connections

4.3.26 Plate 4-2 depicts the 'base case' for water management including source water pretreatment and effluent water management, as discussed in Section Wastewater Disposal.

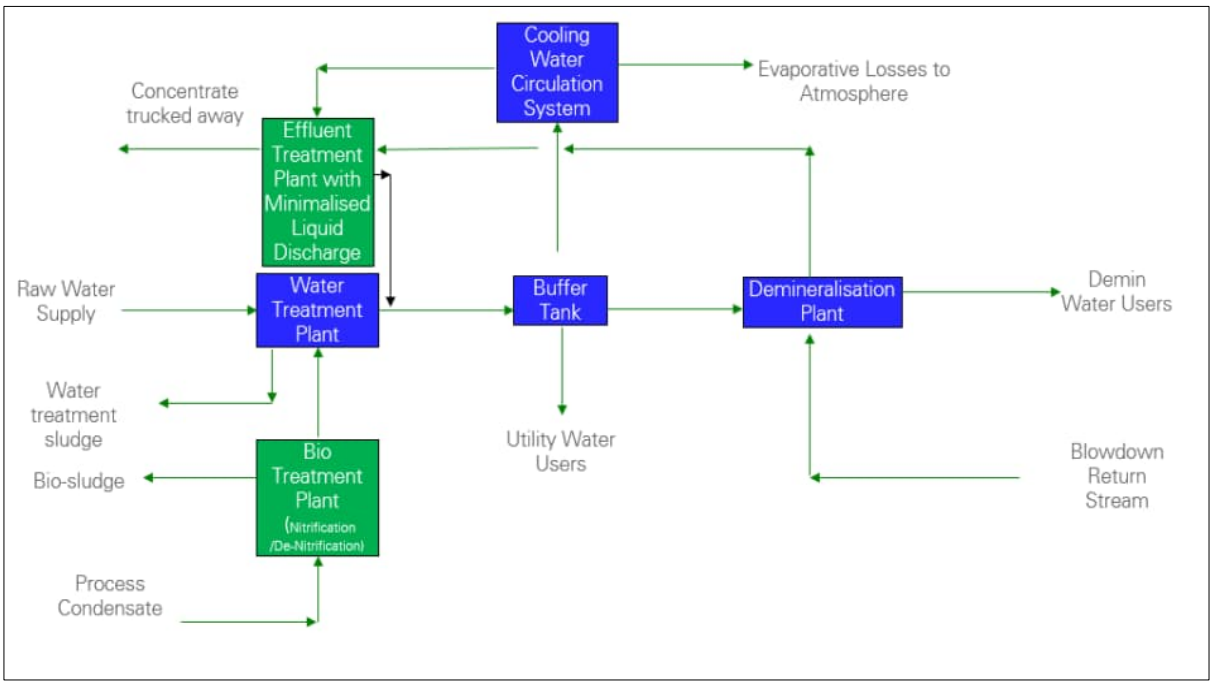


Plate 4-2: Water Management Options (Indicative)

Water Supply

4.3.27 Water supply connections are required at the Hydrogen Production Facility, including for cooling water purposes. It is expected that water (for process and sanitary uses) will be supplied via either:

- the existing Northumbrian Water Ltd (NWL) raw water supply to the STDC site; or
- a new connection to the existing NWL raw water supply either via tie in to NZT infrastructure or the installation of a new connection.

4.3.28 As outlined earlier, a Raw Water treatment Plant will be used to pre-treat the source water prior to the demineralisation stage and the Demineralisation Plant will be used to treat water supplied to the Hydrogen Production Facility, stripped process condensate, flare knockout liquid and steam condensate and blowdown.

4.3.29 The water supply and discharge pipelines will be up to 42” and 16” in diameter, respectively. The pipeline from the Hydrogen Production Facility to the proposed tie-in location at the east end of Blue Road will be constructed below ground.

4.3.30 At this stage in the design and assessment process and in applying the Rochdale Envelope approach, the land required for both of the above water connection options has been depicted as a broad corridor, as shown by Figure 4-7: Water Connections Corridor (ES Volume II, EN070009/APP/6.3).

Wastewater Disposal

4.3.31 Water discharge connections are required at the Hydrogen Production Facility for discharge of treated effluent. An indicative Surface water drainage plan is shown in

Figure 2-12 (EN070009/APP/2-12). There are a number of wastewater streams that would be created within the Main Site that need to be handled appropriately, so that they can be treated and reused, namely:

- process wastewater (which is a process condensate stream from the reforming process);
- cooling tower blowdown (as part of the cooling water system);
- demineralisation plant rejects (as part of the demineralised water plant);
- chemical spillages from chemical storage tanks contained in kerbed/bunded area routed to sump for neutralisation including an independent hazardous segregated drain system for managing amine contaminated surface water;
- other streams under non-ordinary operations, such as oily water (during maintenance), first flush stormwater / firewater and clean second flush stormwater and firewater; and
- domestic / sanitary effluent.

4.3.32 Process wastewater would be treated in a Bio-treatment Plant while other wastewater streams would be treated in an Effluent Treatment Plant (ETP). Both treatment plants would be located on the Main Site.

4.3.33 Two options are under consideration in terms of process effluent management. The first option is based on Minimalised Liquid Discharge (MLD) from the Effluent Treatment Plant. In this scenario, treated wastewater from the on-site Effluent Treatment Plant will be reused as makeup water in the Raw Water Pre-Treatment Plant. A concentrated liquid waste stream containing salts and residual nutrients would be transported off-site by tanker to an approved and licensed facility and treated in a manner consistent with nutrient neutrality requirements by either a) denitrification and discharge of resultant effluent within the Teesmouth & Cleveland Coast SPA/Ramsar catchment or b) discharging outside of the designated site catchment by a third party.. The second option is an alternative to MLD and requires treatment of processed effluent in the bio-treatment plant and discharge via the NZT outfall to Tees Bay.

4.3.34 Clean stormwater could be discharged either to the NZT outfall discharging into Tees Bay or alternatively to a new outfall via the STDC drainage system into the Estuary.

4.3.35 Discharge of domestic / sanitary effluent would be to the local sewage system for treatment with a tie-in to Bran Sands via STDC system. In terms of waste disposal from the water plant, sludge from the Raw Water Pre-Treatment Plant and Bio-treatment Plant may be processed at Bran Sands WwTW with Brine from the Effluent Treatment Plant being sent to a suitable consented outfall for discharge.

4.3.36 The wastewater disposal pipelines are planned to be up to 16” in diameter and will be entirely below ground.

4.3.37 At this stage in the design and assessment process and in applying the Rochdale Envelope approach, the land required for the water connection options currently

proposed for the Main Site (i.e. connection to the NZT outfall) has been depicted as a broad corridor, as shown by Figure 4-7: Water Connections Corridor (ES Volume II, EN070009/APP/6.3) to account for all options.

Other Gases Connections

4.3.38 Other Gas Connection Corridors may be required for the transportation of compressed O_2 and N_2 for use at the Hydrogen Production Facility, should a third-party ASU be selected to supply these gases.

4.3.39 The land required for the Other Gas Connection Corridor is shown in Figure 4-8: Other Gases Connection Corridor (O_2 and N_2) (ES Volume II, EN070009/APP/6.3). The pipeline connections for other gases will either be entirely above or below ground or a combination of the two.

4.4 Hydrogen Storage

4.4.1 On-Site above ground storage of H_2, located at the Main Site, will be utilised to provide resilience to the hydrogen production network. The hydrogen storage will have a capacity of approximately 5 tonnes usable volume (up to 11 tonnes total inventory), which is common for Phases 1 and 2 of the Proposed Development. As this exceeds the relevant threshold, permission will be sought from the Health and Safety Executive and the Hazardous Substances Authority (HSA) (i.e. Local Planning Authority (LPA)) for storage, under the Control of Major Accident Hazards (COMAH) (HM Government, 2015) and Hazardous Substance Consent regimes respectively. No off-site storage of H_2 is required for the Proposed Development.

4.5 Material Storage

4.5.1 Chemicals required for the operation of the Hydrogen Production Facility would need to be stored and used at the Main Site. Some of these materials may be classed as hazardous. Where any substance could pose a risk to the environment through its uncontrolled release (e.g. through the surface water drainage system), appropriate containment facilities would be used including (but not limited to) bunds and concrete surfaces appropriately designed and sized for their intended use. Chemical storage will comply with requirements under the site's Environmental Permit.

4.5.2 An inventory of materials to be stored on the Main Site would be finalised through the detailed design. However, where storage of hazardous materials, individually or in-combination exceeds the relevant thresholds, separate permissions will be sought from the Health and Safety Executive (HSE) and HSA (LPA) for their storage, under the COMAH and Hazardous Substance Consent regimes respectively. All chemical storage will also be regulated by the EA through an Environmental Permit that will be required for the operation of the Proposed Development.

4.5.3 Further information regarding hazardous substances likely to be present during the operational phase of the Proposed Development, including their transport and storage, is included at Chapter 20: Major Accidents and Disasters (ES Volume I, EN070009/APP/6.2).

4.6 Design Parameters

4.6.1 The design of the Proposed Development will continue to be refined until the completion of the detailed design stage. However, the final design will be within the parameters assessed within this ES. The evolution of the Proposed Development's design to date is outlined in Chapter 6: Alternatives and Design Evolution (ES Volume I, EN070009/APP/6.2).

4.6.2 A number of the design aspects and features of the Proposed Development cannot be confirmed until the Engineering, Procurement and Construction (EPC) Contractor(s) has been appointed. For example, the building sizes may vary depending on the EPC Contractor(s) selected and their specific configuration and selection of plant. Focussed use of the Rochdale Envelope approach has been adopted to define appropriate parameters for use in the EIA.

4.6.3 Table 4-1 sets out the maximum and minimum dimensions of the principal elements of the Proposed Development, which have been used as the basis of the various technical assessments undertaken. Maximum and minimum parameters have been devised to enable the EIA to progress prior to the final design information becoming available and to enable the compilation of a robust assessment based on a reasonable and appropriate worst-case option.

Table 4-1: Maximum and Minimum Design Parameters

COMPONENT OF THE PROPOSED DEVELOPMENT	MAXIMUM AND MINIMUM DIMENSIONS			
	LENGTH (m)	WIDTH / DIAMETER (m)	HEIGHT (m ABOVE ORDNANCE DATUM m AOD)	NOTES
Flare Stack	N/A	4.0	108 (max) 73 (min)	Flare Stack 1.0 m diameter. Platforms 4 m diameter
Auxiliary Boiler	35	20	18	N/A
Auxiliary Boiler Stack	N/A	2.0	78	N/A
Start-Up Fired Heater	N/A	2.0	53 (max) 43 (min)	N/A
CO_2 Absorber Column	N/A	5.5 Diameter Top Section 8.5 Diameter Bottom Section	56	Bottom Section 0 m to 30 m above ground level. Top Section 30 m to 48 m above ground level

COMPONENT OF THE PROPOSED DEVELOPMENT	MAXIMUM AND MINIMUM DIMENSIONS			
	LENGTH (m)	WIDTH / DIAMETER (m)	HEIGHT (m ABOVE ORDNANCE DATUM m AOD)	NOTES
Other Production Plant	N/A	N/A	36 (max)	N/A
Flash Vessel	N/A	N/A	58	N/A
ASU	20	8	60	N/A
Electrical Substation Connections				
New electrical substation at Tod Point	N/A	N/A	22	N/A
National Grid Tod Point substation extension (northern bay)	N/A	N/A	22	N/A
National Grid Tod Point substation extension (southern bay)	N/A	N/A	22	N/A
Above Ground Installations (AGI)	N/A	N/A	15	Several AGIs at multiple geographical locations. Rochdale Envelope AGI height is 4 m. For AOD height purposes, the AGI location with the highest ground level has been used.

4.6.4 The flare will be the tallest element of the Proposed Development; as detailed in Table 4-1, a maximum height of 100 m for the flare (i.e., ≤108 m above Ordnance Datum (AOD)) has been considered. All other structures on the Main Site will be 70 m high or less.

4.6.5 A minimum height of 70 m is proposed for the auxiliary boilers stacks, and a worst case minimum height of 65 m is assessed the air quality assessment (as detailed in Chapter 8: Air Quality (ES Volume I, EN070009/APP/6.2)).

4.6.6 All development associated with the Hydrogen Production Facility will fall within the confines of the Main Site, as illustrated on Figure 4-2: Parts of the Proposed

Development Site (ES Volume II, EN070009/APP/6.3). The undertaken approach assumes activities occur at the nearest point to receptors as a worst-case scenario.

4.6.7 The existing minimum ground level at the Main Site is approximately 6.5 m AOD. The minimum Development platform elevation to minimise the risk of flooding (allowing for climate change) is 6.83 m AOD. Post site clearance and STDC remediation it is anticipated that ground level will be at 7.1 m AOD for Phase 1, where the final high pavement point will be above 7.4 m AOD. The Development platform for Phase 2 will be at least 7.1 m AOD but not exceeding 8 m AOD. The 7.1 m AOD elevation is therefore regarded as the worst-case for evaluating air emission modelling, and 8 m AOD is considered the worst case scenario for determining the maximum height of the stack in relation to the assessment of landscape and visual impacts.

4.6.8 The horizontal limits of deviation for the Work Nos. mentioned in Section 4.2 are shown on the Works Plans (EN070009/APP/2.4), represented by the edges of the relevant Work No. area.

4.6.9 A standard permanent easement width of 12 m, 6 m either side of the pipeline centreline, will be used for the buried sections of the Hydrogen and Natural Gas Pipelines laid outside the Main Site. For the following pipelines, the easement width will be the diameter of the pipeline:

- Wastewater tie-in pipeline;
- Water pipeline;
- CO_2 Pipeline; and
- All above ground pipelines.

4.6.10 The detailed design of the Proposed Development will be secured by a Requirement in the DCO. The maximum parameters set out above are also secured through the DCO.

4.7 Operation

Hours of Operation

4.7.1 Once commissioned and operational (including for Phase 1 only), the Hydrogen Production Facility will be designed to operate twenty-four hours a day, seven days per week until decommissioning, with brief exceptions for planned outages such as for maintenance and repair.

Staff

4.7.2 A minimum operational workforce of 60 staff members will be required at the Site. Peak workforce numbers during operation will be a maximum of approximately 130 staff once both Phase 1 and Phase 2 of the Proposed Development are progressed. Operations staffing will be on a shift basis to be spread over a 24-hour period. Normally staff levels would be minimum 60 during the week, however, during 28-day maintenance periods (discussed below), which are likely to occur approximately every four years, there could be up to 400 people on-site.

Process Inputs

4.7.3 The Proposed Development will use various raw materials during its operation. With the exceptions of natural gas, 'other gases' (O_2 and N_2) and water (which will be transported via the Water Connections Corridor), it is anticipated these will be delivered to the facility in bulk road transportation vehicles. Storage capacity on the Main Site will be set to reflect the process requirements and delivery capability.

4.7.4 The Proposed Development will also utilise a number of chemicals during its operation, including but not limited to:

- amine
- phosphates;
- morpholine;
- sulphuric acid
- activated MDEA (aMDEA)
- sodium hypochlorite
- bromine
- carbohydrazide;
- aqueous ammonia;
- water treatment chemicals (including sulphuric acid, sodium hypochlorite and bromine);
- corrosion inhibitor;
- scale inhibitor;
- cleaning chemicals; and
- lubricating oils.

Maintenance

4.7.5 The objective of plant maintenance is to ensure the Hydrogen Production Facility and the connections operate safely and reliably. Routine maintenance will be planned and scheduled via the maintenance management system with major overhauls occurring approximately once every four years on each unit and last for 28 days. These maintenance activities will require additional EPC Contractor(s) to work on-site (see above). The EPC Contractor(s) would access the Proposed Development Site via the main entrance.

4.7.6 Inspection and maintenance activities are key criteria for determining the footprint and layout of the Hydrogen Production Facility. The maintenance strategy to be adopted will use established methods such as Risk Based Inspection (RBI) and Reliability Centred Maintenance (RCM). Therefore, to support the maintenance strategy for the Hydrogen Production Facility, each major element would have appropriate access and temporary construction compound(s), whilst the internal

road layout for the Main Site would enable free movement for cranes and heavy lifting equipment.

4.7.7 Pipelines will be subject to an Integrity Management Plan that will include, but not be limited to, Inline Inspection (ILI), Cathodic Protection (CP) surveys, visual inspections, and maintenance of associated equipment at frequencies informed by RBIs.

4.7.8 It is anticipated that an integrated Operations and Maintenance (O&M) team would have the responsibility for daily operations, including troubleshooting and effecting minor repairs on the plant. Major O&M interventions are likely to be outsourced, whilst major equipment items are likely to be serviced by original equipment manufacturers.

4.7.9 All major maintenance activities requiring significant equipment outages will be coordinated to occur during the planned routine turnaround (TAR). Equipment requiring routine maintenance outside of this timeframe will be spared and fitted with sufficient isolation to facilitate the activity whilst plant production continues.

Operational Access Agreements

4.7.10 It is currently assumed that The Main Site would be accessed from Steel House Gate roundabout on the A1085 Trunk Road. The A1085, is a mixed single / dual carriageway road running North-east to South-west between Redcar and the A1053 Tees Dock Road. The road is subject to the national speed limits for single / dual carriageways (60/70 mph). Travelling south-west from the Main Site access, the A1085 Trunk Road provides a link to the A1053 Tees Dock Road, which in turn connects to the A174 to the south and the A66 to the north. The A1053 Tees Dock Road and A174 are part of National Highways core network.

4.7.11 Access routes to the Hydrogen Pipeline Corridor north of the River Tees are assumed to be via the A1046 Haverton Hill Rd / Port Clarence Road and the B1275. Access routes to the Connection Corridors located to the south of the River Tees are assumed to be via the A1085 Trunk Road and Steel House Gate roundabout.

Heavy Goods Vehicle Movements and Traffic

4.7.12 The average daily operational traffic will comprise fewer than 15 Heavy Goods Vehicles (HGVs) and approximately 50 light vehicles during regular operations.

4.7.13 Operational workforce peak numbers are expected to be a maximum of approximately 130 people (staff) on a shift basis to be spread over a 24-hour period. Thiswill increase during periods of periodic maintenance to around 400 workers on site –this will be relatively infrequent (approximately every 4 years, for a 28-day period) and would be managed through the adoption of the TAR.

4.7.14 Staff will travel to and from work in various directions. Based on census information regarding work commutes and HGVs, the regional distribution of journeys to and from the Proposed Development Site indicates that most journeys from outside the immediate area lead to the A19, with 50% heading North and 50% heading South. Operational (including maintenance) traffic movements (including HGVs) are

expected to be very low – significantly lower than those experienced associated with the construction period.

4.7.15 Natural gas would be delivered by pipeline. Other operational and maintenance consumables will be managed to be kept as low as is reasonably practicable thereby minimising traffic movements.

4.7.16 For further detail regarding anticipated traffic movements during construction and operation please refer to Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

Hazard Prevention and Emergency Planning

4.7.17 To protect human health, site activities will be safely and responsibly managed. A Health and Safety Plan covering the works, commissioning and operation of the Proposed Development will be prepared by the operator. For design a competent and adequately resourced Principal Designer (under the Construction (Design and Management) Regulations) will be appointed. The Applicant will ensure that its own staff and designers follow the Approved Code of Practice (AcoP) laid down by the CDM Regulations (Health and Safety Executive (HSE), 2015).

4.7.18 Written procedures clearly describing responsibilities, actions and communication channels will be available for operational personnel dealing with emergencies. Procedures will be externally audited, and contingency plans written in preparation for any unexpected complications.

4.7.19 Depending on the volumes of hazardous materials stored within the Proposed Development Site, a Hazardous Substances Consent and, a COMAH Licence will be required. This will introduce additional hazard prevention and emergency planning procedures. At this stage, it is anticipated that the Hydrogen Production Facility will qualify as a Top Tier COMAH establishment.

External Lighting

4.7.20 Some external lighting (and signage) would be required to ensure that the Hydrogen Production Facility can operate safely at all times. It would be at the appropriate luminance required to provide safe working conditions. Lighting would be designed, positioned and directed to prevent or minimise light disturbance to sensitive receptors (human and ecological) and low-energy fittings would be used where possible.

4.7.21 An Indicative Lighting Strategy (Operation) (EN070009/APP/5.8) and Appendix C: Indicative Lighting Strategy (Construction) (EN070009/APP/5.12.3) have been prepared and submitted as part of the DCO Application and used as the basis of assessments in the ES. These strategies cover the construction and operational phases of the Proposed Development. Both strategies require the final lighting scheme to be designed in accordance the Indicative Lighting Strategy (ILS) and relevant standards, such as the Guidance Notes for the Reduction of Obtrusive Light (2021) published by the Institute of Lighting Engineers and/or Chartered Institution of Building Services Engineers (CIBSE) requirements, as appropriate. This will ensure

that safe working conditions are provided, whilst reducing light pollution and the visual impact on the local environment.

Environmental Management During Operation

4.7.22 The Hydrogen Production Facility will require an Environmental Permit and activities will comply with this under the Environmental Permitting (England and Wales) Regulations 2016 (HM Government, 2016) so that any impacts of emissions to air, soil, surface and groundwater, to the environment and human health are minimised and avoided where possible. In addition, when granted, the DCO will include Requirements to control environmental management matters.

4.7.23 The Proposed Development will be operated in line with appropriate standards, whilst the operator will implement and maintain an Environment Management System (EMS) which will be attested to the International Standards Organisation (ISO) 14001 (International Organisation for Standardization, 2015). The EMS will outline requirements and procedures required to ensure that the Proposed Development Site is operating to the appropriate standard.

4.7.24 Any requirements for sampling and analysis of pollutants will be undertaken where required in accordance with the Environmental Permit.

4.8 Landscaping and Biodiversity

4.8.1 The DCO Application is supported by the Outline Landscape and Biodiversity Management Plan (LBMP) (EN070009/APP/5.9), and implementation of landscaping and biodiversity measures is secured through a Requirement in the Draft DCO (EN070009/APP/4.1). Landscaping will include woodland planting on the replacement land at Cowpen Bewley Woodland Park.

Cowpen Bewley Open Space Replacement Land

4.8.2 The Applicant notes that part of its proposals involves the replacement of the part of the Cowpen Bewley Woodland Park that is lost as a result of the works needed to create the Cowpen Bewley arm of the Hydrogen Distribution Network and its associated AGI (the impacts of which are assessed in the relevant technical chapters of the ES).

4.8.3 The detail of these proposals will be developed and agreed with STBC, but will as a starting point involve like for like replacement of the amount of trees lost to the Proposed Development. The location of the Cowpen Bewley Open Space Replacement is shown on the Works Plans (EN070009/APP/2.4), and is assumed to be Grade 3 agricultural land. The impacts of this have been considered in Chapter 10: Geology and Soils. Access to construct this area is to be taken from an existing access from the public highway and traffic impacts associated with it are expected to be minimal and below the IEMA thresholds for traffic assessment (and thus consequential air quality and noise assessments).

4.8.4 In light of this, and as the works to create replacement woodland are short term and involve predominantly planting activities; and given that the construction works to create the replacement woodland will be managed using the best practice

measures set out in the Framework CEMP (EN070009/APP/5.12) and through the development of a CEMP related to those works; these works are not otherwise specifically assessed in the technical chapters of this ES.

4.9 Decommissioning

4.9.1 The Phase 1 and Phase 2 production facilities will each have a design life of 25 years; however, the operational life could extend beyond that duration, depending on market conditions and plant's condition. The ES does not assume the removal of facilities after 25 years. At the end of its operational life, the most likely scenario would be that the Proposed Development would be decommissioned, with all above ground structures on the Main Site removed, and the ground remediated as required by the Environmental Permit to facilitate future re-use. The Applicant will assess at that time whether any infrastructure should be retained for future use.

4.9.2 It is expected that the hardstanding and sealed concrete areas will be left in place. Any areas of the Proposed Development Site which are to be decommissioned and that are below ground level will be backfilled to ground level to leave a levelled area.

4.9.3 For the purposes of this assessment, the same design life is assumed to apply for the proposed hydrogen pipeline and utility connections. Underground pipelines are expected to be capped and remain in situ. Above ground infrastructure will be decommissioned and removed following completion of the decommissioning activities.

4.9.4 A Decommissioning Environmental Management Plan (DEMP)) would be produced at the time of decommissioning, pursuant to a DCO Requirement. The DEMP would consider in detail all potential environmental risks on the Proposed Development Site and contain guidance on how risks can be removed or mitigated. This will include details of how surface water drainage should be managed during decommissioning and demolition. The implementation of the approved DEMP would also be secured by the DCO Requirement. The Decommissioning Plan will include an outline programme of works.

4.9.5 During decommissioning and demolition there will be a requirement for the provision of office accommodation and welfare facilities.

4.9.6 Any demolition contractor would have a legal obligation to consider decommissioning and demolition under the CDM Regulations (HSE, 2015), or the equivalent prevailing legislation at that time.

4.9.7 Decommissioning activities will be conducted in accordance with the appropriate guidance and legislation at the time of the Proposed Development's closure. All decommissioning and demolition activities will be undertaken in accordance with the waste hierarchy. Materials and waste produced during decommissioning and demolition would be stored in segregated areas to maximise reuse and recycling. All materials that cannot be reused or recycled would be removed from the Proposed Development Site and transferred to suitably permitted waste recovery/disposal facilities. It is anticipated that a large proportion of the materials

resulting from demolition will be recycled and a record kept demonstrating that the maximum level of recycling and reuse has been achieved.

4.9.8 Upon completion of the decommissioning programme the relevant regulatory authority at the time (e.g. the EA) will be invited to witness a post-decommissioning inspection by site staff. All records from the decommissioning process will be made available for inspection by the EA and other relevant statutory bodies, in accordance with the Environmental Permit requirements.

4.10 Elements of the Proposed Development Consented Under a Deemed Marine Licence

4.10.1 In England, the Marine and Coastal Access Act 2009 (MCAA) (HM Government, 2009) provides that a Marine Licence (ML) is required for certain 'licensable activities' within the UK Marine Area. This is defined as any area seaward of the normal tidal limit of any tidally influenced water body. This includes intertidal zones, which are periodically exposed by the tide and subtidal zones which are always submerged.

4.10.2 MLs can be issued via a 'standalone' Marine Licence Application (MLA) or a licence 'deemed' within the body of the DCO (i.e. a Deemed Marine Licence (DML)). The Marine Management Organisation (MMO) is the body responsible for issuing, revoking, and enforcing a ML, other than where a licence is in the form of a DML, in which case, it will be granted by the SoS.

4.10.3 Some aspects of the Proposed Development are taking place within the area seaward of the normal tidal limit, namely the construction of the crossing of the River Tees for the proposed hydrogen pipeline, and the crossing of Greatham Creek below Mean High Water Springs (MHWS), north of the Tees and to the west of the Main Site. The design work for all crossings is ongoing. However, currently it is proposed that the crossing under the Tees would be constructed using trenchless crossing methodology such as microtunnel (MBT) or Horizontal Directional Drill (HDD) or a combination of the two, thereby minimising disturbance during construction. For crossing Greatham Creek the use of HDD is proposed.

4.10.4 Following the Initial consultation with the MMO and the preliminary advice using the MMO's online interactive assistance tool, there is no identified need for an MLfor the Proposed Development including trenchless crossings of the River Tees and Greatham Creek. This is on the basis that they involve the construction of bored tunnels wholly under the riverbed and pursuant to the methodologies being considered, will not significantly adversely affect any part of the environment of the UK marine area or the living resources that it supports; and so a DML has not been included within the draft DCO.

4.11 References

- Environment Agency (2023). *Emerging techniques for hydrogen production with carbon capture.*
- Health and Safety Executive (HSE) (2015). *The Construction (Design and Management) Regulations 2015.*
- HM Government (2008). *The Energy Act.*
- HM Government (2009). *Marine and Coastal Access Act 2009.*
- HM Government (2015). *The Control of Major Accident Hazards Regulations.*
- HM Government (2016). *The Environmental Permitting (England and Wales) Regulations 2016.*
- HM Government (2020). *Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 (SI 2020/1497).*
- Institution of Lighting Professionals (2021). *Guidance Note 1 for the reduction of obtrusive light 2021.*
- International Organization for Standardization (2015). ISO 14001:2015 *Environmental Management Systems*. Geneva: International Organisation for Standardisation.
- The Planning Inspectorate (2018). *Advice Note 9: Rochdale Envelope.*