TABLE OF CONTENTS

TABLES

PLATES

There are no plates in this chapter.

VOLUME II: FIGURES (ES VOLUME II, EN070009/APP/6.3)

Figure 5-1: Construction Access and Temporary Construction Compounds

Figure 5-2: Indicative Pipeline Routing

VOLUME III: APPENDICES (ES VOLUME III, EN070009/APP/6.4)

No appendices associated with this chapter.

Rev: 0

5.0 CONSTRUCTION PROGRAMME AND MANAGEMENT

5.1 Introduction

5.1.1 This chapter of the Environmental Statement (ES) describes the construction phase of the Proposed Development (including commissioning).

5.1.2 This chapter includes information on the expected construction programme and methods of working, based on current understanding at this stage in the design of the Proposed Development. A detailed construction programme is not currently available as this will be determined by the Engineering, Procurement and Construction (EPC) Contractor(s) which has not yet been appointed. Where construction details cannot be confirmed, reasonable worst-case estimates have been made based on experience gained on similar developments and professional judgement.

5.1.3 All construction works will be undertaken in accordance with the Construction Design and Management Regulations (HM Government, 2015).

5.1.4 This chapter is supported by Figures 5-1 and 5-2 (ES Volume II, EN070009/APP/6.3) which show the Construction Access and Temporary Construction Compounds and the Indicative Pipeline Routing respectively.

5.2 Construction Programme

5.2.1 The Proposed Development construction programme is anticipated to commence shortly after the Development Consent Order (DCO) decision (projected to be by Q3 2025) and after the Final Investment Decision (FID).

5.2.2 The construction of the Proposed Development will be undertaken by:

- EPC Contractor(s) – construction of all elements of the Proposed Development within the Main Site (including electrical connection, telecommunications connection, natural gas connection, oxygen (O_2) and nitrogen (N_2) connections, carbon dioxide (CO_2) export connection to the Northern Endurance Partnership (NEP) site and water connections); and
- EPC Contractor(s) – construction of hydrogen pipeline, electrical connection, natural gas connection, oxygen (O_2) and nitrogen (N_2) connections, carbon dioxide (CO_2) export connection to the Northern Endurance Partnership (NEP) site, telecommunications connections and water connections corridors.

5.2.3 It is proposed that the Proposed Development will be constructed in two phases as outlined in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2). Phase 1 will consist of a single hydrogen production unit, on-site hydrogen storage and supporting utilities. Phase 2 will consist of a further hydrogen production unit and supporting utilities constructed thereafter. The majority of the Hydrogen Pipeline Corridors to facilitate transportation of hydrogen to offtakers will be constructed and completed in Phase 1.

5.2.4 Permitted preliminary works for Phase 1 are expected to start in the third quarter (Q3) of 2025 (subject to the granting of the DCO), with the main civils works

beginning in Q4 of 2025. Construction of Phase 1 is anticipated to last approximately 32 to 36 months and is expected to be complete in Q2 2028.

5.2.5 The early enabling works for Phase 2 may overlap with commissioning for Phase 1 in Q2 2028. It is expected that the main civils works for Phase 2 will begin in Q3 of 2028 (after Phase 1 is commissioned) and be completed by the end of 2030. It is proposed that there will be no overlap between the main construction phases of Phases 1 and 2.

5.2.6 If the duration of the construction of Phase 2 is extended (when compared to that for Phase 1 due to potential overlaps in Phase 1's operation and Phase 2's construction activities), ongoing management of the simultaneous operation and construction activities and minimisation of the associated risks and impacts would be required. The Applicant would be in control of both, and would be able to implement any management required directly and through its respective EPC Contractor(s) operating Phase 1 and constructing Phase 2.

5.2.7 This ES assesses the construction, commissioning, operation and decommissioning of the Proposed Development and considers its phased nature. As outlined in Chapter 2: Assessment Methodology (ES Volume I, EN070009/APP/6.2) and Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2), the ES includes an assessment of any likely significant environmental effects arising from the phased nature of the Proposed Development, including risks of major accidents from the proximity of construction activity to the operational Hydrogen Production Facility.

5.2.8 Phase 1 construction works will include the Hydrogen Production Facility at the Main Site (Phase 1 components as described in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2)) consisting of:

- a single hydrogen production unit and associated on-site hydrogen storage;
- various utility connections required, including the CO_2 Export Corridor to NEP infrastructure on the adjacent Net Zero Teesside (NZT) site; and
- the gas, water, telecoms and electricity connections.

5.2.9 Phase 1 will also include the construction of the majority of the Hydrogen Pipeline Corridor, except for short additional spurs of the Hydrogen Pipeline Corridor which will be constructed as part of Phase 2 as shown on the Works Plans (EN070009/APP/2.4).

5.2.10 Phase 2 construction at the Main Site will include the infrastructure and connections required for the second Hydrogen Production Unit to increase the capacity of the Hydrogen Production Facility. The additional Phase 2 infrastructure will be constructed within the Main Site, adjacent to the Phase 1 constructed infrastructure. Further detail is set out in Chapter 4.

5.2.11 The key stages of all phases of the construction programme are outlined at a high level in Table 5-1 (below). It is anticipated that within this high-level programme the following activities will take place following site remediation works to be undertaken by South Tees Development Corporation (STDC) in advance of site handover to the Applicant:

- construction of temporary construction compounds and undertaking of permitted preliminary works;
- construction of the Hydrogen Production Facility (Phase 1) – Main Site works (including new Air Separation Unit (ASU), if required);
- construction of utility connections tie ins for natural gas, electricity, telecoms, water and effluent and foul water supply and discharge, CO2 export, N2 and O2 import;
- construction of Hydrogen Pipeline Corridor and spurs;
- plant, utility and Hydrogen Pipeline Corridor Commissioning (Phase 1);
- construction of Hydrogen Production Facility Phase 2 elements; and
- Phase 2 plant and network commissioning.

5.2.12 The Hydrogen Production Facility will be located on the Main Site, which is part of the site of the former Redcar Steelworks. It is brownfield land that currently contains some above and below ground structures and redundant services associated with the former works and earlier development on the site.

5.2.13 Any demolition works to clear the Site will be undertaken by STDC prior to and irrespective of the Proposed Development taking place. Any remediation works required to create a suitable development area will be undertaken by STDC under reserved matters approval, or other planning approvals, before the commencement of the construction of the Proposed Development on the Main Site, with STDC obtaining all necessary consents and permits. Thus, the demolition and site remediation works to be undertaken by STDC do not form part of the DCO Application for the Proposed Development.

5.2.14 The Applicant will also review the scope of any remedial measures considered to be required following the completion of (referred to herein as 'Additional'), or in place of, the remedial works undertaken by STDC. Additional remedial measures before or during construction, could include measures such as a discovery strategy for unexpected contamination, and will be reviewed following review of both Ground Investigations (GI) and relevant remediation specifications and verification reports from STDC. The process for securing the delivery of these remedial measures including the Additional measures is secured by DCO Requirement.

5.2.15 It is common for much of the groundwork (for example piling and pouring of concrete slabs) to be progressed, but not completed prior to above ground erections. The erection of civil and structural components (such as cladding and external civil works) usually continues whilst mechanical erection is ongoing. However, the detailed phasing of construction is the responsibility of the EPC Contractor(s) and can vary dependent on plant layout and procurement of key equipment.

Table 5-1: Indicative Construction Programme for the Proposed Development

DEVELOPMENT PHASE	2025				2026				2027				2028				2029				2030			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PPW Phase 1																								
Construction Phase 1																								
Phase 1 Operation Commences																								
Enabling Works Phase 2																								
Construction Phase 2																								
Phase 2 Operation Commences																								

5.3 Construction Management

Construction Equipment

5.3.1 For the purposes of this ES, in advance of Front End Engineering Design (FEED)[1], reasonable worst-case estimates have been made for the types and numbers of plant and machinery likely to be used on the Main Site during the construction period, as well as the use of piling at the Main Site, in line with the principles of the Rochdale Envelope detailed in the Planning Inspectorate's Advice Note 9 (The Planning Inspectorate, 2018).

5.3.2 Reasonable worst-case estimates have been used to inform a number of chapters within the ES, but are of particular relevance to Chapter 8: Air Quality and Chapter 11: Noise and Vibration (ES Volume I, EN070009/APP/6.2), and the Indicative Lighting Strategy (Construction) (EN070009/APP/5.12), noting that these chapters and reports feed into a number of other assessments as presented within the ES.

5.3.3 Construction plant is likely to include (but is not limited to):

- piling equipment;
- mobile plant and civils equipment;
- heavy lifting equipment (including cranes);
- concrete batching plant;
- mobile power generating equipment; and
- trenchless crossing (Horizontal Directional Drilling (HDD)/Micro-Bored Tunnelling (MBT)) equipment.

5.3.4 There may be a requirement for point of use temporary generators for site power during construction. Details of the number of generators, sizing and modes of operation are not yet available. These will be defined by the Applicant's EPC Contractor(s), as appropriate. Depending on aggregated plant capacities, an Environmental Permit or medium combustion plant permit will be applied for as required from the Environment Agency, which will regulate emissions from the generators. Alternatively, site construction power may be provided by STDC or via a connection to the National Grid. This EIA assumes use of temporary generators for site power as a reasonable worst case in terms of noise and emissions to air.

Site Clearance and Remediation

5.3.5 Site remediation works at the Main Site will be completed by STDC prior to the commencement of construction of the Proposed Development. STDC will obtain the necessary consents and permits to do this work. The scope of works anticipated to be undertaken by STDC's demolition and civils contractor includes:

[1] Front End Engineering Design (FEED) is a critical phase in project development, occurring after the initial concept stage and before detailed design. Its primary focus is on defining project scope, technical specifications, feasibility, and cost estimates.

- demolition of existing structures within the boundary of the Main Site and construction temporary compounds areas on the STDC site within the Proposed Development Site;
- turn-over of made ground within the boundary of the Main Site and temporary construction compounds areas within the STDC site to a depth of up to 2.5 m below ground level (BGL), including removal of derelict underground structures and obstructions and removal and treatment of historic environmental contamination as required (where not already dealt with by the landowner prior to the Proposed Development);
- targeted removal of additional underground obstructions and remediation as requested by the Applicant; and
- placement of suitable material (either reused excavation spoil or imported fill) to form the appropriate platform levels for development.

5.3.6 Further remedial measures may be required depending on the requirements of the detailed design and the outcome of further GI. This is due, in part, to the presence of derelict structures associated with former developments on the Main Site. Targeted remediation (including below 2.5 m) may be required by the Applicants or within Phase 2 (see Section 10.5, Chapter 10 Geology, Hydrogeology and Contaminated Land (EN070009/APP/6.2)). Where required, these works would be managed and controlled through the Framework Construction Environmental Management Plan (CEMP), noting that a Framework CEMP (EN070009/APP/5.12) has been prepared and is being submitted as part of this DCO Application. The Final CEMP(s) will be based upon the Framework CEMP (EN070009/APP/5.12). As such, these potential additional remediation works are considered and assessed within the relevant chapters of this ES as a reasonable worst-case scenario. Details of

Permitted Preliminary Works

5.3.7 Permitted Preliminary Works (PPW) are early works that are considered to be minor and therefore allowed to be undertaken prior to discharge of pre-commencement DCO Requirements. The Contractor's PPW CEMP (secured by a DCO Requirement) would only apply to work prior to commencement of development, i.e. only prior to the start of Phase 1 construction works as per Framework Construction Environmental Management Plan (CEMP) Section below. There would be no PPWs associated with Phase 2 construction works which would be covered by the Final CEMP(s).

5.3.8 PPWs can include:

- environmental surveys (including any archaeological investigations);
- geotechnical surveys;
- surveys and protection of existing infrastructure;
- other investigations for the purpose of assessing ground conditions,
- the preparation of facilities for the use of contractors;

- the provision of temporary means of enclosure and site security for construction;
- temporary access roads;
- paving;
- the temporary display of site notices or advertisements:
- diversion of existing services and laying of temporary services; and
- any other works agreed by the relevant planning authority, provided that these will not give rise to any materially new or materially different environmental effects from those assessed in this environmental statement.

Main Site Civil Works

5.3.9 The Applicant's selected EPC Contractor(s) will commence with piling and excavation works for the main foundations of the Proposed Development.

5.3.10 It is anticipated that the foundations will include bored piles (approximately 20 m deep) for heavily loaded structures or structures that are sensitive to settlements. Shallow foundations (such as rafts or pads) shall be used in areas of the Main Site with less onerous loading or settlement requirements.

5.3.11 A Piling Risk Assessment and associated Piling Methodology will be produced in accordance with Environment Agency's Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001) to consider and mitigate the risks of causing new pollutant linkages and/or worsening existing linkages with respect to risks to controlled waters (including surface watercourses and aquifers) during construction of the Proposed Development. The results of this assessment will be used in the piling design and this will be secured by a Requirement to the DCO.

5.3.12 Subject to detailed design, further ground investigation, consideration and assessment of surrounding sensitive receptors, and Unexploded Ordnance (UXO) surveys, the piled foundations will be installed by boring through the made ground using a suitable rotary bored piling rig down to existing natural soils. The rotary bored pile shall simultaneously install temporary casing to the base of the made ground to support the ground to allow follow on of continuous flight auger (CFA) piles. A CFA piling rig will then be used to install the remaining length of pile into the natural ground below. The temporary casing shall be extracted once the concrete has been placed into a given pile.

5.3.13 The driven piles will be constructed using a similar methodology, employing the rotary bored pile method through the made ground and down to natural soils. Casing will be installed in the made ground, and subsequently, driven piles will be installed.

5.3.14 Once the piles are installed, excavators will be used to reduce the ground level to the required height for the pile caps, effluent sump, fire water pond and other deep foundations. Where required, piles will then be trimmed to the required level using a suitable integrated pile breaking method or hydraulic pile breaker. A blinding layer

will be installed before installation of the pile caps, plinths, slabs and walls using standard reinforced concrete methods. Where appropriate, excavations will be backfilled using the previously excavated material.

5.3.15 A review of published geological and hydrogeological information and historical borehole records indicates that shallow groundwater levels are approximately 3 m below the development platform which will be at approximately 7.1 m above Ordnance Datum (AOD) for Phase 1, with the final high pavement point above 7.4 m AOD. The development platform for Phase 2 might be above 7.1 m AOD but will not exceed 8 m AOD. With the exception of piled foundations, ponds and underground piping, excavation below the existing groundwater level is not anticipated to be necessary as part of the proposed foundation works at the Main Site.

5.3.16 If water is encountered in made ground during below ground construction, suitable de-watering methods will be used. Any significant groundwater dewatering will be managed through the best practice measures detailed in the Final CEMP(s) (refer to the Framework CEMP (EN070009/APP/5.12)), and undertaken in line with the requirements of the Water Resources Act 1991 (HM Government, 1991) and Environmental Permitting Regulations (England and Wales) Regulations (HM Government, 2016). Water would be settled and tested to ensure that only uncontaminated water would be discharged. To avoid flooding, drains/controlled waters would be assessed to confirm they have capacity to receive the volumes of any significant groundwater and surface water likely to be produced.

5.3.17 The main plant components for the Hydrogen Production Facility are likely to be a combination of modular and stick built[2] components. The Applicant is seeking to optimise opportunities for modularisation to construct the Hydrogen Production Facility where possible. However, in some cases a stick built approach will be used when a modular approach is not practicable, safe or advantageous. The modular elements will be constructed partially off-site and over-sized (classified as Abnormal Indivisible Loads – AILs). The exact routeing of these is not known at this stage, but it is assumed that where required, these would be delivered by ship to the Redcar Bulk Terminal (RBT) wharf and transported to the Main Site via the STDC internal road network. There are anticipated to be in the order of 80-100 individual AILs to be delivered but these will only be transported from the RBT wharf to the Main Site via the internal private road network. Containerised material or equipment will be imported by HGV, or via RBT and then by road.

5.3.18 Following ground and civils works, the EPC Contractor(s) will commence the installation of the main plant. Erection of facilities and plant installation will be carried out as concurrent activities, noting that not all facilities will be erected prior to the commencement of plant installation. The main plant may be first placed on foundations with facilities erected around it thereafter.

[2] A stick-built approach in construction refers to the traditional method of assembling a building on-site, using individual components like lumber or steel. This method allows for flexibility, customization, and incremental construction, making it a common choice.

5.3.19 Control of noise during construction will be through the final CEMP(s) pursuant to the Framework CEMP (EN070009/APP/5.12), secured via a requirement in the draft DCO. Example measures may include noise screens, limiting nighttime works, and limiting concurrent noisy activities.

Spoil Management

5.3.20 Spoil material generated during construction will be stored temporarily within the Proposed Development Site (within Flood Zone 1). Re-use of spoil will be based on obtaining the necessary consents and permits to do this work. Any spoil which cannot be re-used will be removed from the Main Site for re-use or disposal. If necessary, suitable measures will be put in place to prevent sediment being washed off-site, with the stockpiles being monitored/measured for wash away. Further details of the measures which will be implemented are included within the Framework CEMP (EN070009/APP/5.12). (A) Final CEMP(s) will be prepared by the EPC Contractor(s) prior to construction, in accordance with the Framework CEMP (EN070009/APP/5.12).

5.3.21 Soils will be managed in accordance with the Department for Environment, Food and Rural Affairs (Defra) Construction Code of Practice for the Sustainable Use of Soil on Development Sites (Defra, 2009) to minimise impacts on soil structure and quality. Appropriate measures to minimise short-term and long-term impacts on land drainage have been discussed with each landowner (where relevant, principally for the Hydrogen Pipeline Corridor) and are included in the Framework CEMP (EN070009/APP/5.12) which the Final CEMP(s) will be based on, along with measures relating to the management of any contaminated soils. HGV traffic associated with the export of soils has been accounted for in the traffic figures as assessed in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

5.3.22 As a reasonable worst-case due to the historic industrial land uses of the Main Site, it has been assumed a proportion of the material excavated could be classified as hazardous material and require off-site disposal at a permitted facility. Excavated material will be sampled and screened against site-specific assessment criteria. Any suspected contaminated material would be segregated and placed on an impermeable membrane to prevent leaching of contaminants – this will be secured via a requirement in the draft DCO and is covered in the Framework CEMP (EN070009/APP/5.12).

5.3.23 Additionally, the Framework CEMP (EN070009/APP/5.12) incorporates measures to prevent an increase in flood risk during the construction works in land within Flood Zones 2 or 3 in North Tees or around Dabholm Gut (including the presence of a small number of temporary construction compounds). For instance, spoil will be stockpiled in low-risk flooding areas, appropriate dewatering methods will be identified, and all construction materials and temporary construction compounds will be situated in Flood Zone 1.

Temporary Construction Compounds

5.3.24 To optimise the management of construction, temporary construction compounds are needed to provide appropriately located areas for specific activities including

(but not limited to), equipment and material storage, site offices, managing and maintaining plant, workers' welfare facilities, car parking, environmental / waste handling areas, vehicle wheel wash areas, and operational activities such as concrete batching.

5.3.25 The location of temporary construction compounds has been selected based on the following requirements:

- to support the type, scale and complexity of the works;
- to facilitate material deliveries and storage in key locations;
- to be in suitable proximity to work sites and existing transport infrastructure, such as the road network, rail and river access, to optimise vehicle movements and minimise impacts on the environment and local community;
- to provide the necessary facilities and operations capability to the construction workforce;
- to be close to the existing transport networks to enable the workforce to commute to their place of work; and
- taking account of feedback from stakeholders and landowners.

5.3.26 Based on the above criteria, seven temporary construction compounds are required for construction of the Proposed Development, as shown on Figure 5-1: Construction Access and Temporary Construction Compounds (ES Volume II, EN070009/APP/6.3).

5.3.27 The temporary construction compounds will be required for varying amounts of time in support of Phase 1 construction and Phase 2 construction, which is a subset of those for Phase 1, depending upon their specific use and location (as shown in Table 5-2). Some temporary construction compounds will be necessary throughout the entire construction phase, including the Main Site Compound and, most likely, the RBT Satellite Compound as well (the modules can be landed on modular transporters and then travel directly to the site from the RBT Compound). The use of temporary construction compounds has been assessed using conservative assumptions regarding the nature of activities to be undertaken.

Table 5-2: Indicative Location and Uses of Temporary Construction Compounds

LOCATION	USE
Main Site Compound: The Main Site Compound is located within the Main Site.	Temporary construction compound including laydown area and parking to service construction of the Hydrogen Production Facility.
RBT Satellite Compound: RBT Construction Compound comprising of Quayside and North of Red Main areas.	The Quayside and North of Red Main areas include parking & welfare offices.

LOCATION	USE
Wilton International Satellite Compound: South bank of Tees, within Wilton International site.	Temporary construction compound including laydown area and parking to service pipeline works on the Wilton International site.
Seal Sands Compound: North bank of Tees, in Seal Sands within or adjacent to the Ineos site.	Temporary construction compound including laydown area and parking to service pipeline works
Greatham Satellite Compound: North bank of Tees, adjacent to Seaton Carew Road.	Temporary construction compound including laydown area and parking to service pipeline works.
Cowpen Bewley Satellite Compound. North bank of Tees, adjacent to Statera Energy Operations – Saltholme Power Station.	Temporary construction compound including laydown area and parking to service pipeline works.
Billingham Industrial Park Satellite Compound: North bank of Tees, in Billingham Industrial Park site.	Temporary construction compound including laydown area and parking to service pipeline works.

5.3.28 Project offices, welfare facilities and workshops will be constructed from a mix of single and modular units. These will be stacked where practicable to minimise the surface area taken up at ground level. It is anticipated that units will be stacked up to an equivalent maximum height of five units (approximately 15 m) at compounds and two units (approximately 6 m) at satellite compounds, with potential for viewing areas for the Applicant's EPC Contractor(s) and stakeholders at the top of some.

5.3.29 Contractor parking may use STDC off-site Park and Ride facility, there will also be designated contractor parking for vehicles and bicycles provided at each temporary construction compound as outlined in Table 5-2. On-site parking will also be included in close proximity to the Main Site. Full details of Parking provision will be incorporated into the Final Construction Traffic Management Plan (CTMP) and assumptions about movements associated with parking are explained in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2) and the Framework CTMP (EN070009/APP/5.16). Water will be supplied by tanker and stored sitewide where appropriate/required. For the Main Site Compound, the potential for a connection to a potable and raw water line is being investigated. Sanitary facilities will be provided at each temporary construction compound, and waste stored for off-site disposal.

5.3.30 Site clearance, levelling and ground preparation works for temporary construction compounds may be required to provide a suitable working area. Where appropriate, the surface material of laydown areas will be permeable to allow

rainwater to percolate into the ground. Suitably bunded and lined locations will be identified as storage areas for any hazardous or polluting materials and chemicals, to control the risk of pollution. Further detail can be found in Chapter 9: Surface Water, Flood Risk and Water Resources (ES Volume I, EN070009/APP/6.2).

5.3.31 Rainfall runoff from areas where there is a risk of contamination will be managed using temporary drainage systems and or tankered offsite for treatment (including settlement of suspended solids and or oil interceptors) prior to discharge to local watercourses with the approval of the Environment Agency pursuant to a discharge licence. The drainage systems will incorporate pollution control systems designed in line with the Control of Water Pollution from Construction Sites – Guidance for consultants and contractors C532 (CIRIA, 2001) or as agreed with the relevant authorities. Surface watercourses and waterbodies near worksites will be regularly inspected for signs of siltation or other forms of pollution in line with CIRIA Environmental Good Practice on Site Guide C741 (CIRIA, 2015), whilst pumped groundwater, process effluents and construction site runoff will be tested to ensure compliance with discharge consent requirements – these measures are detailed in the Framework CEMP (EN070009/APP/5.12) and will be set out in the Final CEMP.

5.3.32 Rainfall runoff from areas of low contamination risk will be captured and stored in settlement ponds for reuse where reasonably practicable to reduce consumptive water use (e.g. to supply wheel wash facilities or for dust suppression).

5.3.33 Habitats that will be temporarily lost or damaged during construction will be mitigated and compensated for in line with the Outline Landscape and Biodiversity Management Plan (Outline LBMP) (EN070009/APP/5.9).

5.3.34 Associated requirements for the protection of retained vegetation (e.g. during vehicle movements and construction/re-instatement works), vegetation restoration soil protection and handling, and temporary soil storage are specified in the Framework CEMP (EN070009/APP/5.12) and will be included in the Final CEMP(s). These specifications reflect current industry good practice and will be location specific.

Construction of Connection Corridors

Use Existing Pipeline Corridors

5.3.35 Construction activities within existing pipeline corridors may include (but not be limited to) the following:

- survey of proposed new pipeline route;
- undertaking of ground surveys (e.g. topographical, environmental, and geotechnical) including trial pits, UXO and/or Ground Penetrating Radar (GPR) surveys;
- obtain associated access permits and clearance certification;
- constructing and using access roads and protection of existing infrastructure/pipelines;
- ground preparation and management of any associated excavation works;

- installation of new pipeline sections;
- construction of new and modification of existing pipe bridges;
- management of lifting operations for the positioning and installation of steelwork, piping sections, valves, materials and concrete supports etc;
- installation of temporary pig launching/ receiving facilities;
- non-destructive testing of pipe work by radiography, magnetic particle inspection and ultrasonic;
- thickness surveys;
- hydrostatic piping testing;
- corrosion protection preparation and coating (including structural steel work supports) and installation of cathodic protection;
- electrical, control and instrumentation works;
- commissioning;
- reinstatement of fence lines, railing, supports, walkways and any other obstacles temporarily removed or modified by prior agreement to allow for construction and safe works access; and
- site clean-up.

Above Ground Pipelines

5.3.36 Much of the newly constructed above ground pipeline will be routed in designated pipeline corridors with existing pipeline infrastructure. It is anticipated that new pipelines will be installed in parallel and working to one side of the existing pipelines. The design and installation methodology will be discussed with existing asset owners and routeing carefully coordinated with other developers who plan to use these corridors.

5.3.37 Existing pipework and other infrastructure will limit the available working space at various locations on the pipeline route. It is difficult to define an exact working area and methodology at all locations due to these restrictions, but generally it is anticipated that cranes will be used to lift sections of new pipeline into position with temporary crash decks used to protect existing pipelines during these operations. Scaffolding or Mobile Elevated Working Platforms will be used to provide access at height. Access will be via existing access tracks or from temporary roads made from bog mats or similar. Hot works including welding and preparations for joint coating will need to be managed through a suitable agreed permit process considering other apparatus in the area.

5.3.38 In areas where the existing pipeline corridor is too congested to accommodate the proposed pipeline at ground level, ‘T’ post type supports or similar will be used to raise the new pipeline above the existing assets. The horizontal separation of new supports is anticipated to be no greater than 9 m.

5.3.39 Where possible the pipeline route will use existing pipe bridges to cross existing infrastructure. Where existing pipe bridges have insufficient capacity to accommodate the proposed pipeline or are deemed unfit for service, new pipe bridges will be installed.

5.3.40 Figure 4-4: Hydrogen Pipeline Corridor (ES Volume II, EN070009/APP/6.3), Figure 5-2: Indicative Pipeline Routings (ES Volume II, EN070009/APP/6.3), and the Indicative Hydrogen Distribution Network Plans (EN070009/APP/2.10) show the areas of the Hydrogen Pipeline Corridor that will be above ground.

Buried (Open-Cut) Pipelines

5.3.41 For other connections the pipeline will be constructed using open-cut techniques, excepting where a trenchless method is proposed as set out below. The width of the pipeline construction corridor will vary between 10 and 25 m, depending on factors such as location and pipeline diameter. The method of installation for the sections of buried pipeline is expected to involve:

- segregating a working area using suitable fencing and safety signage;
- removal of topsoil if present and stockpile for reuse;
- laying out sections of pipe adjacent to pipeline route;
- welding pipeline joints together and test welds;
- coating pipe joints and perform checks;
- excavating a trench to the required depth with battered sides or suitable trench supports to suit the temporary works design and stockpile excavated material for reuse;
- installation of pipe bedding material at the base of the trench;
- lifting sections of pipeline into the trench;
- installation of packing material around the pipe;
- backfill of the trench with excavated material and if required remove surplus material from the site; and
- replacement of topsoil and reinstatement to agreed standards.

5.3.42 Excavation depths for the largest diameter pipes (up to 42”) are not anticipated to exceed 3.0 m. Sections of the pipeline route that use smaller diameter pipes (6”) will have excavation depths less than 2.0 m.

5.3.43 A review of published geological and hydrogeological information and historical borehole records indicates that shallow groundwater may be encountered within the depth of the proposed open cut trenches in some locations. The ground conditions in this area indicate soft sandy clay extending from the surface or below made ground where present. For the purposes of this ES, it is assumed that one of the following options is adopted if water is encountered during below ground construction (with the relevant worst case assessed in the relevant technical chapters):

- Option 1: concrete coat the pipe and then lift / drag the pipe into the wet trench. Pipe strings would need to be maximised and a suitable manhole box or similar to facilitate access for the tie ins;
- Option 2: jetting in dewatering hoses either side of the trench and locally lowering the groundwater level for the duration of the works;
- Option 3: as per option 2 but pre-auger the ground prior to installation of the dewatering hoses.

5.3.44 Any significant groundwater dewatering will be managed through the Final CEMP(s) prepared by the EPC Contractor(s) and undertaken in accordance with the requirements of the Environment Agency (under the Water Resources Act 1991 as amended) (HM Government, 1991) and Environmental Permitting Regulations (HM Government, 2016). Water will be settled and tested to ensure that only uncontaminated water will be discharged. To avoid flooding, drains / controlled waters will be assessed to confirm that they have capacity to receive the volume of water likely to be produced.

5.3.45 As a worst-case, unless specified, it has been assumed that open-cut methods will be required for the connection corridor crossings of all watercourses other than those listed as using trenchless crossing techniques (as detailed below). In such cases, it is assumed that flow will be temporarily over-pumped, diverted around or flumed through the working area and the watercourse fully reinstated as before.

Trenchless Technologies

5.3.46 Trenchless technologies (such as HDD, MBT or Auger Boring) are proposed for crossing of environmentally sensitive watercourses (e.g., River Tees and Greatham Creek) and major infrastructure (e.g., Seal Sands road and some railways). Figure 4-4: Hydrogen Pipeline Corridor (ES Volume II, EN070009/APP/6.3) and the Indicative Hydrogen Distribution Network Plans (EN070009/APP/2.10) show the areas of the Hydrogen Pipeline Corridor that will be constructed using trenchless technologies. The proposed trenchless technologies below the River Tees will be at a minimum depth of approximately 25 m (at the deepest point of crossing) to prevent impacts on river channel integrity, habitats and infrastructure (including other bores and tunnels); and a maximum depth of 60 m.

Horizontal Directional Drilling

5.3.47 HDD is proposed for the crossing of the Greatham Creek underneath the Teesmouth and SPA and Ramsar site to prevent impacts on the internationally designated site. HDD involves drilling a gently curved horizontal bore from a launch site to a receiving site. The pipeline is then drawn in reverse through the bore. The HDD launch locations require the installation of sheet piles to provide anchorage for the drill rig. The number, size and depth of these sheet piles will be established by the temporary works design. The drill site will also include mud mixing plant (typically a bentonite mix), mud pumps, steering cabin, a suitable generator and a lagoon to collect drilling mud and cuttings. The stringing site is land at the other end of the bore which will be used to store sections of pipeline and for the welding and coating

of the pipestring. Facilities at the stringing site will also include a crane for lifting sections of pipe and mud pump to return drill mud back to the drill site.

5.3.48 The first stage of the HDD process will be to install a mud return line offset from the proposed pipeline using the drill rig. Following this, a pilot hole will be drilled along the proposed pipeline alignment. A reamer / hole opener will then be attached to the drill and working in the reverse direction from the stringing site back to the drill site, the bore diameter will be incrementally increased. A number of reams will be required based on the required bore diameter and ground conditions encountered onsite. Cleaning runs will then be used to remove any cuttings and obstructions in the bore. The reamer / hole opener will be attached to the pipestring via a pull head will be pulled back through the HDD bore. The pipestring for the crossing will be assembled, pre-welded and pressure tested on the stringing site. Sections of pipe will be lifted into position using a crane, welded and coated sequentially until the full length of pipe is installed. The completed pipestring will be pulled back through the HDD bore using a pull head. As the pipe is pulled back for processing, drill mud used in the HDD process will be collected in the mud pits on the drill site and then removed from site by tanker to a permitted waste disposal facility. The launch and receiving sites will then be backfilled with clean excavated material, and temporary haul roads, plant and equipment removed before the site is restored.

5.3.49 Where HDD is used to cross watercourses, risk of escape of drilling fluid arising from hydrofracturing to the surface will be minimised by the following:

- performing appropriate geotechnical investigations along the HDD alignment;
- designing the HDD profile to pass at an appropriate depth below the water course;
- designing the HDD profile to pass through competent soil layers identified by geotechnical investigations;
- performing drilling fluid hydrofracture analyses for each drilling operation and maintaining downhole pressures within recommended limits;
- using appropriate downhole pressure monitoring equipment;
- designing a drilling fluid appropriate for the anticipated ground conditions;
- appropriate monitoring of drilling fluid parameters during drilling; and
- performing regular monitoring of the ground above the HDD alignment for drilling fluid leaks to the surface.

5.3.50 In addition, casing pipe to contain drilling fluid may be installed through less competent shallow ground layers at HDD entry or exit points when considered necessary. Contingency plans are expected to be in place during drilling operations for rapid containment and disposal of any drilling fluid leaks to the surface. Where applicable the design and methodology (including procedures and contingency plans for containment and disposal of drilling fluid leaks to the surface) will be subject to review by the Environment Agency and Natural England.

5.3.51 Measures included in the HDD methodology which are considered sufficient to avoid the risk fluid break out include:

- Before drilling:
  - Undertaking a ground investigation;
  - Detailed design of the launch point or landfill of the HDD, showing geological layers and the intended drill path which has sufficient depth below surface for the expected ground conditions to minimise risk of failure; and
  - Undertaking a hydraulic fracture analysis.
- During drilling:
  - Ensure drilling fluid is of sufficient viscosity and properties for the ground being drilled;
  - Having lost circulation cleanup materials on site to seal any breakout;
  - Use casing through weaker cohesive layers near the ground surface if necessary;
  - Removal of poor ground / ground stabilisation prior to drilling ;
  - Monitoring of drilling fluid returns and volumes during drilling to warn of inadequate hole cleaning ;
  - Monitoring downhole annular pressure (set by fracture analysis) in real time to warn of over pressurising by drilling fluid ;

5.3.52 In addition, the Framework CEMP (EN070009/APP/5.12) includes the following commitments:

- A commitment to producing a Code of Construction Practice which would specify measures designed to minimise the risk of collapse of any HDD crossing;
- A requirement for the contractor's drilling method statement to form the basis of contingency plans which provide details of specific clean-up and pollution control measures which would be used in the event of an accidental spillage;
- Natural England, and any landowner of land crossed by the HDD, would be consulted on the effectiveness of the proposed measures in reducing effects on designated sites; and
- A requirement for the contractor's drilling method statement to include pollution prevention measures that would be used to minimise the risk of accidental spillage.

Micro-Bored Tunnelling

5.3.53 Boring of an MBT also requires a launch and receiver site. However, an MBT will require an area at the launch site to be prepared to allow excavation of a shaft to the required launch depth constructed by conventional civil engineering excavation techniques. The shaft will be supported by concrete rings to prevent soil slump to

ensure integrity of the tunnel bore. The shaft allows for the installation and launch of the tunnel micro-boring machine. The receiver site at the opposite end of the tunnel trajectory is likely to have a sloped entry point to allow for the installation of the pre-welded and tested pipe string. The MBT head is designed to self-propel from the base of the shaft along a design trajectory surfacing at a specific point on the pre-constructed arrival ramp. The boring machine is likely to be driven by hydraulic fluid from a diesel-powered hydraulic pump system. Drill cuttings from the MBT machine will return along its own internal conveyor via slurry pumps with gravity separation in a slurry pond at the launch location. Separated solid material will be removed by HGVs by road for re-use or disposal at a suitably permitted facility. Liquid wastes (including waste drilling mud) will be removed by tanker and disposed of at a suitability permitted facility.

5.3.54 Upon completion, the MBT drill head will be removed from the tunnel. A pre-welded and tested pipe may be pulled from the exit point across its full length. Once fully installed, works at the shaft end will commence to install a single length of pre-welded and tested pipe between the pipe in the base of the shaft up to ground level. Once the weld is confirmed as good, then works to reinstate the shaft using removed spoil and to restore the land at the exit from the tunnel will be undertaken. Following installation of the pipe strings into the tunnel, the work site will be demobilised, and the tunnel heads capped, with the surrounding land reinstated. The removal of redundant infrastructure may be required to enable construction of a tunnel.

Auger Boring

5.3.55 Auger boring is the process of forming a horizontal bore by jacking steel casing through the earth from a main shaft to a reception shaft. Spoil is removed from inside the casing by means of a rotating auger. These rotating augers carry the spoil back through the casing pipe to the main shaft for removal. An auger boring machine bores through soil or rock with a cutting head attached to the 'lead' auger to install steel casing pipe. The auger will install the new pipeline below the existing pipeline or service.

Hydrogen Pipeline Corridor

5.3.56 Hydrogen will be exported using the proposed Hydrogen Pipeline Corridor, at up to 24" diameter and with a Maximum Operating Pressure (MOP) of up to 49 barg.

5.3.57 Since the preparation of the Preliminary Environmental Information (PEI) Report, further refinement of the Hydrogen Pipeline Corridor options and construction methodologies has been carried out, informed by engineering feasibility work, the outcome of environmental studies and consultation with statutory consultees such as Natural England and the Environment Agency. Further detail on this is presented in Chapter 6: Need, Alternatives and Design Evolution (ES Volume I, EN070009/APP/6.2).

5.3.58 A number of different route options are proposed for the Hydrogen Pipeline Corridors to transport H_2 to various industrial offtakers within the vicinity of the Main Site. A variety of above ground, below ground open trench and trenchless

construction techniques, as well as the repurposing and reuse of existing disused pipeline infrastructure, where practicable, are proposed for the hydrogen pipeline corridor. Each corridor, and the preferred construction methodologies proposed, are presented below with the selection of the specific methodology depending on the sensitivity of the receiving environment as well as the best engineering solution for the construction activity taking place – these are shown on Figure 5-2. For the specific pipeline routeings and descriptions of the proposed Hydrogen Pipeline Corridors, refer to Chapter 4: Proposed Development (Volume I, EN070009/APP/6.2) and the Indicative Hydrogen Distribution Network Plans (EN070009/APP/2.10).

5.3.59 Drilling and stringing operations will be carried out concurrently to reduce the duration of the works and therefore limit environmental impacts. Works in the area of the Pipeline Corridor nearest to the SPA would be scheduled to avoid the most sensitive seasons for nesting and wintering birds. Where it is considered beneficial and practicable acoustic (and potentially visual) barriers would be used for works in the area adjacent to the SPA – this would be confirmed in the Final CEMP(s). To minimise impacts in this area further, pipe stringing the stringing area would be undertaken a minimum of 30 m away from the SPA. The pipe stringing area would be used to fabricate manageable lengths of pipe string.

5.3.60 All buried pipeline work will be carried out by a series of individual crews moving along the pipeline spread sequentially. This process will occur over several weeks, during which each crew will work on a pipeline section and topsoil strip, excavate, lay the pipe, bury the pipe and complete the reinstatement.

5.3.61 Table 5-3 provides a summary of the proposed construction methodologies within the Hydrogen Pipeline Corridor route based on the studies carried out to date.

5.3.62 A single route option to each offtaker has been selected where possible taking into consideration the location of sensitive environmental receptors including but not limited to statutory designated sites within the area. Where possible, the selected route has sought to avoid environmentally sensitive areas and utilise existing established pipeline routes, and/or the least intrusive construction methodologies (e.g. trenchless methods, as opposed to open-cut trench). Further detail on this issue is presented in Chapter 6: Need, Alternatives and Design Evolution (ES Volume I, EN070009/APP/6.2).

Table 5-3: Hydrogen Pipeline Routeing and Construction Methodologies

CONSTRUCTION METHODOLOGY	REQUIREMENT IN RELATION TO HYDROGEN PIPELINE ROUTEING
Open cut trench-buried	Open cut trench is currently being considered as a construction methodology for some sections of the network. Whilst trenchless methods are proposed to avoid sensitive areas, open cut trenching (resulting in buried pipelines) is proposed to be used within less sensitive areas (while considering where appropriate, the environmental impacts of this method and development of

CONSTRUCTION METHODOLOGY	REQUIREMENT IN RELATION TO HYDROGEN PIPELINE ROUTEING
	appropriate mitigation as prescribed by the Framework CEMP (EN070009/APP/5.12)).
Trenchless (HDD/ MBT)	The route of the Hydrogen Pipeline Corridor crosses a number of sensitive receptors and constraints. Trenchless crossings (either HDD / MBT) are proposed for all of the River Tees crossing options, Cowpen Bewley road, Teesworks and Seal Sands, and for the crossing of Greatham Creek. These trenchless crossings will be at a sufficient depth to minimise risks of damage or harm for watercourses, some roads, utilities infrastructure and public railways where there are no existing crossings.
Utilising existing pipeline corridors and other pipeline infrastructure	Utilising existing pipeline corridors and other pipeline infrastructure is currently being considered for various parts of the Hydrogen Pipeline Corridor. It is anticipated that new pipelines will be installed in parallel on existing pipe racking or working to one side of the existing pipelines. Once the hydrogen pipeline crosses the River Tees the pipeline will follow the existing link line corridor through North Tees to Billingham. As discussed above, the design and installation methodology will need to be discussed with existing asset owners and routeing carefully coordinated with other developers who plan to use these corridors, including the possibility of repurposing existing pipelines.

5.3.63 Where optionality is maintained, as a reasonable worst-case, it has been assumed that open-cut methods will be required for the crossings of minor watercourses and drains. In such cases, it is assumed that flow will be temporarily over-pumped, diverted around or flumed through the working area and the watercourse fully reinstated as before.

5.3.64 The extent of the Hydrogen Pipeline Corridor is shown on Figure 4-4: Hydrogen Pipeline Corridor (ES Volume II, EN070009/APP/6.3) and the Indicative Hydrogen Distribution Network Plans (EN070009/APP/2.10).

CO_2 Export Connection Corridor

5.3.65 As outlined in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2), CO_2 captured and compressed after metering will be exported from the Proposed Development to the NEP CO_2 gathering network on the adjacent NZT site via a CO_2 export connection pipeline up to 22" diameter at a MOP of 28 barg.

5.3.66 The CO_2 export connection will be entirely below ground. Due to the short length of CO_2 sections, stringing multiple lengths of pipes may not be feasible, hence the

installation will be one or two pipe lengths at a time. This will necessitate a compact team to perform all installation operations. Hand digging around existing services will be required for this activity.

5.3.67 The CO_2 Export Connection Corridor is shown on Figure 4-3: CO_2 Export Corridor (ES Volume II, EN070009/APP/6.3).

Natural Gas Connection Corridor

5.3.68 As outlined in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2), natural gas will need to be imported to the Hydrogen Production Facility for use in the reforming process. A natural gas pipeline with diameter up to 24" will be constructed which will connect the Hydrogen Production Facility at the Main Site to an existing natural gas pipeline.

5.3.69 The gas connection will be constructed by the EPC Contractor(s), with works coordinated with the National Grid. The construction of the Minimum Offtake Connection (MOC) from the National Grid Above Ground Installation (AGI) will be undertaken by a National Grid approved contractor.

5.3.70 The natural gas connection will be entirely below ground, using construction methods similar to those as described for the Hydrogen Pipeline Corridor above.

5.3.71 The Natural Gas Connection Corridor is shown by Figure 4-5: Natural Gas Connection Corridor (ES Volume II, EN070009/APP/6.3).

Electrical and Telecommunication Connection Corridor

5.3.72 The Proposed Development will connect to a power supply network at a substation, either at STDC or to the NZT electrical substation. The connection between the Proposed Development and the sub-station will comprise high voltage electrical cables and control system cables.

5.3.73 Electrical cables will be routed below ground and installed using an open-cut methodology at a depth of approximately 1.1 m and overlain by suitable protective tiles and warning tape, using excavation and backfilling techniques similar to those as described for the Hydrogen Pipeline Corridor Section.

5.3.74 The Electrical Connection Corridor is shown by Figure 4-6: Electrical Connection Corridor (ES Volume II, EN070009/APP/6.3).

Water and Wastewater Connections Corridor

5.3.75 The Water Connections are described in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2) and Chapter 9: Surface Water, Flood Risk and Water Resources (ES Volume I, EN070009/APP/6.2).

5.3.76 The Water Connections will be routed below ground and installed using an open-cut methodology at a depth of approximately 1.1 m, using excavation and backfilling techniques similar to those as described for the Hydrogen Pipeline Corridor Section.

5.3.77 The Water Connections corridor is shown in Figure 4-7: Water Connections Corridor (ES Volume II, EN070009/APP/6.3).

Other Gases Connection Corridor

5.3.78 As outlined in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2), 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 used to supply the required gases. These connections may be above or below ground or a combination of the two, using construction methods similar to those as described for the Hydrogen Pipeline Corridor Section. As a reasonable worst-case, open-cut methods have been assumed for below ground installation.

5.3.79 The other gas connection corridor is shown by Figure 4-8: Other Gases Connection Corridor (O_2 and N_2) (ES Volume II, EN070009/APP/6.3).

Crossings of Existing Assets

5.3.80 Where possible, the Proposed Development has sought to follow existing linear infrastructure, however, in addition to the watercourse crossings detailed above, the Hydrogen Pipeline Corridor will need to cross existing assets at several locations along the proposed route including buried gas pipelines, overhead lines, roads, railways and ditches. A combination of controls will be imposed on the construction works in these areas such as monitoring, protection, exclusion zones, hand digging/vacuum excavation, and temporary road closures. The design and installation methodology for pipeline crossings will need to be discussed with the relevant asset owners during the next phase of design development. This will be detailed within the Final CEMP(s), produced by the EPC Contractor(s) prior to construction and in accordance with the Framework CEMP submitted as part of this DCO Application.

5.3.81 Table 5-4 lists the special crossings on the Hydrogen Pipeline Corridor. Refer to the Indicative Hydrogen Distribution Network Plans (EN070009/APP/2.10) for details of these crossings.

Table 5-4: Special Crossings on the Hydrogen Pipeline Corridor

CROSSING TYPE	CROSSING NAME	EASTING	NORTHING	CROSSING METHOD	EXISTING/ UPGRADED/ NEW	NOTES
Railway	M-Railway-1	-1.118539	54.612923	Trenchless	New	Culvert Crossing covering both rail and road
River	M-River-1	-1.155201	54.614826	Trenchless	New	River crossing
Minor watercourse	M-Minor watercourse-1	-1.239205	54.607203		New	Crossing over small stream
Minor Road	W-Minor Road-2	-1.120939	54.605172	New culvert	New	New crossing required to reach AGI
Minor Road	W-Minor Road-3	-1.120947	54.605242	New culvert	New	New crossing required to reach AGI
Minor Road	V-Minor Road-1	-1.212492	54.603839	Open cut	New	Cross small dirt track
Minor Road	V-Minor Road-2	-1.212497	54.603488	Open cut	New	Cross small dirt track
Minor Road	V-Minor Road-3	-1.250049	54.616840	Open cut	New	Cross small dirt track
Pipeline	V-Pipeline-1	-1.211126	54.604864	HDD	New	HDD under pipe bridge
Minor Road	V-Minor Road-4	-1.252919	54.618244	HDD	New	HDD under road
Railway	V-Railway-1	-1.211066	54.606692	HDD	New	HDD under railway
Pipeline	V-Pipeline-2	-1.211638	54.609394	Trenchless	New	crossing under buried the Transmission and Distribution Infrastructure Connection Gas pipeline
Pipeline	V-Pipeline-3	-1.212054	54.61098	Trenchless	New	crossing under pipe corridor

CROSSING TYPE	CROSSING NAME	EASTING	NORTHING	CROSSING METHOD	EXISTING/ UPGRADED/ NEW	NOTES
Minor Road	V-Minor Road-5	-1.212796	54.613108	Open cut	New	
Minor watercourse	V-Minor watercourse-1	-1.210079	54.615969	Open cut	New	Stream crossing (required depth check)
Minor Road	V-Minor Road-6	-1.207907	54.615984	Open cut	New	
Minor Road	V-Minor Road-7	-1.206136	54.61599	Open cut	New	
Minor Road	V-Minor Road-8	-1.205943	54.61617	Open cut	New	
Minor Road	V-Minor Road-9	-1.205483	54.618959	Open cut	New	
River	V-River-1	-1.204807	54.622491	Trenchless	Existing	Crossing Greatham creak using existing bridge
Pipeline	V-Pipeline-4	-1.20539	54.625648	Trenchless	New	Crossing buried pipelines
Minor Road	V-Minor Road-10	-1.205932	54.62644	Trenchless	New	
Minor road	G-Minor road -1	-1.241353	54.608363	Trenchless	New	
Pipeline	G-Pipeline-1	-1.241583	54.608497	Trenchless	New	
Minor watercourse	G-Minor watercourse-1	-1.245653	54.610702	Open cut	New	Stream crossing (required depth check)
Minor Road	G-Minor Road-2	-1.248444	54.613869	Open cut	New	Minor track
Minor Road	G-Minor Road-3	-1.251092	54.616735	Open cut	New	Minor track

CROSSING TYPE	CROSSING NAME	EASTING	NORTHING	CROSSING METHOD	EXISTING/ UPGRADED/ NEW	NOTES
Minor Road	G-Minor Road-4	-1.254776	54.617444	Open cut	New	Minor track
Railway	G-railway-1	-1.258667	54.61752	Trenchless	New	HDD crossing for public railway

5.3.82 There are no special crossings on the CO_2 Export Connection Corridor, Natural Gas Connection Corridor, Electrical Connection Corridor, Water and Wastewater Connections, and the Other Gases Connection Corridor.

Construction Staff

5.3.83 The construction labour resource requirements for the Proposed Development is expected to peak at between 800 and 1,300. This includes workers associated with both the Main Site and Connection Corridors. Refer to Chapter 15: Traffic and Transport and Chapter 18: Socio-economics and Land Use (ES Volume I, EN070009/APP/6.2) for further details.

5.3.84 Construction staff are anticipated to travel to the Proposed Development Site using the existing trunk road and local road networks. The Applicant will seek to maximise sustainable transport options such as public transport (including rail), cycling and car sharing in accordance with the National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023). This is outlined within Framework Construction Workers Travel Plan (EN070009/APP/5.15). Further details regarding the approach to the Construction Worker Travel Plan, and the assumptions about worker travel routes is presented in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

Site Access

5.3.85 As outlined in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2), the Main Site will be accessed from the A1085 Trunk Road, a dual carriageway road running north-east to south-west between Redcar and the A1053 Tees Dock Road. 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' network.

5.3.86 Access routes to the Hydrogen Pipeline Corridor network north of the River Tees are assumed via the A1046 Haverton Hill Road/Port Clarence Road and the B1275, with temporary construction compounds access points proposed off the A178 Seaton Carew Road, A1185, Nelson Avenue, Cowpen Bewley Road and the unnamed road to Seal Sands (commonly known as Seal Sands Road). Access routes to the Main Site and Connection Corridors south of the River Tees are assumed to be via the A1085 Trunk Road 'Steel House Gate' roundabout.

5.3.87 It is assumed that all construction HGVs associated with the Main Site will arrive/depart the Proposed Development Site either from Tees Dock Road via the A1053/A66/Tees Dock Road roundabout and then a private road to the Main Site, or alternatively from A1085 Trunk Road via the Lackenby Steelworks entrance and then using the internal STDC road network to the Main Site. At the junction with the A1053/A66/Tees Dock Road, it is assumed that 50% will head west on the A66 and 50% will head south on the A1053 then west on the A174. Alternatively, HGV traffic could access the A1085 Trunk Road from the Lackenby Steelworks entrance (accessed from the Main Site via the internal STDC road network) from where traffic could route via the A66 or A1053 as above. For further details regarding access and

assessment assumptions, refer to Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

5.3.88 The existing tie in points to highways / private roads included in the DCO boundary will be used to access the Hydrogen Pipeline Corridor and the Connection Corridors. Those will be identified at suitable locations along the pipeline routes located north of the River Tees to ensure that disturbance is kept to a minimum for temporary construction compounds, including stockpiling, welfare facilities and parking.

5.3.89 The transportation of AILs during the construction of the Hydrogen Production Facility may utilise Lift on Lift off (Geared Vessels), Barges, Roll on Roll off, and Coastal Vessels. Several transportation options for AILs during construction are available through local ports. The locations for equipment vendors and fabrication yards for AILs have not been identified yet but may potentially be a combination of overseas or UK suppliers. AIL movements will be facilitated through local ports. The nearest commercial port to the Proposed Development Site is Teesport, which can only be used for the import of containerised equipment or small modular plant due to height restrictions. Use of modular plant will minimise the number of HGV movements required for their transportation. The use of the existing wharf at RBT for the transportation of AILs will be considered for modular plant.

5.3.90 The Applicant is also exploring the use of railways for the import of materials to the Main Site and associated connection corridors. The potential for reopening the mothballed Redcar British Steel railway station on the Tees Valley Line for construction worker access is under consideration by the landowner which could then potentially be used for the Proposed Development.

Construction Traffic Management

5.3.91 Where temporary traffic signals or similar are required to facilitate the safe movement of construction vehicles, such as access to temporary construction compounds and construction vehicle crossing points, they will be locally controlled to ensure that traffic on the local road network has priority in terms of traffic movements. In addition, when the temporary traffic signals are not required operationally, they will be turned off. The Applicant's proposals in this regard are set out on the Traffic Regulations Measures Plans (EN070009/APP/2.13).

Personnel Movements to Main Site and Temporary Construction Compounds

5.3.92 The labour resource requirements generate a significant demand for personnel movements to Site. To get people to the Main Site and temporary construction compounds whilst minimising congestion at the Site entrance during peak times, a combination of the following measures may be selected by the EPC contractor(s):

- Using STDC's proposed park and ride;
- shuttle buses;
- contractor's minibuses;
- car share incentives;
- Redcar British Steel train station (if re-opened);

- staggered start times and shift patterns; and
- capacity improvements at the site entrance such as additional security checkpoints and technology (e.g. Automatic Number Plate Recognition (ANPR) and automatic vehicle barriers for pre-authorised movements).

5.3.93 These measures will be used to limit the number of vehicles arriving at the Steel House Gate entrance, accessed off the Trunk Road roundabout, during the morning (06:00 and 09:00) and evening peaks (17:00 and 20:00) to prevent vehicles from backing up onto the Trunk Road roundabout. Mitigation measures will be incorporated into the Final Construction Workers Travel Plan (Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2)), which sets out the assumptions that have underpinned the assessment in this ES in respect of these movements.

HGV Movements to Main Site

5.3.94 A suitable delivery booking system will be used to ensure materials and plant movements are planned to avoid peak times where practicable. The performance of these measures will be monitored. Further details will be provided in the Final Construction Traffic Management Plan (CTMP), explained in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

5.3.95 The forecast HGV movements have been assessed based on the assumption that deliveries of materials and plant are made by road to reflect a reasonable worst-case scenario and maintain flexibility in the Applicant's approach to delivery.

5.3.96 For AILs it is anticipated that these will be delivered by ship to the RBT and transported on private roads to the Main Site. It is envisaged that up to 40 AILs may be required over the duration of the construction period.

All Construction Vehicle Movements for Hydrogen Pipeline Corridor

5.3.97 Vehicle movements associated with the hydrogen pipeline have been divided amongst the temporary pipeline construction compounds by South and North of the River Tees based upon the relative links of the pipelines served to reflect the extents of the pipelines scope, Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2) sets out the assumptions made in this ES in this regard.

Volume of Construction Vehicles

5.3.98 For construction personnel, daily staff numbers are anticipated to be approximately 1,300 for Phase 1, and a similar number for Phase 2 during the peak months of construction. A worst-case of 1,300 two-way vehicle movements per day (650 arriving and 650 departing) during the peak construction period, based upon an average car occupancy for workers of two has been assumed for the purposes of this assessment, although the alternative options for personnel movement described above will be explored.

5.3.99 During the peak month, the volume of construction HGVs on the network is predicted to be 2,210. This equates to 111 per day (rounded from 110.5) based on 20 working days per month.

Construction Traffic Management Plan and Travel Plan

5.3.100 The principal vehicle movements associated with the Proposed Development construction phase will be managed in accordance with the Contractor's CTMP. A Framework CTMP is included at Appendix 15C (ES Volume III, EN070009/APP/6.4) – this will be implemented in order to control the impact of HGVs on the local road network during the Proposed Development construction phase.

5.3.101 For further details on construction traffic are provided in Chapter 15: Traffic and Transport (ES Volume I, EN070009/APP/6.2).

Construction Working Hours

5.3.102 The working hours at the temporary construction compounds depend on the construction activities. Core construction working hours must not take place outside the hours of 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturday, plus, up to one hour before and / or after for mobilisation (start-up and close down) procedures, this is secured via a Requirement of the draft DCO.

5.3.103 A mobilisation period (i.e. the period up to one hour after and / or before the standard hours) is required in relation to daily start-up and close down procedures, including the following:

- deliveries and unloading;
- workforce movement to place of work;
- site briefings;
- inspections, refuelling and maintenance; and
- general preparation and housekeeping works.

5.3.104 During the mobilisation period, activities will not include operation of plant or machinery and will be limited to activities that do not cause a disturbance to local residents, schools, businesses or other sensitive environmental receptors identified in the EIA.

5.3.105 In line with existing RBT operational constraints, materials movements from ships docked at RBT facilities to the adjacent temporary construction compound area will be tidally dependent.

5.3.106 Extended working hours for repair and maintenance (where required) on Sundays will be able to take place from 08:00 to 17:00. Repair and maintenance activities will comprise general mechanical maintenance to construction machinery and plant, cranes, excavators, compressors, grouting equipment and dewatering pumps.

5.3.107 These core working hours will apply to all works authorised under the DCO except in specific circumstances where it is likely that some construction activities will require 24-hour working at certain times. The list of activities proposed for 24-hour working is set out in the Framework CEMP (EN070009/APP/5.12).

5.3.108 Chapter 11: Noise and Vibration (ES Volume I, EN070009/APP/6.2) and Framework CEMP (EN070009/APP/5.12) sets out specific mitigation and control measures

required in order to prevent disturbance from such night-time construction activities.

Storage of Construction Plant and Materials

5.3.109 There will be temporary construction compound areas with temporary surfaces positioned close to access roads on the Proposed Development Site (mainly in the vicinity of the Main Site) where materials will be unloaded and then transported to the area of works. It is not envisaged that these will be used for long term storage of materials (materials will be stored for six months or less). At the end of each shift, small mobile plant will be returned to a secure overnight plant storage area where drip trays will be utilised under the various types of plant, if required.

5.3.110 Storage areas for flammable/toxic corrosive materials will be in a separate, locked, bunded and fenced off areas. Material data sheets will be available for all these materials and the Control of Substances Hazardous to Health (COSHH) assessments kept within the relevant risk assessment for the task.

5.3.111 Although options to utilise existing site power are also being explored, temporary generators are likely to be required during construction, with mobile generators being used along the construction corridors.

Lighting

5.3.112 Construction temporary site lighting is proposed to enable safe working on the construction site in hours of darkness. Construction lighting will be designed so as not to cause a nuisance outside of the Proposed Development Site in relation to views from residential receptors or light disturbance to ecological receptors. An Indicative Lighting Strategy (Construction) (EN070009/APP/5.12) has been prepared for temporary working in sensitive areas to the north of the River Tees which are close to the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI) and the Teesmouth and Cleveland Coast SPA/Ramsar site. The final construction lighting design will form part of the Final CEMP(s), secured by a Requirement to the DCO.

Wheel Wash Facilities

5.3.113 Self-contained wheel washes will be installed and used by HGVs prior to exiting the Proposed Development Site and prior to them joining the public highway. For loads unable to use the fixed wheel wash, a localised wheel washing facility will be set up to cater for these, to minimise effects on the local highway network.

Water Management

5.3.114 Wastewater generated from the temporary construction compound would be discharged to the existing sewer system, subject to the agreements with the utility providers, or in locations where a sewer connection is not reasonably practicable, wastewater will be collected and taken off site by tankers for disposal at a permitted waste treatment facility. The discharge of trade effluent from welfare facilities would be controlled in accordance with a suitable Trade Effluent Consent under the Water Industry Act 1991.

5.3.115 Where appropriate, the surface material of temporary construction compound areas would be permeable to allow rainwater to percolate to ground, with suitably bunded areas identified for the storage of any hazardous materials to prevent the risk of pollution.

5.3.116 Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and then tankered offsite and would be subject to treatment prior to discharge. The drainage systems would incorporate pollution control systems designed in line with the Control of Water Pollution from Construction Sites – Guidance for consultants and contractors C532 (CIRIA, 2001) as agreed in Final CEMP(s). Surface watercourses and waterbodies near worksites would be regularly inspected for signs of siltation or other forms of pollution in line with CIRIA Environmental Good Practice on Site Guide C741 (CIRIA, 2015) and pumped groundwater, process effluents and construction site runoff would be tested to ensure compliance with discharge consent requirements. Requirements for managing potentially contaminated run-off are included in Framework CEMP (EN070009/APP/5.12).

5.3.117 Rainfall runoff from areas of low contamination risk will be captured and reused where reasonably practicable to reduce consumptive water use (e.g. to supply wheel wash facilities or for dust suppression).

Framework Construction Environmental Management Plan (CEMP)

5.3.118 Framework CEMP (EN070009/APP/5.12) sets out the key measures to be employed during the Proposed Development construction phase to control and minimise impacts on the environment. This includes standard industry best practice measures, and specific measures as set out elsewhere within this ES.

5.3.119 The purpose of the Framework CEMP (EN070009/APP/5.12) is to:

- ensure nuisance levels as a result of construction activities are kept to a minimum;
- comply with regulatory requirements and environmental commitments set out in this ES; and
- ensure procedures are put into place to minimise environmental effects during construction.

5.3.120 A PPW and Final CEMP(s) will be prepared by the EPC Contractor(s) in accordance with the Framework CEMP (EN070009/APP/5.12) prior to construction, as based upon the Framework CEMP. The PPW CEMP will cover PPW planned to commence prior to the start of the main Phase 1 construction works. The Final CEMP(s) will cover both Phase 1 and Phase 2 of construction and will be updated for Phase 2 as required. The submission, approval and implementation of the PPW CEMP and Final CEMP(s) will be secured by a Requirement of the draft DCO. The Applicant will require that the EPC Contractor(s) maintains the Final CEMP(s) to appropriately control site activities to minimise impacts on the environment.

5.3.121 To manage and monitor waste generated during Proposed Development construction, a Framework SWMP has been developed as part of the Framework

CEMP (EN070009/APP/5.12). This will allow for waste streams to be estimated and monitored. The Framework SWMP will require that the construction contractor segregates waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from the Proposed Development Site will be undertaken by fully licensed waste carriers and taken to permitted waste facilities. Refer to Chapter 21: Materials and Waste Management (ES Volume I, EN070009/APP/6.2) for further details.

Commissioning

5.3.122 Commissioning of the Proposed Development will include testing of the process equipment and pipework. A Commissioning Plan will be required to be agreed with the Environment Agency under the Environmental Permit, which will specify monitoring and control procedures to be used and set out a schedule of commissioning activities. Phase 1 commissioning is programmed for Q1 2028, whilst that for Phase 2 is programmed for Q4 2030 (as shown in Table 5-1).

5.4 Summary

5.4.1 The proposed construction methodologies are subject to ongoing design work, discussions with landowners and statutory consultees, and informed by environmental sensitive receptors and constraints and surveys. The construction methodologies to be utilised during construction of the Proposed Development will be confirmed during the detailed design stage. For environmental assessment purposes, a worst-case has been evaluated, based on the Rochdale Envelope and the methodologies outlined in this chapter, and is presented in each technical chapter of this ES.

5.5 References

- CIRIA (2001). *Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532).*
- CIRIA (2015). *Environmental Good Practice on Site Guide (fourth edition) (C741).*
- Environment Agency (2001). *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.*
- HM Government (1991). *Water Resources Act 1991.*
- HM Government (2015). *The Construction (Design and Management) Regulations 2015.*
- HM Government (2016). The Environmental Permitting (England and Wales) Regulations 2016.
- The Planning Inspectorate (2018). *Advice Note 9: Rochdale Envelope.*