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TABLES

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. This includes information on the anticipated construction programme, timings and methods of working, where available. References to 'Work No.' are to the corresponding work numbers in Schedule 1 of the draft Development Consent Order (DCO) (**Application Document Ref 2.1**) – and the location of each Work No. within the Proposed Development Site is shown on the Works Plans (**Application Document Ref. No. 4.3**).

5.1.2 At this stage, a detailed construction programme is not available, as this is normally determined by the Engineering, Procurement and Construction (EPC) contractor who has not yet been appointed. Where construction details cannot be confirmed at this stage, reasonable worst-case estimates have been made based on experience gained on similar developments and professional judgment.

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

5.2 Construction Timing and Programme

5.2.1 As described in **Chapter 4**: The Proposed Development (ES Volume I – **Application Document Ref. 6.2**) construction of the Proposed Development could (subject to the necessary consents being granted and an investment decision being made) potentially start shortly after Quarter 4 2022 when it is anticipated the consent would be granted.

5.2.2 The Applicant would appoint one or more EPC contractors for the construction of the combined cycle gas turbine (CCGT) and carbon capture plant (CCP) (**Work No 1**). Additional contractors are likely to be appointed to undertake the proposed minor highway works (**Work No. 8A**). An early works phase, including the A18 carriageway improvements and Mabey Bridge replacement, would be undertaken over a circa 6 month period. Construction activities for the main works phase would follow and are expected to be completed within approximately three years, followed by commissioning. Table 5.1 shows an indicative construction and commissioning programme.

Table 5.1: Indicative construction and commissioning programme

	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Early Works including A18 and Mabey Bridge Replacement	■	■														
Site Enabling and Preparation	■	■	■	■												
Groundworks			■	■	■	■	■									
Erection of main process equipment						■	■	■	■	■	■	■				
Gas and electrical connection						■	■	■	■							
Electrical and mechanical connections									■	■	■	■	■	■		
Above ground civil works						■	■	■	■	■	■	■	■	■	■	■
Commissioning and testing														■	■	■

5.2.3 It is common for much of the groundwork, for example piling and pouring of concrete slabs, to be completed prior to the erection of any above ground permanent structures. The completion of buildings 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 appointed EPC contractor(s) and may vary dependent on plant layout and procurement of key equipment. The indicative 4-year programme including commissioning is considered robust.

5.2.4 The Low-Carbon Gas Power Station (**Work No. 1**) is located on part of the Proposed Development Site which is currently temporarily being used for soil storage during construction of the Keadby 2 Power Station. The removal of this material does not form part of this Application. Rather, it will be undertaken[1] prior to construction of the Proposed Development. This ES assesses the likely

[1] An application was made in June 2020 to North Lincolnshire Council (NLC) (PA/2020/952) to enable movement of material stored temporarily on the Proposed PCC Site – details are provided in **Chapter 19**: Cumulative and Combined Effects in ES Volume I – **Application Document Ref. 6.2**.

significant environmental effects of construction, assuming that this site clearance has already been completed.

5.2.5 Due to uncertainties in the market and Government investment decisions in carbon capture and storage (CCS), it is proposed that the DCO Application would be made on the basis that commencement of development can take place for up to seven years from the granting of consent. For this reason, a scenario whereby construction commences later in the programme, up to 2029 (seven years after the DCO could be granted) has also been considered as a reasonable worst-case for some technical assessments.

5.3 Construction Approach

5.3.1 During the detailed design stage, the approach to construction will be defined. For the purposes of this ES, it is assumed that certain equipment will be modularised and pre-fabricated/ assembled. Modularised units, along with large specialist equipment are likely to require special transport considerations. Off-site pre-fabrication will be supplemented by on-site construction of certain larger components which due to their size or weight, may involve fabrication and erection on-site.

5.3.2 Small components and modules will be transported using the existing road network with more significant modules being transported by ship along the River Trent to the Waterborne Transport Offloading Facility – Railway Wharf (**Work 10B**) where they will be unloaded by temporary mobile cranes onto suitable haulage vehicles and transported into the Proposed PCC Site using the Additional Abnormal Indivisible Load (AIL) Route (**Work 10A**). Where the access routes from the quayside at Railway Wharf are unsuitable for some of the larger modularised units e.g. stripper column, there is a possibility that these can be brought into the Proposed Development Site from the west or otherwise these units would be constructed on-site.

5.3.3 Construction traffic and road haulage will be achieved along designated transport routes as outlined within the Framework Construction Traffic Management Plan (CTMP) (**Application Document Reference 7.2**). The Final CTMP will be prepared by the EPC Contractor(s) in accordance with the Framework CTMP and secured through a requirement of the Draft DCO (**Application Document Ref. 2.1**).

5.3.4 A Construction Environmental Management Plan (CEMP) will be prepared by the EPC Contractor(s) prior to construction. The submission, approval and implementation of this will be secured through a requirement of the draft DCO (**Application Document Ref. 2.1**). A Framework CEMP (**Application Document Ref. 7.1**), accompanies the DCO application and sets out the key measures to be employed to control and minimise the impacts on the environment. The Final CEMP will be prepared by the EPC Contractor(s) in accordance with the Framework CEMP.

5.4 Construction Methods

Construction Equipment

5.4.1 For the purposes of this ES (and in particular for the noise and vibration assessment presented in **Chapter 9**: Noise and Vibration (ES Volume I - **Application Document Ref. 6.2**), reasonable worst-case estimates have been made of the types and numbers of plant and machinery likely to be used at the Proposed Development Site during the construction period, as well as the potential use of piling for foundations of the main structures and works to install a cofferdam required in the Water Connection Corridor (either for the Canal Water Abstraction Option (**Work 4A**) or River Water Abstraction Option (**Work 4B**).

Early Works including A18, Mabey Bridge Replacement and Emergency Access

5.4.2 Early works will include the widening of the A18 and the replacement of Mabey Bridge (**Work 8A**) to provide the permanent access into the Proposed Development Site. Prior to the works to widen the northern carriageway of the A18 commencing, utility diversions/ protection will take place, where required. Initial site clearance will be undertaken including vegetation clearance and removal of road furniture and existing vehicle restraint systems. Following this, works off the main carriageway will be undertaken including the installation of new kerbs/ gullies, build-up of capping, sub-base and the installation of new vehicle restraint systems.

5.4.3 Whilst these works are ongoing, Mabey Bridge will be replaced. Temporary traffic management will be put in place so that the skew access off the A18 continues to provide a means of access to the Proposed Development Site during the Mabey Bridge closure. Piling works using continuous flight auger methods are likely to take place for the new bridge and the existing deck removed before the main new structure is constructed and installed. Both the A18 carriageway and Mabey Bridge will then be re-graded and re-surfaced, where required.

5.4.4 For the proposed emergency access bridge from the Proposed PCC Site, initial site clearance will be undertaken including vegetation clearance. The channel beneath the proposed bridge crossing would be lined to prevent vegetation growth as this area will no longer be accessible to machinery. It is not envisaged that any temporary traffic management would be required given the existing infrequent use of the farm track. Piling works, if required, would then take place before the main structure of the bridge is constructed. The section of the existing access road affected by bridge construction would then be re-graded and surfaced.

5.4.5 Works would require consent of the internal drainage board (IDB) – the Isle of Axholme and North Nottinghamshire Water Level Management Board

(IoAaNNWLMB) which has been consulted on the works and has confirmed their agreement in principle to a crossing, which takes into account relevant bylaws (Lindsey Marsh Drainage Board, 2018).

Site Enabling and Preparation

5.4.6 The first construction activities for the main works phase will be the initial civil earthworks, including the clearing of unsuitable soil and reprofiling with clean infill (where required). As far as reasonably practicable, a material cut and fill balance would be used to minimise waste arisings. However, given the anticipated ground conditions (which would be confirmed in a ground investigation, secured by a requirement of the draft DCO – **Application Document Ref. 2.1**), it is anticipated that some import/ export of materials will also be necessary to provide a suitable foundation platform for the Proposed Development Site.

5.4.7 An estimate of soil movements has been undertaken in order to ensure that the assessments made in technical chapters of this ES (e.g. **Chapter 10**: Traffic and Transport (ES Volume I – **Application Document Ref. 6.2**)) consider a reasonable worst-case. It is anticipated that up to 65,000m^3 of soils may need to be removed and up to 130,000m^3 of soils imported to provide a suitable platform for foundations and buildings/ equipment across the Proposed PCC Site. These materials would be removed from/ delivered to the Proposed Development Site via HGV using the access from the A18. It is envisaged that the material movement would take place over a two month period – see **Chapter 10**: Traffic and Transport (ES Volume I – **Application Document Ref. 6.2**).

5.4.8 Any excess spoil generated during construction will be managed through the Site Waste Management Plan (SWMP) that would form part of the final CEMP. Spoil which cannot be re-used will be removed from site for re-use, treatment or disposal at a permitted facility. The re-use of excavated materials during construction will be governed by either a Materials Management Plan developed in accordance with relevant guidance including 'The Definition of Waste: Development Industry Code of Practice' (CL:AIRE, 2011), an environmental permit or a relevant exemption.

5.4.9 Where necessary, suitable measures will be put in place to prevent sediment being washed off-site, and the stockpiles will be visually monitored for wash away during and after periods of prolonged rainfall. Further details of the measures which would be implemented to control earthworks are included in the Framework CEMP (**Application Document Ref. 7.1**).

5.4.10 Appropriate measures to minimise short-term and long-term impacts on land drainage will be agreed with the relevant landowner for those works affecting drains within the temporary construction and laydown areas (**Work No. 9A**). Where land drains are under the control of the IDB, relevant bylaws will be adhered to or consent obtained for works affecting/ crossing drains within the

Electrical Connection to the Northern Powergrid 132kV Substation (**Work No. 3A**), Water Discharge Corridor (**Work No. 5**) and emergency vehicle access route (**Work No. 8B**). These measures will be secured in the Final CEMP.

5.4.11 Additionally, the Final CEMP will incorporate measures to prevent an increase in flood risk or pollution risk during the construction works. An indication of measures is provided in the Framework CEMP (**Application Document Ref. 7.1**) that accompanies the Application.

Construction Laydown Areas and Welfare Facilities

5.4.12 Proposed laydown areas required during construction, including equipment and material storage, site offices, batch concrete facilities, welfare facilities and car parking, environmental/ waste handling area and vehicle wheel wash area will be located at identified locations within the Proposed Development Site boundary dependent on the appointed EPC contractor's working methods. Laydown areas will be required for the duration of construction, in particular areas of the Proposed Development Site set out in the construction programme (**Plate 5-1**).

5.4.13 Laydown requirements have been estimated using conservative assumptions to ensure that the areas assessed in this ES represent a worst-case. Up to 20.7ha of construction laydown is required for materials and plant storage and laydown areas; field based fabrication and erection of components on-site, siting of concrete batching facilities; vehicle and cycle parking facilities and for works to the A18 junction, including Mabey Bridge replacement. This includes areas for construction offices, contractor parking and construction staff welfare facilities. The proposed location of laydown areas is identified on **Figure 3.3** whilst **Figure 5-1** (ES Volume III - **Application Document Ref. 6.4**) provides an indication of how these areas may be used and restored/ enhanced.

5.4.14 Where required, laydown areas would be levelled to provide an even surface and underlain by semi-permeable surfacing, to allow surface water and rainwater to percolate through. No hazardous materials would be stored unbunded within the construction laydown areas. All construction laydown areas would be secured by security fencing and gates as appropriate.

5.4.15 Impacts relating to the handling, movement and temporary storage of soils, including those agricultural soils classified as 'best and most versatile – Agricultural Land Classification (ALC) Grade 1' that will be disturbed for temporary laydown, will be controlled through the Final CEMP. Measures within the Final CEMP would include:

- a pre-construction condition survey of laydown areas within Area 2 (ALC Grade 1) including soil depths and textures of soil horizons;
- a method statement for the works to include soil handling and storage proposals;

- a restoration specification; and
- a post-works survey to confirm condition.

5.4.16 All soils will be managed in accordance with the Defra Construction Code of Practice for the Sustainable Use of Soil on Development Sites (Defra, 2009) to minimise impacts on soil structure and quality. A Framework Soil Resources Plan is provided in the Framework CEMP (**Application Document Ref. 7.1**).

5.4.17 Following site establishment, ground clearance and installation of underground utilities, foundation formation, rebar, and concrete placement activities would commence. Pre-cast concrete items will be used as far as reasonably practicable. Where cast in-situ concrete is required, ready-mix concrete from trucks as direct pours or concrete pumps may be utilised. A temporary concrete batching plant may also be required.

5.4.18 If water is encountered during below ground construction, suitable de-watering methods will be used. Any significant groundwater dewatering required will be undertaken in line with the requirements of the Environment Agency under the Water Resources Act 1991 as amended (HMSO, 1991) and Environmental Permitting (England and Wales) Regulations 2016 (HMSO, 2016).

5.4.19 All works will comply with the safety clearances and requirements set out by the utility providers who have assets within the Proposed Development Site.

Main Civil and Process Works

5.4.20 The contractor will prepare and level the site of the Low Carbon Gas Power Station (**Work No. 1**), followed by piling and excavation for main foundations for some of the larger elements of the Proposed Development e.g. turbine halls, Heat Recovery Steam Generator (HRSG), the compressors, the absorber, carbon dioxide scrubber and direct contact cooler columns, as well as large buildings.

5.4.21 It is anticipated that bored piles to a depth of approximately 20m into rockhead may be required for heavily loaded/ movement sensitive structures such as the absorber(s) and regenerator, the CCGT stack, the HRSG building, turbine hall and compression facilities. Lightly loaded structures/ less critical plant are likely to be founded on shallow raft foundations, although this is subject to the result of the proposed ground investigation secured by a requirement of the draft DCO (**Application Document Ref. 2.1**).

5.4.22 A piling and penetrative foundation design method statement, informed by a risk assessment would be undertaken in accordance with Environment Agency guidance (2001). This would be secured by a Requirement of the draft DCO and submitted to the local authority for approval, in consultation with the Environment Agency. All piling and penetrative foundation works would be carried out in accordance with the approved method statement to prevent contamination of the underlying soils and groundwater.

5.4.23 A Piling Methodology will be prepared. As set out in **Chapter 8**: Noise and Vibration and **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**), the piling method will be designed to minimise the risk of disturbance to fish or other noise sensitive human and ecological receptors as far as reasonably practicable. The piling methodology is proposed to be secured under a Requirement of the draft DCO.

5.4.24 The principal items of plant will be modular and delivered by ship to the waterborne transport offloading facility (**Work No. 10B**). The exact number and size/ weight is not known at this stage and is based on specific construction methodologies that will be confirmed during front end engineering design (FEED). However, around 35 - 40 such deliveries are expected over a 12 month period. The components will then be lifted using a mobile crane onto a hauled trailer and transported to the Proposed PCC Site along the existing temporary haulage route (**Work No. 10A** – Additional Abnormal Indivisible Load Route) for assembly. Building erection and plant installation will be carried out as concurrent activities, noting that not all buildings will be erected prior to the commencement of plant installation. Large plant may be first placed on foundations with steelwork erected around it.

5.4.25 Plant and equipment will be pre-fabricated where practicable, however, it is anticipated that larger equipment may need to be fabricated and erected on-site due to its anticipated size. The main items that could require special consideration due to their size or weight comprise:

- flue gas blowers;
- direct contact cooler (DCC);
- absorber column(s);
- stripper column and drum;
- carbon dioxide compressor and drying package;
- storage tanks;
- flue gas dampers; and
- major transformers and associated electrical equipment.

5.4.26 It is unlikely that buildings will be prefabricated and so will require construction on-site.

Construction of Gas Connection and Above Ground Installation

5.4.27 A new natural gas connection (**Work No. 2**) would link into Keadby Power Station's existing natural gas supply infrastructure. 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. The construction of the MOC will require stripping and storing soil/ made ground and excavation to approximately 1m below the depth of the existing gas main

along a length of approximately 12m (6m either side of the connection point). The gas connection is shown on the Indicative Gas Supply Pipeline Connection Plans (**Application Document Ref. 4.11**).

5.4.28 A concrete pad and supports for the existing gas main either side of the connection point will then be installed together with a new 'tee' piece and construction valve. The existing gas main will then be drilled using specialist pressure drilling equipment (whilst the gas main is in operation) and the construction valve will be closed until the new connection pipeline is completed.

5.4.29 The construction of the contractor's compound adjacent to the AGI will require excavation of a trench up to the interface with the AGI compound to allow installation of a swan neck to bring the pipework above ground for the Applicant's compound, and installation of valves and pipework, the Pipeline Inspection Gauge (PIG) trap, and electrical and telemetry equipment. Following installation of below ground infrastructure, the area will be backfilled, and excess soils will be used in the landscaping of the compound perimeter. The AGI is shown on the Indicative Gas Above Ground Installation Plans (**Application Document Ref. 4.12**).

5.4.30 The gas pipeline connecting the AGI to the Low Carbon Gas Power Station may run above ground on sleepers or alternatively, will be constructed using an open-cut method. If below ground construction is proposed, these works will generally be as follows:

- fencing off works area and fit safety signage;
- stripping and storing of topsoil;
- facilitating a working area of around 36m wide to allow for temporary trackway, welding and soils storage;
- excavation of a trench;
- pipe laid (welding pipe sections together at grade level (pipe stringing), within approximately 1.2m below ground level; and
- testing the pipe integrity, re-instating land drainage, and then backfilling subsoil, reinstating topsoil and re-planting to the original state as required.

Construction of Water Supply Connections

5.4.31 Two main options are being considered for the raw water supply connections for the Proposed Development cooling tower and boiler make-up:

- the preferred option for supply is via a new intake to be construction within the Stainforth and Keadby Canal (Canal Water Abstraction Option - **Work 4A**); or alternatively
- river water may be abstracted from the River Trent using the existing Keadby 1 Power Station infrastructure (River Water Abstraction Option -

Work 4B). This abstraction point would need upgrading to meet current legislative requirements including The Eels (England and Wales) Regulations 2009 ('Eels Regulations').

5.4.32 The preferred cooling water abstraction from the Stainforth and Keadby Canal is the subject of ongoing technical evaluation including engagement with the Environment Agency and Canal and River Trust.

5.4.33 Should the preferred Canal Water Abstraction Option be selected, at the cooling water abstraction point, a temporary cofferdam would be installed within the canal in order to allow installation of a new abstraction structure to safely take place adjacent to the existing Keadby 2 Power Station abstraction structure. The construction methods and programme are anticipated to be comparable to the recently constructed intake for Keadby 2 Power Station (circa 3 months) and would include:

- pre-works survey(s) along the Stainforth and Keadby Canal wall;
- the installation of a temporary cofferdam (up to circa 10m into the canal) using sheet piling techniques to provide a safe, dry and stable working area;
- the construction of appropriate hazard warning, screening, lighting and signage, as required;
- the installation of screening to mitigate impacts on aquatic ecology, including reducing the risk of fish entrapment and to comply with the Eels Regulations;
- removal of the cofferdam;
- completion of post-construction surveys, as required; and
- the presence of vessels such as work boat(s) and/or barge(s) to support the works.

5.4.34 The installation and subsequent removal of the temporary cofferdam for the Proposed Canal Water Abstraction Option will be completed in accordance with the requirements of the relevant regulators.

5.4.35 Additional measures to minimise environmental impacts at the Canal Water Abstraction Option intake would include:

- adoption of the Joint Nature Conservation Commission (JNCC) best-practice measures for piling including the implementation of a soft-start process; and
- avoidance of night-time piling.

5.4.36 No seasonal restrictions are proposed in relation to installation or removal of the cofferdam within the Stainforth and Keadby Canal given that the only migratory fish species likely to use the canal is European eel. **Chapter 11**:

Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**) concludes that seasonal restrictions are not required for this species.

5.4.37 Should this option not be feasible, the River Water Abstraction Option would be used. The existing pipework and associated infrastructure in the river (in use for Keadby 1 Power Station) is likely to need to be upgraded, due to its age and condition and to enable compliance with the Eels Regulations. Potential refurbishment activities assessed include:

- boat or shore-led pre-works survey(s) along the River Trent, including diving operations where required;
- the installation of a cofferdam (which may extend into the River up to 22m) within the River Trent to provide a safe, dry and stable working area It is assumed for the purposes of the assessments presented in **Chapter 9**: Noise and Vibration, **Chapter 11**: Biodiversity and Nature Conservation and **Chapter 12**: Water Environment and Flood Risk (ES Volume I – **Application Document Ref. 6.2**) that a single-wall sheet piled cofferdam of approximately 100m or less would be installed using vibratory and, where necessary, impact piling;
- isolation of the existing cooling water system intake and insertion of stop gates to ensure a safe working area;
- manual removal of silt and marine growth which may have accumulated within the forebay/ surge pit;
- removal, replacement and installation of screening, as required, to mitigate impacts on aquatic ecology, including reducing the risk of fish entrapment and to comply with the Eels Regulations;
- general repair, upgrades and re-purposing of the existing intake structure (including gantry system, concrete supports, hazard dolphins as well as any lighting and marking required);
- re-commissioning of the cooling water system, including flushing and testing;
- completion of post-construction surveys, as required;
- the removal of the cofferdam; and
- the presence of vessels such as work boat(s) and/or barge(s) to support the refurbishment process.

5.4.38 It is anticipated that the cofferdam will be required for two separate periods, with an intervening gap. The first circa three-month period will comprise inspections, measurements and cleaning of the existing structure to inform the detailed design of works required to upgrade or reconstruct the existing infrastructure. The installation would take place during the second period which it is envisaged may be up to circa five months. A two-stage cofferdam installation would reduce the duration of the cofferdam being present in the

water, and consequently, reduce potential ecological and hydrodynamic/ erosion/ scour impacts.

5.4.39 Additional measures to minimise environmental impacts at the River Water Abstraction Option intake would include:

- adoption of the Joint Nature Conservation Commission (JNCC) best-practice measures for piling including the implementation of a soft-start process;
- avoidance of night-time piling;
- agreement with relevant marine stakeholders of appropriate sensitive timings for any cofferdam installation and removal taking into account the potential for the upstream migration of adult Salmon during their most sensitive migratory period and to minimise disturbance to other sensitive fish species. It is anticipated that this will include avoidance of piling works for the cofferdam in the River Trent between the period September to November inclusive; and
- use of silt curtains (to minimise impacts on water quality).

5.4.40 Further details of these and other mitigation measures are present in **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**) and **Appendix 11H**: Underwater Sound Effects on Fish (ES Volume II – **Application Document Ref. 6.3**).

5.4.41 The final seasonal restriction will be reflected within the 'Deemed' Marine Licence for the Proposed Development.

5.4.42 Potential impacts associated with works in the River Trent have been assessed in **Chapter 9**: Noise and Vibration, **Chapter 11**: Biodiversity and Nature Conservation and **Chapter 12:** Water Environment and Flood Risk) (ES Volume I – **Application Document Ref. 6.2**). Other potential impacts associated with the construction works in the River Trent have been considered in the Navigation Risk Assessment (NRA) included as **Appendix 12C** (ES Volume II – **Application Document Ref. 6.3**). The NRA has concluded that navigation will not be impeded, and appropriate warning signs will be installed for navigational safety.

5.4.43 Whichever abstraction option is selected, a pipeline would be constructed using open cut methods from the intake into the Proposed PCC Site. If the River Water Abstraction option is selected, some of the existing pipework that runs to the north of Trent Road may be able to be re-used but this will need to be extended to the Proposed PCC Site. Where upgrades to existing pipework are required, trenchless excavation methods ('sliplining') could be applied. This technique involves the existing pipeline remaining in-situ and acting as a host pipe for a new smaller diameter carrier pipe. The space between the two pipes ('annulus') would then be grouted and the ends sealed.

5.4.44 The corridors within which the water supply connections would run are shown on the Water Connection Plans (**Application Document Ref. 4.9**).

5.4.45 In addition to cooling water connections, a connection would also be made within the Proposed PCC Site to provide a towns water connection including works to the existing towns water pipelines and connections to the proposed fire and raw water storage tank (refer to **Application Document Ref. 4.10**).

Water Discharge Connections

5.4.46 The Applicant is proposing to re-use existing assets including outfall and pipework for Keadby 1 Power Station for the discharge of cooling tower blowdown and treated effluent to the River Trent. A Water Discharge Corridor is included in the Proposed Development Site comprising the easement of the existing cooling water outfall corridor north-east from Keadby 1 Power Station, connecting with the River Trent. The corridor is shown on the Water Connection Plans (**Application Document Ref. 4.9**).

5.4.47 Interconnecting pipework would extend from Proposed PCC Site to connect to this infrastructure. As part of refurbishment and/ or replacement works within the Water Discharge Corridor, various ancillary works may be required. It is not envisaged that upgrades to pipework will be necessary, however, if minor upgrades are required, trenchless excavation methods ('sliplining') would be applied to the existing pipeline. There will be no open cut pipeline replacement along the existing pipeline easement.

5.4.48 It is anticipated that it will be possible to re-use the existing outfall and that any maintenance activities are likely to be minor and limited to inspection and hand-based maintenance. This may be either shore-led or supported by small specialist workboats, comparable to those which are periodically used for Keadby Power Station operation and maintenance activities.

5.4.49 The existing connection to foul sewer for Keadby 2 Power Station may also be used for the Proposed Development if it is in a suitable condition. The route of the foul sewer pipeline crosses land owned by the Applicant within Keadby Power Station, and via an existing easement towards the Severn Trent Water pumping station on Chapel Lane. If the pipeline condition is not suitable for continued use, foul sewerage would instead be treated on site in a package treatment plant with the treated water directed to the river Trent via the water discharge connection.

Electrical Connection

5.4.50 The proposed electrical connection consists of an Electrical Connection (**Work No. 3A**) between the Low Carbon Gas Power Station (**Work No. 1**) and National Grid Electricity Transmission (NGET) Keadby 400kV Substation. This is likely to comprise a 400kV single circuit cable route and control system cables which will be installed primarily below ground.

5.4.51 An underground connection up to 132kV will potentially be constructed to supply the Low Carbon Gas Power Station from the existing Northern Powergrid substation located at Chapel Lane (**Work No. 3B**). The two corridors within which the electrical connections could run are shown on the Indicative Electrical Connection Plan (**Application Document Ref. 4.8**).

5.4.52 Underground construction will require the use of an 'open-cut' method, whereby a trench will be excavated, and the cables laid below ground. This method will be applied where there is sufficient space and the work area is relatively flat. These works will generally be as follows:

- fence off works area and fit safety signage;
- strip and store topsoil (if required);
- a working area approximately 10m – 15m wide to allow for temporary trackway and soils storage;
- excavation of a reinforced trench; and
- cables laid at a depth of at least 1.1m on a bed of cement bound sand overlain by protective tiles and backfilling, including warning tape).

5.4.53 Where service crossings over existing IDB drains are required, these would require consent of the IDB and take into account relevant bylaws (Lindsey Marsh Drainage Board, 2018).

Humber Low Carbon - Carbon Dioxide Export Pipeline

5.4.54 As shown on the Indicative Carbon Dioxide Above Ground Installation Plans (**Application Document Ref. 4.12**), it is assumed that the connection to the Humber Low Carbon Pipeline carbon dioxide export pipeline will be constructed adjacent to, and within, the west of the Proposed PCC Site by National Grid Carbon (NGC).

5.4.55 It is assumed that within the Proposed PCC Site, a trench will be excavated, and the pipe laid approximately 1.2 – 3.0m below ground level. This will involve fencing off the works area, stripping and storing overburden, excavating a trench and storing subsoil, laying and welding pipe sections together at grade level (pipe stringing), laying pipe in the trench, re-instating drainage, and then backfilling subsoil, followed by strength testing of the buried pipe using pressurised water, reinstating overburden and (where necessary) re-planting to the original state as required.

5.4.56 There will be an interface for construction activities between the Applicant's EPC Contractor and NGC which would potentially overlap for a short period. The cumulative effects of construction activities have been considered in **Chapter 19**: Cumulative and Combined Effects (ES Volume I – **Application Document Ref. 6.2**) taking into account available information.

Construction Staff

5.4.57 It is estimated that there will be circa 1,300 personnel contracted to work on the Proposed Development at the peak of construction. This figure is based on experience of other comparable developments and informs the transport assessment presented in **Chapter 10:** Traffic and Transport (ES Volume I - **Application Document Ref. 6.2**) and **Appendix 10A**: Transport Assessment (ES Volume II – **Application Document Ref. 6.3**). The peak of construction activity is anticipated between months 26 to 27 of the construction programme.

5.4.58 Further detail is presented in the Framework Construction Workers' Travel Plan (CWTP) which accompanies the DCO Application (**Application Document Ref. 7.3**) and will be secured through a Requirement in the draft DCO (**Application Document Ref. 2.1**).

Construction Working Hours

5.4.59 Core construction working hours would be 07:00 and 19:00 Monday to Friday (except bank holidays) and 08:00 and 13:00 on Saturdays. However, it is likely that some construction activities may need to be undertaken outside of these core working hours. This is principally because certain construction activities cannot be stopped, such as concrete pouring, but also potentially to manage the construction programme. Where on-site works are to be conducted outside the core hours, they would comply with any restrictions agreed with the local planning authority, in particular regarding control of noise and traffic. Twenty-four hour working for certain activities has therefore been assessed in **Chapter 9:** Noise and Vibration (ES Volume I – **Application Document Ref. 6.2**) which sets out specific mitigation and control measures required to prevent disturbance from any activities outside of core working hours. Requirements in the draft DCO (**Application Document Ref. 2.1**) secure the working hours and the approach to exceptions to the core working hours. Any such works will be minimised and will be carefully managed to reduce effects on the local community.

Construction Traffic and Site Access

5.4.60 Access to the Proposed Development Site during construction for both construction workers and HGV traffic would be via the existing access road from the A18 via Mabey Bridge. This access road is a purpose built road that serves the existing Keadby Windfarm and is used by all construction traffic for the Keadby 2 Power Station construction project. It is wide enough to allow access by construction traffic, without the need for alteration.

5.4.61 Construction staff are anticipated to travel to the Proposed Development Site via the existing trunk road and local networks. Construction staff arriving by car will use on-site parking, likely within the construction laydown Area 2 illustrated on **Figure 5.1** (ES Volume III - **Application Document Ref. 6.4**) and then use a park and ride system to transport the workers between Area 2 and the

Proposed PCC Site (and other works areas) over North Pilfrey Bridge, via the existing internal access roads within Keadby Power Station (**Work 9B**).

5.4.62 HGV delivering construction materials would also access the Proposed Development Site from the site entrance off the A18, with all HGV arriving and departing to/ from the west via the A18, A161 and onwards to the M180 Junction 2. The volume of HGV associated with construction of the Proposed Development on the network is predicted to be at its maximum of 624 daily two-way vehicle movements (312 in and 312 out) for 2 months during the initial 6 month Site Enabling and Preparation phase of construction once Mabey Bridge has been replaced. This traffic is associated with the anticipated cut and fill of the top layer of ground within the Proposed PCC Site Area to improve the geotechnical condition of the ground. During the remainder of the construction period, it is estimated there will be a maximum of 120 HGV trips (two-way) in months 18 – 29 (which includes the peak of construction) and 60 HGV trips (two-way) for the remainder of construction.

5.4.63 Combining construction workforce vehicle movements with construction HGV movements over the entire construction programme shows the overall peak to occur in Months 26 and 27 when 1,236 two-way vehicle movements are anticipated (1,116 two-way car / van movements and 120 two-way HGV movements per day). Further information on traffic volumes and routing is provided in **Appendix 10A:** Transport Assessment (ES Volume II – **Application Document Ref. 6.3**).

5.4.64 It may be necessary to construct new temporary access points into the laydown areas (Area 1 and Area 2 in **Figure 5.1** – ES Volume III **(Application Document Ref. 6.4**)) from the existing site access road. Existing farm crossings will be utilised and upgraded where this is reasonably practicable.

5.4.65 It is proposed that the largest abnormal loads will be received at the Port of Immingham and transported by boat to the Waterborne Transport Off-Loading Area (Railway Wharf – **Work No. 10B**) where they would be offloaded using mobile cranes. The load bearing capacity of the wharf and crane pads has recently been upgraded to facilitate the delivery of AIL for the Keadby 2 Power Station construction therefore only maintenance and temporary placement of mobile crane(s) is proposed. Following any minor clearance works, the temporary crane(s) will be delivered to and erected on-site (using separate vehicle mounted crane(s)) on a suitable foundation which is likely to involve simple grading/levelling, compaction and use of a temporary plate to spread loads. The components will then be transported to the Proposed Development Site crossing the B1392 onto the temporary haul road that runs to the east of PD Port Services yard. Temporary traffic management in the form of Stop / Go signs will be required to halt traffic along the B1392 in order to allow the abnormal loads to cross the B1392. AIL would enter the Proposed Development Site via the Additional AIL Route (**Work No. 10A**) which is currently being used as a temporary AIL haul route in the construction of Keadby 2 Power Station. There may be a requirement for reinforcement/ strengthening works along this

temporary haul road to facilitate transport of the larger abnormal loads towards the Proposed PCC Site.

5.4.66 Smaller abnormal loads are expected to be transported by road from Immingham Dock via the M180 to Junction 2 and then from the A161 to the A18, entering the Proposed Development Site via either the perpendicular construction access or, if required, the skewed construction access off the A18 (**Work No. 8A**) and then over North Pilfrey Bridge.

5.4.67 Should it be necessary, an alternative access route for certain abnormal loads that cannot pass over North Pilfrey Bridge that has been used during construction of Keadby 2 Power Station is via Ealand village from the A161, New Trent Road and Bonnyhale Road. During Keadby 2 Power Station construction, consent was provided for up to 10 AIL to use this route. As this is already an established route and no works are required for the purposes of the Proposed Development, this route is not included within the Order Limits for the Application.

Storage of Construction Plant and Materials

5.4.68 There will be temporary laydown areas positioned close to some access roads on the Proposed PCC Site where any materials will be unloaded and then transported to the area of works. Some of these may need to be used for storage of materials for up to two years. At the end of the shift, unsecured 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. Laydown areas/ construction compounds for construction materials are illustrated on **Figure 5.1** (ES Volume III – **Application Document Ref. 6.4**).

5.4.69 Storage areas for flammable/ toxic or corrosive materials would be located in a separate, locked, bunded and fenced area. Material data sheets would 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, all subject to the Applicant's approval.

Lighting

5.4.70 Construction temporary site lighting is proposed to enable safe working on the construction site in the hours of darkness.

5.4.71 Construction temporary lighting will be arranged so that glare is minimised outside the construction site. The appointed contractors will be responsible for establishing the required approach to and levels of lighting and a Lighting Strategy will be prepared for approval pursuant to a requirement in the draft DCO (**Application Document Ref. 2.1**) as required. An Indicative Lighting Strategy is included in the DCO Application (**Application Document Ref. 5.11**).

5.4.72 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.

Security

5.4.73 Security will be managed to ensure that risks are maintained to as low as reasonably practicable. The approach to security will include:

- compliance with the Applicant's existing security policies, procedures and arrangements;
- controlled vehicular access to the Proposed Development Site from the A18, including new gatehouses;
- perimeter fencing around the Proposed PCC Site and other work areas, with controlled pedestrian and vehicular access; and
- closed circuit television surveillance and intruder alerts.

Wheel Wash Facilities

5.4.74 A self-contained wheel wash will be installed and will be used during ground works by vehicles prior to exiting the construction site and prior to joining the public highway.

5.4.75 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 to the highway.

Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP)

5.4.76 The Applicant will require that the contractor produces and maintains a CEMP to control construction activities to minimise, as far as reasonably practicable, impacts on the environment. This is proposed to be secured by a requirement in the draft DCO (**Application Document Ref. 2.1**). A Framework CEMP has been produced to accompany the Application (**Application Document Ref. No. 7.1**) setting out the key measures to be employed during construction of the Proposed Development to control and minimise impacts on the environment. This includes industry best practice measures and specific measures set out in this ES. The contractor's CEMP must be in accordance with the principles set out in the Framework CEMP.

5.4.77 The purpose of the CEMP is:

- to ensure nuisance levels as a result of construction activities are kept to a minimum;
- to comply with regulatory requirements and environmental commitments; and

- to ensure procedures are put into place to minimise environmental effects including a scheme for environmental monitoring and reporting, corrective actions and a notification scheme for handling any complaints received relating to construction impacts.

5.4.78 In order to manage and monitor waste, including any spoil generated on-site, during construction, a Framework SWMP has been developed as part of the Framework CEMP (**Application Document Ref. No. 7.1**) which allows for waste streams to be estimated and monitored and goals set with regards to waste produced.

5.4.79 The SWMP will require that the contractor segregates the waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from Proposed Development Site would be undertaken by licensed waste carriers and taken to permitted waste facilities.

5.4.80 Construction best practice measures that will be adopted during the construction phase have been taken into account in the EIA environmental assessments and are set out in the Framework CEMP (**Application Document Ref. 7.1**). Construction works will be undertaken in accordance with the environmental commitments identified in **Chapters 8 to 19** (ES Volume I - **Application Document Ref. 6.2**) and having regard to relevant legislation.

Commissioning and Testing

5.4.81 Commissioning of the Proposed Development would include testing and commissioning of the process equipment in order to ensure that that all systems and components installed are in accordance with the requirements of the Applicant. This is anticipated to take approximately six to nine months. 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 and testing activities.

5.4.82 Commissioning and testing activities include both cold and hot testing as a structured process to include static, dynamic, energised, functional and performance testing . These activities will generally commence using inert materials such as air, water and nitrogen and lubricants before progressing to pressurised operation using process fluids such a natural gas and steam. Diesel supplies may be required on-site for use in mobile generators to supply temporary power.

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