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TABLES

4.0 THE PROPOSED DEVELOPMENT

4.1 Introduction

4.1.1 The Proposed Development is an energy from waste power station with a gross electrical generation capacity of up to 95 MW.

4.1.2 The design of the Proposed Development incorporates an appropriate degree of flexibility in the siting, dimensions, and configurations of buildings to allow for the selection of the preferred technology and contractor. For example, the maximum building dimensions are defined to accommodate horizontal or vertical boilers, and, although the height of the stacks is fixed, their position must fall within a defined part of the Site.

4.1.3 In order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, the Environmental Impact Assessment (EIA) has being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained. Where this approach is being applied to the specific aspects of the EIA, this is confirmed within the relevant chapters of this Environmental Statement (ES). Justification for the need to retain flexibility in certain parameters is also outlined in this chapter and in Chapter 6: Need, Alternatives and Design Evolution.

4.1.4 Full planning permission for a 49.9 MW energy from waste power station was granted by North East Lincolnshire Council (NELC) under the Town and Country Planning Act 1990 on 12th April 2019 (referred to as the 'Consented Development'). Since the grant of planning permission for the Consented Development ('the Planning Permission') the Applicant has been assessing potential opportunities to improve its efficiency. The Applicant is now proposing an up to 95 MW energy from waste power station ('the Proposed Development').

4.1.5 Whilst the Development Consent Order (DCO) is being sought, the Applicant is likely to progress the Consented Development in accordance with the Planning Permission. A construction programme of approximately three years is anticipated for the Consented Development, with construction expected to commence in Quarter 2 (Q2) 2020. Following grant of a DCO for the Proposed Development (which would be anticipated around Q3 2021, approximately half way through the three year construction programme for the Consented Development), the additional works that would be required (in addition to those which benefit from the Planning Permission – see Section 4.4 below) would then be undertaken, and the Proposed Development would commence operation in 2023.

4.1.6 Whilst this is the most likely construction programme scenario for the Proposed Development, two other potential construction programme scenarios are also being considered in order that a robust assessment of environmental effects is undertaken. The alternative scenarios relate to the potential for the Proposed Development to be constructed and operated pursuant to only the DCO with construction commencing either in Q3 2021 (when the DCO would be granted)

or Q3 2026 (before the DCO would expire). In these two alternative scenarios the Proposed Development would commence operation in 2024 or 2029 respectively.

4.1.7 Construction of the Proposed Development is detailed in Chapter 5: Construction Programme and Management. 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; however an indicative programme is presented within Chapter 5.

4.1.8 It is envisaged that the Proposed Development will have a design life of at least 30 years. At the end of the design life, the Proposed Development would either be decommissioned as outlined in Section 4.9 below, or the lifetime could potentially be extended. Decommissioning will therefore commence at some point after 2053.

4.1.9 This chapter is supported by Figures 4.1 to 4.3 in ES Volume II (Document Ref. 6.3), which show the Proposed Development layout, the indicative ecological mitigation and enhancement area, and a comparison of the Consented and Proposed Development layouts for reference.

4.2 Components of the Proposed Development

4.2.1 The purpose of this chapter is to provide further detail on the various components of the Proposed Development, both internal and external, including buildings, infrastructure and access. All of the various components which make up the Proposed Development are contained within the Order Limits shown on the Works Plans (Document Ref. 4.3) ('the Site') and are described or encompassed within the description of the Proposed Development in the Draft DCO (Document Ref. 2.1) - in the DCO the Proposed Development is referred to as the 'authorised development', and the description is in Schedule 1 to the Draft DCO. References to 'Work No.' below are to the work numbers listed in that Schedule 1. The Order Limits and the areas defined for each Work No. are also shown on Figure 3.1 in ES Volume II (Document Ref. 6.3).

4.2.2 The Proposed Development will comprise:

- an electricity generating station fuelled by RDF (Work No. 1) comprising:
  - fuel reception and storage facilities, consisting of vehicle ramps, a tipping hall, shredder, fuel storage bunker and cranes;
  - a combustion system housed within a boiler hall, consisting of two combustion lines and associated boilers;
  - a steam turbine and generator housed within a turbine hall, with a cooling system comprising fin fan coolers;
  - a bottom ash handling system, including ash storage;
  - a flue gas treatment (FGT) system, including residue and reagent silos;
  - a silo or tank for the storage of ammonia or urea based reagents;
  - an air cooled condenser (ACC);

  - a compressed air system;
  - a process effluent storage tank;
  - a demineralised water treatment plant and demineralised water storage tanks;
  - indoor storage tanks for boiler water treatment chemicals;
- two emissions stacks and associated emissions monitoring systems (Work No. 1A);
- administration block including control room, workshops, stores and welfare facilities (Work No. 1B);

4.2.3 The above items are described in more detail in paragraphs 4.2.10 to 4.2.43 below.

4.2.4 The following works will be required in connection with the electricity generating station (Work No. 1), emission stacks (Work No. 1A) and administration block (Work No. 1B):

- an electrical switchyard, including generator transformers;
- auxiliary diesel generators and diesel storage tanks;
- pipe racks, pipe runs and cabling;
- fire water pump house and fire water tank;
- internal vehicle access roads, crossings and pedestrian cycle facilities and routes;
- security gatehouse, barriers and enclosures (fencing);
- weighbridges;
- car parking;
- a heavy goods vehicle (HGV) holding area and driver welfare facilities;
- a surface water drainage system, including oil-water separators and attenuation pond; and
- connections between parts of Work No. 1 and each connection comprised in Work No. 2.

4.2.5 The area defined for Work No. 1 (encompassing Work Nos. 1A and 1B) is referred to throughout the ES as the 'Main Development Area' – see Figure 3.1 in ES Volume II (Document Ref. 6.3).

4.2.6 The Proposed Development will also include utilities connections (Work No. 2) which may comprise:

- an underground or overground electrical connection from the electricity generating station to provide a connection to either the 132 kilovolt (kV) local electricity distribution network or the 400 kV National Grid electricity transmission network;

- an underground gas supply pipeline to the electricity generating station from the existing South Humber Bank Power Station (SHBPS) Above Ground Installation (AGI), or from the existing SHBPS gas supply network to provide a connection to the National Grid gas distribution network, or from a connection to the local gas distribution network;
- towns water connection;
- telecommunications connection;
- steam connection(s); and
- other utility connections.

4.2.7 The Proposed Development also includes:

- landscaping and biodiversity (Work No. 3), comprising soft landscaping including planting and biodiversity mitigation and enhancement measures;
- a new site access on to South Marsh Road and an existing site access on South Marsh Road (Work No. 4); and
- temporary construction and laydown areas (Work No. 5) comprising hardstanding, laydown and open storage areas, including materials and plant storage, contractor compounds and construction staff office and welfare facilities, generators, concrete batching facilities, vehicle and cycle parking facilities, pedestrian and cycle routes and facilities, security fencing and gates, external lighting, roadways and haul routes, wheel wash facilities and signage

4.2.8 In connection with and in addition to all of the above will be:

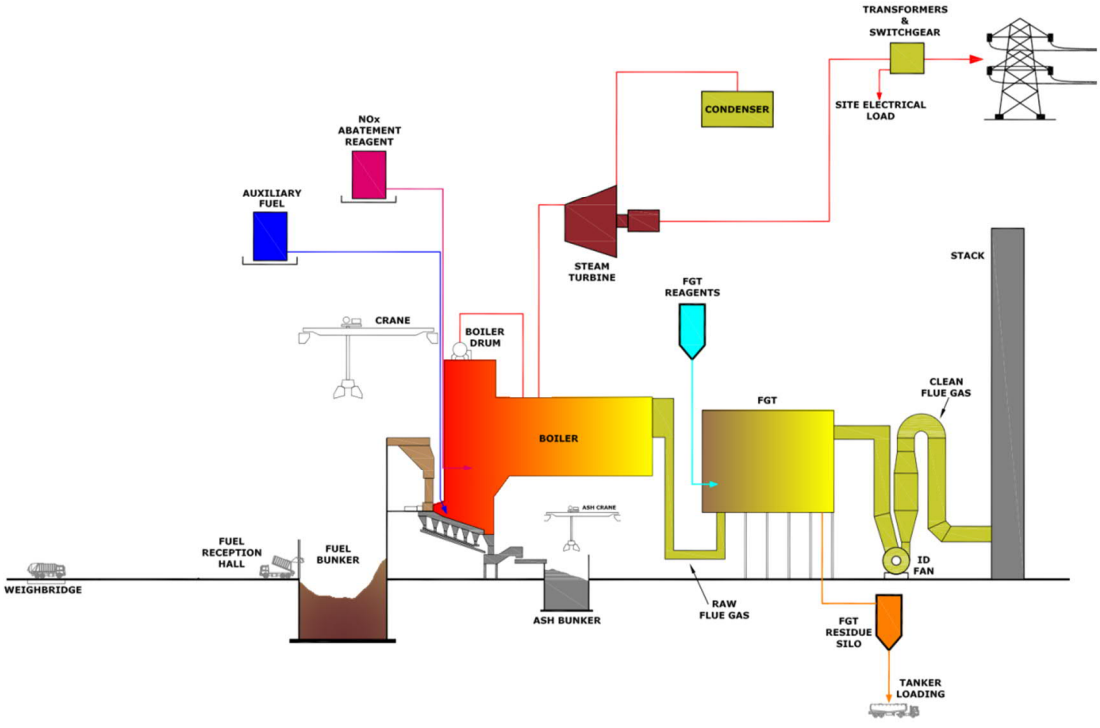
- external lighting, including lighting columns;
- security fencing, gates, boundary treatment and other means of enclosure;
- closed circuit television (CCTV) cameras and columns and other security measures;
- surface and foul water drainage systems, oil-water separators, including channelling, culverting, crossings and works to existing drainage ditches and systems;
- electric, gas, potable water supply, telecommunication infrastructure connections and works, and works to alter the position of such services and utilities connections;
- hard and soft landscaping;
- biodiversity mitigation and enhancement measures;
- site establishment and preparation works, including site clearance (including vegetation removal), earthworks (including soil stripping and storage and site levelling) and excavations, temporary fencing, the creation of temporary construction access points, and the temporary alteration of the position of services and utilities apparatus and connections;

- temporary construction laydown areas and contractor facilities, including materials and plant storage and laydown areas, generators, concrete batching facilities, vehicle and cycle parking facilities, pedestrian and cycle routes and facilities, offices and staff welfare facilities, security fencing and gates, external lighting, roadways and haul routes, wheel wash facilities, and signage;
- vehicle access roads, crossings parking and pedestrian and cycle facilities and routes; and
- further associated development that may be required in connection with the above, which are within the scope of the works assessed in this ES.

4.2.9 The buildings will be steel framed, and concrete floored with appropriate external cladding, which will be appropriately coloured to minimise the visual impact of the Proposed Development (see Chapter 11: Landscape and Visual Amenity).

4.2.10 The main parts of the Proposed Development are described in further detail below, and the process is graphically illustrated in Plate 4.1 below. The maximum dimensions of each component are provided in Section 4.3 Design Parameters.

Plate 4.1: Process diagram



Fuel Reception and Storage (Work No. 1)

4.2.11 The reception area will incorporate tipping bays to allow multiple vehicles to discharge to the concrete fuel bunker at the same time. The entry and exit doors to the fuel reception hall will be equipped with automated vertical folding or roller doors, which will be kept closed except for times of vehicle access and egress.

4.2.12 The fuel reception area may be raised above ground level by approximately 3.5 m with access and egress via ramps. This would have benefits in terms of reduced excavation depth, and flood resilience.

4.2.13 The bunker will be large enough to provide for up to four days of fuel supply, in case of periods when there are no fuel deliveries. The base of the bunker will be approximately 10 m below the fuel reception hall floor. Cranes will span the bunker.

4.2.14 Fuel delivered to the Site is not expected to require further pre-treatment. However, the fuel will need mixing prior to combustion to improve homogeneity, and may require shredding to ensure any oversize items are broken up before being fed to the furnace. Typically, mixing would be done using the cranes in the bunker and a shredder may be installed.

4.2.15 The primary air for the boiler will be extracted from above the bunker, and the doors would be kept closed when not in use, thereby maintaining a negative pressure and minimising the release of dust and odours.

Boiler Hall (Combustion System) (Work No. 1)

4.2.16 The boiler hall will contain two combustion lines and associated boilers to produce steam for the generation of electricity or for export.

4.2.17 A reciprocating grate system will be used together with combustion air preheating. Auxiliary burners will be installed for use on start up or when required to maintain a two second residence time in the combustion chamber above 850°C. These burners will either be fired on natural gas or diesel.

4.2.18 Fuel will be transported from the bunker in to the furnace feeding hopper using an overhead crane. The fuel will then fall though the feeding chute to the combustion grate. The fuel feed rate, the grate control and the primary air flows will be controlled to ensure that the fuel is completely burnt when it reaches the end of the grate. The ash will fall into a quench pit where it will be cooled and from there transported to the ash handling system.

4.2.19 Gases will flow upwards into the combustion chamber where ‘secondary’ air will be added in a controlled way to enhance mixing of the flue gas and ensuring all combustible gases are burnt.

4.2.20 The combustion system is automatically controlled to optimise the process efficiency and to control emissions. The control system uses a number of parameters to do this including gas temperature, oxygen content, steam flow, grate speed, fuel feed rate and air flows. In addition, the operator can intervene if required based on operating experience and observation of plant performance.

4.2.21 Carbon monoxide and oxygen levels will be continuously monitored to ensure good combustion is maintained.

4.2.22 In the event that the residence time at the required temperature cannot be maintained, fuel would automatically be stopped from entering the combustion chamber until normal operating conditions are re-established.

Turbine Hall (Including Steam and Heat Export Potential) (Work No. 1)

4.2.23 The Proposed Development design includes a steam turbine serving both streams. The Proposed Development will be capable of generating up to 95 MW of electricity (gross) from the steam turbine, although some of the electricity generated will be used to meet the parasitic load within the plant.

4.2.24 Fin fan coolers will be provided for the closed circuit cooling water (CCCW) system, which will provide cooling to the generator, steam turbine lubrication oil and other systems requiring cooling. The fin fan coolers will consist of modular units, each with a fan, to pass ambient air over the finned tubes containing cooling water from the CCCW system. Heat will be rejected to the ambient air from the cooling water to reduce its temperature before it returns to the circuit.

4.2.25 The Proposed Development will be configured to enable heat (steam or hot water) to be exported to nearby consumers via an extraction from the steam turbine (i.e. the Proposed Development will be Combined Heat and Power (CHP) Ready (see the CHP Assessment Report (Document Ref 5.6)).

Ash Handling and Storage (Work No. 1)

4.2.26 Incinerator bottom ash is the burnt-out residue from the combustion process. The bottom ash will be discharged from the boiler to a bottom ash bunker or concrete slab for storage. Bottom ash will either be landfilled or recycled off-site as an aggregate.

4.2.27 As a worst case, based on a fuel NCV of 9 MJ/kg the facility would generate approximately 179,000 tonnes per annum (tpa) of wet (i.e. quenched) bottom ash which will need to be collected for disposal or recycling. Ferrous metals may be removed from the bottom ash by means of magnetic separators and discharged to a separate storage area for recycling.

Flue Gas Treatment System (Work No. 1)

4.2.28 A number of pollutants may be present in the flue gas that will require treatment and control, as outlined below. A combination of primary combustion control measures and FGT will be used to control emissions to the limits set in the Environmental Permit and to meet national and international standards.

4.2.29 Nitrogen oxides (NOx) emissions are controlled through primary means including burner design and optimisation. However, additional secondary removal is likely to be required, using either Selective Non-Catalytic Reduction (SNCR) or Selective Catalytic Reduction (SCR) techniques. Both involve the controlled addition of ammonia or urea, which will be stored in a silo or tank.

4.2.30 Acid gases produced during the combustion process will be removed by a scrubbing system, typically using hydrated lime as a reagent. Activated carbon will also be injected into the flue gas duct to minimise the emissions of dioxins, mercury, and other heavy metals.

4.2.31 After mixing with the flue gas treatment reagents, the gases will be drawn through a bag filter to remove particulates, including the added lime and activated carbon particles. Regular bag filter cleaning will be performed on-line by pulsing

compressed air through the filter bags. The residues will be collected in fully enclosed hoppers beneath the filters.

4.2.32 Following cleaning, the gases from the combustion process will be released into the atmosphere via the gas flue within the stacks.

4.2.33 FGT residues comprise fine particles of ash and residues that are collected in the bag filters. It is estimated that the Proposed Development will generate approximately 20,600 tpa of FGT residue. The FGT residue will be stored in sealed silos adjacent to the FGT plant. Due to the alkaline nature of the FGT residues, they are classified as a hazardous material. As a result, the residues will be transported by road in a sealed tanker and either disposed of as hazardous waste, or treated at an appropriate treatment facility and disposed of as non-hazardous waste or recycled as an aggregate.

Air Cooled Condensers (Work No. 1)

4.2.34 There are a number of different cooling options available to condense the exhaust steam exiting the turbine (see Chapter 6: Need, Alternatives and Design Evolution). The Proposed Development will use an ACC, which will consist of fans housed within a frame of fin-tube walls, all supported above the ground by a steel structure. The steam will be condensed by passing through the finned tubes cooled by ambient air.

4.2.35 The ACC will be located outside the main building.

Compressed Air System (Work No. 1)

4.2.36 The compressed air system will consist of compressors, filters, air dryers, air receivers and distribution ring mains to supply the compressed air to the plant continuous and intermittent consumers, including process equipment and instrumentation.

Effluent Storage (Work No. 1)

4.2.37 Liquid effluent will be produced from the boiler water treatment system and from the boiler blow-down. This liquid effluent will be fed to the ash discharger via the process water system. Under normal operating conditions, no effluents will require disposal as they will be returned into the process for re-use. In this way, the majority of liquid effluent produced on Site will either be evaporated or absorbed into the ash for transport off Site. Any excess liquid effluent, including arisings from boiler maintenance activities, will be collected on Site, analysed and transported off Site for treatment, or alternatively discharged to foul sewer (if a connection is available) under the conditions specified in the Environmental Permit and trade effluent agreement.

Demineralised Water Treatment (Work No. 1)

4.2.38 Towns main water will need to be treated on Site in a water treatment plant to demineralise it for use in the boiler and for other uses. Water treatment chemicals will be stored in tank(s), and treated water will be stored in tank(s) prior to use.

Emissions Stacks (Work No. 1A)

4.2.39 Two stacks each 102 m Above Ordnance Datum (m AOD)) in height (i.e. approximately 100 m above ground level) will be constructed on the eastern side of the main building adjacent to the FGT hall. Flue gases will be emitted from the stacks at approximately 120°C. Detailed air dispersion modelling has been carried out to inform the stack height and the EIA as discussed in Chapter 7: Air Quality and presented in detail in Appendix 7A in ES Volume III (Document Ref. 6.4).

4.2.40 Emissions from the stacks will be monitored continuously using Continuous Emission Monitoring Systems (CEMS), an automatic computerised system, and reported in accordance with the Environment Agency's requirements for the operation of the Proposed Development under an Environmental Permit.

4.2.41 The stacks will be fitted with aviation warning lights as required by the Civil Aviation Authority.

4.2.42 The stacks will be located within the area defined as Work No. 1A (see Document Ref. 4.3: Works Plans).

Administration Block (Work No. 1B)

4.2.43 The administration block will be located in the main building and will contain the main reception, offices, control room, workshop, stores, electrical equipment and staff welfare facilities.

4.2.44 The administration block will be located within the area defined as Work No. 1B (see Document Ref. 4.3: Works Plans).

Substation and Electrical Connections (Work Nos. 1 and 2)

4.2.45 Electricity will be exported either to the National Grid Electrical Transmission (NGET) 400 kV system at the SHBPS 400 kV substation (located within the Site), or to the Northern Powergrid 132 kV local distribution network (located off Site).

4.2.46 Connection to the NGET system at the 400 kV substation would require 400 kV underground or overground electrical cables and control system cables from a new transformer compound.

4.2.47 Connection to the 132 kV local distribution network would require an on Site substation which is included in the layout for the Proposed Development (see Figure 4.1 in ES Volume II, Document Ref. 6.3). This substation would be connected to the local distribution network at a 132 kV tower approximately 2 km to the west of the Site. It is anticipated that the route to the 132 kV tower would follow South Marsh Road (see Figure 17.2 in ES Volume II, Document Ref. 6.3).

4.2.48 Electrical connection works outside of the Site, if required, do not form part of the Proposed Development, and the relevant undertaker will rely either on their statutory powers or obtain the relevant consents prior to connection. Any such works have been considered in Chapter 17: Cumulative and Combined Effects.

Auxiliary Diesel Generators (Work No. 1)

4.2.49 Auxiliary generators will be required to ensure power is available in the event of fuel supply interruption and power failure to the Site and to enable controlled shut-

down of the plant in such a scenario. The capacity of these generators is expected to be relatively small, up to 5 MW, and will only be required for emergency use.

4.2.50 The auxiliary generators will use diesel which will be stored in a suitably bunded tank.

Fire Water Pump House and Fire Water Tank (Work No. 1)

4.2.51 A fire water system is required to comply with the requirements of the Environmental Permit. The fire water system will include fire water pumps, a fire water storage tank (as described at paragraph 4.2.36 above), hydrants and mains, and a sprinkler system. Gaseous extinguishing systems will also be provided for use in electrical rooms if required.

Access Into and Within the Site (Work Nos. 1 and 4)

4.2.52 The new Site access road (part of Work No. 4) in the north-east of the Main Development Area will require an extension/ replacement of an existing culvert over a drainage ditch in the north-east of the Main Development Area. There is also an existing site access in the north-west of the Main Development Area which will be used during construction, which will not require culvert extension/ replacement.

4.2.53 The Main Development Area is currently crossed by an internal access road which links the SHBPS to the cooling water pumping station to the east of the Site. The Proposed Development will maintain access to the pumping station for SHBPS via a redirected roadway.

4.2.54 The Proposed Development has been designed to minimise conflict between HGVs and smaller vehicles, to reduce queue length and prevent delays to employees and visitors accessing the Site. A holding area will be provided between the Site entrance and the incoming weighbridge with welfare facilities for delivery drivers. Other areas within the Site can be used as HGV holding areas if necessary, for example during an unplanned shutdown, to avoid delivery HGVs queuing onto the public highway.

4.2.55 Internal roadways will be hard surfaced with appropriate drainage systems to manage surface water runoff and pollution risk.

4.2.56 After entering the Site, incoming HGVs will proceed via the security gatehouse and associated barriers to the incoming weighbridges where the quantity of fuel will be checked, weighed and recorded (all forming part of Work No. 1). Only authorised fuel will proceed to the fuel reception area. Radioactivity detection will be installed to monitor incoming fuel at the entrance to the Site. Non-compliant waste will be quarantined and addressed separately.

4.2.57 After tipping fuel into the bunker and prior to exiting the Site, the weight of the outgoing vehicles will be recorded on separate outgoing weighbridges (part of Work No. 1).

4.2.58 Up to 57 car parking spaces, including approximately five electric vehicle charging bays, and a bicycle shelter (all forming part of Work No. 1) will be

provided on the Site as shown on Figure 4.1 in ES Volume II (Document Ref. 6.3).

4.2.59 Pedestrian and cycle routes and crossings will be clearly marked within the Site. Key pedestrian and cycle route will be segregated from HGVs where possible.

Security Fencing, Gates, Boundary Treatments, and Security Measures (Work No. 1)

4.2.60 The Main Development Area will be surrounded by security fencing, with new gates at the new Site access on South Marsh Road and at the boundary with SHBPS (and elsewhere as required).

4.2.61 CCTV and other security measures may be installed within the Site, for health, safety and security purposes.

4.2.62 A visual screen (a close boarded fence approximately 2.5 m in height) will be provided along part of the southern boundary of the Site for ecological (bird) mitigation (see Chapter 10: Ecology).

Surface and Foul Water Drainage (Work No. 1)

4.2.63 An Outline Drainage Strategy is presented within Appendix 14B in ES Volume III (Document Ref. 6.4). Surface water runoff will be drained and attenuated within the Site and discharged at 'greenfield' runoff rate via a new discharge point to one of the two existing land drains within the Site.

4.2.64 Oil-water separators will be provided where necessary.

4.2.65 Foul water will be discharged to the mains sewer, stored for tankering off Site or treated on Site using a package treatment plant which discharges to one of the ditches on Site. These options are all assessed as part of the EIA and are described in the Outline Drainage Strategy (Appendix 14B in ES Volume III, Document Ref. 6.4).

Potential Gas Connection (Work Nos. 1 and 2)

4.2.66 Natural gas may be required at the Proposed Development as auxiliary fuel for start-up of the combustion process and for combustion stabilisation. The gas supply would be connected via a pipeline to either the National Grid gas network or the Cadent local gas distribution network.

4.2.67 If a connection is made to the National Grid gas network this would be at the location of the adjacent SHBPS AGI or to the SHBPS gas supply pipework, both located within the Site (see Figure 17.3 in ES Volume II, Document Ref. 6.3).

4.2.68 If a connection is made to the local distribution network, gas connection works will be required outside of the Site (see Figure 17.3 in ES Volume II, Document Ref. 6.3). This does not form part of the Proposed Development, and the relevant undertaker will rely either on their statutory powers or obtain the relevant consents prior to connection. Any such works have been considered in Chapter 17: Cumulative and Combined Effects.

Towns Water, Telecommunications and Other Utility Connections (Work Nos. 1 and 2)

4.2.69 The Proposed Development will require a towns water connection (to supply water for the boiler and domestic use) and a telecommunications connection (for a local area network (LAN) and digital telephones).

Combined Heat and Power (CHP) Readiness (Work Nos. 1)

4.2.70 In accordance with Environment Agency guidance, opportunities for the use of CHP from the Proposed Development are being considered and the Proposed Development has been designed to be CHP Ready in the event that no immediate CHP opportunities can be identified.

4.2.71 A review of potential heat demand within a 15 km radius of the Proposed Development has been undertaken and a CHP Assessment report (Document Ref. 5.6) is submitted with the Application.

Landscaping and Biodiversity Mitigation and Enhancement Measures (Work No. 3)

4.2.72 Figure 4.2 in ES Volume II (Document Ref. 6.3) presents indicative areas proposed for ecological mitigation and enhancement (Work No. 3). This is discussed in more detail in Chapter 10: Ecology (Section 10.7) and in the Indicative Biodiversity Strategy (Document Ref. 5.11).

4.2.73 Existing woodland in the north-west, west and south-west of the Site will be retained and managed to provide ongoing landscape screening of SHBPS and the Proposed Development and for biodiversity. This is discussed further in Chapter 11: Landscape and Visual Amenity (Section 11.7) and in the Indicative Landscape Strategy (Document Ref. 5.10).

External Lighting (All Works Nos.)

4.2.74 An Indicative Lighting Strategy (Document Ref. 5.12) has been prepared for submission as part of the DCO Application.

4.2.75 Prior to the commissioning of the Proposed Development a detailed lighting scheme based on the Indicative Lighting Strategy will be submitted to NELC for approval. The external lighting scheme will be designed in accordance with relevant standards, such as the *Guidance Notes for the Reduction of Obtrusive Light (2020)* published by the Institute of Lighting Engineers and/ or Chartered Institution Building Services Engineers (CIBSE) requirements – as appropriate.

4.2.76 The external lighting scheme will be designed to provide safe working conditions in all areas of the Site whilst reducing light pollution and the visual impact on the local environment. This is likely to be achieved by the use of luminaires that eliminate the upward escape of light.

4.3 Design Parameters

4.3.1 A number of the design aspects and features of the Proposed Development cannot be confirmed until the EPC contractor has been appointed and detailed design has been completed. For example, the building sizes may vary depending on the contractor selected and their specific configuration and selection of plant.

Focussed use of the Rochdale Envelope approach has therefore been adopted to define appropriate parameters for use in the EIA.

4.3.2 Table 4.1 sets out the maximum dimensions for the layout of the Proposed Development which have been used for the basis of the various technical assessments. Maximum parameters have been devised to enable the EIA to progress in the absence of the final design information and to enable the compilation of a robust assessment based on a reasonable and appropriate worst case option. These same maximum dimensions are secured through the Draft DCO (Document Ref. 2.1) in Schedule 2. The Proposed Development design parameters in Table 4.1 are consistent with those defined within the Consented Development Planning Permission.

4.3.3 Existing ground levels at the Site are approximately 2 m AOD. Finished floor levels at the Site are expected to remain at approximately 2 m AOD, with the exception of the fuel reception hall which is anticipated to be raised to approximately 5.5 m AOD (with ramps for HGV access and egress) in order to reduce the depth of excavation required for the fuel storage bunker and thereby reduce the volume of excavated material that may require off-site disposal during construction.

4.3.4 There is a potential requirement for cut and fill during construction to improve the bearing capacity of the ground within the Main Development Area. This is outlined further in Chapter 5: Construction Programme and Management. The requirement will be determined by the contractor as part of the detailed design but has been considered where relevant in the EIA (for example in terms of construction waste and traffic movements).

4.3.5 The evolution of the design is outlined in more detail in Chapter 6: Need, Alternatives and Design Evolution.

Table 4.1: Maximum design parameters

COMPONENT	DIMENSIONS
Main building maximum height	59 m AOD (including 2 m parapet wall on boiler hall)
Main building maximum footprint	210 m x 110 m
Stack height	102 m AOD
Stack diameter	3 m per combustion stream
Bunker base maximum depth	-8 m AOD

Limits of Deviation

4.3.6 The Works Plan (Document Ref. 4.3) defines the areas within which each element of the Proposed Development will be located. These areas are also

shown on Figure 3.1 in ES Volume II (Document Ref. 6.3). As described at paragraphs 4.2.2 to 4.2.8, in summary:

- Work No. 1 (also referred to in the ES as the Main Development Area) comprises the electricity generating station itself (with the locations of the stacks and administration block constrained to the areas for Work Nos. 1A and 1B respectively);
- Work No. 2 comprises utilities connections (where they are required outside of Work No. 1; utilities connections are also provided for within Work No. 1);
- Work No. 3 comprises landscaping and biodiversity mitigation and enhancement;
- Work No. 4 comprises the new Site access on South Marsh Road in the north-east of the Main Development Area and an existing entrance on South Marsh Road in the north-west of the Main Development Area;
- Work No. 5 comprises temporary construction and laydown areas.

4.3.7 The stacks form Work No. 1A, which provides only limited flexibility as to location, since the air quality modelling, noise assessment and landscape and visual assessments are based on a relatively fixed stack location.

4.3.8 The administration block, which is the only building that could potentially have three or more occupied storeys, will be located within Work No. 1B. This ensures it lies outside designated Health and Safety Executive (HSE) consultation zones in the vicinity and complies with their Land Use Planning Methodology.

4.4 Comparison of Consented Development and Proposed Development (the Additional Works)

4.4.1 For reference, in comparison to the Consented Development, the Proposed Development includes the following additional equipment and works ('the Additional Works'), which are required to enable generation of up to 95 MW of electricity:

- a larger ACC, with an additional row of fans and heat exchangers compared to the Consented Development – this will allow a higher mass flow of steam to be sent to the steam turbine whilst maintaining the exhaust pressure and thereby increasing the amount of power generated;
- a greater installed cooling capacity for the generator – additional heat exchangers will be installed to the closed circuit cooling water system compared to the Consented Development to allow the generator to operate at an increased load and generate more power;
- an increased transformer capacity – depending on the adopted grid connection arrangement the capacity will be increased through an additional generator transformer operating in parallel with the Consented Development's proposed generator transformer or a single larger generator transformer may be installed. Both arrangements would allow generation up to 95 MW; and
- ancillary works – the above works will require additional ancillary works and operations compared to the Consented Development, such as new cabling or

pipes, and commissioning to ensure that the apparatus has been correctly installed and will operate safely and as intended.

4.4.2 All of the above fall within Work No. 1.

4.5 Proposed Development Operation

Fuel Consumption

4.5.1 The anticipated annual capacity of the facility is 616,500 tonnes per annum of Refuse Derived Fuel (RDF) based on a design net calorific value (NCV) of 11 MJ/kg and the expected plant annual running hours. The plant is capable of maintaining the maximum electrical output while combusting fuel in a range of NCVs between 9 and 14 MJ/kg. The maximum fuel throughput of the Proposed Development is theoretically 753,500 tonnes per annum if only fuel with a NCV of 9 MJ/kg were used and based on the expected plant annual running hours.

Start-Up and Shut-Down

4.5.2 The Proposed Development will be started and stopped automatically, but under the supervision of trained operators, using auxiliary fuel (diesel or natural gas) to reach safe combustion temperatures before any solid fuels are added. The flue gas cleaning system and emissions monitoring will be in operation before any solid fuel is added.

4.5.3 If the operator wishes to turn the process off, this will be carried out in a controlled manner by reversing the start-up process. Solid fuel feeding will be stopped, but the process will continue to operate to ensure that all material is burnt, and any flue gases are cleaned out of the system. Air flows will be left on to allow the boiler to cool down before the process is fully shut off.

4.5.4 If any emergency condition is reached, or if a rapid shut down is required, the Proposed Development will stop automatically in a rapid manner. Fuel flows and air flows will be stopped instantly causing combustion to stop very quickly. This system is fully interlocked to prevent manual intervention unless it is safe to do so. The Proposed Development is also protected in case of a complete loss of power by auxiliary generator(s) and uninterruptible power supplies (UPSs).

Electrical Demand

4.5.5 In normal operating conditions, the power requirements of the Proposed Development will be supplied by the steam turbine generator with the balance exported to the grid. In the event of a breakdown of the steam turbine generator the power for the Proposed Development will be supplied from the grid. Auxiliary generators will also be available for safe shut down of the Proposed Development in the event of a loss of grid connection. The auxiliary generators will be sized to allow the Proposed Development to start without grid connection if necessary.

Maintenance

4.5.6 Routine maintenance will be undertaken in accordance with maintenance manuals provided by the construction contractor.

4.5.7 It is expected that each boiler will be taken offline for maintenance each year. This work may include the following:

- internal inspection of the boiler, storage tanks and silos;
- replacement of wear parts such as sections of the grate, refractory material and the filter bags that form part of the FGT system;
- non-destructive testing and thickness checks of pressure parts such as the boiler tubes;
- testing and inspection of lifting equipment;
- calibration and testing of instrumentation;
- cleaning of equipment such as the boiler internal surfaces and material handling systems; and
- full replacement of lubricants.

4.5.8 It is expected that annual maintenance outages will last for approximately three weeks in total. Where the outage works cannot be undertaken by permanent members of staff the number of staff on any one day could increase by up to 20. During the annual outage operational deliveries to the Site would significantly reduce, so overall traffic impacts are expected to be lower than during normal operation.

4.5.9 During an annual maintenance outage the majority of works will be undertaken within the building envelope. Where works are completed externally, they are likely to be minor in nature and not present an environmental risk above that presented during operation of the Proposed Development.

4.5.10 In addition to annual outages, it is expected that major outages will be required on a less frequent basis, for example, every five to six years. A major outage could be expected to last for up to five weeks, and up to 200 staff may be required on Site on any one day. During this time, operational deliveries to the Site would reduce, so overall traffic impacts are expected to be lower than during normal operation. In addition to the works associated with a typical annual outage (as listed above), the works during a major outage may include:

- replacement of boiler parts;
- internal inspection of the steam turbine and generator; and
- servicing of control valves, fans and pumps.

4.5.11 During a major outage it is likely that Abnormal Indivisible Loads (AILs) will be required for delivery of equipment such as major boiler parts. It is likely that there will be fewer than five AILs required during a major outage.

4.5.12 A major outage is also likely to require the use of a large crane, and the dismantling and reassembly of sections of the building cladding.

Hazard Prevention and Emergency Planning

4.5.13 Measures to prevent the risks of fire, flooding, spillages or other potentially major incidents will be embedded in the design of the Proposed Development.

4.5.14 Measures to prevent fire include:

- design and construction in accordance with the National Fire Protection Association guidance, supplemented by British and European Standards where appropriate;
- measures to segregate, detect and suppress fires to reduce the risk of any fire spreading;
- installation of infrared cameras in the fuel bunker to track hot spots;
- encasement of steelwork (e.g. in fire boarding or concrete) and installation of localised sprinkler systems to protect the building structure in the event of a fire; and
- provision of a quarantine area for the safe storage of any delivery vehicles in the case of smouldering loads.

4.5.15 Measures to prevent flooding include:

- the surface water drainage system which includes an appropriate storage volume for surface water runoff within the Site;
- raised critical infrastructure and a place of safe refuge; and
- flood resistance and resilience measures incorporated into the design to minimise damage and reduce recovery time in the unlikely event of the Site becoming inundated.

4.5.16 Measures to prevent spillages include:

- bunded or double-skinned storage areas for liquid chemicals;
- regular maintenance and Site housekeeping to reduce the likelihood of leakages and improve leakage detection;
- spill kits stored on Site; and
- installation of an appropriate drainage system including oil interceptors for road drainage.

4.5.17 Measures to prevent other potentially major incidents include:

- compliance with all relevant health, safety and environmental legislation;
- design, build and operation of the Proposed Development in accordance with good industry practice; and
- regular maintenance and inspections to reduce the risk of equipment failures.

4.5.18 A site specific Health and Safety Plan covering the works, commissioning and operation of the Proposed Development will be prepared to ensure compliance with relevant health and safety legislation.

4.5.19 A Site Emergency Plan will be developed to cover the Proposed Development in accordance with the Environmental Permit, which will include a fire strategy and appropriate training procedures.

4.5.20 A Flood Emergency Response Plan will be prepared in consultation with the Environment Agency. This will define access and egress routes from the site and

will ensure that the development is registered to receive flood warnings from the EA's 'Floodline Warnings Direct' service.

4.5.21 Procedures will be in place to clearly outline the responsibilities, actions and communication channels for operational staff and personnel on how to deal with emergencies should they occur. Staff will also receive the level of training required for their role and position. This will include dealing with events such as fires, spillages, flooding etc. Such measures will be included in the site operating and management system and regulated by the Environment Agency through the Environmental Permit.

Process Inputs

4.5.22 The Proposed Development will use various raw materials during operation. Primarily these include hydrated lime, ammonium hydroxide or urea, activated carbon, water and fuel (diesel or natural gas) for auxiliary burners. Except for water (and potentially natural gas for the auxiliary burners), these will be delivered to the facility in bulk transportation vehicles. The minimum on Site storage capacity will be set to reflect the process requirements and delivery capability.

4.5.23 In order to minimise the risks of contamination to process and surface water, all liquid chemicals stored on site will be kept in bunded controlled areas with a volume of 110% of stored capacity. Diesel will be held in a bunded storage tank.

Environmental Management

4.5.24 The Proposed Development will comply with the Industrial Emissions Directive (IED) under its Environmental Permit so that any impacts of emissions to air, soil, surface and groundwater, and effects on the environment and human health, will be minimised and avoided where possible.

4.5.25 The Site will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Site is operating to the appropriate standard.

4.5.26 Sampling and analysis of pollutants will be carried out where required including monitoring of exhaust emissions levels using CEMS prior to discharge from the stacks, in accordance with the Environmental Permit.

Odour Management

4.5.27 Odour could be generated through the receipt and handling of RDF. The key odour abatement measure incorporated into the design and management of the Proposed Development is the provision of a fully enclosed fuel reception area, incorporating a tipping hall and enclosed fuel storage bunker. The tipping hall will be fitted with fast acting doors and maintained under slight negative pressure to reduce the risk of odours escaping. Deodorisers may also be used in the tipping hall.

4.5.28 Odour levels around the plant will be regularly monitored to assess the effectiveness of the installed odour control measures.

4.6 Hours of Operation

4.6.1 The Proposed Development will operate twenty four hours a day, seven days a week, with occasional offline periods for maintenance. Fuel will be delivered to the Site by road twenty-four hours a day, seven days a week (excluding Christmas Day, Boxing Day and New Year's Day).

4.6.2 The Proposed Development will have storage capacity for approximately four days of fuel, so that the facility can continue to operate if there are any short term supply issues.

4.7 HGV Movements

4.7.1 Operational traffic movements are detailed within the Transport Assessment (TA) (Appendix 9A in ES Volume III, Document Ref. 6.4). In summary it is anticipated that during the operational phase of the Proposed Development, total HGV movements at the Site will be around 312 in and 312 out per day. These figures include fuel (RDF) deliveries and movements associated with delivery of consumables and removal of waste products e.g. bottom ash and FGT residues.

4.7.2 Although fuel deliveries will be accepted twenty-four hours a day, it is expected that the majority of fuel deliveries will occur between 6am and 6pm, with a maximum of 44 deliveries in any one hour, and only approximately three deliveries per hour between 6pm and 6am. The transport, noise and air quality assessments consider the worst case traffic profile relevant to that topic.

4.8 Staffing

4.8.1 The Proposed Development will be operated and managed by suitably qualified and trained personnel. It is anticipated that a total of up to 56 staff will be employed.

4.8.2 It is estimated that staff arrivals to the Site will be spread over a 24 hour period and on a shift system.

4.9 Decommissioning

4.9.1 The Proposed Development is expected to have a design life of at least 30 years. At the end of its design life it is expected that the Proposed Development may have some residual life remaining and the operational life may be extended. Works to achieve such an extension would be similar in nature to a major outage.

4.9.2 At the end of its operating life, all above-ground equipment associated with the Proposed Development will be decommissioned and removed from the Site. Prior to removing the plant and equipment, all residues and operating chemicals will be cleaned out from the plant and disposed of in an appropriate manner.

4.9.3 The bulk of the plant and equipment will have some limited residual value as scrap or recyclable materials, and the contractor will be encouraged to use materials that could be recycled.

4.9.4 Prohibited materials such as asbestos, polychlorinated biphenyls (PCBs), ozone depleting substances and carcinogenic materials will not be allowed within the design of the Proposed Development, and other materials recognised to pose a

risk to health (but which are not prohibited) will be subject to detailed risk assessment.

4.9.5 Prevention of contamination is a specific requirement of the Environmental Permit for the operation of the Proposed Development and therefore it is being designed such that it will not create any new areas of ground contamination or pathways to receptors as a result of construction or operation. Once the plant and equipment have been removed to ground level, it is expected that the hardstanding and sealed concrete areas will be left in place.

4.9.6 A Decommissioning Plan (including a Decommissioning Environmental Management Plan) will be produced and agreed with the Environment Agency as part of the Environmental Permitting and site surrender process. The Decommissioning Environmental Management Plan will consider in detail all potential environmental risks on the Site and contain guidance on how risks can be removed or mitigated. This will include details of how surface water drainage should be managed on the Site during the decommissioning and demolition.

4.9.7 The Decommissioning Plan will include an outline programme of works. It is anticipated that it would take up to a year to decommission the Site, with demolition following thereafter and taking around two years to complete.

4.9.8 During decommissioning and demolition there will be a requirement for office, accommodation and welfare facilities.

4.9.9 Any demolition contractor would have a legal obligation to consider decommissioning and demolition under the Construction (Design and Management) Regulations 2015, or the equivalent prevailing legislation at that time.

4.9.10 Decommissioning activities will be conducted in accordance with the appropriate guidance and legislation at the time of the Proposed Development's closure. All decommissioning activities will be carried out in accordance with the waste hierarchy and materials and waste produced during decommissioning and demolition will be stored in segregated areas to maximise reuse and recycling. All materials that cannot be reused or recycled will be removed from the Site and transferred to suitably permitted waste recovery/ disposal facilities. It is anticipated that a large proportion of the materials resulting from the demolition will be recycled and a record will be kept to demonstrate that the maximum level of recycling and reuse has been achieved.

4.9.11 Upon completion of the decommissioning programme, including any remediation works that might be required, the Environment Agency will be invited to witness a post-decommissioning inspection by site staff. All records from the decommissioning process will be made available for inspection by the Environment Agency and other relevant statutory bodies, in accordance with the Environmental Permit requirements.

4.10 References

Environment Agency (2013) *CHP Ready Guidance for Combustion and Energy from Water Power Plants Note (V1.0).* Environment Agency, Bristol.

The Institute of Lighting Professionals (2020) *Guidance Notes for the Reduction of Obtrusive Light (GNO1/20).* ILP, Rugby.