Thurrock Flexible Generation Plant

Preliminary Environmental Information Report
Chapter 2: Project Description

Date: September 2018

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume 2

Chapter 2

Report Number: OXF10872

Version: Final

Date: September 2018

This report is also downloadable from the Thurrock Flexible Generation Plant website at:
http://www.thurrockpower.co.uk

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Summary

This document provides a description of the proposed development's design, nature of its operation, temporary and permanent road access options, and construction programme with an overview of the construction techniques and plant to be used.

Qualifications

This document has been prepared by Tom Dearing, a Chartered Environmentalist and full Member of the Institute of Environmental Management and Assessment, who has eight years' experience of environmental impact assessment.

1. Site Location and Overview of Development

1.1 Site location and setting

1.1.1 The proposed development is located on land south west of Station Road near Tilbury, Essex. The location and order limits are shown in Figure 1.4. The British National Grid coordinates are TQ662766 and the nearest existing postcode is RM18 8UL. It is within the administrative area of Thurrock Borough Council (TBC) and lies in the Thurrock Green Belt.

1.1.2 The main development site (see definition in the following Section 1.2) currently comprises open fields crossed by three overhead power lines with steel lattice electricity pylons. It is immediately to the north of the existing Tilbury Substation and site of the decommissioned Tilbury coal fired power station, with the River Thames further to the south. To the north is a section of the London, Tilbury and Southend Railway known as the Tilbury Loop, used mainly for commuter passenger services between central/east London and locations in Essex.

1.1.3 Within the main development site and other land within the order limits are areas of registered Common Land, discussed in Volume 3, Chapter 8: Land Use, Agriculture and Socio-Economics.

1.1.4 A photograph of the main development site in its baseline condition, looking north from close to Tilbury Substation, is shown in Figure 1.1.

Figure 1.1: Main development site baseline photograph – looking north from Tilbury Substation.

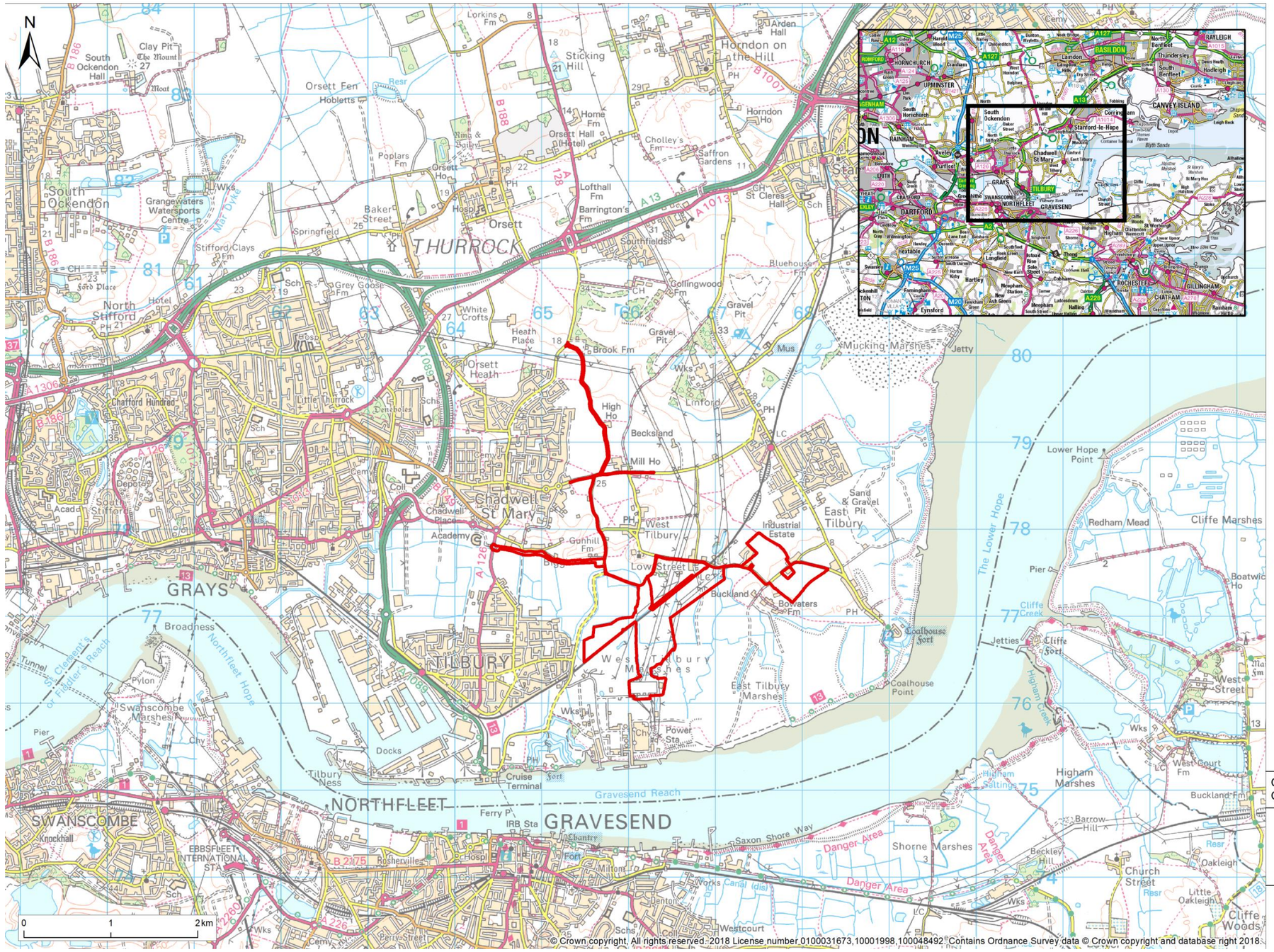
1.1.5 Substantial development is envisaged in the area, with the proposed extension of Tilbury Port to the west, redevelopment of Tilbury Power Station and the Lower Thames Crossing major highway scheme among other proposals. Further details of other proposed developments are given in Volume 5, Appendix 4.1: Cumulative Developments and Screening.

1.1.6 The eastern edge of Tilbury is approximately 750 m west of the main development site, the village of West Tilbury is approximately 1.25 km to the north and East Tilbury village is approximately 2.1 km to the east. In addition, there are a number of individual or small groups of houses within around 800 m of the main development site boundary, the nearest being:

- Walnut Tree Farm and Low Street (600 m north east);
- Condovers Cottages (715 m north east);
- Polwicks (750 m north east);
- West Cottages (790 m north east);
- St James Church (790 m north);
- Byron Gardens (700 m west);
- Brennan Road (750 m west); and
- Sandhurst Road (770 m west).

1.1.7 The nearest European designated site is the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, approximately 2.6 km east of the main development site. The nearest Scheduled Monuments are Tilbury Fort (960 m south west) and ‘Earthworks near church, West Tilbury’ (730 m to the north).

1.1.8 Details of the baseline environment and sensitive receptors of the development site and its setting are given in each environmental topic chapter in Volume 3. Overviews of the site setting illustrating environmental sensitivities are shown in Figure 1.3 and Figure 1.4.



Legend

Development boundary

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Thurrock Flexible Generation Plant
Development boundary

Figure 1.2: Site Location.

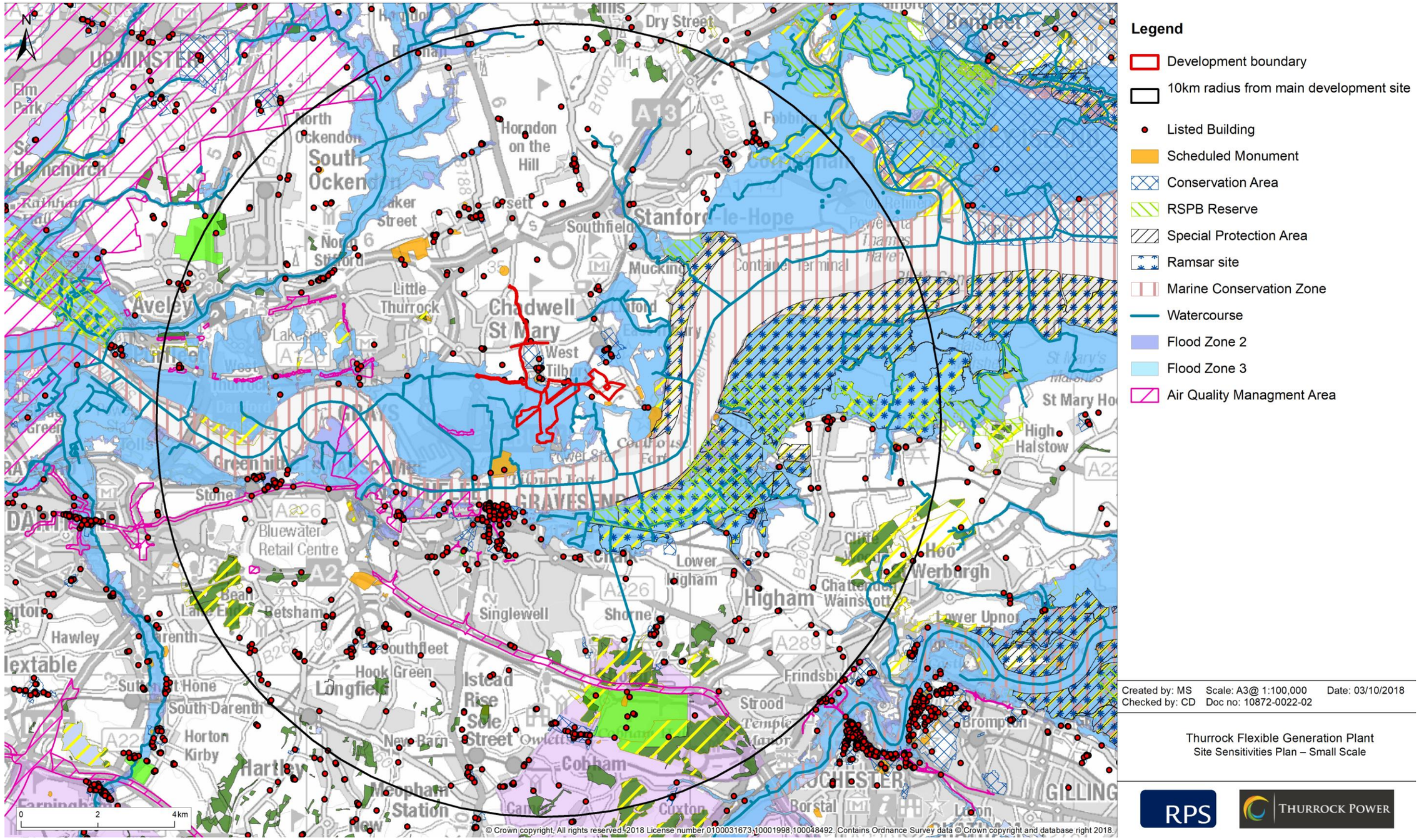
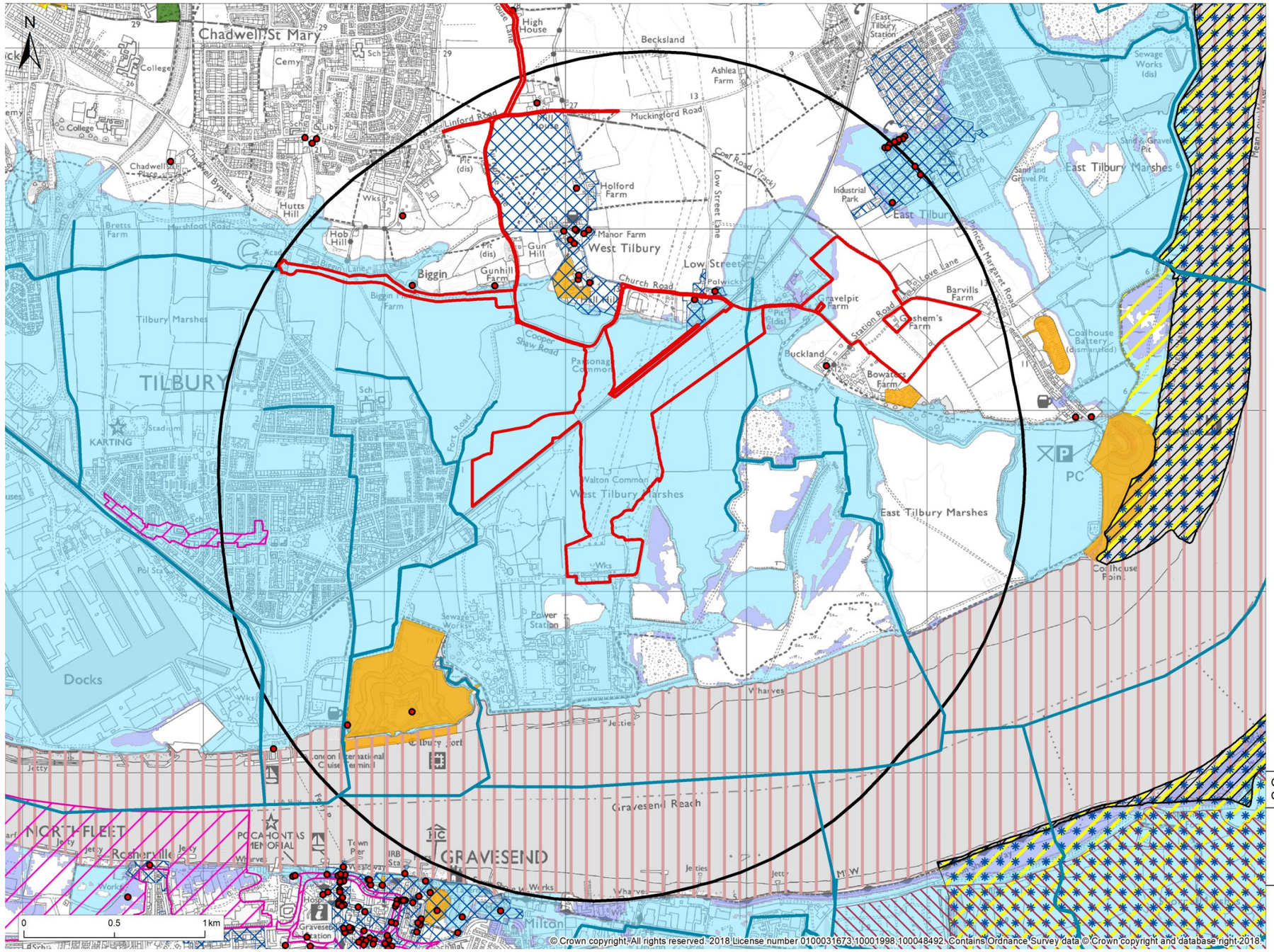


Figure 1.3: Site Sensitivities – Small Scale.



Legend

- Development boundary
- 2km radius buffer from main development site
- Listed Building
- Scheduled Monument
- Conservation Area
- RSPB Reserve
- Special Protection Area
- Ramsar site
- Marine Conservation Zone
- Watercourse
- Flood Zone 2
- Flood Zone 3
- Air Quality Managment Area

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Thurrock Flexible Generation Plant
Site Sensitivities Plan – Large Scale

RPS

THURROCK POWER

Figure 1.4: Site Sensitivities – Large Scale.

1.2 Development overview

1.2.1 In overview, the proposed development comprises the construction and operation of:

- reciprocating gas engines with rated electrical output totalling 600 MW;
- batteries with rated electrical output of 150 MW and storage capacity of up to 600 MWh[1];
- gas and electricity connections;
- creation of temporary and permanent private access road(s) for construction haul and access in operation, including potential minor public highway widening for delivery of large loads; and
- designation of exchange Common Land and habitat creation or enhancement for protected species translocation and biodiversity gain.

1.2.2 The proposed development will be designed to operate for up to 35 years, after which ongoing operation and market conditions will be reviewed. If it is not appropriate to continue operating after that time, one or both elements of the development (gas engines or batteries) will be decommissioned.

1.2.3 The applicant requires flexibility in the Development Consent Order (DCO) for the design of a number of elements of the development. For example, the number and size of gas engines and batteries to provide the electricity generation and storage capacity specified would vary depending on the technology provider and equipment models selected. Flexibility in options for construction access and haul routes (described in Section 3.3) and the gas pipeline route and micro-siting of the above-ground installation (AGI) for connection to the National Transmission System (NTS) is also required.

1.2.4 A 'Rochdale envelope' approach to assessment has therefore been taken, whereby maximum design parameters are defined for assessment. These maximum parameters would not be exceeded by the proposed development's final design, in terms of its physical dimensions, nature of construction and operational activities, or significance of environmental effects. The design envelope is discussed in further detail in Section 2.13.

1.2.5 For descriptive purposes, land within the order limits has been divided into zones, labelled as follows. These zones are illustrated in Figure 1.5. Further details of the development design within these zones are given in Section 2.

1.2.6 Several of these zones provide options for potential temporary construction access routes, not all of which may be required (subject to logistical considerations and ongoing negotiation with third parties). Further details are given in Section 3.3.

Zone A

1.2.7 The 'main development site' immediately north of Tilbury Substation, within which the principal buildings or structures of the proposed development would be constructed. The gas engines, batteries, electrical switchgear (customer substations), runoff attenuation, control room and staff parking would be within zone A.

Zone B

1.2.8 This is the existing National Grid Tilbury Substation. The proposed development would connect to the 275 kV circuit at this substation via underground cables crossing from zone A into zone B.

Zone C

1.2.9 Zone C is a corridor of land south of the railway line in which the permanent access road and underground gas pipeline would be constructed, between Station Road and the main development in zone A. The route of the access road and gas pipeline within this corridor would be defined following detailed design.

Zone D

1.2.10 Zone D comprises a section of Station Road and two agricultural fields within which the gas pipeline would be constructed. This zone allows flexibility in the routing of the gas pipeline between zone C and zone E. The final route would be defined following detailed design.

Zone E

1.2.11 The AGI for the connection of the gas pipeline to the NTS would be constructed within zone E. The NTS high pressure pipeline 'Feeder 18' runs through this zone. The final location of the AGI within zone E would be defined following detailed design.

Zone F

1.2.12 This zone north of the railway, currently agricultural land, is the primary area in which exchange Common Land would be provided. Habitat creation / enhancement, compatible with Common Land rights, would also be provided in this zone.

[1] i.e. storing up to four hours' power at the rated discharge capacity

Zone H

1.2.13 This zone comprises sections of public highway and sections of an existing private road with temporary planning permission that would be retained for the proposed development's construction period in order to provide a possible access route from Orsett Cock junction (in the north) to zone I and/or zone C that could accommodate heavy goods vehicle (HGV) traffic and abnormal loads, as an alternative to routing via zone J (see below). Public highway sections will require widening at certain pinch points and temporary traffic controls.

Zone I

1.2.14 Up to 1 acre of this zone adjacent to the railway line could be used for temporary laydown during the construction period and a temporary tower crane for moving items across the railway. A temporary haul road south from Coopers Shaw Road may also be constructed. Undisturbed areas of zone I may be used for protected species translocation and habitat creation / enhancement, compatible with existing Common Land rights.

Zone J

1.2.15 A construction haul road would be created in this zone from St Chad's Road to Gun Hill. The haul road would remain *in situ* following the end of the construction programme in order to provide a continued access option for abnormal loads should a major component (such as transformer) of the proposed development fail in operation and require replacement.

Legend

- Development Boundary
- A - Main Development Site where the gas fired facility, battery storage facility and customer substation will be located
- B - The existing Tilbury Substation to which an electrical connection will be made
- C - Corridor for permanent access road and gas pipeline route
- D - Corridor for gas pipeline
- E - Field within which above-ground installation for connection to high-pressure gas main will be made
- F1 - Primary area within which exchange Common Land could be provided.
- F2 - Wildlife corridor
- H - Access route including minor works on public highway to accommodate HGV tracking
- I - Existing Common Land used for temporary construction haul route, laydown area and biodiversity mitigation
- J - Temporary construction haul route
- Speed restriction
- Weight restriction

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Thurrock Flexible Generation Plant
Development Zones

RPS

THURROCK POWER

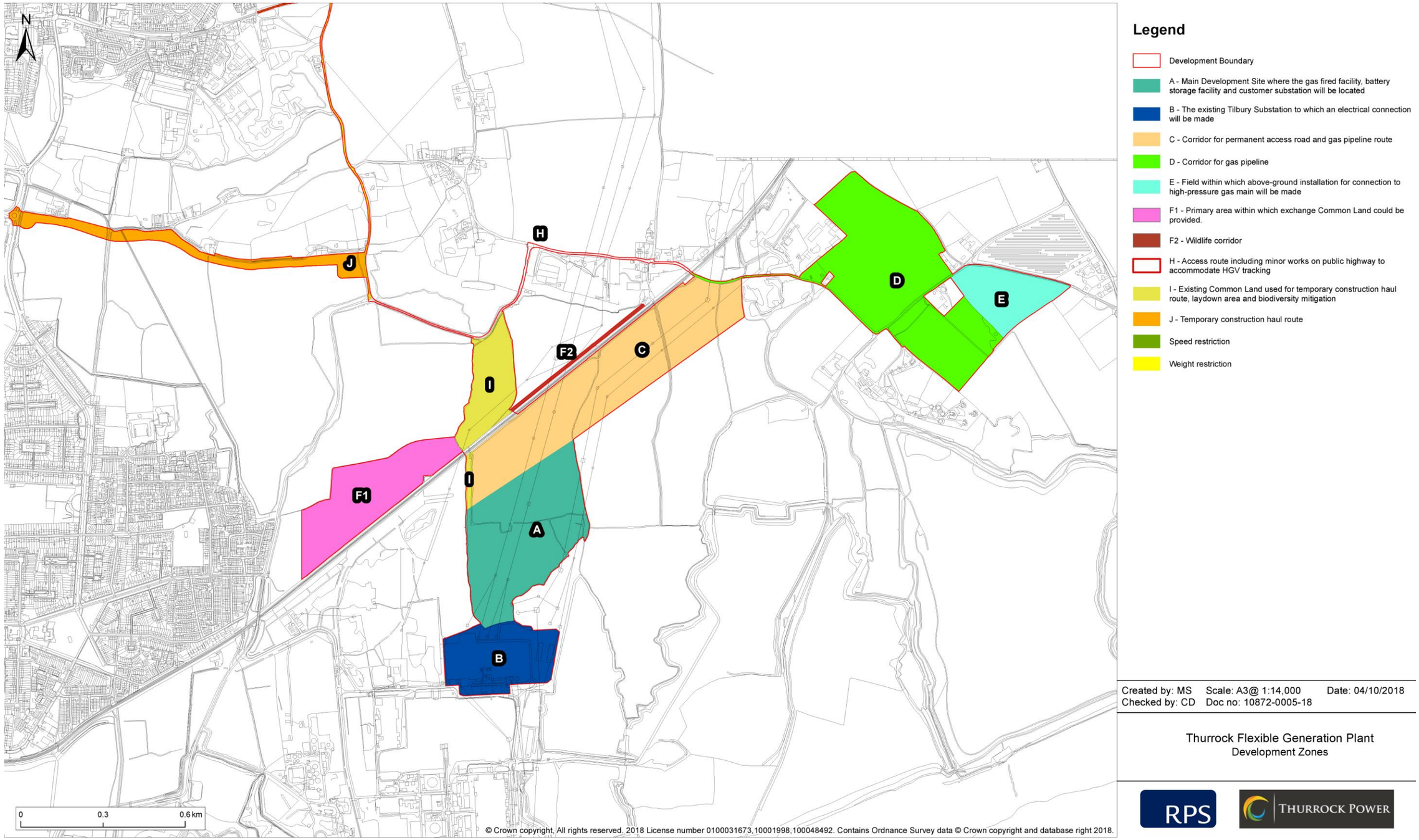

Figure 1.5: Development zones.

2. Development Design

2.1 Main development site – zone A

2.1.1 Within the main development site, the proposed development will comprise a range of buildings, structures and apparatus for the gas engines, batteries, electricity and gas connection points, and staff facilities. These are listed in Table 2.1.

2.1.2 An indicative layout for the main development site is shown in Figure 2.1. This is subject to change following consultation with stakeholders and ongoing technical and environmental studies, but as currently designed shows the expected location and space requirements within the application site of many of the main development elements.

Table 2.1: Built development elements on main development site.

Development element	Structures and equipment
Reciprocating gas engines	Up to 60 gas engines and generators with heat exchangers and cooling fans (mounted over one or more of the groups of engines or at ground level) Up to 60 gas engine exhaust stacks (which may be aggregated into fewer stacks) up to 40 m high Organic Rankine cycle (ORC) system recovering heat from gas engine exhausts for electricity generation Engine coolant and lubricant storage and engine selective catalytic reduction (SCR) reagent storage Gas reception compound, control equipment, heating and distribution system Workshop and stores Electrical switchgear
Battery storage	Either: A design based around freestanding prefabricated units consisting of: • a number of battery 'e-houses', in the order of 52 freestanding units similar to double-width shipping containers which may be stacked two high, with roof-mounted air conditioning heat exchangers, the final number and dimensions being subject to detailed design; and • containerised transformer and power conversion system units to provide electrical connection between electricity network and batteries; Or, a purpose-built building containing the above equipment, each option taking up the same space allocated on the site. Electrical switchgear and control equipment
Electrical and other infrastructure	11 kV, 33 kV, 132 kV and 275 kV step-up substations with relays, transformers and associated equipment Switchgear buildings at 11 kV and 33 kV Control room and administrative building with welfare facilities Fire water tank Surface water drainage and runoff controls Internal access roads and car parking with around 30 spaces Gatehouse, security fencing, lighting and CCTV

2.2 Reciprocating gas engines

2.2.1 The proposed development's fast-start gas engines will be used intermittently, firing up when National Grid requires some or all of them to do so. Compared with conventional baseload electricity generation, which cannot increase or decrease output quickly, this plant will provide National Grid with the necessary flexibility it needs in transforming electricity system.

2.2.2 The total generation capacity of 600 MWe will be provided by 33 to 60 individual gas engines of between 10 and 18 MWe capacity (with appropriate de-rating), each comprising the engine itself, electrical generator, air cooling system and exhaust flue. The gas engines will also include a system to generate electricity from recovered exhaust gas heat, using the organic Rankine cycle (ORC i.e. using a non-water working fluid that is efficient at lower temperatures).

2.2.3 The gas engines will typically be rated at 52% efficiency[2] overall, including the ORC system, depending on the manufacturer and engine model.

2.2.4 The gas engines and associated equipment will either be in buildings or grouped in encasements up to 50 m wide, 125 m long and 20 m high, located within the plan form area shown in Figure 2.1. The engine exhausts may be individual flues for each engine or aggregated into fewer stacks with groups of flues, in either case up to 40 m in height.

2.2.5 The maximum operating time of the gas engines per year could be up to 4,000 hours, subject to agreement with the Environment Agency.

2.3 Battery storage

2.3.1 The battery storage system will comprise battery cells, cooling systems, inverters to convert the direct current to alternating current and electrical transformers.

[2] lower heating value, ISO3046 test conditions

2.3.2 Battery technology, which can import or export large amounts of electricity with no time lag, helps National Grid with the balancing market (balancing transmission requirements as large generation and consumption sources come on- or off-line), the energy market (storing excess generation until it is needed) and with maintaining the narrow frequency range around 50 Hz required for safe transmission network operation.

2.3.3 Depending on the technology provider, the battery systems may be located within a purpose-built building or buildings, or may be freestanding pre-fabricated units similar in appearance to shipping containers, which could be stacked up to two high. In total, batteries with rated electrical output of 150 MWe and storage capacity of up to 600 MWh would be installed.

2.3.4 The battery systems, whether in freestanding units or one or more buildings, would have dimensions in total up to 75 m wide, 120 m long and 10 m high located within the plan form area shown in Figure 2.1.

2.4 Electricity substations and grid connection

2.4.1 The proposed development will connect to the existing National Grid Tilbury 275 kV substation, which is immediately adjacent to the southern boundary of the main development site, via a short section of underground cable(s) lying within the boundary of the main development site and the existing National Grid substation site (zone B).

2.4.2 No changes are proposed to the existing high-voltage overhead lines crossing the main development site or other land within the application boundary. The indicative development layout shown in Figure 2.1 takes account of safe clearance zones around the existing electricity pylons and overhead wires on the main development site, which will remain in place.

2.4.3 Within the main development site will be switchgear, step-up transformers, breakers, disconnectors, current and voltage transformers and relays (collectively the switchgear) to connect the gas engines and batteries to the 275 kV underground export cable(s) that will in turn connect into the National Grid substation adjacent to the south. These will consist of:

- 33 kV switchgear houses, two 33 kV to 132 kV step-up transformers and associated switchgear, and two 132 kV to 275 kV step-up transformers and associated switchgear for batteries; and
- eight 11 kV to 132 kV step-up transformers and associated switchgear, and three 132 to 275 kV step-up transformers and associated switchgear for gas engines.

2.5 Gas connection

2.5.1 A new gas pipeline connection to the existing high-pressure National Grid gas NTS at Feeder 18 will be required. Feeder 18 is approximately 2 km away from the main development site to the north east. Zone C provides a corridor for routing the gas pipeline through agricultural land as far as Station Road. The underground pipeline may then be routed along Station Road or through the adjacent agricultural land to the north or south of the road in zone D.

2.5.2 The pipeline will connect to Feeder 18 where it runs across the field of zone E. The connection itself will comprise an AGI for the junction point with instrumentation kiosks and emergency pressure release valve set in a compound no greater than 50 m square and with structures no more than 6 m in height. It would include a perimeter security fence, potential screening planting, and access road to the public highway.

2.5.3 The applicant requires flexibility in the DCO for the final route of the gas pipeline and NTS connection point as land along the route of Feeder 18 is subject to a third party residential development option being agreed with the landowner. It is not anticipated that there will be any difficulty defining a route for the pipe through zone D to the connection compound in zone E, but the route will take account of residential development plans if these become sufficiently progressed.

2.6 Carbon capture readiness

2.6.1 The proposed development is required to be 'Carbon Capture Ready' (CCR) under the Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013, which entails setting aside sufficient land for future carbon capture and storage (CCS) technology to be installed.

2.6.2 Construction of possible future CCS technology on the development site does not form part of the application and current development design. However, as the land reserved for possible CCS is a requirement of the current application, this land-take does form part of the design and is shown in Figure 2.1.

2.7 Drainage

2.7.1 The proposed development will not generate waste water or process effluent during normal operation.

2.7.2 Clean surface runoff will be to the existing watercourse, controlled via sustainable drainage (SuDS) features (e.g. runoff attenuation ponds) and/or hydrobrake as required. Potential space for attenuation ponds is shown indicatively on Figure 2.1, with the size and design of such features subject to further drainage design after the decision on engine supplier is made. Further details of the drainage concept are provided in Volume 6, Appendix 15.1: Flood Risk Assessment.

2.7.3 The proposed development will not have a sewer connection. Foul drainage from staff welfare facilities on site will be either to a packaged biological foul treatment plant with discharge to the surface water system or to a storage tank for off-site disposal via road tanker.

2.8 Operation and maintenance

2.8.1 The flexible generation plant may operate continuously or at intervals during the day and night, depending on the power generation and storage requirements of National Grid. Subject to agreement with the Environment Agency, the maximum annual operating time of the gas engines is not expected to exceed 4,000 hours.

2.8.2 The facility is not expected to have a full-time workforce on site during operation, as it would be controlled remotely by around four full-time equivalent (FTE) employees. However, control room, administrative and staff welfare buildings or prefabricated units would be provided for when staff are required on site, such as during inspection, maintenance or repair work.

2.8.3 Motion-activated directional security lighting may be used at the main development site and the AGI for gas connection (zone E), but full-time lighting is not proposed.

2.8.4 Up to one major maintenance period (duration three weeks) and four minor maintenance visits (duration one week each) are expected per annum, estimated to require up to 20 and six staff daily respectively.

2.8.5 Up to 600 m^3 of engine lubricating oil and 60 m^3 of engine coolant (containing glycol antifreeze) would be stored on site. Reagent for the selective catalytic reduction (SCR) air pollution control (APC) system for the gas engines would also be stored: depending on APC manufacturer, this may be either urea or ammonia solution. These substances would be stored in tanks with appropriate containment bunds to ensure no release to soil or the surface water drainage system in the event of a spillage or tank leak, and a leak detection system to alert the operator.

2.8.6 If ammonia solution is used, which is a hazardous substance, no more than 50 tonnes at no more than 25% concentration would be stored on site, i.e. below the threshold at which the proposed development would be a lower-tier Control of Major Accident Hazards (COMAH) site or require a Hazardous Substances Consent.

2.8.7 The working fluid of the ORC system is subject to further design, but could be a hydrofluorocarbon refrigerant gas such as R245fa. This is expected to be supplied as a sealed, ready-filled system with no storage of working fluid on site or top-up required during maintenance.

2.8.8 Environmental management of the flexible generation plant will be regulated by the Environment Agency using the facility's Environmental Permit, which will specify operating techniques and will include a regular schedule of audits. The permit will also regulate discharges and emissions from the facility, specifying limits, monitoring and reporting of these. Thurrock Power will implement an ISO14001 or equivalent Environmental Management System (EMS) as required by the Environmental Permit.

2.8.9 Thurrock Power will operate the flexible generation plant in accordance with legislation and regulatory requirements for environmental protection and in accordance with its duties under the Health and Safety at Work etc. Act 1974 as amended and associated statutory instruments. Volume 5, Appendix 2.3: Accident and Emergency Management summarises measures that would be taken as part of the operation of the facility to control the potential for major accident hazards and Thurrock Power's principles for emergency management, including gas safety and fire prevention and control.

2.8.10 Taking into account the existing legislative controls and Thurrock Power's management approach, regulated by the Environment Agency and the Health and Safety Executive, the risk of accidents and disasters is expected to be as low as reasonably practicable. Major accidents or disasters with potential for significant environmental effects are not considered to be likely.

2.8.11 A Flood Emergency Plan will be developed, establishing a response procedure for flood hazard (such as tidal defence breaches) to manage risks to site users. Further details are provided in Volume 3, Chapter 15: Hydrology and Flood Risk.

2.9 Road access

2.9.1 Permanent road access will be provided through zone C to the public highway at Station Road. As set out above, there will be limited need for access during operation, as the facility will not typically have an on-site workforce. The permanent road access will be used for maintenance staff as described above and for delivery of SCR reagent by road tanker, for which around one vehicle per two to three days is estimated to be required.

2.9.2 Up to 30 car parking spaces would be provided within the main development site.

2.9.3 Section 3.3 details road access during construction and in the event of a major component failure (e.g. transformer) requiring an abnormal load delivery in operation.

2.10 Resources, residues and emissions

2.10.1 The main natural resource consumed by the flexible generation plant would be natural gas, estimated at up to around 325,000 tonnes per annum with the maximum 4,000 operating hours for the full 600 MWe gas-fired generation capacity.

2.10.2 Annual consumption of engine lubrication oil and coolant is estimated as up to 660 m^3. SCR reagent consumption, either urea or ammonia solution, is estimated as up to 6,000 m^3 per annum of pre-mixed solution.

2.10.3 Process emissions would comprise air pollutants and greenhouse gases released from the gas engine stacks and the noise of the flexible generation plant in operation. These are detailed in Volume 3, Chapter 12: Air Quality, Chapter 11: Noise and Vibration and Chapter 14: Climate Change. There would be no process effluent discharges.

2.10.4 The main residues and wastes would be used lubrication oil and coolant, with quantities no greater than the consumption listed above. These substances would be disposed via a licensed waste carrier to appropriate treatment for each material.

2.11 Design evolution and alternatives

2.11.1 The design has been developed iteratively during environmental assessment process undertaken to date. The design evolution and alternatives studied (including site location and choice of flexible generation plant technology) are detailed in Volume 2, Chapter 3: Consideration of Alternatives.

2.11.2 Several layout options within the main development site in zone A for the gas engines, batteries and substation components have been considered. The alternative layouts have not been found to significantly affect potential environmental impacts, except for the total length of drainage ditch (providing water vole habitat) that would be disturbed.

2.11.3 The proposed layout has been selected primarily on practicality grounds, taking into account the constraints of the existing high-voltage overhead power lines crossing the site. The proposed development areas and internal access roads within the site, shown indicatively in Figure 2.1, have been moved inwards during design iteration to maximise the length of existing boundary ditch that can be retained undisturbed (with suitable standoff distance within which no construction activity would take place).

2.12 Embedded ('designed-in') mitigation

2.12.1 Details of development design elements that provide embedded mitigation of environmental impacts are given in Section 2.8 of each topic chapter in Volume 3.

2.12.2 All embedded mitigation measures (together with recommended further mitigation, enhancement and monitoring commitments, where required), are set out in Volume 5, Appendix 2.1: Enhancement, Mitigation and Monitoring Commitments. Appendix 2.1 is currently in draft form for the purposes of this PEIR and will be finalised for the ES, following consultation regarding the draft mitigation measures proposed.

2.13 Design envelope and limits of deviation

2.13.1 As described in Section 1.2, the applicant requires flexibility in the DCO and a design envelope has therefore been defined for the purpose of EIA.

2.13.2 Assessment parameters have been defined in each topic chapter in Volume 3 that provide a reasonable maximum design envelope relevant to each assessment, based on the design and construction details described in this chapter. These are both physical parameters, such as building dimensions, and other parameters such as duration or timing of activity, methods employed, and options for continued use or decommissioning at the end of the flexible generation plant's initial 35-year design life.

2.13.3 The assessment parameters have been carefully considered to ensure that where design flexibility is sought within the overall design envelope described in this chapter, reasonable maximum impacts and resulting effects have been assessed.

2.13.4 Overall limits of deviation, in terms of physical design of the development, are the maximum dimensional envelopes described in this chapter and the boundaries of zones shown on Figure 1.5 and Figure 2.1. Further topic-specific limits of deviation are defined in topic chapters in Volume 3 where appropriate, based on the degree of deviation that would not materially affect the assessment of that topic.

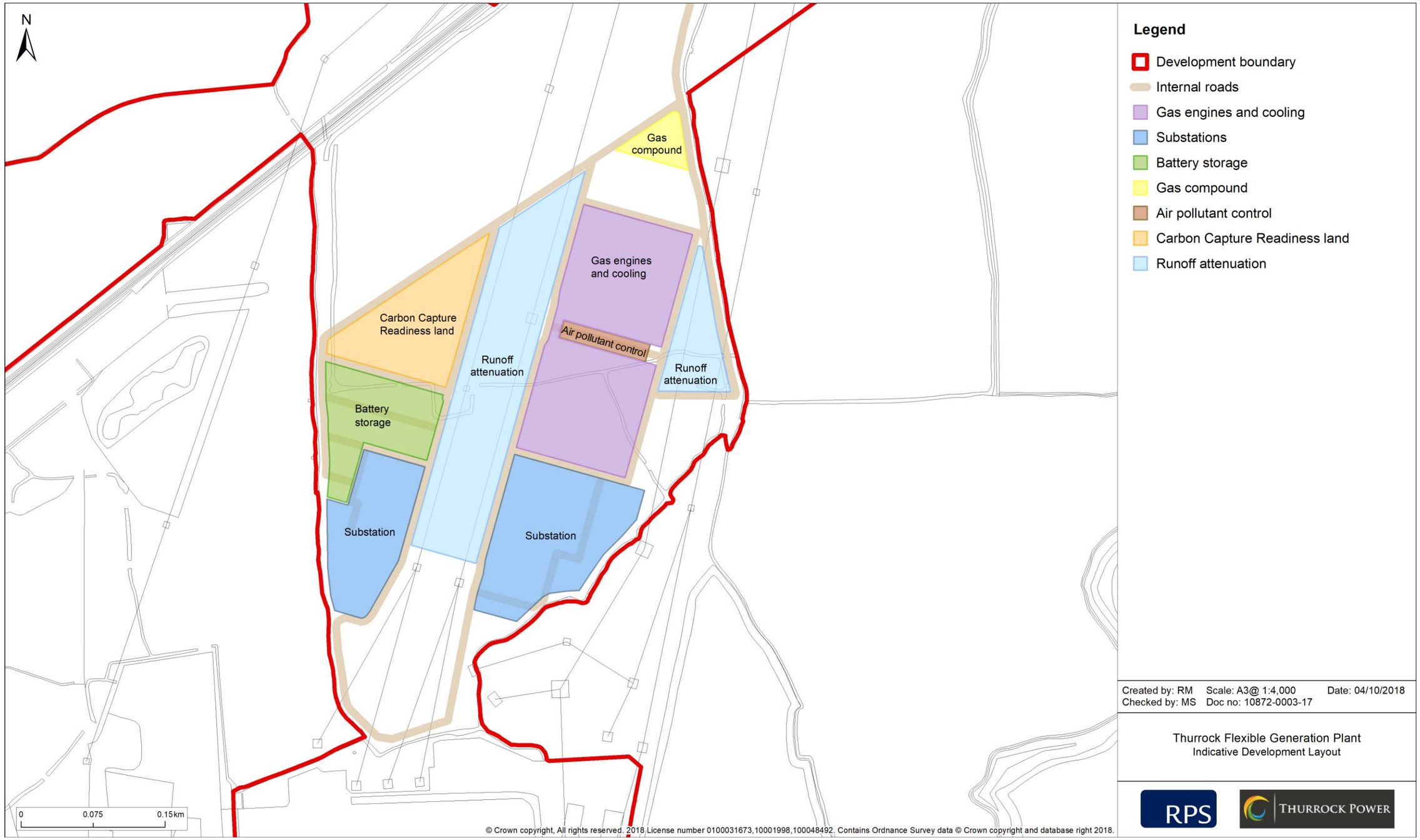

Figure 2.1: Indicative development layout.

3. Construction and Decommissioning

3.1 Construction programme

3.1.1 Subject to being granted development consent and subsequent Final Investment Decision, the earliest date of development start would be in 2020 for work in advance of the main construction period to provide exchange Common Land, protected species management and habitat creation.

3.1.2 The start of construction work on the main development site (zone A), haul road(s) and gas connection is expected to be quarter one (Q1) 2021. The proposed development may be constructed as a whole in a single phase of work or may be split into three phases, subject to the Final Investment Decision.

3.1.3 National Grid will have completed necessary works for the proposed development's electrical export connection within Tilbury Substation by late 2021.

Single phase construction

3.1.4 The minimum construction period for a single-phase development, after the advance works in 2020, is expected to be 12–18 months with a programme generally as follows:

- 2020: provision of exchange common land and habitat creation / enhancement outside main development site, potential protected species relocation;
- Q1 2021: main development site preparation and ground works, creation of construction access road(s), start of gas pipeline trenching;
- Q2-Q3 2021: construction/installation of gas engines, batteries and associated equipment; connection of gas supply pipeline and electricity export cables;
- Q3-Q4 2021: commissioning and energisation; completion of landscaping and permanent access road; and
- end of Q4 2021: facility is available for operation.

Three phase construction

3.1.5 If the proposed development is constructed in three phases, these are anticipated to be as follows. Each phase may last up to 18 months and the overall construction programme may last four and a half to six years, i.e. each phase may be back to back or there may be a gap of nine to 18 months between phases, depending on market conditions.

3.1.6 Construction phasing on the main development site (zone A) is shown in Figure 3.1.

Phase 1

3.1.7 The first 300 MW of gas engines and one on-site substation would be constructed with necessary ground works, drainage, control equipment and internal access roads for that part of the main development site (containing and serving the first 300 MW of gas engines) only.

3.1.8 Access roads, gas pipeline and electrical export cables with capacity for the full 750 MW development (600 MW gas engines and 150 MW batteries) would all be installed in this first construction phase. All exchange Common Land and habitat creation / enhancement would be established, together with protected species management for the disturbed part of zone A.

Phase 2

3.1.9 The second 300 MW of gas engines, substation and associated equipment would be constructed in the same way as for phase 1.

Phase 3

3.1.10 The 150 MW battery storage facility, substation and associated equipment would be constructed in the same way as for phase 1.

3.2 Construction methods

Construction environmental management

3.2.1 Construction of the proposed development will be managed under a Code of Construction Practice (CoCP) that sets out the principles of good environmental management to be followed in order to avoid or minimise environmental impacts. An Outline CoCP is included at Volume 5, Appendix 2.2. This includes principles for management of construction noise, dust, traffic, materials storage and waste management, drainage and ecological protection.

3.2.2 The CoCP would be supported by a detailed Construction Environmental Management Plan (CEMP) to be produced by the lead construction contractor, which would provide method statements for construction activities detailing how the requirements of the CoCP are met.

3.2.3 A Construction Traffic Management Plan (CTMP) with Construction Staff Travel Plan will be produced.

Construction activities and plant

3.2.4 In overview, construction activities will comprise:

- pre-construction work to provide ecological management and Common Land exchange;
- construction of haul routes and laydown areas;
- site clearance and provision of temporary drainage;
- earthworks and construction of foundations;
- trenching for gas pipeline and electrical export cables;
- installation of pre-manufactured components, i.e. gas engines and stacks, batteries, substation and control equipment;
- erection and mechanical and electrical fit-out of buildings or enclosures;
- commissioning; and
- landscaping, restoration of temporary construction areas and ongoing habitat creation and management.

3.2.5 Piling may be required for foundations on the main development site and may use impact/driven or vibratory techniques, to be defined following further design.

3.2.6 Crossings of watercourses, hedges and other barriers for the gas pipeline route may be with trenched or trenchless techniques (e.g. horizontal directional drilling, HDD), to be defined following further design for each crossing location. The maximum trench depth is expected to be 4 m and the minimum burial depth of the gas pipe 1.5 m.

3.2.7 Typical construction plant to be used will include excavators, drilling rigs, graders and haulage vehicles, mobile and tower cranes, heavy and light goods vehicles.

3.2.8 Directional lighting may be required during normal construction hours in winter. Outside normal construction working hours, motion-activated directional security lighting may be used at the main development site (zone A), AGI for gas connection (zone E) and component laydown area within zone I, but the construction areas would not be lit full-time at night except during any period of continuous working (described in paragraph 3.2.11) or other exceptional circumstances.

Construction working hours

3.2.9 Normal construction working hours will be Monday to Friday 08:00–18:00 and Saturday 08:00–13:00. No Sunday, bank holiday or night working is proposed save as described below.

3.2.10 Non-noisy activities such as fit-out within buildings may be undertaken outside those hours where these would not cause disturbance off-site. Further details of allowable activities and limitations would be defined in the CEMP.

3.2.11 It is possible that certain construction activities that cannot be interrupted, such as a continuous concrete pour, may be required. Up to 10 days' 24-hour construction working per phase for such continuous activity is assumed (not necessarily consecutive) as a maximum for assessment in this PEIR.

Construction working areas and laydown

3.2.12 The main construction working and laydown areas will be contained within zone A, the main development site.

3.2.13 As described below in the construction access section, a laydown area of up to 1 acre within zone I (parallel to the railway) may be used for storage of large equipment before it is craned across the railway.

3.2.14 Working corridors of up to 20 m width for construction of temporary and permanent access roads and the gas pipeline route are assumed at this stage, to allow for construction plant access, spoil and materials laydown.

3.2.15 In addition, up to 2 hectares in total would be used for construction compound(s) and materials laydown within the application boundary in areas outside zone A. The size and location of these working areas are subject to further design, with the further 2 hectare temporary land-take assumed as the maximum design envelope parameter for the PEIR.

Construction waste

3.2.16 The proposed development would largely be assembled from components that have been pre-manufactured off-site, such as the gas engines, substation components, batteries and gas pipeline sections. Construction waste from assembling and installing these components on-site would be minimal.

3.2.17 Aside from a possible section of gas pipeline under Station Road, the development would be constructed on greenfield land. The desk study and risk assessment of potential ground contamination, reported in Volume 3, Chapter 16: Geology, Hydrogeology and Ground Conditions and Volume 6, Appendix 16.1: Phase 1 Preliminary Risk Assessment, does not indicate that significant ground contamination requiring remediation or disposal of contaminated spoil is expected. Although historic landfills are present in the area, these are outside the proposed development area and no waste arisings due to disturbance of landfills would occur.

3.2.18 Potential transport of clean soil from foundation excavations, if this cannot be accommodated on-site, has been allowed for in the estimation of construction traffic which is assessed in Volume 3, Chapter 10: Traffic and Transport.

3.2.19 The Outline Code of Construction Practice (Volume 5, Appendix 2.2) includes good practice measures for managing waste generated during construction. All waste generated would be disposed of by a suitably licensed waste contractor.

3.2.20 Taking these points into consideration, construction waste arisings of a nature or quantity to have potential for likely significant environmental effects are not predicted.

3.3 Construction access

3.3.1 Access will be required for heavy goods vehicles (HGVs), abnormal loads for certain items (gas engine blocks, transformers, large cranes or construction plant) and for construction workforce traffic. Construction traffic generation and abnormal loads are detailed in Volume 3, Chapter 10: Traffic and Transport.

3.3.2 Existing access to the main development site (zone A) is via a farm track through zone C from a junction with Station Road immediately south of the level crossing over the railway.

3.3.3 The applicant is considering a number of potential construction access and traffic routes due to constraints, in particular for abnormal loads, caused by weight and dimensional limitations on sections of the public highway and the Station Road railway level crossing (set out below). It is not possible for the applicant to commit to a single construction access for the DCO application due to these logistical considerations and ongoing discussions with third parties, so all options are included within the design envelope and the impact assessments reported in this PEIR consider the maximum design scenario in the case of each option.

3.3.4 It is expected that one or a combination of these route options may be used in practice, with impacts no greater than the use of each route assessed individually for the construction traffic generated.

Construction deliveries overview and constraints

3.3.5 Major components of the proposed development, including the gas engines and substation transformers, are likely to be delivered via either the Port of Tilbury to the west or London Gateway (DP World) port to the east. Other construction delivery and workforce traffic could use a variety of routes on the local and regional transport network.

3.3.6 Use of Fort Road for access to the Port of Tilbury is constrained by the geometry and weight limit of a bridge where it crosses the railway line, which make it unsuitable for the abnormal loads required. Although there are existing private roads to Fort Road south of the bridge, through the Tilbury Power Station site, development proposals for the power station redevelopment and Tilbury2 port extension make future access by this route uncertain.

3.3.7 The existing access from Station Road would require use of the level crossing for routes north, where the clearance between the crossing and overhead power supply wires for trains may constrain the size of abnormal loads that could cross. The Lower Thames Crossing (LTC) east-west link road, if constructed as currently envisaged, could offer direct access to the main development site but it is uncertain whether this would become available even towards the end of a phased construction programme.

3.3.8 For routes north towards the A13 at the Orsett Cock junction, Turnpike Lane leading to Muckingford Road is subject to a 7.5 tonne weight restriction and is at risk of flooding. North of Muckingford Road, High House Lane provides a haul route to Brentwood Road that is currently used for sand and gravel extraction. However, existing planning permission for that activity including the haul route is temporary, expiring on 31 December 2020[3], and the junction with Muckingford Road has poor visibility looking east.

Construction access route options

3.3.9 Potential construction traffic routes on the public highway network are described in Volume 3, Chapter 10: Traffic and Transport. The various possible routing options would require construction of up to three haul routes on private land. One would be retained for permanent access to the site in operation and a second would be retained for the first 15 years in operation to provide a continued option for abnormal loads in case of major component failure requiring replacement.

From Station Road level crossing to main development site – zone C

3.3.10 A private access road would be constructed within zone C, from the existing junction with Station Road to the main development site in zone A. This road would remain as the permanent access between the main development site and the public highway during operation.

[3] Thurrock Borough Council planning reference 17/01081/CV, extending permission 11/50397/TTGMIN

From Coopers Shaw Road south to railway – zone I

3.3.11 A temporary construction haul road could be constructed from Cooper's Shaw Road through zone I to the railway, to enable laydown and use of a crane in zone I should delivery of some or all abnormal loads across the Station Road level crossing not be possible. The haul road and laydown area would be reinstated to Common Land with potential biodiversity enhancement after construction.

From St Chad's Road (A126) to Gun Hill – zone J

3.3.12 A construction haul road would be constructed from St Chad's Road Gateway Academy roundabout running east to Gun Hill. From Gun Hill, routes to the main development site would be as above.

3.3.13 This use would be temporary for the duration of the construction programme, but the haul road would remain *in situ* (closed to public access) in order to provide a backup access route in the exceptional circumstance of a major component failure (e.g. transformer) during initial operation and no alternative access being available.

South from Orsett Cock junction (A13) – zone H

3.3.14 As a possible alternative to the construction haul road from St Chad's Road to Gun Hill, the existing use of High House Lane farm track and haul route for sand and gravel extraction and reservoir creation could be extended for the proposed development's construction phase. From Turnpike Lane and Gun Hill, routes to the main development site would be as above.

3.3.15 Widening of certain locations on the public highway to allow passage of abnormal loads would be required, shown by the development boundary of zone H. Temporary Traffic Regulation Orders for the duration of the construction programme, or at intervals within it, would be required to for traffic management at the junction of High House Lane with Muckingford Road and for the use of Turnpike Lane by HGVs.

3.4 Decommissioning

3.4.1 The proposed development has an initial design lifetime of 35 years. Extension of its operation beyond this timescale will be dependent on prevailing market conditions. The assets, if in continuing use, would be upgraded and follow any necessary approvals process in place at that time.

3.4.2 The facility will be developed in a modular fashion and would be capable of being decommissioned and deconstructed non-intrusively. Should the facility be decommissioned, all above ground structures would be removed from the site, with the maximum value being recovered from materials and equipment via re-use or recycling at the time. The decision on how much of the below ground infrastructure including concrete pads would be retained would be agreed with the landowner and any other interested parties, accounting for decommissioning methods and timescales at the time.

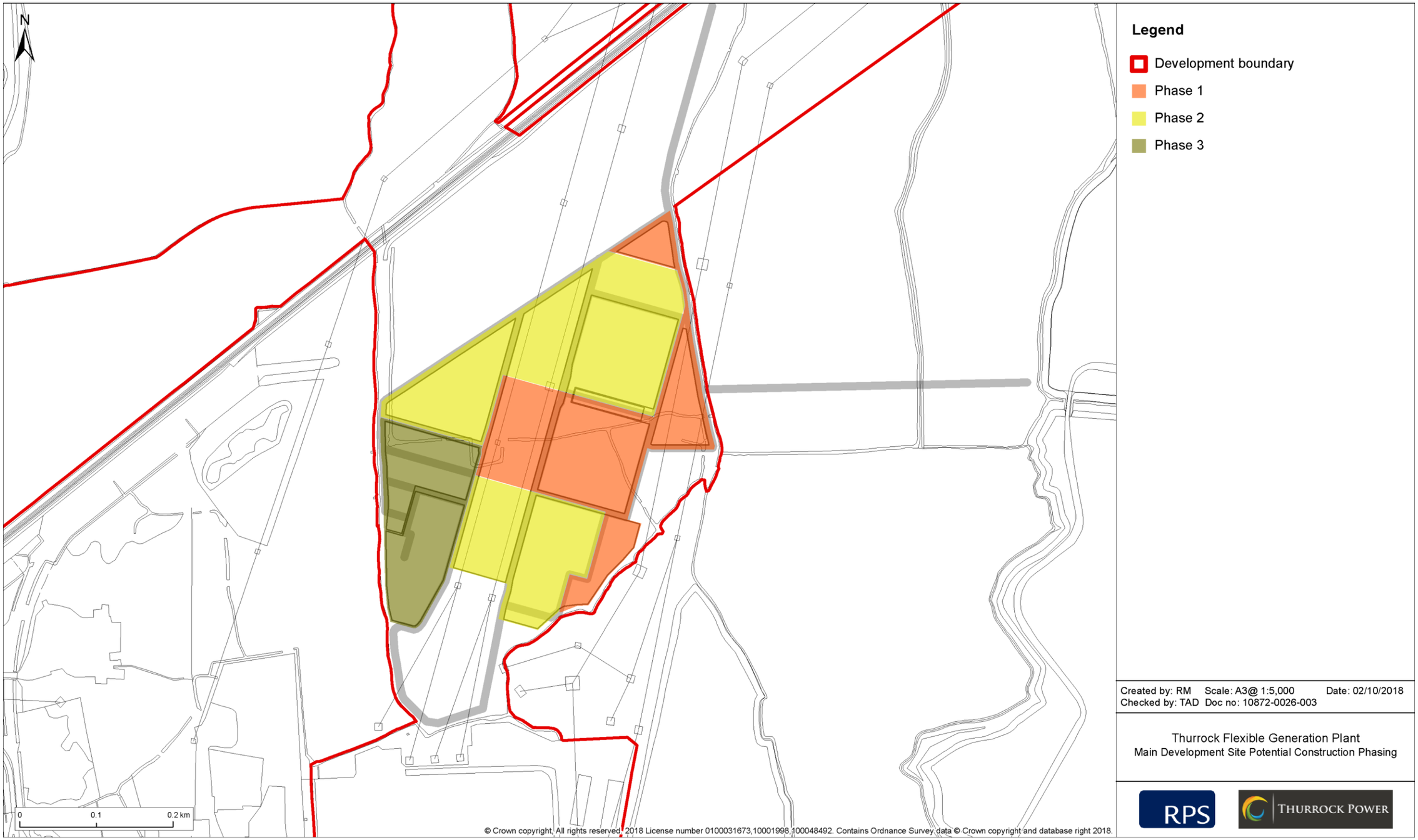

Figure 3.1: Main development site potential construction phasing.