



Thurrock Flexible Generation Plant

**Environmental Statement Volume 4: Cumulative Environmental Assessment
Chapter 25: Air Quality**

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Cumulative Effects Assessment

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Chapter 25

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1. Introduction and Approach

1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Statement (ES) provides an assessment of the air quality effects of the proposed development in combination with other relevant future development projects that have been scoped into the cumulative assessment.

1.1.2 In particular, this cumulative effects assessment (CEA) topic chapter:

- identifies the potential impact interactions of the proposed development in combination with other relevant future development projects;
- identifies the receptors with the potential to be significantly affected by these potential impact interactions and characterises these receptors, including their sensitivity and any relevant environmental thresholds;
- evaluates the likely significant cumulative effects on these key receptors as a result of the proposed development in combination with other development projects;
- identifies any additional mitigation measures that are proposed to prevent, minimise, reduce or offset these significant cumulative effects; and
- taking into account any proposed mitigation measures, evaluates the significance of predicted residual cumulative effects.

1.1.3 There are other environmental topic areas that have relevance to aspects considered in this chapter, including ecology. The specific assessment of potential cumulative effects of these other environmental topics are provided in the relevant chapters of ES Volume 4.

1.2 Approach to cumulative assessment

1.2.1 The assessment of air quality cumulative effects follows the approach set out in ES Section 3 of Volume 2, Chapter 4: EIA Methodology.

1.3 Study area

1.3.1 During the construction phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the proposed development (the Institute of Air Quality Management (IAQM) indicative maximum radius of effects for an individual construction site being 350 m (IAQM, 2014)). There is also the potential for cumulative effects at receptors within 200 m of roads used by traffic generated during the construction phase.

1.3.2 For the operational and maintenance phase, the zone of influence is considered to be approximately 10 km for human-health receptors for point source emissions and up to 200 m from roads for traffic emissions.

1.3.3 The study area for ecological receptors is up to 15 km from the stacks. This is based on the Environment Agency (EA) online guidance (Department for Environment, Food & Rural Affairs (DEFRA) and EA, 2016) which recommends that:

“some larger (greater than 50 megawatt) emitters may be required to screen to 15km for European sites and to 10km or 15km for SSSIs.”

1.4 Screening of cumulative developments

1.4.1 ES Volume 4, Chapter 18: Cumulative Effects Assessment Introduction and Screening identifies a short-list of potential cumulative developments that have been screened as potentially relevant to the CEA overall (i.e. for one or more topic areas). From this shortlist of cumulative development projects, Table 1.1 identifies those projects that fall within the zone of influence for air quality and have potential for cumulative effects that require assessment in this topic area.

1.4.2 Developments have been shortlisted in Table 1.1 where:

- the conclusions of the environmental assessments for those developments predicted significant effects on receptors within the zone of influence for the proposed Thurrock Flexible Generation Plant development; or
- where there is considered to be potential for effects that were not predicted to be significant for those individual developments but that may become significant in the cumulative scenario; or
- where environmental studies for those developments have not been published but there is sufficient information available about the development to both indicate the potential for cumulative effects and allow assessment.

1.4.3 Where sufficient information about a development to consider its potential for cumulative effects was not publicly available, the development has not been shortlisted.

- 1.4.4 The cumulative effect of NH₃ has not been assessed in detail as concentrations of NH₃ from Thurrock Flexible Generation Plant are predicted to be less than 0.5% of the environmental assessment level (EAL), as detailed in Volume 3, Chapter 12. As the Thurrock Flexible Generation Plant Process Contribution (PC) for NH₃ is predicted to be so low, the cumulative effect would be negligible regardless of the cumulative Predicted Environmental Concentrations (PEC). On that basis, the cumulative effect of NH₃ is not significant.
- 1.4.5 The cumulative effects of traffic-related emissions during the construction phase have not been assessed further here as the results of dispersion modelling undertaken in Volume 6 Appendix 12.6: Assessment of Traffic-related Emissions indicated that the change in concentration of nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) were less than 0.5%. THE EPUK&IAQM (2017) guidance states that for human-health receptors “Changes of 0%, i.e. less than 0.5%, will be described as Negligible”. On that basis, regardless of the concentrations with the addition of cumulative developments in the construction year, the impact descriptor for the contribution from Thurrock Flexible Generation Plant to effects on human-health receptors will be ‘Negligible’. Similarly, for ecological receptors if the PC is less than 1% of the critical level/load, the impacts can be screened out as insignificant (DEFRA and EA, 2016).
- 1.4.6 On that basis, the contribution of Thurrock Flexible Generation Plant construction traffic to any cumulative effects of traffic-related emissions is not significant.

Table 1.1: Shortlist of relevant cumulative developments

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
002	A new build 2 storey 420 place Primary School with car park, playground, floodlit artificial pitch, and associated landscaping with new access road, footpaths, highway improvements (including the widening of Westcott Avenue and the provision of a footpath link to Lanes Avenue) and service connections	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
005	Redevelopment of an area of previously developed land towards the southern boundary of Thames Industrial Estate to provide 50 dwellings, together with an associated financial commitment towards the repair, upkeep and stewardship of surrounding former factory buildings (some of which are listed), improved access arrangements and the creation of an area of public open space along the site frontage.	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
006	The construction of a temporary load out and storage area and access to Station Road to enable removal of Pulverised Fuel Ash	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
009	Engineering works using imported inert materials to construct an Ecology Park including ancillary treatment plant and buildings and the provision of a footway along Buckingham Hill Road.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
011	Request for Environmental Impact Assessment (EIA) Screening Opinion: Proposed development of up to 200 dwellings with associated access and open space	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
012	Application for outline planning permission with some matters (appearance, landscaping, layout and scale) reserved: Proposed development of up to 1,000 dwellings (Use Class C3), a new local road network including a vehicular / pedestrian railway crossing, a new single form entry primary school, local centre including provision for a maximum of 750 sq.m. Use Class A1 (shops) / Use Class A3 (food and drink) / Use Class D1 (non-residential institutions) floorspace, and new areas of open space, including formal recreation.	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
014	Outline application for proposed residential redevelopment, with all matters reserved apart from principle and access (Indicative layout provided indicates up to 203 dwellings)	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
015	Redevelopment of 15ha area comprising part of existing golf course and agricultural land for up to 350 residential dwellings together with associated infrastructure including: new vehicular accesses onto Butts Lane, on-site vehicular, cycle and footway network, amenity space, landscaping, a	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
	community building (Use Class D2- Assembly and Leisure) and Doctors Surgery (Use Class D1 - Non-Residential Institution). Landscaping, including limited re-profiling of land on parts of the 15ha development site, 51.5ha of strategic open space, including formal and informal recreation uses. Change of use of existing golf clubhouse as cafe and/or information centre in connection with the strategic open space. Outline application with all matters reserved for the means of access to the site.				
016	Retention and completion of waste wood processing plant (Class B2/B8) & fire retained area bounded by concrete push walls, erection of buildings to form associated storage, reception/ administration, security, and staff welfare area; formation of impermeable surface to form a lorry parking/waiting area; weighbridge and staff parking area together with associated highways and drainage works	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
018	An extension of time limit for implementation of planning permission ref 01.08.04/87C. To construct and operate a Biomass and Energy from waste fuelled generating station for a period of two years to 26 Aug 2014.	None	Increase of NO ₂	None	All
025	Demolition of Tilbury B power station and all associated buildings and structures (including remaining structures from Tilbury A power station). The Jetty will not be demolished.	Increase in suspended and deposited dust	None	None	None
034	Outline application (with all matters reserved for a subsequent application) for proposed residential redevelopment of land between 39 and 41 St John's Road consisting of up to 43 dwellings, landscaping and new access.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
042	Tilbury 2: A new port facility acting alongside the existing Port of Tilbury. This will involve the extension of existing jetty facilities and the dredging of berth pockets in the River Thames, and land works and facilities for: a "Roll-On / Roll-Off" (Ro-Ro) terminal for importing and exporting containers on road trailers; a facility for importing and processing bulk construction materials; and areas of external storage for a variety of goods such as imported cars. The project also involves the construction of road and rail links to the site from adjacent networks.	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
044	EIA screening request for the construction and operation of up to 32,160sqm of B8 storage and distribution space	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
045	EIA Screening Opinion in accordance with Regulation 6 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 for the proposed development of 19,410 square metres (sqm) gross external area (GEA) of storage and distribution uses (Use Class B8) with 2,650sqm (GEA) of ancillary offices (Use Class B1), 695sqm (GEA) of welfare units (Use Class B8), 70sqm (GEA) of gatehouses (Use Class B8), a 100sqm (GEA) pump house and a	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
	6,550sqm (GEA) car park, access, drainage, landscaping, plant and other associated works.				
048	Request for an EIA Scoping opinion. Redevelopment of the Site to provide a mixed-use scheme comprising of circa 2500 new homes plus community facilities, retail, food and drink, car parking and associated access arrangements, public realm works and environmental improvements.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
050	EIA Screening Opinion - Application for a Certificate of Lawfulness of Proposed Use or Development: Proposed processing of biofuels and other suitable waste derived feedstocks into a manufactured clean gas product (Use Class B2).	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
057	Outline planning application for the development of up to 400 new homes and associated infrastructure including provision of open space, with access off Coldharbour Road.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
058	The Lower Thames Crossing will be a new road crossing connecting Essex and Kent. Located east of Gravesend and Tilbury, this new crossing will offer the improved journeys, new connections and network reliability, and economic benefits that only a new, alternative crossing, away from Dartford, can provide.	Increase in suspended and deposited dust	Increase of NO ₂	None	Construction - Receptors within 350 m of Application Site and Cumulative Development. Operation and maintenance - Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
059	Leisure and entertainment resort including a theme park, hotels, bars, restaurants, business space, training academy, monorail and associated infrastructure works. The application is anticipated to be submitted to the Planning Inspectorate in 2019.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
060	Outline approval (with all matters reserved, except for access) sought for: up to 2,158 dwellings comprising a mix of 1, 2, 3-bedroom units (Use Class C3); a serviced plot for a new primary / nursery school up to 1,850 sq.m; a health centre up to 1,000 sq.m (Use Class D1); community pavilion of up to 500 sq.m (Use Class D1); convenience retail store up to 400 sq.m (Use Class A1); public art together with associated vehicle parking, open space, landscape and public realm provision, ecological mitigation, highways, pedestrian and vehicular access routes, and other associated engineering, utilities and infrastructure works. Detailed approval sought for: 342 dwellings (Use Class C3) comprising a mix of 1, 2, 3-bedroom units; linear park; a lido facility with changing room facilities up to 340 sq.m (Use Class D1) and ancillary café up to 100 sq.m (Use Class A3); 3km of mountain bike routes and a pump track, a pedestrian / cycle link	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
	tunnel from Lakeside Shopping Centre underneath the A1306, and vehicular access from the A126, A1306 and MSA roundabout (bus / emergency).				
063	Outline planning permission with all matters (except for access) reserved for the demolition, phased remediation and redevelopment of 167 hectares of former Coryton Oil Refinery to provide up to 480,000 sq. m of commercial development including a Food Park (Use Class B2/B8); Energy & Waste related facilities (Use Class Sui Generis/B2/B8); A Central Hub incorporating a range of active uses (office, leisure, education, hotel and conferencing facilities) (Use Classes B1; D1; D2; C1) and ancillary retail/leisure/community facilities (Use Classes A1, A3, A4, A5, D2 & Sui Generis), as well as additional land set aside for a Rail Freight Terminal; 4.1 Hectares of Open Storage (Use Class B8); Lorry Parking Facilities; structural landscaping; car parking, new road and access facilities; vehicular crossing over Shellhaven Creek; pedestrian crossing facilities to existing and proposed estate roads; retention of existing jetties; and associated infrastructure works.	None	Increase of NO ₂	None	All
064	Canal Basin Regeneration Area: Gravesend Local Plan Core Strategy Policy CS04 for mixed-use development of around 650 dwellings and 4,650 sq m of B1a and B1c employment floorspace.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
065	Outline application for a mixed development and comprising up to 532 Homes, related car parking and landscaping (C3); up to 46,000 sq m Employment Floorspace, related car parking, servicing and landscaping (B1/B2/B8); Mixed Use Neighbour Centre comprising mix of: up to 850 sq m retail/cafe/takeaway floor space (A1/A2/A3/A5); residential uses (C3); community centre (D1); up to 1,000 sq m clinic/health centre (D1) and related car parking and landscaping; Riverside Food and Drink Uses comprising up to 500 sq m of pub or food and drink uses (A3/A4); Public Open Space including riverside promenade, public park with equipped play areas and playing field with shared public/school use and wildlife corridors; Fastrack Link to provide a segregated link across the site along with Fastrack stops; Street and Footpath Network to provide access to development and maintain and enhance existing public rights of way, including a bridge link between Hive Lane and Factory Road; Access Improvement to Grove Road/The Creek and The Shore/Crete Hall Road and associated highway improvements; Supporting Services and Infrastructure including new utilities, enhanced flood defences and providing for access to cliffs and tunnels; Ground re-grading to create efficient development and open space platforms and to raise land to address flood risk; and Other Minor Works and development ancillary to the main proposals including the principle of relocating the Scout Hut within the site and the retention of tunnels and facing walls adjacent to Lawn Road.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
067	Part full and part outline planning application comprising: (1) full planning application for the erection of 628 residential dwellings including affordable housing; retail floorspace (Use Classes A1, A2 and/or A3); amendments to	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
	existing highway access and realignment of Crete Hall Road; demolition of rear WT Henley Building; provision of open spaces, equipped areas of play and landscaping; and associated internal accesses/roads, parking, infrastructure, attenuation features and earthworks, and (2) outline planning application (with all matters except access reserved) for a two form entry primary school and for the refurbishment, change of use (for Use Classes A1/A2/A3/B1(a)/C3/D1) and demolition of the boundary wall and rear portion of the WT Henley Building.				
076	Request for Environmental Impact Assessment (EIA) Screening Opinion: Proposed development of c.600 dwellings and associated infrastructure, including access and relief road.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
078	Request for Environmental Impact Assessment (EIA) Screening Opinion - Proposed construction of up to 161 new dwellings (C3) with vehicular access from Churchill Road; construction of 7,650 sqm (GEA) of flexible employment floorspace (B1c/B2/B8) with vehicular access from Thurrock Park Way; provision of open space including landscaping and drainage measures; new pedestrian/cycle links; and associated parking and access.	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
079	Demolition of existing temporary teaching block (2 classrooms) and erection of 2 storey extensions to both west (Phase 1) and east (Phase 2) wings of existing Science Block to provide 4 classrooms (net addition of 2 classrooms).	None	Increase of NO ₂	None	Potentially all receptors within 200 m of roads used by traffic generated by cumulative development.
080	Application for outline planning permission, with all matters reserved for subsequent approval, except for means of access, for mixed-use redevelopment involving the demolition of existing buildings and other structures, site preparation works, and the development of up to 2,850 dwelling houses (Use Class C3) comprising a mix of 1, 2, 3 and 4 bedroom units including affordable housing, up to 11,000 sq.m (f/s) of business uses (Use Class B1), up to 8,880 sq.m (f/s) of shops (Use Class A1), up to 5,220 sq.m (f/s) of restaurants and cafes (Use Class A3), up to 900 sq.m (f/s) drinking establishments (Use Class A4), up to 20,000 sq.m (f/s) of hotel accommodation (Use Class C1), up to 18,300 sq.m (f/s) of non-residential institutions uses, comprising a primary school, secondary school and sixth form, medical and community uses (Use Class D1), up to 6,200 sq.m (f/s) of assembly and leisure uses (Use Class D2), up to 135,000 sq.m (f/s together with external backlot production space) film and television production space including ancillary workshops, offices and post production facilities and ancillary infrastructure, together with ancillary car park, provision of temporary railway station facilities, up to 1,600 sq.m (f/s) of upgraded railway station facilities and local waste and power facilities (Sui Generis), all together with associated vehicle parking, open space, landscape and public realm provision, ecological mitigation, highways, pedestrian and vehicular access routes, and other associated engineering, utilities and infrastructure works including but not limited to, rebuilding, repairing, replacing and upgrading of	None	Increase of NO ₂	None	All

ID	Development	Potential cumulative impacts (construction)	Potential cumulative impacts (operation and maintenance)	Potential cumulative impacts (decommissioning)	Receptor(s) affected
	river wall and flood defence wall and associated works of repair and reinstatement of the former Yara Purfleet Terminal jetty and the former Cory's Wharf jetty to facilitate the river wall and flood defence works, the provision of four grade separated railway crossings including a new bridge as part of the re-profiling and realignment of London Road.				
081	Tilbury Green Power Phase 2 S36C application. Biomass and energy from waste fuelled generation station at Tilbury Docks, Essex: variation application under section 36c of the electricity act 1989.	None	Increase of NO ₂	None	All
082	Gateway Energy Centre: Development up to 1250 MW capacity to comprise either: up to two CCGT units; or one CCGT unit and one or more OCGT units and/or battery energy storage.	None	Increase of NO ₂	None	All

1.5 Identifying cumulative developments affecting each receptor

1.5.1 Table 1.2 to Table 1.4 summarise the cumulative developments that have the potential to cause cumulative effects at each identified receptor, the sensitivity of that receptor to cumulative impacts, and the starting position to the cumulative effects assessment, which is the predicted residual effect of Thurrock Flexible Generation Plant alone during construction, operation and decommissioning (as established in ES Volume 3).

Table 1.2: Summary of cumulative developments affecting each receptor (construction)

Receptor affected	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
Human receptors within 350 m and ecological receptors within 50 m of Application Site and a cumulative development	High, medium and low	Negligible with implementation of IAQM mitigation measures	005, 006, 012, 016, 025, 042, 050, 058

1.5.2 The standalone effects of Thurrock Flexible Generation Plant for the human-health receptors in this table are based on the annual-mean NO₂ impact descriptors. The short-term impact descriptor for NO₂ ranged between negligible to moderate adverse based on the PC alone. When the PC is added to the Ambient Concentration (AC), the resulting Predicted Environmental Concentrations (PECs) were all below the relevant air quality objective and the short-term effects were considered not significant for all receptors.

Table 1.3: Summary of cumulative developments affecting each receptor (operation and maintenance)

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
Fort Road	Residential	High	Slight adverse (not significant)	All
Sandhurst Road	Residential	High	Slight adverse (not significant)	All

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
School	School	High	Slight adverse (not significant)	All
Gateway Academy	School	High	Negligible (not significant)	All
Gravel Pit Cottages	Residential	High	Slight adverse (not significant)	All
Princess Margaret Rd	Residential	High	Slight adverse (not significant)	All
Walnut Tree Farm	Residential	High	Moderate adverse (potentially significant)*	All
The Green	Residential	High	Negligible (not significant)	All
West Street	Residential	High	Moderate adverse (potentially significant)*	All
Milton School	School	High	Negligible (not significant)	All
Royal Pier Road	Residential	High	Slight adverse (not significant)	All
West Tilbury Hall	Residential	High	Negligible (not significant)	All
Cooper Shore	Residential	High	Slight adverse (not significant)	All
R1	Residential	High	Negligible (not significant)	All
R2	Residential	High	Negligible (not significant)	All
R3	Residential	High	Negligible (not significant)	All
R4	Residential	High	Negligible (not significant)	All
R5	Residential	High	Negligible (not significant)	All
R6	Residential	High	Negligible (not significant)	All

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
R7	Residential	High	Negligible (not significant)	All
R8	Residential	High	Negligible (not significant)	All
R9	Residential	High	Slight adverse (not significant)	All
R10	Residential	High	Slight adverse (not significant)	All
R11	Residential	High	Negligible (not significant)	All
R12	Residential	High	Negligible (not significant)	All
R13	Residential	High	Slight adverse (not significant)	All
R14	Residential	High	Negligible (not significant)	All
R15	Residential	High	Slight adverse (not significant)	All
R16	Residential	High	Negligible (not significant)	All
R17	Residential	High	Negligible (not significant)	All
R18	Residential	High	Negligible (not significant)	All
R19	Residential	High	Slight adverse (not significant)	All
R20	Residential	High	Negligible (not significant)	All
R21	Residential	High	Negligible (not significant)	All
R22	Residential	High	Negligible (not significant)	All
R23	Residential	High	Negligible (not significant)	All

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
R24	Residential	High	Negligible (not significant)	All
R25	Residential	High	Negligible (not significant)	All
R26	Residential	High	Negligible (not significant)	All
R27	Residential	High	Negligible (not significant)	All
16/01232/OUT	Residential	High	Slight adverse (not significant)	All
18/00664/CONDC	Residential	High	Moderate adverse (potentially significant)*	All
16/00412/OUT	Residential	High	Negligible (not significant)	All
15/00379/OUT	Residential	High	Negligible (not significant)	All
16/01475/SCR	Residential	High	Slight adverse (not significant)	All
GR/17/674	Residential	High	Negligible (not significant)	All
20141214	Residential	High	Slight adverse (not significant)	All
Thames Estuary and Marshes SPA	Ecological Site	High	Not significant	All
North Downs Woodlands SAC	Ecological Site	High	Not significant	All
Basildon Meadows SSSI	Ecological Site	Medium	Not significant	All
Canvey Wick SSSI	Ecological Site	Medium	Not significant	All
Chattenden Woods and Lodge Hill SSSI	Ecological Site	Medium	Not significant	All
Cobham Woods SSSI	Ecological Site	Medium	Not significant	All
Darenth Wood SSSI	Ecological Site	Medium	Not significant	All

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
Grays Thurrock Chalk Pit SSSI	Ecological Site	Medium	Not significant	All
Great Crabbles Wood SSSI	Ecological Site	Medium	Not significant	All
Halling to Trottiscliffe Escarpment SSSI	Ecological Site	Medium	Not significant	All
Hangmans Wood and Deneholes SSSI	Ecological Site	Medium	Not significant	All
Holehaven Creek SSSI	Ecological Site	Medium	Not significant	All
Mucking Flats and Marshes SSSI	Ecological Site	Medium	Not significant	All
Northward Hill SSSI	Ecological Site	Medium	Not significant	All
Pitsea Marsh SSSI	Ecological Site	Medium	Not significant	All
Shorne and Ashenbank Woods SSSI	Ecological Site	Medium	Not significant	All
South Thames Estuary and Marshes SSSI	Ecological Site	Medium	Not significant	All
Thorndon Park SSSI	Ecological Site	Medium	Not significant	All
Tower Hill to Cockham Wood SSSI	Ecological Site	Medium	Not significant	All
Vange and Fobbing Marshes SSSI	Ecological Site	Medium	Not significant	All
West Thurrock Lagoon and Marshes SSSI	Ecological Site	Medium	Not significant	All
Broom Hill LWS	Ecological Site	Low	Not significant	All
West Tillbury Hall LWS	Ecological Site	Low	Not significant	All
Low Street Pit LWS	Ecological Site	Low	Not significant	All

Receptor affected	Receptor Type	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
Lyttag Brownfield LWS	Ecological Site	Low	Not significant	All
Tilbury Centre LWS	Ecological Site	Low	Not significant	All
Tilbury Marshes LWS	Ecological Site	Low	Not significant	All
Goshems Farm LWS	Ecological Site	Low	Not significant	All

*As outlined in Volume 3, Chapter 12: Air Quality, the EPUK & IAQM (2017) guidance makes it clear that: "a moderate adverse impact at one receptor may not mean that the overall impact has a significant effect."

Table 1.4: Summary of cumulative developments affecting each receptor (decommissioning)

Receptor affected	Sensitivity of receptor to cumulative effects	Standalone effect of Thurrock Flexible Generation Plant on receptor	Cumulative development(s) with the potential to affect this receptor
If plant deconstructed, receptors within 350 m of Application Site and a Cumulative Development.	High, medium and low	Negligible with implementation of IAQM mitigation measures	005, 006, 012, 016, 025, 042, 050, 058
If the operation of the plant is ongoing, receptors listed in Table 1.3	High	Minor Adverse	All

2. Assessment of Cumulative Effects

2.1 Construction phase of Thurrock Flexible Generation Plant

Assessment of effects

Receptors within 350 m of Application Site and a Cumulative Development

- 2.1.1 During the construction phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the proposed development (the IAQM indicative maximum radius of effects for an individual construction site being 350 m).
- 2.1.2 Large construction sites would typically be required to implement mitigation measures, such as those recommended in the IAQM (2014) dust guidance. With the effective implementation of appropriate mitigation measures at other construction sites within 700 metres of the proposed development, the residual cumulative dust effects are unlikely to be significant.

Further mitigation or enhancement

- 2.1.3 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Residual effects

- 2.1.4 No further mitigation or enhancement is considered to be required so the residual effect is predicted to be **negligible**, which is not significant in EIA terms.

2.2 Operation and maintenance phase of Thurrock Flexible Generation Plant

Assessment of effects

Human Health Receptors

- 2.2.1 As outlined in Paragraph 1.1.1 of Volume 6, Appendix 12.5: Results of Other Scenarios Modelled, four scenarios have been modelled. The results presented in this chapter are for scenario 1: 48 X 12.4 MW engines, each with its own stack (48 stacks) as the predicted concentrations for this scenario were highest. The results for the other three scenarios are presented in Volume 6, Appendix 12.5: Results of Other Scenarios.

Tilbury2 – Cumulative Development 042

- 2.2.2 The PECs presented in Section 4.2 of Volume 3, Chapter 12: Air Quality comprise the PCs from the Thurrock Flexible Generation Plant and the AC. The AC for R1 to R27 (receptors 14 to 40) also includes the PC for Tilbury2. Therefore, the effects of Tilbury2 have already been considered at these receptors. For receptors 1 to 3, the Tilbury2 PC has been considered by adding the PC from the nearest modelled receptor to the Thurrock Flexible Generation Plant PC and the AC. The Tilbury2 PC at receptors 3 to 13 is considered to be zero as they are more than 500m from the Tilbury2 receptors.

Lower Thames Crossing – Cumulative Development 058

- 2.2.3 The Lower Thames Crossing (LTC) Preliminary Environmental Information Report, Appendix D, Table D.1, shows the change in predicted NO₂ concentrations with the development for a number of receptors. For the Thurrock Flexible Generation Plant receptors close to the LTC route, LTC receptors closest to or most representative of the Thurrock Flexible Generation Plant receptors were identified and used as a LTC PC as shown in Table 2.2. In some locations the Lower Thames Crossing is expected to reduce NO₂ concentrations; however, to ensure the assessment is conservative, it was assumed that no fall in concentrations would occur at these locations, i.e. there would be 0 µg.m⁻³ change in NO₂ concentrations.

Tilbury Green Power – Cumulative Development 081

- 2.2.4 The Tilbury Green Power biomass plant includes two phases each with its own stack. Both phases have been modelled at each of the Thurrock FGP receptors. Table 2.1 sets out the stack parameters and emissions data modelled to derive a PC for Tilbury Green Power. It was assumed that the plant for both phases will run continuously as a worst case.

Tilbury Peak Reserve – Cumulative Development 079

- 2.2.5 The Tilbury Peak Reserve plant includes 14 gas engines each with its own stack and has been modelled at each of the receptors. Table 2.1 sets out the stack parameters and emissions data modelled to derive a Tilbury Peak Reserve PC. It was assumed that the engines will all run continuously which is highly unlikely.

Thames Enterprise Park – Cumulative Development 063

- 2.2.6 The air quality assessment undertaken for the Thames Enterprise Park indicates that there will be an Energy from Waste (EfW) facility and gas engines on site. The emissions from the EfW and gas engines have been modelled at each of the Thurrock Flexible Generation Plant receptors. Table 2.1 sets out the stack parameters and emissions data modelled to derive a Thames Enterprise Park PC. The location of the stacks are not fixed but the ES indicated a likely area for the stacks. For modelling purposes, the stacks were assumed to be located at the nearest point to the Thurrock FGP site. It was assumed that the EfW and engines will all run continuously.

Gateway Energy Centre – Cumulative Development 082

- 2.2.7 In 2014, the air quality assessment undertaken for the Gateway Energy Centre included modelling of 2 x CCGT and 2 x auxiliary boilers. The proposals were later changed to either include 2 x CCGT or 1 x CCGT and 1 x OCGT. Only the August 2014 Environmental Statement Further Information Document (FID) included emissions data for the proposed CCGT and auxiliary boiler plant but paragraph 8.5.4 of the Gateway Energy Centre 2019 ES FID states that *“during operation, the likely significant direct and indirect / secondary effects of the Proposed Development on air quality will not materially differ from those previously described, and the assessments contained within the February 2010 ES, the December 2010 ES FID, the August 2014 ES FID and the February 2016 ES FID remain valid and appropriate”*.
- 2.2.8 The August 2016 ES FID states that *“Based on the updated air quality impact assessment, during operation, the likely significant effects on the environment (with regards to air quality) of the Proposed Development would not differ from those previously reported.”*
- 2.2.9 The updated air quality impact assessment has not been found but based on the above conclusion, emissions data from the August 2014 ES FID has been modelled to derive a Gateway Energy Centre PC. Table 2.1 sets out the stack parameters and emissions data modelled to derive a Gateway Energy Centre PC. It was assumed that the CCGTs and auxiliary boilers will all run continuously as a worst case.

Purfleet Centre Regeneration – Cumulative Development 080

- 2.2.10 The Purfleet Centre Regeneration includes an energy centre with one stack that includes 8 boilers and 2 CHPs. Table 2.1 sets out the stack parameters and emissions data modelled to derive a Purfleet Centre Regeneration PC. It was assumed that the boilers and CHPs will all run continuously. For the Purfleet Centre Regeneration air quality assessment, the boilers and CHPs stack parameters presented in Table 2.1 were combined using the combine multiple point source input file option within ADMS. This has also been done for this cumulative assessment.

Table 2.1: Stack Emissions and Parameters Modelled for Cumulative Developments

Parameter	Unit	Tilbury Green Power		Tilbury Peak Reserve (gas engines x 14)	Thames Enterprise Park (EfW and gas engines)		Gateway Energy Centre (CCGT x 2, Auxiliary Boilers x 2)			Purfleet Centre Regeneration (Boilers x 8, CHP x 2)	
		Phase 1	Phase 2	Per gas engine	EfW	Gas engines	CCGT 1	CCGT 2	Auxiliary Boilers x 2	Boilers (per boiler)*	CHP (per CHP)*
Source of Data		Tilbury green Power Phase 2 Air Quality Assessment, December 2019, Table 2		Tilbury Peak Reserve Air Quality Assessment, July 2019, Tables 3.1 and 3.2	Thames Enterprise Park Environmental Statement, September 2018, Appendix 13.5 AERMOD Input Data		Gateway Energy Centre, Updated Environmental Statement Further Information Document, August 2014, Tables 9.11 and 9.12 and paragraphs 9.4.16, 9.4.22 and 9.4.49			Purfleet Centre Regeneration, December 2017, Appendix 8.1 Air Quality Assessment Detailed Methodology, Table A8.7	
Grid coordinates	x,y	561994, 177078	562013, 177153	565517, 175969 565523, 175969 565529, 175970 565535, 175970 565641, 175971 565547, 175972 565553, 175972 454449, 175973 565565, 175973 565570, 175973 565576, 175974 565582, 175974 565588, 175975 565593, 175975	573801, 181970	573796, 181996	573079, 182022	573079, 181911	573061, 172039	555409, 178379	
Stack height	m	100	100	7	100	100	75	75	15	21	
Internal diameter	m	2.3	3.0	0.4	1	0.7	8	8	0.5	0.4	
Efflux velocity	m.s ⁻¹	17.76	19.76	32.6	11.1	35.2	17.6	17.6	30	15	10
Efflux temperature	° C	140.2	130	388	150	345	81	81	198	70	150
NO _x Mass Emission Rate	g.s ⁻¹	13.56	18.84	0.261	1.3	1.3	45.9	45.9	0.33	0.029167	0.1325

Other Cumulative Projects

- 2.2.11 There are a number of other smaller cumulative projects in the area described in Volume 4, Chapter 18: Cumulative Effects Assessment Introduction and Screening that will generate traffic.
- 2.2.12 As the Thurrock Flexible Generation Plant development will not generate significant traffic during the operational phase, detailed modelling of traffic-related emissions was scoped out. As such, the cumulative traffic has not been explicitly modelled or included in the Cumulative PEC presented in this chapter. Instead the effects of cumulative traffic from the smaller cumulative developments have been considered qualitatively in paragraph 2.2.24.

Magnitude of impact

- 2.2.13 For the purposes of this assessment, the magnitude of impact is considered to be the change in concentration relative to the AQAL i.e. the PC as a % of AQAL column in Table 2.2 and Table 2.4.

Sensitivity of the receptor

- 2.2.14 For the purposes of this assessment, the sensitivity of the receptor is considered to be the long term average concentration at each receptor i.e. the Cumulative PEC as a % of the AQAL column in Table 2.2 and Table 2.4.

Significance of effect

Long-term Impacts

- 2.2.15 Table 2.2 summarises the long-term maximum PC and the Cumulative PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown.

Table 2.2: Long-term Cumulative Predicted NO₂ Concentrations (µg.m⁻³) at Sensitive Receptors.

Receptor ID	Receptor Name	AC (µg.m ⁻³)*	Thurrock Flexible Generation Plant PC (µg.m ⁻³)	PC as % of AQAL	Tilbury2 PC (µg.m ⁻³)*	Lower Thames Crossing PC (µg.m ⁻³)	Tilbury Green Power PC (µg.m ⁻³)	Tilbury Peak Reserve PC (µg.m ⁻³)	Thames Enterprise Park PC (µg.m ⁻³)	Gateway Energy Centre PC (µg.m ⁻³)	Purfleet Centre Regeneration PC (µg.m ⁻³)	Cumulative PEC (µg.m ⁻³)	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	3.6	9	0.6	-	0.27	1.23	0.01	0.15	<0.005	32.3	81	Moderate
2	Sandhurst Road	26.4	2.7	7	3	-	0.26	1.23	0.01	0.14	<0.005	33.7	84	Moderate
3	School	34.0	1.3	3	0.9	-	0.31	0.35	0.01	0.13	0.01	37.0	93	Slight
4	Gateway Academy	28.7	0.5	1	-	0.6	0.70	0.24	0.01	0.17	<0.005	30.9	77	Negligible
5	Gravel Pit Cottages	18.0	4.1	10	-	1.0	0.28	0.44	0.01	0.18	<0.005	24.0	60	Slight
6	Princess Margaret Rd	18.0	2.3	6	-	-	0.21	0.32	0.01	0.19	<0.005	21.0	53	Slight
7	Walnut Tree Farm	18.3	4.8	12	-	1.0	0.33	0.65	0.01	0.17	<0.005	25.3	63	Moderate
8	The Green	18.3	1.5	4	-	-	0.45	0.40	0.01	0.18	<0.005	20.9	52	Negligible
9	West Street	41.8	0.6	2	-	-	0.14	0.26	0.01	0.12	<0.005	43.0	107	Moderate
10	Milton School	30.9	0.5	1	-	-	0.12	0.18	0.01	0.12	<0.005	31.8	79	Negligible
11	Royal Pier Road	31.8	0.6	2	-	-	0.14	0.24	0.01	0.12	<0.005	32.9	82	Slight
12	West Tilbury Hall	18.3	1.8	5	-	-	0.42	0.48	0.01	0.18	<0.005	21.2	53	Negligible
13	Cooper Shore	18.3	2.7	7	-	-	0.36	0.65	0.01	0.17	<0.005	22.3	56	Slight
14	R1	31.1	0.2	0	0.1	-	0.09	0.04	0.01	0.17	0.06	31.6	79	Negligible
15	R2	27.6	0.1	0	<0.05	-	0.07	0.03	0.01	0.17	0.04	28.1	70	Negligible
16	R3	28.3	0.2	1	0.4	-	0.14	0.06	0.01	0.23	0.01	29.0	72	Negligible
17	R4	26.9	0.3	1	0.5	-	0.31	0.13	0.01	0.27	0.01	28.0	70	Negligible
18	R5	32.2	0.3	1	0.3	-	0.29	0.13	0.01	0.28	0.01	33.3	83	Negligible
19	R6	26.9	0.5	1	0.1	2.1	0.36	0.11	0.01	0.31	0.01	30.3	76	Negligible
20	R7	28.1	0.4	1	0.8	0.9	0.53	0.17	0.01	0.25	0.01	30.3	76	Negligible
21	R8	28.9	0.4	1	0.8	0.1	1.06	0.14	0.01	0.15	0.01	30.8	77	Negligible
22	R9	36.6	0.9	2	1.9	-	0.41	0.21	0.01	0.14	0.01	38.3	96	Moderate
23	R10	30.6	1.2	3	4.4	-	0.29	0.41	0.01	0.13	0.01	32.6	82	Slight
24	R11	26.6	1.1	3	1.7	-	0.24	0.79	0.01	0.13	<0.005	28.9	72	Negligible
25	R12	26.1	1.2	3	1.7	-	0.24	0.92	0.01	0.13	<0.005	28.6	71	Negligible
26	R13	26.4	2.4	6	3.0	-	0.26	1.14	0.01	0.14	<0.005	30.4	76	Moderate
27	R14	26.8	2.0	5	3.8	-	0.26	1.14	0.01	0.14	<0.005	30.3	76	Slight

Receptor ID	Receptor Name	AC ($\mu\text{g.m}^{-3}$)*	Thurrock Flexible Generation Plant PC ($\mu\text{g.m}^{-3}$)	PC as % of AQAL	Tilbury2 PC ($\mu\text{g.m}^{-3}$)*	Lower Thames Crossing PC ($\mu\text{g.m}^{-3}$)	Tilbury Green Power PC ($\mu\text{g.m}^{-3}$)	Tilbury Peak Reserve PC ($\mu\text{g.m}^{-3}$)	Thames Enterprise Park PC ($\mu\text{g.m}^{-3}$)	Gateway Energy Centre PC ($\mu\text{g.m}^{-3}$)	Purfleet Centre Regeneration PC ($\mu\text{g.m}^{-3}$)	Cumulative PEC ($\mu\text{g.m}^{-3}$)	Cumulative PEC as % of AQAL	Impact Descriptor
28	R15	23.6	3.6	9	0.6	-	0.25	1.50	0.01	0.14	<0.005	29.1	73	Slight
29	R16	25.8	1.4	4	1.8	-	0.25	1.24	0.01	0.13	<0.005	28.8	72	Negligible
30	R17	26.2	1.3	3	2.1	-	0.24	1.18	0.01	0.13	<0.005	29.0	73	Negligible
31	R18	24.1	0.3	1	0.2	-	0.16	0.08	0.01	0.24	0.01	24.9	62	Negligible
32	R19	31.6	1.3	3	0.9	-	0.32	0.34	0.01	0.13	0.01	33.7	84	Slight
33	R20	23.5	0.2	1	0.1	-	0.14	0.05	0.01	0.22	0.02	24.1	60	Negligible
34	R21	34.8	0.2	0	0.5	-	0.12	0.05	0.01	0.20	0.02	35.4	88	Negligible
35	R22	24.8	0.2	0	<0.05	-	0.08	0.04	0.01	0.16	0.08	25.3	63	Negligible
36	R23	34.1	0.1	0	0.1	-	0.07	0.03	0.01	0.15	0.04	34.5	86	Negligible
37	R24	28.5	0.2	0	0.1	-	0.08	0.03	0.01	0.12	0.02	28.9	72	Negligible
38	R25	33.8	0.4	1	0.1	2.0	0.23	0.09	0.02	0.34	0.01	36.9	92	Negligible
39	R26	22.6	0.2	0	<0.05	-	0.07	0.03	0.01	0.11	0.01	23.0	57	Negligible
40	R27	24.5	0.4	1	0.3	0.9	0.52	0.17	0.01	0.25	0.01	26.7	67	Negligible
41	16/01232/OUT	18.0	3.5	9	-	2.1	0.34	0.44	0.01	0.19	<0.005	24.5	61	Slight
42	18/00664/CONDC	29.9	2.3	6	-	-	0.31	0.31	0.01	0.20	<0.005	33.0	83	Moderate
43	16/00412/OUT	18.3	0.7	2	-	0.4	0.56	0.31	0.01	0.18	<0.005	20.4	51	Negligible
44	15/00379/OUT	18.3	0.6	1	-	0.4	0.58	0.28	0.01	0.19	<0.005	20.4	51	Negligible
45	16/01475/SCR	29.9	1.4	4	-	-	0.32	0.26	0.01	0.24	<0.005	32.1	80	Slight
46	GR/17/674	22.4	0.3	1	-	1.1	0.09	0.08	<0.005	0.10	<0.005	24.1	60	Negligible
47	20141214	38.6	0.3	1	-	1.1	0.09	0.07	<0.005	0.10	<0.005	40.3	101	Slight

*For receptors R1 to R27, the AC includes the PC from Tilbury2.-
Receptors in bold exceed the AQAL.

2.2.16 Predicted annual-mean NO₂ at the facades of existing receptors are below the AQS objective for NO₂ for all but two receptors. At West Street (receptor 9) the predicted NO₂ concentration exceeds the AQS objective of 40 µg.m⁻³ both with and without the Thurrock Flexible Generation Plant development. At receptor 47 (20141214), the AQS objective is exceeded with the cumulative developments. The PC from Thurrock Flexible Generation Plant at this receptor is only 1% of the AQS objective and the biggest contribution is from the Tilbury2 development.

2.2.17 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse' for all receptors.

2.2.18 There are seven receptors where the cumulative impact is 'moderate adverse'. At Fort Road (receptor 1), Sandhurst Road (receptor 2), Walnut Tree Farm (receptor 7), West Street (receptor 9), R9 (receptor 22), R13 (receptor 26) and the proposed receptor 18/00664/CONDC (receptor 42), the cumulative impact descriptor is moderate adverse.

2.2.19 With reference to the impacts at these seven receptors, the Environment Agency's on-line guidance states that:

"You don't need to take further action if your assessment has shown that both of the following apply:

Your proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is not BAT AEL

... the resulting PECs won't exceed environmental standards".

2.2.20 At six of these seven receptors, the PEC is below the AQAL.

2.2.21 At West Street, the cumulative impact descriptor is 'moderate adverse' and the cumulative PEC is 107% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2013 and 2017¹ at the nearest monitoring location, GR13. The table and graph below shows the measured concentrations at GR13 in the last ten years.

Table 2.3: Annual-mean NO₂ Concentrations at GR13 (µg.m⁻³).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GR13	50	51	48	46	48.2	45.2	42.5	40	37.5	44	47.1

¹ Monitoring data for 2018 for locations in Thurrock was not available at the time of assessment. Therefore, the AC for receptors in Gravesham are based on the average between 2013 and 2017 rather than 2014 to 2018 for consistency.

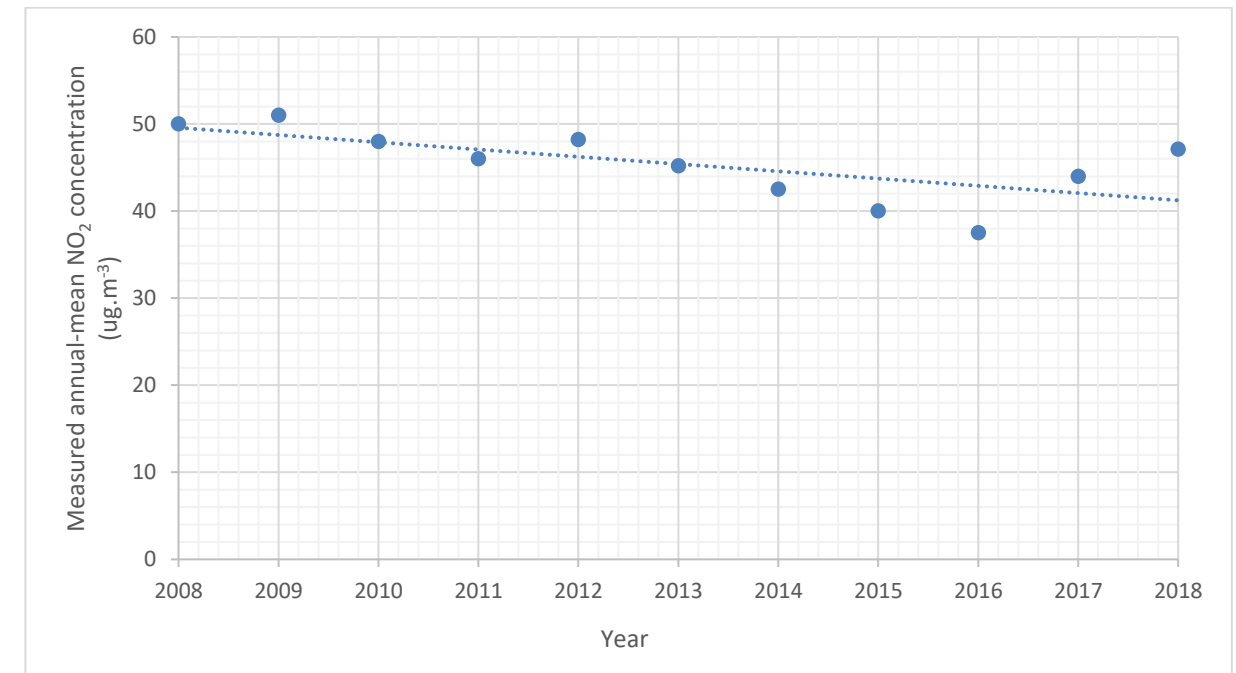


Figure 2.1: Annual-mean NO₂ Concentrations at GR13 (µg.m⁻³).

2.2.22 The results show that at this location, measured concentrations have decreased. Therefore an AC of 41.8 µg.m⁻³ (the five-year average from 2013 to 2017) is likely to be a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO₂ concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be in 2022 at the earliest and the opening years of some of the other cumulative developments are likely to be even later so concentrations are expected to decrease even further.

2.2.23 If the AC at West Street is assumed to be 37.5 µg.m⁻³, the PEC is only 97% of the AQAL and based on the Environment Agency's on-line guidance further action would not be required. Further analysis of air quality in Gravesham is provided in Volume 6: Appendix 12.8.

2.2.24 As discussed in paragraph 2.2.12, other smaller cumulative developments will generate traffic which could increase concentrations of NO₂.

- 2.2.25 There are five receptors where the Cumulative PEC is greater than 90% of the AQAL: receptors 3, 9, 22, 38 and 47.
- 2.2.26 Section 2.5 of Volume 3, Chapter 12: Air Quality provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.
- 2.2.27 Similarly a number of maximum design parameters were assessed. It should be noted that the results presented in this chapter are worst-case and based on a number of conservative assumptions. In reality, it is unlikely that all the maximum design parameters will be implemented.
- 2.2.28 In particular, SCR will be implemented and the Thurrock Flexible Generation Plant PCs are likely to be more than halved.
- 2.2.29 On that basis and using professional judgement, the overall significance of the long-term cumulative effect is considered to be minor adverse.

Short-term Impacts

- 2.2.30 Table 2.4 summarises the short-term maximum PC and cumulative PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown. For the short-term Cumulative PEC, the Thurrock Flexible Generation Plant PC has been added to the Cumulative AC and the short-term PC for Tilbury Green Power, Tilbury Peak Reserve, Thames Enterprise Park, Gateway Energy Centre and Purfleet Regeneration Centre. The cumulative AC has been calculated by adding the short-term PCs of the above cumulative developments to the doubled AC, Tilbury 2 PC and Lower Thames Crossing PC. This follows the Environment Agency's on-line guidance which states that: *"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."*

Table 2.4: Short-term Cumulative Predicted NO₂ Concentrations (µg.m⁻³) at Sensitive Receptors.

Receptor ID	Receptor Name	AC (µg.m ⁻³)*	PC (µg.m ⁻³)	PC as % of AQAL	Tilbury2 PC (µg.m ⁻³)*	Lower Thames Crossing PC (µg.m ⁻³)	Tilbury Green Power PC (µg.m ⁻³)	Tilbury Peak Reserve PC (µg.m ⁻³)	Thames Enterprise Park PC (µg.m ⁻³)	Gateway Energy Centre PC (µg.m ⁻³)	Purfleet Centre Regeneration PC (µg.m ⁻³)	Cumulative AC (µg.m ⁻³)	Cumulative PEC (µg.m ⁻³)	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	58.6	29	0.6	-	5.10	15.98	0.21	3.44	0.12	78.9	137.5	69	Moderate
2	Sandhurst Road	52.9	49.4	25	3.0	-	4.85	19.45	0.19	3.26	0.13	86.8	136.1	68	Moderate
3	School	68.1	29.0	15	0.9	-	5.61	6.41	0.18	2.83	0.15	85.0	114.1	57	Slight
4	Gateway Academy	57.4	26.6	13	-	0.6	6.76	4.82	0.24	3.16	0.14	73.7	100.4	50	Slight
5	Gravel Pit Cottages	36.0	47.3	24	-	1.0	4.12	4.74	0.23	4.14	0.09	51.3	98.7	49	Moderate
6	Princess Margaret Rd	36.0	32.8	16	-	-	3.16	4.09	0.22	4.37	0.08	47.9	80.7	40	Slight
7	Walnut Tree Farm	36.7	75.7	38	-	1.0	4.48	6.02	0.22	4.12	0.10	53.6	129.3	65	Moderate
8	The Green	36.7	48.0	24	-	-	5.35	5.82	0.23	3.94	0.12	52.1	100.1	50	Moderate
9	West Street	83.7	23.9	12	-	-	3.84	7.70	0.15	2.77	0.11	98.3	122.1	61	Slight
10	Milton School	61.7	23.7	12	-	-	3.43	6.11	0.14	2.83	0.10	74.3	98.0	49	Slight
11	Royal Pier Road	63.6	26.7	13	-	-	3.75	7.04	0.15	2.78	0.11	77.4	104.1	52	Slight
12	West Tilbury Hall	36.7	56.6	28	-	-	5.32	6.31	0.23	3.74	0.11	52.4	108.9	54	Moderate
13	Cooper Shore	36.7	72.9	36	-	-	4.73	6.86	0.23	3.73	0.10	52.3	125.2	63	Moderate
14	R1	62.2	10.9	5	0.1	-	2.93	1.82	0.17	2.69	0.43	70.2	81.2	41	Negligible
15	R2	55.2	10.4	5	0.0	-	2.08	1.48	0.20	2.62	0.38	62.0	72.3	36	Negligible
16	R3	56.6	18.1	9	0.4	-	2.74	2.16	0.24	3.49	0.20	65.4	83.6	42	Negligible
17	R4	53.8	17.3	9	0.5	-	3.22	3.48	0.27	4.40	0.16	65.3	82.6	41	Negligible
18	R5	64.4	16.2	8	0.3	-	3.03	3.34	0.27	4.25	0.16	75.5	91.7	46	Negligible
19	R6	53.8	17.8	9	0.1	2.1	3.23	3.50	0.28	4.64	0.14	69.8	87.6	44	Negligible
20	R7	56.2	18.8	9	0.8	0.9	3.87	4.23	0.27	4.68	0.15	71.2	90.0	45	Negligible
21	R8	57.8	19.1	10	0.8	0.1	8.81	4.50	0.22	2.89	0.13	74.5	93.7	47	Negligible
22	R9	73.2	24.1	12	1.9	-	7.01	5.04	0.19	3.04	0.16	88.6	112.8	56	Slight
23	R10	61.2	28.5	14	4.4	-	5.45	7.06	0.18	3.02	0.15	77.1	105.6	53	Slight
24	R11	53.2	32.4	16	1.7	-	4.85	9.31	0.18	3.03	0.14	70.7	103.1	52	Slight
25	R12	52.2	32.4	16	1.7	-	4.84	10.12	0.17	3.03	0.14	70.5	102.9	51	Slight
26	R13	52.8	47.2	24	3.0	-	4.93	19.32	0.19	3.23	0.13	80.6	127.8	64	Moderate

Receptor ID	Receptor Name	AC ($\mu\text{g.m}^{-3}$)*	PC ($\mu\text{g.m}^{-3}$)	PC as % of AQAL	Tilbury2 PC ($\mu\text{g.m}^{-3}$)*	Lower Thames Crossing PC ($\mu\text{g.m}^{-3}$)	Tilbury Green Power PC ($\mu\text{g.m}^{-3}$)	Tilbury Peak Reserve PC ($\mu\text{g.m}^{-3}$)	Thames Enterprise Park PC ($\mu\text{g.m}^{-3}$)	Gateway Energy Centre PC ($\mu\text{g.m}^{-3}$)	Purfleet Centre Regeneration PC ($\mu\text{g.m}^{-3}$)	Cumulative AC ($\mu\text{g.m}^{-3}$)	Cumulative PEC ($\mu\text{g.m}^{-3}$)	Cumulative PEC as % of AQAL	Impact Descriptor
27	R14	53.6	43.5	22	3.8	-	4.78	18.07	0.18	3.21	0.13	80.0	123.5	62	Moderate
28	R15	47.2	56.4	28	0.6	-	5.03	19.13	0.20	3.39	0.12	75.1	131.5	66	Moderate
29	R16	51.6	36.6	18	1.8	-	5.16	13.99	0.18	3.13	0.14	74.2	110.8	55	Slight
30	R17	52.4	35.4	18	2.1	-	4.86	11.92	0.17	3.10	0.14	72.6	108.0	54	Slight
31	R18	48.2	18.7	9	0.2	-	2.85	2.34	0.25	3.74	0.18	57.6	76.3	38	Negligible
32	R19	63.2	28.9	14	0.9	-	5.62	6.00	0.18	2.78	0.15	77.9	106.9	53	Slight
33	R20	47.0	12.5	6	0.1	-	3.71	2.07	0.22	3.46	0.22	56.7	69.1	35	Negligible
34	R21	69.6	12.3	6	0.5	-	3.61	2.12	0.21	3.38	0.23	79.1	91.4	46	Negligible
35	R22	49.6	10.7	5	<0.05	-	2.70	1.68	0.17	2.63	0.58	57.4	68.0	34	Negligible
36	R23	68.2	9.7	5	0.1	-	1.98	1.34	0.17	2.35	0.58	74.6	84.4	42	Negligible
37	R24	57.0	12.2	6	0.1	-	1.86	1.17	0.20	2.58	0.29	63.1	75.3	38	Negligible
38	R25	67.6	12.9	6	0.1	2.0	2.38	2.43	0.39	5.54	0.11	82.5	95.3	48	Negligible
39	R26	45.2	12.6	6	<0.05	-	1.67	1.16	0.19	2.57	0.25	51.0	63.6	32	Negligible
40	R27	49.0	17.9	9	0.3	0.9	3.67	4.16	0.27	4.75	0.16	63.8	81.7	41	Negligible
41	16/01232/OUT	36.0	42.8	21	-	2.1	4.64	5.00	0.23	4.29	0.10	54.5	97.3	49	Moderate
42	18/00664/CONDC	59.8	33.2	17	-	-	4.32	4.69	0.24	4.57	0.10	73.7	106.9	53	Slight
43	16/00412/OUT	36.7	32.4	16	-	0.4	5.87	5.45	0.26	3.43	0.13	52.6	85.0	42	Slight
44	15/00379/OUT	36.7	28.1	14	-	0.4	5.82	5.28	0.26	3.72	0.13	52.7	80.7	40	Slight
45	16/01475/SCR	59.8	26.9	13	-	-	4.05	4.08	0.29	4.87	0.11	73.2	100.1	50	Slight
46	GR/17/674	44.8	15.8	8	-	1.1	2.80	3.41	0.13	2.56	0.11	56.0	71.9	36	Negligible
47	20141214	77.3	14.6	7	-	1.1	2.75	3.33	0.13	2.58	0.11	88.4	103.0	52	Negligible

* The short-term AC is twice the long-term AC. For receptors R1 to R27, the AC includes the PC from Tilbury2.

2.2.31 For all receptors the cumulative PEC is less than 70% of the AQAL of $200 \mu\text{g.m}^{-3}$. This demonstrates that there is considerable headroom between the short-term AQAL and the PEC. On that basis and using professional judgement, the short-term cumulative effect is considered to be minor adverse.

Ecological Receptors

2.2.32 For the Tilbury Green Power, Tilbury Peak Reserve, Thames Enterprise Park, Gateway Energy Centre and Purfleet Centre Regeneration developments, the stack parameters and emissions data outlined in Table 2.1 have been modelled for a grid of receptors across the designated ecological sites within 15 km of the Thurrock Flexible Generation Plant. The PCs for NO_x , nutrient nitrogen deposition and acid deposition have been calculated in the same way as for the assessment of non-cumulative air quality effects on ecological receptors as outlined in Volume 6, Appendix 12.1: Assessment of Air Quality Impacts on Ecological Receptors.

2.2.33 For ecological receptors, the cumulative effects have been considered in line with Natural England's guidance (Natural England 2018). In summary, the maximum process contributions from each development where emissions to air might occur has been combined with the process contribution from the proposed development at the same location to give a single combined process contribution that is then compared to the relevant critical level/load (CL). Consistent with the Natural England guidelines, if the process contribution from any development is potentially significant in its own right, it is excluded from further assessment on the basis that it will be required to mitigate its impacts anyway. Only those developments where the predicted PCs are not potentially significant by themselves are included in the cumulative assessment.

2.2.34 In other words, where the maximum predicted NO_x PC of an individual cumulative development exceeds $0.3 \mu\text{g.m}^{-3}$ of NO_x (1% of the critical level of $30 \mu\text{g.m}^{-3}$ and therefore the development is potentially significant), the PC has been removed from the calculation of total PEC.

2.2.35 For the Lower Thames Crossing and Tilbury2, the maximum predicted concentrations outlined in their respective air quality assessments at each designated site are greater than $0.3 \mu\text{g.m}^{-3}$ so have not been considered in this cumulative assessment.

2.2.36 The maximum cumulative predicted annual-mean NO_x concentrations are compared with the critical level (CL) in Table 2.5. The maximum cumulative predicted nutrient nitrogen deposition rates are compared with the critical load (CL) in Table 2.6. The maximum cumulative predicted acid deposition rates are compared with the critical load function (CLF) in Table 2.7.

Table 2.5: Predicted Cumulative Annual-Mean NOx Concentrations at Designated Sites

Designated Site	CL (µg.m ⁻³)	AC (µg.m ⁻³)	Thurrock FGP PC (µg.m ⁻³)	Tilbury Green Power PC (µg.m ⁻³)	Tilbury Peak Reserve PC (µg.m ⁻³)	Thames Enterprise Park PC (µg.m ⁻³)	Gateway Energy Centre PC (µg.m ⁻³)	Purfleet Centre Regeneration PC (µg.m ⁻³)	Cumulative PC (µg.m ⁻³)	Cumulative PEC (µg.m ⁻³)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
Thames Estuary and Marshes SPA	30	21.69	2.1	*	*	0.07	*	0.01	2.2	23.9	7	80
North Downs Woodlands SAC		18.26	0.1	0.1	<0.05	0.01	0.1	<0.005	0.4	18.6	1	62
Basildon Meadows SSSI		22.13	0.4	0.2	0.1	0.02	0.3	0.01	1.1	23.3	4	78
Canvey Wick SSSI		23.43	0.4	0.2	0.1	0.15	*	<0.005	0.9	24.3	3	81
Chattenden Woods and Lodge Hill SSSI		19.04	0.3	0.1	0.1	0.01	0.2	<0.005	0.6	19.7	2	66
Cobham Woods SSSI		19.71	0.2	0.1	<0.05	0.01	0.1	<0.005	0.5	20.2	2	67
Darenth Wood SSSI		31.61	0.3	0.2	0.1	0.01	0.1	0.01	0.7	32.3	2	108
Grays Thurrock Chalk Pit SSSI		31.25	0.3	0.3	0.1	0.01	0.3	0.02	1.0	32.3	3	108
Great Crabbles Wood SSSI		23.97	0.2	0.1	<0.05	0.01	0.1	<0.005	0.5	24.5	2	82
Halling to Trottscliffe Escarpment SSSI		16.31	0.2	0.1	<0.05	0.01	0.1	<0.005	0.4	16.7	1	56
Hangmans Wood and Deneholes SSSI		28.82	0.5	*	0.2	0.02	0.3	0.01	1.0	29.8	3	99
Holehaven Creek SSSI		29.66	0.5	0.2	0.1	0.21	*	0.01	1.0	30.7	3	102
Mucking Flats and Marshes SSSI		26.73	2.4	*	*	0.07	*	0.01	2.5	29.2	8	97
Northward Hill SSSI	17.43	0.3	0.1	0.1	0.01	0.2	<0.005	0.6	18.1	2	60	

Designated Site	CL (µg.m ⁻³)	AC (µg.m ⁻³)	Thurrock FGP PC (µg.m ⁻³)	Tilbury Green Power PC (µg.m ⁻³)	Tilbury Peak Reserve PC (µg.m ⁻³)	Thames Enterprise Park PC (µg.m ⁻³)	Gateway Energy Centre PC (µg.m ⁻³)	Purfleet Centre Regeneration PC (µg.m ⁻³)	Cumulative PC (µg.m ⁻³)	Cumulative PEC (µg.m ⁻³)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
Pitsea Marsh SSSI		20.32	0.4	0.2	0.1	0.03	*	0.01	0.7	21.0	2	70
Shorne and Ashenbank Woods SSSI		24.57	0.2	0.1	0.1	0.01	0.1	<0.005	0.6	25.1	2	84
South Thames Estuary and Marshes SSSI		21.03	1.2	0.3	0.2	0.04	*	<0.005	1.8	22.8	6	76
Thorndon Park SSSI		20.15	0.2	0.1	<0.05	0.01	0.1	0.01	0.5	20.6	2	69
Tower Hill to Cockham Wood SSSI		24.82	0.2	0.1	<0.05	0.01	0.1	<0.005	0.4	25.2	1	84
Vange and Fobbing Marshes SSSI		20.08	0.6	0.2	0.1	0.07	*	0.01	1.0	21.1	3	70
West Thurrock Lagoon and Marshes SSSI		35.43	0.5	*	0.1	0.01	0.2	0.03	0.8	36.2	3	121
Langdon Ridge SSSI		20.17	0.4	0.2	0.1	0.01	0.2	0.01	0.9	21.1	3	70
Broom Hill LWS		-	9.7	*	*	0.01	0.3	0.01	10.0	-	33	-
West Tilbury Hall LWS		-	2.9	*	*	0.01	0.3	0.01	3.1	-	10	-
Low Street Pit LWS		-	8.7	*	*	0.01	0.3	<0.005	8.9	-	30	-
Lyttag Brownfield LWS		-	10.8	*	*	0.01	0.2	0.01	11.0	-	37	-
Tilbury Centre LWS		-	4.7	0.3	*	0.01	0.2	0.01	5.2	-	17	-
Tilbury Marshes LWS		-	3.8	*	*	0.01	0.2	0.01	9.6	-	32	-
Goshems Farm LWS		-	5.2	0.3	*	0.01	0.2	0.01	5.8	-	19	-

Notes:

*PC is greater than 0.3 µg.m⁻³ so not considered further.

Consistent with the Institute of Air Quality Management's *A guide to the assessment of air quality impacts on designated nature conservation sites* (IAQM, 2019), the PC as a % of the CL has been rounded to the nearest integer. As per the DEFRA and EA (2016) guidelines, the PEC does not need to be calculated for local nature sites.

Table 2.6: Predicted Cumulative Nutrient Nitrogen Deposition at Designated Sites

Designated Site	Interest Feature	CL (kgN.ha ⁻¹ .yr ⁻¹)	AC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
Thames Estuary and Marshes SPA	Charadrius hiaticula (Europe/Northern Africa - wintering) - Ringed plover (A137)	8	12.2	0.7	12.9	8	161
	Circus cyaneus - Hen harrier (A082)	20	12.2	0.7	12.9	4	86
	Recurvirostra avosetta (Western Europe/Western Mediterranean - breeding) - Pied avocet (A132)	20	12.2	0.7	12.9	3	64
	Pluvialis squatarola (Eastern Atlantic - wintering) - Grey plover (A141)	20	12.2	0.7	12.9	3	64
	Calidris canutus (North-eastern Canada/Greenland/Iceland/North-western Europe) - Red knot (A143)	20	12.2	0.7	12.9	3	64
	Calidris alpina alpina (Northern Siberia/Europe/Western Africa) - Dunlin (A149)	20	12.2	0.7	12.9	3	64
	Limosa limosa islandica (Iceland - breeding) - Black-tailed godwit (A156)	20	12.2	0.7	12.9	3	64
	Tringa totanus (Eastern Atlantic - wintering) - Common redshank (A162)	20	12.2	0.7	12.9	3	64
North Downs Woodlands SAC	Taxus baccata woods of the British Isles (H91J0)	5	26.4	0.1	26.5	2	530
	Asperulo-Fagetum beech forests (H9130)	10	26.4	0.1	26.5	1	265
	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (H6210)	15	15.4	0.1	15.5	1	103
Basildon Meadows SSSI	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	20	23.31	0.2	23.5	1	118
Canvey Wick SSSI	Bombus sylvarum - Shrill Carder Bee	10	10.2	0.2	10.4	2	104
	Invertebrate assemblage - Invertebrate Assemblage	10	10.2	0.2	10.4	2	104
Chattenden Woods and Lodge Hill SSSI	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	24.4	0.2	24.6	1	164
	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	20	14.2	0.1	14.3	1	72
Cobham Woods SSSI	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	26.4	0.1	26.5	1	177

Designated Site	Interest Feature	CL (kgN.ha ⁻¹ .yr ⁻¹)	AC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	26.4	0.1	26.5	1	177
Darenth Wood SSSI	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	28	0.2	28.2	2	188
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	28	0.2	28.2	2	188
Great Crabbles Wood SSSI	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	26.2	0.2	26.4	1	176
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	26.2	0.2	26.4	1	176
Halling to Trottscliffe Escarpment SSSI	Broad-leaved, mixed and yew woodland (Taxus baccata woodland)	5	25.7	0.1	25.8	3	517
	Broad-leaved, mixed and yew woodland (Fagus sylvatica - Mercurialis perennis woodland)	10	25.7	0.1	25.8	1	258
	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	25.7	0.1	25.8	1	172
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	25.7	0.1	25.8	1	172
	Calcareous grassland (Bromus erectus lowland calcareous grassland)	15	15.3	0.1	15.4	1	103
	Calcareous grassland (Festuca ovina - Avenula pratensis lowland calcareous grassland)	15	15.3	0.1	15.4	1	103
Mucking Flats and Marshes SSSI	Calidris alpina alpina - Dunlin	20	14.7	0.8	15.5	4	77
	Charadrius hiaticula - Ringed Plover	20	14.7	0.8	15.5	4	77
	Limosa limosa islandica - Black-Tailed Godwit	20	14.7	0.8	15.5	4	77
	Pluvialis squatarola - Grey Plover	20	14.7	0.8	15.5	4	77
	Tadorna tadorna - Shelduck	20	14.7	0.8	15.5	4	77
	Tringa totanus - Redshank	20	14.7	0.8	15.5	4	77
Pitsea Marsh SSSI	Fen, marsh and swamp (Phragmites australis swamp and reed-beds)	15	29.7	0.2	29.9	1	199

Designated Site	Interest Feature	CL (kgN.ha ⁻¹ .yr ⁻¹)	AC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
Shorne and Ashenbank Woods SSSI	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	25.2	0.2	25.4	1	169
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	25.2	0.2	25.4	1	169
South Thames Estuary and Marshes SSSI	Littoral sediment (Annual Salicornia Saltmarsh)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Atriplex portulacoides saltmarsh)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Inula crithmoides stands)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Puccinellia maritima saltmarsh, Puccinellia maritima dominant sub-community)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Rayed Aster tripolium on saltmarsh)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Sarcocornia perennis)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Spartina Anglica Saltmarsh)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Suaeda Maritima Saltmarsh)	20	12.3	0.4	12.7	2	64
	Littoral sediment (Transitional low marsh vegetation with Puccinellia maritima, annual Salicornia species and Suaeda maritima.)	20	12.3	0.4	12.7	2	64
	Circus cyaneus - Hen Harrier	15	12.3	0.4	12.7	3	85
	Anas acuta - Pintail	20	12.3	0.4	12.7	2	64
	Anas crecca - Teal	20	12.3	0.4	12.7	2	64
	Anas querquedula - Garganey	20	12.3	0.4	12.7	2	64
	Anser albifrons albifrons - White-Fronted Goose	20	12.3	0.4	12.7	2	64
	Calidris alpina alpina - Dunlin	20	12.3	0.4	12.7	2	64
	Calidris canutus - Knot	20	12.3	0.4	12.7	2	64
	Charadrius hiaticula - Ringed Plover	20	12.3	0.4	12.7	2	64
	Limosa limosa islandica - Black-Tailed Godwit	20	12.3	0.4	12.7	2	64
	Numenius arquata - Curlew	20	12.3	0.4	12.7	2	64
	Pluvialis squatarola - Grey Plover	20	12.3	0.4	12.7	2	64
Recurvirostra avosetta - Avocet	20	12.3	0.4	12.7	2	64	
Tadorna tadorna - Shelduck	20	12.3	0.4	12.7	2	64	
Tringa nebularia - Greenshank	20	12.3	0.4	12.7	2	64	

Designated Site	Interest Feature	CL (kgN.ha ⁻¹ .yr ⁻¹)	AC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (kgN.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CL (%)	Cumulative PEC/CL (%)
	Tringa totanus - Redshank	20	12.3	0.4	12.7	2	64
Thorndon Park SSSI	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	28.9	0.2	29.1	1	194
Tower Hill to Cockham Wood SSSI	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	24	0.1	24.1	1	161
West Thurrock Lagoon and Marshes SSSI	Calidris alpina alpina - Dunlin	20	14	0.2	14.2	1	71
	Tringa totanus - Redshank	20	14	0.2	14.2	1	71
Langdon Ridge SSSI	Broad-leaved, mixed and yew woodland (Crataegus monogyna - Hedra helix scrub)	10	28.3	0.3	28.6	3	286
	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	15	28.3	0.3	28.6	2	191
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	15	28.3	0.3	28.6	2	191
	Fen, marsh and swamp (Juncus subnodulosus - Cirsium palustre fen meadow)	15	15.9	0.2	16.1	1	107
	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	20	15.9	0.2	16.1	1	80
Broom Hill LWS	Acid grassland	10	-	3.0	-	30	-
West Tilbury Hall LWS	Acid grassland	10	-	0.9	-	9	-
Low Street Pit LWS	Acid grassland	10	-	2.7	-	27	-
Lytag Brownfield LWS	Acid grassland	10	-	3.4	-	34	-
Tilbury Centre LWS	Acid grassland	10	-	1.5	-	15	-
Tilbury Marshes LWS	Coastal & floodplain grazing marsh	20	-	1.8	-	9	-
	Coastal saltmarsh	20	-	1.2	-	6	-
Goshems Farm LWS	Coastal & floodplain grazing marsh	20	-	5.1	-	26	-

Notes: Results are not shown for sites/interest features which are not sensitive to nutrient nitrogen deposition, or for which no data are provided on APIS. Critical loads (CLs) for nutrient nitrogen deposition are provided as a range. In this case, the lower limit of the CL range has been used in the assessment. Consistent with the Institute of Air Quality Management's *A guide to the assessment of air quality impacts on designated nature conservation sites* (IAQM, 2019), the PC as a % of the CL has been rounded to the nearest integer. As per the DEFRA and EA (2016) guidelines, the PEC does not need to be calculated for local nature sites.

Table 2.7: Predicted Cumulative Acid Deposition at Designated Sites

Designated Site	Interest Feature	CLF CLminN (keq.ha ⁻¹ .yr ⁻¹)	CLF CLmaxN (keq.ha ⁻¹ .yr ⁻¹)	AC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CLF (%)	Cumulative PEC/CLF (%)
Thames Estuary and Marshes SPA	Charadrius hiaticula (Europe/Northern Africa - wintering) - Ringed plover (A137)	0.223	0.743	0.9	0.05	0.9	6	128
North Downs Woodlands SAC	Taxus baccata woods of the British Isles (H91J0)	0.142	1.983	1.9	0.01	1.9	0	96
	Asperulo-Fagetum beech forests (H9130)	0.142	1.983	1.9	0.01	1.9	0	96
	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (H6210)	0.856	4.856	1.1	0.01	1.1	0	23
Basildon Meadows SSSI	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	0.438	2.48	1.67	0.01	1.7	1	68
Chattenden Woods and Lodge Hill SSSI	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	0.223	0.733	1	0.01	1.0	1	138
South Thames Estuary and Marshes SSSI	Anas querquedula - Garganey	0.856	0.733	0.9	0.03	0.9	4	127
	Numenius arquata - Curlew	0.856	0.733	0.9	0.03	0.9	4	127
Thorndon Park SSSI	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	0.142	2.645	2.1	0.01	2.1	0	80
Langdon Ridge SSSI	Broad-leaved, mixed and yew woodland (Crataegus monogyna - Hedra helix scrub)	0.357	2.889	2	0.02	2.0	1	70
	Broad-leaved, mixed and yew woodland (Fraxinus excelsior - Acer campestre - Mercurialis perennis woodland)	0.357	2.889	2	0.02	2.0	1	70
	Broad-leaved, mixed and yew woodland (Quercus robur - Pteridium aquilinum - Rubus fruticosus woodland)	0.357	2.889	2	0.02	2.0	1	70
	Fen, marsh and swamp (Juncus subnodulosus - Cirsium palustre fen meadow)	0.438	2.048	1.1	0.01	1.1	1	54
	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	0.438	2.048	1.1	0.01	1.1	1	54
Broom Hill LWS	Acid grassland	0.438	4.578	-	0.22	-	49	-
West Tilbury Hall LWS	Acid grassland	0.48	4.578	-	0.07	-	14	-
Low Street Pit LWS	Acid grassland	0.223	1.113	-	0.19	-	87	-

Designated Site	Interest Feature	CLF CLminN (keq.ha ⁻¹ .yr ⁻¹)	CLF CLmaxN (keq.ha ⁻¹ .yr ⁻¹)	AC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PEC (keq.ha ⁻¹ .yr ⁻¹)	Cumulative PC/CLF (%)	Cumulative PEC/CLF (%)
Lyttag Brownfield LWS	Acid grassland	0.48	4.578	-	0.24	-	50	-
Tilbury Centre LWS	Acid grassland	0.48	4.578	-	0.11	-	22	-

Notes: Results are not shown for sites/interest features which are not sensitive to acid deposition, or for which no data are provided on APIS.

CLF = Critical Load Function.

Consistent with the Institute of Air Quality Management's *A guide to the assessment of air quality impacts on designated nature conservation sites* (IAQM, 2019), the PC as a % of the CL has been rounded to the nearest integer.

As per the DEFRA and EA (2016) guidelines, the PEC does not need to be calculated for local nature sites.

*As advised by the proposed development's ecologist, a CLF CLminN of 0.856 keq.ha⁻¹.yr⁻¹ has been used on the basis that the SSSI is entirely on the south bank of the Thames and is either grazing marsh or saltmarsh sitting over London Clay.

2.2.37 For NO_x, there are four designated sites where the cumulative PC exceeds 1% of the CL and the PEC is greater than the CL:

- Darenth Wood SSSI;
- Grays Thurrock Chalk Pits SSSI;
- Holehaven Creek SSSI; and
- West Thurrock Lagoon and Marshes SSSI.

2.2.38 The effect of NO_x on flora at these concentrations is confined to those driven by changes in N availability and corresponding changes to growth rate, rather than any direct toxic effects (WHO, 2000); direct toxicity has only been reported at concentrations >100 µg.m⁻³. It is therefore considered highly unlikely that the exceedance of the critical level in these locations would have a significant effect on the designated sites.

2.2.39 For nutrient nitrogen deposition, there are ten interest features where the PC exceeds 1% of the CL and the PEC exceeds the CL:

- Thames Estuary and Marshes SPA – *Charadrius hiaticula* (Europe/Northern Africa – wintering) Ringed plover (A137);
- North Downs Woodlands SAC - *Taxus baccata* woods of the British Isles (H91J0);
- Canvey Wick SSSI – *Bombus sylvarum* Shril Carder Bee;
- Canvey Wick SSSI – Invertebrate assemblage;
- Darenth Wood SSSI – Broad-leaved, mixed and yew woodland (*Fraxinus excelsior* – *Acer campestre* - *Mercurialis perennis* woodland);
- Darenth Wood SSSI - (*Quercus robur* – *Pteridium aquilinum* – *Rubus fruticosus* woodland);
- Halling to Trottscliffe Escarpment SSSI - Broad-leaved, mixed and yew woodland (*Taxus baccata* woodland);
- Langdon Ridge SSSI – Broad-leaved, mixed and yew woodland (*Crataegus monogyna* – *Hedra helix* scrub);
- Langdon Ridge SSSI – Broad-leaved, mixed and yew woodland (*Fraxinus excelsior* - *Acer campestre* – *Mercurialis perennis* woodland); and
- Langdon Ridge SSSI – Broad-leaved, mixed and yew woodland (*Quercus robur* – *Pteridium aquilinum* – *Rubus fruticosus* woodland).

2.2.40 With respect to nutrient nitrogen effects on the Thames Estuary and Marshes SPA, for the majority of interest features of the SPA, the PCs and/or PECs for all pollutant types were <1% or <CL. The one exception was nutrient nitrogen deposition for Ringed Plover where the maximum PC >1% and the PEC exceeded the relevant CL. The CL used in the assessment is taken from the Site-Relevant Critical Load tool on APIS and is for acidic coastal stable dune grassland. This habitat type does not occur within the Thames Estuary and Marshes SPA; indeed, the main associations of this species within the SPA are the grazing marsh and inter-tidal mudflats, in particular, at Mucking Flats near east Tilbury and further east at Allhallows-on-Sea (Frost et al., 2016). Such habitats are not highly susceptible to either acid or nutrient nitrogen deposition on the basis that they are both high nutrient systems (as demonstrated by a high critical load of 20-30 kgN.ha⁻¹.yr⁻¹) and brackish (or salt water) and therefore more alkaline.

2.2.41 On this basis, it is considered that the data on APIS is not directly relevant to the population of Ringed Plover using the SPA where a higher critical load would be more appropriate, given the habitat associations of this species in this geographic location. Therefore, there is no potential for a likely significant effect on Ringed Plover using the Thames Estuary and Marshes SPA as a result of cumulative emissions to air.

2.2.42 With respect to the effect of nutrient nitrogen on North Downs Woodland SAC, the critical load used in Table 2.6 (5 kgN.ha⁻¹.yr⁻¹) is the lowest found on APIS for any habitat type and represents coniferous woodland on the very poorest soils with strong lichen/free-living algal communities. APIS notes that unless such lichen communities are present within the site, then 10 kgN.ha⁻¹.yr⁻¹ is a more appropriate critical load for coniferous woodland in the UK (APIS n.d). Using this value, the cumulative PC becomes 1% of the critical load and, as such, insignificant.

2.2.43 With respect to the effect of nutrient nitrogen interest features at Canvey Wick SSSI, this is located on a former oil refinery and was the first brownfield SSSI designated in the UK. The ecological interest of the site arises from the diversity of habitats present, forming on the various substrates imported for the construction of the oil refinery. These substrates are nutrient poor and, as such, have led to the colonisation of a rich flora that supports an invertebrate assemblage of national importance. The critical load used (10 kgN.ha⁻¹.yr⁻¹) in Table 2.6 is the lowest of an unimproved grasslands since APIS does not provide a site-relevant critical load for Canvey Wick. Although the cumulative PC/PEC is 2%/104% of the critical load for Canvey Wick SSSI, the 10 kgN.ha⁻¹.yr⁻¹ is at the very lowest end of a possible critical load. The exceedance of the critical load occurs by the ambient deposition rate, without any of the cumulative developments. Therefore, given that the site is currently in favourable status (Natural England 2019a), no effect of the small increase in cumulative nutrient nitrogen is predicted on the SSSI.

- 2.2.44 With respect to the effect of nutrient nitrogen on interest features at the Darenth Wood SSSI, this is an area of ancient woodland near to Dartford across a variety of slopes and is bisected by the A2 dual carriageway. The presence of the major road means that the site is already subject to high rates of nutrient nitrogen deposition. Notwithstanding this, the majority of the site is still in favourable condition (Natural England 2019b) and, as such, the very small increase in deposition rate due to the cumulative projects would be insignificant.
- 2.2.45 With respect to the effect of nutrient nitrogen on interest features at the Halling to Trottscliffe Escarpment SSSI, the closest units comprise a matrix of calcareous grassland on steep slopes with mixed woodland including that which is both yew- and beech-dominated. The critical load used in Table 2.6 (5 kgN.ha⁻¹.yr⁻¹) is the lowest found on APIS for any habitat type and represents coniferous woodland on the very poorest soils with strong lichen/free-living algal communities. APIS notes that unless such lichen communities are present within the site, then 10 kgN.ha⁻¹.yr⁻¹ is a more appropriate critical load for coniferous woodland in the UK (APIS n.d). Using this value, the PC becomes <1% of the critical load and, as such, insignificant.
- 2.2.46 With respect to the effect of nutrient nitrogen on woodland interest features at the Langdon Ridge SSSI, the ambient deposition rate already exceeds the minimum critical load for the all interest features. Much of the SSSI is in unfavourable recovering condition, suggesting that the current exceedance is not preventing recovery at the site. Therefore, given the very small increase represented by the cumulative PC (<1%), potential effects due to nutrient nitrogen deposition on the woodland interest features of the SSSI are considered unlikely.
- 2.2.47 For acid deposition, there are three interest features where the PC exceeds 1% of the CL and the PEC exceeds 70% of the CL:
- Thames Estuary and Marshes SPA – Charadrius hiaticula (Europe/Northern Africa – wintering) – Ringed plover (A137);
 - South Thames Estuary and Marshes SSSI – *Anas querquedula* – Garganey
 - South Thames Estuary and Marshes SSSI – *Numenius arquata* – Curlew
- 2.2.48 With respect to acid deposition effects on the Thames Estuary and Marshes SPA, for the majority of interest features of the SPA, the PCs and/or PECs for all pollutant types were <1% or <CLF. The one exception was acid deposition for Ringed Plover where the maximum PC was >1% and the PEC exceeded the CLF. As set out in paragraph 2.2.40, it is considered that the data on APIS is not directly relevant to the population of Ringed Plover using the SPA where a higher critical load function would be more appropriate, given the habitat associations of this species in this geographic location. Therefore, there is no potential for a likely significant effect on Ringed Plover using the Thames Estuary and Marshes SPA as a result of cumulative emissions to air.

2.2.49 With respect to acid deposition effects on the two interest features of the South Thames Estuary and Marshes SSSI, the CLF used in Table 2.7 is that of acid grassland used by both Garganey and Curlew in other parts of the country. However, this habitat type does not occur within the SSSI. APIS also includes CLF data for calcareous grassland which is more relevant in this location, given the underlying geology. Using these data, no effects are predicted.

2.2.50 Based on the results of detailed modelling and advice from the proposed development's ecologist, no significant cumulative air quality effects on designated habitat sites are expected to arise.

Further mitigation or enhancement

2.2.51 At this stage the specifics of the engine types, layout and building dimensions are not fixed. A number of worse-case scenarios have been modelled as outlined in Volume 3, Chapter 12: Air Quality Table 2.18. Further mitigation or enhancement could include the aggregation of stacks and reductions in NO_x emission concentration due to the use of SCR technology. The results presented in this chapter assume that there is no aggregation of stacks and no emission reductions from use of SCR, as a worst case. With use of SCR it is likely that the Thurrock Flexible Generation Plant PCs would more than halve and the impacts would be much lower than presented in this chapter.

Residual effects

2.2.52 If the stacks are aggregated or emission reductions are achieved by SCR then the residual effects would be minor adverse or negligible, which is not significant in EIA terms.

2.3 Decommissioning phase of Thurrock Flexible Generation Plant

Assessment of effects

Receptors within 350 m of Application Site and a Cumulative Development

2.3.1 If the plant is deconstructed, during the decommissioning phase, there is the potential for cumulative effects where there are other sources of dust located within 700 metres of the proposed development (the IAQM indicative maximum radius of effects for an individual construction site being 350 m).

2.3.2 Large construction sites would typically implement mitigation measures, such as those recommended in the IAQM dust guidance. With the effective implementation of appropriate mitigation measures at other construction sites within 700 metres of the proposed development, the residual cumulative dust effects are unlikely to be significant.

Human Health and Ecological Receptors

2.3.3 If the operation of the plant is ongoing after 35 years, the significance of effect would be similar to the operational phase and would result in a **minor adverse** effect which is not significant in EIA terms.

Further mitigation or enhancement

2.3.4 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Residual effects

2.3.5 No further mitigation or enhancement is considered to be required so the residual effect is predicted to be **negligible**, which is not significant in EIA terms.

2.4 Conclusions

2.4.1 For the construction and decommissioning phases (if the plant is deconstructed), there is the potential for cumulative effects where there are other sources of dust located within 700 m of the proposed development. With the effective implementation of appropriate mitigation measures at other construction sites within 700 metres of the proposed development, the residual cumulative dust effects are unlikely to be significant.

2.4.2 For traffic-related emissions during the construction and decommissioning phase, the contribution of Thurrock Flexible Generation Plant to cumulative effects is negligible, which is not significant in EIA terms.

2.4.3 For the operational and maintenance phase, and if operation of the plant is ongoing after 35 years, there is the potential for cumulative effects from the increase in NH₃ and NO₂. This chapter has assessed the likely cumulative effects on both human-health and ecological receptors from a large number of cumulative developments.

2.4.4 At this stage the specifics of the engine types, layout and building dimensions are subject to further detailed design. A number of worse-case scenarios have been modelled as outlined in Table 2.18 of Volume 3, Chapter 12: Air Quality. Further mitigation or enhancement could include the aggregation of stacks and will include a reduction in NO_x emissions due to the use of SCR technology. The results presented in this chapter are based on the assumption that there is no aggregation of stacks.

2.4.5 The conservative assumption of no SCR has been used in the assessment, to reflect at as-yet unconfirmed performance of the SCR system that will be installed; however, the use of SCR is likely to more than halve the PCs in practice and the impacts would be much smaller than those presented in this chapter. If the stacks are aggregated or emission reductions are achieved by SCR then the residual effects would be minor adverse or negligible, which is not significant in EIA terms.

2.4.6 The overall significance of the long-term and short-term cumulative effect on human-health receptors is considered to be minor adverse. Based on the results of detailed modelling and advice from the proposed development's ecologist, no significant cumulative air quality effects on designated habitat sites are expected to arise.

2.4.7 Overall the cumulative effect is considered to be minor adverse, which is not significant in EIA terms.

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