



# The London Resort Development Consent Order

BC080001

## Environmental Statement Volume 2: Appendices

### Appendix 18.6 – Phase 1 Geo-environmental Assessment Update, Kent Project Site (Swanscombe Peninsula)

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Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Regulation 12(1)

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# **London Resort**

**Desk Study – Kent Project Site (Swanscombe Peninsula)**

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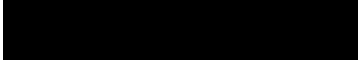
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# 1 Introduction

## 1.1 General

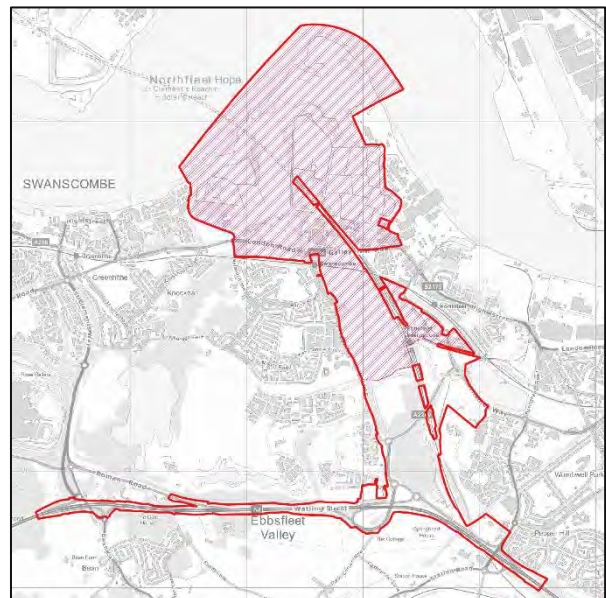
This report presents the results of a Geoenvironmental Desk Study for the Swanscombe Peninsula portion of the Kent Project Site (Figure 1-1), prepared by Buro Happold on behalf of London Resort Company Holdings (LRCH). This report forms one study as part of the wider London Resort project, which has been divided into the Kent Project Site and Essex Project Site. It is one of two Desk Study reports prepared for the Kent Project Site, which has been assessed as the Swanscombe Peninsula and A2 Highway Works elements.

This current report is an update to a Desk Study Report for a similar area of the Swanscombe Peninsula (by Atkins) that was produced for the Paramount Park Entertainment Resort [1], also on behalf of LRCH. This update includes a current set of environmental data and historical mapping and study of some additional areas but much of the information in that earlier Atkins report remains pertinent. For brevity, not all of that earlier text is repeated here, and this report should therefore be read in conjunction with that earlier Atkins report. The study area covered by this report (Swanscombe Peninsula) is shown by the pink shaded area in Figure 1-2. It is located in a meander of the River Thames, centred at National Grid Reference (NGR) TQ 60657 76055, and covering some 326 hectares. Note: Because this Report has followed the structure of the earlier Atkins reports, the northern part of the Resort Access Road (including the People Mover) falls into Zone 6 and is therefore reported here. The rest of the Resort Access Road is assessed in the Atkins desk study of that area [2] and the up-date prepared by Buro Happold [3].

The purpose of this study is to establish the environmental, geological, hydrological and hydrogeological conditions present that may result in potential contamination and ground related risks for the proposed future use. The assessment is also prepared to support a planning application in accordance with the Planning Act (2008) [4] for a Nationally Significant Infrastructure Project (NSIP) for the wider London Resort.



**Figure 1-1 - Aerial photograph of the Kent Project Site (Google Maps, 2020).**



**Figure 1-2 - OS map of Kent Project Site, Swanscombe Peninsula assessment area shown by pink shading (OS Open Data, 2020).**

## 1.2 Proposed development

The London Resort will be a nationally significant visitor attraction and leisure resource, built largely on brownfield land at Swanscombe Peninsula on the south bank of the River Thames (the Kent Project Site) and with supporting transport and visitor reception facilities on the northern side of the river (the Essex Project Site). The focus of the resort will be a Leisure Core located on the Swanscombe Peninsula (i.e. the area covered by this report), comprising a range of event spaces, themed rides and attractions, entertainment venues, theatres and cinemas, developed in two phases known as Gate One and Gate Two. The Gates will have entrance plazas offering ancillary retail, dining and entertainment facilities. The Resort will also include hotels, a conference and convention centre, an eSports venue, creative spaces, a transport interchange and 'back of house' service buildings.

## 1.3 Study aims and objectives

The overall aim of this work was to carry out a Geoenvironmental assessment of the site, presented in the form of an update to a Desk Study Report for a similar area of the Swanscombe Peninsula (by Atkins), in order to inform the Client's understanding of potential contamination and ground-related risks associated with the proposed development. This report will provide information relevant to redevelopment in accordance with the requirements of the Planning Act 2008 [4] and relevant policy in the NPS for National Networks (NPS NN). Regard is also given to the National Planning Policy Framework (NPPF) [5] and also with respect to any potential liability under Part 2A of the Environmental Protection Act [6], the primary policies under which contaminated land is managed in the UK.

The work was carried out in general accordance with the Model Procedures [7] and its recent replacement [8], the relevant British Standard [9], the Environment Agency Guiding Principles [10] and other current good practice guidance. The particular objectives were:

- To determine the historical and current use of the Site and its surroundings;
- To determine the nature of the ground conditions and the environmental sensitivity of the Site;
- To assess the potential location, nature and extent of any ground and groundwater contamination;
- To assess the potential risks to people and the environment (natural and built) associated with ground contamination (solid, liquid or gas) both in the site's existing condition and for the proposed future use;
- To construct an initial Conceptual Site Model and carry out a preliminary contaminated land risk assessment;
- To prepare a report based upon all of the above suitable to inform the Client about potential risks related to ground conditions and also suitable to support a planning application in accordance with the Planning Act 2008 [4] and to provide baseline information suitable to enable Environmental Impact Assessment.
- To determine the status of the Site with respect to Part 2a of the Environmental Protection Act 1990 and the nature and extent of any associated environmental liabilities; and
- To evaluate the need for and scope of any subsequent site investigation and/or remedial action or design.

## 1.4 Information sources

The principal sources of information for this Desk Study include: the previous Desk Study prepared by Atkins for the Swanscombe Peninsula [1]; results of a ground investigation undertaken subsequent to this [11, 12]; findings of a site walkover survey carried out in 2020; public register information and other data from a 2020 Groundsure Report

(summarised in Appendix B of this report and presented in full as a separate Appendix to the ES Chapter); information available from the Environment Agency website; and other online sources. This report is therefore based upon information obtained from third party sources, together with observations from the site walkover survey. The third-party data has been accepted at face value and has not been independently verified. Buro Happold can therefore give no warranty, representation or assurance as to the accuracy or completeness of such information.

## 1.5 Methodology and site zoning

To facilitate assessment of this approximately 326-hectare area, the Swanscombe Peninsula assessment area has been divided into six Zones (Zones 1 to 6, see Chapter 2), determined based on previous land use patterns, current ownership, plus the zoning adopted in the Atkins Desk Study [1]. Some of these areas are further divided into sub-zones. This report first provides an updated assessment to areas that were previously considered in the Atkins Study, to reflect further / updated data that has been obtained since that report was published (Chapters 3 to 8). Where possible, the structure adopted in the Atkins Desk Study is repeated. A complete assessment of areas of the Swanscombe Peninsula that were not previously included within the assessment area of the Atkins Desk Study (Zone 4D and Zone 6C) is then presented (Chapters 9 and 10).

Note: As stated above, the northern part of the access road (which also includes a dedicated roadway called the People Mover, from Ebbsfleet International Station to the Resort (falls within Zone 6 and is therefore covered in this report and the relevant Atkins Desk Study [1].

Furthermore, since preparing the report some parts of the area subject to study (Zone 6C have been excluded from the DCO Order Limits).

## 1.6 Competence

This work reported here was carried out by geoenvironmental scientists and engineers from Buro Happold. Buro Happold is a consulting engineering company that manages its work under various Quality Management Systems that are certified to ISO 9001. The work itself was carried out by the staff with relevant qualifications, training and experience. This overall technical responsibility for the work was held by a Technical Director with substantial experience in the assessment of land affected by contamination who is a Chartered Geologist and registered SiLC (Specialist in Land Contamination) and SQP (Suitably Qualified Person).



## 2 Site setting

### 2.1 Site location

The Swanscombe Peninsula is an irregularly shaped parcel of land, centred at National Grid Reference (NGR) TQ 60657 76055, and covering some 326 hectares. The assessment area is formed by a meander in the river and is bisected by the municipal boundary between the boroughs of Dartford to the west and Gravesham to the east. The urban areas of Stone, Greenhithe, Ingress Park and Swanscombe lie to the west and south of the site. These are largely residential in character, with commercial uses concentrated on Stone’s river frontage. To the east lies Northfleet, an area of mixed residential and commercial uses. To facilitate assessment, the Swanscombe Peninsula has been divided into six zones, illustrated by Figure 2-1 and described overleaf.

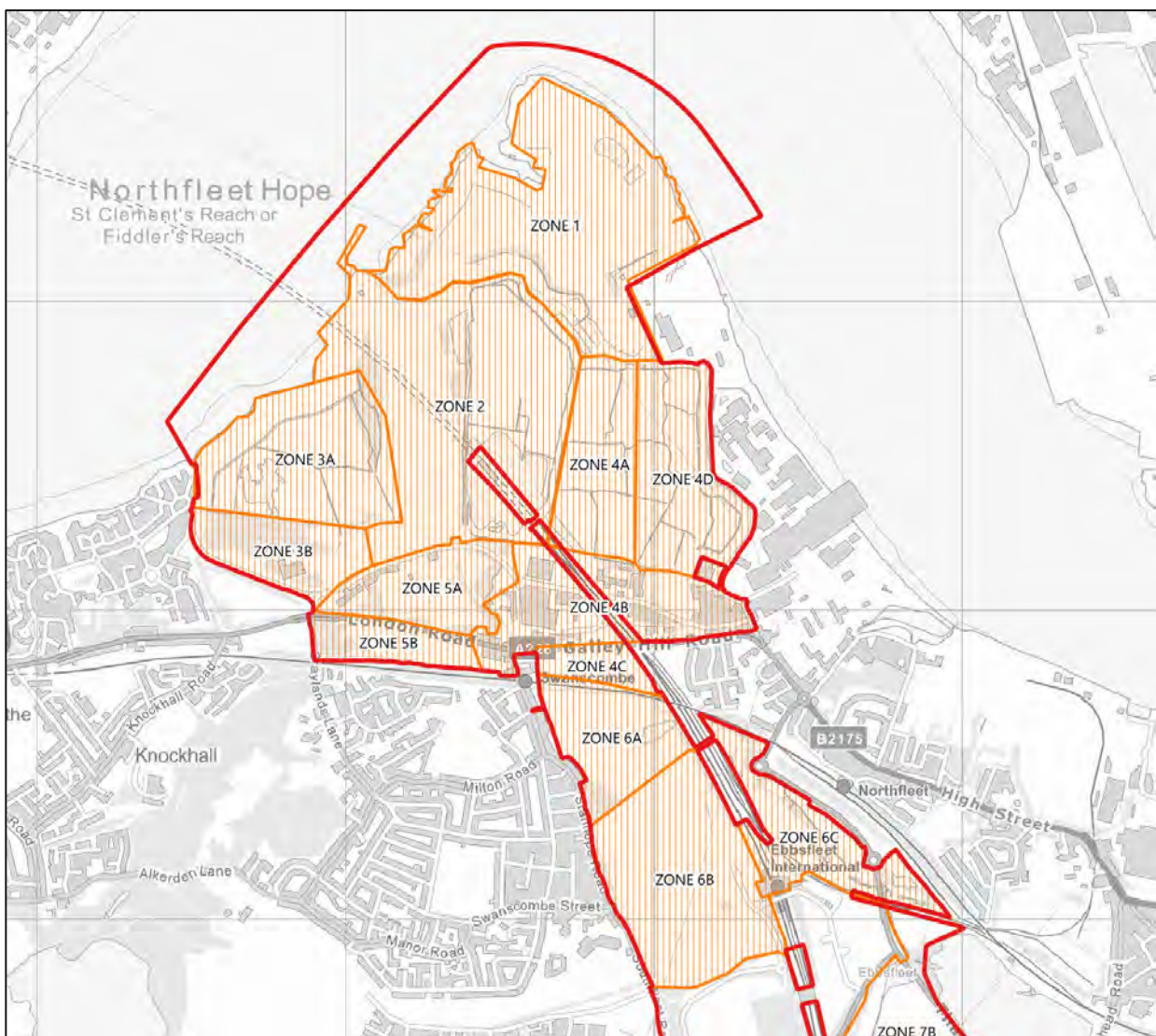


Figure 2-1 - Zoning of Swanscombe Peninsula (Zones 1-6), indicated by orange hatched area. Kent Project Site shown by red line.

## 2.2 Site zoning

The Swanscombe Peninsula has been divided into six zones, determined based on previous land use patterns, current ownership, plus the zoning adopted in the Atkins Desk Study [11]. It should be noted that the area of the Kent Project Site has changed (by omission and addition of parcels of land) since that report was published. Some areas of land assessed in this report were not covered by the Atkins Desk Study (Zone 4D and Zone 6C). However, Zone 6C has since been excluded from the DCO Order Limits.

**Table 2-1 - Summary of Zones adopted for the Swanscombe Peninsula**

Zone	Description
<b>Zone 1</b>	Located on the northerly part of the Swanscombe Peninsula. The Zone covers some 47.5 hectares and is the same area of land referred to as Zone 1 that was assessed by Atkins. It historically comprised Broadness Marsh and has been used for the deposition of dredging from the River Thames and subsequently for extensive landfilling (referred to as Broadness Landfill) with cement kiln dust (CKD). Currently the area is largely unused other than for informal access by walkers. There is also an unmanned Port of London Authority radar / weather station and electricity pylons which support a cable crossing the River Thames. A number of occupied houseboats are moored in the natural inlet in the northwest part of the zone. Upgrades to the leachate treatment system associated with Broadness Landfill have been ongoing since the zone was last assessed in 2014.
<b>Zone 2</b>	Located in the northwestern / central portion of the Swanscombe Peninsula. The zone covers some 54.3 hectares and is the same area that was assessed by Atkins. Historically comprised marshes prior to clay extraction and subsequent landfilling, predominantly with CKD wastes associated with the adjacent cement industry. There were also some industrial uses in the southwestern corner, including cement manufacture and a small gasworks. The High Speed 1 (HS1) rail link crosses the zone partially in tunnel, with the tunnel portal located in the southeast corner. A disused sewage works is also present in the centre.
<b>Zone 3</b>	<p><b>Zone 3A</b> is located on the western side of the Swanscombe Peninsula and northern part of Zone 3. It covers some 24.7 hectares and is the same area assessed by Atkins. It mainly comprises undeveloped marshland.</p> <p><b>Zone 3B</b> is located in the southern part of Zone 3 and covers 11.4 hectares. It has historically been used for cement manufacture, chalk extraction and landfilling. It currently supports structures associated with light industrial and waste recycling operations. During the site visit in 2020 it was unclear whether these facilities were still operational. It is slightly reduced in area to that assessed by Atkins.</p>
<b>Zone 4</b>	<p><b>Zone 4A</b> is located in the centre / east of Swanscombe Peninsula and northern part of Zone 4. It is currently marsh / agricultural land (referred to as Botany Marshes) and has not been subject to past industrial / commercial use. It covers 14.9 hectares and is the same area assessed by Atkins. HS1 passes through the southeast corner.</p> <p><b>Zone 4B</b> is the central portion of Zone 4 which covers 21.7 hectares. It was formerly partially quarried and now comprises a series of commercial / industrial areas. Zone 4B is currently occupied by the Northfleet and Kent Kraft Industrial Estates and eastern section of Manor Way Business Park, characterised by small to medium commercial and industrial units including a car breakers, skip hire / storage company and waste transfer station. HS1 passes through the middles of Zone 4B.</p> <p><b>Zone 4C</b> is located in the southern part of Zone 4 and comprises an area of former quarried and partially in-filled land, known as Sportsfield. It covers 4.2 hectares and is the same area that was assessed by Atkins in 2015.</p> <p><b>Zone 4D</b> is an area that was outside of the redline boundary of the London Paramount site and therefore has not previously been assessed. It is located to the east of Zone 4A and covers some 20 hectares. It is currently marsh / agricultural land referred to as Botany Marshes, located to the east of Zone 4A.</p>
<b>Zone 5</b>	<b>Zone 5A</b> currently comprises the western portion of Manor Way Business Park. It is the northern part of Zone 5, covers 12.8 hectares and is the same area assessed by Atkins in 2015. Manor Way Business Park consists of small to medium sized industrial units, including a haulage company and electricity substation. There are some

Zone	Description
	<p>commercial units / retail outlets on London Road (A226). It was historically part of the Portland Cement Works and also included railway tracks / tramways, an electricity substation, part of a former paper works and mills and part of the in-filled Pilgrim's Pit.</p> <p><b>Zone 5B</b> is the southern section of Zone 5. It is an open area which is a part in-filled quarry off Crayland's Lane, to the south of London Road and covers 7.1 hectares. The quarry is understood to have been part in-filled using arisings from the HS1 development. It is the same area that was assessed by Atkins.</p>
<b>Zone 6</b>	<p><b>Zone 6A</b> is known as Bamber Pit, a permitted landfill within a former chalk quarry which is now in the aftercare period. Zone 6A covers 13.7 hectares and is the same area assessed by Atkins. Bamber Pit received mixed wastes predominantly associated with the adjacent paper industries during the 1970s and 1980s. To the south of this is a further partially infilled, non-permitted quarry (referred to as Bamber Pit South / Baker's Hole) which includes a pond in the north-eastern section. This is understood to have received inert natural deposits.</p> <p><b>Zone 6B</b> forms the southern part of Zone 6 and is the same area assessed by Atkins. It comprises Northfleet Landfill, a further permitted landfill in the aftercare period. It received mixed household, industrial and commercial wastes, latterly restricted to inert wastes. There is an easement along the boundary of Northfleet Landfill with the HS1 land. A car park, access roadway and infrastructure associated with Ebbsfleet International Station are located in the eastern part of Zone 6B.</p> <p><b>Zone 6C</b> is located in the east of Zone 6 and is an area that was outside of the redline boundary of the London Paramount site (and therefore was not assessed in the Atkins Desk Study). It covers 14.5 hectares. It is currently occupied by Ebbsfleet International Station, infrastructure associated with the station, a limited section of railway line, and car parking that serves the train station. The River Ebbsfleet crosses the zone. Historically the zone has been crossed with tramways associated with ground workings in the surrounding area, and has been occupied by a Sports Ground and allotments.</p>

## 3 Update to Zone 1

### 3.1 Description

Zone 1 is located in the northernmost part of the Swanscombe Peninsula and covers some 47.5 hectares. It forms the tip of the peninsula with the River Thames adjacent to the north, northwest and northeast. It is generally covered with scrub vegetation and is of undulating topography due to the historical infilling of Cement Kiln Dust (CKD). There is also a leachate management system within the north of the zone.

Site inspections carried out in 2020 together with information from Groundsure (Appendix B) indicate that Zone 1 remains, in general, as described in the Atkins Desk Study [1]. It is understood that some upgrades to the leachate management system have been completed since the study was prepared in 2015. The upgrading of the leachate management system is an ongoing process.

### 3.2 Data sources

The following additional data sources relevant to Zone 1 have been available for review, with a summary provided below:

- Atkins (2015) London Paramount Entertainment Resort. Geotechnical and Geo-Environmental Interpretative Report [11]; and
- Geotechnical Engineering Limited (2015) London Paramount Entertainment Resort. Factual Report on Ground Investigation [12].

#### 3.2.1 2015 ground investigation

Atkins were commissioned by LRCH in 2015 to design and procure a ground investigation and to produce a Geotechnical and Geoenvironmental Interpretative Report based on the findings [11]. Contractors services for the on-site works were provided by Geotechnical Engineering [12]. The investigation included a very limited number of exploratory holes within Zone 1: two shallow window sample holes for perched water and ground gas monitoring, and one deep borehole installed to monitor groundwater within the chalk aquifer. Summary text included in the Atkins Interpretative Report is repeated below.

*The primary source of contamination in Zone 1 is the CKD and river dredging in-fill material which overlies the majority of the zone.*

*The ground investigation data did not record any exceedances of the human health generic screening criteria within either the soils or the groundwater within Zone 1. The highly alkaline nature of the CKD presents a risk to human health. Elevated pH was encountered within the superficial deposits and the perched water, which could cause adverse effects on human health should it come into contact with future workers or site visitors. Asbestos was identified in three samples taken from BH101, though when quantified was found to be below the threshold limit for hazardous waste.*

*A number of contaminants were found to exceed the generic screening criteria within the leachate, perched water and groundwater samples taken from Zone 1. However, it appears that Alluvium is providing a level of protection between the perched water and the deeper Chalk/RTD aquifers, as generally fewer contaminants were encountered within the deeper groundwater. In addition, those contaminants that were encountered in the deeper groundwater in Zone 1 were also largely found in the groundwater in other zones of the Site, even those situated at distance such as Zone 7. Therefore, it is*



*likely that these contaminants are indicative of wider groundwater quality in the area of the Site rather than attributable to specific zonal activity.*

*The worst-case ground gas scenario monitored indicates the zone would likely be classified as Characteristic Situation (CS) 2 due to elevated methane within BH101. However, this does not comprise a full ground gas risk assessment and additional data would be required to assess the zone fully.*

*Some risks to water supply pipes were identified due to potentially corrosive conditions within the soils.*

### **3.3 Surrounding land uses**

Zone 1 was accessed during a site visit during 2020. Surrounding land uses remain as described by Atkins in 2014. The River Thames is located to the north, east and west of the zone. Beyond the River Thames to the north is the town of Grays. Northfleet Industrial Estate is adjacent to the southeast, specifically the CEMEX Northfleet Concrete Plant (with associated stockpiles, storage containers, jetty, shipping facilities, silos and mixers) and Gill Aggregates (sand and gravel suppliers). Tilbury Docks are present beyond, on the northern bank of the River Thames. Zones 2 and 4 of the wider site are present to the south. Beyond the River Thames to the west is an industrial area associated with West Thurrock.

### **3.4 Historical land uses**

Based on OS maps provided in the Groundsure 2020, there has been no significant change in land use since the Atkins Desk Study was published in 2014. History of land use therefore remains as described in that report.

### **3.5 Geology**

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The ground conditions remain as described in the Atkins Desk Study [1] which corresponds with the BGS mapping. The limited number of new exploratory holes constructed within Zone 1 confirm the general stratigraphic sequence.

### **3.6 Hydrology and hydrogeology**

#### **3.6.1 Surface water**

The hydrological setting remains as described in the Atkins Desk Study [1]. There are ponds associated with leachate treatment (east and southeast extents of Zone 1) and several drains located within the zone.

#### **3.6.2 Groundwater**

The Atkins Desk Study reported that, based on historical borehole data, groundwater was likely to be encountered at 3m bgl. Higher groundwater levels were recorded (1.1m bgl) during their investigation in 2015 [11]. It is noted that the groundwater monitoring installation from the ground investigation provide some indicative data on how the groundwater levels change daily and seasonally, but further monitoring is required.

#### **3.6.3 Abstractions**

The 2020 Groundsure Report identified a historical and active record of a groundwater abstraction located about 5m east of Zone 1. This is operated by CEMEX UK Materials Ltd for mineral washing. The active license relates to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026. The 2020 Groundsure Report also

identified a record of an active surface water abstraction located 560m east. This is licensed to Robert Brett & Sons Ltd for mineral washing.

### 3.6.4 Groundwater vulnerability

Zone 1 is located in a Source Protection Zone 3 (total catchment) area.

## 3.7 Regulatory data

The full dataset provided in the 2020 Groundsure Report has been reviewed and summarised in Table B (Appendix B). The key items of relevant information are described in the following subsections.

### 3.7.1 Mineral abstractions

There is no evidence of recent or historical mining or quarrying in Zone 1.

### 3.7.2 Designated environmentally sensitive sites

The environmental sensitivity remains as described in the Atkins Desk Study [1]. In addition, the 2020 Groundsure Report identifies the area of the River Thames bordering the northwest of Zone 1 as a Marine Conservation Zone under the Marine and Coastal Access Act 2009. This is due to presence of intertidal muds and the tentacled lagoon worm. Some areas (total <10%) defined as habitats of principal importance (Priority Habitat Inventory) are also located within and adjacent to Zone 1 (and also within the other site zones, discussed in the relevant subsection for that zone). Within the zone, this includes deciduous woodland, coastal and floodplain grazing marsh and coastal saltmarsh. Coastal saltmarsh and mudflats are also identified on the bank of the River Thames.

### 3.7.3 Environmental permits, incidents and registers

No pollution incidents have been recorded since or in addition to those recorded in the Atkins Desk Study. As with the Atkins Desk Study, the 2020 Groundsure Report identifies a number of discharge consents and other Environmental Permits attributed to a discharge point on the disused jetty within Zone 2 (~100m northwest of Zone 1). This relates to the release of leachate generated from Broadness Landfill following treatment to the River Thames. No further active or important historical environmental permits, incidents or registers have been identified within 1km of the zone (excluding those found within or closer to other zones of the wider site).

### 3.7.4 Landfills and other waste sites

The Atkins Desk Study identified the closed Broadness Landfill to occupy Zone 1. Two further landfills were noted within 1km of the Zone (excluding those located in other zones of the wider site), repeated in Table 3-2 for ease of reference. The 2020 Groundsure Report did not identify any further landfill or waste sites.

**Table 3-1 - Landfills and waste sites within 1km of Zone 1 (excluding those located in other site zones).**

Location	Landfill name and type	Operator	Waste type	Dates of operation
Zone 1	Broadness Marsh, historical landfill	Blue Circle Industries Ltd	Inert, industrial	License issued – 15 Aug 1977 Surrendered – 2 Nov 1992
211m SE	Botany Road, historical landfill	Britannia Refined Metals	Inert, industrial, special	License issued – 14 June 1977 Surrendered – 19 Sept 2002
280m SE	Botany Road, industrial waste landfill	Britannia Refined Metals	Factory curtilage	License issued – 14 June 1997 Expired – 27 July 1998

### 3.7.5 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 3.8 Conceptual Site Model

### 3.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins Desk Study was published has not identified any new or further sources of contamination within Zone 1. As described in Section 3.2, the limited data from ground investigation within Zone 1 during 2015 did not identify any exceedances of human health criteria in soils or groundwater. However, highly alkaline pH associated with CKD was recorded in superficial deposits and perched water, and asbestos was detected in three soil samples. Exceedances of generic screening criteria with respect to waters were recorded in leachate, perched water and groundwater. The data indicate that Alluvium is providing some protection between perched and deeper aquifers. The worst-case ground gas scenario monitored indicates the zone would likely be classified as Characteristic Situation (CS) 2, however this dataset is very limited.

**Table 3-2 - Summary of potential sources of contamination**

Potential source	Location	Likely age	Potential contaminants of concern
Broadness Landfill (which received CKD and other potential deposits)	Zone 1	About 40 years	Highly alkaline pH, metals Ground gas (methane, carbon dioxide)

### 3.8.2 Pathways and receptors

The development proposals for London Resort are unconfirmed at this stage, but Zone 1 is anticipated to remain predominantly undeveloped as Broadness Marsh, but with some enhancement to the landscaping (see below) and possible limited Back of House structures. The Marsh currently supports a number of ecologically sensitive habitats which includes open mosaic habitat on previously developed land, the reedbeds at Black Duck Marsh and surrounding the Channel Tunnel Rail Link, saltmarsh around the coast and the grazing marsh within Botany Marsh supporting nationally scarce plants, a nationally significant invertebrate population and an internationally significant winter bird population. Landscape works are planned on both Black Duck Marsh and Broadness Salt Marsh, involving the restoration and creation of a series of areas of woodlands, scrub, grasslands, salt marsh, wetlands and standing water, watercourses and other water bodies.

In a departure from the Atkins Desk Study, the pathways and receptors in the proposed future use are also considered here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use. All other pathways and receptors remain as identified by the Atkins Desk Study and are summarised in Table 3-3.

**Table 3-3 - Summary of receptors and potential pathways.**

Receptor	Pathway
Zone visitors	

Receptor		Pathway
Human Health	Zone workers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
Controlled Waters	Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching from CKD / waste materials to groundwater followed by lateral migration of contamination within groundwater
	Principal Aquifer in bedrock	Leaching / migration of contaminants from soils Direct surface water run-off and sub-surface flow to surface waters
	River Thames adjacent to the north, west and east of Zone	Lateral migration of contaminated groundwater Vertical migration of contaminated groundwater
Ecology	Flora and fauna (Broadness marshes)	Direct contact and root up-take
Buildings / Services	Buried concrete foundations	Direct contact
	Potable water supply pipework	Aggressive attack

### 3.8.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 3-4. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping. It also assumes that the current leachate management system remains in place (or is upgraded in order to integrate with the proposed development).

**Table 3-4 - Summary of risk assessment – Zone 1**

Source	Receptor	Pathway	Consequence	Probability	Risk
Broadness Marsh Landfill	Zone visitors Zone workers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Medium	Low likelihood	Moderate / Low
		Inhalation of soil- or groundwater-derived vapours	Medium	Unlikely	Low
		Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	River Thames	Leaching / migration of contaminants from soils	Medium	Low likelihood	Moderate / Low
		Lateral migration of contamination within groundwater			
		Direct surface water run-off and sub-surface flow to surface waters			
	Secondary Aquifer in superficial deposits	Leaching / migration of contaminants	Medium	Low likelihood	Moderate / low

Source	Receptor	Pathway	Consequence	Probability	Risk
	Principal Aquifer in bedrock	Vertical migration of contaminated groundwater			
	Flora and fauna	Direct contact and root up-take	Medium	Low likelihood	Moderate / low
	Buried concrete foundations	Direct contact / aggressive attack	Mild	Low likelihood	Low
	Potable water supply pipework				



## 4 Update to Zone 2

### 4.1 Description

Zone 2 is located in the north-western portion of the Swanscombe Peninsula and covers an area of approximately 54.3 hectares. It is generally covered by scrubland, with undulating topography due to various phases of infilling (North Pit, South Pit and Surge Pile) with wastes from the adjacent cement industry. A disused and derelict sewage works is located near the centre of the zone. The HS1 railway runs in a northwest to southeast orientation within the zone, and emerges at a portal in the south-central section of the zone (although this is outside of the study site). A derelict pier (Bell Wharf) is present on the northwest extent, on the bank of the River Thames. There are a number of roads, tracks and drains across Zone 2. There is also a leachate collection system for the South Pit and Surge Pile landfills which discharge to foul sewer. During the site walkover in June 2020, a compound in the southwest of the zone was being used for storage of concrete rings (associated with the Thames Tideway project), by the return visit in September 2020 these had been removed and the area was largely clear.

Site inspections carried out in 2020 together with information from Groundsure (Appendix B) indicate that Zone 2 remains, in general, as described in the Atkins Desk Study [1] although a small area of Zone 2 was now being used for storage of concrete rings for the Thames Tideway project and car parking. It is also understood that some upgrades to the leachate management system have been completed since the study was prepared in 2015.

### 4.2 Data sources

The following additional data sources relevant to Zone 1 have been available for review, with a summary provided below:

- Atkins (2015) London Paramount Entertainment Resort. Geotechnical and Geo-Environmental Interpretative Report [11]; and
- Geotechnical Engineering Limited (2015) London Paramount Entertainment Resort. Factual Report on Ground Investigation [12].
- CMS Enviro (2019) Swanscombe Landfills: South Pit Phase 3 Landfill and South Pit & Surge Pile Landfill. Annual Report 2019 [15].

#### 4.2.1 2015 ground investigation

Atkins were commissioned by LRCH in 2015 to design and procure a ground investigation and to produce a Geotechnical and Geoenvironmental Interpretative Report based on the findings [11]. Contractors services for the on-site works were provided by Geotechnical Engineering [12]. The investigation included a very limited number of exploratory holes within Zone 2: three shallow window sample holes, four deep cable percussive boreholes, and one trial pit. Summary text included in the Atkins Interpretative Report is repeated below.

*The main sources of contamination identified within Zone 2 are the former and current landfills used for the deposition of CKD: North Pit (not currently permitted) and South Pit Phase 1 (including Surge Pile) and Phase 3. In addition, there is a former sewage works and historical cement works and gasworks within the zone.*

*There were three exceedances of chromium (total) above the screening criteria within the Made Ground / CKD materials in BH203 and BH204 at depths from 1.0 to 3.6m bgl; these are not considered likely to cause significant risk to human health as there were no concentration of the more toxic hexavalent chromium above the limit of detection (LOD) in any*

soil sample analysed. No exceedances of the human health screening criteria were found within the water samples taken from Zone 2. The highly alkaline pH of CKD presents a risk to human health. Elevated pH was encountered within the superficial deposits and the perched water, which could cause effects to human health should it come into contact with future workers or site visitors. Asbestos was identified within six samples across the zone, though when quantified was found to be below the threshold for hazardous waste.

The controlled waters risk assessment for Zone 2 indicated that concentrations of contaminants – notable heavy metals and inorganics – were elevated above generic screening criteria and could indicate a significant risk to aquifers below the site and the River Thames. Samples taken from the perched water within the Made Ground showed more exceedances than those samples taken from the deeper groundwater within the Chalk or RTD, indicating the Alluvium is providing some level of protection to the deeper aquifers. Additionally, the contaminants encountered within the deeper aquifers under Zone 2 were also found in Zones 1, 5 and 7, indicating that the exceedances may be related to wider groundwater quality. However, within the former North Pit area, where the Alluvium was stripped out during previously phases of operation; deeper groundwater quality was not able to be assessed during this investigation due to the limited scope.

The ground gas risk assessment indicates the zone is likely to be classified as CS2 due to elevated concentrations of methane and carbon dioxide. Such a classification required some level of ground gas protection to be installed within buildings established on the zone. Carbon monoxide and hydrogen sulphide were also found above the occupational workplace guidelines, with hydrogen sulphide encountered at concentrations up to 1000 times the long term exposure limit in one borehole in Zone 2.

The indicative property/services risk assessment suggested that there would likely be some risks to services laid at the Site due to ground conditions, including contaminated soils and the highly corrosive nature of CKD deposits.

#### **4.2.2 Swanscombe landfills – 2019 annual report**

A combined 2019 annual monitoring report was prepared by CMS Enviro for the South Pit Phase 3 landfill and South Pit and Surge Pile Landfill and issued to the Environment Agency in early 2020 [15]. This report was prepared in order to satisfy the permit requirements for the two sites: condition 4.2.2 for EPR/RP3039SZ/V007 (South Pit Phase 3) and the closure conditions for EPR/KP3998HW (South Pit and Surge Pile). The key elements from the Executive Summary of that report are repeated below:

*Both landfill Sites are located on the Swanscombe Peninsula and share an identical environmental setting and deposited waste type, cement kiln dust. Monitoring suites and compliance parameters are different due to the Permitting regime they are regulated by.*

*The 2018 Annual Monitoring Report for South Pit Phase 3 landfill concluded that the Site was in compliance with Permit Limits and work was continuing to commission the Leachate Treatment Plant (LTP). South Pit and Surge Pile Landfill was confirmed as definitely closed in December 2016 and the requirements of the Environmental Management Plan/Closure Report (EMP/CR) had been fully implemented in 2017. The Hydrogeological Risk Assessment (HRA) review carried out in June 2017 for South Pit Phase 3 landfill recommended assessment levels for a number of key parameters at SSW2 and EW5/14 and EW6/14; these have been implemented into CMS Reporting system.*

*Surface water remains consistent with previous years. Low rainfall and low flow in the surface water courses during 2019 have prevented sampling on a number of occasions at a number of points, including those introduced in 2017 following acceptance of the EMP/CR. Low rainfall and low flow conditions prevented samples being taken from some points on all monitoring occasions and some samples are concluded to be non-representative with little or no flow.*

Leachate levels remained compliant throughout 2019 for both landfill sites. Leachate quality is typical of a CKD waste leachate with elevated pH and high concentrations of potassium, chloride and sulphate. Leachate treatment is required for leachate collected in the perimeter drain of South Pit Phase 3 and is fully commissioned. For South Pit Phase 3 landfill the HRA, and its subsequent review in 2017, concluded that a leachate level compliance limit of 2.5m above the local groundwater level was appropriate. The revised mechanism for calculating leachate compliance has confirmed that leachate level did not rise above this limit in 2019. For South Pit and Surge Pile landfill the leachate limit is set at 4m AOD and was not exceeded in 2019.

Groundwater quality beneath South Pit and Surge Pile and South Pit Phase 3 landfill in 2019 remained comparable to previous years with evidence of impact from saline intrusion in down-gradient boreholes.

Landfill gas (LFG) monitoring has continued at the in-waste points for both landfills and the results confirm that LFG is not an issue for either site. LFG production is inhibited by the high pH and low carbon content of the CKD wastes. Monitoring of trace concentrations is carried out annually at South Pit Phase 3 landfill, in accordance with permit conditions.

A leachate treatment plant (LTP) on South Pit Phase 3 has been constructed and collects leachate from the perimeter drain. A Construction Quality Assurance (CQA) Report was submitted in July 2017. The plant has had some minor issues throughout 2018 leading to the plant sporadically discharging this reporting year. Since November 2018, the plant has been running automatically, working on leachate levels and treating as appropriate.

### 4.3 Surrounding land uses

Zone 2 is surrounded by Zone 1 to the north, Zone 4 to the east, Zone 5 to the south, and Zone 3 to the west. The River Thames is present beyond the northwest boundary.

### 4.4 Historical land uses

OS maps show no significant changes in land use since the Atkins Desk Study was published in 2014.

### 4.5 Geology

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The limited number of new exploratory holes constructed within Zone 2 by Atkins in 2015 confirm the general stratigraphic sequence reported in their Desk Study Report which also corresponds with BGS mapping. One exploratory hole (BH201) recorded Made Ground directly overlying River Terrace Deposits; Atkins inferred that the Alluvium was likely stripped out during former operations of North Pit.

### 4.6 Hydrology and hydrogeology

#### 4.6.1 Surface water

Zone 2 is bordered by the River Thames to the northwest. A number of surface drains cross the site to regulate the landfills.



#### 4.6.2 Groundwater

The Atkins Desk Study concluded that groundwater was likely to be encountered at 11m bgl, or as high as 1.6m bgl in Made Ground. Groundwater levels as high as 3.2m bgl (BH202) were recorded during their investigation in 2015 [11]. It is noted that the groundwater monitoring installation from the ground investigation provide some indicative data on how the groundwater levels change daily and seasonally, but further monitoring is required.

#### 4.6.3 Abstractions

The Atkins Desk Study Report did not identify any groundwater abstractions within Zone 2. The 2020 Groundsure Report provides record of one historical groundwater abstraction license (01/153) within the Zone. The license was active between 2002 and 2004 for dust suppression and mineral washing. The licensed abstraction volume is unknown. There is also record of a historical and active groundwater abstraction located about 500m east of Zone 2 (off-site). The current abstraction is operated by CEMEX UK Materials Ltd for mineral washing. The active license relates to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026. There are no further records within 1km of Zone 2.

#### 4.6.4 Groundwater vulnerability

Part of Zone 2 is located in Source Protection Zone 3 (total catchment).

#### 4.7 Regulatory data

The full dataset provided in the 2020 Groundsure Report has been reviewed and summarised in Table B (Appendix B). The key items of relevant information are described in the following subsections.

##### 4.7.1 Mineral abstractions

The Atkins Desk Study Report noted that there are records of unspecified pits within Zone 2. No further evidence of quarrying or mineral abstraction within Zone 2 has been obtained.

##### 4.7.2 Designated environmentally sensitive sites

The Atkins Desk Study did not identify any environmentally sensitive sites within 1km of Zone 2, excluding those found within other zones on-site. The 2020 Groundsure Report identified the area of the River Thames bordering Zone 2 as a Marine Conservation Zone under the Marine and Coastal Access Act 2009. This is due to the presence of intertidal muds and the tentacled lagoon worm. About 50% of the zone is defined as habitats of principal importance (Priority Habitat Inventory). This includes areas of coastal saltmarsh, deciduous woodland, coastal and floodplain grazing marsh, and other habitats. The area of the River Thames adjacent to Zone 2 is also identified as mudflats.

##### 4.7.3 Environmental permits, incidents and registers

There are a number of records of environmental permits, incidents and registers related to the disused jetty in the north of Zone 2. These records relate to landfill discharge from Zone 1 (Broadness Landfill). This is summarised in Table 4-1. Leachate from Zone 2 is discharged to foul sewer. No pollution incidents have been recorded since or in addition to those recorded in the Atkins Desk Study.

Table 4-1 - Records of environmental permits and registers within Zone 2.

Location	Operator	Type of permit, incident or register	Status	Additional information
End of jetty	Various iterations of Lafarge Tarmac including Blue Circle Industries plc	List 2 dangerous substance inventory site	Active	Authorised substances: chromium, copper, lead, nickel, zinc.
		List 1 dangerous substance inventory site	Active	Authorised substances: mercury (other)
		Red list discharge consent	Modified / varied / active	Discharge type: manufacture of cement lime plaster; making of glass / ceramics / cement / cutting stone; industrial waste site Effluent type: trade discharge; waste site (unspecified).
		Discharge consents (3)	2 revoked, 1 active	2 records (revoked and active) relate to release of trade discharge from Broadness Marsh CKD tip. 1 record (revoked) relates to release of sewage discharge from Broadness Marsh.
Southern part of Zone 2	Northern Eastern / Western Quarry, Swanscombe Pumping Station	Discharge consents (2)	Active	1 record relates to release of trade discharge from Eastern / Western Quarry to unnamed tributary. 1 record relates to release of sewage discharge to unnamed tributary.
Southwest part of Zone 2	Croxton and Garry	Local Pollution Prevention and Control (LPPC) Part B	Historical	Use of bulk cement.

#### 4.7.4 Landfills and other waste sites

The Atkins Desk Study identified the majority of Zone 2 to have been used as landfill. A summary of the landfill permits within Zone 2 as determined by the Groundsure 2020 Report is presented in Table 4-2. Part of Zone 2 was excavated as a clay pit, which formed the North Pit (no information provided by Groundsure) and South Pit and Surge Pile Phase 1 landfills. These are now closed. South Pit Phase 3 is currently permitted. South Pit Phase 2 was permitted but not infilled. The operator of the sites has changed since the Atkins Desk Study was published and is now Swanscombe Development LLP. There is a record of a historical leachate disposal plant within Zone 2, which relates to South Pit Landfill to enable raw leachate to be collected and managed so that it can be disposed of to sewer.

Table 4-2 - Landfills and waste sites with potential to impact Zone 2 (within 1km, excluding those in other site zones).

Location	Type, name and reference	Operator	Waste type	Dates of operation
Zone 2 (eastern half)	Authorised / active / recent landfill South Pit and Surge Pile (Phase 1, 2 and 3) EPR/EB3802FX/V002	Swanscombe Development LLP	Industrial Waste Landfill (Factory curtilage)	License issued – 30 May 1977 Closed since 2016
Zone 2 (northeast quadrant)	Authorised / active / recent landfill South Pit Phase 3 Landfill EPR/RP3039SZ	Swanscombe Development LLP	Waste landfilling; >10 T/D with capacity >25,000T excluding Inert Waste	License transferred – 26 June 2017
Zone 2	Historical landfill South Pit WML P/01/11A	Blue Circle Industries Plc	Inert, industrial	First input – 31 Dec 1977 Last input – 31 Dec 1992

Location	Type, name and reference	Operator	Waste type	Dates of operation
Zone 2	Licensed waste sites South Pit and Surge Pile EPR/KP3998HW/V004	Lafarge Tarmac and Cement Lime Limited	Industrial Waste Landfill (Factory curtilage)	License issued – 30 May 1977 License modified – 19 Oct 2015

#### 4.7.5 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

### 4.8 Conceptual Site Model

#### 4.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins Desk Study was published has not identified any new or further sources of contamination within Zone 2. As described in Section 4.2, the ground investigation within Zone 2 in 2015 identified very limited exceedances of human health screening criteria (trivalent chromium) for soils, and no exceedances of human health criteria for water. The investigation did identify highly alkaline pH and asbestos in soils within the zone. Exceedances of generic screening criteria for waters were recorded in perched and deeper groundwater, but the data indicate that Alluvium is providing a level of protection to the deeper aquifer. The ground gas risk assessment indicates the zone is likely to be classified as CS2 due to elevated concentrations of methane and carbon dioxide. Carbon monoxide and hydrogen sulphide were also found above the occupational workplace guidelines, with hydrogen sulphide encountered at concentrations up to 1000 times the long-term exposure limit in one borehole in Zone 2. However, this dataset is very limited. The potential sources of contamination are summarised in Table 4-3, the ground investigation within Zone 2 in 2015 identified very limited exceedances of human health screening criteria (trivalent chromium) for soils, and no exceedances of human health criteria for water. The investigation did identify highly alkaline pH and asbestos in soils within the zone. Exceedances of generic screening criteria for waters were recorded in perched and deeper groundwater, but the data indicate that Alluvium is providing a level of protection to the deeper aquifer. The ground gas risk assessment indicates the zone is likely to be classified as CS2 due to elevated concentrations of methane and carbon dioxide. Carbon monoxide and hydrogen sulphide were also found above the occupational workplace guidelines, with hydrogen sulphide encountered at concentrations up to 1000 times the long-term exposure limit in one borehole in Zone 2. However, this dataset is very limited.

The 2019 annual monitoring report for the South Pit Phase 3 and South Pit and Surge Pile landfills indicate that the management of landfills is generally compliant with permit conditions and data are consistent with previous years (in terms of surface water quality, leachate generation and ground gas production). The leachate generated is typical of a CKD waste landfill, however the upgrade LTP has been running automatically since 2018, working on leachate levels and treating as appropriate. The potential sources of contamination are summarised in Table 4-3.

**Table 4-3 - Summary of potential sources of contamination.**

Potential source	Location	Likely age	Potential contaminants of concern
North Pit Landfill	Zone 2	Approx. 25-50 years	
South Pit and Surge Pile Phase 1		Approx. 35-45 years	

South Pit and Surge Pile Phase 3		Approx. 10-45 years	Highly alkaline pH, metals (particularly copper), PAHs, TPH Ground gas (methane, carbon dioxide)
Derelict sewage works. Operational sewage pumping station		Recent – 50 years	
Bell Wharf (jetty within Zone 2)		Recent – 50 years	
Cement works and associated infrastructure (electricity substation, railway sidings, cement pits and associated tanks between Bell Wharf and former cement works)		Up to 150 years	
Former gasworks		80-110 years	

#### 4.8.2 Pathways and receptors

The development plans are unconfirmed at this stage, but Zone 2 is anticipated to be located within Gate 1 (i.e. the Leisure Core) of London Resort. The Zone could be occupied by rides / attractions, hotels, event space, a waterpark or back of house facilities. In a departure from the Atkins Desk Study, the pathways and receptors in the proposed future use are also considered here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use. All other pathways and receptors remain as identified by the Atkins Desk Study and are summarised in Table 4-4.

**Table 4-4 - Summary of receptors and potential pathways.**

Receptor		Pathway
Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres. Inhalation of soil and groundwater derived vapours Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
	Zone workers	
Controlled Waters	Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching from CKD / waste materials to groundwater followed by lateral migration of contamination within groundwater
	Principal Aquifer in bedrock	Leaching / migration of contaminants from soils
	River Thames adjacent to the north, west and east of Zone	Direct surface water run-off and sub-surface flow to surface waters Lateral migration of contaminated groundwater Vertical migration of contaminated groundwater
Ecology	Flora and fauna	Direct contact and root uptake
Buildings / Services	Buried concrete foundations	Direct contact
	Potable water supply pipework	Aggressive attack

#### 4.8.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 4-5. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping. It also assumes that the current leachate management system remains in place (or is upgraded in order to integrate with the proposed development).



Table 4-5 - Summary of risk assessment – Zone 2

Source	Receptor	Pathway	Consequence	Probability	Risk
Broadness Marsh Landfill	Zone visitors  Zone workers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Medium	Unlikely	Low
		Inhalation of soil- or groundwater-derived vapours	Medium	Unlikely	Low
		Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	River Thames	Leaching / migration of contaminants from soils	Medium	Low likelihood	Moderate / Low
		Lateral migration of contamination within groundwater			
		Direct surface water run-off and sub-surface flow to surface waters			
	Secondary Aquifer in superficial deposits	Leaching / migration of contaminants from soils	Medium	Low likelihood	Moderate / low
	Principal Aquifer in bedrock	Leaching from CKD / waste materials to groundwater followed by lateral migration of contamination within groundwater			
	Flora and fauna	Direct contact and root up-take	Medium	Low likelihood	Moderate / low
	Buildings / Services	Direct contact	Mild	Low likelihood	Low
Aggressive attack					

## 5 Update to Zone 3

### 5.1 Description

Zone 3 is located in the west of Swanscombe Peninsula and is further divided into two sub-zones: Zone 3A in the northern part and Zone 3B in the southern. Very limited development has occurred within Zone 3A, which is currently and historically has been marshland. There is some limited current development within Zone 3B. This includes a security compound and informal car parking associated with management of land on the wider Swanscombe Peninsula. There are facilities related to Basic Engineering Co Ltd (a welding company), although during the site visit in September 2020 it was unclear whether these were still operational. Part of the zone is also currently occupied by Texo Scaffolding. Zone 3B has historically been occupied by tramway tracks, chalk pits and whiting works. Swanscombe Cement Landfill was also present in the southern part, between 1980 and 1993.

Site inspections carried out in 2020 together with information from Groundsure (Appendix B) indicate that Zone 3 remains, in general, as described in the Atkins Desk Study [1]. The northern portion is referred to as Zone 3A and the southern portion as Zone 3B. Very limited development has occurred within Zone 3A, which historically and currently has predominantly been marshland. The area covered by Zone 3B has been slightly reduced in size from that considered in the 2015 Desk Study.

### 5.2 Data sources

The following additional data sources relevant to Zone 3 have been available for review, with a summary provided below:

- Atkins (2015) London Paramount Entertainment Resort. Geotechnical and Geo-Environmental Interpretative Report [11]; and
- Geotechnical Engineering Limited (2015) London Paramount Entertainment Resort. Factual Report on Ground Investigation [12].

#### 5.2.1 2015 ground investigation

Atkins were commissioned by LRCH in 2015 to design and procure a ground investigation and to produce a Geotechnical and Geoenvironmental Interpretative Report based on the findings [11]. Contractors services for the on-site works were provided by Geotechnical Engineering [12]. The investigation included two trial pits within Zone 3 (TP301 and TP302). Windowless sample boreholes had been proposed but could not be advanced due to obstructions, therefore no controlled waters risk assessment or ground gas risk assessment was possible within Zone 3. Summary text included in the Atkins Interpretative Report is repeated below.

*The key sources of contamination identified within Zone 3 were the historical industrial uses including a former cement works, whiting works, other industrial uses. Infilled pits, including Lover's Lane Pit and Swanscombe Cement Landfill, are also noted as being key contamination sources.*

*Very limited investigation was completed in Zone 3; comprising only two trial pits. A controlled waters assessment was unable to be completed. There were no exceedances of the human health generic screening criteria within Zone 3. No asbestos was encountered in any of the four samples analysed. The indicative property / services risk assessment suggested that there would likely be some risks to services laid at the Site due to ground conditions, including contaminated soils.*

### 5.3 Surrounding land uses

Zone 3 is bounded by the River Thames to the north. Zone 2 is present adjacent to the east. To the southeast is Zone 5A, including Manor Way Business Park. There is a plot of land to the southwest beyond Tiltman Avenue, which in 2014 was a waterfilled quarry. During the site visit in September 2020 this was undergoing redevelopment for residential use (Ebbsfleet Cross development by Bellway) and soils were being imported to infill / level the area. The Ingress Park residential development is adjacent to the west.

### 5.4 Historical land uses

Based on OS maps provided in the Groundsure 2020 dataset, the only discernible change within Zone 3 since 2014 is the presence of lake / pond within Zone 3A which occupied about 20% of the area.

### 5.5 Geology

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The ground conditions remain as described in the Atkins Desk Study [1] which corresponds with the BGS mapping. Two shallow trial pits were excavated within Zone 3 in 2015. The trial pits confirmed the presence of CKD and landfill deposition (plastic, brick, glass, wood, steel reinforcing bars and plates, scaffolding poles, fibrous textile etc.), but were otherwise in sufficient in depth and extent to prove the anticipated stratigraphic sequence.

### 5.6 Hydrology and hydrogeology

#### 5.6.1 Surface water

Zone 3 is bordered by the River Thames to the north. There are numerous watercourses / surface water drains within the zone, the majority of which are in Zone 3A. There is also an area of ponding within Zone 3A, covering about 20% of the area.

#### 5.6.2 Groundwater

The very limited ground investigation undertaken within Zone 3 in 2015 did not characterise the groundwater regime. The level of the groundwater table is therefore uncertain. Atkins noted that groundwater was previously encountered at between 1.00 and 3.50m bgl in the southern part of Zone 3, but this is likely to vary across the zone.

#### 5.6.3 Abstractions

The 2020 Groundsure Report identified a historical and active record of a groundwater abstraction located about 1km east of Zone 3. This is operated by CEMEX UK Materials Ltd for mineral washing. The active license relates to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026. The Atkins Desk Study also noted a record of an active abstraction that is not identified in the 2020 Groundsure Report. This relates to abstraction at the same location, licensed to Lafarge for spray irrigation. There are no other groundwater abstractions within 1km (excluding those located within other site zones).

#### 5.6.4 Groundwater vulnerability

Zone 3 is not located within a Source Protection Zone.

## 5.7 Regulatory data

### 5.7.1 Data summary

The full dataset provided in the 2020 Groundsure Report has been reviewed and summarised in Table B (Appendix B). The key items of relevant information are described in the following subsections.

### 5.7.2 Designated environmentally sensitive sites

There are no designated environmentally sensitive sites within Zone 3. The 2020 Groundsure Report identified the area of the River Thames bordering Zone 3 as a Marine Conservation Zone under the Marine and Coastal Access Act 2009. This is due to the presence of intertidal muds and the tentacled lagoon worm. About 20% of Zone 3A and 40% of Zone 3B and an area to the south of Zone 3B are identified as habitats of principal importance (Priority Habitat Inventory) due to presence of deciduous woodland. The area of the River Thames adjacent to Zone 3 is also identified as mudflats.

Two Grade II listed buildings are identified on the Zone 3 boundary – Boundary Stone and Garden Bridge in Ingress Park. There are a number of other off-site listed buildings / features from 250m distant. Zone 3 is also within a SSSI Impact Risk Zone.

### 5.7.3 Environmental permits, incidents and registers

There are four licensed discharge consents related to Zone 3, all within Zone 3A. One of these discharge consents (associated with Northfleet Eastern Quarry) postdates the 2015 Atkins Desk Study, summarised in Table 5-1. No pollution incidents further to those reported in the 2015 Atkins Desk Study have been identified. All other identified environmental permits, incidents and registers are either located within other site zones (and reported in the relevant subsections), or off-site but at such a distance as to have no impact.

**Table 5-1 - Records of discharge consents within Zone 3.**

Location	Address	Effluent type	Receiving water	Status
Zone 3A (north)	Channel Tunnel Rail Link Site, Swanscombe Marsh	Trade discharge (unspecified)	Tidal River Thames	Issued – 6 Feb 2001 Revoked – 29 Aug 2002
Zone 3A (northwest)	Northfleet Eastern Quarry, Watling Street	Sewage discharge – final / treated effluent	Thames Estuary	Issued – 6 May 2016 Revoked – 1 Feb 2017
Zone 3A (south)	Swanscombe Wastewater Pumping Station, Swanscombe Marshes	Sewage discharges	Saline Estuary	Issued – 11 Aug 1988 Revoked – 28 Jan 2009
Zone 3A (south)	Swanscombe CEO, Manor Way	Sewage discharges	Tributary of Thames Estuary	Issued – 04 May 2006 Revoked – 13 July 2009

### 5.7.4 Landfills and other waste sites

Review of the 2020 Groundsure Report identified one historical landfill within Zone 3B, referred to as Swanscombe Cement. The Atkins Desk Study also referred to this as "Lovers Lane Pit". There is a current licensed waste site in Zone 3B, Swanscombe Glass Recovery Facility. The details of these facilities are summarised in Table 5-2. All other landfill and other waste sites are either located within other site zones (and reported in the relevant subsections of this report), or off-site but at such a distance as to have no impact. The land to the immediate south of Zone 3B is recorded as an area of surface ground working but is not identified as a licensed or unpermitted waste site.



**Table 5-2 - Landfills and other waste sites with potential to impact Zone 3 (within 1km, excluding those in other site zones).**

Location	Type, name and reference	Operator	Waste type	Dates of operation
Zone 3B	Historical landfill Swanscombe Cement P/01/11B, 21EX	Blue Circle Industries Plc	Inert	License issued – 18 May 1979 Revoked – 16 April 1993
Zone 3B	Licensed waste site Swanscombe Glass Recovery Facility EA/EPR/AB3103KR/A001	Refresco Limited	Physical treatment facility	License issued – 4 Dec 2013 Currently active

### 5.7.5 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 5.8 Conceptual Site Model

### 5.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins Desk Study was published has not identified any new or further sources of contamination within Zone 3. For the purposes of assessment, Zone 3 is split into two distinct areas (Zone 3A and Zone 3B), with the sources within those sub-zones summarised in Table 5-3. Very limited site investigation has been undertaken within Zone 3 since the Atkins Desk Study was published. The works confirmed the presence of CKD and other landfilling material but were insufficient to confirm the anticipated stratigraphic sequence or characterise the groundwater and ground gas regime.

**Table 5-3 - Summary of potential sources of contamination.**

Location	Potential source	Likely age	Potential contaminants of concern
Zone 3A	Swanscombe Marshes: Alluvium and marshland present below significant portion of the Zone	Up to 2 million years	Ground gas (methane, carbon dioxide)
Zone 3B	Current and historical industrial uses (cement works in the southeast, welding works [Basic Engineering Co Ltd], Swanscombe Glass Recovery facility, whiting works [including tanks and silos], electricity substations)	Between ~150 years and recent	Asbestos, metals, TPH, PAHs, high pH, cyanide, potassium, calcium and sodium
	Swanscombe Cement Landfill (infilled with CKD and other wastes)	Up to 40 years	
	Alluvium and marshland	Up to 2 million years	Ground gas (methane, carbon dioxide)

### 5.8.2 Pathways and receptors

Zone 3 will in part be located within the Leisure Core of the London Resort. The development proposals are unconfirmed at this stage; however, it is anticipated that the majority of Zone 3A will remain as marshland (Black Duck Marsh). About 20% of Zone 3A and the entirety of Zone 3B will be located within London Resort Gate 2, which could be occupied by event space, ride / attractions, entertainment venues / theatres of ancillary retail and dining etc. In a departure from the Atkins Desk Study, the pathways and receptors in the proposed future use are also considered

here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use). All other pathways and receptors remain as identified by the Atkins Desk Study and are summarised in Table 5-4.

**Table 5-4 - Summary of receptors and potential pathways.**

Zone	Receptor	Pathway	
Zone 3A and Zone 3B	Human Health	Zone visitors	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
		Zone workers	
		Trespassers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres
		Neighbours	Inhalation of soil and groundwater derived vapours
Zone 3A and Zone 3B	Controlled Waters	Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching from CKD / waste materials to groundwater followed by lateral migration of contamination within groundwater
		Principal Aquifer in bedrock	Leaching / migration of contaminants from soils Lateral migration of contaminated groundwater Vertical migration of contaminated groundwater
Zone 3A		River Thames	Direct surface water run-off and sub-surface flow to surface waters
		Surface water channels	
Zone 3	Ecology	Flora and fauna	Direct contact and root uptake
Zone 3A and Zone 3B	Buildings / Services	Buried concrete foundations Potable water supply pipework	Aggressive attack Direct contact

### 5.8.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 5-5. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

**Table 5-5 - Summary of risk assessment for Zone 3A and Zone 3B**

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 3A Swanscombe Marshes	Zone visitors	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	Zone workers				
	Trespassers				
	Neighbours				
	River Thames	Leaching / migration of contaminants from soils	Minor	Low likelihood	Very low

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
	Surface water channels	Lateral migration of contamination within groundwater			
		Direct surface water run-off and sub-surface flow to surface waters			
		Lateral migration of contaminated surface runoff and entrained dust within surface runoff			
	Secondary Aquifer in superficial deposits Principal Aquifer in bedrock	Leaching / migration of contaminants	Minor	Low likelihood	Very low
	Flora and fauna	Direct contact and root up-take	Medium	Low likelihood	Moderate / low
Buildings / Services	Direct contact	Aggressive attack	Mild	Unlikely	Very low
Zone 3B  Current and historical land uses  Swanscombe Cement Landfill  Alluvium and marshland	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Severe	Unlikely	Moderate / Low
	Zone workers	Inhalation of soil- or groundwater-derived vapours	Medium	Unlikely	Low
	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	Neighbours				
	Secondary Aquifer in superficial deposits Principal Aquifer in bedrock	Leaching / migration of contaminants	Medium	Low likelihood	Moderate / Low
	Flora and fauna	Direct contact and root up-take	Medium	Low likelihood	Moderate / low
	Buildings / Services	Direct contact	Aggressive attack	Mild	Low

## 6 Update to Zone 4

### 6.1 Description

Zone 4 is located on the east of the Swanscombe Peninsula. It is divided into four subareas: Zone 4A, Zone 4B, Zone 4C and Zone 4D. Zone 4D was not included in the area assessed by Atkins in 2014 and is therefore described and assessed separately in Chapter 9. Zone 4A and Zone 4D are areas of marshland. Zone 4B is the central subarea of Zone 4. It is dissected by the HS1 railway and comprises a series of industrial / commercial units within Northfleet Industrial Estate, Kent Kraft Industrial Estate and the eastern part of Manor Way Business Park. Zone 4C is to the south of Zone 4B and comprises open ground known as the Sportsground, which historically included a rifle range.

A site visit was undertaken in 2020 and in general land uses remain as described in the Atkins 2014 desk study [1]. No / very limited development has occurred within Zone 4A which historically has been and currently is marshland. Zone 4B is bisected by the HS1 railway. It is occupied by industrial / commercial development, including Northfleet Industrial Estate, Kent Kraft Industrial Estate and Manor Way Business Park. Zone 4C comprises open ground known as the Sportsfield, which also contains a historical rifle range (now closed).

### 6.2 Data sources

No data sources or reports further to those identified by Atkins in 2014 have been obtained.

### 6.3 Surrounding land uses

Zone 1 is present to the north of Zone 4. To the east of Zone 4 is an industrial area, which includes CEMEX Northfleet Concrete Plant, WB Services Ltd, Britannia Refined Metals and the wider Northfleet Industrial Estate. Northfleet, a mixed commercial and residential area, is present to the south of Zone 4B and east of Zone 4C. Zone 6A is present to the south. Zone 2 and Zone 5 are located to the west and Swanscombe to the southwest.

### 6.4 Historical land use

There have been no significant changes in land use since the Atkins Desk Study was published in 2014.

### 6.5 Geology

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The anticipated geological sequence within Zone 4A, 4B and 4C remains as described in the Atkins Desk Study [1] which corresponds with the BGS mapping.

### 6.6 Hydrology and hydrogeology

#### 6.6.1 Surface water

A number of land drains are present within Zone 4A, separating the fields into roughly rectangular areas. These land drains also surround and divide the Botany Marshes area (Zone 4D).

## 6.6.2 Groundwater

The anticipated depth to groundwater remains as described by the Atkins 2015 Desk Study report. Historical boreholes indicate groundwater to be at an average of 2.75m bgl (minimum 2.3m bgl and maximum 4.0m bgl).

## 6.6.3 Abstractions

The 2020 Groundsure Report did not identify any active or historical abstractions located within Zone 4. The nearest records are for a historical and active groundwater abstraction located about 150m north of Zone 4A / Zone 4D, operated by CEMEX UK Materials Ltd for mineral washing. The active license related to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026. The Atkins Desk Study also noted active abstraction at the same location that is not identified in the 2020 Groundsure Report, licensed to Lafarge for spray irrigation. There is an active surface water abstraction located about 500m east of Zone 4B / Zone 4B. This is licensed to Robert Brett & Sons Ltd for mineral washing.

## 6.6.4 Groundwater vulnerability

Most of Zone 4 is located in Source Protection Zone 3 (total catchment), with a smaller proportion located in Source Protection Zone 2 (outer catchment).

## 6.7 Regulatory data

### 6.7.1 Data summary

The full dataset provided in the 2020 Groundsure Report has been reviewed and summarised in Table B (Appendix B). The key items of relevant information within Zone 4 are described in the following subsections.

### 6.7.2 Mineral abstractions

Zone 4B and Zone 4C have been identified as areas of surface ground workings. This corresponds with the information provided in the Atkins Desk Study, which noted these areas were used as a chalk quarry relating to Britannia / Northfleet Cement Works.

### 6.7.3 Designated environmentally sensitive sites

There are no designated environmentally sensitive sites within Zone 4. About 95% of Zone 4D and 5% of Zone 4A are identified as habitats of principal importance (Priority Habitat Inventory) due to presence of coastal and floodplain grazing marsh. There are no scheduled monuments or listed buildings within Zone 4, but the Church of All Saints located within 100m of Zone 4B / Zone 4C is Grade II\* listed. Zone 4 is also located within a SSSI Impact Risk Zone.

### 6.7.4 Environmental permits, incidents and registers

#### Part A2 and B LPPC Activities

The Atkins 2014 Desk Study identified 10 records of Local Pollution and Prevention Control (LPPC) Part B historical permits within Zone 4, all within Zone 4B. No records of Part A2 permits were noted. The 2020 Groundsure Report identified the same records. An enforcement was notified against one of the Part B permits (meaning a permit condition was known or suspected to have been breached), summarised in Table 6-1. A further record of a Part B permit was identified within Zone 4D, discussed in Chapter 9.



**Table 6-1 - Enforcements notified against LPPC Part B permits within Zone 4.**

Location	Address	Process	Status	Enforcement details
Zone 4B (west)	Unit D, North East Industrial Estate Lower Road Northfleet DA11 9SN	Unknown	Historical permit	Enforcement notified 02/05/2002, for timber / construction

### Licensed discharge consents

The 2014 Atkins Desk Study identified two records of licensed discharge consents within Zone 4 (both within Zone 4B and attributed to P15, Kent Kraft Industrial Estate). The 2020 Groundsure dataset identified one further record within Zone 4B. These three records are summarised in Table 6-2.

**Table 6-2 - Licensed discharge consents within Zone 4.**

Location	Address	Effluent type	Receiving water	Status
Zone 4B (west)	P15, Kent Kraft Industrial Estate Lower Road Northfleet	Trade discharges – site drainage	Into land	New consent: issued and effective from 14/09/1999
Zone 4B (west)	P15, Kent Kraft Industrial Estate Lower Road Northfleet	Trade discharges – site drainage	Into land	Varied under EPR 2010 (superseded by the above)
Zone 4B (central / south)	Kent Kraft Mills Northfleet Gravesend Kent	Trade discharges – unspecified	Unspecified	Issued 1975 Effective 1979 Revoked 1986

### Pollution incidents

The Atkins 2014 Desk Study identified 13 records of pollution incidents that occurred within Zone 4. Five of these were listed to have occurred within Zone 4B. The location of the remaining incidents was noted to be unknown. The 2020 Groundsure Report identified the same records within Zone 4B only, summarised in Table 6-3. Eight further records of pollution incidents were identified within 1km of Zone 4, with a maximum impact classification of Category 3 (minor).

**Table 6-3 - Pollution incidents within Zone 4.**

Location	Incident date	Pollutant	Impact
Zone 4B (west)	27 June 2001	Inert materials and wastes; construction and demolition materials and wastes	Land – Category 3 (minor) Air – Category 3 (minor)
Zone 4B (southeast)	18 August 2001	Contaminated water; fire-fighting runoff	Water – Category 3 (minor)
Zone 4B (southeast)	1 August 2002	Organic chemicals / products	Land – Category 1 (major) Air – Category 3 (minor)
Zone 4B (southeast)	23 August 2002	General biodegradable materials and wastes	Land – Category 3 (minor)

Location	Incident date	Pollutant	Impact
Zone 4B (southeast)	18 September 2003	Construction and demolition materials and wastes	Land – Category 3 (minor)

### 6.7.5 Landfills and other waste sites

#### Licensed waste sites

In addition to those identified by the Atkins 2014 Desk Study, the 2020 Groundsure Report identified further Waste Management Licenses (WMLs) associated with the operation of Ace Car Breakers. The additional licenses that were identified refer to operation of an 'end of life vehicle facility' at the same site identified by the Atkins 2014 Desk Study, plus operation of a 'vehicle depollution facility' on another site within Manorway Business Park. The licenses attributed to Ace Car Breakers are summarised in Table 6-4. The other licenses located within Zone 4 are as identified by the Atkins 2014 Desk Study.

**Table 6-4 - Waste Management Licenses attributed to Zone 4.**

Permit number and location	Facility name and address	Operator	Waste type / description	License information
ARN003 EA/EPR/ZP3195HH/A001 and EA/EPR/ZP3195HH/V003 Zone 4B (west)	Ace Car Breakers Plot 16 Manorway Business Park Manorway DA10 0PP	Mr Henry Arnold, Mrs Ruth Arnold and Mr Robert Arnold	End of life vehicle facility, <25000 tonnes	Issued – 24 Nov 2011 Modified – 28 Oct 2011
ACE003 EA/EPR/GB3605FH/T001 and ARN003 EA/EPR/ZP3195HH/V004 Zone 4B (west) and extending into Zone 5	Ace Car Breakers Plot 16 Manor Way Business Park		Metal recycling facility, <25000 tonnes	Issued – 24 Nov 2004 Modified – 23 July 2012 Effective – 21 Nov 2018
ACE029 EA/EPR/DB3802TR/A001 Zone 4B (south)	Ace Car Breakers Site 3 Manorway Business Park		Vehicle depollution facility, <25000 tonnes	Issued – 20 June 2016

#### Local Authority recorded historical landfills

The Atkins 2014 Desk Study and Groundsure 2020 dataset identified records of historical landfilling in a central / northern portion of Zone 4B (and extending into Zone 5). This was identified based on presence of a refuse tip on historical mapping from the 1970s. The Atkins 2014 Desk Study noted that this likely relates to 'Pilgrims Pit', which lies in the western part of a disused chalk quarry. It was filled between approximately 1947 and 1974, likely with cement works waste and demolition materials.

### 6.7.6 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 6.8 Conceptual Site Model

### 6.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins Desk Study was published has not identified any new or further sources of contamination within Zone 4 (see Table 6-5) . For the purposes of assessment presented here, Zone 4 is split into four distinct areas (Zone 4A, Zone 4B, Zone 4C and Zone 4D). Zone 4D is assessed separately in Chapter 9. No site investigation is known to have been undertaken within Zone 4 since the Atkins 2014 Desk Study was published but account is taken of the data obtained from previous investigations described in that Desk Study and BGS borehole logs available from the HS1 ground investigations.

**Table 6-5 – Summary of potential sources of contamination.**

Location	Potential source	Likely age	Potential contaminants of concern
Zone 4A	Alluvium and marshland	Up to 2 million years	Metals and other contaminants Ground gas (methane, carbon dioxide)
Zone 4B	Historical land uses (Thames Tar Distillery, paper mills, cement works, chemical works, tramways, electricity substations, tramline) Current land uses associated with Northfleet Industrial Estate, Manorway Business Park, Kent Kraft Industrial Estate Infilling of lagoon / Pilgrims Pit	Between ~150 years and recent	Asbestos, metals, TPH, PAHs, high pH, chloride, sulphate, sodium, manganese Ground gas (methane, carbon dioxide)
Zone 4C	Firing range	About 70 years	Metals and other contaminants Ground gas (methane, carbon dioxide)

### 6.8.2 Pathways and receptors

The details of the development proposals are unconfirmed at this stage. However, it is anticipated that Zone 4A will be located within London Resort Gate 1, which could be occupied by event space, rides / attractions, entertainment venues / theatres or ancillary retail and dining etc. Zone 4B is expected to be occupied by visitor parking, a transport interchange, entrance plaza, back of house space and part of Gate 1. Zone 4C is expected to be occupied by back of house space. In a departure from the Atkins 2014 Desk Study, the pathways and receptors in the proposed future use are also considered here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use). All other pathways and receptors remain as identified by the Atkins 2014 Desk Study and are summarised in Table 6-6.



**Table 6-6 - Summary of receptors and potential pathways.**

Zone	Receptor		Pathway
Zone 4A, Zone 4B and Zone 4C	Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres
		Zone workers	Inhalation of soil and groundwater derived vapours
		Trespassers	
		Neighbours	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
Zone 4A, Zone 4B and Zone 4C	Controlled Waters	Principal Aquifer in bedrock	Leaching from waste materials to groundwater followed by lateral migration of contamination within groundwater
Zone 4A and Zone 4B		Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching / migration of contaminants from soils
Zone 4A			Lateral migration of contaminated groundwater
			Vertical migration of contaminated groundwater
Zone 4A		Surface water channels	Direct surface water run-off and sub-surface flow to surface waters
Zone 4A, Zone 4B and Zone 4C	Buildings / Services	Buried concrete foundations	Direct contact
		Potable water supply pipework	Aggressive attack

**6.8.3 Assessment of risk**

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 6-7. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

**Table 6-7 - Summary of risk assessment for Zone 4A, Zone 4B and Zone 4C.**

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 4A  Alluvium and marshland	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Minor	Unlikely	Very low
	Zone workers				
	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	Neighbours				

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater	Minor	Unlikely	Very low
	Principal Aquifer in bedrock	Vertical migration to the Secondary Aquifer and Principal Aquifer			
	Surface water channels	Leaching from unsaturated soils and lateral migration to controlled waters receptors Direct surface water run-off and sub-surface flow to surface waters	Minor	Unlikely	Very low
	Buildings / services	Direct contact Aggressive attack	Mild	Unlikely	Very low
Zone 4B  Historical land uses  Current land uses  Infilling of lagoon / Pilgrims Pit	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Severe	Unlikely	Moderate / Low
	Zone workers				
	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / low
	Neighbours				
	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater	Medium	Likely	Moderate
	Principal Aquifer in bedrock	Vertical migration to the Secondary Aquifer and Principal Aquifer			
Buildings / services	Direct contact Aggressive attack	Mild	Low	Low	
Zone 4C  Firing range	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Medium	Unlikely	Low
	Zone workers				
	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / low
	Neighbours				
	Principal Aquifer in bedrock	Leaching from unsaturated soils followed by migration in the groundwater Vertical migration to the Principal Aquifer	Mild	Unlikely	Very low
	Buildings / services	Direct contact Aggressive attack	Mild	Low	Low

## 7 Update to Zone 5

### 7.1 Description

Zone 5 is located in the southwest of the wider Swanscombe Peninsula site, immediately north of the North Kent Line railway and west of HS1. The zone is characterised by presence of chalk spines upon which the principal roads and rail links are located with industrial / retail and open space land uses in between, in areas of former chalk quarrying. Zone 5 is split into Zone 5A and Zone 5B. The northern half of the zone (Zone 5A) comprises an area of land north of London Road (A226) but south of Manor Way. It includes the western part of Manor Way Business Park, which consists of light / medium industrial units. A chalk spine is also present in this area, running in a north-south alignment, along Pilgrim's Road. The southern part of the zone (Zone 5B) comprises an open, unoccupied area which is a part in-filled former quarry off Crayland's Lane, to the south of London Road. There are a number of tunnels and associated roadways through the chalk spine upon which London Road is located.

### 7.2 Data sources

The following additional data sources relevant to Zone 3 have been available for review, with a summary provided below:

- Atkins (2015) London Paramount Entertainment Resort. Geotechnical and Geo-Environmental Interpretative Report [11]; and
- Geotechnical Engineering Limited (2015) London Paramount Entertainment Resort. Factual Report on Ground Investigation [12].

#### 7.2.1 2015 ground investigation

The following additional data sources relevant to Zone 5 have been available for review, with a summary provided below:

- Atkins (2015) London Paramount Entertainment Resort. Geotechnical and Geo-Environmental Interpretative Report [11]; and
- Geotechnical Engineering Limited (2015) London Paramount Entertainment Resort. Factual Report on Ground Investigation [12].

Atkins were commissioned by LRCH in 2015 to design and procure a ground investigation and to produce a Geotechnical and Geoenvironmental Interpretative Report based on the findings. Contractors services for the on-site works were provided by Geotechnical Engineering. The investigation included a very limited number of exploratory holes within Zone 5: two rotary boreholes within Zone 5B to 20.45m bgl with screens for groundwater monitoring constructed within Chalk. Summary text included in the Atkins Interpretative Report is repeated below.

*The key source of contamination identified for Zone 5B was the infilled land within the former chalk quarry. No investigation was undertaken in Zone 5A during this assessment.*

*There were no exceedances of the human health generic screening criteria within either the soils or the groundwater within Zone 5. Asbestos was detected in one sample but at a concentration below the hazardous waste threshold.*

*The controlled waters risk assessment identified contaminants which exceeded the relevant screening criteria, though groundwater quality was generally better than noted within the zones on Swanscombe Peninsula to the north. However,*

*the contaminants encountered within Zone 5 were also encountered within Zones 1, 2 and 7, indicating that these may represent a wider groundwater quality issue.*

*The initial ground gas risk assessment indicates that the zone would be classified as CS2, which would require some protective measures to be installed within buildings established on the zone. However, these boreholes were installed within the Chalk and are therefore unlikely to provide an indication of the worst-case ground gas generation potential of the Made Ground situated near the surface.*

*The indicative property / services risk assessment suggested that there would likely be some risks to services laid at the Site due to ground conditions, including corrosive conditions within the soils.*

### **7.3 Surrounding land uses**

Zone 2 (Swanscombe Marshes) and Zone 3 (Swanscombe Marshes and some light industrial / commercial buildings) border Zone 5 to the north. Zone 4 is located to the east, which includes the eastern part of Manor Way Business Park along with Kent Kraft Industrial Estate and Northfleet Industrial Estate. Beyond this are further industrial sites, including Britannia Refined Metals, and the River Thames. The North Kent Line railway runs in an east to west alignment along the southern boundary, beyond which is the town of Swanscombe (generally residential in the immediate surrounds). To the west are two plots of land (located to the north and south of London Road), which in September 2020 were being developed for residential use. Ingress Park is present beyond.

### **7.4 Historical land uses**

There have been no significant changes in land use since the Atkins Desk Study was published in 2014.

### **7.5 Geology**

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The ground conditions remain as described in the Atkins Desk Study [1] which corresponds with the BGS mapping. In addition, the Atkins Desk Study noted that Made Ground within Zone 5B was expected to comprise chalk spoil from construction of the HS1 Thames Tunnel (used to partially infill the former chalk quarry). This was in general confirmed by the two exploratory holes constructed in this area as part of the Atkins 2015 ground investigation. These exploratory holes recorded up to 11.9m of Made Ground, described as slightly sandy gravelly silt with rare ash, woof, ceramic, metal and brick. The gravel was angular to rounded, fine to coarse, flint, brick and chalk.

### **7.6 Hydrology and hydrogeology**

#### **7.6.1 Surface water**

There is a small linear surface water feature (probable drain) within Zone 5A. This corresponds with the information provided in the Atkins 2014 Desk Study.

#### **7.6.2 Groundwater**

The Atkins Desk Study noted that groundwater was encountered at between 5m bgl and 7m bgl (based on BGS borehole logs). Groundwater levels recorded during the 2015 investigation were between about 11 and 12m bgl within Chalk.

### 7.6.3 Abstractions

The nearest groundwater abstraction to Zone 5 (excluding those within other site zones) is located about 850m northeast. There is record of a historical and active license associated with this. The active license relates to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026, and operated by CEMEX UK Materials Ltd for mineral washing. This corresponds with the information provided in the Atkins Desk Study. All other groundwater, surface water or potable water abstractions (excluding those within other site zones) are > 1km distant.

### 7.6.4 Groundwater vulnerability

Zone 5 is not located within a Source Protection Zone.

## 7.7 Regulatory data

The full dataset provided in the 2020 Groundsure Report has been reviewed and summarised in Table B (Appendix B). The key items of relevant information are described in the following subsections.

### 7.7.1 Mineral abstractions

Groundsure data indicate presence of surface ground workings within Zone 5A and Zone 5B (unspecified pits / chalk pits). There are so multiple tunnels through the A226 London Road chalk spine and tunnels through the railway on the southern edge of Zone 5B.

### 7.7.2 Designated environmentally sensitive sites

There are no designated environmentally sensitive sites within Zone 5. It is located in a SSSI Impact Risk Zone related to all planning applications (except householder applications). The Swanscombe Skull Site SSSI is located about 460m south, which currently is in a favourable condition. A very small proportion of Zone 5A (about 5%) is identified as habitat of principal importance (Priority Habitat Inventory) due to presence of deciduous woodland. Deciduous woodland is also identified adjacent to the Zone 5 boundary.

### 7.7.3 Environmental permits, incidents and registers

#### Part A2 and B LPPC Activities

The Atkins Desk Study identified record of one historical LPPC part B permit (located in the northwest of Zone 5A) related to lime processes at Omya UK Whiting Works. No enforcements were notified. The 2020 Groundsure dataset identified no further records of LPPC activities within Zone 5.

#### Licensed discharge consents

The 2020 Groundsure dataset identified two records of licensed discharge consents within Zone 5, both located within Zone 5A and related to Northfleet Eastern Quarry Waste Water Treatment Works (WWTW). These records post-date the Atkins Desk Study and are summarised in Table 7-1. The Atkins Desk Study identified two further licensed discharge consents noted to be in the north of Zone 5A) The 2020 Groundsure dataset placed these consents within Zone 2 - these are therefore discussed in Chapter 4 of this report.



Table 7-1 - Licensed discharge consents within Zone 5.

Location	Address	Effluent type	Receiving water	Status
Zone 5A (west)	Northfleet Eastern Quarry WWTW Watling Street Bean Dartford	Sewage discharges – final / treated effluent	Swanscombe Marshes	Issued 10/05/2018 Effective 10/05/2018 Revoked 17/11/2019
Zone 5A (west)	Northfleet Eastern Quarry WWTW Watling Street Bean Dartford	Sewage discharges – final / treated effluent	Swanscombe Marshes	Issued 18/11/2019 Effective 18/11/2019 Revoked 01/03/2021

#### 7.7.4 Landfills and other waste sites

##### Historical Local Authority landfill records

There is a Local Authority recorded historical landfill records within Zone 5A and extending into Zone 4B, related to a small refuse tip (Pilgrims Pit). This was infilled between approximately 1947 and 1974, most likely with cement works waste and demolition materials.

##### Historical waste sites

The 2020 Groundsure dataset identified one historic planning application (07/00147/CPO) related to change of use to a facility for processing and recycling of plastic materials, for which planning permission was granted. The address is listed as Night Freight GB Ltd, Manor Way.

##### Licensed waste sites

There are three records of licensed waste sites within Zone 5A. The details of these are summarised in Table 7-2. The Veka Recycling Ltd facility was identified by the Atkins 2014 Desk Study. The licensing of the Sheerness Recycling Facility (a physical treatment facility) post-dates that report.

Table 7-2 - Waste Management Licenses attributed to Zone 5.

Permit number and location	Address	Operator	Waste type / description	License information
VEK006 and EA/EPR/BB3003CH/A001 Zone 5A (west)	Manor Way Industrial Park Manor Way Swanscombe DA10 0LL	Veka Recycling Ltd	75kte HCl Waste Transfer Station and treatment, <25000 tonnes	Issued – 17 Dec 2013
VEK006 and EA/EPR/BB3003CH/V002 Zone 5A (west)	Manor Way Industrial Park Manor Way Swanscombe DA10 0LL	Veka Recycling Ltd	Physical treatment facility, >= 25000 and <75000 tonnes	Issued – 17 Dec 2013 Modified – 13 April 2017
SHE288 and EA/EPR/CB3305XA/A001 Zone 5A (east)	Manor Way Materials Recovery Facility Swanscombe DA10 0PP	Sheerness Recycling Limited	Physical treatment facility, >=75000 tonnes	Issued – 12 March 2015

### 7.7.5 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 7.8 Conceptual Site Model

### 7.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins 2014 Desk Study was published has not identified any new or further source of contamination within Zone 5. As described in Section 7.2.1, the limited data from ground investigation within Zone 5 during 2015 did not record any exceedances of human health generic screening criteria (although asbestos was detected in one sample) within either soils or groundwater within Zone 5. Controlled waters risk assessment identified concentrations of some contaminants above relevant screening criteria, consistent with data obtained elsewhere on the Swanscombe Peninsula. The initial dataset from ground gas monitoring indicated that the site would be classified as CS2, but monitoring was undertaken within Chalk rather than Made Ground strata.

**Table 7-3 - Summary of potential sources of contamination.**

Location	Potential source	Likely age	Potential contaminants of concern
Zone 5A	Historical land uses (cement works, whiting works, tramway tracks, conveyors, railway sidings) Current land uses (tanks, electricity substations, waste sites) Infilled land / Pilgrims Pit Made Ground from historical and current land use	Between ~150 years and recent	Asbestos, metals, cyanide, TPH, PAHs, VOCs and SVOCs, sulphates, high pH Ground gas (methane, carbon dioxide)
Zone 5B	Infilled land (associated with partial filling of former chalk quarry) Current and historical land uses (tramways / sidings, conveyors, tanks)	Between ~150 years and recent	Asbestos, metals, cyanide, TPH, PAHs, VOCs and SVOCs, sulphates, high pH Ground gas (methane, carbon dioxide)

### 7.8.2 Pathways and receptors

The detailed development proposals for London Resort are unconfirmed at this stage, but Zone 5A is anticipated to be located within London Resort Gate 2, which could be occupied by event space, rides / attractions, entertainment venues / theatres or ancillary retail and dining etc. Zone 5B is expected to be occupied by staff accommodation. In a departure from the Atkins 2014 Desk Study, the pathways and receptors in the proposed future use are also considered here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use). The pathways and receptors relevant to Zone 5 are summarised in

Table 7-4.

Table 7-4 - Summary of receptors and potential pathways.

Receptor		Pathway
Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres
	Zone workers	
	Trespassers	Inhalation of soil and groundwater derived vapours
	Neighbours	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
Controlled Waters	Principal Aquifer in bedrock	Leaching from waste materials Leaching / migration of contaminants from soils
Buildings / Services	Buried concrete foundations	Direct contact
	Potable water supply pipework	Aggressive attack

### 7.8.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 7-5. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

Table 7-5 - Summary of risk assessment – Zone 5

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 5A	Zone visitors	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / low
Historical land uses	Zone workers				
Current land uses	Trespassers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Medium	Unlikely	Low
	Neighbours	Inhalation of soil and groundwater derived vapours			
Infilled land / Pilgrims Pit	Principal Aquifer in bedrock	Leaching from waste materials Leaching / migration of contaminants from soils	Mild	Likely	Moderate / low
Made Ground from current and historical land uses	Buildings / Services	Direct contact Aggressive attack	Mild	Low	Low
Zone 5B	Zone visitors	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / low
Infilled land	Zone workers				
Current and historical land uses	Trespassers	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Medium	Unlikely	Low
	Neighbours				

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
		Inhalation of soil and groundwater derived vapours			
	Principal Aquifer in bedrock	Leaching from waste materials Leaching / migration of contaminants from soils	Mild	Likely	Moderate / low
	Buildings / Services	Direct contact Aggressive attack	Mild	Low	Low



## 8 Update to Zone 6

### 8.1 Description

Zone 6 has been divided into three subzones: Zone 6A, Zone 6B and Zone 6C. Zone 6A and Zone 6B are the same areas that were assessed by Atkins in 2014. Zone 6C is an area that has not previously been assessed, located to the immediate east of Zone 6B and described and assessed separately in Chapter 10. Site inspections carried out in 2020 together with information from Groundsure (Appendix B) indicate that Zones 6A and 6B remain, in general, as described in the Atkins Desk Study [1].

Zone 6A comprises a former chalk pit ('Bamber Pit'), now partially landfilled and which is now overgrown open land. Bamber Pit is divided into two areas – Bamber Pit North (a licensed landfill) and Bamber Pit South (unlicensed landfill, which was not completely infilled and contains a pond). Zone 6A and Zone 6B are separated by a pedestrian / cyclist roadway. The southern part of Zone 6B comprises an excavated chalk pit and landscaped area, known as Baker's Hole and Northfleet Landfill. There is a compound to the south of Northfleet Landfill contains the gas management / control system for the landfill. Along the eastern boundary of Zone 6B are car parking and infrastructure associated with Ebbsfleet International Station.

### 8.2 Data sources

The following additional data sources relevant to Zone 1 have been available for review, with a summary provided below:

- WSP (2020) Bamber Quarry Landfill. Annual Report 2019 [16]; and
- CMS Enviro (2020) Northfleet Landfill Annual Report [17].

#### 8.2.1 Bamber Quarry Landfill – 2019 Annual Report

This report presents the results of the monitoring undertaken at the Bamber Quarry Landfill Site. The scope of the monitoring is determined by the Environmental Permit for the site (EPR/KP3598HT) and includes: fortnightly monitoring for landfill gas; periodic (annual) monitoring of trace gases; periodic (annual) monitoring of surface emissions; and periodic (6 monthly) monitoring of surface water and groundwater.

The landfill was designed as a disperse and attenuate facility and was operational from the mid 1970s to 1986. The waste deposits are covered with a soil later which supports mature vegetation. The landfill is situated in an area of the Chalk (Principal Aquifer) that is harnessed for public water supply. Leachate generated within the site disperses readily within the Chalk Aquifer. The potential migration of landfill gas across the western boundary is controlled by a gas management system. This system was replaced in early 2012 with the installation of five new gas extraction wells, pipework and condensate soakaway.

WSP concluded that the data obtained during 2019 continues to demonstrate that the Bamber Quarry Landfill poses little, if any, environmental risk. Within the body of the landfill, methane and carbon dioxide concentrations are consistent with pockets of anaerobic activity within the waste. The 2019 surface walkover survey demonstrated that the integrity of the surface was good and that methane and carbon dioxide emissions to air from the surface of the site were predominantly imperceptible. It was concluded that emissions of greenhouse gases from site are currently minimised, both from the western margin and the main waste mass within the centre and east of the site.



In 2019, the results of monitoring of the water environment were consistent with previous years and demonstrate that groundwater and surface water chemistry are generally stable. The results confirm that the area covered by the Environmental Permit is having little deleterious impact on the quality of surrounding groundwater. The poorest groundwater quality was observed to the north of the area covered by the Environmental Permit, where wells regularly recorded concentrations of ammoniacal nitrogen, nitrite, sulphate and chloride above relevant screening criteria. The water quality at these locations is attributed to leaching from Made Ground to the north of the Dartford to Gravesend railway line, as well as anthropogenic inputs in the vicinity of the monitoring wells. The Chalk aquifer shows relatively little impact from the key parameters most typically associated with leachates from putrescible wastes. The monitored water quality within the pond to the south of the site was consistent with the previous year.

### 8.2.2 Northfleet Landfill – 2019 Annual Report

This report presents the results of monitoring undertaken at Northfleet Landfill over the period April 2019 to March 2020. The landfill is within a former chalk quarry, excavated by Blue circle and partially backfilled with Thanet Sands prior to waste deposit. Landfilling operations were first conducted between 1984 and 1994 where the site operated as a dilute and disperse landfill, accepting household, industrial and commercial waste (Waste Management License P/01/26).

The site was developed without containment engineering or pollution control systems. A landfill gas collection and disposal system was installed as the waste was deposited and has changed over the life of the landfill. The site was progressively restored and in 1995 a cap consisting of 750mm Thanet Sand was placed when waste acceptance stopped. Waste disposal recommenced in 2000, and the permit modified to allow acceptance up to 750,000 tonnes per year of non-hazardous contaminated soil waste.

Between 1994 to 2000 landfill gas control with power generation continued and it was following removal of the landfill gas engines that the license was modified to allow the acceptance of non-hazardous soil. The landfill gas extraction system was extended vertically through the soil profile and connected to the two flared located on the southern boundary. Land raise activities were completed in 2006 and the site is now capped with a HDPE membrane, closed and has undergone restoration. Following approval of the 2012 Closure Report, the site entered definite closure. Post closure activity is limited to active landfill gas control and environmental monitoring.

Data collected over the 2019 monitoring period was comparable to the previous years. The primary risk is landfill gas. Secondary risk of leachate contamination to groundwater is known but with very limited management options. Two methane exceedances of the compliance limit (1%v/v) were recorded on the eastern boundary on days of lower atmospheric pressure. Revisits recorded 0% methane, with the initial methane exceedance considered to be a direct response to atmospheric pressure drop. Carbon dioxide exceedances were minimal over the reporting period. The landfill gas extraction system was noted to be operating efficiently.

Leachate levels remained low over the reporting period and leachate quality remains indicative of an ageing domestic waste landfill site. The impact of an isolated plume of contaminated groundwater observed at a down-gradient borehole has continued to reduce, with ammoniacal-nitrogen concentrations consistently below the groundwater compliance limit over the reporting period. Three surface water samples were obtained, with no exceedances of the Closure Report control limits recorded.

### 8.3 Surrounding land uses

Zone 6 is bordered to the north by the North Kent Line railway, which runs along a chalk spine, with Zone 4 beyond. HS1 runs along the eastern boundary of Zone 6A and Zone 6B, with Zone 6C present beyond. Ebbsfleet International

Station, associated infrastructure and carparking are present in Zone 6C. Zone 7, which includes a large carpark for Ebbsfleet International Station with associated link road, is present to the south. Beyond this is open / agricultural land. To the immediate west are Swanscombe High Street and Stanhope Road / Southfleet Road, with Swanscombe town and associated residential and retail properties beyond.

## 8.4 Historical land use

There have been no significant changes in land use since the Atkins Desk Study was published in 2014.

## 8.5 Geology

The relevant BGS map for the area is Sheet 271 – Dartford [13]. The ground conditions remain as described in the Atkins Desk Study [1] which corresponds with the BGS mapping plus the known history of landfilling.

## 8.6 Hydrology and hydrogeology

### 8.6.1 Surface water

There is a groundwater-fed pond (Swanscombe Pond) in the northern portion of Zone 6A. Ebbsfleet River runs approximately north-south in the east of the Zone (Zone 6C), from Springhead to the River Thames. Sawyer's Lake (reservoir / urban lake) is present adjacent to the southeast of Zone 6C.

### 8.6.2 Groundwater

The anticipated depth to groundwater remains as described by the Atkins 2014 Desk Study report. Groundwater was noted to be present generally between about 8 and 10m AOD, but highly variable likely due to the varying nature of Made Ground fill.

### 8.6.3 Abstractions

The 2020 Groundsure Report did not identify any active or historical groundwater abstractions located within Zone 6. The nearest records of active and historical abstractions are located from about 150m southeast and are licensed to Lafarge Cement UK Plc. The abstractions are located at Blue Lake (Sawyer's Lake) for non-evaporative cooling, process water and spray irrigation. There are several further groundwater abstractions between here and the River Thames. The nearest licensed potable water abstraction is located about 700m south of Zone 6B. The license to this expired in March 2020. It was licensed to Thames Water Utilities Ltd for annual abstraction of up to 6,716,000m<sup>3</sup>.

### 8.6.4 Groundwater vulnerability

Zone 6 is located part within Source Protection Zone 1 (inner catchment), 2 (outer catchment) and 3 (total catchment), associated with the groundwater abstractions to the southeast.

## 8.7 Regulatory data

### 8.7.1 Data summary

The full 2020 Groundsure dataset has been reviewed and summarised in Table B (Appendix B). The key items of relevant information within Zone 6 are described in the following subsections.

### 8.7.2 Mineral abstractions

Historical OS maps indicate that the majority of Zones 6A and 6B were quarried for chalk or gravel between 1895 and 1946. The historical quarries within Zone 6 are listed in Table 8-1.

**Table 8-1 - Historical quarries in Zone 6.**

Name	Location	Abstracted mineral
Bamber Pit	Zone 6A	Chalk and gravel
Baker's Hole	Zone 6B (east)	Chalk
Northfleet Landfill	Zone 6B	Chalk

### 8.7.3 Designated environmentally sensitive sites

Along the eastern side of Zone 6B is Baker's Hole SSSI. Part of this area is also a Scheduled Ancient Monument (also known as Baker's Hole). The whole of the Baker's Hole SSSI is in an unfavourable (declining) condition. Zone 6 is also located in a SSSI Impact Risk Zone. No further designated environmentally sensitive sites have been identified within Zone 6, but about 25% of Zone 6A is identified as habitat of principal importance (Priority Habitat Inventory) due to presence of deciduous woodland.

### 8.7.4 Environmental permits, incidents and registers

#### LPPC Activities

There are no LPPC licensed activities within Zone 6. The nearest activities are as described by the Atkins 2014 Desk Study report, related to Swanscombe Dry Cleaners (about 75m west) and operation of a waste oil burner (about 50m east of Zone 6C). No enforcements have been notified.

#### Licensed discharge consents

There are no records of licensed discharge consents within Zone 6A or Zone 6B. There is one record of a discharge consent within Zone 6C, summarised in Table 8-2. There are three further licensed discharge consents located in the vicinity of Zone 6 (within 200m, positioned in Zone 7). One of these (revoked in 2003) relates to release of trade discharge (site drainage) from Baker's Hole Landfill to a freshwater river (assumed the River Ebbsfleet).

**Table 8-2 - Licensed discharge consents within Zone 6.**

Location	Address	Effluent type	Receiving water	Status
Zone 6C	Lafarge Cement UK The Shore Northfleet DA11 9AN	Trade discharges – mineral workings	River Ebbsfleet	Issued – 06 Oct 1993

#### Pollution incidents

There are no records of pollution incidents within Zone 6. The 2020 Groundsure dataset identified one pollution incident within 1km of Zone 6 that post-dates publication of the Atkins 2014 Desk Study. This occurred in 2018, approximately 220m south of Zone 6C (within Zone 7). The incident related to inert materials and wastes, with Category 2 (significant) impact to water, Category 3 (minor) impact to land and Category 4 (no impact) to air.

### 8.7.5 Landfills and other waste sites

There are two licensed landfills within Zone 6, Bamber Pit [north] within Zone 6A and Northfleet Landfill (also referred to as Baker's Hole) within Zone 6B. There is also one historical landfill, Bamber Pit [south], within Zone 6A. Table 8-3 summarises the information on landfills within Zone 6 gained from the Groundsure 2020 dataset. Information on Waste Management Licenses shows that operation of Northfleet Landfill was variable licensed to Blue Circle Industries Plc, Lafarge Cement UK Limited, Tarmac Cement and Lime Limited and Lafarge Tarmac Cement and Lime, until its closure in 2012.

**Table 8-3 – Landfills within Zone 6.**

Site type	Permit number and location	Facility name and address	License holder / operator	Waste type / description	License information
Authorised landfill / active or recent EA landfill	EA/EPR/CB3908CE/T001 Zone 6A (north)	Bamber Quarry Landfill / Bamber Pit [north] Swanscombe High Street Swanscombe Kent DA10 0AN	London Resort Company Holdings Limited	A04: household, commercial and industrial waste landfill	Issued – 01/01/81 Listed as closed
Authorised landfill / active or recent EA landfill	EA/EPR/KP3898HE/V006 Zone 6B	Northfleet Landfill Baker's Hole Northfleet Kent DA11 8HF	Tarmac Cement and Lime Limited	A04: household, commercial and industrial waste landfill	Issued – 16/11/83 Listed as closed
Historical EA landfill	P/01/16, 21ER Zone 6A (south)	Bamber Pit [south] Stanhope Road Swanscombe Kent	Holder – D.R.G. Operated – Blue Circle Industries Plc	Inert, industrial	First input – 31/12/77 Last input – 16/04/93

### 8.7.6 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 8.8 Conceptual Site Model

### 8.8.1 Sources

Review of the 2020 Groundsure Report and other data sources that have become available since the Atkins Desk Study was published has not identified any new or further sources of contamination within Zone 6 (see Table 8-4). For the purposes of assessment presented here, Zone 6 is split into four distinct areas (Zone 6A, Zone 6B, Zone 6C). Zone 6C is assessed separately in Chapter 10. No site investigation is known to have been undertaken within Zone 6 since the Atkins 2014 Desk Study was published but account is taken of the data presented in the annual reports for the Bamber Quarry and Northfleet Landfill sites.

Table 8-4 – Summary of potential sources of contamination.

Location	Potential source	Likely age	Potential contaminants of concern
Zone 6A	Bamber Pit (received waste from local paper manufacture and cement works, including putrescible waste, and which had an active gas extraction and monitoring system). Historical land uses (railway, pumphouse, engine house, pipeline)	Between about 40 and 100 years	Asbestos, metals, TPH, PAHs, landfill leachate, various other contaminants. Ground gas (methane, carbon dioxide)
Zone 6B	Northfleet Landfill (received mixed household, industrial and commercial wastes, and minor household tipping) Historical land uses (rifle range, railway uses and conveyor, pumping station, army barracks) Current land uses (car parking and other minor infrastructure associated with Ebbsfleet International Station)	Between ~150 years and recent	Asbestos, metals, TPH, PAHs, landfill leachate, various other contaminants. Ground gas (methane, carbon dioxide)

### 8.8.2 Pathways and receptors

The details of the development proposals are unconfirmed at this stage. However, it is anticipated that Zone 6A will remain largely undeveloped but with some back of house structures. Zone 6B is also expected to remain largely undeveloped. However, a transport interchange will be integrated with Ebbsfleet International Station to bring site visitors from the train station to the main gates of the resort (Gate 1 and Gate 2) on the Swanscombe Peninsula. Visitor flow will be from the Ebbsfleet International Station, heading north through Zone 6B, Zone 6A and Zone 4C, to the interchange and entrance plaza within Zone 4B and Zone 5A. In a departure from the Atkins 2014 Desk Study, the pathways and receptors in the proposed future use are also considered here. Correspondingly, the presence of contamination has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during the proposed future use). Pathways and receptors relevant to Zone 6 are summarised in Table 8-5.



Table 8-5 - Summary of receptors and potential pathways.

Zone	Receptor		Pathway
Zone 6A and Zone 6B	Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
		Zone workers	
		Trespassers	
		Neighbours	
Zone 6A and Zone 6B	Controlled Waters	Principal Aquifer in bedrock	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Principal Aquifer
		Secondary (Undifferentiated) Aquifer in superficial deposits (still present in limited areas of Zone 6A and Zone 6B)	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Secondary (Undifferentiated) Aquifer
		Surface waters (River Ebbsfleet, Sawyer's Lake)	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.
Zone 6A	Environment	Baker's Hole SSSI and Scheduled Ancient Monument	Direct contact and physical damage
Zone 6A and Zone 6B	Buildings / Services	Buried concrete foundations Potable water supply pipework	Direct contact Aggressive attack

### 8.8.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 8-6. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

Table 8-6 - Summary of risk assessment for Zone 6A and Zone 6B.

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 6A Bamber Pit	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Medium	Unlikely	Low
	Zone workers				
Historical land uses	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	Zone neighbours				

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater	Medium	Likely	Moderate
	Principal Aquifer in bedrock	Vertical migration to the Secondary Aquifer and Principal Aquifer			
	Surface waters (River Ebbsfleet, Sawyer's Lake)	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.	Mild	Low	Low
	Baker's Hole SSSI and Scheduled Ancient Monument	Direct contact and physical damage	Medium	High	High
	Buildings / Services	Direct contact Aggressive attack	Mild	Low	Low
Zone 6B Northfleet Landfill	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres	Medium	Unlikely	Low
	Zone workers				
	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Severe	Unlikely	Moderate / Low
	Zone neighbours				
Historical land use	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater	Medium	High	High
	Principal Aquifer in bedrock	Vertical migration to the Secondary Aquifer and Principal Aquifer			
Current land use	Surface waters (River Ebbsfleet, Sawyer's Lake)	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.	Mild	Low	Low
	Buildings / Services	Direct contact Aggressive attack	Mild	Low	Low

## 9 Zone 4D

### 9.1 Zone characterisation

#### 9.1.1 Location

Zone 4D is located in the eastern part of the wider Swanscombe Peninsula site. It is approximately centred at NGR 561070 175472 and is located entirely within the Gravesham Borough Council administrative area.

#### 9.1.2 Description

Zone 4D is an approximately rectangular shaped area of land that covers some 20 hectares. It is currently open vegetated marshland, referred to as Botany Marshlands. A number of land drains subdivide the area. There is a commercial / industrial compound in the southeast corner (currently occupied by The London Bus Company – supplier / restorer of vintage buses) which is excluded from the DCO Order Limits. Lower Road forms the eastern boundary of the zone.

#### 9.1.3 Zone-specific data sources

No data sources specific to Zone 4D have been obtained.

#### 9.1.4 Surrounding land uses

Zone 4D is bounded to the north in part by Zone 1 (northwest) and in part by industrial land uses (northeast), in particular the CEMEX Northfleet Concrete Plant. To the east is the Kent Kraft Industrial Estate (including Britannia Refined Metals), with the River Thames beyond (from 250m distant from Zone 4D). Zone 4B is present to the south, with the town of Northfleet (residential and light commercial / industrial) and other sites zones (Zone 4C, Zone 6A) beyond. Zone 2 of the London Resort site is present to the immediate west.

#### 9.1.5 Historical land uses

A summary of historical land uses within Zone 4D and in the surrounding area (within 1km) is presented in Table 9-1. Table 9-1 provides a brief description of land uses within other site zones that are in the vicinity of Zone 4D, but the relevant Chapter of the Atkins Desk Study should be consulted for the complete information.

**Table 9-1 - Historical land uses in Zone 4D and surrounding area.**

Date and scale	Within Zone 4D	Surrounding area
1865 1:2,500	Zone 4D is labelled as Botany Marshes. Manor Way is present along the eastern boundary. There is evidence of ground workings (ridges) in the southeast quadrant. There are a number of drains within the Zone which split the area into rectangular sections.	<b>N:</b> partial coverage only. Immediately to the north are mudflats and marshland. There are a number of streams / drains in the area. <b>E:</b> marshland and mudflats, with River Thames beyond. <b>S:</b> Zone 4B (undeveloped) to immediate south. Northfleet present to the southeast with Old Clay Pits (200m); Cement Works with Chalk Pit, Cement Mill, Kilns etc (400m); North Kent Railway (400m); and other light industrial and residential properties beyond, <b>W:</b> Swanscombe Marshes (generally undeveloped) with River Thames beyond. Portland Cement Works with associated Chalk Pits 775m southwest (Zone 5A and Zone 5B). Whiting Works present in Zone 3B.
1872 1:2,500	No significant change.	No significant change.

Date and scale	Within Zone 4D	Surrounding area
1888 1:10,560	No significant change.	<b>N:</b> Broadness Salt Marsh shown to north with River Thames beyond. <b>E:</b> small area of ground workings shown on bank of River Thames (180m). Portland Cement Works and Tower Portland Cement Works with associated rail / tram lines also present on bank of river (expansion of cement works to south). <b>S:</b> Zone 4B is now occupied by Britannia Cement Works, Northfleet Paper Works and Chalk Pit. Evidence of ground working / extraction in Zone 4C and Zone 6A. Expansion to industrial activity on shore of River Thames to southeast (several Cement Works, Gas Works, and ground workings). <b>W:</b> cement works within Zone 5A has been expanded. Tramlines are shown from the pier within Zone 2 to that cement works.
1895 1:10,560	No significant change.	No significant change.
1897 1:2,500	No significant change.	No significant change.
1898 1:10,560	No significant change.	No significant change.
1907 1:2,500	No significant change.	<b>N, E, S:</b> partial coverage to north and east. No significant change. <b>W:</b> Cement Works buildings present in area of former chalk pit in Zone 5A. Numerous tanks shown in Zone 5B. Evidence of ground workings in Zone 2.
1923 1:10,560	No significant change.	No significant change.
1932 1:10,560	Football Ground present in south of Zone 4D.	<b>N:</b> no significant change <b>E:</b> Portland Cement Works no shown as Britannia Lead Works. Several associated tanks labelled. <b>S:</b> previous area of vacant land in Zone 4B labelled as Thames Tar Distilleries. Reservoir labelled in east of Zone 4B. Expansion to Paper Mills in Zone 4B. <b>W:</b> Sewage Disposal Works shown in centre of Zone 2. Ground workings in southwest of Zone 2 no longer evident. Some scaling back of Portland Cement Works and Whiting Works in Zone 3 and Zone 5. Football Ground and Cricket Ground now shown in Zone 3A.
1938 1:10,560	No significant change.	No significant change.
1939 1:2,500	No significant change.	<b>N, E, S:</b> partial coverage only. No significant change. <b>W:</b> a number of paths / tracks through Swanscombe Marshes (Zone 2) are no longer present.
1946 1:10,560	No significant change.	<b>N, S, W:</b> partial coverage in north. No significant change. <b>E:</b> several damaged properties (residential) are shown within Northfleet.
1952 1:2,500	Football Ground no longer present. Drains are labelled across Botany Marshes (no change to configuration).	<b>N, E:</b> no significant change. <b>S:</b> Areas of land infilling shown in Zone 4B. Thames Chemical Works shown in Zone 4B. Paper Sacks Factory shown on previously vacant land to south of Zone 4B (off-site). Bowling Green and Tennis Courts shown within Sports Ground (off-site, east of Zone 4C). <b>W:</b> scaling back of Tramway in Zone 3A. Ground workings in Zone 5A / Zone 4B still present but labelled as Pond. Sludge Beds and tanks shown at Sewage Disposal Works in Zone 2.
1955 1:10,560	No significant change.	<b>N, E, S:</b> no significant change. <b>W:</b> large area of land infilling shown in Zone 2.
1966 1:10,560	No significant change.	No significant change.



Date and scale	Within Zone 4D	Surrounding area
1970 1:2,500	Electricity transmission cable and associated pylons pass through Zone 4D	<b>N:</b> creeks / rivers within Broadness Salt Marsh are no longer present. There is a track present through Broadness Salt Marsh, leading to a Radar Station in the north of Zone 1. <b>E:</b> Partial coverage only. Tower Wharf on bank of River Thames expanded. <b>S:</b> Partial coverage only. Reservoir shown in east of Zone 4B. Refuse Tip labelled on Zone 4B / Zone 5A border. <b>W:</b> Partial coverage only. Sewage disposal works in Zone 2 has been expanded. Refuse Tip labelled in north of Zone 2.
1973 1:10,000	No significant change.	<b>N:</b> Depots, Jetty and Wharf shown to immediate north on bank of River Thames. <b>E, S:</b> partial coverage only. No significant change. <b>W:</b> partial coverage only. Majority of western half of Zone 2 shown as area of landfilling.
1978 1:2,500	Four buildings (assumed warehouses) present in southeast corner (area excluded from DCO Order Limits).	<b>N:</b> partial coverage only. No significant change. <b>E:</b> partial coverage only. Previously vacant / marshland to immediate east now occupied by unspecified commercial / industrial use (yard, chimneys). Tram / rail lines scaled back or no longer present, access roads shown instead. <b>S:</b> Partial coverage only. Warehouses shown in previously vacant land in Zone 4B. <b>W:</b> No coverage.
1982 1:10,000	Lower Road present along southern boundary. Track shown along eastern boundary.	<b>N, E, S:</b> partial coverage to east and south. No significant change. <b>W:</b> refuse tip / landfilling within Zone 2 no longer shown.
1989 1:2,500	No significant change.	<b>N:</b> partial coverage to north, east, south. No significant change. <b>W:</b> no coverage.
1990 1:10,000	No coverage	<b>S:</b> Whole of Zone 6A and Zone 6B shown as area of landfilling. Minor changes to residential and commercial / industrial land uses in surrounding area.
1992 1:10,000	No significant change.	<b>N, E, S, W:</b> partial coverage to east and south. No significant change.
1993 1:10,000	No significant change	<b>N, E:</b> partial coverage to east. No significant change <b>S:</b> Paper Mills no longer present in Zone 4B. Northfleet Industrial Estate developed in area. <b>W:</b> eastern part of Zone 5A has been cleared and is vacant land. Sports facilities no longer shown in Zone 3A. Area of landfilling shown in west of Zone 3B.
1993 1:2,500	No significant change	<b>N, S, W:</b> no coverage. <b>E:</b> Sand and Gravel Works shown in former area of Cement Works. Lead Works labelled as Works. Northfleet Industrial Estate extends off-site immediately east of Zone 4D.
1995 1:2,500	No significant change.	<b>N, S, W:</b> no coverage <b>E:</b> New large warehouse structure on frontage to River Thames. Other minor changes to commercial / industrial buildings. Majority of buildings of unspecified use.
2001 1:10,000	No significant change.	<b>N:</b> no significant change <b>E:</b> Minor changes to buildings on frontage to River Thames. All unlabelled. <b>S:</b> Northfleet Industrial Estate labelled Kent Kraft Industrial Estate. Areas of landfilling (Zone 6A / Zone 6B) no longer shown, areas now appear undeveloped / vacant. <b>W:</b> areas of landfilling no longer shown in Zone 3B. Area to west predominantly marshland with small works / commercial / industrial buildings.
2010 1:10,000	No significant change.	<b>N, E:</b> no significant change <b>S, W:</b> HS1 crosses through Zone 2, Zone 4B, and areas off-site to the south.



### 9.1.6 Summary of historical land uses

Zone 4D has a very limited history of development. The has been identified as being marshland (Botany Marshes) since the earliest available map (dated 1865). A number of drains have been present within the Zone since that time, which divide the area into roughly rectangular sections. A Football Ground was present in the south of Zone 4D between approximately 1932 and 1952. An electricity transmission cable supported by a series of pylons has crossed the Zone since approximately 1970. Light industrial / commercial buildings were constructed in the southeast corner of the Zone in the 1970s, which are still present and occupied today (these are excluded from the DCO Order Limits).

## 9.2 Environmental context

### 9.2.1 Geology

The 1:50,000 BGS Geology Sheet Map for the area (271 – Dartford) [18] indicates Zone 4D to be underlain by Alluvium (described to be mainly silt and clay, locally peaty) beneath which is Chalk (Upper Chalk Formation). The Upper Chalk Formation is described as soft white chalk with courses of flints and is regionally up to 70m thick. This generally corresponds with the nearest historical BGS records (see Section 9.2.2). Some Made Ground may also be present in limited areas of the Zone.

### 9.2.2 Historical borehole records

There are no available to view historical BGS borehole records for within Zone 4D. The nearest records are located within Zone 4B, related to the Channel Tunnel Rail Link Investigations. The exploratory holes were mostly to shallow depth but confirmed a general stratigraphic sequence of Made Ground (typically up to about 1m thick), over Alluvium or Head Deposits (about 2m thick) over Chalk.

### 9.2.3 Historical reports

No historical reports related to Zone 4D have been obtained.

### 9.2.4 Surface water

A number of drains are present within Zone 4D (and adjacent Zone 4A), generally orientated approximately north-south and east-west, which divide the Zone into approximately rectangular shaped areas. The Zone is also located on the eastern side of the Swanscombe Peninsula, with the River Thames present from about 120m east at its nearest point.

### 9.2.5 Groundwater

No groundwater data specific to Zone 4D is available. The nearby BGS borehole records (located in Zone 4B) encountered groundwater at variable depth (typically between about 0.80m bgl and 2.00m bgl in Made Ground and Alluvium. A deeper groundwater body is also expected in Chalk.

### 9.2.6 Abstractions

The nearest records of groundwater abstraction relate to a historical and active abstraction licenses located about 150m north of Zone 4D, operated by CEMEX UK Materials Ltd for mineral washing. The active license relates to annual abstraction of up to 26,300m<sup>3</sup> of groundwater, which is licensed up to 2026. All other records of groundwater abstraction are located in other site zones or are >1km distant. There is also a surface water abstraction (from the

River Thames) located about 600m east. This is licensed to Robert Brett & Sons Ltd for mineral washing with annual abstraction up to 45,500m<sup>3</sup>.

### 9.2.7 Groundwater vulnerability

Most of Zone 4D is located within Source Protection Zone 3 (total catchment). The southeast corner is located within Source Protection Zone 2 (outer catchment). Zone 4D is underlain by a Secondary (Undifferentiated) Aquifer in superficial deposits and Principal Aquifer in bedrock.

## 9.3 Regulatory data

### 9.3.1 Data summary

The full 2020 Groundsure dataset has been reviewed and summarised in Table B (Appendix B). The key items of relevant information within Zone 6 are described in the following subsections.

### 9.3.2 Mineral workings

The 2020 Groundsure dataset identified an area of surface ground workings (unspecified pit) in the southeast quadrant of Zone 4D. Historic maps dated from the 1860s to 1990s show evidence of a ridge around the eastern boundary of Zone 4D, which remains unlabelled and unchanged over this duration (with no evidence of extraction / infilling). The land to the immediate east of Zone 4D is identified as 'Southfleet' historical mineral planning area for chalk extraction.

### 9.3.3 Designated environmentally sensitive sites

There are no designated environmentally sensitive sites within Zone 4D. Zone 4D is located within a SSSI Impact Risk Zone for all developments (except householder) outside or extending outside existing settlements / urban areas. The whole Zone is also identified as habitat of principal importance (Priority Habitat Inventory) due to presence of coastal and floodplain grazing marsh.

### 9.3.4 Environmental permits, incidents and registers

#### LPPC Part B Activities

There are two records of LPPC Part B permits within Zone 4D and two records within 100m, summarised in Table 9-2. There are seven other records within 1km (all >250m distant and not considered to impact Zone 4D).

**Table 9-2 - Records of LPPC Part B permits in Zone 4D or within 100m.**

Location	Address	Process	Status	Enforcement details
Zone 4D (north)	Cemex Concrete Products Ltd Lower Road Northfleet DA11 9AP	Use of bulk cement	Current permit	No enforcements notified
Zone 4D (south)	London Bus and Truck Ltd Lower Road Northfleet DA11 9SN	Respraying of road vehicles	Current permit	No enforcements notified
Off-site (95m north)	Cemex Concrete Products Ltd Botany Marshes	Use of bulk cement	Current permit	No enforcements notified

Location	Address	Process	Status	Enforcement details
	Northfleet DA11 9BB			
Off-site (95m southeast)	N. T. C. Lumber (Southern) Ltd Botany Road Northfleet DA11 9SL	Timber manufacture	Historical permit	No enforcements notified

### Pollution incidents

The nearest record of a pollution incident occurred in 2002, about 30m east of Zone 4D. This related spill of oils and fuels and had Category 4 (no impact) to air, land and water. There are seven other records of pollution incidents within 1km of Zone 4D. These were all >250m distant and with Category 4 (no impact) or Category 3 (minor impact) to air, land and water.

### Britannia Refined Metals

All other records of environmental permits, incidents and registers in the vicinity of Zone 4D relate to Britannia Refined Metals, located adjacent to Zone 4D (east) at Botany Road, Northfleet. These are summarised in Table 9-3.

**Table 9-3 - Permits, incidents and registers related to Britannia Refined Metals.**

Type of permit, incident or register	License status	Additional information
List 2 dangerous substance inventory site	Active	Substances: arsenic, copper, lead, nickel, zinc. Receiving water: River Thames
List 1 dangerous substance inventory site	Active	Substances: mercury (other), cadmium. Receiving water: River Thames.
Pollution inventory waste transfer	-	-
Licensed industrial activities Part A1	6 superseded 1 effective	All records relate to non-ferrous metals; melting with capacity >4T/D for lead and cadmium or 20T/D for others.
Licensed discharges to controlled waters	8 revoked (unspecified)	7 records related to release of trade discharge (site drainage). 1 record related to release of sewage discharge (treated effluent). All release to the River Thames.
Pollution inventory substances	-	5 records, all related to non-ferrous metals. Melting with capacity >4T/D for lead and cadmium or 20T/D for others.
COMAH sites	Current	COMAH Upper Tier Operator.
Historical licensed industrial activities	2 superseded 1 revoked (now LPPC)	3 licenses related to use of non-ferrous metals. Most recent license dated 1998.
Hazardous substances storage	Approved	Application dated 2015 for storage of various hazardous materials. No enforcements notified.

### 9.3.5 Landfills and other waste sites

#### Britannia Refined Metals

There are no records of licensed or unlicensed waste sites, waste operations or landfills within Zone 4D. The majority of records in the vicinity of Zone 4D relate to activities at Britannia Refined Metals, summarised in Table 9-4.

Table 9-4 - Waste-related activities at Britannia Refined Metals.

Type of record	Permit number	Dates of operation	Description
Waste exemption	WEX235662 WEX089874	-	7 records of waste exemptions associated with Britannia Refined Metals (address is specified as Britannia Refined Metals on one of these, for the others no address is given but the location corresponds with that site) under two permit numbers Disposing of waste exemptions – deposit of waste from dredging of inland waters, burning of waste in the open, deposit of waste from dredging of inland waters. Storing waste exemption – storage of waste in a secure place.
Historical EA landfill	21EM, P/02/01	License issued 14/06/1977, surrendered 19/09/2000	Record related to Botany Road Landfill, which was operated by Britannia Refined Metals. Accepted inert, industrial and special waste.
EA licensed waste sites	BRI001	Licensed issued 14/06/1997, expired 27/07/1998.	Record related to Botany Road, which was operated by Britannia Refined Metals. Accepted industrial waste (factory curtilage).

### Other waste sites

There are records of a small number of other waste exemptions within 1km of Zone 4D (summarised in Table 9-5). In addition, there is one record of a waste site from a historic planning application (DA/96/00457) located 175m east. This related to use of land as a waste transfer station handling Category A and B waste with ancillary portable office, messroom/store and carparking.

Table 9-5 - Waste exemptions within 1km of Zone 4D.

Location	Permit number	Address	Exemption description
Off-site: 30m north	WEX152719	Botany Marsh, Lower Road, Northfleet, DA11 9BB	Using waste exemption – use of waste in construction
Off-site: 215m southeast	WEX153887	Robins Wharf, Grove Road, Northfleet, DA11 9AX	Treating waste exemption – screening and blending of waste.
Off-site: 350m southeast	EPR/LF0602FN/A001	Unit 1a, Robins Wharf Grove, Northfleet, DA11 9AX	Storing waste exemption – storage of waste in secure containers and storage of waste in a secure place.
Off-site: 860m southwest	EPR/FF0900NA/A001	90-94 Church Road, Swanscombe, Kent, DA10 0HF	Treating waste exemption – sorting and denaturing of controlled drugs for disposal.
Off-site: 925m southwest	WEX148318	90-94 Church Road, Swanscombe, Kent, DA10 0HF	Treating waste exemption – sorting and denaturing of controlled drugs for disposal.

### 9.3.6 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 9.4 Conceptual Site Model

### 9.4.1 Sources

Review of the 2020 Groundsure Report and other data sources (geological and historical maps etc.) has identified a limited history of development within Zone 4D. Potential sources of contamination within Zone 4D and in the surrounding area (off-site) are summarised in Table 9-6.

**Table 9-6 – Summary of potential sources of contamination.**

Location	Potential source	Likely age	Potential contaminants of concern
Zone 4D	Current and historical commercial / industrial uses in southeast corner of Zone 4D (warehouses / depot)	Up to 50 years	Asbestos, metals, TPH, PAHs.
Zone 4D	Marshland / Alluvium within Zone 4D	Up to 2 million years	Ground gas (methane, carbon dioxide)
Off-site (adjacent to east)	Botany Road Landfill (accepted inert, industrial and special wastes, factory curtilage)	Up to about 45 years	Asbestos, metals, TPH, PAHs, landfill leachate, various other contaminants. Ground gas (methane, carbon dioxide)
Off-site (from adjacent)	Current and historical industrial uses in the surrounding area. Current: Britannia Refined Metals, CEMEX Northfleet Concrete Plant, Northfleet Industrial Estate. Historical: clay pits, various cement works, lead works, tram / rail lines, sand and gravel works.	Up to ~150 years	Asbestos, metals, TPH, PAHs.

### 9.4.2 Pathways and receptors

The details of the development proposals are unconfirmed at this stage. However, it is anticipated that Zone 4D will remain largely undeveloped (i.e. remain as Botany Marshes). Current developments plans do not include any buildings or structures within Zone 4D. Potential pathways and receptors are considered in terms of the proposed future use, and therefore have potential to impact upon human and environmental receptors both in the short term (during construction / development) and in the long term (during the proposed future use). Pathways and receptors relevant to Zone 4D are provided in

Table 9-7.

**Table 9-7 - Summary of receptors and potential pathways.**

Receptor		Pathway
Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
	Zone workers	
	Trespassers	
	Zone neighbours	
Controlled Waters	Principal Aquifer in bedrock	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Principal Aquifer



	Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Secondary (Undifferentiated) Aquifer
	Surface waters (land drains)	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.
	River Thames	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.
Ecology	Flora and fauna	Direct contact and root uptake.

**9.4.3 Assessment of risk**

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 9-8. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

**Table 9-8 - Summary of risk assessment for Zone 4D.**

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 4D	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Severe	Unlikely	Moderate / low
	Zone workers				
Current and historical commercial / industrial uses in Zone 4D	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Mild	Unlikely	Very low
	Zone neighbours				
Marshland / Alluvium	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater Vertical migration to the Secondary Aquifer and Principal Aquifer	Mild	Low likelihood	Low
	Principal Aquifer in bedrock				
Botany Road Landfill	Surface waters (land drains)	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.	Mild	Low likelihood	Low
	River Thames				
Current and historical industrial uses in the surrounding area.	Flora and fauna	Direct contact and root uptake.	Mild	Low likelihood	Low

## 10 Zone 6C

### 10.1 Zone characterisation

#### 10.1.1 Location

Zone 6C is located in the south-eastern part of the wider Swanscombe Peninsula site. It is approximately centred at NGR 561549 174249 and covers some 14.5 hectares.

#### 10.1.2 Zone description

Zone 6C is an irregularly shaped parcel of land. It is currently occupied by Ebbsfleet International Station, a short section of the HS1 railway line which the station serves, Ebbsfleet International Car Park C, and further minor infrastructure associated with the railway station. The A226 and Thames Way which link Ebbsfleet International Station to the wider area also cross the Zone. Approximately 50% of the area is undeveloped and covered by woodland / vegetation. The River Ebbsfleet crosses the zone in a southeast to northwest direction.

#### 10.1.3 Zone-specific data sources

Zone 6C is outside of the London Paramount site that was assessed in 2014/2015. No data sources specific to Zone 6C have been obtained.

#### 10.1.4 Surrounding land uses

The Thames way runs parallel to the eastern boundary (and part within Zone 6C) The North Kent Railway Line is present beyond this runs parallel to the eastern side of the zone in an approximately northwest to southeast direction. Northfleet Station is located on this line and next to the zone. Beyond the railway line to the north are residential and light commercial and industrial properties located in the town of Northfleet. Beyond this are Zone 4B and Zone 4D, and in the wider area, heavier industrial uses on the eastern side of Swanscombe Peninsula. Residential properties in Northfleet also bound Zone 6C to the east, with industrial and commercial land uses beyond, generally on the bank of the River Thames. Zone 7A, Zone 7B and Sawyer's Lake (also known as Blue Lake), a former chalk pit, bound the zone to the south. Beyond this is Springhead, a settlement of mixed residential and commercial / industrial uses. To the west are Zone 6A and Zone 6B (with former landfills in both of these areas), and Swanscombe town beyond.

#### 10.1.5 Historical land uses

A summary of historical land uses within Zone 6C and in the surrounding area (within 1km) is presented in Table 10-1. Table 10-1 provides a brief description of land uses within other site zones that are in the vicinity of Zone 6C, but the relevant Chapter of the Atkins Desk Study should be consulted for the complete information.

**Table 10-1 - Historical land uses in Zone 6C and surrounding area.**

Date and scale	Within Zone 6C	Surrounding area
1865 1:2,500	Zone 6C is bisected by the River Ebbsfleet. A number of associated drains / streams further divide the zone. The area to the west of the River	The North Kent Railway line runs in an approximately northwest to southeast direction parallel to the eastern side of Zone 6C. <b>N:</b> Limited development. Residential properties and Old Clay Pits 250m distant. Chalk pits 385m northeast. Zone 6A and all of Zone 4 generally undeveloped. <b>E:</b> Streams associated with the River Ebbsfleet adjacent, with railway line, Northfleet station and associated Goods Depot beyond. Residential properties within Northfleet about 300m distant. Commercial / industrial uses include a

Date and scale	Within Zone 6C	Surrounding area
	Ebbsfleet is indicated to be liable to floods.	Chalk Quarry (450m distant) and a Cement Works located on bank of River Thames (600m). <b>S:</b> River Ebbsfleet present to the south (flows approximately south-north to the River Thames). Land to south generally undeveloped. <b>W:</b> Zone 6A and Zone 6B generally undeveloped. Swanscombe located about 400m distant, which includes residential properties, a church, Manor House and farmland.
1888 1:10,560	A tramway crosses Zone 6C in a east-west direction, appears to link the North Kent Railway line with a quarry in Zone 6B.	<b>N:</b> A Chalk Pit is present in Zone 4C. A Chalk Pit, Northfleet Paper Works and Britannia Cement Works are present in Zone 4B. There are a number of rail / tram lines leading from the North Kent Railway line to the surrounding industrial land uses. A number of wharfs and a Portland Cement Works are present on the bank of the River Thames to the northeast. <b>E:</b> A quarry is present adjacent to east of North Kent Railway (75m distant). Further residential development within Northfleet. A Portland Cement Works with associated ground workings is present from about 450m. <b>S:</b> No significant change. <b>W:</b> Quarry, Old Chalk Pit and Gravel Pit present in southern half of Zone 6B. Old Gravel Pit and Chalk Pit shown in Zone 6A. Smithy present on western boundary of Zone 6A. Swanscombe has undergone expansion to include further residential properties, roads and Football Ground. Crayland Lane (new road) present about 700m distant, with Chalk and Gravel Pits present beyond.
1895 1:10,560	No significant change.	<b>N, E, W:</b> No significant change. <b>S:</b> Watercress Bed shown on land surrounding River Ebbsfleet about 900m south.
1897 1:2,500	No significant change.	No significant change.
1898 1:10,560	Gravel Pit within Zone 6B extends into Zone 6C (very minor extent)	<b>N, E, S:</b> No significant change. <b>W:</b> Old Clay Pit located about 300m southwest.
1907 1:10,560	Tramway across Zone 6C diverts north to Chalk Pits now shown in Zone 6A.	<b>N:</b> A pond is shown in Zone 4B. <b>E:</b> Expansion reconfiguration to Portland Cement Works on bank of River Thames. <b>S:</b> Area of ground workings shown about 670m southwest (west of Zone 7). <b>W:</b> Marl Pit, further ground workings and Barracks shown in Zone 6B.
1909 1:2,500	Allotment gardens present in southeast corner.	<b>N:</b> No coverage <b>E:</b> Partial coverage only. There are further residential properties in Northfleet, present immediately beyond railway line. <b>S:</b> Small quarry shown in Zone 7A, access appears to be via Zone 6C. <b>W:</b> Allotment gardens shown in Zone 6B (next to barracks) and extending outside of Zone 6.
1923 1:10,560	Minor ground workings shown in north of Zone 6C.	<b>N, E, S, W:</b> Partial coverage to the south. No significant change.
1932 1:10,560	Pavilions and Sports Ground to west of River Ebbsfleet.	<b>N:</b> Thames Tar Distillery present in north of Zone 4B. Further Paper Mills present in south of Zone 4B. Britannia Lead Works and Tower Works present in place of Portland Cement Works on River Thames. <b>E:</b> Further residential properties present beyond North Kent Railway line. To the southeast, Old Chalk Pits surround railway line on both sides (from 200m distant). <b>S:</b> Portland Cement Works with associated tanks and tramway present adjacent to Zone 6C (within Zone 7A). Northern half of Zone 7 labelled as Old Chalk Pit. Sewage Works present about 460m south (within Zone 7B). <b>W:</b> Quarry in Zone 6B labelled as Baker's Hole. Chalk Pits in Zone 6A now labelled Old Chalk Pits. Substantial expansion to development in Swanscombe (residential properties).

Date and scale	Within Zone 6C	Surrounding area
1938 1:10,560	No significant change.	<b>N, E, S:</b> No significant change. <b>W:</b> Terraced residential properties present in previous location of allotments (525m distant).
1946 1:10,560	Minor expansion to sports facilities within Zone 6C.	<b>N:</b> Zone 4C is labelled as a Sports Ground. <b>E:</b> No significant change. <b>S:</b> Tramway shown along the length of the Old Chalk Pit through Zone 7. <b>W:</b> Some vacant plots shown within Swanscombe.
1952 1:2,500	Ruin and Pump House labelled in south of Zone 6C.	<b>N:</b> Paper Sacks Factory present 75m north on previously vacant land. <b>E:</b> Large area of former ground workings (450m distant) labelled as Old Chalk Pit. <b>S:</b> Partial coverage only. Site of Roman Building on Zone 6C / Zone 7A boundary. Former Old Chalk Pits adjacent to southeast labelled as a Pond. <b>W:</b> No significant change.
1955 1:10,560	No significant change.	<b>N:</b> Partial coverage only to north. No significant change. <b>E:</b> Ebbsfleet Pleasure Ground and playground adjacent to east. <b>S:</b> Extent of ground workings in Zone 7 has expanded to the west to cover the majority of the area. Swanscombe Park labelled to southwest (from 1km) <b>W:</b> Baker's Hole no longer labelled in Zone 6B, with minor changes to ground workings in area. Craylands ground workings (270m west) shown as area of infilling. Further residential development within Swanscombe, nearest from 500m.
1966 1:10,560	No significant change.	<b>N:</b> Partial coverage only. Expansion to Paper Sack Factory (further associated buildings shown). <b>E:</b> Significant change to industrial / commercial buildings 800m east (on bank of River Thames). Structures all unlabelled. <b>S:</b> Further ground workings and possible areas of infilling shown in northern part of Zone 7A. Neolithic Pottery and Flints found. <b>W:</b> Further ground workings in Zone 6A and Zone 6B, Paleolithic Flints found in Zone 6B. Roman Burial labelled to have been found on Zone 6B western boundary in 1955. Ridge orientated approximately east-west extends perpendicular to Zone 6B boundary. Further residential development shown in south of Swanscombe.
1971 1:10,000	Path of River Ebbsfleet no longer continuous (possibly culverted). Drains surrounding the river are no longer shown. A Pump House is present in the south of the Zone.	<b>N:</b> Partial coverage only. No significant change. <b>E:</b> Further changes to commercial / industrial land uses on bank of River Thames. Uses unspecified (labelled Works). <b>S:</b> Pits in Zone 7 labelled as disused. Sewage Works labelled in Zone 7B. <b>W:</b> Ridge extending perpendicular to west of Zone 6B boundary labelled as a conveyor. Recreation Ground shown on former area of ground workings (570m distant).
1973 1:10,000	No coverage.	Coverage to north only. No significant change.
1977 1:10,000	Most of area to west of River Ebbsfleet is labelled as a Sports Ground.	<b>N:</b> partial coverage only. No significant change. <b>E:</b> Ebbsfleet Pleasure Ground and playground no longer present. Residential properties developed on previously vacant plots in Northfleet (from 250m) <b>S:</b> Further ground workings in south of Zone 7. <b>W:</b> Further ground workings in Zone 6A and 6B. Possible infilling shown in disused pit in east of Zone 6A. School present in southeast of Swanscombe (600m from Zone 6B).
1982 1:10,000	No coverage.	Coverage to north only. No significant change.
1990 1:10,000	No significant change.	<b>N:</b> Industrial Estate present from 65m (adjacent to Paper Sack Factory). <b>E:</b> Further residential properties present adjacent to North Kent Railway Line.



Date and scale	Within Zone 6C	Surrounding area
		<p><b>S:</b> Most ground workings in Zone 7 no longer evident, except for small area of possible infilling in centre of Zone.</p> <p><b>W:</b> Most of Zone 6A and Zone 6B shown as areas of infilling. Small area of infilling at disused pit off Craylands Lane.</p>
1992 1:10,000	No coverage	Coverage to north only. No significant change.
1993 1:10,000	No coverage	<b>N:</b> Zone 4B is labelled to be an Industrial Estate.
2001 1:10,000	No significant change.	<p><b>N:</b> No significant change.</p> <p><b>E:</b> No significant change.</p> <p><b>S:</b> Zone 7 appears as open land, no detail shown.</p> <p><b>W:</b> No detail shown in Zone 6A or Zone 6B. No significant change to development in Swanscombe.</p>
2010 1:10,000	Zone has been developed to its current configuration.	No significant change.

### 10.1.6 Summary of historical land uses

On the earliest available map Zone 6C was shown to be bisected by the River Ebbsfleet and further divided by drains and streams associated with the river. At this time the area was indicated to be liable to flooding. Between circa 1888 and 1907 there was little change to Zone 6C, save for tramways crossing the zone associated with ground workings and quarrying in the surrounding area. Small areas of ground workings encroached into the zone (in the west, dated 1889 and in the north, dated 1932). Between the 1930s and approximately the 1990s, most of the area was used as a sportsground for a variety of sports and housed a pavilion. These facilities were expanded over time. In particular, this occurred after the River Ebbsfleet was culverted in approximately the 1970s, from which time the associated drains and streams are also no longer shown on mapping. A Pump House was also present in the south of Zone 6C from around the time that the river was culverted. The next significant developed within Zone 6C was associated with the construction of the HS1 railway, when the area was redeveloped to its current configuration.

## 10.2 Environmental context

### 10.2.1 Geology

The 1:50,000 BGS Geology Sheet Map for the area (217 – Dartford) [18] indicates the geology within Zone 6C to be influenced by the presence of the River Ebbsfleet. Around the channel of the River Ebbsfleet, the Zone is underlain by Alluvium (mainly silt and clay, locally peaty). This is shown at the surface over approximately 50% of the area. Beneath this and covering the remainder of the site are Head Deposits (silt, sand and clay with variable gravel; chalky in places). These superficial deposits are underlain by the Upper Chalk Formation, described as soft white chalk with courses of flints, which is regionally up to 70m thick. Made Ground will also be expected at the surface, consistent with the relatively limited history of development in the Zone. In particular, fill materials may be present in the the area of the River Ebbsfleet's former drainage channels.

### 10.2.2 Historical borehole records

There are a number of available to view historical BGS borehole records located within Zone 6C (related to the Channel Tunnel Rail Link ground investigations). These exploratory holes generally proved the stratigraphic sequence



shown by the available geological map (see 10.2.1). In general no or a limited thickness of Made Ground (gravel of chalk and flint) was recorded. The exception to this was where up to 2m thickness of fill was recorded in two exploratory holes (no description / detail provided), inferred to relate to culverting of the River Ebbsfleet or raising ground levels in that area. Superficial deposits were generally between about 4 to 11m thick and were comprised of a variable sequential thickness of Alluvium, River Terrace Deposits and Head Deposits, beneath which was the Upper Chalk.

### 10.2.3 Historical reports

No historical reports related to Zone 6C have been obtained.

### 10.2.4 Surface water

The River Ebbsfleet bisects Zone 6C. The river flows in an approximately south to north direction from a spring source in Springhead to the River Thames on the eastern side of the Swanscombe Peninsula. The earliest available maps for Zone 6C (dated 1865) showed a number of drains / streams associated with the river within Zone 6C. However, by the map dated 1971 these were no longer evident, and the river was shown to be part culverted. The River Thames is located approximately 700m east at its nearest point. Sawyer's Lake (also known as Blue Lake), a former chalk pit, is also located about 70m southeast of Zone 6C at its nearest point. The lake is located at a topographically lower level compared to the surrounding roads.

### 10.2.5 Groundwater

One available to view historical BGS exploratory hole recorded encountering groundwater at 5.2m bgl within Head Deposits. No further data specific to Zone 6C has been obtained. However, a shallow / perched groundwater body is expected in the superficial deposits, along with a deeper groundwater aquifer in Chalk.

### 10.2.6 Abstractions

The nearest groundwater abstraction is located about 220m south of Zone 6C, described as Point B at Blue Lake Northfleet Cement Works. There are three active licenses and one historical license associated with this, all licensed to Lafarge Cement UK Plc. The active licenses relate to abstraction for non-evaporative cooling, process water, spray irrigation and general use relating to a secondary category. The annual abstraction volume listed on each of these licenses is 1,186,000m<sup>3</sup>, with a maximum daily volume of 4,374m<sup>3</sup>. There are several other records of groundwater abstraction in the area surrounding Sawyer's Lake. There are no potable water abstractions within 1km of Zone 6C.

### 10.2.7 Groundwater vulnerability

The southern / eastern part of Zone 6C is located within Source Protection Zone 1 (inner catchment), associated with the groundwater abstractions located in the vicinity of Sawyer's Lake. The northern / western part of the Zone is located within Source Protection Zone 2 (outer catchment). Zone 6C is over in part a Secondary A Aquifer in superficial deposits, and in part a Secondary (Undifferentiated) Aquifer. The chalk bedrock is a Principal Aquifer.

## 10.3 Regulatory data

### 10.3.1 Data summary

The full 2020 Groundsure dataset has been reviewed and summarised in Table B (Appendix B). The key items of relevant information within Zone 6C are described in the following subsections.

### 10.3.2 Mineral workings

Historical mapping showed very limited areas of ground workings that encroached into Zone 6C. These were evident for limited periods of time with no real evidence of extraction or infilling. The 2020 Groundsure dataset identifies the nearest historical mineral planning area to be 'Southfleet' surface mineral working for Chalk, located 100m east of Zone 6C at its nearest point.

### 10.3.3 Designated environmentally sensitive sites

There are no designated environmentally sensitive sites within Zone 6C. The only designated site within 1km is the Baker's Hole Site of Special Scientific Interest (SSSI) and Scheduled Ancient Monument, located in Zone 6B. Zone 6C is located in a SSSI Impact Risk Zone for all developments (except householder) outside or extending outside existing settlements / urban areas.

### 10.3.4 Environmental permits, incidents and registers

There are very limited records of environmental permits, incidents and registers within 1km of Zone 6C that have the potential to impact the zone. Those relevant records are presented below.

#### Discharge consents

There is one record of a discharge consent located within Zone 6C, the details for which are summarised in Table 10-2. There are several further discharge consents located on the eastern side of the Swanscombe Peninsula, all with discharge to the River Thames. The nearest of these is about 550m distant. All other records within 1km of Zone 6C are located in other zones of the wider London Resort site.

**Table 10-2 - Licensed discharge consents within Zone 6C.**

Location	Address	Effluent type	Receiving water	Status
Zone 6C	Lafarge Cement UK The Shore Northfleet DA11 9AN	Trade discharges – mineral workings	River Ebbsfleet	Issued – 06 Oct 1993

#### Pollution incidents

There are six records of pollution incidents between 100 and 250m from Zone 6C, and 18 further records within 1km. The vast majority of these incidents had no (Category 4) impact or minor (Category 3) impact to air, water and land. The incidents that had impact of magnitude greater than Category 3 are summarised in Table 10-3.

**Table 10-3 - Pollution incidents in vicinity of Zone 6C.**

Location	Incident date	Pollutant	Impact
Off-site (120m east)	04 May 2004	Atmospheric pollutants and effects - dust	Air – Category 2 (air) Land – Category (minor) Water – Category 4 (no impact)
Off-site (345m east)	30 April 2004	Atmospheric pollutants and effects - dust	Air – Category 2 (air) Land – Category (minor) Water – Category 4 (no impact)

Location	Incident date	Pollutant	Impact
Zone 7B (200m south)	13 April 2018	Inert materials and wastes – mineral materials and wastes	Air – Category 4 (no impact) Land – Category 3 (minor) Water – Category 2 (significant)

### 10.3.5 Landfills and other waste sites

There are limited records of landfills and other waste sites within 1km of Zone 6C that have a potential to impact the Zone. Those sites that do have a potential to impact Zone 6C relate to activities within Zone 6A and Zone 6B, i.e. Bamber Pit and Northfleet Landfill. These sites are discussed in Section 8.7.5.

### 10.3.6 Unexploded ordnance (UXO)

A detailed UXO risk assessment was carried out in accordance with relevant guidance [13] and reported for the wider site in 2014. The report of that assessment is included as an Appendix to the desk study report [1]. The assessment considered the overall risk for the wider site as High.

## 10.4 Conceptual Site Model

### 10.4.1 Sources

Review of the 2020 Groundsure Report and other data sources (geological and historical maps etc.) has identified a relatively limited history of development within Zone 6C. Potential sources of contamination within Zone 6C and in the surrounding area (off-site) are summarised in Table 9-4.

**Table 10-4 – Summary of potential sources of contamination.**

Location	Potential source	Likely age	Potential contaminants of concern
Zone 6C	Fill and Made Ground associated with development within Zone 6C.	Up to ~150 years	Asbestos, metals, TPH, PAHs. Ground gas (methane, carbon dioxide)
Zone 6C and surrounding area	Alluvium (including peat) and Head Deposits	Up to 3 million years	Ground gas (methane, carbon dioxide)
Zone 6C	Current and historical land uses in Zone 6C (tramway, car parking, train station, railway line).	Up to ~100 years	Asbestos, metals, TPH, PAHs, VOCs and SVOCs, glycols
Off-site (from adjacent)	Current and historical land uses in surrounding area: landfills [Bamber Pit and Northfleet Landfill], railway line and tramways, sewage works, Paper Sacks Factory, barracks, rifle range	Up to ~150 years	Asbestos, metals, TPH, PAHs, landfill leachate. Ground gas (methane, carbon dioxide)

### 10.4.2 Pathways and receptors

The details of the development proposals are unconfirmed at this stage. However, it is anticipated that land uses at Zone 6C will remain largely unchanged. A transport interchange will be integrated with Ebbsfleet International Station to transport London Resort visitors to the main gates of the development. There is also potential for further areas of car parking to be included in the zone. Potential pathways and receptors are considered in terms of the proposed

future use, and therefore have potential to impact upon human and environmental receptors both in the short term (during construction / development) and in the long term (during the proposed future use). Pathways and receptors relevant to Zone 6C are provided in Table 10-5.

**Table 10-5 - Summary of receptors and potential pathways.**

Receptor		Pathway
Human Health	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres
	Zone workers	
	Trespassers	Inhalation of soil and groundwater derived vapours
	Zone neighbours	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion
Controlled Waters	Principal Aquifer in bedrock	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Principal Aquifer
	Secondary (Undifferentiated) Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater Lateral and vertical migration of contaminated groundwater to the Secondary (Undifferentiated) Aquifer
	River Ebbsfleet	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.
	River Thames	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters. Migration via secondary rivers (River Ebbsfleet).
Buildings / Services	Buried concrete foundations Potable water supply pipework	Direct contact Aggressive attack

### 10.4.3 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above has been carried out with reference to relevant good practice [14] and is summarised in Table 10-6. The assessment assumes that standard mitigation measures are adopted, for example appropriate site controls during construction (to ensure suitable health, safety and hygiene regime), use of gas protection measures in buildings, use of appropriate foundation solution / piling technique and provision of a clean capping layer in areas of soft landscaping.

**Table 10-6 - Summary of risk assessment for Zone 6C.**

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Zone 6C Fill and Made Ground within Zone 6C.	Zone visitors	Inhalation, ingestion and / or dermal contact with contaminants in soil and soil-derived dust/fibres Inhalation of soil and groundwater derived vapours	Severe	Unlikely	Moderate / low
	Zone workers				
Alluvium and Head Deposits	Trespassers	Migration and accumulation of ground gases, followed by inhalation or ignition, causing asphyxiation and/or explosion	Medium	Unlikely	Low
	Zone neighbours				
Current and historical land uses in Zone 6C	Secondary Aquifer in superficial deposits	Leaching from unsaturated soils followed by migration in the groundwater	Medium	Unlikely	Low

Zone / Source	Receptor	Pathway	Consequence	Probability	Risk
Current and historical land uses in surrounding area	Principal Aquifer in bedrock	Vertical migration to the Secondary Aquifer and Principal Aquifer			
	River Thames	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters. Migration via secondary rivers (River Ebbsfleet).	Mild	Unlikely	Very low
	River Ebbsfleet	Leaching and migration of contaminants from soils. Direct surface water run-off and sub-surface flow to surface waters.	Mild	Low likelihood	Low
	Buildings / Services	Direct contact Aggressive attack	Mild	Unlikely	Very low



## 11 References

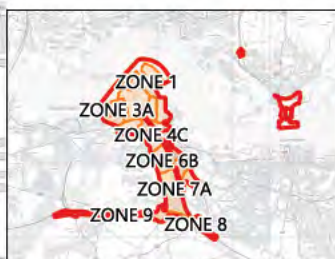
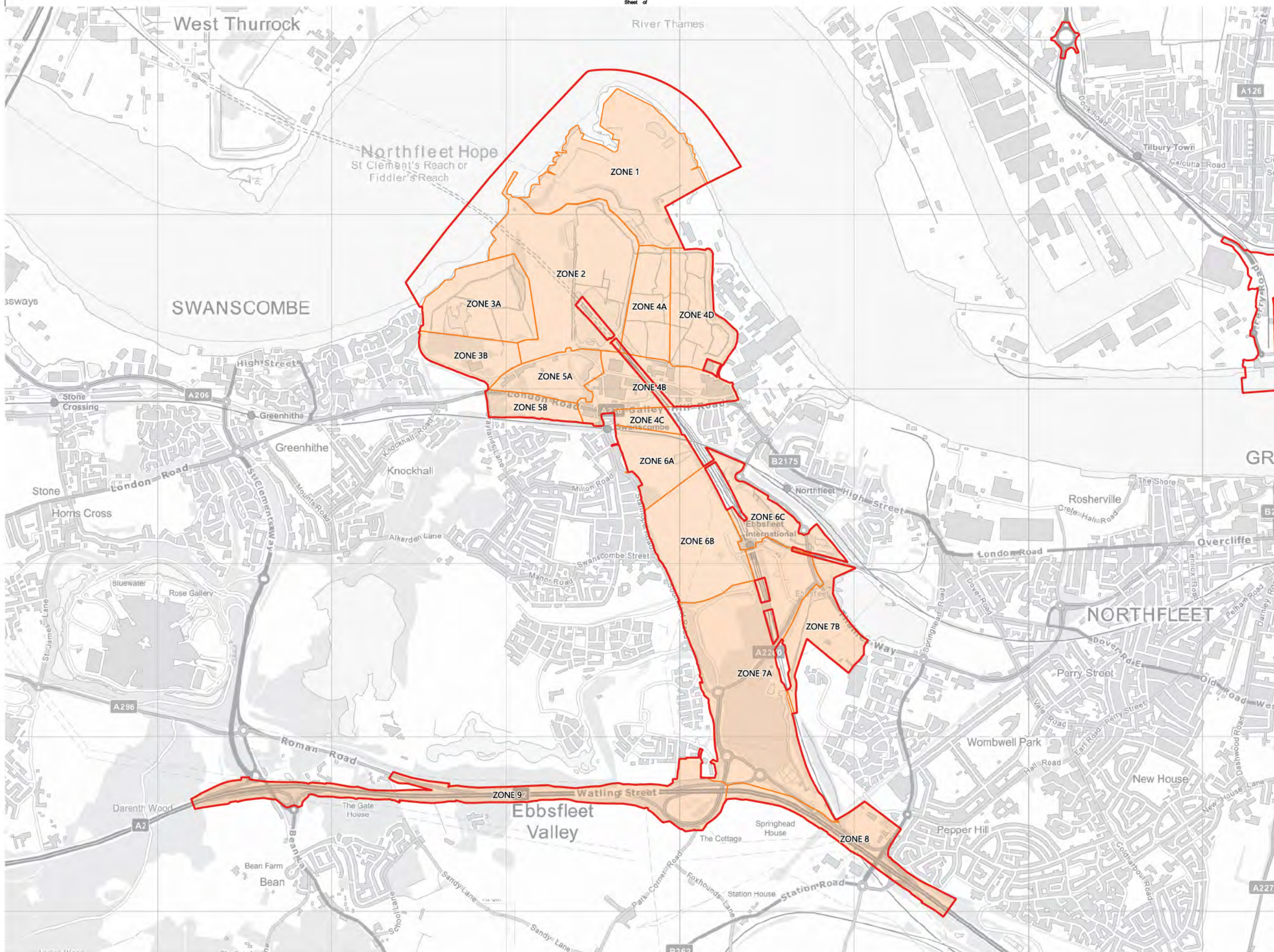
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## Appendix A Relevant Figures





Key  
 DCO Order Limits  
 Zoning of Kent Project Site

**BURO HAPPOLD**

Project: The London Resort Project No: 0042936

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PD	Issue	23/02/20	NS/IM
Rev	Reason for Issue	Date	Draw/Chk

THE LONDON RESORT DEVELOPMENT CONSENT ORDER  
Zoning of Kent Project Site

Sheet of

Application Number  
**BC080001**

Drawing Reference  
**Figure 1**

Scale: **1:10,000 @ A1** Sheet: **1 of 1** Revision: **P01**



## Appendix B Regulatory data summary (Groundsure 2020)

### B.1 Zone 1

Table B-1 - Summary of regulatory data for Zone 1.

Item	Location [relative to Zone 1]	Information	Potential to impact
<b>Past land use</b>			
Historical industrial land uses	On-site	Unspecified station dated 1973. Record relates to Port of London Authority unmanned radar / weather station	No
	<100m	Unspecified depot located from adjacent to Zone 1. Records dated 1973 and 1981 and relate to development at area now occupied by Northfleet Industrial Estate. <b>All other records (excluding those within other site zones) ~1km distant from Zone 1.</b>	Yes
Historical tanks	<100m	Records of five tanks associated with area currently occupied by Northfleet Industrial Estate. Dated between 1970 and 1999. <b>All other records (excluding those within other site zones) ~1km distant from Zone 1.</b>	Yes
<b>No records of the following within 1km of Zone 1 (excluding those within other site zones): historical energy features, historical garages, historical petrol stations or historical military land.</b>			
<b>Waste and landfill</b>			
Historical landfill (EA records)	On-site	Zone 1 identified as Broadness Landfill. Accepted inert and industrial waste between 1977 and 1992, operated by Blue Circle Industries Plc.	Yes
	<100m	Zone 2 (from adjacent) identified as South Pit Landfill. Accepted inert and industrial waste between 1977 and 1992, operated by Blue Circle Industries Plc.	Yes
	>250m	Botany Road Landfill located to the west of Zone 4D (from about 250m southeast of Zone 1). Accepted inert, industrial and special waste between 1977 and 2000, operated by Britannia Refined Metals. <b>All other records (excluding those within other site zones) ~1km distant from Zone 1.</b>	No
Historical waste sites	>100-250m	Leachate disposal plant located in north / centre of Zone 2, associated with South Pit Landfill. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	Yes
Licensed waste sites	<100m	South Pit Landfill (Zone 2) is a licensed Industrial Waste Landfill, EA/EPR/KP3998HW/V004.	Yes
	>250m	Botany Road Landfill is a licensed waste site. Operated by Britannia Refined Metals. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	No
Waste exemption	<100m	Waste exemption held for Botany Marsh, for use of waste in construction.	Yes
	>250m	Record for ~300m southeast (address unrecorded). Relates to deposit of waste for dredging of inland rivers, burning of waste in the open, and storage of waste in secure place. Location corresponds with Botany Road Landfill. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	No
Historical Local Authority landfill records	<100m	Refuse tip identified within Zone 2 (from adjacent) from 1970 historical mapping.	Yes
	>250m	Refuse tip identified within Zone 2 (from 500m) from 1971 historical mapping. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	Yes
EA active or recent landfill sites	<100m	South Pit Landfill (Zone 2, from adjacent) Phase 3 listed as industrial waste landfill. South Pit Phase 3 Landfill (Zone 2, from adjacent) also recorded. All other sites >1km distant from Zone 1. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	Yes
Permitted waste sites	<100m	South Pit (Zone 2) identified as Industrial Waste Landfill, license EA/EPR/EB3802FX/V002 <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 1.</b>	Yes
<b>No historical BGS landfill records within 500m of Zone 1.</b>			



Item	Location [relative to Zone 1]	Information	Potential to impact
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Pylon, landing stages, radar station, mast	No
	<100m	Off-site: electricity substation, tank, construction and tool hire, moorings and unloading facilities.	No
	100 - <250m	Off-site: wharf, depot, conveyors	No
	>250m	Off-site: conveyors, chimneys, tanks, electricity substation, unspecified works or factories, concrete products, sand and gravel works, container and storage <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Licensed pollutant release Part A2 and B	>100-250m	Offsite (~150m southeast): Two current permits attributed to CEMEX Concrete Products Ltd for use of bulk cements. Records for 100m southeast (off-site) and 230m south (within Zone 4D). No enforcements notified.	No
	>250m	Off-site (~700m southeast): Historical permit related to timber manufacture on Botany Road. No enforcements notified. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Licensed discharges to controlled waters	<100m	Within Zone 2: Two records (current and superseded) related to release of trade / process effluent from Broadness Marsh to River Thames. One revoked license for release of sewage to River Thames.	Yes
	>100-250m	Off-site (~150m southeast): record attributed to Northfleet Industrial Estate for release of trade effluent from lagoon outlet, dated 1978.	Yes
	>250m	Offsite: Three records related to Britannia Refined Metals (350-550m distant), related to site, sewage or trade discharges to the River Thames. Dated 1969-1996. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Pollutant release to surface waters	<100m	Within Zone 2: Two licenses (modified) associated with release of trade discharge associated with Broadness Marsh. Attributed to a discharge point on the disused jetty within Zone 2 (~100m northwest of Zone 1). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	Yes
Pollution incidents (EA)	On-site	Pollution incident dated 2003 related to release of contaminated water (landfill leachate). No impact (Category 4) to air, minor impact (Category 3) to land and water. Pollution incident dated 2002 related to presence of suspended solids within contaminated water. No impact to air, minor impact to land and water.	Yes
	>250m	Record of oil / fuel release ~600m southeast. No impact (Category 4) to air, land and water. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Licensed industrial activities Part A(1)	<100m	Within Zone 2: record (superseded) related to waste landfilling of South Pit Phase 3 but Lafarge Cement UK Plc.	Yes
	>250m	Off-site (300m southeast): Melting of non-ferrous metals at Britannia Refined Metals Ltd Off-site (600m southeast): Melting of non-ferrous metals at Britannia Refined Metals Ltd <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
List 1 dangerous substances	<100m	Within Zone 2: Related to discharge to River Thames from Blue Circle Tip. Attributed to a discharge point on the disused jetty within Zone 2 (~100m northwest of Zone 1).	Yes
	>250m	Off-site (300m southeast): Related to release of mercury and cadmium to River Thames by Britannia Refined Metals Ltd (associated with Botany Road Landfill). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
List 2 dangerous substances	<100m	Within Zone 2: Related to discharge to River Thames from Blue Circle Tip. Attributed to a discharge point on the disused jetty within Zone 2 (~100m northwest of Zone 1).	Yes
	>250m	Off-site (300m southeast): Related to release of arsenic, copper, lead, nickel and zinc to River Thames by Britannia Refined Metals Ltd (associated with Botany Road Landfill). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Pollution inventory substances	>250m	Off-site (300m southeast): Attributed to Britannia Refined Metals Ltd for use of metals for melting (lead, cadmium, alloys). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Pollution inventory waste transfers	<100m	Within Zone 2: Record relates to physio-chemical treatment of landfill leachate associated with landfilling of South Pit Phase 3. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	Yes

Item	Location [relative to Zone 1]	Information	Potential to impact
COMAH sites	>250m	Off-site (200m southeast): Britannia Refined Metals Ltd is a current COMAH site. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
Historical licensed industrial activities	>250m	Off-site (650m southeast): Record related to use of non-ferrous metals by Britannia Refined Metals Ltd. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 1.</b>	No
<b>No records of the following within 1km of Zone 1 (excluding records within other site zones): high voltage underground electricity cables, gas pipelines, Part 2a sites, regulated explosive sites, hazardous substance storage / usage, radioactive substance authorisations, pollutant release to public sewer, pollution inventory radioactive waste, current or recent petrol stations.</b>			
<b>Environmental, visual and cultural designations</b>			
Marine Conservation Zones	<100m	The area of the River Thames bordering the northwest of Zone 1 is a designated Marine Conservation Zone.	No
Priority Habitat Inventory	On-site	Small areas of Zone 1 (<10%) are identified as deciduous woodland, coastal and floodplain grazing marsh or coastal saltmarsh.	Yes
	<100m	Small areas on the foreshore of the River Thames (adjacent to Zone 1) are identified as coastal saltmarsh and mudflats. <b>Various habitats are identified within the other Zones, described in the relevant subsection of this report.</b>	Yes
SSSI impact risk zone	On-site	Zone 1 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	No
<b>No records of the following (within 1km of Zone 1): Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt Land, Open Access Land, Tree Felling Licenses, Scheduled Ancient Monuments, SSSIs, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conservation Areas, Conserved Wetland Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Listed Buildings, Local Nature Reserves, National Nature Reserves, National Parks, Nitrate Sensitive Areas, Nitrate Vulnerable Zones, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, SSSIs, World Heritage Sites.</b>			

## B.2 Zone 2

Table B-2 - Summary of regulatory data for Zone 2.

Item	Location [relative to Zone 2]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	On-site	Gasworks and gasometer dated 1907 located in southwest of Zone 2. Electricity substation dated 1970 to 1984 located in south of Zone 2.	Yes
	>250m	Off-site: Various substations from ~400m distant, dated 1970s to 1990s. Gasometer dated 1898 ~900m distant.	No
Historical garages	>250m	Off-site: various records of garages and service stations. Nearest about 450m distant and dated 1993.	No
Historical industrial land uses	On-site	Cement works, gasworks, gasometer, marshes, mineral railway sidings, railway buildings, railway sidings, refuse tip, sewage disposal works, tramway building, tramway sidings, unspecified commercial / industrial, unspecified ground workings, unspecified heap, unspecified tanks, unspecified wharf, unspecified works	Yes
	<100m	Cement works within Zone 3A, 5A and 5B, industrial estate within Zone 4B (dated 1990s onwards). Old chalk pits within Zone 5A. Old paper mill within Zone 4B. Refuse tip within Zone 4B. Tar distillery within Zone 4B. Sidings within Zone 3A, 3B, 5A, 4B. Unspecified mills within Zone 4B. Tanks within Zone 5A. Unspecified works within Zone 3B, 5A, 4B. Whitening works in Zone 3B.	Yes
	>250m	Off-site: Cement works located off-site to the east (adjacent to Zone 4D and extending along shore of River Thames), from 600m distant. Dated 1880s to 1930s. Chalk pits located from 400m off-site, dated 1890s onwards. Also (all >400m distant): corn mill, cuttings, old / disused chalk pit, disused windmill, gravel pit, industrial estate, lead works, old sand and gravel pit, old paper mills, paper store, pump house, quarry, railway sidings, refuse tip, smithy, tower works, tramway sidings, unspecified commercial / industrial, unspecified depot, unspecified factory, unspecified heap, unspecified mills, tanks, unspecified wharf, unspecified works, unspecified yard, wharf.	No
Historical mineral planning areas	>250m	Off-site: Area of land 350m south (adjacent to Zone 5B) identified as 'Swanscombe' surface mineral working for Chalk. Area of land 400m southwest identified as 'Craylands Lane' surface mineral working for sands and gravel. Area of land located 470m east (adjacent to Zone 4D) identified as 'Southfleet' surface mineral working for Chalk	No
Historical petrol station	>250m	One record of a historical petrol station located 265m southwest and dated 1952.	No
Historical railway features	On-site	Historical railway features extended from wharf in Zone 2, south through Zone 3A, 3B, 5A and 5B. Also extend from Zone 5B east-west to eastern side on peninsula.	Yes
Historical tanks	On-site	Records of historical tanks in area of sewage station (1930s to 1970s) and former gas works (1900s).	Yes
	>250m	Off-site: nearest records ~300m distant.	No
<b>No records of the following within 1km of Zone 2 (excluding records within other site zones): military land</b>			
<b>Waste and landfill</b>			
Permitted waste sites	On-site	South Pit and Surge Pile, identified as Industrial Waste Landfill (Factory curtilage). License issued in 1977 (EA/EPR/EB3802FX/V002), now closed. South Pit Phase 3 Landfill, accepted >10 T/D with capacity >25,000T excluding inert waste. License issued 2017 (EPR/RP3039SZ), transfer effective. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 2.</b>	Yes
Waste exemptions	>250m	Off-site: Nearest record 300m south for use of waste in construction, associated with a network rail substation. Several other exemptions held for 350m-1km distant. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 2.</b>	No
EA active or recent landfill sites	On-site	South Pit Phase 3 Landfill, accepted >10 T/D with capacity >25,000T excluding inert waste. South Pit and Surge Pile Landfill, Accepted Industrial Waste (factory curtilage). Listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 2.</b>	Yes



Item	Location [relative to Zone 2]	Information	Potential to impact
Historical landfill (EA records)	On-site	Zone 2 identified as South Pit Landfill. Accepted inert and industrial waste between 1977 and 1992, operated by Blue Circle Industries Plc.	Yes
	<100m	Zone 1 identified as Broadness Landfill. Accepted inert and industrial waste between 1977 and 1992, operated by Blue Circle Industries Plc.	Yes
	>250m	Off-site: Botany Road Landfill located to the west of Zone 4D (from about 500m east of Zone 2). Accepted inert, industrial and special waste between 1977 and 2000, operated by Britannia Refined Metals. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Historical Local Authority landfill records	On-site	Refuse tips located within Zone 2 from 1970 and 1971 mapping.	Yes
	<100m	Refuse tip located within Zone 5A from mapping dated 1970 to 1984. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	Yes
Historical waste sites	On-site	Leachate disposal plant located in north / centre of Zone 2, associated with South Pit Landfill.	Yes
	>250m	Off-site (800m southeast): One record from a historic planning application for a Waste Transfer Station. Attributed to Kent Kraft Industrial Estate. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Licensed waste sites	On-site	South Pit and Surge Pile Landfill is a licensed Industrial Waste Landfill, EA/EPR/KP3998HW/V004. Licensed from 1977, modified 2015.	Yes
	>250m	Off-site: Botany Road Landfill (600m east) was a licensed Industrial Waste Landfill (Factory curtilage) waste site from 1997 to 1998. Operated by Britannia Refined Metals. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
<b>No historical BGS landfill records within 1km of Zone 2.</b>			
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Sewage works, travelling crane, wharf, sewage pumping station	Yes
	<100m	Within Zone 1 and 4A: pylon. Within Zone 5A: electricity substation, construction tool hire. Within Zone 4B: construction suppliers, plate makers / print finishers, electricity substation.	No
	>250m	Off-site: industrial uses generally concentrated along eastern side of peninsula. This includes: containers and storage; electricity substation; tanks, moorings and unloading facilities; construction and tool hire; chimneys; conveyor; metal manufacturers; fabricators and stockholders; works; traveling crane; mooring posts; telecommunications facilities; new vehicles; concrete products; vehicle hire and rental; sand, gravel and clay extraction and merchants; printing solutions; vehicle cleaners; depot; unspecified quarries. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
List 2 dangerous substance inventory site	On-site	Related to discharge to River Thames from Blue Circle Tip. Attributed to a discharge point on the disused jetty.	Yes
	>250m	Off-site (700m east): Related to release of arsenic, copper, lead, nickel and zinc to River Thames by Britannia Refined Metals Ltd (associated with Botany Road Landfill). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Pollution incidents	On-site	Pollution incident dated 2003 related to release of contaminated water. No impact (Category 4) to air and land, minor impact (Category 3) to water. Pollution incident dated 2007 related to release of crude sewage. Significant impact (Category 2) impact to water, no impact (Category 4) to air and land. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
List 1 dangerous substance inventory site	On-site	Related to discharge to River Thames from Blue Circle Tip. Attributed to a discharge point on the disused jetty.	Yes
	>250m	Off-site (700m southeast): Related to release of mercury and cadmium to River Thames by Britannia Refined Metals Ltd (associated with Botany Road Landfill). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Pollution inventory waste transfers	On-site	Record relates to physio-chemical treatment of landfill leachate associated with landfilling of South Pit Phase 3.	Yes
	>250m	Off-site (485m east): record relates to Britannia Refined Metals for recycling / reclamation of metals and metal compounds, oil refining and other uses of oil. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No

Item	Location [relative to Zone 2]	Information	Potential to impact
Red list discharge consents	On-site	Two licenses (modified) associated with release of trade discharge associated with Broadness Marsh. Attributed to a discharge point on the disused jetty. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	Yes
Local Pollution and Prevention Control (LPPC) activities Part A(1)	On-site >250m	Record (superseded) related to waste landfilling of South Pit Phase 3 by Lafarge Cement UK Plc. Off-site (500m southeast): Melting of non-ferrous metals at Britannia Refined Metals Ltd Off-site (680m southeast): Melting of non-ferrous metals at Britannia Refined Metals Ltd <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	Yes No
Discharge consents	On-site  >250m	On jetty: two records (current and superseded) related to release of trade / process effluent from Broadness Marsh to River Thames. One revoked license for release of sewage to River Thames. In the south of Zone 2: license dated 2019 for sewage discharge to unnamed tributary to River Thames. Historic license dated 1993-2000 for release of trade discharge from mineral workings to unnamed drain to River Ebbsfleet. Off-site: record attributed to Northfleet Industrial Estate (485m east) for release of trade effluent from lagoon outlet, dated 1978. Three records related to Britannia Refined Metals (525-705m distant), related to site, sewage or trade discharges to the River Thames. Dated 1969-1996. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	Yes  No
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	On-site >250m	Historical record of Part B permit for use of bulk cement. No enforcements notified. Off-site: Current Part B permit attributed to CEMEX Concrete Products Ltd (365m east) for use of bulk cements. No enforcements notified. Several other current and historical Part B permits >700m distant, generally located on eastern side of peninsula, for: timber manufacture, use of bulk cement, metal coating, unloading of petrol etc. No enforcements notified. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	Yes No
Pollution inventory substances	>250m	Off-site (500m east): Attributed to Britannia Refined Metals Ltd for use of metals for melting (lead, cadmium, alloys). <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
COMAH sites	>250m	Off-site (450m east): Britannia Refined Metals Ltd is a current COMAH site. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Radioactive substance authorisations	>250m	Off-site (700m south): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste.	No
Historical licensed industrial activities	>250m	Off-site (680m east): Record related to use of non-ferrous metals by Britannia Refined Metals Ltd. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
Hazardous substances storage (HSE)	>250m	Off-site (680m): Approved authorisation since 2015 for storage of various hazardous materials at Britannia Refined Metals Ltd. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 2.</b>	No
<b>No records of the following within 1km of Zone 1 (excluding records within other site zones): Part 2A sites, pollutant releases to public sewer, radioactive pollution inventory, regulated explosive sites.</b>			
<b>Environmental, visual and cultural designations</b>			
Open Access Land	>250m	Off-site (800m southwest): Swanscombe Skull Site NNR, defined as Section 16 dedicated land.	No
Sites of Special Scientific Interest	>250m	Off-site (800m southwest): Swanscombe Skull Site NNR. Disused pit, reported due to presence of Pleistocene vertebrata.	No
Habitat Networks	On-site	Small proportion of Zone 2 (<10%) is identified as saltmarsh.	No
Listed Buildings	>250m	Off-site: there are a number of listed buildings within 1km of Zone 2, the nearest 650m west.	No
Marine Conservation Zones	<100m	The area of the River Thames bordering the northwest of Zone 2 is a designated Marine Conservation Zone.	Yes



Item	Location [relative to Zone 2]	Information	Potential to impact
National Nature Reserve	>250m	Off-site (800m southwest): Swanscombe Skull Site NNR.	No
Priority Habitat Inventory	On-site	~50% of Zone 2 identified as coastal saltmarsh, deciduous woodland, coastal and floodplain grazing marsh or other habitats.	Yes
	<100m	Small area on the foreshore of the River Thames (adjacent to Zone 2) is identified as mudflats.	Yes
SSSI impact risk zone	On-site	Zone 2 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	No
<b>No records of the following within 1km of Zone 2 (excluding records within other site zones): Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt, Tree Felling Licenses, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conservation Areas, Ramsar Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserves, National Parks, Nitrate Sensitive Areas, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites</b>			

### B.3 Zone 3

Table B-3 - Summary of regulatory data for Zone 3.

Item	Location [relative to Zone 2]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	<b>On-site</b> <b>&gt;250m</b>	Zone 3B: Three records of electricity substations, dated 1971 to 1992.	<b>Yes</b>
		Off-site: Various substations from ~265m distant, dated 1980s to 1990s. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
Historical garages	<b>&gt;250m</b>	Off-site: nearest record relates to a garage 655m west, dated 1969. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
Historical industrial land uses	<b>On-site</b>  <b>&lt;100m</b>	Zone 3A: barge yard, cement works, mineral railway sidings, railway sidings, tramway sidings, unspecified commercial / industrial, tank, unspecified wharf, unspecified yard	<b>Yes</b>
		Zone 3B: cement works, chalk pit, mineral railway sidings, railway sidings, refuse heap, tramway sidings, unspecified commercial / industrial, unspecified disused pit, unspecified ground workings, tank, unspecified works, whitening works, whitening works	<b>Yes</b>
	Off-site: old chalk pits, paper mills, tramway sidings, unspecified disused pit, unspecified ground workings, unspecified mills, tank, unspecified wharf, unspecified works, wharf	<b>Yes</b>	
	Zone 5A and Zone 5B: cement works, chalk pit, mineral railway sidings, old chalk pits, railway sidings, tramway sidings, unspecified commercial / industrial, unspecified works	<b>Yes</b>	
<b>100 to &lt;250m</b> <b>&gt;250m</b>	Zone 2: gasworks, gasometer, railway building, railway sidings, refuse heap, tramway sidings, unspecified wharf	No	
	Off-site: paper store, quarry, railway sidings, unspecified ground workings, unspecified store	No	
Historical mineral planning areas	<b>100 to &lt;250m</b>	Off-site: abbatoir, boat house, cemetery, chalk pit, cuttings, disused chalk pit, gravel pit, hop kilns, oil depot, old gravel pit, old sand and gravel pit, railway building, railway sidings, railway station, refuse heap, sand pit, saw pit, smithy, unspecified disused workings, unspecified works	No
		Off-site: Area of land from 250m southeast identified as 'Swanscombe' surface mineral working for chalk, chert and flint. Area of land 220m southwest identified as 'Craylands Lane' surface mineral working for sand and gravel.	No
Historical petrol station	<b>&lt;100m</b>	Off-site: Record of a historical petrol station located 75m south and dated 1952.	No
Historical railway features	<b>On-site</b>	Historical railway features extended from wharf in Zone 2, south through Zone 3A, 3B, 5A and 5B. Also extend from Zone 5B east-west to eastern side on peninsula.	<b>Yes</b>
Historical tanks	<b>On-site</b>	Zone 3A: unspecified tank on Zone 3A / Zone 2 boundary, dated 1939.	<b>Yes</b>
	<b>&lt;100m</b>	Zone 3B: numerous tanks in south and east of Zone 3B, dated between 1907 and 1984. Off-site: numerous records up to 1km distant, nearest 20m west.	<b>Yes</b>
<b>No records of the following within 1km of Zone 3 (excluding records within other site zones): military land</b>			
<b>Waste and landfill</b>			
Permitted waste sites	<b>&lt;100m</b>	Zone 2: South Pit and Surge Pile, identified as Industrial Waste Landfill (Factory curtilage). License issued in 1977 (EA/EPR/EB3802FX/V002), now closed. South Pit Phase 3 Landfill, accepted >10 T/D with capacity >25,000T excluding inert waste. License issued 2017 (EPR/RP3039SZ), transfer effective. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	<b>Yes</b>
Surface ground workings	<b>On-site</b>	Zone 3B: surface ground workings identified in majority of area.	<b>Yes</b>
	<b>&lt;100m</b>	Zone 3A: surface ground workings identified along eastern and northern boundary. Surface ground workings identified adjacent to south of Zone 3B.	<b>Yes</b>
Waste exemptions	<b>On-site</b>	Zone 3B: waste exemption identified (Manor Way) for storage of waste in a secure place for use in construction.	No
	<b>&gt;250m</b>	Off-site: 6 records, nearest 250m south, attributed to network rail substation for use of waste in construction.	No

Item	Location [relative to Zone 2]	Information	Potential to impact
EA active or recent landfill sites	Off-site	Zone 2: South Pit Phase 3 Landfill, accepted >10 T/D with capacity >25,000T excluding inert waste. South Pit and Surge Pile Landfill, Accepted Industrial Waste (factory curtilage). Listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	Yes
Historical landfill (EA records)	On-site	Zone 3B: small area of Zone 3B identified as Swanscombe Cement (P/01/11B, 21EX). Accepted inert waste. Operated by Blue Circle Industries Plc. License issued 1973 and surrendered 1993.	Yes
	<100m	Zone 2 identified as South Pit Landfill. Accepted inert and industrial waste between 1977 and 1992, operated by Blue Circle Industries Plc.	Yes
	>250m	Off-site: Craylands Lane Landfill located 390m south. Accepted inert, commercial and household waste, operated by Dartford District Council / Kent County Council. Last input listed as 1977. Knockhall Chase Landfill. Located 730m west. Accepted inert, industrial, commercial and household waste. Licensed between 1977 and 1994. Operated by Biffa Limited. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
Historical Local Authority landfill records	<100m	Refuse tips located within Zone 2 from 1970 and 1971 mapping.	Yes
	>250m	Off-site: record 390m south (Craylands Land Landfill), identified from 1973 mapping, Record 730m west (Knockhall Chase Landfill), record from Dartford Borough Council. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
Historical waste sites	<100m	Zone 5A (adjacent): related to planning application for change of use of facility for processing and recycling of plastic materials.	No
Licensed waste sites	On-site	Zone 3B: Swanscombe Glass Recovery Facility. License issued to Recresco Limited in 2013 for physical treatment (EA/EPR/AB3103KR/A001).	Yes
	>250m	Zone 3A: License issued to Veka Recycling Limited in 2013, related to HCl waste and treatment (EA/EPR/CB3305XA/A001). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
<b>There are no records of the following within 1km of Zone 3 (excluding records within other site zones): BGS landfill records.</b>			
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Zone 3B: hoppers and silos, electricity substation, recycling services, unspecified works / factories.	Yes
	<100m	Off-site: several records of electricity substations, tank, container and storage	No
	100 to <250m	Off-site: several records of electricity substations	No
	>250m	Off-site: several records of electricity substations, petrol and fuel station, vehicle repair garage, sign craft, silos and hoppers. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	No
List 2 dangerous substance inventory site	>250m	Off-site: one record positions 950m northwest, attributed to Northfleet Cement Works, Blue Circle Industries Ltd. Related to release of copper and lead to the River Thames.	No
Pollution incidents	On-site	Zone 3A: record dated 2003 related to release of natural ochre. No impact (Category 4) to air and land, minor impact (Category 3) to water. Record dated 2003 related to release of inert materials and wastes. No impact (Category 4) to air, minor impact (Category 3) to land and water. Zone 3B: record dated 2002 related to release of crude sewage. No impact (Category 4) to air and land, significant impact (Category 2) to water.	No
	>250m	900m west: record related to firefighting runoff. Minor impact (Category 3) to air, land and water.	No



Item	Location [relative to Zone 2]	Information	Potential to impact
Discharge consents	On-site             >250m	Zone 3A (north): historic permit related to release of trade effluent from Channel Tunnel Rail Link Site to the River Thames. Consent issued 06/02/2001, effective 12/06/1998, revoked 29/08/2002. Zone 3A (south): revoked permit for release of sewage discharge from Swanscombe Wastewater Pumping Station to River Thames. Issued 11/08/1998, effective 11/08/1998, revoked 28/01/2009. Another revoked permit for release of sewage discharge from Swanscombe CEO, Manor Way to tributary of River Thames. Issued 04/05/2006, effective 01/11/2006, revoked 13/07/2001. Zone 3A (northwest): effective permit for release of final / treated discharge to the River Thames from Northfleet Eastern Quarry. Issued 06/05/2016, effective 01/02/2017. Off-site: Revoked permit attributed to shore of River Thames ~320m northwest, related to trade discharge of cooling water. Issued 27/10/1976, revoked 18/09/1990. Two revoked consents related to West Thurrock Power Station, positioned within River Thames ~600m north. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	Yes             No
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	<100m  >250m	Zone 2: Historical record of Part B permit for use of bulk cement. No enforcements notified. Zone 5A: Historical Part B permit held by Omya UK for lime processes. Offsite: Historical and current Part B permit held by Greenhithe Service Station (635m west) for petrol vapour recovery (historical) and unloading of petrol for storage (current). Current Part B permit held by Swanscombe Dry Cleaners (800m southeast). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 3.</b>	Yes  No
Radioactive substance authorisations	>250m	Off-site (546m south): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste.	No
<b>No records of the following within 1km of Zone 3 (excluding records within other site zones): Part 2A sites, List 1 dangerous substance inventory site, pollution inventory waste transfer, pollutant release to public sewer, pollutant release to surface waters, Part A1 licensed industrial activities, radioactive pollution inventory, pollution inventory substances, COMAH sites, historical licensed industrial activities, hazardous substances storage (HSE), regulated explosive sites.</b>			
<b>Environmental, visual and cultural designations</b>			
Open Access Land	>250m	Off-site (615m south): Swanscombe Skull Site NNR, defined as Section 16 dedicated land.	No
Tree Felling Licenses	>250m	Off-site (810m west): tree felling license (019/484/12-13) was held for selective felling / thinning. Application dated 16/04/2013.	No
Sites of Special Scientific Interest	>250m	Off-site (615m south): Swanscombe Skull Site NNR. Disused pit, reported due to presence of Pleistocene vertebrata.	No
Conservation Areas	>250m	Off-site: Area in Greenhithe (500m west), Dartford, was designated a Conservation Area in 1975.	No
Listed Buildings	<100m	Off-site: two records adjacent to Zone 3 boundary. Boundary Stone and Garden Bridge, Ingress Park, are both Grade II listed (since 2012). Numerous other listed buildings / features from 250m distant.	Yes
Marine Conservation Zones	<100m	The area of the River Thames bordering Zone 3 is a designated Marine Conservation Zone.	Yes
National Nature Reserve	>250m	Off-site (615m south): Swanscombe Skull Site NNR.	No
Priority Habitat Inventory	On-site  <100m	Zone 3A: About 20% of area identified as deciduous woodland. Zone 3B: About 40% of area identified as deciduous woodland.  Small area on the foreshore of the River Thames (adjacent to Zone 3) is identified as mudflats. Area to south of Zone 3B identified as deciduous woodland.	Yes  Yes
SSSI impact risk zone	On-site	Zone 3 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	No

Item	Location [relative to Zone 2]	Information	Potential to impact
<b>No records of the following within 1km of Zone 2 (excluding records within other site zones): Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt, Schedules Ancient Monuments, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conserved Wetland Sites, Designate Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserve, National Parks, Possible Special Areas of Conservation, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites, Habitat Networks</b>			



## B.4 Zone 4

Table B-4 - Summary of regulatory data for Zone 4.

Item	Location [relative to Zone 4]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	On-site	Zone 4B: record of electricity substation in centre of 4B, records dated 1984-1993. Record of substation (dated 1988-1993) and transformer (dated 1971-1978) in southwest of 4B.	Yes
	<100m	Off-site: numerous records of electricity substations within 1km. Nearest a substation / electricity transformer on eastern boundary of 4B, record dated 1973. Small gasworks about 175m east. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical garages	<100m	Off-site: record for garage / service station 50m south (Zone 4B), record dated 1993.	No
	>250m	Off-site: garage 300m southwest (dated 1973) and 350m southwest (dated 1971). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical industrial land uses	On-site	Zone 4B: cement works, chalk pit, industrial estate, mineral railway sidings, paper mills, paper works, parchment works, railway sidings, tar distillery, tramway sidings, unspecified commercial / industrial, unspecified ground workings, unspecified heap, unspecified mills, unspecified pit, unspecified tank, unspecified works	Yes
	<100m	Zone 4C: chalk pit, cuttings, mineral railway sidings, old chalk pit, railway sidings, tramway sidings, unspecified pit	Yes
	100 to <250m	Off-site: cement works, corn windmill, disused windmill, mineral railway sidings, railway sidings, railway station, refuse heap, smithy, tramway sidings, tunnel, unspecified commercial / industrial, unspecified depot, unspecified factory, unspecified heap	No
	>250m	Off-site: fire engine station, industrial estate, old chalk pit, unspecified pit, unspecified quarry, unspecified tank, unspecified wharf Off-site: brick works, cement mill, cement works, cemetery, dock, dock yard, engine house, gasworks, gasometer, goods depot, gravel pit, lead works, old gravel pit, old sand and gravel pit, Portland cement works, quarry, railway building, tanks, tower works, unspecified disused pits, unspecified old quarry, unspecified works, wharf. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical mineral planning areas	100 to <250m	Off-site: Area of land 225m west of Zone 4C identified as 'Swanscombe' surface mineral working for Chalk / Chalk cement. Area of land 230m east of Zone 4A identified as 'Southfleet' surface mineral working for Chalk.	No
	>250m	Off-site: Area of land from 700m west identified as 'Craylands Lane' surface mineral working for sand and gravel. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical petrol station	>250m	Off-site: Record of a historical petrol station located 500m west and dated 1952. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical railway features	On-site	Railway sidings crossed Zone 4B and Zone 4C, through other site zones and adjacent to Zone 4. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Historical tanks	On-site <100m	Zone 4B: numerous records of historical tanks, dated 1980s to 1990s. Off-site: nearest off-site records within 25m. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes Yes
Historical tunnel features	On-site	Records of tunnel features beneath railway line between Zone 4C and Zone 6A. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
<b>No records of the following within 1km of Zone 4 (excluding records within other site zones): military land</b>			
<b>Waste and landfill</b>			
Surface ground workings	On-site	Zone 4B and Zone 4C identified as areas of surface ground workings.	Yes
	<100m	Off-site: land from adjacent to Zones 4B and 4C identified as areas of surface ground workings. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes

Item	Location [relative to Zone 4]	Information	Potential to impact
Waste exemptions	On-site	Zone 4B: at least 16 permits held within Manor Way Business Park and Kent Kraft Industrial Estate	Yes
	<100m	Off-site: record 100m east of Zone 4A for Botany Marsh, use of waste in construction, WEX152719. Record 100m east of Zone 4B for Robins Wharf, screening and blending of waste, WEX153887.	No
	100 to <250m	Off-site: records of three permits for storage of waste in a secure place, deposit of waste from inland rivers, burning of waste in the open.	No
	>250m	Off-site: records of five permits, nearest 400m south for sorting and denaturing of controlled drugs for disposal. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical landfill (EA records)	On-site	Zone 4C: 50% of area identified as Bamber Pit (P/01/16, 21ES), accepted inert and industrial waste. This has been incorrectly identified to be located within Zone 4. Operated by Blue Circle Industries Plc. License issued 1978 and surrendered 1993.	Yes
	>250m	Off-site: Botany Road Landfill located 275m east (21EM, P/02/01). Accepted inert, industrial and special waste. License issued 1977 and surrendered 2000. Site operated as Britannia Refined Metals, license issued to Britannia Lead. Craylands Lane Landfill located 700m west. Accepted inert, commercial and household waste, operated by Dartford District Council / Kent County Council. Last input listed as 1977. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical Local Authority landfill records	On-Site	Zone 4B: north / central section identified as a refuse tip from historical mapping.	Yes
	>250m	Off-site: record of refuse tip 700m west from 1973 mapping (Craylands Lane Landfill). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical waste sites	On-site	Zone 4B: four records from historical planning applications, all attributed to Manor Way / Manor Way Business Park KCC/DA/0270/2014 – Land to south of Manor Way - application related to aggregate recycling facility. Accept construction and demolition waste. 15/01882/EDCCON – C1 & C3, Plot 14 Manor Way – Construction of building to accommodate plant for processing / transfer of construction, demolition and excavation wastes. EDC/18/0161 / KCC/DA/048/2018 – Site 3, Manor Way Business Park – operation of aggregate recycling facility to accept construction and demolition waste.	Yes
	100 to <250m	Off-site: record related to Kent Kraft Industrial Estate 180m east (DA/96/00457). Use of land as Waste Transfer Station. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Licensed waste sites	On-site	Zone 4B: six records within Manorway Business Park for Waste Transfer Stations and vehicle depollution facility. Two records attributed to Northfleet Lake / Northfleet Industrial Estate for deposit of waste as a land recovery operation.	Yes
	>250m	Off-site: Britannia Refined Metals (BR1001) located 370m west recorded as an Industrial Waste Landfill. License issued 1977, expired 1998 <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
<b>No records of the following within 1km of Zone 4 (excluding those in other site zones): permitted waste sites, active or recent EA landfills</b>			
<b>Current Industrial Land Use</b>			

Item	Location [relative to Zone 4]	Information	Potential to impact
Recent industrial land uses	<b>On-site</b>	Vast majority of records within Zone 4B – Manor Way Business Park or Northfleet Industrial Estate. Manor Way Business Park: general construction supplies; electricity substation; recycling centres; waste storage, processing and disposal; scrap metal merchants; sign makers; business park and industrial estate; consumer products; industrial coatings and finishing; industrial engineering; stationery, stamps, tags and labels; electrical equipment repair and services; unspecified works / factories; cutting, drilling and welding services; distribution and haulage; vehicle hire and rental; published goods; vehicle repair, testing and servicing. Northfleet Industrial Estate: construction and tool hire; vehicle repair, testing and servicing; business park and industrial estates; electricity substation; marine engineers and servicing; concrete products; distribution and haulage; published goods; electrical and electronic engineers; caterers; vehicle parts and accessories; general construction supplies; containers and storage; secondhand vehicles; unspecified works or factories. Zone 4A: pylon Zone 4C: shooting facilities	<b>Yes</b>
	<b>&lt;100m</b>	Off-site: construction and tool hire; concrete products; chimneys; conveyors; tanks; pylon; cooling and refrigeration; warehouse; electricity substation; mast; new vehicles; rail station.	<b>Yes</b>
	<b>100 to &lt;250m</b>	Off-site: depot; wharf; mooring and unloading facilities; travelling crane; chimney; electricity substation; conveyor; tanks; vehicle hire and rental; pest control and vermin; container and storage; electrical components; vehicle parts and accessories; concrete products; car wash; petrol and fuel stations; plate makers; business park and industrial estate; published goods; fire brigade station; and giftware.	No
	<b>&gt;250m</b>	Off-site: several records of electricity substations; vehicle repair, testing and servicing; vehicle breakdown and recovery services; vehicle hire and rental; wharf; mooring and unloading facilities; warehouse; vehicle parts and accessories; medical equipment; Ebbsfleet Industrial Estate; vehicle cleaning services; new vehicles; mast; seals, tapes, taps and valves; industrial engineers; distribution and haulage; published goods; alcoholic drinks; bus and coach station. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
List 2 dangerous substance inventory site	<b>100 to &lt;250m</b>	Off-site: Record positioned 210m east of Zone 4D. Attributed to Britannia Refined Metals for release of arsenic copper, lead, nickel and zinc to the Thames Estuary.	No
	<b>&gt;250m</b>	Record positioned 560m east of Zone 4B. Attributed to W T Henley but listed as not active. Substances are chromium, copper, cyanide, iron, pH, silver and zinc. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Pollution incidents	<b>On-site</b>	All records relate to Zone 4B. Record dated 2001 related to inert materials and wastes. Minor impact (Category 3) to air and land. No impact (Category 4) to water. Record dated 2003 related to inert materials and wastes/ No impact (Category 4) to air and water. Minor impact (Category 3) to land. Record dated 2002 related to organic chemicals / products. Major impact (Category 1) to land. Minor impact (Category 3) to air. No impact (Category 4) to water. Record dated 2002 related to biodegradable materials and wastes. No impact (Category 4) to air and water. Minor impact (Category 3) to land. Record dated 2001 related to firefighting runoff. No impact (Category 4) to air and land. Minor impact (Category 3) to water.	No
	<b>&lt;100m</b>	Off-site: one record 30m east of Zone 4D dated 2002 related to oils and fuels. No impact (Category 4) to air, land and water.	No
	<b>100 to &lt;250m</b>	Off-site: one record 180m east of Zone 4B dated 2002 related to oils and fuels. No impact (Category 4) to air and water. Minor impact (Category 3) to land.	No
	<b>&gt;250m</b>	Off-site: six records to east of Zone 4. Most recent dated 2003. All impacts Category 3 or Category 4 (minor or no impact). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
List 1 dangerous	<b>100 to &lt;250m</b>	Off-site: one record 220m east of Zone 4D. Attributed to Britannia Refined Metals Ltd for mercury (other) and cadmium	No



Item	Location [relative to Zone 4]	Information	Potential to impact
substance inventory site	>250m	Off-site: one record 550m east of Zone 4B for mercury (other) and cadmium. Attributed to Gec Henley, listed as active. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Pollution inventory waste transfer sites	<100m	Off-site: one record located adjacent to east of Zone 4D. Site is operated by Britannia Refined Metals Ltd. Processed listed as recycling / reclamation of metals and metal compounds, oil refining or other uses of oil, incineration on land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Part A1 licensed industrial activities	<100m	Off-site: one effective and six superseded licenses from adjacent to east of Zone 4D. Attributed to Britannia Refined Metals Ltd. Licenses relate to 'non-ferrous metals; melting with capacity >4T/D lead/cadmium or 20T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more.' <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Discharge consents	On-site	Three records within Zone 4B. Amended and effective discharge consent related to P15, Kent Kraft Industrial Estate (P07708) for trade discharges / site drainage. Discharge into ground. Revoked permit (active 1979-1986) related to Kent Kraft Mills for unspecified trade discharges (CTMR.0181).	Yes
	<100m	Off-site: six records of revoked permits attributed to Britannia Refined Metals Ltd, located adjacent to east of Zone 4D. All relate to release of trade discharges / site drainage to River Thames. Revoked in 1996.	No
	100 to <250m	Off-site: two records of revoked permits attributed to Britannia Refined Metals Ltd. One dated 1969 to 1989 (CPLR.0023) for release of sewage discharge. One dated 1991 to 1996 for release of unspecified trade discharge. Both release to River Thames. One record attributed to 220m northeast of Zone 4D, related to discharge of process effluent from a lagoon outlet. Dated 1978 to present.	No
	>250m	Off-site: 12 records related to Northfleet Waste Water Treatment Works, located 450m east of Zone 4B. One effective license, remainder revoked. Licenses related to sewage discharges (storm overflow / release of final treated effluent etc.) to River Thames. Records of Five other licenses from 450m distant, all revoked. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	On-site	Zone 4B: 10 records of historical Part B permits for recycling, mineral processes, timber / construction, timber manufacture, 2x waste oil burner, use of bulk cement, 3x respraying of road vehicles. Enforcement associated with one of these records. Zone 4D: current Part B permit for use of bulk cement by Cemex Concrete Products Ltd. Current Part B for respraying of road vehicles by London Bus and Truck Ltd. No enforcements notified.	Yes
	<100m	Off-site: record of current Part B permit ~100m north of Zone 4D. Attributed to Cemex Concrete Products Ltd for use of bulk cement. Historical Part B permit ~100m east of Zone 4D for timber manufacture. No enforcements notified.	No
	100 to <250m	Off-site: record of current Part B permit (130m south of Zone 4B) for unloading of petrol into storage at service stations at Shell Northfleet Service Station. No enforcements notified.	No
	>250m	Off-site: five records of Part B permits for: dry cleaning (current), use of waste oil burner (current), 2x use of bulk cement (current), metal coating processes (historical). No enforcements notified. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Pollution inventory substances	<100m	Off-site: five records attributed to Britannia Refined Metals (adjacent to east of Zone 4D). Related to 'non-ferrous metals; melting capacity >4T/D lead / cadmium or 20 T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more'. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
COMAH sites	<100m	Britannia Refined Metals Limited (adjacent to east of Zone 4D) listed as COMAH Upper Tier Operator. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Radioactive substance authorisations	>250m	Off-site (520m west Zone 4C): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No

Item	Location [relative to Zone 4]	Information	Potential to impact
Historical licenses industrial activities	<100m	Off-site: three records related to Britannia Refined Metals Ltd (adjacent to east of Zone 4D), for processes using non-ferrous metals. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Hazardous substances storage	<100m	Off-site: three records related to Britannia Refined Metals Ltd (adjacent to east of Zone 4D), related to non-ferrous metals. Permits superseded by variation or revoked.	Yes
<b>No records of the following within 1km of Zone 4 (excluding records within other site zones): Part 2A sites, pollutant release to public sewer, red list discharge consents, radioactive pollution inventory, regulated explosive sites.</b>			
<b>Environmental, visual and cultural designations</b>			
Open Access Land	>250m	Off-site (920m west of Zone 4C): Swanscombe Skull Site NNR, defined as Section 16 dedicated land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Sites of Special Scientific Interest	>250m	Off-site (920m west of Zone 4C): Swanscombe Skull Site NNR. Disused pit, reported due to presence of Pleistocene vertebrata. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Listed Buildings	<100m >250m	Church of All Saints, located adjacent to Zone 4B / 4C boundary is Grade II* listed. 820m south of Zone 4C: Parish Church of St Peter and St Paul is Grade I listed. Churchyard wall at the Church is Grade II listed. 790m west of Zone 4B: 1 Knockhall Road is Grade II listed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes
Marine Conservation Zones	>250m	The area of the River Thames bordering Zone 1, 2 and 3 is a designated Marine Conservation Zone. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
National Nature Reserve	>250m	Off-site (920m west of Zone 4C): Swanscombe Skull Site NNR. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Priority Habitat Inventory	On-site  100 to <250m	Zone 4A: About 5% of area identified as coastal and floodplain grazing marsh. Zone 4D: About 95% of area identified as coastal and floodplain grazing marsh. Foreshore of River Thames identified as mudflats. Small areas of deciduous woodland identified from 600m. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	Yes  No
SSSI impact risk zone	On-site	Zone 4 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	Yes
Site of Special Scientific Interest	>250m	Off-site (920m west of Zone 4C): Swanscombe Skull Site. Reportable due to Pleistocene Vertebrata. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
<b>No records of the following within 1km of Zone 2 (excluding records within other site zones): Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt, Tree Felling Licenses, Scheduled Ancient Monuments, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conservation Areas, Conserved Wetland Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserves, National Parks, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites.</b>			



## B.5 Zone 5

Table B-5 - Summary of regulatory data for Zone 5.

Item	Location [relative to Zone 5]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	On-site	Zone 5A: Gasworks identified from 1907 historical mapping encroaches into Zone 5A (mostly located within Zone 2). Records of electricity substations in two locations, records dated 1950s to 1990s. Zone 5B: Electricity transformer, records dated 1971 and 1978.	Yes
	<100m	Off-site: numerous records of electricity substations within 1km. Nearest a substation / electricity transformer about 90m south of Zone 5B, records dated 1970s to 1990s. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
	>250m	Off-site: 7 records within 1km. Nearest two records about 330m south and refer to garages dated 1970s. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4.</b>	No
Historical industrial land uses	On-site	Zone 5A: cement works, chalk pit, gasworks, mineral rail sidings, railway sidings, tramway sidings, tunnel, unspecified ground workings, unspecified heap, unspecified pit, unspecified tank, unspecified works Zone 5B: cement works, chalk pit, mineral rail sidings, railway building, railway sidings, tramway sidings, tunnel, unspecified commercial / industrial, unspecified ground workings, unspecified heap, unspecified pit, unspecified quarry, unspecified tank, unspecified works	Yes
	<100m	Off-site: chalk pit, cuttings, railway building, railway sidings, tramway sidings, tunnel, unspecified disused pit, unspecified ground workings, unspecified pit	Yes
	100 to <250m	Off-site: chalk pit, engine house, fire engine station, railway sidings, railway station, sand pit, smithy, tramway sidings, unspecified ground workings, unspecified heap, unspecified pit	No
	>250m	Off-site: abattoir, boat house, cemetery, chalk pit, corn windmill, disused chalk pit, disused windmill, gravel pit, hop kilns, industrial estate, lead works, old gravel pit, old sand and gravel pit, paper mills, paper store, pump house, quarry, railway sidings, refuse heap, sand and gravel pit, saw pit, tower works, tramway sidings, tunnel, unspecified commercial / industrial, unspecified depot, unspecified factory, unspecified ground workings, unspecified heap, unspecified mills, unspecified pit, unspecified store, unspecified wharf, unspecified works, wharf, whiting works <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical mineral planning areas	<100m	Off-site: Adjacent to Zone 5B are 'Swanscombe' surface mineral working for chalk and 'Craylands Land' surface mineral working for sands and gravels.	Yes
	>250m	Off-site: 'Southfleet' surface mineral working for chalk and 'Swanscombe' surface mineral working for chalk, chert and flint. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical petrol station	<100m	Off-site: petroleum depot adjacent to west of Zone 5B, dated 1952.	Yes
	>250m	Off-site: Filling station located 900m west of Zone 5B, record dated 1990. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical railway features	On-site	Railway sidings crossed Zone 5A, Zone 5B, other site zones and off-site from adjacent to Zone 5. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	Yes
Historical tanks	On-site	Zone 5A: numerous records of tanks, dated between 1865 and 1980s. Zone 5B: numerous records of tanks dated between 1865 and 1980s.	Yes
	<100m	Off-site: nearest off-site records 30m west of Zone 5B, dated 1930s to 1960s. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	Yes
Historical tunnel features	On-site	Tunnel features shown between Zone 5A and Zone 5B, through London Road. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
<b>No records of the following within 1km of Zone 5 (excluding records within other site zones): military land</b>			

Item	Location [relative to Zone 5]	Information	Potential to impact
<b>Waste and landfill</b>			
Surface ground workings	On-site	Zone 5A and Zone 5B identified as areas of surface ground workings.	Yes
	<100m	Off-site: land from adjacent to Zone 5B identified as areas of surface ground workings. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	Yes
Waste exemptions	On-site	Zone 5A: seven permissions granted. WEX086081 for: treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising; use of waste for a specified purpose; use of mulch; and use of waste in construction. WEX089611 for storage of waste in a secure place. EPR/XF0800NH/A001 for use of waste in construction. EPR/NE5482VE/A001 for storage of waste in a secure place.	Yes
	<100m	Off-site: record adjacent to south of Zone 5B for use of waste in construction (EPR/TF060MT/A001).	No
	>250m	Off-site: records of 13 permits. Nearest 300m south for use of waste in construction (WEX202707). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical landfill (EA records)	>250m	Off-site: Craylands Lane Landfill located 230m south of Zone 5B. Accepted inert, commercial and household waste, operated by Dartford District Council / Kent County Council. Last input listed as 1977.  Botany Road Landfill located 690m east (21EM, P/02/01). Accepted inert, industrial and special waste. License issued 1977 and surrendered 2000. Site operated as Britannia Refined Metals; license issued to Britannia Lead.  Knockhall Chase Landfill located 930m west (P/01/02, 21FB). Accepted inert, industrial, commercial and household waste between 1977 and 1990. Operated by and licensed to Biffa Limited. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical Local Authority landfill records	On-site	Zone 5A: eastern 25% of Zone 5A identified as refuse tip from historical mapping (dated 1970s). Extends into western part of Zone 4B.	Yes
	>250m	Off-site: record of refuse tip 390m south from 1973 mapping (Craylands Lane Landfill). Knockhall Chase Landfill located 930m west. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical waste sites	On-site	Zone 5A: one record from a historical planning application (07/00147/CPO). Scheme comprises change of use to facility for processing and recycling of plastic materials.	Yes
	>250m	Off-site: two records attributed to 910m east (DA/96/00457 and DA/97/00001). Both related to historical planning application for a waste transfer station at Plot 20, Kent Kraft Industrial Estate. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Licensed waste sites	On-site	Zone 5A: three records. Two attributed to Veka Recycling Limited (EA/EPR/BB3003CH/A001 and EA/EPR/BB3003CH/V002) for a 75tce HCl waste transfer station and treatment facility, modified to a physical treatment facility. License issued 17/12/2013, modified 13/04/2017). One license attributed to Manor Way Materials Recovery Facility (EA/EPR/CB3305XA/A001) for a physical treatment facility (>=75000 tonnes). License issued 12/02/2015. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	Yes
<b>No records of the following within 1km of Zone 5 (excluding those in other site zones): permitted waste sites, active or recent EA landfills, historical BGS landfills.</b>			
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Zone 5A: electricity substation; construction and tool hire; tank.	Yes
	<100m	Zone 5B: seven records of tanks (generic). Off-site: depot; electricity substation; mast.	No
	100 to <250m	Off-site: tank; disused pit; railway station; fire brigade station; electricity substation; published goods.	No
	>250m	Off-site: chimney; conveyors; tanks; electricity substation (numerous records); pylon; general construction supplies; warehouse; depot; new vehicles; mast; distribution and haulage; travelling crane; pest and vermin control; giftware; construction services; vehicle cleaning services. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No



Item	Location [relative to Zone 5]	Information	Potential to impact
List 2 dangerous substance inventory site	>250m	Off-site: Record positioned 925m east of Zone 5A. Attributed to Britannia Refined Metals for release of arsenic copper, lead, nickel and zinc to the Thames Estuary. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Pollution incidents	>250m	Off-site: three records within 1km. Nearest 815m east, dated 2002, related to oils and fuel. No impact (Category 4) to air, land and water. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
List 1 dangerous substance inventory site	>250m	Off-site: record 940m east of Zone 5A. Attributed to Britannia Refined Metals Ltd for mercury (other) and cadmium. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Pollution inventory waste transfer sites	>250m	Off-site: one record 740m east of Zone 5A. Site is operated by Britannia Refined Metals Ltd. Processed listed as recycling / reclamation of metals and metal compounds, oil refining or other uses of oil, incineration on land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Part A1 licensed industrial activities	>250m	Off-site: one effective and six superseded licenses from 740m east of Zone 5A. Attributed to Britannia Refined Metals Ltd. Licenses relate to 'non-ferrous metals; melting with capacity >4T/D lead/cadmium or 20T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more.' <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Discharge consents	On-site	Two records attributed to eastern part of Zone 5A. Both related to Northfleet Eastern Quarry Waste Water Treatment Works for release of sewage discharges (final/treated effluent) to Swanscombe Marshes (EPRHB3591NA).	Yes
	>250m	Off-site: six records of revoked permits attributed to Britannia Refined Metals Ltd, located adjacent to 720m east Zone 5A. All relate to release of trade discharges / site drainage to River Thames. Revoked in 1996.	No
		Two records 860m northwest of Zone 5. Address listed as River Thames at Greenhithe. Permitted discharges were sewage effluent and cooling water. One record 900m east of Zone 5A. Attributed to Britannia Refined Metals for release of sewage discharges (final / treated effluent) to the River Thames. License issued 1969 and revoked 1989. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	On-site	Zone 5A: record of a historical Part B permit for Omya UK, Whiting Works (lime processes). No enforcements notified.	Yes
	>250m	Off-site: nearest record is for a current Part B permit 350m south for dry cleaning. No enforcements notified. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Pollution inventory substances	>250m	Off-site: five records attributed to Britannia Refined Metals (740m east of Zone 5A). Related to 'non-ferrous metals; melting capacity >4T/D lead / cadmium or 20 T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more'. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
COMAH sites	>250m	Britannia Refined Metals Limited (740m east of Zone 5A) listed as COMAH Upper Tier Operator. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Radioactive substance authorisations	>250m	Off-site (330m south of Zone 5B): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Historical licenses industrial activities	>250m	Off-site: three records related to Britannia Refined Metals Ltd (800m east of Zone 5A) for processes using non-ferrous metals. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Hazardous substances storage	>250m	Off-site: three records related to Britannia Refined Metals Ltd (800m east of Zone 5A) related to non-ferrous metals. Permits superseded by variation or revoked.	No
<b>No records of the following within 1km of Zone 5 (excluding records within other site zones): Part 2A sites, pollutant release to public sewer, red list discharge consents, regulated explosive sites</b>			

Item	Location [relative to Zone 5]	Information	Potential to impact
<b>Environmental, visual and cultural designations</b>			
Open Access Land	>250m	Off-site (460m south of Zone 5B): Swanscombe Skull Site NNR, defined as Section 16 dedicated land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Sites of Special Scientific Interest	>250m	Off-site (460m south of Zone 5B): Swanscombe Skull Site NNR. Disused pit, reported due to presence of Pleistocene vertebrata. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Conservation Areas	>250m	Off-site (930m west of Zone 5): 'Greenhithe' conservation area, designated since 1975.	No
Listed Buildings	100 to <250m  >250m	Church of All Saints, located 150m east of Zone 5 is Grade II* listed. 1 Knockhall Road, located 240m west of Zone 5 is Grade II listed.  Numerous listed buildings up to 1km distant. Nearest is Garden Bridge, Ingress Park, located 47m northwest of Zone 5. Grade II listed since 2012. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Marine Conservation Zones	>250m	The area of the River Thames bordering Zone 1, 2 and 3 is a designated Marine Conservation Zone (about 650m from Zone 5). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
National Nature Reserve	>250m	Off-site (460m south of Zone 5B): Swanscombe Skull Site NNR. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	No
Priority Habitat Inventory	On-site  <100m	Zone 5A: about 5% of area identified as deciduous woodland. Off-site: areas of deciduous woodland identified from adjacent to Zone 5. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 5.</b>	Yes  Yes
SSSI impact risk zone	On-site	Zone 5 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	Yes
<b>No records of the following within 1km of Zone 5 (excluding records within other site zones): Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt Land, Tree Felling Licenses, Scheduled Ancient Monuments, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Ramsar Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserves, National Parks, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites.</b>			



## B.6 Zone 6

Table B-6 - Summary of regulatory data for Zone 6.

Item	Location [relative to Zone 6]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	100 to >250m	Off-site: numerous electricity substations and transformers within 1km, nearest about 145m southeast of Zone 6B. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical garages	100 to >250m	Off-site: several records within 1km. Nearest refers to a garage dated 1993, located 160m west. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical industrial land uses	On-site	Zone 6A: chalk pit, cuttings, engine house, gravel pit, old chalk pit, pump house, smithy, tramway sidings, tunnel, unspecified ground workings Zone 6B: artillery barracks, barracks, gravel pit, marl pit, miniature rifle range, old chalk pit, pumping station, railway sidings, refuse heap, rifle range, tramway sidings, unspecified ground workings, unspecified heap, unspecified hole, old quarry Zone 6C: pump house, tramway sidings, unspecified ground workings	Yes
	<100m	Off-site: cement works, cuttings, fire engine station, hop kilns, industrial estate, mineral railway sidings, old chalk pit, quarry, railway building, railway sidings, railway station, tramway sidings, tunnel, unspecified factory, unspecified ground workings, old quarry	Yes
	100 to <250m	Off-site: burial ground, goods depot, old clay pit, unspecified tank	No
	>250m	Off-site: barrack fields, boiler, brick field, brick works, cement mill, cemetery, chalk pit, chimney, clay mill, clay plant, corn windmill, disused cement works, disused windmill, dock, electricity substation, engine house, gas works, gasometer, gravel pit, grid substation, hop kilns, lead works, nursery, old dock, old sand and gravel pit, paper mill, Portland cement works, refuse heap, sand and gravel pit, tanks, tower works, unspecified commercial / industrial, unspecified depot, unspecified disused workings, unspecified heap, unspecified industrial / commercial, unspecified wharf, unspecified works, wharf <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical mineral planning areas	On-site	Zone 6A: whole of area identified as 'Southfleet' surface mineral working for chalk. Zone 6B: part of area identified as 'Southfleet' surface mineral working for chalk, chert and flint.	Yes
	<100m	Off-site: 'Southfleet' surface mineral working identified adjacent to west of Zone 6B.	Yes
	100 to <250m	Off-site: 'Swanscombe' surface mineral working for chalk. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical petrol station	>250m	Off-site: petroleum depot 740m west of Zone 6A, dated 1952. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical railway features	On-site	Railway sidings cross Zone 6A, Zone 6B and Zone 6C. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
Historical tanks	<100m	Numerous records of historical tanks within 1km, nearest dated 1993 and located about 650m west of Zone 6B. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
Historical tunnel features	On-site	Tunnel feature shown between Zone 4C and Zone 6A, and between Zone 6A and Zone 6B.	Yes
	<100m	Tunnel shown adjacent to Zone 6C. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
<b>No records of the following within 1km of Zone 5 (excluding records within other site zones): military land</b>			
<b>Waste and landfill</b>			
Permitted waste sites / authorised landfills	On-site	Zone 6A: northern half of area identified as Bamber Quarry Landfill / Bamber Pit, licensed to London Resort Company Holdings Limited (EA/EPR/CB3908CE/T001). Accepted household, commercial and industrial waste. License issued 1981, listed as closed. Zone 6B: majority of area identified as Bakers Hole, licensed to Tarmac Cement and Lime Limited (EA/EPR/KP3898HE/V006). Accepted household, commercial and industrial waste. License issued 1983, listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes

Item	Location [relative to Zone 6]	Information	Potential to impact
Surface ground workings	On-site	Majority of Zone 6A and Zone 6B, and small proportion of Zone 6C identified as areas of surface ground workings.	Yes
	<100m	Off-site: land from adjacent to Zone 6B identified as areas of surface ground workings. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
Waste exemptions	<100m	Off-site: one record related to sorting and de-naturing of controlled drugs for disposal (EPR/RF0600NP/A001), located 80m west of Zone 6B	No
	100 to <250m	Off-site: two records related to sorting and de-naturing of controlled drugs for disposal (EPR/FF0900NA/A001 and WEX148318). Nearest 125m west of Zone 6B.	No
	>250m	Off-site: several records within 1km. Nearest 500m east of Zone 6A, related to storage of waste in a secure place. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Active or recent EA landfill records	On-site	Zone 6A: northern half of area identified as Bamber Quarry Landfill / Bamber Pit, licensed to London Resort Company Holdings Limited (EA/EPR/CB3908CE/T001). Accepted household, commercial and industrial waste. License issued 1981, listed as closed. Zone 6B: majority of area identified as Bakers Hole, licensed to Tarmac Cement and Lime Limited (EA/EPR/KP3898HE/V006). Accepted household, commercial and industrial waste. License issued 1983, listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
BGS historical landfill record	>250m	Two records. Northfleet Power Station, dated 1947, located 800m east. Springhead Road, dated 1987, located 950m east.	No
Historical landfill (EA records)	On-site	Zone 6A: southern part of area identified as Bamber Pit (P/01/16, 21ER). Operated by Blue Circle Industries Plc. First input 1977, last input 1993.	Yes
	>250m	Off-site: Craylands Lane Landfill located 680m west of Zone 6A. Accepted inert, commercial and household waste, operated by Dartford District Council / Kent County Council. Last input listed as 1977. Springhead Road landfill located 610m southeast of Zone 6C. Accepted inert, industrial, commercial and household waste. First input 1951 and last input 1984. South of Springhead landfill located 900m southeast of Zone 6C. Accepted inert, commercial and household waste. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical Local Authority landfill records	On-site	Zone 6A: Whole of area identified as Bamber Pit landfill.	Yes
	>250m	Zone 6B: southwest quadrant of Zone 6B identified as a refuse tip from 1985 mapping. Off-site: record of refuse tip 820m west from 1973 mapping (Craylands Lane Landfill). Record of refuse tip 645m southeast from 1971 mapping. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical waste sites	On-site	Zone 6A: one record from a historical planning application (07/00147/CPO). Scheme comprises change of use to facility for processing and recycling of plastic materials.	Yes
	>250m	Off-site: nearest record 615m southeast of Zone 6B from a historical planning application (13/01667/FUL). Scheme comprises remediation works to contaminated land. Record 780m southeast from a historic planning application (KCC/GR/0015/2015). Scheme comprised construction of waste oil transfer station. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Licensed waste sites	On-site	Zone 6B: five records related to Bakers Hole / Northfleet Landfill (EA/EPR/KP3898HE). Licensed to Blue Circle Industries Plc, Lafarge Cement UK Ltd and Tarmac Cement and Lime Limited.	Yes
	>250m	Off-site: three records located 800m east related to Northfleet Works (EA/EPR/RP3194EY) for a transfer station taking non-biodegradable wastes 2 records 930m south related to Springhead Enterprise Park for a Special Waste Transfer Station (EA/EPR/CB3005LP). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
<b>No records of the following within 1km of Zone 6 (excluding those in other site zones): permitted waste sites, active or recent EA landfills, historical BGS landfills.</b>			



Item	Location [relative to Zone 6]	Information	Potential to impact
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Zone 6B: pylon. Zone 6C: pylon, mast, vehicle hire services, Ebbsfleet International Rail Station.	Yes
	<100m	Off-site: railway station, fire brigade station, mast, pylon, travelling crane.	No
	100 to <250m	Off-site: electricity substation, published goods, vehicle repair, vehicle breakdown services, plate makers, construction supplies, medical equipment, petrol station, tanks	No
	>250m	Off-site: several records of electricity substations, new vehicles, vehicle cleaning services <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
List 2 dangerous substance inventory site	>250m	Off-site: record located 600m east, attributed to W T Henley (not active) for chromium, copper, cyanide, iron, pH, silver and zinc. Record positioned 960m northeast. Attributed to Britannia Refined Metals for release of arsenic copper, lead, nickel and zinc to the Thames Estuary. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Pollution incidents	100 to <250m	Off-site: 3 records within 250m. Nearest 130m east, related to dust. Significant (Category 2) impact to air, minor (Category 3) impact to land and no impact (Category 4) to water. Other records all categorised as minor or no impact.	No
	>250m	Off-site: approximately 13 records within 1km. One record recorded significant (Category 2) impact to air, about 350m east during 2004. All other records categorised as minor or no impact. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
List 1 dangerous substance inventory site	>250m	Off-site: 7 records within 1km. Nearest related to Gec Henley (600m east) for release of mercury and cadmium. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Pollution inventory waste transfer sites	>250m	Off-site: one record 855m northeast of Zone 6A. Site is operated by Britannia Refined Metals Ltd. Processed listed as recycling / reclamation of metals and metal compounds, oil refining or other uses of oil, incineration on land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Part A1 licensed industrial activities	>250m	Off-site: one effective and six superseded licenses attributed to Britannia Refined Metals Ltd, from 650m northeast of Zone 6A. Licenses relate to 'non-ferrous metals; melting with capacity >4T/D lead/cadmium or 20T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more.' Also a record about 900m east attributed to Lafarge Cement UK Plc for cement and lime producing etc. License issued 2004, now superseded. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Discharge consents	On-site	Zone 6C: one consent listed in Zone 6C. Related to release of trade discharges (mineral workings) to the River Ebbsfleet) by Lafarge Cement UK. License issued 1993.	Yes
	>250m	Off-site: numerous records located on eastern side of peninsula from 800m distant, close to River Thames. All relate to release to the River Thames. One record 685m southwest of Zone 6B. Attributed to Land East of Cherry Orchard Quarry. License held to release sewage discharge (final / treated effluent) to underground strata. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	<100m	Two records within 100m. Part B permit held about 50m east by Hidsons Ltd for use of a waste oil burner. No enforcements notified. Part B permit held about 75m west by Swanscombe Dry Cleaners. No enforcements notified.	No
	100 to <250m	Current Part B permit held about 200m east for unloading of petrol into storage at service stations. No enforcements notified.	No
	>250m	Off-site: 7 further records of Part B permits. No enforcements notified. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Pollution inventory substances	>250m	Off-site: five records attributed to Britannia Refined Metals (850m northeast of Zone 6A). Related to 'non-ferrous metals; melting capacity >4T/D lead / cadmium or 20 T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more'. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No

Item	Location [relative to Zone 6]	Information	Potential to impact
COMAH sites	>250m	Britannia Refined Metals Limited (850m northeast of Zone 6A) listed as COMAH Upper Tier Operator. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Radioactive substance authorisations	>250m	Off-site (560m west of Zone 6): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Historical licenses industrial activities	>250m	Off-site: three records related to Britannia Refined Metals Ltd (620m northeast of Zone 6A) for processes using non-ferrous metals. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Hazardous substances storage	>250m	Off-site: three records related to Britannia Refined Metals Ltd (620m northeast of Zone 6A) related to non-ferrous metals. Permits superseded by variation or revoked.	No
<b>No records of the following within 1km of Zone 6 (excluding records within other site zones): Part 2A sites, licensed pollutant release to public sewer, red list pollutant release to public sewer, radioactive pollution inventory, regulated explosive sites.</b>			
<b>Environmental, visual and cultural designations</b>			
Open Access Land	>250m	Off-site (935m east of Zone 6): Swanscombe Skull Site NNR, defined as Section 16 dedicated land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Tree Felling Licenses	>250m	Off-site: clear fell (conditional) license (019/245/04-05) held 650m southwest. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Scheduled Ancient Monuments	On-site	Zone 6B: Palaeolithic sites near Baker's Hole identified as Scheduled Ancient Monuments. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes
Sites of Special Scientific Interest	On-site >250m	Zone 6B: Baker's Hole SSSI. Status listed as unfavourable – declining. Off-site (900m west of Zone 6B): Swanscombe Skull Site NNR. Disused pit, reported due to presence of Pleistocene vertebrata. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes No
Conservation Areas	>250m	Off-site (450m east): The Hill, Northfleet, designated since 1990. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Listed Buildings	<100m >250m	Church of All Saints, located 60m north of Zone 6, is Grade II* listed. Numerous listed buildings up to 1km distant. Nearest are 400m east (Parish Church of St Peter and St Paul and churchyard wall). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No No
National Nature Reserve	>250m	Off-site (900m west of Zone 6B): Swanscombe Skull Site NNR. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	No
Priority Habitat Inventory	On-site <100m	Zone 6A: about 25% of area identified as deciduous woodland. Off-site: areas of deciduous woodland identified from 60m. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6.</b>	Yes No
SSSI impact risk zone	On-site	Zone 6 is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	Yes
<b>No records of the following within 1km of Zone 6 (excluding records within other site zones): Countryside Stewardship Scheme, Forest Parks, Greenbelt Land, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Ramsar Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserves, Marine Conservation Zones, National Parks, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens</b>			



## B.7 Zone 4D

Table B-7 - Summary of regulatory data for Zone 4D.

Item	Location [relative to Zone 4D]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	100 to >250m	Off-site: numerous electricity substations and transformers within 1km, nearest about 130m southeast of Zone 4B <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Historical garages	100 to >250m	Off-site: nearest record relates to a garage / service station located about 200m south. Dated 1994 from historical mapping. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Historical industrial land uses	On-site	Zone 4D: marshes, unspecified pit, unspecified tank	Yes
	<100m	Off-site: cement works, lead works, railway sidings, refuse heap, tower works, tramway sidings, unspecified commercial / industrial, unspecified depot, unspecified heap, unspecified wharf, unspecified works	Yes
	100 to <250m	Off-site: corn windmill, cuttings, disused windmill, mineral railway sidings, unspecified factory, unspecified ground workings, unspecified industrial / commercial, unspecified pit	No
	>250m	Off-site: brick works, burial ground, cement mill, chalk pit, chimney, clay mill, dock, dock yard, electricity substation, fire engine station, gas works, gasometers, goods depot, industrial estate, old gravel pit, Portland cement works, railway building, tanks, tunnel, unspecified disused pit, unspecified kiln, unspecified old quarry, wharf <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Historical mineral planning areas	<100m	'Southfleet' surface mineral working for chalk located adjacent to west of Zone 4D.	Yes
	>250m	Off-site: 'Swanscombe' surface mineral working for chalk 750m southwest. 'Northfleet' surface mineral working for cement located 850m southeast. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Historical petrol station	>250m	Off-site: petroleum depot 850m west of Zone 4D, dated 1952. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Historical railway features	<100m	Historical railway features present from adjacent to east of Zone 4D. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Historical tanks	<100m	Numerous records of historical tanks within 1km. Nearest located about 25m distant and dated 1980s. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
<b>No records of the following within 1km of Zone 4D (excluding records within other site zones): military land, historical tunnel features</b>			
<b>Waste and landfill</b>			
Surface ground workings	On-site	Eastern part of Zone 4D identified as area of surface ground workings (unspecified pit), identified from historical mapping dated 1895 to 1923.	Yes
	<100m	Off-site: land from adjacent to Zone 4D identified as areas of surface ground workings. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Waste exemptions	<100m	Off-site: one record located 35m north of Zone 4D at Botany Marsh, Lower Road for use of waste in construction. Seven records associated with Britannia Refined Metals Ltd. EPR/SF0303KJ/A0001 – treating waste exemption for crushing of waste fluorescent tubes. WE235662 – disposing of waste exemptions (for deposit of waste from dredging of inland waters and burning of waste in the open) and storing waste exemption (for storage of waste in a secure place. WEX089874 – disposing of waste exemptions (for deposit of waste from dredging of inland waters and burning of waste in the open) and storing waste exemption (for storage of waste in a secure place.	Yes

Item	Location [relative to Zone 4D]	Information	Potential to impact
	100 to <250m	Off-site: two records (100m southeast) associated with Unit 1a Robins Wharf (EPR/LF0602FN/A001) for storage of waste in a secure place.	No
Historical landfill (EA records)	<100m	Off-site: Botany Road Landfill located adjacent to east of Zone 4D (21EM, P/02/01). Operated by Britannia Refined Metals. License issued 1977 and surrendered 2000. Accepted inert, industrial and special waste. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Historical waste sites	100 to <250m	Off-site (200m east): one record from a historic planning application (DA/96/00457) for use of land as a waste transfer station handling category A and B waste at Kent Kraft Industrial Estate. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Licensed waste sites	<100m	Off-site: two records adjacent to Zone 4D attributed to Britannia Refined Metals (EA/EPR/TP3898HP/A001) at Botany Road. Related to an industrial waste landfill (factory curtilage). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
<b>No records of the following within 1km of Zone 4D (excluding those in other site zones): permitted waste sites, active or recent EA landfill records, BGS historical landfill record, historical Local Authority landfill records</b>			
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site	Zone 4D: pylon.	No
	<100m	Off-site: hire services, electricity substation, chimney, Britannia Refined Metals (metal manufacture), tanks, cooling and refrigeration.	Yes
	100 to <250m	Off-site: electricity substation, tanks, depot, wharf, travelling crane, chimneys, works	No
	>250m	Off-site: travelling crane, conveyors, moorings and unloading facilities, distribution and haulage, concrete products, sand and gravel works, unspecified works or factories, warehouse, vehicle hire and rental, pest and vermin control, vehicle components, vehicle parts and accessories, nursery and playground equipment, published goods. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
List 2 dangerous substance inventory site	100 to <250m	Off-site: Britannia Refined Metals identified 200m east. Listed as active license for release of arsenic, copper, lead, nickel and zinc to the River Thames.	Yes
	>250m	Off-site: W T Henley identified 600m east (not active). Related to release of chromium, copper, cyanide, iron, pH, silver and zinc to the River Thames. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Pollution incidents	<100m	Off-site: one record 30m east dated 2002. No impact (Category 4) to air, land and water.	No
	>250m	Off-site: 7 records within 1km. All had no impact (Category 4) or minor impact (Category 3). All dated 2001 to 2003. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
List 1 dangerous substance inventory site	100 to <250m	Off-site: one record 200m east related to Britannia Refined Metals Ltd (active). Related to release of mercury (other) and cadmium.	No
	>250m	Off-site: one record 680m east (active) related to Gec Henley for release of mercury (other) and cadmium. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Pollution inventory waste transfer sites	<100m	Off-site: 7 records adjacent to Zone 4D, related to Britannia Refined Metals. Processes include recycling / reclamation of metals and metal compounds, oil refining or other uses of oil, and incineration on land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Part licensed industrial activities	A1 <100m	Off-site: 7 records related to Britannia Refined Metals, adjacent to Zone 4D. One effective and six superseded licenses related to 'non-ferrous metals; melting with capacity >4T/D lead/cadmium or 20T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more.' <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Discharge consents	<100m	Off-site: 6 records related to release of trade discharges – site drainage at Britannia Refined Metals. All issues 1991 and revoked 1996.	No
	100 to <250m	Off-site: several licensed discharges to the River Thames positioned along the east bank of the Swanscombe Peninsula. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No

Item	Location [relative to Zone 4D]	Information	Potential to impact
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	On-site	Current Part B permit licensed to CEMEX Concrete Products for use of bulk cement. No enforcements notified.	No
	<100m	Current Part B permit licensed to London Bus and Truck Ltd for respraying of road vehicles. No enforcements notified.	No
	>250m	Current Part B permit licensed to CEMEX Concrete Products for use of bulk cement. No enforcements notified. Historical Part B permit licensed to N.T.C. Lumber for timber manufacture. No enforcements notified. Off-site: several further records within 1km. All Part B permits with no enforcements notified. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Pollution inventory substances	<100m	Off-site: five records attributed to Britannia Refined Metals. Related to 'non-ferrous metals; melting capacity >4T/D lead / cadmium or 20 T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more'. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
COMAH sites	<100m	Britannia Refined Metals Limited listed as COMAH Upper Tier Operator. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Historical licensed industrial activities	<100m	Off-site: three records related to Britannia Refined Metals Ltd for processes using non-ferrous metals. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	Yes
Hazardous substances storage	<100m	Off-site: three records related to Britannia Refined Metals Ltd related to non-ferrous metals. Permits superseded by variation or revoked.	Yes
<b>No records of the following within 1km of Zone 4D (excluding records within other site zones): Part 2A sites, pollutant release to public sewer, red list pollutant release to surface waters, EA radioactive substance authorisations, regulated explosive sites.</b>			
<b>Environmental, visual and cultural designations</b>			
Scheduled Ancient Monuments	>250m	Off-site: Aspidin's Kiln located 550m southeast. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Listed Buildings	>250m	Church of All Saints, located 475m southwest of Zone 4D, is Grade II* listed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Marine Conservation Zones	>250m	The area of the River Thames bordering Zone 1, 2 and 3 is a designated Marine Conservation Zone (from 900m from Zone 4D). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
Priority Habitat Inventory	On-site	Whole of Zone 4D identified as coastal and floodplain grazing marsh.	Yes
	100 to <250m	Off-site: bank of River Thames identified as mudflats, <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 4D.</b>	No
SSSI impact risk zone	On-site	Zone 4D is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	Yes
<b>No records of the following within 1km of Zone 4D: Countryside Stewardship Scheme Agreements, Forest Parks, Greenbelt Land, Open Access Land, Tree Felling Licenses, Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conservation Areas, Ramsar Sites, Designated Ancient Woodlands, Environmental Stewardship Scheme Agreements, Local Nature Reserves, National Nature Reserves, National Parks, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites.</b>			

## B.8 Zone 6C

Table B-8 - Summary of regulatory data for Zone 6C.

Item	Location [relative to Zone 6C]	Information	Potential to impact
<b>Past land use</b>			
Historical energy features	100 to >250m	Off-site: numerous electricity substations and transformers within 1km, nearest about 130m east. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Historical garages	100 to >250m	Off-site: several records within 1km. Nearest refers to a garage / service station dated 1993, located 110m east. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Historical industrial land uses	On-site	Cement works, marl pit, pump house, unspecified disused pits, unspecified ground workings	Yes
	<100m	Off-site: cement works, cuttings, industrial estate, mineral railway sidings, old chalk pit, quarry, railway building, railway sidings, railway station, tramway sidings, tunnel, unspecified factory, unspecified old quarry, unspecified pit, unspecified quarry	Yes
	100 to <250m	Off-site: goods depot, unspecified disused pit, unspecified tank, unspecified works	No
	>250m	Off-site: barrack field, boiler, brick field, brick works, burial ground, cement mill, cemetery, chalk pit, chimney, clay mill, corn windmill, disused cement works, disused dock, disused windmill, dock, dock yard, electricity substation, fire engine station, gas works, gasometer, grave yard, gravel pit, hop kilns, isolation hospital, lead works, nursery, old clay pit, old dock, paper mill, Portland cement works, refuse heap, sewage works, tanks, tower works, unspecified commercial / industrial, unspecified depot, unspecified disused workings, unspecified foundry, unspecified heap, unspecified commercial / industrial, unspecified kilns, unspecified mill, unspecified mills, unspecified warehouse, unspecified wharf <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Historical mineral planning areas	100 to <250m	'Southfleet' surface mineral working for Chalk from 100m east and 450m west.	No
	>250m	'Northfleet' surface mineral working for cement 450m east. 'Swanscombe' surface mineral working for Chalk 600m west. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
	<100m	Historical railway sidings present from adjacent to Zone 6C. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes
Historical tanks	100 to <250m	Numerous records of historical tanks within 1km, nearest dated located about 150m north of Zone 6C. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Historical tunnel features	<100m	Nearest adjacent to east of Zone 6C, beneath railway line. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
<b>No records of the following within 1km of Zone 6C (excluding records within other site zones): military land, historical petrol stations.</b>			
<b>Waste and landfill</b>			
Permitted waste sites / authorised landfills	<100m	Zone 6A: northern half of area identified as Bamber Quarry Landfill / Bamber Pit, licensed to London Resort Company Holdings Limited (EA/EPR/CB3908CE/T001). Accepted household, commercial and industrial waste. License issued 1981, listed as closed. Zone 6B: majority of area identified as Bakers Hole, licensed to Tarmac Cement and Lime Limited (EA/EPR/KP3898HE/V006). Accepted household, commercial and industrial waste. License issued 1983, listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes
Surface ground workings	On-site	Small areas of surface ground workings encroach into Zone 6C.	Yes
	<100m	Off-site: land from adjacent to Zone 6C identified as surface ground workings.	Yes
Waste exemptions	>250m	Off-site: several records within 1km. Nearest 365m east for a storing waste exemption – storing of waste in a secure container / storing waste in a secure place. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No



Item	Location [relative to Zone 6C]	Information	Potential to impact
Active or recent EA landfill records	<100m	Zone 6A: northern half of area identified as Bamber Quarry Landfill / Bamber Pit, licensed to London Resort Company Holdings Limited (EA/EPR/CB3908CE/T001). Accepted household, commercial and industrial waste. License issued 1981, listed as closed. Zone 6B: majority of area identified as Bakers Hole, licensed to Tarmac Cement and Lime Limited (EA/EPR/KP3898HE/V006). Accepted household, commercial and industrial waste. License issued 1983, listed as closed. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes
BGS historical landfill record	>250m	Two records. Northfleet Power Station, dated 1947, located 800m east. Springhead Road, dated 1987, located 950m east. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Historical landfill (EA records)	<100m >250m	Zone 6A: southern part of area identified as Bamber Pit (P/01/16, 21ER). Operated by Blue Circle Industries Plc. First input 1977, last input 1993. Off-site: Springhead Road landfill located 640m southeast of Zone 6C. Accepted inert, industrial, commercial and household waste. First input 1951 and last input 1984. South of Springhead landfill located 820m southeast of Zone 6C. Accepted inert, commercial and household waste. Northfleet Power Station located 990m southeast. Accepted inert, industrial and liquid sludge waste. First input 1960 and last input 1992. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes No
Historical Local Authority landfill records	<100m >250m	Zone 6A: Whole of area identified as Bamber Pit landfill. Zone 6B: southwest quadrant of Zone 6B identified as a refuse tip from 1985 mapping. Off-site: Record of refuse tip 630m southeast from 1971 mapping (Springhead Road Landfill). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes No
Historical waste sites	>250m	Off-site: record 560m northeast from a historical planning application (DA/96/00457) for use of land as a Waste Transfer Station. Record 800m southeast from a historic planning application (KCC/GR/0015/2015). Scheme comprised construction of waste oil transfer station. Record 970m southwest from a historical planning application (13/01667/FUL). Scheme comprises remediation works to contaminated land. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Licensed waste sites	<100m >250m	Zone 6B: five records related to Bakers Hole / Northfleet Landfill (EA/EPR/KP3898HE). Licensed to Blue Circle Industries Plc, Lafarge Cement UK Ltd and Tarmac Cement and Lime Limited. Off-site: three records located 775m east related to Northfleet Works (EA/EPR/RP3194EY) for a transfer station taking non-biodegradable wastes 2 records 775m south related to Springhead Enterprise Park for a Special Waste Transfer Station (EA/EPR/CB3005LP). <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes No
<b>No records of the following within 1km of Zone 6C (excluding those in other site zones): permitted waste sites, active or recent EA landfills, historical BGS landfills.</b>			
<b>Current Industrial Land Use</b>			
Recent industrial land uses	On-site <100m 100 to <250m >250m	Pylon, mast, car hire, railway stations. Off-site: electricity substation, distribution and haulage, travelling cranes. Off-site: industrial estate, new vehicles, vehicle cleaning services, vehicle testing and repair, construction supplies, published goods, dental equipment, distillers, car wash, fuel station, rail station, mast, stone quarrying and preparation, tanks Off-site: new vehicles, electricity substations, tanks, depot, foodstuffs, published goods, construction services, radar and telecommunications equipment, clothing products, civil engineers, cutting and drilling, metalworkers, vehicle hire and rental, warehouse, unspecified works, mooring facilities, playground equipment, industrial engineers, packaging, construction and tool hire. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes No No No

Item	Location [relative to Zone 6C]	Information	Potential to impact
List 2 dangerous substance inventory site	>250m	Off-site: record located 585m east, attributed to W T Henley (not active) for chromium, copper, cyanide, iron, pH, silver and zinc. Record positioned 940m northeast. Attributed to Britannia Refined Metals for release of arsenic copper, lead, nickel and zinc to the Thames Estuary. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Pollution incidents	100 to <250m	Off-site: 6 records within 250m. Majority had no (Category 4) or minor (Category 3) impact to air, land and water. One record located 215m south (within Zone 7B) and dated 2018 had significant (Category 2) impact to water, minor impact to land and no impact to air. Incident related to inert materials and wastes.	Yes
	>250m	Off-site: 18 further records within 1km. Majority had no (Category 4) or minor (Category 3) impact to air, land and water. One incident located 330m east had significant (Category 2) impact to air, minor impact to land and no impact to water. This was dated 2004 and relate to release of dust. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
List 1 dangerous substance inventory site	>250m	Off-site: 7 records within 1km. Nearest related to Gec Henley (600m east) for release of mercury and cadmium. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Pollution inventory waste transfer sites	>250m	Off-site: one record 875m northeast of Zone 6C. Site is operated by Britannia Refined Metals Ltd. Processed listed as recycling / reclamation of metals and metal compounds, oil refining or other uses of oil, incineration on land. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Part A1 licensed industrial activities	>250m	Off-site: one effective and six superseded licenses attributed to Britannia Refined Metals Ltd. from 630m northeast of Zone 6C. Licenses relate to 'non-ferrous metals; melting with capacity >4T/D lead/cadmium or 20T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more.' Also a record about 865m east attributed to Lafarge Cement UK Plc for cement and lime producing etc. License issued 2004, now superseded. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Discharge consents	On-site	One consent listed in Zone 6C. Related to release of trade discharges (mineral workings) to the River Ebbsfleet) by Lafarge Cement UK. License issued 1993.	Yes
	>250m	Off-site: numerous records located on eastern side of peninsula from 500m distant. All relate to release to the River Thames. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Local Pollution and Prevention Control (LPPC) activities Part A2 and B	<100m	Part B permit held about 50m east by Hidsons Ltd for use of a waste oil burner. No enforcements notified.	No
	100 to <250m	Current Part B permit held about 200m northeast for unloading of petrol into storage at service stations. No enforcements notified.	No
	>250m	Off-site: 7 further records of Part B permits. No enforcements notified. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Pollution inventory substances	>250m	Off-site: five records attributed to Britannia Refined Metals (870m northeast of Zone 6C). Related to 'non-ferrous metals; melting capacity >4T/D lead / cadmium or 20 T/D others and for alloys a vessel with a design holding capacity of 5 tonnes or more'. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
COMAH sites	>250m	Britannia Refined Metals Limited (560m northeast of Zone 6C) listed as COMAH Upper Tier Operator. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Radioactive substance authorisations	>250m	Off-site (920m west of Zone 6): Revoked or cancelled authorisation attributed to Sirs Navigation Ltd for disposal of radioactive waste. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No
Historical licensed industrial activities	>250m	Off-site: three records related to Britannia Refined Metals Ltd (620m northeast of Zone 6C) for processes using non-ferrous metals. <b>All other records (excluding those within other site zones) &gt; 1km distant from Zone 6C.</b>	No

Item	Location [relative to Zone 6C]	Information	Potential to impact
Hazardous substances storage	>250m	Off-site: record related to Britannia Refined Metals Ltd (645m northeast of Zone 6C) related to non-ferrous metals. Permits superseded by variation or revoked.	No
<b>No records of the following within 1km of Zone 6C (excluding records within other site zones): Part 2A sites, pollutant release to public sewer, Red list pollutant release to surface waters, pollution inventory radioactive substances, regulated explosive sites.</b>			
<b><i>Environmental, visual and cultural designations</i></b>			
Scheduled Ancient Monuments	<100m	Zone 6B: Palaeolithic site near Baker's Hole identified as Scheduled Ancient Monuments. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes
Sites of Special Scientific Interest	<100m	Zone 6B: Baker's Hole SSSI. Status listed as unfavourable – declining. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	Yes
Listed Buildings	>250m	Numerous listed buildings within 1km of Zone 6C. Nearest is The Factory Club (Grade II listed) located 300m east. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
Priority Habitat Inventory	<100m	Off-site: areas of deciduous woodland identified from 60m. <b>All other records (excluding those within other site zones) &gt;1km distant from Zone 6C.</b>	No
SSSI impact risk zone	On-site	Zone 6C is located in a SSSI impact risk zone for all planning applications (except householder) outside or extending outside existing settlements / urban areas.	Yes
<b>No records of the following within 1km of Zone 6C (excluding records within other site zones): Countryside Stewardship Scheme, Forest Parks, Greenbelt Land, Open Access Land, Tree Felling Licenses, Special Areas of Conservation, Special Protection Areas, Areas of Outstanding Natural Beauty, Biosphere Reserves, Conservation Areas, Ramsar Sites, Designated Ancient Woodland, Environmental Stewardship Scheme Agreements, Local Nature Reserves, Marine Conservation Areas, National Nature Reserves, National Parks, Possible Special Areas of Conservation, Potential Special Protection Areas, Proposed Ramsar Sites, Registered Parks and Gardens, World Heritage Sites.</b>			

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