9 Ground Conditions

9.1 Introduction

9.1.1 This Chapter considers potential significant effects that the construction and operation of the K3 and WKN Proposed Developments may have in light of the ground conditions at the K3 and WKN Sites. This chapter therefore considers the geology, hydrogeology ground stability as well as the contamination status of the K3 and WKN Sites to key receptors i.e. human health, controlled waters and ecology.

9.1.2 This Chapter also provides a preliminary (qualitative) assessment of the baseline land contamination status of the K3 and WKN Sites to determine the need for remediation / mitigation of current ground conditions.

9.2 Regulatory and Legislative Framework

Planning Policies

National Policy Statements

9.2.1 The principal legislative drivers for managing risks to human health from historical land contamination are:

- Part IIA of the Environmental Protection Act (EPA) 1990 (as amended), i.e. the 'contaminated land' regime;
- Contaminated Land (England) Regulations 2006 (as amended 2012);
- Environmental Permitting (England and Wales) Regulations 2016 (as amended); and
- The Town and Country Planning Act 1990 (as amended).

9.2.2 The principal legislation regarding the protection of specific water resources, water quality standards and policy relevant to the WKN Proposed Development is set out in the following primary European legislation:

- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive);
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (daughter to 2000/60/EC) (Groundwater Daughter Directive); and

- Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013, amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

9.2.3 The implementation of the Water Framework Directive (WFD) has resulted in the repeal and / or replacement of other European legislation of relevance to consideration of the water environment. Most notably, this includes the following:

- The Groundwater Directive (80/68/EEC), repealed in 2013;
- The Dangerous Substances Directive (76/464/EEC), repealed in 2013;
- The Freshwater Fish Directive (2006/44/EC) repealed in 2013; and
- The EC Shellfish Waters Directive (2006/113/EEC) repealed in 2013.

9.2.4 European legislation is implemented in the UK through specific Regulations. The following national legislation is considered relevant to this chapter:

- Part IIA of the Environmental Protection Act (1990);
- Environment Act (1995);
- Contaminated Land (Wales) Regulations (2006) and Amendment (2012);
- Environmental Permitting (England and Wales) Regulations (2016 as amended);
- Groundwater Regulations (1998);
- Groundwater (England and Wales) Regulations (2009);
- Water Resources Act (1991);
- Water Act (2003);
- Groundwater Regulations (1998), which transpose the EC Groundwater Directive 80/68/EC into UK law;
- Water Environment (Water Framework Directive) (England and Wales) Regulations (2003), which transpose the Water Directive 200/60/EC into UK law;
- Waste Framework Directive (2008) as transposed via Waste (England and Wales) Regulations 2011;
- Landfill (England and Wales) Regulations (2002); and
- Hazardous Waste (England and Wales) Regulations (2005).

9.2.5 In England, Part IIA of the EPA (Ref. 9.1), as introduced by Section 57 of the Environment Act 1995, came into effect in April 2000 with the implementation of the Contaminated Land Regulations 2000 (now superseded by the

Contaminated Land (England) Regulations 2006). Under Part IIA of the EPA, sites are identified as 'contaminated land' if significant harm is being caused or there is a significant possibility of such harm being caused; or significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused. Controlled waters are defined as including both surface waters and groundwater in an aquifer (Ref. 9.2). Once a site is determined to be 'contaminated land' the enforcing authority must consider how it should be remediated and, where appropriate, issue a remediation notice to require such remediation. Where a company volunteers to remediate a site, the local authority should support this and publish a remediation statement.

National Planning Policy Framework (NPPF)

9.2.6 The National Planning Policy Framework (NPPF) (Ref 9.3) sets out how the planning system should contribute to and enhance the natural environment and local environment in a number of ways, including:

- Protecting and enhancing valued landscapes, geological conservation interests and soils;
- Preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, or noise pollution or land instability; and
- Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

9.2.7 The NPPF requires that local planning authorities ensure that new development is appropriate for its location taking account of the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the sensitivity of the area or proposed development to adverse effects from pollution.

9.2.8 NPPF paragraph 121 also requires planning decisions to ensure that:

'The site is suitable for its new use taking account of ground conditions and land instability, including natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation.'

Kent County Council's Development Plan

9.2.9 Kent County Council's 'Minerals and Waste Local Plan' (Ref.9.4) sets out the Council's overarching strategy and planning policies for mineral extraction, importation and recycling and the waste management of all waste streams that are generated or managed in Kent.

9.2.10 Policy CSW6 of the Minerals and Waste Local Plan states that:

'Where it is demonstrated that provision of capacity additional to that required by Policy CSW 7, or that waste will be dealt with further up the hierarchy, or it

is replacing capacity lost at existing sites, facilities that satisfy the relevant criteria above on land in the following locations will be granted consent, providing there is no adverse impact on the environment and communities and where such uses are compatible with the development plan:

3. within existing industrial sites

4. other previously developed, contaminated or derelict land not allocated for another use'.

9.2.11 Policy DM 18 of the same document states that:

'Planning Permission will be granted for minerals or waste development where it is demonstrated that it will not result in land instability.'

Swale Borough Council's Development Plan

9.2.12 The Swale Borough Council Local Plan 'Bearing Fruits' (Ref. 9.5) sets out the Council's vision to transform the Borough's economic, social and environmental prospects.

9.2.13 Policy ST 1 of the Local Plan states to:

'Conserve and enhance the natural environment by:

Applying the national planning policy in respect of pollution, despoiled, degraded, derelict, contaminated, unstable and previously developed land'.

Relevant Guidance

9.2.14 The following national guidance and accepted industry good practice is relevant to this assessment:

- Model Procedures for the Management of Land Contamination (CLR11) (Ref. 9.6);
- Environment Agency "Groundwater Protection Guidance, that includes – Groundwater protection technical guidance (Ref. 9.7);
- The Environment Agency's approach to groundwater protection, Version 1 (Ref. 9.8);
- Construction Industry Research and Information Association (CIRIA) 132: A Guide for Safe Working on Contaminated Sites (Ref. 9.9);
- CIRIA C665, Assessing Risks Posed by Hazardous Ground Gases to Buildings (Ref. 9.10);
- CIRIA 73: Role and Responsibility in Site Investigation (Ref. 9.11);
- BS5930: Code of Practice for Site Investigations (Ref. 9.12);

- BS10175: Investigation of Potentially Contaminated Sites: Code of Practice (Ref, 9.13);
- BSI BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes (Ref. 9.14); and
- Guidelines for Environmental Impact Assessment (Ref. 9.15).

9.3 Methodology

Scoping and Consultation

9.3.1 The formal scoping exercise is summarised in Chapter 3. No significant issues were raised by the key Consultees as a result of the scoping exercise in relation to this Chapter.

Establishing Baseline Conditions

9.3.2 The assessment of ground conditions has involved the review of available information pertaining to the current condition of the soil and groundwater beneath the K3 and WKN Sites and adjacent site areas including within Work No's 1-7 as set out in Chapter 2. This information has been used to define baseline conditions for the K3 and WKN Sites in the context of the K3 and WKN Proposed Developments. Baseline conditions underpin the Conceptual Site Model (CSM) developed for the K3 and WKN Sites to assist in the evaluation of the significance of effects associated with the construction and operational phases of the K3 and WKN Proposed Developments.

9.3.3 A Desk Study and Preliminary Risk Assessment (Appendix 9.1) has been undertaken for the WKN Site. This is based upon available information in relation to the ground conditions at the WKN Site, obtained through published environmental and geological data from various sources including the Environment Agency, Envirocheck and the British Geological Survey. The baseline ground conditions and CSM for the K3 Site have previously been established in the EIA K3 as consented (Ref. 9.18) in 2010 (see Document 3.3 submitted with the application).

9.3.4 The Desk Study provides a summary of the known ground conditions at the WKN Site and defines the preliminary CSM. The CSM is then used to provide a qualitative assessment of potential risk to named receptors (including human health and controlled waters) in relation to the baseline contamination status of soil and groundwater underlying the WKN Site.

9.3.5 The Desk Study and definition of baseline conditions is therefore dependent on the results of several ground investigations previously undertaken on and immediately to the south of the WKN Site, including within the K3 Site. A summary of the previous ground investigations and other studies of greatest relevance to the ground conditions at the K3 and WKN Sites and reviewed within the Desk Study are provided below:

- RPS Group, 'Phase 1 Environmental Site Assessment, Kemsley Paper Mill, Sittingbourne, Kent', on behalf of E.ON, March 2009 (Ref. 9.16).

- RPS Group, 'Phase 2 Intrusive Site Investigation, Kemsley Paper Mill, Sittingbourne, Kent', on behalf of E.ON, September 2009 (Ref. 9.17);

- RPS Group, 'Development of a Sustainable Energy Plant, Kemsley Paper Mill, Environmental Statement, Chapter 11: Hydrogeology and Ground Conditions' (Ref. 9.18);

- URS Group, 'Geotechnical and Environmental Site Investigation', on behalf of John Sisk & Sons Ltd, January 2013 (Ref. 9.19);

- RPS Group, 'Interpretative Ground Investigation Report, Pre-Commencement Works for the Sustainable Energy Plant, Kemsley Paper Mill, Sittingbourne, Kent', on behalf of EEW Energy from Waste UK Limited, June 2013 (this report includes review of a ground investigation undertaken by CMW in 1995) (Ref. 9.20); and

- RPS Group, 'Site Investigation Report, Kemsley Paper Mill' on behalf of Wheelabrator Technologies Inc. December 2015 (Ref. 9.21).

9.3.6 Figure 9.1 shows the location of the exploratory holes from the ground investigations detailed above. The locations of these exploratory holes provide adequate coverage of soils and groundwater to underpin the assessments undertaken for this Chapter.

9.3.7 Baseline conditions regarding chemical contamination have therefore been assessed using data from the previous ground investigations and studies listed above.

Human Health Assessment of Soil Contamination

9.3.1 A Human Health Risk Assessment was undertaken by RPS as part of their Phase 2 Intrusive Site Investigation undertaken in September 2009 (Ref.9.17). The ground investigation was undertaken on land on the southern boundary and to the south of the WKN Site, within the K3 Site.

9.3.2 URS undertook a Human Health Risk Assessment as part of their intrusive ground investigation undertaken in October 2012, and reported in January 2013 (Ref. 9.19). This investigation was undertaken on land adjoining the southern boundary of the WKN Site, within the K3 Site.

9.3.3 A Human Health Risk Assessment was undertaken by RPS as part of their Interpretative Ground Investigation Report (Ref. 9.20) undertaken in June 2013. The investigation was focused on ground investigation locations within the boundaries of and to the south of the WKN Site, including the K3 Site.

9.3.4 A ground investigation was undertaken by RPS in December 2015 (Ref. 9.21) and included a Human Health Risk Assessment. The investigation focussed on land within the boundaries of the WKN Site.

Assessment of Groundwater Quality

9.3.1 A Controlled Waters Risk Assessment was undertaken by RPS as part of their Phase 2 Intrusive Site Investigation undertaken in September 2009 (Ref. 9.17). The ground investigation was undertaken on land on the southern boundary and to the south of the WKN Site, including the K3 Site.

9.3.2 URS undertook a Controlled Waters Risk Assessment as part of their intrusive ground investigation undertaken in October 2012, and reported in January 2013 (Ref.8.19). This investigation was undertaken on land adjoining the southern boundary of the WKN Site, including the K3 Site.

9.3.3 A Controlled Waters Risk Assessment was undertaken by RPS as part of their Interpretative Ground Investigation Report (Ref. 9.20) undertaken in June 2013. The investigation was focused on ground investigation locations within the boundaries of and to the south of the WKN Site, including the K3 Site.

Soil Gas Assessment

9.3.1 A Ground Gas Risk Assessment was undertaken by RPS as part of their Phase 2 Intrusive Site Investigation undertaken in September 2009 (Ref. 9.17). The ground investigation was undertaken on land on the southern boundary and to the south of the WKN Site, including the K3 Site.

9.3.2 A Ground Gas Risk Assessment was undertaken by RPS as part of their Interpretative Ground Investigation Report (Ref. 9.20) undertaken in June 2013. The investigation was focused on round investigation locations within the boundaries of and to the south of the WKN Site, including the K3 Site.

Significance Criteria

9.3.1 The significance of possible effects resulting from the WKN Proposed Development is dependent on the sensitivity of the receptor affected and the predicted magnitude of impact on the receptor, should an impact be realised. These criteria are described below.

9.3.2 The magnitude of any predicted impact has been determined by consideration of the following:

- The temporal scale of individual effects is described as either short, medium or long-term; where short term relates to the construction phase, medium term extends from 1-5 years from the end of works, and long-term extends beyond 5 years from the end of works;
- Adverse or beneficial: whether the nature of the effect increases or decreases potential contamination risks to sensitive receptors;
- Direct or indirect effect: whether the receptor will be affected directly or indirectly;
- Temporary or permanent: effects may occur over the life time of the project or may occur for a limited period of time e.g. whilst a specific activity is taking place;

- Reversible / irreversible effect: effects can be reversed by mitigation measures or by natural environmental recovery within reasonable timescales (5-10 years following cessation of construction); and

- Geographical scale: whether the effect would be experienced at the local, regional or national level.

Assessment of Effects

Receptor Sensitivity / Value

9.3.3 The sensitivity of the receptors have been qualitatively described and categorised based upon the terminology in Table 9.1.

Sensitivity	Typical Descriptors	Examples
High	High importance and rarity, and limited potential for substitution.	• On site future site occupants e.g. staff, through chronic exposure to contamination • Principal aquifer with licensed groundwater abstractions • Excellent quality surface water bodies
Medium	Medium importance and rarity, limited potential for substitution.	• Off site future site occupants e.g. staff on adjacent sites • Secondary A aquifer • Good quality surface water bodies
Low	Low importance and rarity.	• Secondary undifferentiated aquifer • Satisfactory quality surface water bodies
Negligible	Very low importance and rarity.	• Unproductive strata • Poor quality surface water bodies

Table 9.1: Receptor Sensitivity Criteria

Magnitude of Impact

9.3.4 The magnitude of potential impacts during construction and site operation has been qualitatively described and categorised based on the terminology in Table 9.2. These are equivalent to the significance categories defined in the Contaminated Land Statutory Guidance (Ref. 9.1). For planning purposes, following development, land should not fall into Categories 1 or 2 and be capable of being designated as 'contaminated land'.

Magnitude	Criteria	Example / Description
High	Results in loss of attribute and likely to cause exceedance of statutory objectives and/or breaches of legislation.	Category 1 – Soil contamination that could result in a 'contaminated land' designation under Part IIA, i.e. significant possibility of significant harm to human health or controlled waters. Or A change of planning use deems that the concentrations of contaminants in the land may be harmful to receptors Remedial Action under Part IIA will be required Or

Magnitude	Criteria	Example / Description
		Loss of resource or severe damage to characteristics, features or elements e.g. of a geologically designated site.
Medium	Results in impact on integrity of attribute or loss of part of attribute possibly with / without exceedance of Statutory objectives or with/ without breaches in legislation.	Category 2 - Soil contamination that could provide a strong case for considering that the risks are of significant concern so as to be designated as 'contaminated land' designation under Part IIA. Or A change of planning use deems that the concentrations of contaminants in the land may be harmful to receptors Remedial Action under Part IIA will be required on a precautionary basis. Or Partial loss of / damage to characteristics, features or elements e.g. of a geologically designated site.
Low	Results in minor impact on attribute.	Category 3 – Soil contamination could arise but the concentrations would not be considered significant or there is a low likelihood of serious pollution. Or A change of planning use deems that the concentrations of contaminants in the land are not capable of harming receptors. It is unlikely that remedial action will be required, however land owners may consider remedial actions to reduce contamination outside of the Part IIA or planning regime. Or Minor damage to characteristics, features or elements e.g. of geological feature of interest.
Negligible	Results in no discernible change or an impact on attribute of insufficient magnitude to affect the use / integrity.	Soil contaminants present, but risk assessment suggests negligible / low risk to human health. Or Very minor damage to characteristics, features or elements e.g. of geological feature of interest.

Table 9.2: Impact Magnitude Criteria

Assessment of Effects

9.3.5 The significance of an effect has been determined from the predicted magnitude of an impact and sensitivity of the receptor affected using the matrix provided in Table 9.3.

9.3.6 The assessment does not take into account any mitigation measures included as part of the construction phase nor any mitigation measures included as part of the operational site. Mitigation measures are however detailed after the assessment and all predicted significant impacts are re-assessed to take into account the mitigation measures proposed.

Sensitivity	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major

Table 9.3: Receptor Sensitivity Criteria

9.3.7 The broad definitions of these effects are as follows:

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- Moderate: These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular receptor.
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

9.3.1 Where the matrix offers more than one significance option, professional judgement has been used to decide which effect is most appropriate.

9.3.2 Only those effects of moderate and above are considered significant.

Limitations and Assumptions

9.3.3 No specific ground investigation has been undertaken to support the development of the WKN element of this ES Chapter. The information used to determine the significance of potential impacts of the K3 and WKN Proposed Developments is therefore based upon the Desk Study, the 2010 EIA for the K3 Site and previous ground investigation data for the WKN Site and K3. This is augmented by RPS experience on the Kemsley Paper Mill site and professional judgement.

9.4 Baseline Conditions

9.4.1 The baseline conditions within the WKN Site are described in detail in the Desk Study and Preliminary Risk Assessment report (Appendix 9.1). A brief overview is given in this section. The history of the K3 Site has been summarised previously in the 2010 EIA (Ref. 9.18) and is not repeated in this section (see Document 3.3 submitted with the application). K3 as consented is at an advanced stage of

construction and due to be fully operational by the end of 2019. All planning conditions of relevance to ground conditions have been discharged.

Site Land Use

Current Site Use

9.4.2 The WKN Site is currently is use as a car park, office and construction lay down area for K3 being constructed immediately to the south. The proposed construction laydown area for the WKN Proposed Development to the north-east currently comprises an open area of rough vegetation and crushed gravel. An existing access lies to the west of the WKN Site (Work No.4) and is to be used as the site access during operational. An existing haul road lies to the north of the WKN Site and is to be utilised during construction for access (Work No. 5) to the construction laydown area (Work No. 6).

9.4.3 The majority of the WKN Site comprises a car park with a generally level surface primarily covered by hardstanding but with some areas covered by gravel. Along the western and southern border of the WKN Site are temporary construction offices and containers associated with the construction of K3 to the south.

9.4.4 A ditch runs along the northern boundary of the WKN Site. In the south western corner, an area is fenced off area containing a remote mixing station for mortar.

9.4.5 The smaller, eastern area of the WKN Site is separated from the car park by fencing and comprises a construction lay down area. This area appears to comprise of made ground and gravel/rubble although it is largely covered by construction materials and plant. No hardstanding is present in this area. The southern area of this eastern part of the WKN Site comprises an access track for plant to the K3 Site.

Historical Site Use

9.4.6 Ordnance Survey maps that detail the WKN Site history are included within the Desk Study and Preliminary Risk Assessment Report.

9.4.7 The Ordnance Survey maps show that in 1869, the WKN Site was referred to as marshland with various streams and osiers being present. A river embankment was situated in the north-eastern area of the WKN Site with a sheepfold / wash being present close to the southern boundary.

9.4.8 The Kemsley Paper Mill is first recorded approximately 150m to the south-west of the WKN Site by 1938.

9.4.9 By 1963/4, a conveyor had been constructed through the central part of the WKN Site, connecting a jetty on the Swale to the north-east. A railway tack is also recorded in the central part of the WKN Site, running towards the north-west. Several small buildings are also recorded adjacent to the railway line.

9.4.10 The map dated 1978 records a refuse tip to be present in the eastern part of the WKN Site, although no reference to this feature is recorded beyond 1999 on the maps. Further references to spoil heaps / refuse tips are also shown to the south and south-east of the WKN Site from the 1970s.

9.4.11 The overhead conveyor and railway track are no longer recorded on the latest map, dated 2018.

Geology

The geological conditions at the WKN Site detailed below are based upon the available ground investigation information (Refs 9.17 – 9.21).

Made Ground

9.4.12 The WKN Site is currently being used as an office and construction lay down area for K3 that is currently being constructed to the south. Prior to this use, several ground investigations were undertaken within the boundaries of the WKN Site.

9.4.13 Ground investigation data (Refs 9.17, 9.20 & 9.21) has identified Made Ground to be present to depths of at least 4.2m within the boundaries of the WKN Site. The Made Ground was noted to be variable in composition, comprising clays and sands with numerous fragments of concrete, brick, glass, wood, metal, ash and clinker and is considered likely to be indicative of the landfilled materials present at the WKN Site. The Made Ground within RPS-TP01 in the western part of the WKN Site comprised ash and clinker and was distinctly different in composition to the Made Ground across the remainder of the WKN Site and suggests that this location lies outside of the landfilled materials present within the WKN Site.

Superficial Deposits

9.4.14 British Geological Survey (BGS) information indicates the presence of superficial Alluvium across the entire WKN Site and the construction laydown area to the north-east.

9.4.15 Available ground investigation information indicates the presence of Alluvium at 2 no. exploratory hole locations within the WKN Site, comprising soft and firm to stiff brown sandy gravelly clay. Ground investigation works undertaken to the south of the WKN Site identified superficial deposits that typically comprised grey brown orange mottled soft to firm clays of Alluvium above the stiff grey clays of the London Clay Formation. The maximum proven depth of Alluvium was 8.6 mbgl.

Bedrock

9.4.16 BGS information indicates that the entire WKN Site and construction laydown area is underlain by the London Clay Formation that comprises stiff bluish clay. Ground investigation information confirms the thickness of the London Clay within the vicinity of the WKN Site to be between 2.5 and 6.8 m. BGS mapping shows the southern limit London Clay Formation to lie approximately 300 m to the south of the WKN Site.

9.4.17 The Lambeth Group (formerly referred to as the Woolwich Beds), comprising dense sand with clay layers, underlies the London Clay Formation. Deposits of the Lambeth Group are present at the ground surface, to the south of the limit of the London Clay (approximately 300 m to the south of the southern WKN Site boundary). Within the vicinity of the WKN Site, the Lambeth Group has been proven at depths of >16.4 m with a proven thickness of at least 7.8 m. The Thanet

Formation, comprising pale yellow fine grained sands that can be clayey and glauconitic underlies the Lambeth Group. Together the Lambeth Group and Thanet Formation constitute a complex unit comprising interbedded sands, sandstones, clays and silts.

9.4.18 The Seaford Chalk Formation is anticipated to underlie the Thanet Formation but has not been encountered in the exploratory holes shown in Figure 9.1.

Land Stability

9.4.19 The Desk Study Report indicates that natural ground stability hazards at the WKN Site are considered to be negligible to moderate.

9.4.20 The moderate rating relates to the presence of shrink-swell clay, compressible ground and collapsible ground, indicating the potential for differential settlement under loading. This is consistent with the presence of Alluvium underlying the WKN Site

Coal Mining

9.4.21 The WKN Site is not in an area that is recorded as being impacted by coal mining.

Hydrogeology

Overview

9.4.22 Alluvial deposits located across the WKN Site and proposed construction laydown area are classified as a Secondary (Undifferentiated) aquifer by the Environment Agency. Historical investigations have identified perched water within installations completed in the Made Ground and shallow Alluvium.

9.4.23 The London Clay Formation is classified as Unproductive Strata and where present would support shallow perched water in overlying granular units contained within the Alluvium and/or Made Ground.

9.4.24 The Lambeth Group and Thanet Formation that underlie the London Clay Formation are classified as a Secondary A Aquifer. These geological units are known to be groundwater bearing, likely to be confined by the stiff grey clays of the London Clay although vertical flow paths will be complex and tortuous. Historical investigations have identified groundwater within the Lambeth Group and Thanet formation where encountered.

9.4.25 The Seaford Chalk Formation, anticipated to underlie the Lambeth Group and Thanet Beds is classified as a Principal Aquifer.

9.4.26 The low permeability London Clay Formation is expected to act as an aquitard that confines groundwater within the granular Lambeth Group / Thanet Formation and therefore groundwater flow between any perched groundwater and the Lambeth Group / Thanet Formation is likely to be negligible.

Groundwater Flow

9.4.27 Previous hydrogeological assessments undertaken in the vicinity of the WKN Site (Ref. 9.17 & 9.18) indicated a groundwater flow within a perched 'shallow aquifer' present within the Made Ground / upper Alluvium, perched above the Alluvium, towards the Swale Estuary to the east of the WKN Site. Based upon the available ground investigation information, a laterally discontinuous perched water body has been identified at shallow depth.

9.4.28 The granular Lambeth Group / Thanet Sands are saturated beneath the London Clay. Groundwater flow direction within deep boreholes, screened within the Lambeth Group, could not be determined during previous phases of ground investigation.

9.4.29 Groundwater within both the shallow and deeper strata was noted to be tidally-influenced, indicating a degree of hydraulic continuity between the groundwater bodies present and the tidal Swale Estuary.

Groundwater Abstractions

9.4.30 The Envirocheck report included within the Desk Study (Appendix 9.1) does not list any groundwater abstractions within 1km of the WKN Site.

Hydrology

9.4.31 No surface water bodies are present on the WKN Site and the proposed construction laydown area or accesses.

9.4.32 The nearest surface water feature is the Swale Estuary located approximately 15 m to the east of the eastern WKN Site boundary.

Surface Water Abstractions

9.4.33 There are 3 no. permits for surface water abstractions within 500 m of the WKN Site, 2 no. of which are located 140 m to the east. The permits are for non-evaporative cooling (DS Smith) and spray irrigation (Grovehurst Energy) with water being abstracted from The Swale. The third permit is recorded to be operated by Grovehurst Energy 184m to the east of the WKN Site for industrial cooling (miscellaneous) with water being abstracted from The Swale.

Discharge Consents

9.4.34 There are no active discharge consents within the boundaries of the WKN Site, according to Environment Agency information. There are a total of 4 no. active discharge consents listed within 500 m of the WKN Site, recorded to be operated by Clugston Group Ltd, Grovehurst Energy Ltd and Southern Water Services Ltd.

9.4.35 These consents are for Trade Discharges (cooling / process water), Trade Effluent Discharge, Sewage Discharges and Storm Sewage Overflow.

9.4.36 Theses consents relate to the discharge to a number of bodies including freshwater stream / river (1 no.), tributary of the The Swale (1 no.) and into a Saline estuary (2 no.).

Statutory and No Statutory Designations

9.4.37 The Swale Estuary situated approximately 15 m to the east of the WKN Site has been identified as a Marine Nature Reserve, a Ramsar Site, a Site of Special Scientific Interest (SSSI) and a Special Protection Area (SPA).

Soil and Groundwater Contamination

9.4.38 The Desk Study (Appendix 9.1) provides a summary of baseline soil and groundwater quality at and within the vicinity of the WKN Site.

9.4.39 In general terms the available soil quality dataset is characterised by low levels of organic and inorganic contamination in soils, although asbestos has been identified within soils at a number of locations. Soil quality is largely characterised by the absence of Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs), with the exception of Polycyclic Aromatic Hydrocarbons (PAHs). No hot spots indicative of gross soil contamination were identified in any investigation and no requirement for site remediation, other than for asbestos, in advance on future construction works was identified on the basis of observed soil quality.

9.4.40 Low levels of organic and inorganic contamination have been identified in shallow perched waters and/or deep groundwater. Where present, the highest concentrations of contaminants of concern have been observed in Made Ground, which is characterised by the presence of metals, petroleum hydrocarbons and PAHs. Groundwater is typically characterised by the absence of VOCs and SVOCs.

9.4.41 The water quality dataset for shallow and deep groundwater provides no indication of the impact of leachate associated with the Kemsley Paper Mill landfill to the south of the WKN Site.

9.4.42 A summary of the findings of the various ground investigations undertaken at and in the vicinity of the WKN Site is provided below.

9.4.43 The ground investigation undertaken by RPS in December 2015, within the boundaries of the WKN Site, identified:

- Made Ground was identified within all of the intrusive investigation locations, and had a maximum proven thickness of 4.2m. This stratum was noted to contain concrete fragments, brick fragments, glass, metal, ash and clinker;
- Limited olfactory evidence of contamination was identified during the investigation works;
- An oily sheen was observed on the groundwater encountered at one investigation location; and
- Asbestos fibres to be present within soil samples from a total of 3 no. locations:
    - Trial Pit RPS-TP02 at a depth of 1.0 mbgl (chrysotile);
    - Trial Pit RPS-TP04 at a depth of 1.0 mbgl (amosite); and

- Trial Pit RPS-TP05 at a depth of 1.5 mbgl (crocidolite).

9.4.44 The Human Health Risk Assessment concluded that the identified chemical contaminant concentrations were unlikely to present an unacceptable risk to human health. The presence of asbestos fibres was considered to pose a potentially unacceptable risk to human health and it was considered that the removal of asbestos containing soils or use of a clean capping layer or hardstanding would significantly reduce risks posed by asbestos.

9.4.45 The Human Health and Controlled Waters Risk Assessments undertaken by RPS as part of their Phase 2 Intrusive Site Investigation undertaken along the southern boundary of and to the south of the WKN Site, including the K3 area, in September 2009 (Ref. 9.17) identified:

- No exceedances of the applied assessment criteria for all organic (TPH, PAH) or inorganic (heavy metals) contaminants;
- The presence of asbestos at one location at the site, at a depth of between 0.8-1.2mbgl within Made Ground, but outside of the WKN Site. The asbestos was identified as amosite (brown asbestos) and the likely source was attributed to anthropogenic material within the Made Ground; and
- Laboratory analysis of groundwater samples obtained from the Alluvium identified concentrations of nickel, sulphate, chromium, copper, PAH and TPH in exceedance of the applied assessment criteria (EQS or DWS). The identified exceedances within the deeper aquifer (Lambeth Group / Thanet Beds comprised elevated nickel and sulphate.

9.4.46 The findings of the Human Health Risk Assessment undertaken by URS as part of their intrusive ground investigation adjacent to the south of the WKN Site (the K3 area) undertaken in October 2012 (Ref. 9.19) included:

- Concentrations of heavy metals, PAH, BTEX and TPH were not considered to pose an unacceptable risk to human health or controlled waters;
- Asbestos fibres were identified at one location which was considered to represent a potential risk to human health; and
- Material sampled was categorised as non-hazardous waste in accordance with waste management guidelines published by the Environment Agency (EA).

9.4.47 A Human Health Risk Assessment undertaken by RPS in June 2013 (Ref. 9.20), which included locations within and to the south of the WKN Site, including the K3 area, concluded that inorganic parameters, petroleum hydrocarbons and other organic parameters did not represent an unacceptable risk to human health.

9.4.48 The controlled waters risk assessment undertaken within the same report identified the following:

- Perched groundwater was in steady state with Made Ground and patterns of contamination do not suggest significant potential to pollute wider controlled waters;

- The generally limited occurrence of groundwater contamination by organic parameters;
- The absence of significant sources of soil contamination that were resulting in ongoing contamination of groundwater at the WKN site and areas to the south including the K3 area; and
- The concentrations of aliphatic and aromatic hydrocarbons identified in groundwater did not represent an unacceptable risk to groundwater quality at the site boundary.

Pollution Incidents

9.4.49 No pollution incidents have been recorded within the boundaries of the WKN Site.

9.4.50 The Desk Study records a total of 3 no. pollution incidents within 250 m of the WKN Site, however it is considered that none of these have the potential to have impacted on the WKN Site due to their distance and nature of the contaminants.

Landfill Sites

9.4.51 There are 3 no. recorded active landfill sites within 500m of the WKN site:

- 120 m & 292 m south-east, License Holder: DS Smith Paper Ltd
  - Site Location: Kemsley Mill Landfill, Kemsley, Sittingbourne, Kent
  - Date started: 18/04/194
  - Site category: Industrial waste landfills
- 283 m south-east, License Holder: Grovehurst Energy Ltd
  - Site Location: Kemsley Mill extension, Kemsley, Sittingbourne, Kent
  - Max. input rate: 'Large' 75,000-250,000 tonnes per year
  - Date started: 18/04/94
  - Authorised waste: includes bio sludge; dewatered effluent sludge cake; flood sweepings not contaminated; primary sludge cake; pulverised fuel ash; and uncontaminated used fuel containers
- 286 m south-east, License Holder: New Thames Paper Co Ltd
  - Site Location: Kemsley Mill, Kemsley, Sittingbourne, ME10 3ET
  - Max. input rate: 'Medium' 25,000-75,000 tonnes per year
  - Date started: 14/10/1977
  - Authorised waste: includes construction and demolition wastes. Inert/Non-hazardous/non-toxic; paper-making wastes; wet fly ash

9.4.52 There are 2 no. historical landfill sites recorded within 500 m of the WKN Site:

- On Site, License held by Kemsley Paper Mill
  - Dates of operation: unknown
  - Landfill type: inert waste
- 117 m south-east, License held by Bowaters UK
  - Dates of operation: 31/12/1977 to 31/12/1993
  - Landfill type: inert, industrial, commercial, household waste and liquid sludge.

9.4.53 Ground investigation information has provided no evidence of these landfills impacting on the WKN Site.

Ground Gas

9.4.54 A review of historical and environmental records has identified several potential sources of ground gas which could impact the WKN Site, namely the onsite presence of a landfill and other areas of landfill to the south of the WKN Site (including the Kemsley Waste Disposal Site) and the superficial Alluvium deposits located underlying the Made Ground (due to the potential presence of peat within this stratum). Ground investigation works previously undertaken within the boundaries of the WKN Site (most notably by RPS in 2015) have encountered Made Ground soils to a depth of at least 4.2 mbgl and evidence of anthropogenic materials e.g. brick , concrete, metal has been recorded. It is noted however that the presence of these anthropogenic materials is broadly in line with the 'inert' regulatory classification of this landfill and no evidence of materials that have a higher propensity to generate ground gas e.g. household waste, were identified at the WKN Site.

9.4.55 Furthermore, the Kemsley Waste Disposal Site situated to the south of the WKN Site is actively managed by DS Smith to the satisfaction of the Regulatory bodies (Ref. 9.20).

9.4.56 The Ground Gas Risk Assessment undertaken by RPS in September 2009 (Ref. 9.17) to the south of the WKN Site within the K3 Site identified broadly-low concentrations of ground gas within the shallow soils; however a concentration of carbon dioxide was recorded as 5.5% in a single location (outside of the WKN Site) during the gas monitoring.

9.4.57 The Ground Gas Risk Assessment undertaken by RPS in June 2013 (Ref. 9.20) classified ground gas risks to the south of the WKN Site as 'Characteristic Situation 2 – 'Low Risk'' as per CIRIA C665 guidance (Ref. 9.10). This classification was due to elevated concentrations of methane and carbon dioxide (>5%w/w) identified during the course of the post-works monitoring.

9.4.58 On this basis ground gas protection measures will be required for the WKN Proposed Development. The risk assessment referred to above was based upon limited gas monitoring data and therefore and it is recommended to undertake

further ground investigation, gas monitoring and risk assessment to define the ground gas protection measures required.

Conceptual Site Model

9.4.59 Based upon the baseline information outlined above, a Conceptual Site Model has been developed for the WKN Site that identifies potential contamination sources, sensitive receptors and exposure pathways present at the WKN Site.

Potential Contamination Sources

9.4.60 The potential contamination sources listed in Table 9.4 below have the potential to impact sensitive receptors present at and in the vicinity of the WKN Site as a consequence of the WKN Proposed Development.

Potential Contamination Source	Comments
Historical Site Activities	Records have indicated the presence of a historical landfill in the eastern part of the WKN Site and the proposed construction laydown area that was licensed to accept inert waste and represents a potential source of soil contamination, leachate and ground gas No other significant sources of contamination identified across the WKN Site with only localised other sources indicated to be present i.e. small railway line.
Presence of Made Ground and / or perched waters in the Made Ground	Made Ground present at the WKN Site (outside of the landfill area) due to the general developed nature of surrounding areas and history of waste disposal in the area. Localised perched water in the Made Ground is considered to be a potential source of contamination.
Current Site Activities	No contamination sources have been identified from current site activities
Adjacent Site Activities	Current paper mill to the south-west of the WKN Site, however the presence of this activity is not considered to pose a significant contamination source. Landfilling to the south of the WKN Site (including the Kemsley Waste Disposal Site) is considered to pose a contamination source.
Ground Gas	Historical landfilling has been recorded on and to the south of the WKN Site. In addition, the presence of Alluvium underlying the Made Ground may represent a gas source.

Table 9.4: Potential Contamination Sources

Sensitive Receptors

9.4.61 The sensitive receptors listed in Table 9.5 below have the potential to be affected by effects arising from the WKN Proposed Development. The assessment in this Chapter has considered the effects listed in the table upon the identified sensitive receptors.

Receptor	Importance/sensitivity/vulnerability to change
Future Site Users	High
Construction Workers	High
Adjacent Site Users	High
Secondary Undifferentiated Aquifer (Alluvium)	Low
Secondary A Aquifer (Lambeth Group and Thanet Formation)	Medium
Principal Aquifer (Chalk)	High
Surface Water Quality (the Swale)	High
Ecological Receptors e.g. SPA, SSSI (the Swale)	High

Table 9.5: Potentially affected sensitive receptors

Exposure Pathways

9.4.62 The exposure pathways listed in Table 9.6 below have the potential to allow contamination to migrate from potential contamination sources to sensitive receptors as a consequence of the WKN Proposed Development.

Exposure Pathway	Sensitive Receptor Potentially Impacted
Inhalation / ingestion dermal contact with contaminated soil / dust	Future Site Users / Construction Workers
Inhalation of organic vapours	Future Site Users / Construction Workers
Inhalation of asbestos fibres	Future Site Users / Construction Workers
Leaching of contaminants from the Made Ground into perched waters above the Alluvium	Secondary Undifferentiated Aquifer (Alluvium)
Leaching of contaminants from Made Ground into perched waters and downward migration through London Clay to groundwater within the underlying Lambeth Group / Thanet Formation	Secondary A Aquifer (Lambeth Group / Thanet Formation)
Leaching of contaminants from Made Ground into perched waters and downward migration through London Clay to underlying groundwater in the Lambeth Group / Thanet Formation and into the Chalk aquifer at depth.	Principal Aquifer (Chalk)
Leaching of contaminants from Made Ground into perched waters. Lateral migration of shallow perched water to adjacent surface water receptors.	Surface Water Quality and Ecological Receptors (the Swale)
Leaching of contaminants from Made Ground into perched waters and downward migration through London Clay to groundwater within the underlying Lambeth Group / Thanet Formation. Lateral migration of potentially contaminated groundwater in deep aquifer units	Surface Water Quality and Ecological Receptors (the Swale)
Lateral migration and accumulation of ground gas within structures	Future Site Users

Table 9.6: Potentially affected sensitive receptors

9.5 Future Baseline

9.5.1 Assuming that there is no further development at or in the vicinity of the WKN and K3 Sites that introduces new sources of potential contamination to the site,

it is anticipated that there will be no change to baseline conditions at the K3 and WKN Sites in the future, on the basis that risks from any new potential contamination sources are suitably mitigated in accordance with the requirements of the relevant environmental and construction legislation.

9.5.2 No changes to contamination levels are predicted on this basis.

9.6 K3 Proposed Development Predicted Effects

9.6.1 The ground conditions in relation to construction of the K3 were assessed as part of the EIA completed for the original planning application for the facility. No likely significant effects were identified in relation to ground conditions (see Document 3.3 submitted with the planning application).

9.6.2 All works pursuant to construction of the K3 and planning conditions in relation to ground conditions have been completed and discharged, including adherence to a Construction Environmental Management Plan.

9.6.3 No further external construction work is required by way of consequence of the practical effect of the K3 Proposed Development. In the absence of any change in built form associated with K3, it is anticipated that there is no potential for further ground condition related effects.

9.7 WKN Proposed Development Predicted Effects

9.7.1 Based upon the available information for and in the vicinity of the WKN Site and utilising experience and professional judgement, the predicted effects of the WKN Proposed Development, including all relevant works as detailed within Chapter 2, on human, controlled waters and ecological receptors are outlined below.

9.7.2 A summary of the WKN Proposed Development works is provided in Chapter 2.

Construction Effects

Ground Contamination Effects on Human Health – Construction Workers

9.7.3 Available information indicates the presence of a historical landfill within the boundaries of the WKN Site. Investigations undertaken within and adjacent to the WKN Site have not identified any unacceptable risks to human health from the presence of chemical contamination in the Made Ground and shallow soils.

9.7.4 Asbestos fibres have been noted to be present in the Made Ground within the boundaries of the WKN Site and additional areas of asbestos may be present. The potential presence of asbestos within soils does represent a risk to human health.

- Receptor Sensitivity: High (construction workers).
- Impact magnitude: Low – (short-term and temporary exposure)

  Spatial: Site effect only.

Temporal: Short-term, temporary during construction phase, intermittent and decreasing in intensity during construction programme.

Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of short exposure duration during construction and apparent absence of chemical contamination and localised areas of asbestos contamination within soils.

Ground Contamination Effects of Human Health – Adjacent Site Users

9.7.5 Previous ground investigations undertaken within and adjacent to the WKN Site have not identified any unacceptable risks to human health from chemical contamination within the Made Ground and shallow soils. Asbestos fibres have been noted to be present at 3 locations in the Made Ground within the boundaries of the WKN Site and additional areas of asbestos may be present. The presence of asbestos within soils does represent a risk to human health.

- Receptor Sensitivity: High (adjacent site users).
- Impact magnitude: Low (short-term and temporary exposure)

Spatial: Site effect only.

Temporal: Short-term, temporary during construction phase, intermittent and decreasing in intensity during construction programme.

Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of short exposure duration during construction, apparent absence of chemical contamination, localised areas of asbestos contamination within soils and industrial nature of adjacent site activities.

Ground Contamination Effects on Groundwater

Shallow Perched Water (Perched above the Alluvium)

9.7.6 Previous ground investigations undertaken at and adjacent to the WKN Site have identified localised areas of elevated concentrations of inorganic and organic contaminants in shallow perched water within the Made Ground. The risk assessments conclude that there were no unacceptable risks to controlled waters.

9.7.7 The WKN Proposed Development will have piled foundations. Excavations are restricted to relatively shallow depth (i.e. top 2 m) for pile caps, floor slabs, utilities, attenuation pond etc. Any such excavations may encounter shallow perched water within the Made Ground / shallow Alluvium and there is potential for localised areas of contamination within the Made Ground and shallow soils to be remobilised. Based upon previous ground investigation information, it is anticipated that the presence of shallow perched water will be limited and likely discontinuous in nature, thereby having limited lateral continuity.

9.7.8 The Alluvium is classified by the Environment Agency as a Secondary (undifferentiated) aquifer and therefore has a low environmental sensitivity to contamination.

- Receptor Sensitivity: Low (Secondary Undifferentiated aquifer).
- Impact magnitude: Low (likely limited continuity of groundwater within aquifer in WKN Proposed Development area. Contamination as a consequence of construction activities, if it occurs, likely to be limited in extent).

  Spatial: Site effect only.

  Temporal: Short-term, temporary during construction phase, intermittent and decreasing in intensity during construction programme.

  Nature: Effect is reversible, possible and indirect.

- Significance of effect: Minor adverse, on the basis of the likely discontinuous nature of shallow perched water within the Made Ground / Alluvium within the WKN Proposed Development area and the low sensitivity of the groundwater unit to contamination.

Deep Groundwater

9.7.1 Deep groundwater is present within the Lambeth Group, Thanet Formation and the underlying Chalk. The Lambeth Group and Thanet Formation are classified as Secondary A aquifers and the Chalk is classified as a Principal Aquifer by the EA. The Site lies outside of a Source Protection Zone and there are no recorded potable groundwater abstractions within the vicinity of the Site.

9.7.2 The Lambeth Group is afforded protection by the presence of the low permeability London Clay Formation, proven in the vicinity of the WKN Site to be around 2.5 – 6.8 m in thickness and confines the deeper groundwater body.

9.7.3 The potential impact as a result of construction would be deterioration in groundwater quality in the Secondary A aquifers and the Chalk aquifer as a result of preferential pathways i.e. piling, created through the London Clay.

9.7.4 Groundwater quality within the Secondary A aquifers is unlikely to be affected by construction activities and shallow excavations due to the presence of the low permeability London Clay Formation. Piling activities for the construction of foundations for the WKN Proposed Development will, however, provide a pathway for the downward migration of shallow contamination into the Secondary A aquifers, should the installation of piles fully penetrate the London Clay Formation.

- Receptor Sensitivity: Medium (Secondary A aquifer).
- Impact magnitude: Low (gross contamination not identified within soil and shallow groundwater and adverse impact considered to be low).

Spatial: Wider area (groundwater within Secondary A aquifer present outside of Site boundary).

Temporal: Potentially long term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and increasing in intensity during construction programme.

Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of gross contamination not being identified within soil and shallow groundwater and that the Lambeth Group and Thanet Formation aquifer is not considered to be a highly sensitive receptor.

9.7.1 Groundwater quality within the Chalk aquifer is unlikely to be affected by construction activities and shallow excavations given the presence of the overlying groundwater bearing units.

9.7.2 Piling activities for the construction of foundations for the WKN Proposed Development will, however, provide a pathway for the downward migration of shallow contamination into the overlying Secondary A aquifers, should the installation of piles fully penetrate the London Clay Formation. Groundwater quality in the Chalk aquifer is unlikely to be affected by piling activities due to the likely tortuous nature of groundwater flow in the overlying Secondary A aquifers.

- Receptor Sensitivity: High (Principal aquifer).

- Impact magnitude: Low (gross contamination not identified within soil and shallow groundwater and adverse impact considered to be low)

  Spatial: Wider area (groundwater within Chalk aquifer present outside of Site boundary).

  Temporal: Potentially long term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and increasing in intensity during construction programme.

  Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse based upon the presence of groundwater bearing units above (Lambeth Group and Thanet Formation) and the tortuous nature of groundwater flow in these units and the absence of gross contamination identified within the soils and shallow groundwater.

<u>Ground Contamination Effects on Surface Water Quality and Ecological Receptors</u>

9.7.1 Previous ground investigations (Ref. 9.17 & 9.20) have indicated that perched water within the shallow (Made Ground / shallow Alluvium) and deep (Lambeth Group / Thanet Formation) groundwater is likely to have a degree of hydraulic continuity with the Swale Estuary situated approximately 15 m to the east of the WKN Site boundary.

9.7.2 Shallow excavations within the Made Ground / shallow Alluvium may lead to the disturbance and remobilisation of previously unidentified contaminants present within the soil and shallow groundwater at the WKN Site. Ground investigations undertaken at and in the vicinity of the WKN Site suggest that shallow perched water is of limited extent and discontinuous in nature, however there is the potential for shallow groundwater to migrate towards the Swale Estuary, albeit through elongated and tortuous pathways.

9.7.3 The construction of piled foundations that fully penetrate the underlying London Clay Formation may provide a pathway for the downward migration of contamination into the Lambeth Group and Thanet Formation (Secondary A aquifers). Due to the perceived hydraulic connectivity between the Secondary A aquifers and the Swale Estuary, there is a potential for any contamination within groundwater to migrate to the surface water body.

9.7.4 Migration of contamination to the Swale Estuary would adversely impact on surface water quality and the ecological receptors present.

- Receptor Sensitivity: High (Surface Water Quality and Ecological Receptors).

- Impact magnitude: Low (gross contamination not anticipated to be present within soil and shallow perched water. Slow tortuous migration pathway in shallow groundwater body and any contamination would likely be diluted in Secondary A aquifer).

  Spatial: Wider area (the Swale Estuary).

  Temporal: Potentially long term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and increasing in intensity during construction programme.

  Nature: Effect is irreversible, possible and indirect.

- Significance of effect: Minor adverse, on the basis of gross contamination not anticipated to be present within soil and shallow perched water, elongated migration pathways in shallow groundwater body and likely dilution of contamination within the Secondary A aquifer.

9.7.5 Further consideration of the ecological effects of the WKN Proposed Development is present in Chapter 11 Ecology.

<u>Ground Gas Effects on Human Health</u>

9.7.6 Potential sources of ground gas have been identified at and in the vicinity of the WKN Site and the construction laydown area. Site cabins, particularly in the construction laydown area, will be present during construction and may allow the accumulation of ground gas. However, these temporary structures are likely to sealed and placed upon ground level, leaving ventilation between the ground surface and the base of the cabins.

9.7.7 Within the WKN Site, the temporary nature of the construction works and the absence of significant excavations mean that ground gas risks to construction workers are likely to be negligible.

- Receptor Sensitivity: High (Construction Workers).
- Impact magnitude: Low (landfill present within WKN Site boundaries with potential for ground gas generation and accumulation, however ground investigation information indicates landfilled materials broadly in line with the 'inert' regulatory classification. Gas risk assessments indicate a 'Low Risk' ground gas scenario in the vicinity of the Site. Site cabins will be sealed and will likely have ventilation underneath).

  Spatial: Site effect only.

  Temporal: Short term, continuous and no change in intensity.

  Nature: Effect is reversible, possible and indirect.
- Significance of effect: Minor adverse, given the sealed nature of site cabins and the likely presence of ventilation underneath.

Operational Effects

Ground Contamination Effects on Human Health – Future Site Users

9.7.8 Previous ground investigations undertaken at and in the vicinity of the WKN Site have not identified any unacceptable risks to human health from the presence of chemical contamination. Asbestos fibres have been identified in Made Ground at three locations and have the potential to pose a risk to human health. Available ground investigation information indicates that the landfill recorded to be present at the WKN Site contains materials typical of an 'inert' landfill and no other contamination sources have been identified within the WKN Site boundaries. Any previously unidentified contamination is likely to be localised, rather than being widespread across the WKN Site.

9.7.9 The WKN Proposed Development will comprise hardstanding across the majority of area that is to be developed with small areas of landscaping / exposed ground adjacent to the proposed structures. A larger area of landscaping is present in the eastern part of the WKN Proposed Development area in the vicinity of the proposed attenuation pond. The presence of hardstanding will minimise exposure to future site users from the presence of any contaminants within the soil. Future site users may be exposed to contaminants in areas of landscaping, although exposure durations will be limited due to the industrial nature of the WKN Proposed Development.

- Receptor Sensitivity: High (future site users).
- Impact magnitude: Low based upon the majority of the WKN Site being covered in hardstanding and the limited exposure duration of future site users in landscaped areas.

Spatial: Site effect only.

Temporal: Long-term, permanent during site operation, continuous and no change in intensity during operational lifetime.

Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of the presence of hardstanding across the majority of the WKN Proposed Development area minimising exposure to future site users from the presence of contaminants within the soil and the limited exposure durations in landscaped areas.

Ground Contamination Effects of Human Health – Adjacent Site Users

9.7.10 Previous ground investigations undertaken within and adjacent to the WKN Site have not identified any unacceptable risks to human health from chemical contamination within the Made Ground and shallow soils. Asbestos fibres have been noted to be present at three locations in the Made Ground within the boundaries of the WKN Site and additional areas of asbestos may be present. The presence of asbestos within soils has the potential to pose a risk to human health. Available ground investigation information indicates that the landfill recorded to be present at the WKN Site contains materials typical of an 'inert' landfill and no other contamination sources have been identified within the WKN Site. Any previously unidentified contamination is likely to be localised, rather than being widespread across the WKN Site.

9.7.11 The WKN Proposed Development will comprise hardstanding across the majority of the area that is to be developed with small areas of landscaping / exposed ground adjacent to the proposed structures. A larger area of landscaping is present in the eastern part of the WKN Proposed Development area in the vicinity of the proposed attenuation pond. The presence of hardstanding will minimise exposure to adjacent site users from the presence of any contaminants within the soil. Exposure to contaminants present within landscaped areas is likely to be minimal due to there being no direct contact with the soils.

- Receptor Sensitivity: High (adjacent site users).
- Impact magnitude: Negligible

Spatial: Site effect only.

Temporal: Long-term, permanent during site operation, continuous and no change in intensity during operational lifetime.

Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of the presence of hardstanding across the WKN Proposed Development area minimising exposure to adjacent site users from the presence of contaminants within the soil.

Ground Contamination Effects on Groundwater

Shallow Perched Water (Perched above Alluvium)

9.7.12 Previous ground investigations undertaken at and adjacent to the WKN Site have identified localised areas of elevated concentrations of inorganic and organic contaminants in shallow perched water within the Made Ground. The risk assessments conclude that there were no unacceptable risks to controlled waters.

9.7.13 The WKN Proposed Development will comprise hardstanding across the majority of the area that is to be developed with only smaller, localised areas of landscaping / exposed ground. A surface water drainage system will also be constructed to manage surface water runoff from the WKN Site (refer to Chapter 10).

9.7.14 The presence of a significant quantity of hardstanding and suitable management of surface water runoff will minimise the potential for leaching of soil contamination and migration of any shallow groundwater.

- Receptor Sensitivity: Low (Secondary Undifferentiated aquifer).
- Impact magnitude: Negligible.

  Spatial: Wider area (groundwater within Secondary Undifferentiated Aquifer present outside of WKN Site).

  Temporal: Long-term, permanent during site operation, continuous and no change in intensity during operational lifetime.

  Nature: Effect is reversible, possible and indirect.

- Significance of effect: Negligible, on the basis that hardstanding will be present across the WKN Proposed Development area and the implementation of a surface water drainage system, minimising the potential for leaching of soil contamination and migration of any shallow perched water.

Deep Groundwater

9.7.15 Piled foundations that fully penetrate the London Clay Formation will provide a pathway for the downward migration of shallow contamination into the Secondary A aquifers.

- Receptor Sensitivity: Medium (Secondary A aquifer).
- Impact magnitude: Low (gross contamination not anticipated to be present within soil and shallow groundwater).

  Spatial: Wider area (groundwater within Secondary A aquifer present outside of Site boundary).

  Temporal: Long-term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and no change in intensity.

  Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse, on the basis of gross contamination not being anticipated to be present within soil and shallow groundwater and that the Lambeth Group and Thanet Formation aquifer is not considered to be a highly sensitive receptor.

9.7.16 Piling activities for the construction of foundations for the WKN Proposed Development may provide a pathway for the downward migration of shallow contamination into the overlying Secondary A aquifers, should the installation of piles fully penetrate the London Clay Formation. Groundwater quality in the Chalk aquifer is unlikely to be affected by piling activities however due to the likely tortuous nature of groundwater flow in the overlying Secondary A aquifers.

- Receptor Sensitivity: High (Principal aquifer).

- Impact magnitude: Low (gross contamination not anticipated to be present within soil and groundwater)

  Spatial: Wider area (groundwater within Chalk aquifer present outside of WKN Site).

  Temporal: Long-term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and no change in intensity.

  Nature: Effect is reversible, possible and direct.

- Significance of effect: Minor adverse based upon the presence of groundwater bearing units above (Lambeth Group and Thanet Formation) and the tortuous nature of groundwater flow in these units.

<u>Ground Contamination Effects on Surface Water Quality and Ecological Receptors</u>

9.7.17 Previous ground investigations (Ref. 8.17 & 8.20) have indicated that groundwater within the shallow (Made Ground / Alluvium) and deep (Lambeth Group / Thanet Formation) groundwater is likely to have a degree of hydraulic continuity with the Swale Estuary.

9.7.1 The WKN Proposed Development will comprise hardstanding across the majority of the area that is to be developed with smaller localised areas of landscaping / exposed ground. A surface water drainage system will also be constructed to manage surface water runoff from the WKN Site.

9.7.2 The presence of a significant quantity of hardstanding and suitable management of surface water runoff will minimise the potential for leaching of soil contamination and migration of any shallow groundwater. Groundwater recharge will therefore be reduced, thus reducing any effects on the receptors.

9.7.3 The construction of piled foundations that fully penetrate the underlying London Clay Formation may provide a pathway for the downward migration of contamination into the Lambeth Group and Thanet Formation (Secondary A aquifers). Due to the perceived hydraulic connectivity between the Secondary A aquifers and the Swale Estuary, there is a potential for any contamination within groundwater to migrate to the surface water body.

9.7.4 Migration of contamination to the Swale Estuary may adversely impact on surface water quality and the ecological receptors present.

- Receptor Sensitivity: High (Surface Water Quality and Ecological Receptors).
- Impact magnitude: Negligible (gross contamination not anticipated to be present within soil and groundwater. Any contamination would likely be diluted in Secondary A aquifer).

  Spatial: Wider area (the Swale Estuary).

  Temporal: Long term due to installation of contamination migration pathway into Secondary A aquifer, permanent, continuous and no change in intensity.

  Nature: Effect is irreversible, possible and indirect.
- Significance of effect: Minor adverse, on the basis of gross contamination not anticipated to be present within soil and shallow perched water and likely dilution of contamination within the Secondary A aquifer.

9.7.5 Further consideration of the ecological effects of the WKN Proposed Development is present in Chapter 11 Ecology.

Ground Gas Effects on Human Health

9.7.6 Potential sources of ground gas have been identified at the WKN Site comprising the presence of landfills within the WKN Site boundaries and to the south of the WKN Site. An additional source of ground gas is the Alluvium present underlying the Made Ground.

9.7.7 Ground investigation works previously undertaken within the boundaries of the WKN site (most notably by RPS in 2015) have encountered Made Ground soils to a depth of at least 4.2 mbgl and evidence of anthropogenic materials e.g. brick , concrete, metal has been recorded. It is noted however that the presence of these anthropogenic materials is broadly in line with the 'inert' regulatory classification of this landfill and no evidence of materials that have a higher propensity to generate ground gas e.g. household waste, were identified at the WKN Site.

9.7.8 The Ground Gas Risk Assessment undertaken by RPS Group in June 2013 (Ref. 9.20) classified ground gas risks within the vicinity of the WKN Site as 'Characteristic Situation 2 – 'Low Risk'' as per CIRIA C665 guidance (Ref. 9.10). This conclusion however is based upon limited gas monitoring information.

- Receptor Sensitivity: High (Future Site Users).
- Impact magnitude: Low (landfill present within WKN Site boundaries with potential for ground gas generation and accumulation, however ground investigation information indicates landfilled materials broadly in line with the 'inert' regulatory classification. Gas risk assessments indicate a 'Low Risk' ground gas scenario in the vicinity of the Site).

Spatial: Site effect only.

Temporal: Long term due to presence of structures, permanent, continuous and no change in intensity.

Nature: Effect is reversible, possible and indirect.

- Significance of effect: Moderate adverse, given the location of a landfill within the boundaries of the WKN Proposed Development and potential for gas generation and accumulation. In addition, previous ground gas assessments have derived a 'Low Risk' (Characteristic Situation 2) for ground gas in the vicinity of the WKN Site.

Summary of Effects Prior to Mitigation

9.7.9 Table 9.7 provides a summary of the construction and operational effects prior to the implementation of mitigation measures.

Effect Identified	Receptor Sensitivity	Impact Magnitude	Nature	Duration	Degree of Effect
Construction Effects					
Ground Contamination Effects on Human Health – Construction Workers	High	Low	Reversible, possible and direct	Short-term	Minor adverse
Ground Contamination Effects on Human Health – Adjacent Site Users	High	Low	Reversible, possible and direct	Short-term	Minor adverse
Ground Contamination Effects on Groundwater – Shallow Water in Alluvium	Low	Low	Reversible, possible and direct	Short-term	Minor adverse
Ground Contamination Effects on Groundwater – Deep Groundwater in Secondary A aquifer	Medium	Low	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Groundwater – Deep Groundwater in Principal aquifer	High	Low	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Surface Water Quality and Ecological Receptors	High	Low	Irreversible, possible and indirect	Long-term	Minor adverse
Ground Gas Effects on Human Health	High	Low	Reversible, possible and direct	Short-term	Minor adverse
Operational Effects					
Ground Contamination Effects on Human Health – Future Site Users	High	Low	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Human Health – Adjacent Site Users	High	Negligible	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Groundwater	Low	Negligible	Reversible, possible and direct	Long-term	Negligible

– Shallow Water in Alluvium					
Ground Contamination Effects on Groundwater – Deep Groundwater in Secondary A aquifer	Medium	Low	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Groundwater – Deep Groundwater in Principal aquifer	High	Low	Reversible, possible and direct	Long-term	Minor adverse
Ground Contamination Effects on Surface Water Quality and Ecological Receptors	High	Negligible	Irreversible, possible and direct	Long-term	Minor adverse
Ground Gas Effects on Human Health	High	Low	Reversible, possible and direct	Long-term	Moderate adverse

Table 9. 7 – Summary of Effects Prior to Mitigation

9.8 Decommissioning and Demolition Effects

9.8.1 Decommissioning activities at the end of the WKN Proposed Development's operational life will likely include the removal of hazardous substances and the emptying and cleaning of storage tanks and associated pipework prior to demolition. All decommissioning activities will be undertaken in accordance with current legislation and industry best practice to ensure that all hazardous substances are removed and storage tanks / pipework cleaned, thereby minimising the potential for these substances to enter soil and groundwater during demolition works.

9.8.2 A detailed Decommissioning Environmental Management Plan (DEMP) detailing the procedures that will be followed to remove hazardous substances and clean storage tanks/pipework during decommissioning shall be provided for Regulatory approval prior to commencement of decommissioning and demolition activities. The DEMP will also detail procedures to manage contamination risks to the environment during demolition.

9.8.3 On this basis, no significant effects on ground conditions are anticipated during decommissioning and demolition of the WKN Proposed Development are envisaged and so it is not considered further in this assessment.

9.9 Mitigation

9.9.1 The following paragraphs provide a summary of measures that are proposed to be implemented to mitigate the effects from the construction phase.

Mitigation for Construction Effects

9.9.1 Although the impact assessment has not identified any significant effects to human health and the environment as a consequence of the construction phase of the WKN Proposed Development, there are a number of measures that shall be implemented during construction to minimise potential impacts associated with the WKN Proposed Development. These measures are standard in construction

projects and are in line with current industry good practice for construction on brownfield sites.

9.9.2 As a minimum, the contractor would ensure that their statutory obligations under environment, health and safety legislation are fulfilled. A draft Construction Environmental Management Plan (CEMP) that outlines the measures set out below to manage risks to the environment duration the construction phase is provided in Appendix 2.1 of the ES. Measures required include the following:

- Stockpiling of contaminated materials would be avoided where practicable. Where it is necessary, stockpiles would be located on areas of hard-standing or plastic sheeting to prevent contaminants infiltrating into the underlying ground;
- The implementation of dust suppression measures during construction to minimise nuisance dust emissions during the works;
- Any necessary licences would be obtained for the storage, treatment and disposal of waste;
- Where significant unforeseen contamination is identified e.g. hydrocarbons, fibrous asbestos, during the course of the work, work would stop and further investigation would be undertaken to establish the nature and level of contamination and the risks posed to human health and controlled waters. Where remediation is required, on-site treatment, including bioremediation would be carried out wherever practicable;
- Suitable management and control of shallow groundwater during excavation works to minimise the potential for the spread of contamination contained within the water;
- The disposal of solid waste, including surplus spoil, would be managed to maximise the environmental and developmental benefits from the use of surplus material and to minimise any adverse effects of disposal. In general, the principles of the waste management hierarchy, reduce-reuse-recycle would be applied;
- Prior to commencement of construction works, a Site Waste Management Plan would be produced. This would predict all waste streams to be produced including volumes expected and to identify the waste management action proposed for each different waste type in line with the waste hierarchy;
- Potential waste arising from excavation would be sampled and analysed to determine the waste classification required to establish relevant waste streams, suitability for reuse/recycle and disposal/storage requirements;
- Excavation works would be carried out in such a way to enable effective segregation of clean materials for reuse on site wherever practicable. It is anticipated that 'clean' concreate and masonry would be crushed for reuse for backfilling and other purposes, or would be sent offsite for recycling or recovery with disposal only as a final resort. Material would only be re-used on site in accordance with the Environmental Permitting Regulations or

appropriate approved Code of Practice e.g. Contaminated Land: Application in Real Environments (CL:AIRE) or Waste Resource Action Plan (WRAP);

- Storage of hazardous materials, including fuel, during the construction phase should utilise industry best practice e.g. storage in bunded areas, to minimise the potential for spills / leakages to impact soil and groundwater; and

- The implementation of suitable measures in line with the Construction Design Management Regulations (2015) would manage any risks posed to human health, particularly with regard to asbestos. These measures should include the provision of suitable Personal Protective Equipment (PPE) and welfare facilities. Other measures to manage risks to human health from the presence of asbestos should be implemented and should include dust suppression measures and air monitoring.

9.9.3 A piling risk assessment should be undertaken to determine the most suitable piling technique to be implemented, to minimise the potential for the downward migration of contamination within the Made Ground into the Secondary A aquifers (Lambeth Group and Thanet Formation).

Mitigation for Operational Effects

9.9.1 The WKN Proposed Development design will largely mitigate operational effects to human health and shallow groundwater from any soil contamination, through the presence of hardstanding across the majority of the WKN Proposed Development area and the installation of a suitable surface water management system.

9.9.2 In areas of proposed landscaping, a capping layer should be installed to minimise potential exposure of future site users from the presence of contaminants within the underlying soils. The capping layer should comprise the importation of clean soils and be constructed of a suitable thickness to form an effective and robust barrier and to ensure establishment of vegetation.

9.9.3 All hazardous substances e.g. fuel and chemicals, required in relation to site operations should be should utilise industry best practice e.g. storage in bunded areas, for storage, use and disposal to minimise the potential for spills / leakages to impact soil and groundwater.

9.9.4 Construction of suitable piles, as determined by the piling risk assessment, that prevent the downward migration of contamination into the Secondary A aquifer will also mitigate operational effects to deep groundwater.

9.9.5 To mitigate operational effects to human health from the presence of ground gas (determined as a moderate adverse effect), ground gas protection measures should be implemented within new structures to minimise the potential for the migration into and accumulation of ground gas within these structures. It is recommended that additional gas monitoring and risk assessment is undertaken to define the ground gas protection measures required to protect the development.

9.9.6 The design of ground gas protection measures should be undertaken in accordance with CIRIA C665 (Ref. 9.10) and BS8485 (Ref. 9.22) based upon the findings of the additional ground gas monitoring assessments.

9.9.7 Through the implementation of appropriate ground gas protection measures the following effects to human health have been determined:

- Receptor Sensitivity: High (Future Site Users).
- Impact magnitude: Negligible (ground gas measures are in place to prevent ground gas ingress into new structures)

  Spatial: Site effect only.

  Temporal: Long term due to presence of structures, permanent, continuous and no change in intensity.

  Nature: Not applicable due to implementation of ground gas protection measures.

- Significance of effect: Minor adverse, on the basis of the high sensitivity of the receptor. The implementation of ground gas protection measures will however mitigate ground gas risk to human health.

9.10 Residual Effects

9.10.1 Residual effects are those that are predicted to remain after implementation of the secondary mitigation measures described above. After the implementation of all mitigation measures including the implementation of ground gas protection measures detailed within this Chapter, no significant residual effects have been identified.

9.11 Cumulative Effects

9.11.1 The list of developments included for the assessment of potential cumulative environmental effects in the EIA is provided in Chapter 3.

9.11.2 Given the immediate cumulative developments considered (SW/11/1291, EN010090, 18/502489) are likely to have similar geological conditions and will be of similar end use, the risks both in terms of contamination, groundwater and ground gases are likely to similar.

9.11.3 It is assumed that similar mitigation measures will be incorporated for these developments in accordance with the requirements of the relevant legislation set out herein and construction best practice and, as such, the effects associated with the redevelopment of neighbouring sites are considered unlikely to alter the level of the effects identified above.

9.11.4 Ground gas generation at the landfill site referred to as Kemsley Waste Disposal Site (refer to paragraph 9.4.55) to the south of the K3/WKN Site is currently managed to the satisfaction of the Regulatory bodies. On the basis that ground

gas protection measures are implemented in new structures at the WKN Site, no cumulative ground gas effects are anticipated to arise.

9.11.5 During decommissioning of the K3 and / or the WKN Proposed Developments no cumulative effects with other developments on ground conditions are anticipated. Assuming that decommissioning works (including removal of hazardous substances and cleaning of tanks / pipework) are undertaken in line with a method statement agreed with the Regulators and in line with current legislation and industry best practice, the potential for soil and groundwater to be impacted on adjacent developments during decommissioning is minimised.

9.12 Summary

9.12.1 The baseline ground conditions in the vicinity of the K3 and WKN Sites have been considered. This involved reviewing the history, geology, hydrogeology and hydrology of the K3 and WKN Sites and adjacent construction laydown area as well as available ground investigation from investigations undertaken at and in the vicinity of the WKN Site, including within the K3 Site. No specific ground investigation has been undertaken to support this ES Chapter, therefore the assessment is based upon available data for the K3 and WKN Sites and adjacent areas and RPS' experience and professional judgement.

9.12.2 A conceptual site model has been developed that identified potential contamination sources, sensitive receptors and contamination exposure pathways.

9.12.3 Potential effects at the K3 Site have previously been assessed in the K3 EIA (Ref. 9.18) completed for the original planning application for the facility. No likely significant effects were identified in relation to ground conditions (see Document 3.3 submitted with the application).

9.12.4 Based upon the available data, it is anticipated that during the construction phase of the WKN Development there would be potential minor adverse effects to human health (construction workers, adjacent site users and from the presence of ground gas), shallow groundwater (within the Alluvium), deep groundwater (within the Lambeth Group and Thanet Formation), surface water quality (the Swale) and ecological receptors.

9.12.5 Upon completion of the WKN Development, it is anticipated that there would be potential moderate significant adverse effects to human health from the presence of ground gas. Minor potential adverse effects are anticipated to human health (construction workers and adjacent site users), deep groundwater (within the Lambeth Group and Thanet Formation and Chalk aquifer), surface water quality (the Swale) and ecological receptors. Negligible effects are anticipated to shallow groundwater (within the Alluvium).

9.12.6 It is recommended that a number of mitigation measures are implemented during construction of the WKN Development to mitigate effects to human health and controlled waters. These measures are in line with industry best practice and include the appropriate segregation, storage and disposal of waste, the appropriate storage of hazardous materials during construction, undertaking a piling risk assessment to identify the most appropriate piling techniques to prevent the downward migration of contamination into the Secondary A aquifer and the

implementation of suitable measures in line with the CDM Regulations (2015) to manage exposure risks to humans.

9.12.7 The WKN Proposed Development design, comprising hardstanding of the majority of the WKN site, will largely mitigate effects of soil contamination to human health and shallow groundwater and the construction of a suitable capping layer in areas of landscaping will mitigate the effects of soil contaminants to human health upon completion of the development. In addition, the implementation of ground gas protection measures within new structures will mitigate the effects of ground gas to human health upon completion of the development. It is recommended that additional gas monitoring and risk assessment is undertaken to define the ground gas protection measures required to protect structures.

9.12.8 Once ground gas measures have been implemented in new structures, a minor adverse effect is anticipated to be present to human health.

9.12.9 No significant residual effects have been identified in this assessment and no cumulative impact with other developments have been identified on the assumption that the mitigation measures outlined within this assessment have been implemented and that the other developments do not impact on groundwater quality.

References

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9.5 The Swale Borough Local Plan, Full Council Item (2017): Bearing Fruits 2031

9.6 Department for Environment, Food and Rural Affairs (Defra) and Environment Agency (EA) (2004) Model Procedures for the Management of Land Contamination, CLR11.

9.7 Environment Agency, (2017) Guidance: Groundwer proetction technical guidance. https://www.gov.uk/government/publications/groundwater-protection-technical-guidance

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9.9 Construction Industry Research and Information Association (CIRIA) (1996) CIRIA Report 132; A guide for safe working on contaminated sites

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9.16 RPS Group, Phase 1 Environmental Site Assessment, Kemsley Paper Mill, Sittingbourne, Kent, on behalf of E.ON, March 2009, reference: JER3773 R 090318 LW Kemsley Paper Mill P1

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9.18 RPS Group, Development of a Sustainable Energy Plant, Kemsley Paper Mill, Environmental Statement, Chapter 11: Hydrogeology and Ground Conditions, prepared for St. Regis Paper Company Ltd, January 2010, Reference: DLE1726

9.19 URS Group, Geotechnical and Environmental Site Investigation, on behalf of John Sisk & Sons Ltd, January 2013,reference: 47064660

9.20 RPS Group, Interpretative Ground Investigation Report, Pre-Commencement Works for the Sustainable Energy Plant, Kemsley Paper Mill, Sittingbourne, Kent, on behalf of EEW Energy from Waste UK Limited, June 2013, reference: JER5481 R 130613 DH Interpretative Report

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9.22 British Standards Institute (BSi) (2015) BS8485: Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

HISTORIC GROUND INVESTIGATION LOCATIONS

Works No.

1 – Retention and operation of existing the K3 facility with an increased permissible power output of up to 75MW and increase in permissible throughput to 657,000tpa (the K3 Proposed Development)

2- Construction and operation of a waste-to-energy facility capable of processing 390,000 tonnes of waste per annum, with a generating capacity of up to 42MW

3- Retention of existing K3 grid connection and installation of a new grid connection for the WKN Proposed Development

4- Retention and use of existing access road to serve the K3 and WKN facilities

5 – Retention of existing K3 steam connection to Kemsley Paper Mill

6- Use of existing private haul road for the construction of the WKN Proposed Development

7- Creation of a construction compound and laydown area for the construction of WKN

8- Retention of existing K3 surface water outfall to the Swale and the construction and operation of a new surface water outfall for the WKN Proposed Development

WKN SITE

Legend

- DCO Application Limits
- Proposed WKN Development Site

Historic Investigation Locations

RPS (2015)
- Trial Pit

URS (2013)
- Trial Pit

RPS (2011, referenced in RPS 2013 report)
- Borehole
- Window Sample
- Trial Pit

RPS (2009)
- Borehole
- Window Sample
- Trial Pit

CMW (1995, referenced in RPS 2013 report)
- Borehole
- Trial Pit

Work Areas
- Work Area 1
- Work Area 2
- Work Area 3
- Work Area 4
- Work Area 5
- Work Area 6
- Work Area 7

1:8,000

0 50 100 m

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Project	K3 AND WKN DCO
Title	HISTORIC GROUND INVESTIGATION LOCATIONS

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