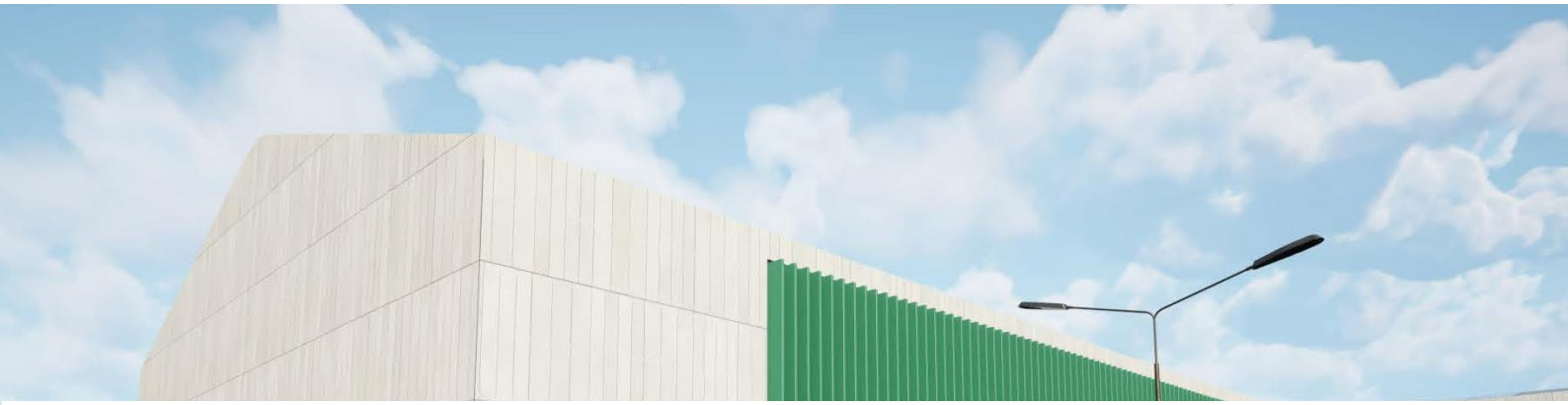

CHAPTER 14 CONTAMINATED LAND

14. CONTAMINATED LAND

14.1. This chapter discusses the historical and current use of the Site with respect to contaminated land and the underlying geology and hydrogeology and the development of the Proposed Development. This chapter details the objectives, methodology and findings of a Phase 1 desk-based environmental review and considers the potential constraints as a result of contamination at the Site associated with the Proposed Development.

14.2. This chapter includes an assessment of the potential contamination risks to groundwater, surface water and habitats and the potential contamination risk to future users of the Site and workers during demolition and construction works. It also considers potential geotechnical constraints posed by potential contamination on the Proposed Development once complete.

14.3. It is important to note that the presented assessment is based on the current Site conditions at the ES submission date. The scope of the assessment has been aligned to the Proposed Development as outlined within Chapter 5. It is important to note that contaminated land has been addressed as a site-wide issue (i.e., it is not possible to address as a development Phase issue).

ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Assessment Methodology

14.4. The assessment of contaminated soils in the UK follows a risk-based approach and is structured in a tiered manner. As well as having a systematic approach to collecting the data it is also necessary to adopt recognised techniques and standards in assessing them and particularly regarding environmental risk assessment.

14.5. An assessment of baseline conditions has been undertaken based on the findings of a desk-based study (Phase I Assessment). The methodology employed in completing the desk-based review of the Site and surroundings involved the following:

- A Site walkover by an experienced environmental consultant to provide an assessment of current site activities and the site's environmental setting;
- A review of available historic maps to determine the land-use history in the context of potentially contaminative activities;
- A review of environmental data relating to the Site and its surroundings using a proprietary third-party environmental database;

- A detailed review of previous environmental data relating to the Site (i.e., earlier phases of environmental assessment both desk-study and field-based);
- Desk-based assessment of site geology, hydrogeology and hydrology from published mapping and web-based sources to determine the Site's environmental setting and sensitivity;
- A web-based search of the Environment Agency (EA) website and other freely available sources of information to identify any potential issues relating to the Site;
- Review of the internet-based MAGIC environmental mapping service, a web-based interactive service which maps governmental environmental information; and
- Provision of a qualitative contaminated land risk assessment based on Source-Pathway-Receptor as per current best practice guidance i.e. the Land Contamination: Risk Management (LCRM) Guidance (Ref. 14.1).

Development of a Conceptual Site Model

14.6. Information from the data sources identified above enable the identification of potential pollution sources and pathways for pollutants to migrate from the source areas to potential receptors (i.e. humans, ecosystems, buildings, etc.). Based on this information a Conceptual Site Model (CSM) has been formed for the Site and its proposed end use. The CSM is based on the risk assessment principles of source, pathway and receptor connecting to form a pollutant linkage.

14.7. LCRM (Ref. 14.1) provides a technical framework for applying a risk management process when dealing with contaminated land. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with Government policies and legislation.

14.8. The Contaminated Land (England) Regulations 2006 (SI 2006/1380) as amended by The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and accompanying DEFRA Contaminated Land Statutory Guidance (Ref. 14.2) describes a risk assessment methodology in terms of 'significant pollutants' and 'significant pollutant linkages' within a 'contaminant-pathway-receptor' conceptual model. For land to be determined as 'contaminated' in a regulatory sense, and therefore requiring remediation (or a change to less sensitive use), all three elements (contaminant-pathway-receptor) of a significant pollutant linkage must be present.

Assessment of Significant Effects

14.9. There are no published qualitative criteria for assessing the likely significant effects from ground conditions and contamination. Significance criteria have therefore been developed using the criteria outlined, published guidance on contaminated land and professional judgement.

14.10. An adverse effect (with respect of ground contamination) relies on the presence of a source, pathway and receptor pollutant linkage. The significance of the effect depends on the value of the resource, the sensitivity of the receptor and the ways in which the Proposed Development can provide a pathway to the receptor. The significance of an effect also partly depends on the timescales involved, i.e. short, medium or long term and the extent of the area affected.

14.11. Environmental receptors can demonstrate different sensitivities to changes in their environment. It is also recognised that environmental impacts can operate over a range of geographical areas and therefore a geographical scale should be considered in the scale/magnitude of the effect, as well as the receptor. The sensitivity of the receptor also considers the long or short-term exposure of the receptor. For this assessment sensitivity is determined (via professional judgement) as outlined within Table 14.1.

Table 14.1: Criteria for assessing sensitivity of a receptor

Sensitivity	Duration
High	Land to be in use for residential purposes with plant uptake (i.e., private gardens). Construction workers (not defined in Part IIA; however relevant in the context of a human receptor during the development process). On-site maintenance works with increased potential for direct contact with areas of contamination (if present) / working in confined spaces; e.g., to install / repair underground services. Principal aquifer, which may be used for public water supply. Source Protection Zone I – Inner Protection Zone and Zone II – Outer Protection Zone. Surface watercourse located on or adjacent to land under assessment. Watercourse with a high-water quality classification. Land located in or directly within the immediate catchment area of an ecologically sensitive area, e.g., Special Protection Area (SPA)/Site of Scientific Interest (SSSI)/RAMSAR Site, etc. Buildings: World Heritage Site or Conservation Area
Medium	Land to be in use for residential purposes (without plant uptake). Off-site land in current residential usage and with potential for consumption of home grown produce. Land to be used for agricultural arable usage or livestock.

	Third party utilities. Secondary aquifer, which is not used for public water supply. Source Protection Zone III – Total Catchment Area. Surface watercourse located less than 250 m from the Site (however not located on or adjacent to the Site). Watercourse with a medium water quality classification. Not located in an ecologically sensitive area however located within its wider catchment. Buildings: Area of Historic Character
Low	Land to be in use for commercial/industrial purposes. Off-site commercial land usage. Members of the public accessing the Site for relatively short periods (*e.g.,* dog walkers, bird watchers). Unproductive strata. Groundwater not used for public water supply. Surface watercourse located more than 250 m from the Site. Watercourse with a poor water quality classification. Not located in an ecologically sensitive area or its wider catchment. Buildings of replaceable or local value only.

14.12. The magnitude of potential impacts during both construction and operation of the Proposed Development has been assessed using professional judgement. The magnitude (scale of change) is determined by considering the degree of deviation from the baseline conditions and whether this is likely to result in any exceedances of statutory objectives or changes in suitable uses of the receptor. For this assessment magnitude is outlined within Table 14.2.

Table 14.2: Magnitude of Impact

Sensitivity	Adverse Impacts	Beneficial Impacts
High	Substantial environmental risk to sensitive receptors requiring extensive remedial works.	Substantial reduction in environmental risk to sensitive receptors. Substantial improvement in ground conditions.
Medium	Moderate environmental risk to sensitive environmental receptors requiring monitoring and localised remedial works.	Moderate reduction in environmental risk to sensitive environmental receptors. Moderate improvements in ground conditions.
Low	Minor environmental risk to sensitive environmental receptors requiring no remedial work (or no additional remedial work if remedial works are ongoing).	Minor reduction in environmental risk to sensitive environmental receptors. Minor improvements in ground conditions.

Negligible	Residual risk considered to be so minor to sensitive receptors that it would not be detectable. No appreciable change in environmental risk to sensitive environmental receptors.

14.13. Where a potential impact is identified, the significance of the impact and level of contamination risk is determined by considering the sensitivity and type of receptor, the temporal nature of the impact and the geographic scope of the impact upon receptors as outlined within Table 14.3.

Table 14.3: Nature of environmental impacts

Impact	Nature of Change	Geographical	Timescale	Frequency
Beneficial Negligible/Neutral Adverse	Temporary Reversible Permanent	Localised Site-wide District Regional National Trans-national	Short-term Medium-term Long-term	Frequent Infrequent Rare

14.14. The potential effects have been classified, prior to mitigation, as minor, moderate or major (either "Adverse", "Neutral/Negligible" or "Beneficial"). Where the predicted effects are significant (substantial), mitigation measures have been incorporated to eliminate or reduce the effects to an acceptable level. The significance criteria are outlined in Table 14.4 and are described in Table 14.5.

Table 14.4: Significance Criteria for Ground Conditions and Contamination Assessment

Sensitivity of Receptor	Magnitude of Effect			
	Large	Medium	Low	Negligible
High	Major	Moderate/Major	Moderate	Minor
Medium	Moderate/Major	Moderate	Minor/Moderate	Negligible/Minor
Low	Moderate	Minor/Moderate	Negligible/Minor	Negligible

Table 14.5: Criteria for assessing significance	
Significance	Description
Major Adverse	Significant environmental risk to a sensitive environmental receptor, and/or humans (construction workers and end users) requiring extensive mitigation works. For example, substantial widespread permanent reduction in quality of potable groundwater and/or surface water resource, substantial and permanent impact on ecosystems (plant and animal numbers) and/or substantial long-term effect on human health.
Moderate Adverse	Local environmental risk to a sensitive environmental receptors, and/or humans (construction workers and/or end users) requiring monitoring and local mitigation work. For example, substantial short-term/moderate long-term reduction in quality of groundwater and/or surface water resource, substantial short-term/moderate long-term effect on ecosystems and/or human health.
Minor Adverse	Temporary and minor environmental risk to a sensitive environmental receptor, for example minor local reduction in groundwater and/or surface water quality, minor local impact on ecosystems. Effects are reversible. Minor effect on human health.
Negligible	No appreciable environmental risk to a sensitive environmental receptor and/or human health. Any minor adverse effects are reversible.
Minor Beneficial	Minor reduction in environmental risk to humans or a sensitive environmental receptor. For example, minor local improvement in groundwater and/or surface water quality, minor local improvement in impact on ecosystems and minor improvement in human health effects.
Moderate Beneficial	Moderate reduction in environmental risk to humans or a sensitive environmental receptor. Moderate improvement in groundwater and/or surface water quality, moderate improvement in ecosystems effects and moderate improvement in human health effects.
Major Beneficial	Substantial reduction in environmental risk to humans or a sensitive environmental receptor. Substantial widespread improvement in quality of potable groundwater and/or surface water resource, major improvement in impact on ecosystems and major improvement on human health effects.
Major Adverse	Significant environmental risk to a sensitive environmental receptor, and/or humans (construction workers and end users) requiring extensive mitigation works. For example, substantial widespread permanent reduction in quality of potable groundwater and/or surface water resource, substantial and permanent impact on ecosystems (plant and animal numbers) and/or substantial long-term effect on human health.

14.15. EIA is a process that identifies the likely significant environmental effects (both beneficial and adverse) of a Proposed Development. The process aims to prevent, reduce and mitigate any adverse significant environmental effects, where these are identified. Significant effects are considered material to the decision process. Based on the above, residual effects of moderate and major scale may be considered significant (as shown by the shaded cells outlined within Table 14.4).

14.16. Any impacts of minor significance or lower are not considered to be significant and as such it will not be necessary to always propose mitigation methods. Impacts of moderate or higher significance will be deemed to be potentially significant and will require, where possible, mitigation methods to be adopted.

Assumptions and Limitations

14.17. The assessment presented in this chapter is based primarily on information from the Wood Group UK Limited Phase I assessment (provided in Annex 14.1).

14.18. As the assessment is limited to desk based study, historical intrusive investigation data has been utilised to establish baseline conditions. It is considered that updated intrusive investigation and subsequent remediation (where necessary) will be undertaken as part of the phasing of the development rather than at the Outline Planning stage.

14.19. Once updated baseline conditions are established, it is considered unlikely that the conditions will deteriorate in the short term (during the proposed construction period) or longer term (once the Proposed Development would be completed). The baseline conditions once determined are therefore representative of future conditions in the absence of the Proposed Development (i.e., without Development proceeding).

LEGISLATION, PLANNING POLICY AND GUIDANCE

National Policy

14.20. The National Planning Policy Framework (July 2021) (Ref. 14.3) sets out the Government's planning policies for England and how these are expected to be applied. The National Planning Policy Framework (NPPF) constitutes guidance for local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications. Fundamental to the NPPF is a presumption in favour of sustainable development.

14.21. The NPPF states that "*planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development*". In addition, "*where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner*".

14.22. Planning policies and decisions should also ensure that:

- *"the site is suitable for its new use taking account of ground conditions and land instability, including from 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";*
- *"after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990"; and*
- *"adequate site investigation information, prepared by a competent person, is presented".*

14.23. The NPPF is supported by on-line guidance that provides guiding principles on how planning can deal with land affected by contamination (Ref. 14.20).

14.24. The planning process can influence how contaminated sites are managed through planning policy and development control. In terms of the latter, planning conditions often require detailed site assessment or, in some cases, the restoration of a site to render it suitable for its proposed new use.

National Legislation

14.25. Part 2A of the Environmental Protection Act 1990 ("Part 2A") provides the legislative framework for the Contaminated Land regime in England, Wales and Scotland. It provides for Contaminated Land to be identified and dealt with in a risk-based manner. The Contaminated Land (England) Regulations 2006 (SI 2006/1380) set out provisions for procedural matters under Part 2A. The 2006 regulations were modified with the introduction of *The Contaminated Land (England) (Amendment) Regulations 2012,* (SI 2012/263) which came into force on 6th April 2012. This includes an amendment to Regulation 3(c) to take account of the updated definition of *"controlled waters*" in Section 78A(9) of the *Environmental Protection Act 1990.*

14.26. Section 78A(2) of Part 2A of the EPA 1990 defines contaminated land as *"land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled waters is being, or is likely to be caused".

14.27. The implementation of Section 86 of The Water Act 2003 on 6th April 2012 by *The Water Act 2003 (Commencement No. 11) Order 2012 (SI 2012/264*) modifies the definition of contaminated land to also include land where there is "*significant possibility of significant pollution of controlled waters".*

Local Policy

14.28. The Redcar & Cleveland Local Plan was adopted in May of 2018. Policies that are of relevance in this document include N1 (Landscape), SD7 (Flood and Water Management) and LS4 (South Tees Spatial Strategy). The specific policy objectives are:

- N1 – The outcomes of this policy are to protect and enhance the areas landscape alongside preventing the unnecessary loss of features important to said landscape. A Landscape Character Assessment will be utilised to add context to developments. Developments which have the potential of leading to a loss of features important to the character of the landscape, or its quality and uniqueness, unless benefits clearly outweigh these.
- SD7 – The Council will encourage proposals for developments which demonstrate that a suitable drainage system has been designed and constructed enabling surface water to discharge and not adversely impact the water quality of receiving water bodies.
- LS4 – This policy outlines that the council will favour developments that demonstrate they have low risk of environmental pollution, and also secure decontamination and push for redevelopment of potentially contaminated land.

14.29. Local authorities are required to publish an annual Brownfield Land Register. These list all of the brownfield (previously developed) sites within an area, where larger than 0.25 hectares or with a capacity of 5 or more dwellings, which in the opinion of the local authority would be suitable for development and have a prospect of coming forward within a 15-year period. The Register is prepared in accordance with the *Town and Country Planning (Brownfield Land Register) Regulations 2017.*

14.30. Redcar and Cleveland's Contaminated Land Strategy (March 2013) has been developed and implemented. *Under the Environmental Protection Act 1990* the Council are legally obliged to inspect the land in the Borough that may be contaminated and pose unacceptable risk to public health and the wider environment. The Strategy has been designed to ensure that the Council meets its legal duties.

Guidance

14.31. Defra Contaminated Land Statutory Guidance published in April 2012 (Ref. 14.2) provides for a four-category test which is intended to clarify when land does or does not need to be remediated, where Category 1 is deemed as being high risk and Category 4 as being low risk.

14.32. "*Significant harm*" is defined in the Guidance on risk-based criteria and must be the result of a significant *"pollutant linkage*". The presence of a pollutant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or linked for a potential risk to exist. An initial assessment of pollutant linkage can be made qualitatively (i.e., through identifying these factors) and may be assessed using qualitative risk assessment models.

14.33. Land Contamination: Risk Management (LCRM) guidance (Ref. 14.1) identifies the risk management framework to be followed when dealing with land affected by contamination in England.

14.34. Further guidance documents relevant to the assessment of contaminated land are provided by various statutory and non-statutory bodies and are referenced where applicable, this includes the NHBC/CIEH RDP66 Guidance for the safe development of housing on land affected by contamination (Ref. 14.21).

BASELINE CONDITIONS

14.35. The Site is accessed via Tees Dock Road and is located centrally within land of PD Teesport at National Grid Reference (NGR) 455549 , 523469. The land is relatively flat and lies at an elevation of between 5.8 and 6.8 metres AOD.

14.36. The site comprises a 23.53 ha irregularly shaped area of commercial/industrial land. The site is situated on both the north and south of Kinkerdale Road. The northern portion of the site comprises a large hardstanding that is used for container storage with a PD Teesport building close to Kinkerdale Road.

14.37. The southern portion of site is currently an area of undeveloped open ground which borders Kinkerdale Road to the north and Teesport Road to the south.

Photograph 14.1: Mid site looking north towards River Tees (November 2022)

Photograph 14.2: View of vegetation at southern end of site (November 2022)

14.38. The Site comprises nine existing buildings, currently used for storage and office space. Two of these will be retained.

14.39. The following current uses were identified surrounding the Proposed Development site:

- NORTH – PD Teesport Automobile storage;
- EAST – ASDA Import Centre and Kemira (Chemical Manufacturer);
- SOUTH – BOC Ltd (Gas Supplier); and
- WEST – PD Teesport Container Terminal.

14.40. As part of the environmental assessment historical maps, photographs and previous assessments were obtained and reviewed by WSP to determine the historical development of the Site and surrounding area.

14.41. Early historical mapping indicates that the site was originally below the high water of the River Tees estuary until the 1890's when a sea wall or defence was constructed through the centre of the site and reclamation of the River Tees estuary commenced. The northern half of site remained below the high water mark until sometime in the late 1950's to mid-1960's when the River Tees estuary is reclaimed to its current limits.

14.42. During the 1950's the southern half of the site included a railway line connecting the site to the adjacent Lackenby Slag Breaking Plant and by the mid-1960's the southern half of the site had been developed with a marshalling yard understood to be utilised for the loading of oil products to rail wagon. The foundations are understood to have remained in place. The remainder of the site was disused until the late 1960's to early 1970's when the Teesport Refinery was developed dominating the land use of the northern half of the site through to the late 1980's. By the early 1990's the Teesport Refinery had been demolished and the northern half of the site utilised as a car importation and container facility (2015 onwards).

14.43. In the wider area industrialisation commenced from the 1890's with the development of the Lackenby Iron Works, Tees Slag Wool Works and the formation of slag heaps to the south of the site. The Lackenby Slag Breaking Plant to the southwest was constructed in the early 1900's and the slow development of earthworks is identified through to the 1960's. During the 1960's and early 1970's significant industrial development is identified to the south and west including the South Teesside Works Lackenby, Teesport Refinery, Lackenby Tank Farm, works (unspecified), warehouses, marshalling yards, electrical sub-stations and an oil supply terminal. By the early 1990's industry declines with the removal of the Teesport

Refinery as well as the oil terminal and Lackenby Tank Farm to the south. Teesport to the west of the site is in use through to the present day.

14.44. The ES chapter makes use of information collected within the Wood Group UK Limited Phase 1 Environmental Assessment which itself uses the following sources of information:

- Groundsure, EnviroGeo Insight report, reference GS-8836186, obtained by Sol Environmental in June 2022.
- British Geological Survey (BGS) GeoIndex, https://mapapps2.bgs.ac.uk/geoindex/home.html, accessed in November 2022.
- British Geological Survey, 1987, Stockton, England and Wales Sheet 33, Solid and Drift Geology, 1:50,000, held on the BGS maps portal (https://webapps.bgs.ac.uk/data/maps), accessed in November 2022
- BGS Non-coal Mining Plans, held on the BGS GeoIndex, accessed in November 2022.
- Ordnance Survey Map of Middlesborough and Hartlepool, OS Explorer Map 306, 2022.
- Zetica Limited Unexploded Bomb Risk Information Map, reference 455721-523418_14112022.
- Defence of Britain Archive, access in Google Earth Pro in November 2022.
- Coal Authority Interactive Map, http://mapapps2.bgs.ac.uk/coalauthority/home.html, accessed in November 2022.
- Environment Agency website Flood Risk Map, https://flood-map-for-planning.service.gov.uk/, accessed in November 2022
- DEFRA Magic Map, https://magic.defra.gov.uk/MagicMap.aspx, accessed in November 2022.
- Sol Environment, Planning and Permitting Due Diligence Risk Appraisal, PD Teesport, Green Lithium Refining Limited, July 2022.
- PD Teesport, Teesport Hidden Structures, June 2021.
- Exploration Associates, Teesport Estate Distribution Warehouse, Report on Ground Investigation, reference 131109, October 2002.
- Exploration Associates, Teesport CATS Terminal, Volume 2, Report on Ground Investigation, reference 137080, July 1997.
- THPA Limited Engineering Department, Tees & Hartlepool Port Authority Limited, Clearance of Tees Port Refinery Site by Shell Oil UK Limited in 1985 – 1987, Borehole Logs and Groundwater Analyses, January 1993.
- Cementation Ground Engineering, Report on an investigation of ground conditions at Teesport Refinery for Shell (U.K) Limited, September 1972.

- Cementation Ground Engineering, Report on an investigation of ground conditions at Teesport Refinery for Shell (U.K) Limited, November 1973.

Geology

14.45. The geology of the Site has been established from British Geological Survey (BGS) mapping, historical borehole information and the Groundsure Report.

14.46. The relevant British Geological Survey (BGS) 1:50,000 map of the area (Sheet 33, Solid and Drift Geology, 1:50,000, 1987) shows the Site is directly underlain by:

- **Made ground** – BGS mapping indicates the site is entirely underlain by Made Ground. Previous site investigations have identified that this ranges in thickness between 0.4 – 6.1 m and is noted to comprise clay, slag, ash and gravel. This Made Ground was historically part of the reclamation from the River Tees (as well as a result of previous site uses), which involved the construction of sea defences made from slag, as such thicknesses of Made Ground are expected to be deeper at such locations across the site.
- **Superficial deposits** – Tidal Flat Deposits, which comprise sand, silt and clay. Nearby Glacial Till is likely to underlie these deposits.
- **Bedrock deposits** – the underlying bedrock geology is the Mercia Mudstone Group. Mapping additionally indicates the site is located within the limits of the Boulby Halite and is therefore likely to be underlain by halite at significant depth.

14.47. A summary of the encountered geology at the Site is provided within Table 14.6.

Table 14.6: Site Geology

Stratum	Area	Depth Range	Description
Made Ground	Across all of the site	0.4 – 6.1 mbGL	Clay, slag, ash and gravel
Tidal Flat Deposits	Occasionally not present	0.4 – 6.1	Generally upper layers of black organic sandy silt underlain by silty sand or sand
Glacial Till	Occasionally not present	0.5 – 10.5	Reddish brown boulder clay or stiff to very stiff brown silty clay
Mercia Mudstone Formation	Across all areas	> 4.9 (not proven)	Grey weathered shale, grey shale or stiff to very stiff marl becoming rock marl from between 9.50-13.00m bgl. Also described as very weak mudstone with gypsum nodules below 12.00m bgl

14.48. The Site is not located within a coal mining affected area (Ref. 14.4).

14.49. According to Public Health England (PHE) all parts of the Site (1km grid square) are in a band of radon potential of between 1 % - 3% of homes above the Action Level (Ref. 14.6).

14.50. A report prepared by the Morris C.H (1994) Report on Abandoned Mineral Workings and Possible Surface Instability Problems, Cleveland County Council has also been reviewed for information on the presence of non-coal mineral workings within the vicinity of the site. The report indicates that the site is not underlain by ironstone workings, or anhydrite mines. However, the nearest brine extraction well is recorded approximately 770m south of the site, and was operation from 1889, extracting salt from a seam with a thickness of 40m at a depth of 510mbgl.

14.51. The site is located outside the inferred zone of settlement and the report details extraction ceasing in the 1950's, as such Wood Group UK Limited ascertain that further settlement from brine extraction or impact to the site is unlikely.

Hydrogeology

14.52. As detailed in the Wood Group UK Limited Phase 1 Environmental Assessment report (Appendix 14.1 of Volume 2) and according to the Environment Agency's aquifer designation maps, the geological sequence underlying the Site is classified as follows:

- Made Ground (Unproductive Strata) – No specific hydrogeological significance although localised perched water may be present within Made Ground as occasionally encountered during previous site investigations.
- Superficial Deposits (Secondary Undifferentiated Aquifer) – deposits where it was not possible to apply either a Secondary A or B classification due to the variable nature of the deposits. These aquifers only have a minor value and negligible significance for water supply to rivers lakes or wetlands. The site is within the tidal limits of the River Tees estuary therefore saline intrusion into the underlying groundwater is considered likely.
- Mercia Mudstone Group (Secondary B Aquifer) – mainly lower permeability layers that may store and yield limited amounts of groundwater through faults, fissure, openings or eroded layers. They support water supplies at local rather than strategic scale.

14.53. The Site is not located in a groundwater source protection zone (SPZ) and there are no groundwater (potable or otherwise) abstractions within 2km of the Site.

14.54. Groundwater levels encountered during ground investigation was generally within the Made Ground or Superficial Deposits between 2.5 – 8.1 mBGL.

14.55. The Wood Group UK Limited report indicates that groundwater vulnerability for the site is classed as High.

14.56. Risk of groundwater flooding at the site is low.

Hydrology

14.57. There are no surface water features located on the Site. The nearest surface watercourse is an unnamed ditch located immediately adjacent to the northeast of the Site. The nearest mainline surface watercourses to the Site is the River Tees (730m northwest) (Figure 14.1).

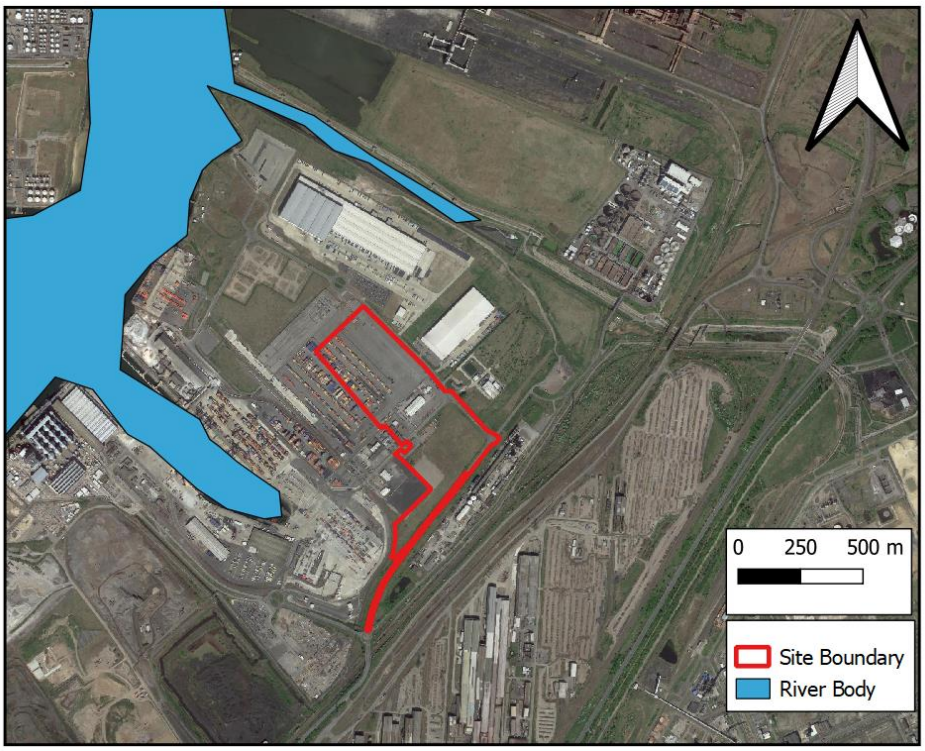

Figure 14.1: Mainline Rivers

14.58. The River Tees Estuary was classified by the EA as having an overall status of Moderate, a chemical status of Fail and an ecological status of Moderate in 2019.

14.59. In addition to the River Tees, Ordnance Survey mapping also identifies a number of unnamed ditches and drains as well as the Dabholm Beck and Dabholm Gut approximately 285m and 610m to the southeast and northeast of the site, respectively.

14.60. Information provided within the Groundsure report (Appendix 14.1.A of Volume 2) indicates that there is no active licensed abstraction points from surface water within 1 km of the Site. The nearest historical abstraction was located 666m west for dust suppression at Tees Bulk Handling Ltd.

14.61. According to the EA flood mapping the Site is within Flood Zone I (low risk) and is not at risk of flooding from rivers. Parts of the Site are predicted to be at risk of surface water flooding (1 in 30 year 0.1 – 0.3m). It is important to note that flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Ecological Receptors

14.62. The MAGIC website which is managed by the Department for Environment, Food and Rural Affairs (Defra), was queried (Ref. 14.8) to locate Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), RAMSAR Sites, National Nature Reserves (NNR), Areas of Outstanding Natural Beauty (AONB), National Parks and Local Nature Reserves (LNR) within 1-km of the Site. The closest designated site is the Teesmouth and Cleveland Coast SSSI, SPA and proposed RAMSAR located c.500 metres to west of the Site (Figure 14.2).

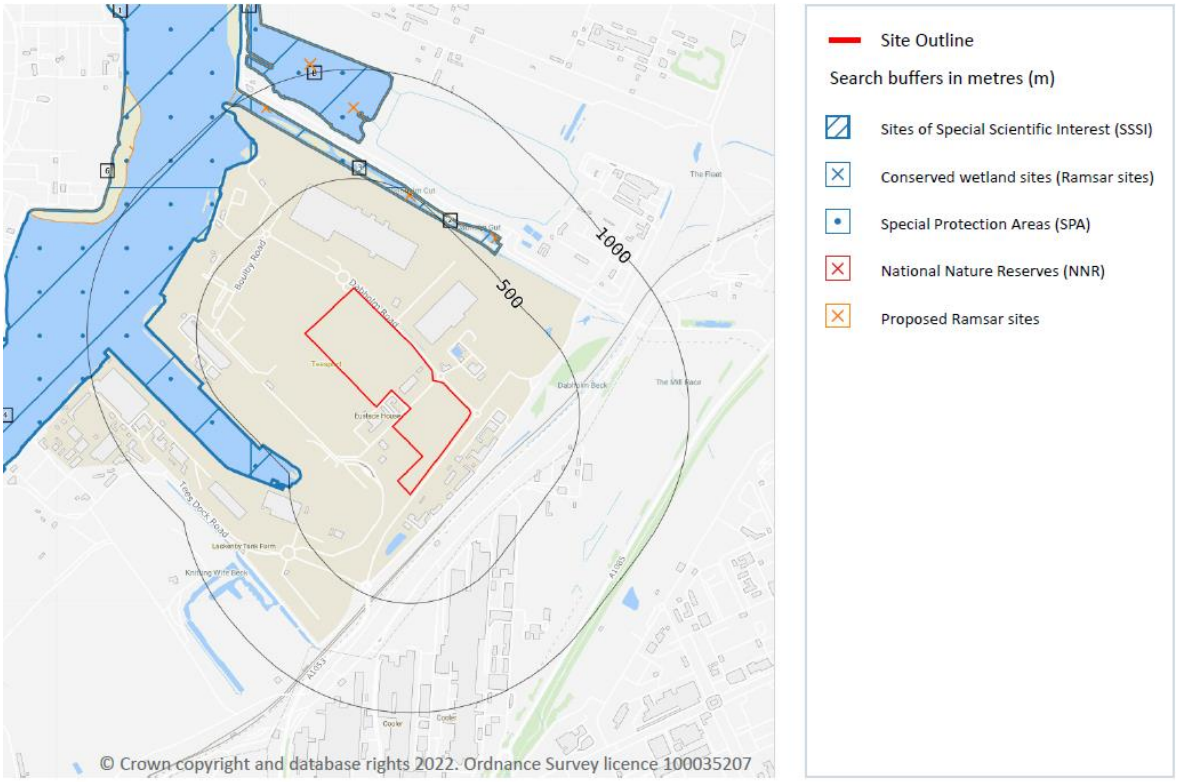

Figure 14.2: Environmental Landscape and Ecological Designations

Protected Buildings

14.63. The Groundsure report (Appendix 14.1.A of Volume 2) identifies Scheduled Monuments, World Heritage Sites and Listed Buildings within 1-km of the Site. There are none located within 1km of the site.

Significance of the Environmental Setting

14.64. The significance of the environmental setting is considered by Wood Group to be as follows:

- Groundwater [MODERATE SENSITIVITY] – The Site is located on a Secondary B Aquifer (bedrock).
- Surface Water [MODERATELY HIGH SENSITIVITY] – The nearest surface water feature is an unnamed ditch immediately adjacent to the northeast of the site which likely flows to the River Tees. The Tees Estuary is located approximately730m northwest of the site and is subject to a number of statutory designations.
- Flood Risk [LOW SENSITIVITY] – The site is not located in area at risk of flooding due to Rivers or groundwater.
- Ecological Sensitive Areas [HIGH SENSITIVITY] – The closest designated site is the Teesmouth and Cleveland Coast SSSI, SPA and RAMSAR approximately 450m west of the Site.
- Protected Buildings and Structures [LOW SENSITIVITY] – There are none located within 1km of the site.
- Residential Areas [LOW SENSITIVITY] – With respect to residential properties the Site is in a low sensitivity area (i.e., the closest residential area is Dormanstown over 1.8km east of the site).

Environmental Licenses and Permits

14.65. According to the Groundsure report (Appendix 14.1.A of Volume 2), the site has no history of landfills or waste sites inside the site perimeter.

14.66. One historical notification of Installations Handling Hazardous Substances Regulations (NIHHS) is identified on the site relating to activities by the Tees and Hartlepool Port Authority.

14.67. There are four historical discharges to controlled waters relating to the site. These are for unspecified trade discharges to the tidal waters of the River Tees, however all are lapsed or revoked as of October 1996.

14.68. The following licenses and permits are recorded in the area surrounding the Site:

- Four historical landfills, the closest a refuse tip 290m northeast and Bells Containers Landfill 300m northwest which was permitted to accept liquid sludge and operated from 1987;

- Five historical waste sites were located within 500m of the site, the closest was a Refuse Pit located 445m east and dated to 1952;
- One Licensed waste site was found 470m northeast of the site, relating to Teesport Landfill operated by Hall Construction and used for construction wastes;
- Three Control of Major Accident Hazards (COMAH) sites, the closest of which is BOC Limited approximately 55m southeast of the site. This facility is also a Planning (Hazardous Substance) Regulations 2015 site authorised to store hydrogen, liquid oxygen and Liquified Petroleum Gas (LPG);
- The nearest licensed industrial activity to the site is located to the northeast and is the Kemira Chemicals (UK) Limited Kemira Teesport installation which holds an Environmental Permit under the Environmental Permitting (England and Wales) regulations 2016 and is a chemical works with organic chemicals and oxygen containing compounds;
- The nearest pollution incident relates to a release of diesel causing a minor impact to land approximately 255m southwest of the Site;
- The nearest active discharge to controlled waters is located 160m southeast of the site at BOC Limited for cooling water to land (soakaway);
- Two discharges of substances regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015 are identified within 500m of the site. The nearest of these is located approximately 210m southwest of the site that relates to discharges of a range of compounds including metals, pesticides, herbicides and semi-volatile organic compounds.

Principal Sources of Contamination Identified at the Site

14.69. The principal sources of contamination identified at the Site in the historical review provided in the Wood Group UK Limited Phase 1 Environmental Assessment report (Appendix 14.1.B of Volume 2) are outlined in the table overleaf. Principally these include potential contamination associated with historical land use including Made Ground associated with reclaimed land, Teesport Oil refinery, Fire Station, Railway and the depot.

14.70. Potential off-Site sources of significant contamination are recorded as the former Tees Works Lackenby, offsite landfills and existing Kimera Ltd Chemical Works and BOC Limited works. Although the Teesport Docks, Bransands Sewage works, Lackenby Tank Farm and Oil Terminal are identified as potential sources of contamination, due to their location down the hydraulic gradient, Wood Group consider these unlikely to have had a significant impact on the site.

Table 14.7: Identified Current and Historical Contaminant Sources				
Ref	Source	Likely Contaminants	Location	Source to be considered further?
1	General Made Ground (reclaimed land including slag and rubble)	Inorganics (metals, abnormal pH, sulphate and cyanide). Organics (PAH, TPH, VOCs and SVOCs)1. Asbestos. Ground gases (carbon dioxide, methane, hydrogen sulphide)	Onsite across the whole site	Yes
2	Teesport Oil Refinery (including the oil loading gantry and substation, excluding railway land)	Inorganics (metals, abnormal pH, sulphate and cyanide). Organics (PAH, TPH, VOCs and SVOCs). PCBs. Asbestos. Ground gases (carbon dioxide, methane, VOCs)	Onsite across the whole site	Yes
3	Fire station	PFAS	Onsite across the whole site	Yes
4	Railway land (marshalling yards)	Inorganics (metals and sulphate). Organics (PAH, TPH, VOCs and SVOCs). PCBs. Asbestos. Ground gases (carbon dioxide, methane)	Onsite across the central and southern part of the site.	Yes
5	Depot (including vehicle and container storage and workshops)	Inorganics (metals and sulphate). Organics (PAH, TPH, VOCs and SVOCs). PCBs.	Onsite across the central and northern part of the site.	Yes
6	BOC Limited Works	Inorganics (metals, abnormal pH, sulphate and cyanide). Organics (PAH and SVOCs). Asbestos. Ground gases (carbon dioxide, methane).	Offsite adjacent to the south.	Yes
7	Kimera Ltd chemical works	Inorganics (metals, abnormal pH, sulphate and cyanide). Organics (PAH, TPH, VOCs and SVOCs).	Offsite adjacent to the east.	Yes
8	Historical industrial land uses including slag breaking and Tees Works Lackenby	Inorganics (metals, abnormal pH, sulphate and cyanide). Organics (PAH, TPH, VOCs and SVOCs). PCBs. Asbestos. Ground gases (carbon dioxide, methane, hydrogen sulphide)	Offsite between 250m and 500m to the south and southeast	Yes

9	Offsite Landfills	Inorganics (metals and sulphate). Organics (PAH, TPH, VOCs and SVOCs). PCBs. Asbestos. Ground gases (carbon dioxide, methane)	Offsite 120m northeast. All other landfills are down gradient of the site.	Yes
10	Teesport Docks including container and potash terminal.	Inorganics (metals, abnormal pH and sulphate). Organics (PAH, TPH, VOCs and SVOCs). PCBs, Asbestos.	Offsite approximately 300m west.	No – activities are down the hydraulic gradient therefore significant migration to the site is unlikely.
11	Historical land uses including Bransands Sewage Works, Lackenby Tank Farm and Oil Terminal	Inorganics (metals, abnormal pH and sulphate). Organics (PAH, TPH, VOCs and SVOCs). Asbestos.	Offsite approximately 500m to >750m south and northeast.	No – these activities are down the hydraulic gradient therefore migration to the site is unlikely.

14.71. Although Wood Group UK Limited review ground investigations previously undertaken at the site, these are limited in nature and the data provided is over 20 years old. As such, further ground investigation and environmental sampling is considered necessary to adequately determine the contamination status and potential required remediation at the site.

14.72. A summary of the contamination findings of the investigations is provided below:

- Cementation Ground Engineering, 1972: No environmental sampling;
- Cementation Ground Engineering , 1973: No environmental sampling;
- Tees & Hartlepool Port Authority Limited, 1993: 8 water samples analysed for hydrocarbons – oil identified.
- Exploration Associates, 1997: Olfactory hydrocarbon contamination identified within the Made Ground. Elevated copper and zinc identified within soils. Ground gas monitoring identified methane concentrations of 25%v/v.
- Exploration Associated, 2002: 9 soil samples analysed, elevated copper, zinc, boron, lead and TPH identified. Elevated Methane and Carbon Dioxide was recorded.

14.73. A full summary of each ground investigation is provided within the Wood Group UK Limited Phase 1 Assessment provided in Appendix 14.1 of Volume 2.

IDENTIFICATION AND EVALUATION OF KEY EFFECTS

14.74. This section considers the potential effects of the Proposed Development, both during the construction and operational phases.

14.75. The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the *Environmental Protection Act 1990* (EPA), as inserted by S.57 of *The Environment Act 1995* and came into effect in England on the 1st of April 2000 as '*The Contaminated Land (England) Regulations 2000* (SI 2000/227)'. These regulations were subsequently revoked through the provision of '*The Contaminated Land (England) Regulations 2006* (SI 2006/1380)', which came into force on 4th August 2006, and consolidated the previous regulations and amendments. The 2006 regulations were modified with the introduction of *The Contaminated Land (England) (Amendment) Regulations 2012*, which came into force on 6th April 2012. Under Part 2A of the EPA Section 78A(2), "contaminated land" is defined as "land which appears… to be in such a condition, by reason of substances in, on or under the land, that –

- Significant harm is being caused or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters (including streams, lakes and groundwater) is being, or is likely to be caused.

14.76. Based on the above factors, an initial qualitative assessment of the presence of potential pollutant linkages can be undertaken. The results of the Qualitative Risk Assessment are outlined within Appendix 14.1 of Volume 2 and are in-line with CIRIA guidance C552 (Ref. 14.10).

14.77. The preliminary risk assessment identifies 24 potentially significant pre-existing contaminant linkages representing Moderate or higher risks to receptors that are related to the onsite historical land use. In addition, 12 potentially significant contaminant linkages have been identified in association with potential offsite sources of contamination.

14.78. The receptors considered in the assessment include future site users, onsite buildings, controlled waters and ecologically designated sites. Additionally, although the CSM does not consider risks to construction workers on the basis that risks to workers will be dealt with under the Health and Safety at Work Act (1974), this ES chapter does consider these as a receptor.

Demolition and Construction

Effects on Human Health from Ground Contamination, Vapours and Ground Gas

14.79. Earthworks would primarily involve the excavation drainage systems, piling and the breaking up of any remaining existing structures, floor slabs and hardstanding. Due to historical land uses there is the potential for widespread soil and groundwater contamination to be present and earthworks have the potential to disturb and expose demolition and construction workers to this, particularly during excavation activities. The Made Ground at the site has the potential to be a source of asbestos, heavy metals and hydrocarbon. Previous investigations have identified areas of free phase hydrocarbons at the site.

14.80. Additionally, there is the potential for elevated concentrations or flows of ground gases due to both onsite (generated from Made Ground soils or organic soils beneath the Site)and offsite sources (nearby historical landfills). As such there is the potential for ground gas to accumulate in poorly ventilated confined spaces, thereby posing a risk to demolition and construction workers.

14.81. Prior to construction of the development, intrusive ground investigation and environmental sampling is required to quantify the risk to construction workers and review the required mitigation and management controls to reduce to the risk.

14.82. All demolition and construction workers would be subject to mandatory health and safety requirements under the Construction (Design and Management) (CDM) Regulations 2015 (SI 2015/51) and the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (SI 2002/2677) (as amended). Groundworkers should be made aware of the possibility of encountering contaminated soils and asbestos in Made Ground through toolbox talks. Safe working procedures should be implemented, good standards of personal hygiene should be observed and appropriate levels of personal protective equipment (PPE) and respiratory protective equipment (RPE), provided and utilised, thereby minimising the risk of exposure to potentially contaminated soils, dust, ACMs, vapour, ground gases and groundwater. Controls would be noted within a formal Construction Environmental Management Plan (CEMP).

14.83. Adherence to these legislative requirements would significantly reduce the health and safety risk posed to demolition and construction workers to a low level. Therefore, the likely effect would be insignificant.

14.84. In the event of exposing soils and stockpiling demolition and construction waste arisings (including excavated materials), dust could be generated during dry and windy conditions. Under these conditions, surrounding public could temporarily be exposed to potentially contaminated dust or asbestos fibres. In the absence of mitigation, the effect is likely to be temporary, local, adverse and of minor significance.

Effects of Contamination on Controlled Waters

14.85. Existing buildings onsite will require demolition and areas of hardstanding at ground level will require breaking out to accommodate the Proposed Development, allowing increased rainwater and surface run-off infiltration to the subsurface. This could potentially mobilise localised areas of contamination which have not yet been identified which could then migrate vertically into the underlying Secondary B aquifer.

14.86. To facilitate construction, it is anticipated that new sources of contamination would be introduced and stored on the Site in the form, for example, of diesel fuel, oils, chemicals and other construction materials. As a result, there would be a risk of leakages or spillages directly or indirectly into the ground thus impacting the underlying aquifer.

14.87. Piled foundations at the Site are likely to be founded within the underlying Mercia Mudstone bedrock. Consequently, piling has the potential to create a preferential pathway for the lateral and vertical migration of contaminants into the aquifer.

14.88. Overall, taking into account that further ground investigation and where necessary remediation will take place prior to groundworks, the likely effects of demolition and construction on the quality of groundwater is temporary, local, adverse and of minor significance.

14.89. The closest surface water body to the Site is located immediately adjacent to the northeast of the site and is considered to flow to the Tees Estuary SSSI, SPA and proposed RAMSAR. As such any spills or leakages have the potential to enter surface water run-off and impact the adjacent ditch. Additionally, any contaminated stockpiled soils have the potential to be windblown and settle in the ditch due to proximity.

14.90. Overall, the likely effects of demolition and construction on the quality of surface water is temporary, local, adverse and of minor significance.

Completed Development

Effects on Human Health from Ground Contamination, Vapours and Ground Gas

14.91. Much of the Proposed Development will be comprised of either building footprint or hardstanding surfacing (roads, pavements, etc.) which would form a barrier between occupants and users of the Site and any contamination that may be present.

14.92. As such, dermal contact and ingestion or inhalation of contaminated soils is not considered a likely pathway. However, a potential pathway does exist through permeation of drinking water pipes and subsequent ingestion by future site users.

14.93. Consequently, in the absence of mitigation, the potential for long-term exposure to contaminated soils by future occupants is considered unlikely. In the absence of mitigation, the effects of ground contamination on human health are long-term, Site-wide, adverse and of moderate significance.

14.94. There is also the potential for elevated concentrations or flows of ground gases. There is a potential for ground gas (generated from Made Ground soils or organic soils beneath the Site) and volatile contaminants (such as hydrocarbons) to accumulate in buildings, thereby posing a risk to future occupants and Site users through asphyxiation or explosion. The risk to future occupants and Site users is long-term, Site-wide, adverse and of minor significance.

14.95. However, It can be assumed that any contamination identified within the ground investigations undertaken prior to development, will be appropriately remediated where required. As such there should be no residual contamination source.

Effects of Contamination on Controlled Waters

14.96. The Proposed Development does not include land uses likely to give rise to significant contamination. Any hazardous materials kept on the Site would be stored and maintained in accordance with relevant legislation which aims to reduce contamination risks. Whilst accidental spillages cannot be ruled out (for example, from the storage of hazardous materials and/or fuel spillages) the Development would be predominantly buildings and drained hardcover which would prevent most of the rainwater and surface run-off infiltration into the ground. The drainage system would be designed to avoid the discharge of any fuels or oils that have entered the system into the underlying groundwater.

14.97. The closest surface water body to the Site is located immediately adjacent to the northeast of the site and is considered to flow to the Tees Estuary SSSI, SPA and proposed RAMSAR. Appropriate drainage design will ensure that no potential contaminants can be discharged to surface water. As such that water quality is unlikely to be affected by the Proposed Development once completed.

14.98. Taking the above into account, the likely effect of the Proposed Development on Controlled Waters once completed is insignificant.

Effects on Buried Structures and Services from Ground Contamination.

14.99. At present, there is not enough information regarding geotechnical ground and groundwater conditions to establish the required mitigation measures. However, it is likely that Made Ground containing slag is aggressive to concrete and the tidal influence on the groundwater regime may gave an effect on buried structures and services.

14.100. As such, buried structures and services associate with the Proposed Development would be suitably designed for the ground conditions at the Site to ensure that the integrity of the materials is maintained. This may include a requirement for sulphate resistant concrete and/or Water Regulations Advisory Scheme (WRAS) approved barrier water supply pipes (Ref. 14.11 and Ref. 14.12). Consequently, in the absence of mitigation, effects are long-term, Site-wide, adverse and of minor significance.

Effects on Vegetation from Ground Contamination

14.101. Areas of soft landscaping within the Proposed Development would be constructed using clean soils (sourced from either onsite or imported pending ground quality). Therefore, an effective barrier would exist between any residual contamination at the Site and areas of vegetation. Consequently, in the absence of mitigation, effects are long-term, local, adverse and of minor significance.

ASSESSMENT OF CUMULATIVE EFFECTS

14.102. The cumulative schemes considered within the assessment are outlined within Chapter 3. These include:

- Combined Tees Valley Authority Municipal Incinerator (Dorman's Point);
- Circular Fuels Ltd DME production facility (Plot 10 Dorman's Point - Teesworks;
- Tees Valley Lithium (Plot 1 – Wilton International); and
- Redcar Energy Centre (Redcar Bulk Terminal, the former Corus Steel works).

14.103. Effects relating to ground conditions and contamination are typically site-specific. As such, it is considered highly unlikely that any nearby committed developments have the potential to give rise to effects that could interact with those arising from the Proposed Development.

14.104. Furthermore, as with the Proposed Development, the potential for contamination and associated risks and effects would be identified by the applicants to ensure that each development would be 'suitable for use' in accordance with the requirements of Part IIA of the *Environmental Protection Act, 1990* and

associated planning conditions. All demolition and construction activities would also be controlled and managed via the implementation of both relevant legislative requirements and best practice guidance to minimise contamination risks and effects to the environment to acceptable levels. The likely demolition and construction related cumulative ground conditions and contamination effects would therefore be insignificant.

Inter-Relationship Effects

14.105. There are inter-relationships identified between this topic and Chapter 7: Water Quality, Hydrology and Flood Risk. The effects of soils contamination have the potential to cause surface water and groundwater quality effects, this has been taken into account in the assessments.

ENHANCEMENT, MITIGATION AND RESIDUAL EFFECTS

Demolition and Construction

Effects on Human Health from Ground Contamination, Vapours and Ground Gas

14.106. Prior to demolition and construction site characterisation comprising extensive ground investigation and subsequent required remediation works will be undertaken.

14.107. During the construction phase, a Construction Environmental Management Plan (CEMP) (to be secured by Condition) would be implemented which would include the following precautions to minimise the exposure of Site workers and the public to potentially harmful substances:

- Adherence to the Control of Substances Hazardous to Health Regulations 2002 (as amended) and the Construction Design and Management Regulations 2015;
- Adherence to current best practice standards for working on contaminated sites such as CIRIA C132 (Ref. 14.15) and HSE HS(G)66 (Ref. 14.16);
- The requirement for all Site workers to wear and utilise appropriate and well maintained Personal Protective Equipment (PPE) and, where necessary Respiratory Protective Equipment (RPE);
- The provision of adequate welfare facilities and procedures to enable Site workers to wash and change;
- The erection of appropriate hoardings around the works;
- The use of dust suppression techniques;
- The provision of wheel washing facilities for vehicles leaving the Site;
- The regular cleaning of Site access roads;
- The avoidance of stockpiling any contaminated materials but where this is not possible, the covering of stockpiled material on the Site and of materials being transported to and from the Site;

- Removal of all excavated material in line with relevant legislation. For example, any excavated material to be removed off-Site, would be subject to chemical testing and a hazard assessment. Waste Acceptance Criteria (WAC) tests (Ref. 14.7) would be carried out, as necessary to classify the waste. Waste would need to be transported, treated and disposed of in accordance with The Waste (England and Wales) Regulations 2011.

14.108. WAC testing would be required to confirm the disposal classification prior to disposal. Any Made Ground would likely be classified as either 'hazardous' or 'non-hazardous'. The natural soils would be expected to be classified as inert. This requirement would be implemented via the CEMP.

14.109. Following the classification of excavation wastes, the options available for the waste would be considered in the context of the waste hierarchy:

- On-site reuse (with or without prior treatment);
- Off-site reuse (with or without prior treatment), e.g. use of waste in construction at a site exempt from the requirement to hold an environmental permit; and
- Off-site disposal (with or without prior treatment), i.e. landfill.

14.110. A formal Materials Management Pan (MMP) shall be developed combined with appropriate method statements, detailing the requirements for internal soil movements, placement and importation of material required to obtain necessary site levels. Where required, the developer will make appropriate use of the CL:AIRE Definition of Waste: Code of Practice (Ref. 14.8).

14.111. All waste transfer documentation shall be maintained by the Principal Contractor for the required statutory period (i.e. two years for general waste and three years for hazardous waste).

14.112. Following appropriate remediation, the risk of harm to human health during demolition/construction works from ground contamination would be low. Therefore, the likely residual effect on human health during the demolition and construction works would be minor beneficial.

Contamination of Controlled Waters

14.113. Prior to demolition and construction site characterisation comprising extensive ground investigation and subsequent required remediation works will be undertaken. This may include additional long-term groundwater monitoring to establish to groundwater regime at the site.

14.114. Geotechnical parameters of the project will be determined following ground investigation ensuring piled foundations are advanced into sufficient (<2m thick) uniform bedrock strata. A Foundation Works

Risk Assessment (FWRA) and Piling Risk Assessment may be required to minimise contamination risks in relation to the underlying Aquifer.

14.115. The following measures would be included within the CEMP and implemented to minimise the potential risk to Controlled Waters during demolition and construction:

- The provision of adequate drainage to manage surface water run-off and minimise contaminated water reaching the ground;
- The handling and storage of any potential hazardous liquids / materials in accordance with relevant legislation and Environment Agency Pollution Prevention Guidance;
- The use of appropriately tanked and bunded storage areas for fuels, oils and other chemicals; and
- Procedures for the management of materials, spillage and spill clean-up, use of best practice construction methods and monitoring.

14.116. No underground storage tanks will be used during the construction phase. This requirement would be implemented via the CEMP. Any liquids such as degreasers, oils or diesel required as part of the construction works will be stored in above ground tanks and located on designated areas of hardstanding. In accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001, any tanks storing more than 200 litres of oil will have secondary bunding. Bunding will be specified having a minimum capacity of 'not less than 110% of the container's storage capacity or, if there is more than one container within the system, of not less than 110% of the largest container's storage capacity or 25% of their aggregate storage capacity, whichever is the greater'.

14.117. The groundwater regime will be established during ground investigation; however, it is likely that groundwater will be present and potentially tidally influenced within the Made Ground and underlying superficial deposits. During construction, dewatering of groundwater from excavations is possible. Should dewatering be necessary, care will be taken to ensure the quality of this water is sufficiently high to allow discharge into the municipal sewer. Prior to the construction phase, discussions will be held with the local water company to ascertain if such disposal would be possible. Alternatively, if the quality of the groundwater is unsuitable for discharge to sewer, collection and off-site disposal to a suitably licensed waste facility will be undertaken.

14.118. Establishment of an appropriate piling methodology and implementation and adherence to a CEMP would ensure that the introduction of new contaminant sources is minimised as far as possible and consequently the likely residual effect on the quality of the groundwater as a result of the demolition and construction phase is considered to be minor beneficial.

Completed Development

Effects on Human Health from Ground Contamination, Vapour and Ground Gas

14.119. Prior to demolition and construction site characterisation comprising extensive ground investigation and subsequent required remediation works will be undertaken.

14.120. This will inform detailed design including foundation design and any required ground gas protection measures. With appropriate design and the implementation of hardstanding across the majority of the site the current risk to future site users is considered Low. Taking this into account, the likely residual effect of ground contamination on future occupants, Site visitors and sub-surface maintenance workers would be insignificant.

Contamination of Controlled Waters

14.121. Ground investigation will be undertaken to establish any required mitigation measures for the Proposed Development in relation to controlled waters. With appropriate drainage design it is considered that the likely residual effects of the Development on Controlled Waters (once completed) are insignificant.

Effects Buried Structures and Services from Ground Contamination.

14.122. Ground investigation will be undertaken to establish any required mitigation measures for the proposed development in relation to buried structures and services. With appropriate design and mitigation measures, the residual effects of the Proposed Development on buried structures and services once completed are insignificant.

Likely Effects to Vegetation from Ground Contamination

14.123. Ground investigation will be undertaken to establish any required mitigation measures for the Proposed Development in relation to vegetation. With appropriate design and mitigation measures, the residual effect of the Proposed Development on vegetation once completed is insignificant.

SUMMARY

14.124. An assessment of ground conditions and contamination has been undertaken using the findings of a desk-based study undertaken at the Site by Wood Group UK Ltd.

14.125. The Conceptual Site Model and preliminary risk assessment has identified potential sources of contamination associated with the historical land use and the presence of Made Ground within the site. The preliminary risk assessment identified 24 potentially unacceptable pre-existing contaminant linkages representing Moderate or higher risks to receptors that are related to the onsite historical land use. In

addition, 12 potentially unacceptable contaminant linkages were identified in association with potential offsite sources of contamination.

14.126. Further ground investigation to characterize the potential contamination and groundwater and ground gas regime beneath the site is required and will be undertaken prior to construction. This will identify any areas where remediation is required and allow the establishment of required mitigation measures during construction and for the completed development.

14.127. Following completion of the specific remediation measures required, the provision of building footprint and hardstanding across most of the Site and the provision of clean topsoil in areas of soft landscaping would result in a very low risk of harm to human health and the wider environment following completion of the Proposed Development.

14.128. The overall effect of the scheme is generally positive and will bring about effective land remediation and will minimise further leaching/mobilisation of residual soil and groundwater contamination located at depth.

Table 14.8: Contaminated Land Summary Table				
Potential Effect	Nature of Effect (Permanent or Temporary)	Significance	Mitigation/ Enhancement Measures	Residual Effects
Demolition & Construction Effects on human health from ground contamination, vapours and ground gas	Temporary Local	Minor Adverse	Site investigation and remediation Construction Environmental Management Plan (CEMP)	Minor beneficial
Demolition & Construction Contamination of controlled waters	Temporary Local	Minor Adverse	Site investigation and remediation CEMP Foundation Works Risk Assessment (FWRA)	Minor beneficial
Completed development Effects on human health from ground contamination, vapours and ground gas	Permanent Site-wide	Minor Adverse	Site investigation and remediation Use of engineering design (barriers and clean break layers)	Negligible
Completed development Contamination of controlled waters	Permanent Site-wide	Insignificant	No specific mitigation measures likely	Negligible
Completed development Effects on Buried Structures and Services from Ground Contamination	Permanent Site-wide	Minor Adverse	Site investigation and remediation Selection of appropriate construction materials and water pipes	Negligible
Completed development Effects on Vegetation from Ground Contamination	Permanent Site-wide	Minor Adverse	Site investigation and remediation Use of engineering design (barriers and clean break layers)	Negligible

REFERENCES

Ref. 14.1: UK Government (2020), Guidance Land contamination risk management (LCRM), 8 October 2020 [online] Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

Ref. 14.2: Department for Environment, Food and Rural Affairs (DEFRA) (2012), Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012 [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf

Ref. 14.3: Department for Communities and Local Government (2019), National Planning Policy Framework (NPPF), February 2019 [online] Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

Ref 13.4: Coal Authority (2021). Interactive Viewer. [online] Available at: https://mapapps2.bgs.ac.uk/coalauthority/home.html.

Ref. 14.5: Welwyn Hatfield Borough Council (2021). Local map and information search, inc. Chalk Mine Buffer, Chalk Mine Zone and Brownfield Land Register. [online] Available at: https://gis.welhat.gov.uk/CommunityMaps/.

Ref. 14.6: Public Health England (2021). UK maps of radon. [online] Available at: http://www.ukradon.org/information/ukmaps.

Ref. 14.7: Environment Agency (2021). Flood map for planning. [online] Available at: https://flood-map-for-planning.service.gov.uk/.

Ref. 14.8: Natural England (2021). MAGIC. [online] Available at: http://www.natureonthemap.naturalengland.org.uk/.

Ref. 14.9: Historic England (2017). Map Search. [online] Available at: https://historicengland.org.uk/listing/the-list/map-search?clearresults=true.

Ref. 14.10: Construction Industry Research and Information Association (CIRIA) (2001), CIRIA report C552, Contaminated Land Risk Assessment – A Guide to Good Practice

Ref 14.11: UK Water Industry Research (2011). Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, Ref 10/WM/03/21, January 2011.

Ref. 14.12: Water Regulations Advisory Scheme (2002). Information and Guidance Note 9-04-03. Laying Pipes in Contaminated Land. 2002.

Ref. 14.13: British Standards (2011). BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice. Code of practice.

Ref. 14.14: British Standards (2015). BS 5930:2015+A1:2020 Code of practice for ground investigations.

Ref. 14.15: Construction Industry Research and Information Association (CIRIA) (1996), CIRIA report C132, A Guide for Safe Working on Contaminated Sites.

Ref. 14.16: Health and Safety Executive (HSE) (1991), HS(G)66 Protection of Workers and the General Public during Development of Contaminated Land.

Ref. 14.17: Environment Agency (2021). Guidance on the classification and assessment of

Waste (1st Edition v1.1.GB), Technical Guidance WM3 [online] available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/948735/Waste_classification_technical_guidance_WM3.pdf

Ref. 14.18: Contaminated Land: Applications In Real Environments (2011). The Definition of Waste: Development Industry Code of Practice, Version 2, March 2011, ISBN 978-1-905046-23-2, CL:AIRE [online] available at https://www.claire.co.uk/component/phocadownload/category/8-initiatives?download=212:definition-of-waste-development-industry-code-of-practice

Ref. 14.19: Environment Agency (2001), Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention National Groundwater & Contaminated Land Centre report NC/99/73, F J Westcott, C M B Lean & M L Cunningham, May 2001.

Ref. 14.20: UK Government (2019). Guidance Land affected by contamination - Provides guiding principles on how planning can deal with land affected by contamination, Last updated 22 July 2019, [online] available at https://www.gov.uk/guidance/land-affected-by-contamination

Ref. 14.21: NHBC/CIEH/EA (2008). Guidance for the safe development of housing on land affected by contamination, R&D Project P5-024, Publication 66. (revision 2008) Two volumes, ISBN 978-1-904306-82-5, 200