9. Geology, Hydrogeology and Ground Conditions

9.1 Introduction

9.1.1 MVV Environment Limited (the Applicant) has submitted a full planning application for a Carbon Capture Retrofit Ready (CCRR) Energy from Waste Combined Heat and Power (EfW CHP) Facility at Canford Resource Park (CRP), off Magna Road, in the northern part of Poole. Together with associated CHP Connection, Distribution Network Connection (DNC) and Temporary Construction Compounds (TCCs), these works are the Proposed Development.

9.1.2 The primary purpose of the Proposed Development is to treat Local Authority Collected Household (LACH) residual waste and similar residual Commercial and Industrial (C&I) waste from Bournemouth, Christchurch, Poole and surrounding areas, that cannot be recycled, reused or composted and that would otherwise be landfilled or exported to alternative EfW facilities further afield, either in the UK or Europe.

9.1.3 The Proposed Development would recover useful energy in the form of electricity and hot water from up to 260,000 tonnes of non-recyclable (residual), non-hazardous municipal, commercial and industrial waste each year. The Proposed Development has a generating capacity of approximately 31 megawatts (MW), exporting around 28.5 MW of electricity to the grid. Subject to commercial contracts, the Proposed Development will have the capability to export heat (hot water) and electricity to occupiers of the Magna Business Park and lays the foundations for a future CHP network to connect to customers off Magna Road.

9.1.4 The location and the extent of the Proposed Development is identified by the red line shown on **Figure 1.1**. In total, the Proposed Development covers an area of 10.0 hectares (Ha).

9.1.5 A full description of the Proposed Development is provided in **ES Chapter 3: Description of the Proposed Development**. A list of terms and abbreviations can be found in **ES Appendix 1.1**.

9.1.6 This chapter of the ES has been produced by Waterman Infrastructure & Environment Ltd (Waterman IE) to assess the Proposed Development in relation to the likely effects it would have to future and surrounding site users, ground and groundwater conditions.

9.1.7 This chapter assesses the likely significant effects of the Proposed Development upon sensitive Receptors in the vicinity of the Red Line Boundary associated with the following:

- construction activities, including excavation, dewatering, basements and installation of deep foundations; and
- operational activities following the completion of the Proposed Development, including the potential for ground contamination associated with users of the Proposed Development.

9.1.8 In addition, consideration has been given to the impact of any existing ground contamination sources within the vicinity of the Proposed Development Boundary upon future sensitive Receptors introduced via the Proposed Development, for example construction workers and people who will be operating the plant or undertaking future maintenance.

9.2 Assessment Criteria & Methodology

Previous Assessment

9.2.1 Two previous environmental assessments have been completed for the EfW CHP Facility Site, as follows:

- Phase 1: Contaminated Land & Geotechnical Desk Study Report, Report No. EX-21-001/P1, Author: Terra Firma (south) (**ES Appendix 9.1**)
- Ground Investigation Report, Report No. EX-21-001/GIR, Author: Terra Firma (south) Revision 02 F (**ES Appendix 9.2**)

Legislative Context, Technical Guidance and Best Practice

Legislative Context

9.2.2 This chapter considers the following legislation:

- Part IIA Environmental Protection Act 1990.

9.2.3 This chapter considers the following national and local planning policy and guidance:

- National Planning Policy Framework (NPPF) 2021, Paragraphs 174, 180, 183 to 185, 188; and,
- National Planning Practice Guidance (PPG), Land affected by contamination.

Guidance Best Practice

9.2.4 This chapter also considers the following additional ground contamination standards and guidelines:

- Land contamination risk management (LCRM) 2019 (updated 2021); and,
- BS10175:2011 + A2:2017 Investigation of potentially contaminated sites. Code of practice.

Baseline Data Collection

9.2.5 A desk-based review of the Proposed Development and its surroundings was undertaken to identify likely sensitive Receptors and sources of existing ground contamination. This used aerial photography, ground conditions records and other available online information.

9.2.6 Assessments made through the desk-based review were confirmed by a site visit on 20 June 2022.

9.2.7 The following searches were undertaken and documents reviewed to establish the baseline conditions within the study area:

- Groundsure Enviro Insight Report (including geological records and historic mapping information), procured December 2021;
- British Geological Survey (BGS), 1:50,000 scale Geological Maps;
- BGS Online Geology of Britain Viewer - https://mapapps.bgs.ac.uk/geologyofbritain/home.html; and,

- Defra Online MAGiC geographic information viewer - https://magic.defra.gov.uk/MagicMap.aspx

Predicting Effects

Previous Investigations at the EfW CHP Facility Site

9.2.8 The potential for contaminated land at the EfW CHP Facility Site has been assessed by Terra Firma through completion of a Phase 1 Desk Study report, and Phase 2 ground investigation works (as reported in **ES Appendix 9.1** and **ES Appendix 9.2**).

9.2.9 The desk study report includes a review and summary of available historical, mapping information and local authority consultation and concludes with consideration of the potential historical and current contamination impacts to the EfW CHP Facility Site.

9.2.10 The ground investigation was designed to target the potentially impacted areas of the EfW CHP Facility Site identified by the desk study, to confirm their contamination status. Intrusive works were undertaken including boreholes, window sample holes and trial pits. Soil and groundwater samples were collected and tested for contaminants and ground gas testing at installed monitoring wells was completed. The report summarised all activities and findings, made an assessment as to the likelihood of contamination encountered impacting future Receptors at and around the EfW CHP Facility Site and made recommendations for further action to break any unresolved linkages to these Receptors.

Contaminant Linkage-Receptor Assessment

9.2.11 To assess the contamination status of the Proposed Development, with respect to the proposed end use, it is necessary to assess whether the Proposed Development could potentially be classified as “Contaminated Land”, as defined in Part IIA of the Environmental Protection Act 1990 and Contaminated Land Statutory Guidance 2012. This is assessed by the identification and assessment of potential contaminant linkages. The linkage between the potential sources and potential Receptors identified needs to be established and evaluated.

9.2.12 To fall within this definition, it is necessary that, as a result of the condition of the land, substances may be present in, on or under the land such that:

a) significant harm is being caused or there is a significant possibility of such harm being caused; or,

b) significant pollution of controlled waters is being caused, or there is significant possibility of such pollution being caused.

9.2.13 It should be noted that Defra has advised (Ref. Section 4, Defra Contaminated Land Statutory Guidance 2012) Local Authorities that land should not be designated as “Contaminated Land” where:

a) the relevant substance(s) are already present in controlled waters;

b) entry into controlled waters of the substance(s) from land has ceased; and,

c) it is not likely that that further entry will take place.

Identifying Potential Receptor Sensitivity

9.2.14 Receptor sensitivity is determined through best practice guidance, dependent on the receptor type, as detailed in **Table 9-1**.

Table 9-1:Guidance for Determining Receptor Sensitivity

Relevant types of Receptor	Significant harm	Significant possibility of significant harm
Human beings	The following health effects should always be considered to constitute significant harm to human health: death; life threatening diseases (e.g. cancers); other diseases likely to have serious impacts on health; serious injury; birth defects; and impairment of reproductive functions. Other health effects may be considered by the local authority to constitute significant harm. For example, a wide range of conditions may or may not constitute significant harm (alone or in combination) including: physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts. In deciding whether or not a particular form of harm is significant harm, the local authority should consider the seriousness of the harm in question: including the impact on the health, and quality of life, of any person suffering the harm; and the scale of the harm. The authority should only conclude that harm is significant if it considers that treating the land as contaminated land would be in accordance with the broad objectives of the regime as described in Section 1 of the Contaminated Land Statutory Guidance.	The risk posed by one or more relevant contaminant linkage(s) relating to the land comprises: (a) The estimated likelihood that significant harm might occur to an identified receptor, taking account of the current use of the land in question. (b) The estimated impact if the significant harm did occur – i.e. the nature of the harm, the seriousness of the harm to any person who might suffer it, and (where relevant) the extent of the harm in terms of how many people might suffer it. In estimating the likelihood that a specific form of significant harm might occur the local authority should, among other things, consider: (a) The estimated probability that the significant harm might occur: (i) if the land continues to be used as it is currently being used; and (ii) where relevant, if the land were to be used in a different way (or ways) in the future having regard to the guidance on “current use” in Section 3 of the Contaminated Land Statutory Guidance. (b) The strength of evidence underlying the risk estimate. It should also consider the key assumptions on which the estimate of likelihood is based, and the level of uncertainty underlying the estimate.
Ecological systems	The following types of harm should be considered to be significant harm: harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any substantial part of that location; or harm which significantly affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location. In the case of European sites, harm should also be considered to be significant harm if it endangers the favourable conservation status of natural habitats at such locations or species typically found there. In deciding what constitutes such harm, the local authority should have regard to the advice of Natural England and to the requirements of the Conservation of	Conditions would exist for considering that a significant possibility of significant harm exists to a relevant ecological receptor where the local authority considers that: significant harm of that description is more likely than not to result from the contaminant linkage in question; or there is a reasonable possibility of significant harm of that description being caused, and if that harm were to occur, it would result in such a degree of damage to features of special interest at the location in question that they would be beyond any practicable possibility of restoration. Any assessment made for these purposes should take into account relevant information for that type of contaminant linkage, particularly in relation to the ecotoxicological effects of the contaminant.

	Habitats and Species Regulations 2010 (as amended).	
Structures and services	Structural failure, substantial damage or substantial interference with any right of occupation. The local authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it is or was intended. In the case of a scheduled Ancient Monument, substantial damage should be regarded as occurring when the damage significantly impairs the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument was scheduled. The Guidance states that this description of significant harm is referred to as a 'building effect'.	Conditions would exist for considering that a significant possibility of significant harm exists to the relevant types of receptor where the local authority considers that significant harm is more likely than not to result from the contaminant linkage in question during the expected economic life of the building (or in the case of a scheduled Ancient Monument the foreseeable future), taking into account relevant information for that type of contaminant linkage.
Controlled waters	In deciding whether significant pollution of controlled waters is being caused, the local authority should consider that this test is only met where it is satisfied that the substances in question are continuing to enter controlled waters; or that they have already entered the waters and are likely to do so again in such a manner that past and likely future entry in effect constitutes ongoing pollution. For these purposes, the local authority should: (a) Regard substances as having entered controlled waters where they are dissolved or suspended in those waters, or (if they are immiscible with water) they have direct contact with those waters on or beneath the surface of the water. (b) Take the term “continuing to enter” to mean any measurable entry of the substance(s) into controlled waters additional to any which has already occurred. (c) Take the term “likely to do so again” to mean more likely than not to occur again. Land should not be determined as contaminated land on grounds that significant pollution of controlled waters is being caused where: (a) the relevant substance(s) are already present in controlled waters; (b) entry into controlled waters of the substance(s) from land has ceased; and (c) it is not likely that further entry will take place.	In deciding whether or not a significant possibility of significant pollution of controlled waters exists, the local authority should first understand the possibility of significant pollution of controlled waters posed by the land, and the levels of certainty/uncertainty attached to that understanding, before it goes on to decide whether or not that possibility is significant. The term “possibility of significant pollution of controlled waters” means the estimated likelihood that significant pollution of controlled waters might occur. In assessing the possibility of significant pollution of controlled waters from land, the local authority should act in accordance with risk assessment guidance.

Reproduced from Defra (2012) Contaminated Land Statutory Guidance pursuant to section 78YA of the Environmental Protection Act 1990 as amended by Section 57 of the Environment Act 1995

Contaminant Linkages during Demolition and Construction Works

9.2.15 This Chapter considers the following likely significant effects during the demolition and construction works:

- effects on construction workers and surrounding off-site users from potentially contaminated soils or dust;
- effects on construction workers and surrounding off-site users from potential unexploded ordnance (UXO);
- effects of the works on ecological Receptors;
- effects on controlled waters from the release of existing contamination, creation of new pollution pathways (for example via piling) and introduction of new sources of contamination; and
- effects on existing structures off-site and future structures and buried services on-site as a result of mobilised contamination.

Contaminant Linkages at the Operational EfW CHP Facility

9.2.16 This Chapter also considers the following likely significant effects once the Proposed Development is completed and the EfW CHP Facility is in operation:

- effects on future occupants and visitors to the operational EfW CHP Facility from any ground contamination, including ground gas or vapour accumulation;
- effects on ecological Receptors at the operational EfW CHP Facility; and
- effects on controlled waters from the operational EfW CHP Facility.

Table 9-2: Significance Criteria for Ground Conditions and Contamination Assessment

Significance Criteria	Description
Beneficial effect of major significance	Major reduction in risks to human, animal or plant health. Regional scale improvement to the quality of potable groundwater or surface water resources.
Beneficial effect of moderate significance	Risks to human, animal or plant health are reduced to acceptable levels. Moderate local improvement to the quality of potable groundwater or surface water resources. Significant improvement to the quality of groundwater or surface water resources used for public water supply.
Beneficial effect of minor significance	Risks to human, animal or plant health are reduced to acceptable levels. Minor local scale improvement to the quality of groundwater or surface water resources used for commercial or industrial abstraction.
Insignificant	Low risk classification - no appreciable effects to human, animal or plant health, potable groundwater or surface water resources.
Adverse effect of minor significance	Low risk classification and potential pollutant linkages with human health and/or animal/plant populations identified. Reversible, localised reduction in the quality of groundwater or surface water resources used for commercial or industrial abstractions, Secondary Aquifer.
Adverse effect of moderate significance	Medium risk classification and proven pollutant linkages with human health and/or animal/plant populations, with harm from long-term exposure. Effect to

Significance Criteria	Description
	a potable groundwater or surface water resource at a local level e.g., effect to an outer groundwater SPZ or Principal Aquifer, which is not abstracted locally. Temporary alteration to the regional hydrological or hydrogeological regime or permanent alteration to the local regime.
Adverse effect of major significance	High risk classification - acute or severe chronic impacts to human health and/or animal/plant populations predicted. Effect to a potable groundwater or surface water resource of regional importance e.g., Principal Aquifer, public water reservoir or inner Source Protection Zone (SPZ) of a public supply borehole.

Geographical Scope

9.2.17 The ground conditions study generally considers a 500m radius from the Proposed Development Red Line Boundary, up to 1km with respect to groundwater abstractions. This is based on professional judgement and experience on ground conditions effects.

- 'local' effects are those affecting neighbouring Receptors;
- 'district' effects are those which are likely to occur to Receptors within the Poole area;
- 'sub-regional' effects are those affecting Poole and nearby towns;
- 'regional' effects are those affecting Receptors across Dorset; and,
- 'national' effects are those affecting Receptors within the UK.

Temporal Scope

9.2.18 The general approach to the temporal and geographical extent of potential effects is reproduced below.

- 'short' to 'medium-term' effects are those associated with the Proposed Development preparation and construction works; and,
- 'long-term' effects are those associated with the operational EfW CHP Facility;

Consultation

9.2.19 The Terra Firma (South) Phase 1 and Phase 2 reports did not include any consultation with the local authority, local water board or the Environment Agency (EA).

9.2.20 A scoping request (**ES Appendix 5.1**) was submitted to BCP Council in April 2022. A scoping opinion was received from the Council in October 2022 (**ES Appendix 5.2**). Regarding contaminated land considerations, the contaminated land officer agreed that geology, groundwater and contaminated land impacts should be scoped into the Environmental Statement, and that the scope as proposed was appropriate.

Assumption and Limitations

9.2.21 The information and conclusions contained in this chapter are based on the findings of the Terra Firma (South) Phase 1 desk top study and Phase 2 ground investigation reports (**ES Appendix 9.1** and **ES Appendix 9.2**, respectively).

9.2.22 The conclusions resulting from these assessments are not necessarily indicative of future conditions or operating practices at or adjacent to the Proposed Development

9.3 Baseline Conditions

Current Baseline

Existing Site Conditions

9.3.1 Terra Firma (South) undertook an inspection of the EfW CHP Facility Site in December 2021. At the time of the study, the EfW CHP Facility Site was occupied by an implemented but not operational, pyrolysis and gasification plant. Waterman reviewed available online mapping and photographic records for the Proposed Development in December 2022.

9.3.2 The EfW CHP Facility Site is occupied by a single large warehouse building in the central area, an existing chimney, and surrounded by gravel surfacing. A series of portable cabins are located north of this warehouse as office space. To the south, the area is used as a car park and yard area, with materials storage alongside outdoor chemical processing infrastructure connected to the warehouse building. The southern extent of the EfW CHP Facility Site is occupied by an area of hardstanding. The CHP Connection and DNC Corridor are open ground and informal woodland. Both proposed locations for the TCCs comprise open ground; TCC1 is located directly off Arena Way and TCC2 is south of the EfW CHP Facility Site and will be accessed off an internal haul road, which will follow the route of an existing track.

9.3.3 Current potentially contaminative activities are identified in the area surrounding the Proposed Development, including a closed landfill to the north-west, MBT facility with outdoor storage to the east and former landraise activity to the south-west.

Historical Land Uses

9.3.4 Details for historical land uses at the Proposed Development and surrounding area are informed by historical mapping information procured from Groundsure as part of the Terra Firma (South) desk top study.

9.3.5 Earliest available mapping information, dated 1887, identifies the Proposed Development as woodland and marshland, surrounded by further woodland and gravel pits to the north-east. Frogmoor Cottage is recorded close to the Red Line Boundary. By 1926 two abstraction wells are recorded adjacent to Frogmoor Cottage. 1974 mapping records no changes on-site, but a new sand and gravel extraction bordering the north-west corner of the Red Line Boundary, which expanded south and south-west up to 1988. By 1989 a pond occupied the majority of the EfW CHP Facility Site, with the gravel pit offsite repurposed as a landfill in 2001, with new industrial buildings in the north-west by 2003. By 2010 the pond on-site had been reduced in size. Most recent 2021 mapping shows the EfW CHP Facility Site as mainly occupied by the implemented but not operational, pyrolysis and gasification plant, with the surrounding area in industrial use.

9.3.6 Potential contaminative land uses identified at the EfW CHP Facility Site are infilling of the ponds, and current use as an implemented but not operational pyrolysis and gasification plant. Surrounding the Red Line Boundary, infilling of the gravel pits as landfill and nearby works are the predominant land use risks.

Geology

9.3.7 The geology has been established from the findings of the ground investigation completed by Terra Firma (South) in September 2022. Terra Firma (South) completed 25no. exploratory holes and 5no. trial pits across the EfW CHP Facility Site.

9.3.8 Shallow geology encountered comprised Made Ground from surface down to between 6.0 and 7.7m bgl (below ground level), overlying Poole Formation clays to the base of all exploratory holes at a maximum of 30m bgl.

9.3.9 The desk top report identified a moderate risk of compressible ground. No other ground stability hazards were identified. The Proposed Development is not in an area at risk of coal or metalliferous mining activity, although historical sand and gravel quarrying close by has occurred.

Soil Chemical Quality

9.3.10 30no. soil samples were collected from the Made Ground and Poole Formation as part of the ground investigation works. Samples were tested for metals, hydrocarbons, asbestos and soil properties.

9.3.11 None of the soil samples collected recorded contamination concentrations above the assessment criteria for land with a proposed commercial end-use.

Hydrology

9.3.12 There are no significant surface waters present within 250m of the Proposed Development.

9.3.13 The Proposed Development site is recorded by the Environment Agency as being within a Flood Risk Zone 1, with a 1 in 1,000 risk of flooding occurring in any given year. No flood mitigation features or defences are present within 250m of the Red Line Boundary.

9.3.14 Surface water sampling was not undertaken as part of the investigation works at the EfW CHP Facility Site.

Hydrogeology

9.3.15 The Terra Firma (South) desk top study (**ES Appendix 9.1**) identified the Made Ground as an unproductive stratum, with the underlying Poole Formation a Secondary A Aquifer.

9.3.16 As part of the ground investigation, groundwater monitoring wells were installed in 7no. of the exploratory holes across the EfW CHP Facility Site, targeting shallow groundwater in the Made Ground and deeper groundwater in the Poole Formation. Groundwater levels were reported between 0.63m bgl and 5.1m bgl in the Made Ground, and 7.43m in the Poole Formation.

9.3.17 Groundwater sampling was not completed as part of the Terra Firma (South) investigation (**ES Appendix 9.2**) works.

Ground Gas and Vapour

9.3.18 Searches have identified that the area within the Red Line Boundary is not in an area at risk of radon gas, with less than 1% of dwellings above the action level.

9.3.19 Four rounds of gas monitoring results (relating to methane and carbon dioxide) are reported in the Terra Firma (South) investigation report (**ES Appendix 9.2**). Elevated concentrations of methane or carbon dioxide were not encountered, and the EfW CHP Facility Site was rated very low risk for potential ground gas issues.

9.3.20 Vapour monitoring was not undertaken as part of the investigation.

Unexploded Ordnance

9.3.21 Online WWII bomb strike mapping information does not indicate the Red Line Boundary was a target of wartime bombing. The risk for encountering unexploded ordnance is determined to be low.

Future Baseline

9.3.22 The existing use of the EfW CHP Facility Site is an implemented but not operational pyrolysis and gasification plant, with limited potential pathways for site users to contact potential ground or groundwater contamination. Should no redevelopment occur and the existing use continue, no risks are identified to these Receptors.

9.3.23 The Proposed Development consists of the following key elements (as shown on **Figure 2.1**):

- The EfW CHP Facility;
- CHP Connection;
- DNC; and
- two TCCs, of which only one will be implemented.

9.4 Inherent Design Mitigation

9.4.1 The installation will be operated under an Environmental Permit (EP). The EP will require baseline ground contamination and groundwater contamination data to be collected and reported in a Site Condition Report. Regular groundwater quality monitoring will be undertaken during operation of the EfW CHP Facility. Similar ground contamination and groundwater contamination data will be collected on surrender of the EP and if significant deterioration is recorded, remedial action will be required. The EP also requires design measures to manage and control processes, discharges and wastes.

9.4.2 The NPPF requires the Proposed Development to not be capable of being classified as contaminated land as defined by Part IIA of the Environmental Protection Act 1990 on completion of works. This, combined with discharge of an anticipated contaminated land Planning Condition, will ensure the Proposed Development will not have a significant impact on ground conditions.

9.5 Identified Potential Receptors for Ground Contamination

9.5.1 Potential sensitive Receptors for ground contamination are summarised as follows:

Table 9-3: Identified Potential Receptors

Receptor	Description	Assessed Sensitivity*
Construction workers	Contact with potential unrecorded ground contamination during below-ground works	Low-Medium

Receptor	Description	Assessed Sensitivity*
	Inhalation of ground gas or vapours arising from Made Ground and infilled gravel pits surrounding the EfW CHP Facility Site	Medium
	Unexploded ordnance	Low
Future site users	Contact with potential unrecorded ground contamination via soft landscaped areas	Low
	Inhalation of ground gas or vapours	Medium
Surrounding site users	Contact with potentially contaminated dust or run-off during the construction works	Medium
Proposed new structures	Contact with potentially corrosive shallow soil conditions	Low
Proposed new soft landscaping	Contact with potential unrecorded ground contamination via root uptake	Medium
Existing structures adjacent to the Proposed Development	Contact with potential unrecorded contaminants migrating from the Proposed Development Boundary	Low
Secondary A Aquifer underlying the Proposed Development	Downward and lateral migration of potential unrecorded ground contamination from shallow strata	Low

*The assessed sensitivity is based on professional judgement of the conceptual model for the site and the likelihood of a contaminant linkage being present because of the Proposed Development.

9.6 Potential Environmental Impact and Effects

Construction Phase

9.6.1 Anticipated works will involve demolition of all existing structures, excavation to form new foundations, and construction of the new EfW CHP Facility buildings and hardstandings. A component of soft landscaping will be included.

9.6.2 The CHP connection including hot water pipework and the DNC will be installed to the east, as part of the Proposed Development.

9.6.3 A TCC will also be established as part of the Proposed Development. Two locations have been assessed as part of this ES; TCC1 located to the north-east and TCC2 located to the south of the EfW CHP Facility Site, but only one will be required for the construction works.

Construction Workers

9.6.4 Ground investigation undertaken at the EfW CHP Facility Site did not identify any significant contamination in soils. However, unrecorded contamination may be present within the Made Ground and construction workers could be exposed to this during the works. Workers will also contact shallow groundwater during foundations works.

9.6.5 Site workers would be subject to the mandatory health and safety requirements (including preparation and following of risk assessments and method statements) of the Control of

Asbestos Regulations (CAR) 2012. This would require the provision of appropriate personal protective equipment (PPE) to all construction workers, minimising the risk of exposure to potential contamination from contact with soils, groundwater, dust emissions and other sources.

9.6.6 Geological stability hazards are identified at the EfW CHP Facility Site. However, standard trenching practices and specialist temporary works for deep excavations during ground works would prevent any impacts to construction workers such as trench instability or collapse.

9.6.7 Historical information does not identify a potential unexploded ordnance risk to the Proposed Development.

9.6.8 The Proposed Development includes the establishment of a single TCC. The selected TCC will be used for material storage and installation of temporary facilities during the construction phase and will not involve any permanent new structures. Construction workers may have limited contact with any potential ground contamination during excavation for utilities and foundations.

9.6.9 Adherence to the legislative requirements described above would reduce the potential risks to workers and visitors from ground contamination. As such, the likely effect is considered to be insignificant (no appreciable effects).

Surrounding Site Users

9.6.10 The TCC would not be accessible by members of the public. This would prevent direct contact with any unanticipated contamination present within the ground. The likely significant effects via this pathway are therefore considered insignificant (no appreciable effects).

9.6.11 During demolition, excavation, regrading, buried infrastructure installation (including the DNC and CHP Connection) or foundation works, potentially contaminated arisings may be stockpiled while awaiting transport or re-use. Potentially contaminated dust could be generated from these stockpiles during dry and windy conditions, or run-off during rainy conditions, potentially exposing nearby site users to contamination via inhalation or dermal contact.

9.6.12 As these Receptors would not be wearing PPE, in absence of mitigation the worst-case likely significant effects are considered short-term, local, adverse, and of minor significance (not significant in EIA terms).

Proposed New Structures

9.6.13 Geological information available identified a moderate compressible ground risk. As such, there is the potential for instability during excavation and foundation works. In absence of appropriate geotechnical assessment and mitigation, the effect to structures and services under construction is likely to be short-term, local, adverse and of major significance.

9.6.14 The ground investigation works identified the appropriate design sulphate class for new concrete as DS1 (Design Sulphate Class 1), and appropriate ACEC (Aggressive Chemical Environment for Concrete) class as AC-1. Use of concrete meeting this specification will prevent chemical attack from potentially corrosive ground conditions. The effect to structures would therefore be insignificant (no appreciable effects).

9.6.15 New buried infrastructure will be installed at the EfW CHP Facility Site, the TCC, DNC and CHP Connection, including buried water pipework. New potable water pipes will be installed using barrier pipe, which, as agreed by the UK Water Industry Report (UKWIR) steering

group, will prevent any contaminated land impacts to these services. Therefore, the effect to this pipework would be insignificant (no appreciable effects).

Proposed New Soft Landscaping

9.6.16 The gravel surfacing and underlying Made Ground currently present is not suitable for plant growth. It is anticipated that clean imported soils would be required.

9.6.17 Siting new landscaping in clean soils would prevent vegetation contacting potential ground contamination through roots. As such, the likely effects from any residual contamination would be insignificant (no appreciable effects).

Existing Structures Adjacent to the Proposed Development

9.6.18 Historical mapping (see **ES Appendix 9.1**) indicates surrounding structures were built alongside the initial development. As such, these structures would have been designed taking into account the existing ground conditions.

9.6.19 Therefore, redevelopment and installation of supporting services such as the DNC and CHP Connection is not likely to mobilise any new potential contamination to the surrounding areas, and the likely effects from the Proposed Development would be insignificant (no appreciable effects).

Secondary A Aquifer Underlying the Proposed Development

9.6.20 Whilst the ground investigation did not encounter soil contamination, the potential exists for shallow groundwater contamination to be present. Groundwater quality was not assessed as part of the investigation works.

9.6.21 During demolition and construction works, increased rainfall infiltration would occur, with the potential to drive groundwater mobilisation downward and off-site. However, large areas of the Proposed Development are currently unsurfaced and this would not represent a significant change in infiltration conditions.

9.6.22 No groundwater abstractions or other potential Receptors for contamination in shallow groundwater are recorded close by. The underlying Secondary A Aquifer in the Poole Formation is within clayey strata, which would prevent downward groundwater migration from the Made Ground. Piled foundations and the bunker will penetrate into the Poole Formation. A Foundation Works Risk Assessment will be carried out to demonstrate the risk to the Poole Formation is low.

9.6.23 It is considered that the likely contamination effects, without mitigation measures, would be insignificant (no appreciable effects).

9.6.24 During construction works, new potential contamination sources including fuels, chemicals and construction materials would be brought on-site. In the absence of appropriate storage measures, spills or leaks from these sources could impact shallow groundwater via permeable ground.

9.6.25 The likely effects of contamination to shallow groundwater would be short term, local, adverse and of minor significance (not significant in EIA terms).

Operational phase

Future Site Users

9.6.26 The Proposed Development mainly comprises structures, infrastructure and hardstanding, which will prevent future site users contacting unrecorded ground contamination. New amenity soft landscaping would require import of clean topsoil, preventing site users contacting existing soils in these areas. The CHP Connection and DNC will all be below ground (with the exception of the DNC compound) and the ground cover returned to existing following installation of the infrastructure.

9.6.27 Four rounds of ground gas monitoring classified the EfW CHP Facility Site as very low risk for gas ingress. No vapour monitoring has been completed, however, the new structures will be designed to prevent accumulation of harmful gases. This in turn would prevent any gas or vapour accumulation risks.

9.6.28 Therefore, without mitigation the potential risk to future site users is insignificant (no appreciable effects).

Surrounding Site Users

9.6.29 Large areas of the Proposed Development are currently unsurfaced. However, a large area of the EfW CHP Facility Site will be covered with new structures and hardstanding.

9.6.30 This new surfacing would prevent dust generation and run-off from previously exposed soils reaching surrounding Receptors. Therefore, the potential risk to surrounding site users would be long-term, local and of minor beneficial significance.

Existing Structures Adjacent to the Proposed Development

9.6.31 Most of the EfW CHP Facility Site will be covered with new hardstanding, structures and buried infrastructure. This will reduce rainfall infiltration rates to the ground, in turn reducing the potential for unanticipated ground contamination to be mobilised off-site via shallow groundwater. The CHP Connection and DNC will all be below ground (with the exception of the DNC compound) and the ground cover returned to existing, following installation of the infrastructure.

9.6.32 The anticipated risks to surrounding structures are assessed as insignificant (no appreciable effects).

Secondary A Aquifer Underlying the Proposed Development

9.6.33 New hardstanding and structures will reduce rainfall infiltration rates to ground, in turn reducing the risk for rainfall-driven contaminant migration to the Secondary A Aquifer in the Poole Formation. Furthermore, the clayey strata of the Poole Formation would further restrict downward groundwater migration from the Made Ground.

9.6.34 During operation of the EfW CHP Facility, the anticipated risks to this aquifer are assessed as insignificant (no appreciable effects).

9.7 Decommissioning

9.7.1 For the purpose of the assessment, a working assumption has been made that the Proposed Development has an operational lifespan of approximately 40-years. However, it should be noted that it is common for such developments to be operational for longer

periods. It is anticipated that the process of decommissioning would involve the termination of operational activity, following which there would be electrical and process isolation and demolition activities. The EfW CHP Facility Site including the CHP Connection and the DNC would be left in a clear and secure condition in accordance with a Decommissioning Plan. The decommissioning process is anticipated to last for one year.

9.7.2 For the purposes of this assessment, the environmental effects associated with the decommissioning phase would be of a similar level to those reported for the construction phase works, albeit with a lesser duration, of one year.

9.8 Additional Mitigation

9.8.1 An intrusive geo-environmental ground investigation has been completed across the EfW CHP Facility Site, with soil sampling, ground gas and groundwater level monitoring.

9.8.2 A remediation strategy would be prepared and agreed in consultation with the EA and local authority. This would detail all remediation or mitigation works necessary to break any contaminant linkages to future Receptors, such as use of appropriate soils in landscaped areas.

9.8.3 In addition, precautions would be taken during demolition and construction to minimise the exposure of workers and the general public to potentially harmful substances or ground contamination. These precautions would be set out in the method statements for the contractors undertaking the works, and are set out in the outline CEMP (**ES Appendix 3.2**) submitted alongside the application, and would likely include measures such as:

- Stockpiling of soils on plastic sheeting with bunds, and the use of hoarding around the perimeter of the Proposed Development to contain dust or surface run-off from exposed soils and stockpiles;
- Using dust screens and covers and the appropriate location of dusty materials storage;
- Appropriate storage of fuels in bunded tanks with drip trays, and construction chemicals in COSHH storage containers; and,
- Damping down of exposed soils during dry weather.

9.9 Residual Effects

Construction phase

Surrounding Site Users

9.9.1 Appropriate mitigation measures during construction works set out in the outline CEMP would minimise off-site emissions of dust or run-off. This mitigation would reduce the worst-case likely significant effects to off-site Receptors to insignificant (no appreciable effects).

Proposed New Structures and Services

9.9.2 Appropriate design work informed by the findings of the ground investigation would identify the risk of instability during excavation and foundation works. This would reduce the likely effect to structures and services during construction to insignificant (no appreciable effects).

Secondary A Aquifer Underlying the Proposed Development

9.9.3 Appropriate storage measures for fuels, chemicals and construction materials brought on-site as set out in the outline CEMP would reduce the risk of spills or leaks to shallow groundwater.

9.9.4 This in turn would reduce the likely effects to insignificant (no appreciable effects).

Operational phase

Future Site Users

9.9.5 Four rounds of ground gas monitoring classified the EfW CHP Facility Site as very low risk for gas ingress.

9.9.6 The potential for ground gas impacts is insignificant (no appreciable effects).

9.10 Implications of Climate Change

9.10.1 There is potential for climate change to impact groundwater levels, giving greater fluctuations in levels (both up and down) due to increased rainfall and hotter summers.

9.10.2 A significant rise in groundwater levels can affect below ground structures. However, the design of the Proposed Development will consider the potential for a higher groundwater table.

9.10.3 Further details with respect to groundwater levels and flooding can be found in **ES Chapter 11: Hydrology**.

9.11 Cumulative Effects

9.11.1 A requirement for all new developments is that land contamination shall be managed to prevent impacts to surrounding Receptors, as set out by Part IIA of the Environmental Protection Act 1990. These requirements prevent the aggregation of cumulative impacts across developments surrounding the Proposed Development.

9.11.2 As such, there are not considered to be any cumulative effects with respect to ground conditions.

9.12 Summary

9.12.1 A summary of the assessment is set out in **Table 9-4** overleaf.

Table 9-4: Summary of Effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant/not significant
Construction Phase					
Construction Workers	Low-Medium	Exposure to potential contamination during the works; ground stability hazards.	Use of PPE and appropriate trenching practice and specialist temporary works in line with relevant legislation.	Insignificant	Not significant
Surrounding Site Users	Low-Medium	Exposure to potentially contaminated dust or run-off during the works	Mitigation measures to reduce potential for run-off or dust emissions, set out in the Outline CEMP.	Insignificant	Not significant
Proposed New Structures	Low	Instability during excavation works; Chemical attack to new foundations and services	Excavation undertaken using appropriate precautions against ground instability. Foundations and services constructed using appropriate materials informed by ground investigation findings	Insignificant	Not significant
Proposed New Soft Landscaping	Medium	New plants uptaking potential contamination in soil via roots	Proposed Development will require import of new topsoil for landscaping, which will be confirmed clean and suitable for use.	Insignificant	Not significant
Existing Structures Adjacent to the Proposed Development	Low	Chemical attack to structures through potentially contaminated	Existing buildings were developed alongside the existing structure, and foundations will have been designed	Insignificant	Not significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant/not significant
		groundwater mobilisation from the site.	taking into account existing ground conditions.		
Secondary A Aquifer Underlying the Proposed Development	Low	Rainfall-driven migration of potential contamination to aquifer; leaks and spills from fuel and chemical storage during construction	Existing EfW CHP Facility Site is majority gravel surfacing and therefore demolition works will not cause a significant increase in rainwater infiltration. Construction materials will be appropriately stored as detailed in the Outline CEMP.	Insignificant	Not significant
Operational Phase					
Future Site Users	Low	Potential contamination within ground; ground gas risk	Proposed Development will cover majority of EfW CHP Facility Site with structures and hardstanding, new soft landscaping will be installed in imported clean soils.	Insignificant	Not significant
Surrounding Site Users	Medium	Dust emissions from previously unsurfaced ground at the EfW CHP Facility Site	Proposed new structures and hardstanding on the EFW CHP Facility Site will reduce dust emissions from unsurfaced ground.	Long-term, local and of minor beneficial significance.	Not significant
Existing Structures Adjacent to the Proposed Development	Low	Rainfall-driven migration of potential contamination to site surroundings	Majority of EfW CHP Facility Site will be covered with structures and hardstanding, reducing infiltration to ground and migration of potentially contaminated groundwater.	Insignificant	Not significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant/not significant
Secondary A Aquifer Underlying the Proposed Development	Low	Rainfall-driven migration of potential contamination to underlying aquifer	Majority of EfW CHP Facility Site will be covered with structures and hardstanding, reducing infiltration to ground and migration of potentially contaminated groundwater.	Insignificant	Not significant

9.13 Mitigation Commitments Summary

Table 9-5: Summary for Securing Mitigation

Identified Receptor	Type and purpose of additional mitigation measure (prevent, reduce, offset, enhance)	Means by which mitigation may be secured (e.g., planning condition/legal agreement)	To be delivered by	Auditable by
Construction				
All Receptors	Remediation strategy to be prepared detailing all required measures, submitted to and agreed with the local planning authority (LPA)	Secured by Planning Condition	Applicant/ EPC Contractor	LPA
Construction workers, surrounding site users.	Contractor to prepare CEMP with details of how impacts to all Receptors will be managed	Secured by Planning Condition	Applicant/ EPC Contractor	LPA
Future site users, plants installed in new landscaping	New soft landscaping to be installed in certified clean topsoil	Required by remediation strategy	Applicant/ EPC Contractor	Applicant/ EPC Contractor

Identified Receptor	Type and purpose of additional mitigation measure (prevent, reduce, offset, enhance)	Means by which mitigation may be secured (e.g., planning condition/legal agreement)	To be delivered by	Auditable by
All Receptors	Validation report to be prepared recording all measures required by the remediation strategy and works undertaken to meet these requirements.	Secured by Planning Condition	Applicant/ EPC Contractor	LPA
Operation				
All receptors	Implementation of requirements of Environmental Permit	Secured by Environmental Permit	Applicant/ EPC Contractor	EA