Waterman

Canford Energy from Waste Combined Heat and Power Facility, Poole, Dorset

Flood Risk Assessment and Drainage Strategy

April 2023

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Client Name: MVV Environment Ltd
Document Reference: WIE18278-100-R-1-4-1_FRA
Project Number: WIE18278

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	Date	Prepared by	Checked by	Approved by
First	13.12.2022	Lucy Elcoat-Dean	Sean Whelan	Brendan McCarthy
Comments		Draft issue for comments		
Second	03.02.2023	Lucy Elcoat-Dean	Sean Whelan	Brendan McCarthy
Comments		Updated based on comments		
Third	09.02.2023	Lucy Elcoat-Dean	Sean Whelan	Brendan McCarthy
Comments		Updated based on comments		
Fourth	10.02.2023	Lucy Elcoat-Dean	Sean Whelan	Brendan McCarthy
Comments		Client Issue		
Fifth	25.04.2023	Lucy Elcoat-Dean	Sean Whelan	Brendan McCarthy
Comments		Client Issue		

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Executive Summary

Waterman Infrastructure and Environment (WIE) was commissioned by MVV Environment Ltd to undertake a Flood Risk Assessment (FRA) to support the detailed planning application for a 260,000 tonnes per annum (tpa) Energy from Waste (EfW) Combined Heat and Power (CHP) facility on land at Canford Resources Park, Magna Road, Poole.

This FRA, which includes a drainage strategy, provides the evidence base that flood risk will be managed to ensure the development is safe from flooding for its lifetime without increasing flood risk elsewhere.

According to the Environment Agency's (EA) Flood Map for Planning, the Proposed Development is shown to be located wholly within Flood Zone 1, denoting a less than 0.1% annual probability of flooding. As such, the Proposed Development is classified as being at low risk of fluvial and tidal flooding.

The EA's Surface Water Flood Maps show various areas with medium to high probability of surface water flooding within the Proposed Development. Flood risk is a function of probability and consequence and the Proposed Development has been assessed with consideration for these criteria in Table 1.

Table 1: Summary of Current Flood Risk

Type of Flooding	Summary of surface water flood risk	Risk
EfW CHP Facility	• Offsite surface water runoff will be managed upstream and routed through the EfW CHP Facility Site via an appropriately sized surface water sewer; and • Surface water runoff from the EfW CHP Facility Site will be managed by the proposed drainage strategy.	Low
TCC1 and access roads	• Isolated area at low risk of surface water flooding within TCC1; and • Isolated area with high probability (1 in 30 year return period) of flooding within the access road to the EfW CHP Facility Site from Magna Road due to a depression in the existing CRP access road. The consequence of flooding in this area is classified as low as TCC1 and the construction site would still be accessible during the medium probability event. The medium probability rainfall event is an extreme weather event and, in reality, construction would not be undertaken during such weather conditions. Risk is a function of probability and consequence and although the probability of flooding is high, the consequence of flooding is low. Therefore, the risk from surface water flooding in this area is low.	Low
TCC2 and CHP and DNC connection route	• Very low risk of surface water flooding to TCC2; and • There is a medium probability (1 in 100 year return period) of flooding along the CHP and DNC connection routes, where they cross the Knighton Stream. The proposed works will not affect the probability of flooding at this location. The DNC compound could still be accessed from the east via Provence Drive. TCC2 would not be accessible although, in reality, construction would	Low

	not be undertaken during a medium probability event due to this being an extreme weather event. Therefore, the risk from surface water flooding is low.

The risk of flooding from groundwater, sewers and artificial sources to the Proposed Development has been assessed as low.

In line with the drainage hierarchy, the proposed drainage strategy is to discharge to the Knighton Stream, which lies to the south of the EfW CHP Facility Site. Runoff from the EfW CHP Facility Site will be drained towards verges where SuDS features such as swales or filter drains will be used to convey flow into the piped drainage network.

Surface water runoff will be restricted to the QBAR greenfield rate of 2.2 l/s/ha. A surface water storage volume of c.2,500 m^3 will be provided to ensure the capacity of the drainage network is not exceeded for the 1 in 100 +45% climate change event.

It is proposed to discharge foul water via the existing private network to the Wessex Water pumping station at Magna Road. It has been calculated that the maximum foul flow rate to foul sewer from the Proposed Development would be 3.8 l/s. A pre-planning enquiry has been raised with Wessex Water and further consultation will be required, post-outline planning, to confirm capacity in their network.

It is considered that the information provided within this report satisfies the requirements of the National Planning Policy Framework and local policy.

1. Introduction

1.1. Waterman Infrastructure and Environment (WIE) was commissioned by MVV Environment Ltd to prepare a Flood Risk Assessment (FRA) to support the detailed planning application for a 260,000 tonnes per annum (tpa) Energy-from Waste Combined Heat and Power Facility on land at Canford Resources Park, Magna Road, Poole (hereafter referred to as the 'Proposed Development').

EfW CHP Facility Site Description

1.2. This Proposed Development Red Line Boundary area is approximately 10 hectares and is located north of Poole. The Proposed Development will complement the existing waste activities of the integrated waste management park extending to 6.23 hectares known as Canford Resource Park (CRP), off Magna Road. It is within the administrative area of Bournemouth Christchurch and Poole Council (BCPC) and is centred at National Grid Reference SZ 03436, 96720. The location of the Proposed Development is illustrated on Figure 1.

1.3. The EfW CHP Facility would be located on an area of land forming part of the existing waste management park which currently includes:

- a Mechanical Biological Treatment (MBT) facility;
- a landfill gas engine generator compound;
- a Materials Recovery Facility (MRF);
- an inert waste recycling facility; and
- an implemented, but not operational, low carbon gasification and pyrolysis energy from waste facility.

1.4. The EfW CHP Facility will occupy the land that the low carbon gasification and pyrolysis energy from waste facility currently occupies.

1.5. Access to CRP is via a 1km dedicated hard surfaced 7.5m wide private road (Arena Way), which is constructed to adoptable standards, from a traffic light-controlled junction on the A341, Magna Road.

Figure 1: EfW CHP Facility Site Location

1.6. The topographic survey (Appendix A) indicates that the topography within the red line boundary is fairly flat and slopes gently towards the southeast. The existing levels across the Proposed Development Boundary vary from +42m AOD to +54m AOD.

1.7. The Proposed Development is located in the catchment of the River Stour which flows in a south easterly direction, approximately 1,800m to the northeast of the red line boundary. The River Stour is designated as Main River by the EA.

1.8. Knighton Stream flows from south-west to north-east approximately 180m south-east of Canford Resource Park. It is crossed by the proposed Combined Heat and Power (CHP) Connection and Distribution Network Connection (DNC) Corridor. As an ordinary watercourse this comes under the jurisdiction of BCPC.

1.9. A further un-named ordinary watercourse runs through the Proposed Development from the north-west and leaves the Red Line Boundary at an outfall in the south-east corner.

Development Proposals

1.10. The EfW CHP Facility is designed to treat up to 260,000 tonnes (t) of residual waste per annum at the thermal design point of 100.5 Megawatts thermal (MWth). It will have a design throughput of 33.2 tonnes per hour (tph) of waste with a Calorific Value (CV) of 10.9 Megajoules per kilogram (MJ/kg)) and an availability of 89.4% (equal to approximately 7,830 full load operational hours per year).

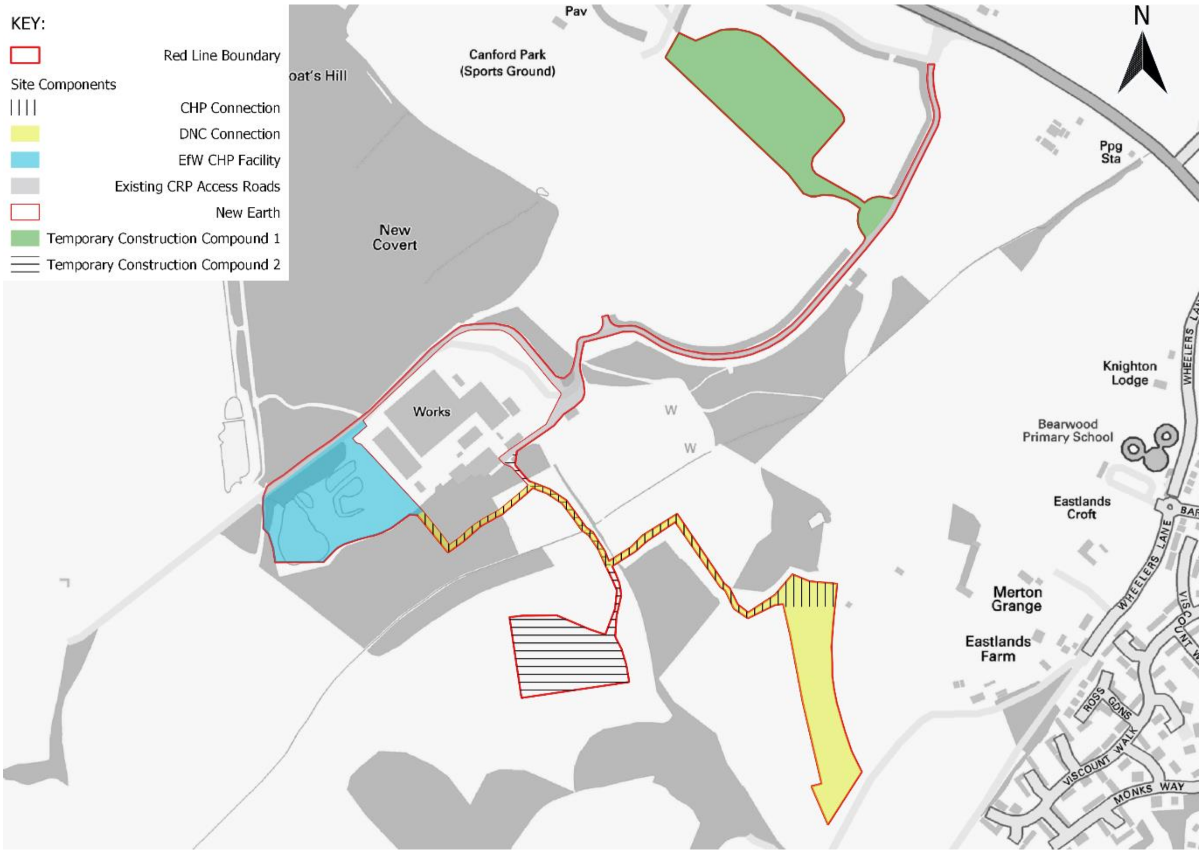
1.11. The residual waste received will be combusted and the heat will be used to generate steam. The steam will drive a steam turbine and generate partly renewable electricity for use at the EfW CHP Facility and for export to the grid and nearby businesses. The steam turbine will be designed so that low pressure steam can be used to produce hot water to supply a district heating system at Magna Business Park and enable the future supply of heat to new and existing local businesses in the locality.

1.12. Solid residues will be left from the combustion process in the form of bottom ash, which will be transported off-site, processed and reused, and residues from the air pollution control system, which will require disposal off-site at a licensed hazardous waste landfill.

1.13. Figure 2 shows the Proposed Development components consisting of the following key elements:

- EfW CHP Facility;
- CHP Connection;
- Distribution Network Connection (DNC); and
- Temporary Construction Compounds (TCC).

Figure 2: Proposed Development Components



1.14. The Canford Resources Park is identified within the BCP and Dorset and Waste Plan (2019) as an allocated waste management site for potential intensification and redevelopment, including facilities for the management of non-hazardous waste. Providing it does not lead to an adverse effect upon the integrity of the adjacent protected European sites, suitable land uses include incineration.

1.15. The development proposals are illustrated in the Site Layout Plan included in Appendix B.

Scope of Report

1.16. This report assesses the potential effects of fluvial, pluvial, groundwater and artificial sources of flooding upon the Proposed Development, in line with national and local planning policy. The management of surface water runoff is also assessed, so as not to have a detrimental effect on the Proposed Development or its surroundings. An assessment of foul drainage has also been included.

2. Local Planning Policy and Guidance

2.1. This Section details local policies and guidance affecting this Proposed Development . National policy and guidance are set out in Appendix C.

BCPC Local Plan

2.2. This Proposed Development is identified as having potential capacity to manage recyclates to address an identified shortfall in the BCP and Dorset Waste Plan (2019).

2.3. The BCPC Local Plan is being currently prepared. The current Poole Local Plan[1] was adopted in June 2018 and sets out the proposals for how Poole will grow and develop up until 2033. The Local Plan contains a set of policies that will govern development in the Borough. The key policies relating to this FRA are summarised below. Development proposals within the current and future flood risk zones, or areas at risk from ground or surface water flooding will be required to undertake a Flood Risk Assessment (FRA), based on advice set out in Planning Practice Guidance and which should be proportionate to the scale and nature of the development proposed. A revised Strategic Flood Risk Assessment (2017) for Poole will provide additional guidance on FRAs.

BCPC Local Plan Policy PP38 Managing Flood Risk

2.4. Sustainable Drainage Systems - Sustainable Drainage Systems will be required for all major developments, unless the relevant Surface Water Management Plan (SWMP) indicates otherwise or they are demonstrated to be impractical. Proposals should be appropriate to the location and designed to manage surface water run-off in accordance with the appropriate technical standards (Department for Environment, Food and Rural Affairs (DEFRA): Non-statutory technical standards for sustainable drainage systems (2015)).

BCPC Strategic Flood Risk Assessment

2.5. BCPC is currently preparing a BCP-wide Strategic Flood Risk Assessment (SFRA) to inform the emerging BCP Local Plan. However, until the BCP SFRA is completed, the SFRAs produced by the legacy authorities will apply, taking account also of the Environment Agency (EA) flood map updates published since the legacy authority SFRAs were produced. In December 2021, BCPC published an explanatory note to give specific guidance for each of the legacy authorities which gave the details below.

2.6. Pending completion of the BCP-wide SFRA, the main purpose of the existing legacy authorities' SFRAs is to provide a comprehensive and robust flood risk evidence base to support the production of the emerging BCP Local Plan, the selection of site allocations within it, and to guide day to day development management decisions. This is done through the application of the 'Sequential Test' and the 'Exception Test'. National planning guidance further advocates a tiered approach to flood risk assessment and identifies two levels of the SFRA:

- Level 1: where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test.
- Level 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

[1] Borough of Poole Local Plan, November 2018. *The Poole Local Plan.*

Poole 2017 Revised SFRA Levels 1 and 2

2.7. Pending completion of the consolidated BCP-wide SFRA, the currently adopted SFRAs are the Poole 2017 Revised SFRA Levels 1 and 2. For applications where the site boundary (defined by a red line on the site plan accompanying a planning application), includes areas of Flood Zones 1 and 2 and/or 3 and the 2133 Future Flood Risk Zone, the consideration of whether the application of the Sequential Test will apply will depend on the nature and layout of the development proposed.

2.8. Where more vulnerable uses such as housing are proposed to be located in Flood Zones 2 and 3 or the 2133 Future Flood Risk Zone, then the whole Proposed Development would be subject to the Sequential Test.

2.9. The Proposed Development is in Flood Zone 1 and outside the 2133 Future Flood Risk Zone but is classified as 'More Vulnerable' as a waste management facility.

2.10. Where more vulnerable uses can be accommodated in areas of the Proposed Development at low risk of flooding and where safe access and egress can be secured throughout the lifetime of the development, a site-specific FRA will be required that addresses any residual flood risk issues.

3. Sources of Potential Flooding

Tidal and Fluvial

3.1. According to the EA's Flood Map for Planning (Figure 3), the Proposed Development is shown to be located wholly within Flood Zone 1 denoting a less than 0.1% annual probability and as such is classified as being at low risk of fluvial and tidal flooding.

3.2. The Knighton Stream is a fluvial ordinary watercourse that crosses the CHP Connection and DNC Corridor, lying south of the proposed EfW CHP Facility. As there is no floodplain associated with this watercourse or the smaller un-named watercourse on the Flood Map for Planning, assessment of the flood risk from this watercourse is included in the Pluvial section below.

Figure 3: Environment Agency Flood Map for Planning

Pluvial

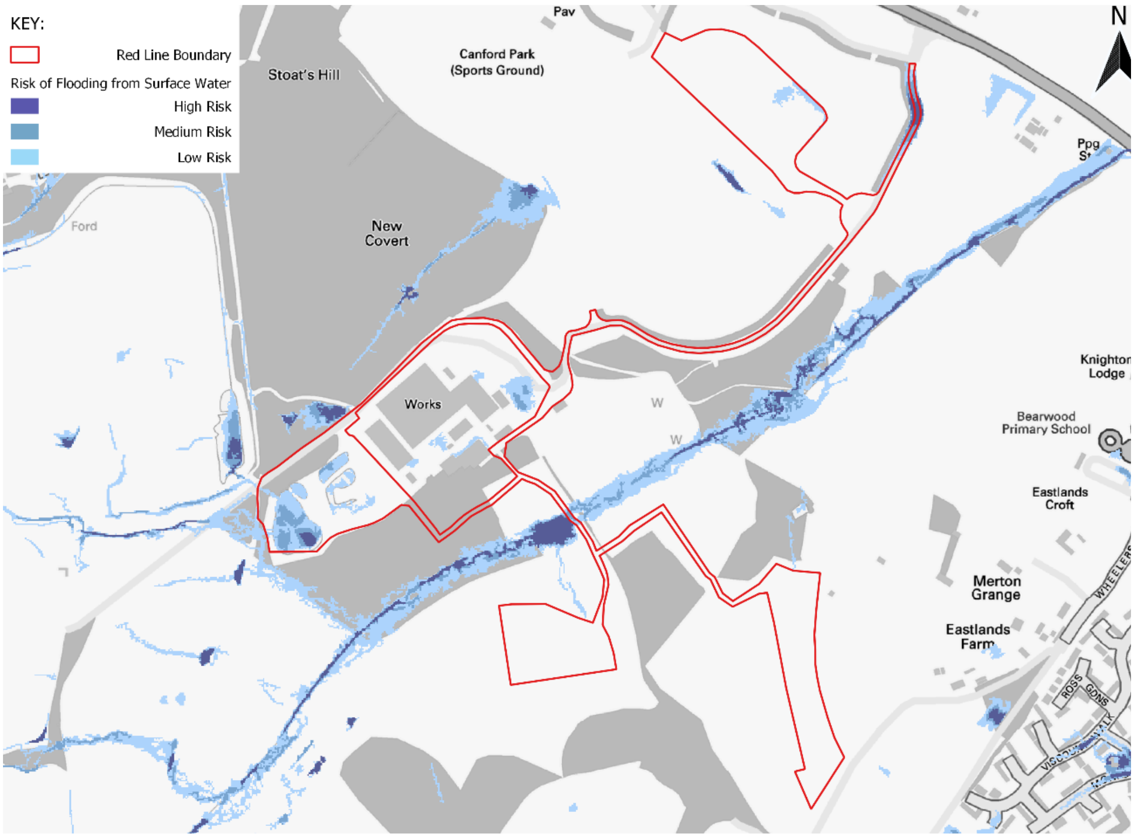
3.3. Pluvial flooding (also known as surface water and sewer flooding) occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during extreme, high intensity, low duration summer rainfall events which overwhelm the local surface water drainage systems, or in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes dictated by the local topography. Overland

Flows

3.4. Review of the EA’s Risk of Flooding from Surface Water (RoFfSW) maps indicates that the majority of the Proposed Development is at a very low risk of surface water flooding, see Figure 4. There are localised areas at medium to high probability of flooding where the EfW CHP facility will be located, at the entrance to the Proposed Development from Magna Road, and where the CHP and DNC routes cross the Knighton Stream. There is a low risk of ponding within TCC1. An assessment of the risk from surface water to the EfW CHP Facility Site components is provided in the following subsections.

3.5. Although not shown on the RoFfSW mapping, it is understood that Magna Road is regularly subject to surface water flooding. Flooding of the road would affect access to the Site. This is outside of the Proposed Development Red Line Boundary and therefore outside of the control of the EfW CHP Facility Site operator. However, the Proposed Development will not increase the risk of flooding to Magna Road.

Figure 4: Environment Agency Flood Risk from Surface Water



EfW CHP Facility

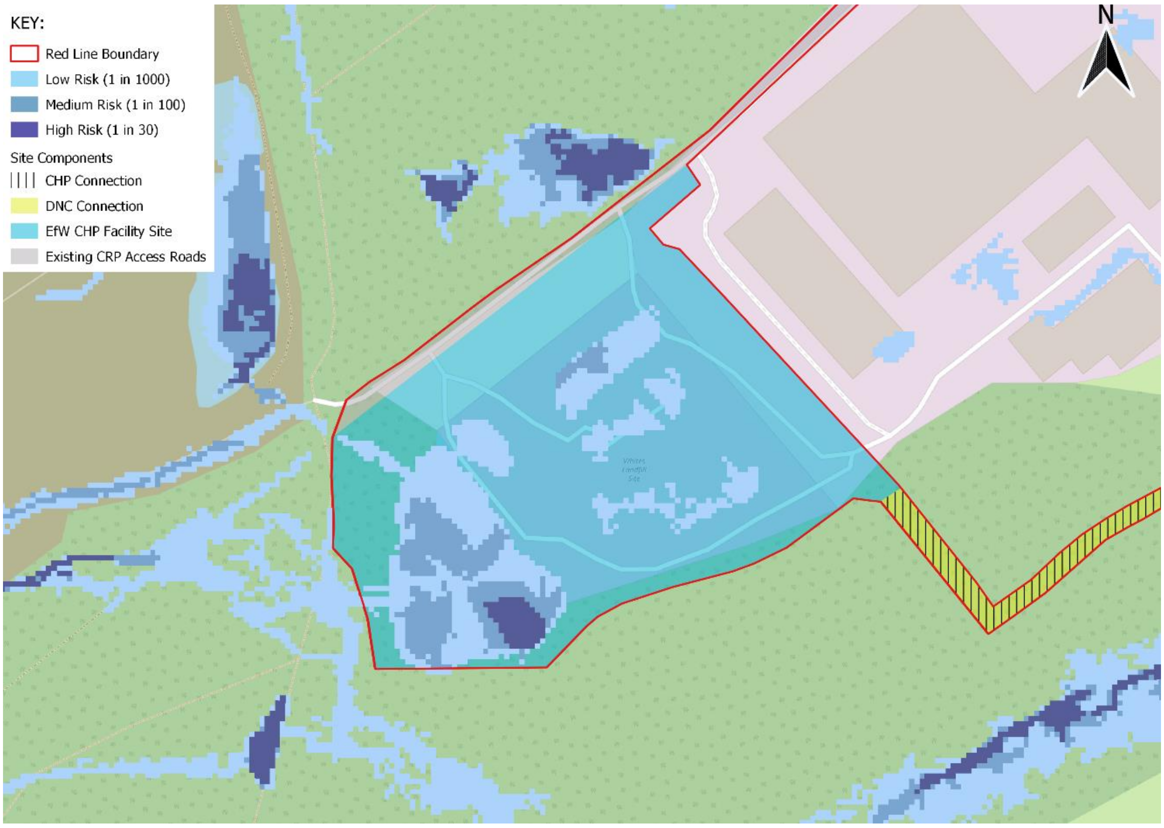
3.6. The mapping indicates that there is an off-site flow route from the White’s Pit Landfill site. The existing flood risk within the proposed EfW CHP Facility Site, shown by the RoFfSW mapping (Figure 5), is due to a combination of this off-site flow and runoff from the proposed EfW CHP Facility Site itself.

3.7. The topographic survey (Appendix B) confirms that the areas at medium to high risk of flooding are limited to depressions in the EfW CHP Facility Site's topography where water would pond in the absence of a functioning drainage system.

3.8. The localised depressions will be removed through site levelling as part of the Proposed Development. Additionally, surface water from impermeable surfaces will be positively drained with sufficient storage provided to prevent flooding for the 1:100 year + 45% climate change event. The EfW CHP Facility Site will drain away from the building, ensuring that the building would not be flooded in the event of blockage or exceedance of the proposed drainage network. Further information on the proposed drainage for this area is provided within the drainage strategy section of the report.

3.9. The adjacent White's Pit Landfill has a drainage strategy (Appendix D) that limits flow from this area to a maximum of 58.3 l/s in a 1:100 year + 30% climate change event. Flow is currently routed through the EfW CHP Facility Site via a surface water sewer. This flow route will be maintained as part of the proposed drainage strategy. Therefore, the off-site flow route as shown on the RoFfSW mapping is not representative of the actual risk of surface water flooding from the adjacent site.

Figure 5: Environment Agency Flood Risk from Surface Water – EfW CHP Facility Site



3.10. The risk of flooding from surface water is concluded to be low because:

- Off-site surface water runoff will be managed upstream and routed through the EfW CHP Facility Site via an appropriately sized surface water sewer; and

- Surface water runoff from the EfW CHP Facility Site will be managed by the proposed drainage strategy.

Temporary Construction Compound 1 and Existing CRP Access Road

3.11. TCC1 is shown in Figure 6 to be at low risk of surface water flooding. It is noted that within the Proposed Development boundary, the Temporary Construction Compounds and access roads will be surfaced with permeable materials which will therefore allow flows to pass through them and either discharge to ground or be converted to runoff, replicating the undeveloped scenario.

3.12. There is an isolated area with a high probability (1 in 30 year return period) of flooding within the entrance to the Proposed Development from Magna Road. Flooding in this location is due to a depression in the existing CRP access road. The Proposed Development will not affect the probability of flooding in this area.

3.13. Flooding in this area does not pose a risk to people or buildings. The main consequence of flooding in this location would be reduced access to the Proposed Development. The depth of flooding in the road is expected to be below 150mm along the centreline, increasing to 150-300mm of flooding along the verge.

3.14. There is a risk that 300mm of flowing water could be enough to move a standard car[2,3]. However, the Proposed Development would still be accessible to regular vehicles in a high risk event as flood water would be ponded (i.e. not flowing) and depths in the centre of the road are less than 300mm. Depths of 300-600mm are expected for the medium risk (1 in 100 year return period) event, meaning only larger vehicles such as delivery trucks and the emergency services could access the Proposed Development . Pedestrian access/egress would still be feasible for all flood events via the footway to the east that runs parallel to the access road. The consequence of flooding in this area is classified as low as the Proposed Development would still be accessible during the medium risk event that equates to the 'design' flood event for planning.

[2] Pregnolato, M. (2017) 'The impact of flooding on road transport: A depth-disruption function.' *Transportation Research Part D: Transport and Environment,* Volume 55, August 2017, Pages 67-81. Available at: https://www.sciencedirect.com/science/article/pii/S1361920916308367 [Accessed on: 02/02/2023]
[3] AA (2017) *Driving in heavy rain and floods.* Available at: https://www.theaa.com/driving-advice/seasonal/driving-through-flood-water

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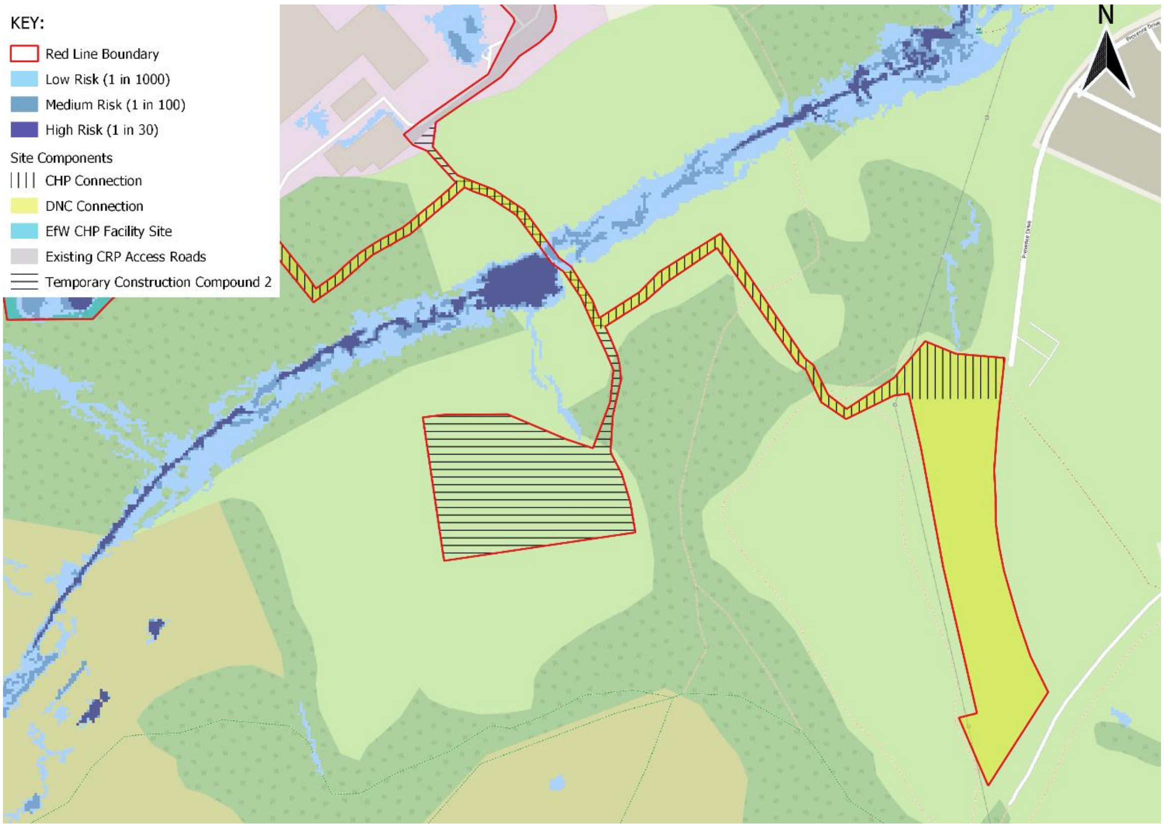
Figure 6: Environment Agency Flood Risk from Surface Water – TCC1

3.15. Risk is a function of probability and consequence and although the probability of flooding is high (as indicated by areas classified as 'high risk' within the EA's Risk of Flooding from Surface Water (RoFfSW) mapping), the consequence of flooding is low. Therefore, the overall risk from surface water flooding in this location is concluded to be low.

Temporary Construction Compound 2 and CHP and DNC connection routes

3.16. TCC2 and the CHP and DNC Connection routes are shown in Figure 7. There is very low risk of surface water flooding to TCC2. There is a medium probability (1 in 100 year return period) of flooding along the CHP and DNC connection routes, where they cross the Knighton Stream. Consultation will be taken with the EA and the Lead Local Flood Authority (LLFA) to ensure that the route crossings are appropriately constructed to ensure no detriment to the watercourse or its capacity. Therefore, the Proposed Development will not affect the probability of flooding at this location. The consequence of the flooding at this location would be reduced access to the DNC compound during a medium risk event. However, the compound could still be accessed from the east via Provence Drive. Therefore, the consequence of flooding in this location would be low.

Figure 7: Environment Agency Flood Risk from Surface Water – TCC2, CHP & DNC Connection



3.17. Risk is a function of probability and consequence and although the probability of flooding is high (as indicated by areas classified as 'high risk' within the EA's RoFfSW mapping), the consequence of flooding is low. Therefore, the overall risk from surface water flooding in this location is concluded to be low.

Summary of surface water flood risk to Proposed Development

A summary of the existing risk of flooding from surface water to the Proposed Development is provided in Table 2: Summary of Current Flood Risk

Type of Flooding	Summary of surface water flood risk	Risk
EfW CHP Facility	• Offsite surface water runoff will be managed upstream and routed through the EfW CHP Facility Site via an appropriately sized surface water sewer; and • Surface water runoff from the EfW CHP Facility Site will be managed by the proposed drainage strategy.	Low
TCC1 and access roads	• Isolated area at low risk of surface water flooding within TCC1; and • Isolated area with high probability (1 in 30 year return period) of flooding within the access road to the	Low

	EfW CHP Facility Site from Magna Road due to a depression in the existing CRP access road. The consequence of flooding in this area is classified as low as TCC1 and the construction site would still be accessible during the medium probability event. The medium probability rainfall event is an extreme weather event and, in reality, construction would not be undertaken during such weather conditions. Risk is a function of probability and consequence and although the probability of flooding is high, the consequence of flooding is low. Therefore, the risk from surface water flooding in this area is low.	
TCC2 and CHP and DNC connection route	• Very low risk of surface water flooding to TCC2; and • There is a medium probability (1 in 100 year return period) of flooding along the CHP and DNC connection routes, where they cross the Knighton Stream. The proposed works will not affect the probability of flooding at this location. The DNC compound could still be accessed from the east via Provence Drive. TCC2 would not be accessible although, in reality, construction would not be undertaken during a medium probability event due to this being an extreme weather event. Therefore, the risk from surface water flooding is low.	Low

3.18. .

Table 2: Summary of Current Flood Risk

Type of Flooding	Summary of surface water flood risk	Risk
EfW CHP Facility	• Offsite surface water runoff will be managed upstream and routed through the EfW CHP Facility Site via an appropriately sized surface water sewer; and • Surface water runoff from the EfW CHP Facility Site will be managed by the proposed drainage strategy.	Low
TCC1 and access roads	• Isolated area at low risk of surface water flooding within TCC1; and • Isolated area with high probability (1 in 30 year return period) of flooding within the access road to the EfW CHP Facility Site from Magna Road due to a depression in the existing CRP access road. The consequence of flooding in this area is classified as low as TCC1 and the construction site would still be accessible during the medium probability event. The medium probability rainfall event is an extreme weather event and, in reality, construction would not be undertaken during such weather conditions. Risk is a function of probability and consequence and although the probability of flooding is high, the consequence of flooding is low. Therefore, the risk from surface water flooding in this area is low.	Low
TCC2 and CHP and	• Very low risk of surface water flooding to TCC2;	Low

DNC connection route	and • There is a medium probability (1 in 100 year return period) of flooding along the CHP and DNC connection routes, where they cross the Knighton Stream. The proposed works will not affect the probability of flooding at this location. The DNC compound could still be accessed from the east via Provence Drive. TCC2 would not be accessible although, in reality, construction would not be undertaken during a medium probability event due to this being an extreme weather event. Therefore, the risk from surface water flooding is low.

Sewer Flooding

3.19. Wessex Water's asset information (Appendix E) indicates that there are no public sewers within the Red Line Boundary. The closest sewers to the Red Line Boundary are two foul rising mains that run parallel to the Knighton Stream on the south bank. In the event of these bursting, they would discharge to the Knighton Stream and would not pose a risk to the Proposed Development.

3.20. The risk of flooding from sewers is therefore considered to be low.

Groundwater

3.21. The Poole SFRA mapping (Appendix F) indicates that the Proposed Development is located in an area with >=50%<75% susceptibility to groundwater flood emergence. A review of the SFRA geology mapping and the BGS online Geology of Britain indicate that the Proposed Development is underlain by the Poole Formation composed of Sand, Silt and Clay. The ability of groundwater to rise above ground will be governed by the exact composition of the bedrock below. The fact that the Proposed Development is not located in a significant topographic low spot means that the risk of groundwater flooding is likely to be low.

3.22. Table 3 below summarises the likely underlying geology beneath the Proposed Development and was established using the Ground Investigation Report by Terrafirma (South) in September 2022. Groundwater monitoring has confirmed groundwater levels between 4.20m and 7.43m below ground level (bgl). The maximum extent of the waste bunker would be approximately 12m bgl for excavation and therefore would be below the recorded ground water level. However, groundwater flows would be low due to the underlying clay and it is expected that any groundwater flow would be able to pass around the waste bunker without resulting in significant increases in the water table.

Table 3: Underlying Site Geology

Stratum	Area Covered	Estimated Thickness	Typical Description
Made Ground	Whole Site	Up to 7.7m	Loose multicoloured sandy gravel, gravelly sand and sandy clay with anthropogenic inclusions.

Stratum	Area Covered	Estimated Thickness	Typical Description
Poole Formation	Whole Site	>24m	Stiff blueish grey and grey silty (sandy) clay. Interbedded at depth with dense bluish grey slightly clayey silty fine to medium sand.

3.23. The Poole SFRA (Appendix F) indicates that there have not been any groundwater flooding incidents at or within the vicinity of the Proposed Development. It is not located in a groundwater Source Protection Zone (SPZ).

3.24. In the Ground Investigation Report, the Aquifer Designation Map for the area shows the Proposed Development to be underlain by a 'Secondary A' aquifer. These aquifers consist of permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. Surface and perched groundwater flows from the Proposed Development are likely to be in a southerly direction following the natural topography of the wider area and collected by the Knighton Stream or the un-named tributary.

3.25. Therefore, considering the lack of historical groundwater flooding on the EfW CHP Facility Site and within the local area and the relatively low groundwater level, the risk of flooding from groundwater to the Proposed Development is assessed as low.

Artificial

3.26. The EA's Flood Risk from Reservoirs map shows that the Proposed Development would not be affected by flooding due to local reservoirs. The risk of flooding from artificial sources is therefore considered to be low.

Summary

3.27. The existing flood risk from all sources to the Proposed Development has been summarised in Table 4.

Table 4: Summary of Current Flood Risk

Type of Flooding	Source of Flooding	Existing Flood Risk to Proposed Development
Tidal/Fluvial	Knighton Stream/River Stour	Low
Sewers	Wessex Water sewer network	Low
Surface Water	Runoff from surrounding land	Low
Groundwater	Underlying geology and groundwater levels	Low
Artificial sources	Nearby reservoirs or canals	Low

4. Surface Water Drainage Strategy

Existing Surface Water Drainage

4.1. Merged service asset plans have been obtained for the areas surrounding the Proposed Development (Appendix G). Surface water sewer assets are shown to be located within the Proposed Development Red Line Boundary which appear to comprise of privately owned pipe runs draining the existing Canford Resource Park. The wider connectivity beyond the Proposed Development Red Line Boundary is shown.

Table 5: Sewers

Location	Sewer	Invert Level
South of Knighton Stream	Wessex Water foul rising main	Not known
Southwest edge of the Proposed Development	Private surface water sewer (diameter not known)	Not known
Eastern side of Proposed Development	Mixed service route (splits into foul sewer and potable water pipes)	Not known

Proposed Surface Water Discharge Location

4.2. The proposed surface water drainage system would be designed to convey surface water only, with foul water being discharged separately. The design would be in accordance with the appropriate standards.

4.3. Part H of the Building Regulations and the Planning Policy Guidance set out a hierarchy of surface water disposal, which should be adhered to in decreasing order of preference. As a key priority for sustainable management of runoff, rainwater harvesting has been included in the below hierarchy as the most preferential means of surface water disposal:

I. Store rainwater for later use;

II. Discharge to ground;

III. Discharge to a surface water body;

IV. Discharge to a surface water sewer; and

V. Discharge to a combined sewer.

4.4. Water re-use: rainwater harvesting should be considered. There is limited scope for rainwater harvesting; this may only be feasible as a reuse feature for the WC facilities.

4.5. Infiltration: during the site investigation, in-situ permeability tests were undertaken within TP09 and where possible were carried out to the requirement of BRE Digest 365. The test did not drain sufficiently (75% effective depth) to give an infiltration rate. Further soakaway tests were attempted but due to continued collapse of the side walls the test was terminated on safety grounds. Due to the nature of the made ground deposits and slow infiltration recorded, infiltration methods are not deemed suitable.

4.6. Surface water body: due to the proximity of the EfW CHP Facility Site, surface water will discharge to Knighton Stream in line with the existing site drainage.

Sustainable Drainage Systems

4.7. The most sustainable way to drain surface water runoff is through the use of SuDS, which need to be considered in relation to site-specific constraints.

4.8. SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, SuDS features can improve water quality, and provide biodiversity and amenity benefits.

4.9. A variety of SuDS are available to reduce or temporarily hold back the discharge of surface water runoff. Table 6 outlines the potential SuDS devices and their constraints and opportunities for the EfW CHP Facility Site.

Table 6: Sustainable Drainage Techniques

Device	Description	Constraints/Comments	✓/✗
Green/brown roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff	There are no constraints to the incorporation of green/brown roofs	✓
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration	Due to the nature of the made ground deposits and slow infiltration recorded, soakaways are not deemed suitable for this Proposed Development.	✗
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers	Where possible, pervious surfaces would be incorporated into the landscape design. Due to the depth of made ground, these would be lined and discharge into Knighton Stream.	✓

Device	Description	Constraints/Comments	✓/×
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the EfW CHP Facility Site by reusing water for non-potable uses e.g. toilet flushing	There are no constraints to the incorporation of rainwater harvesting. However, the reduction of surface water runoff cannot be quantified with certainty as this would be dependent on the demand for harvested rainwater. The location and form of rainwater harvesting would be determined at detailed design stage.	✓
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting)	Potential for inclusion within verges at the EfW CHP Facility Site to pick up runoff from areas of hardstanding.	✓
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration and/or slow release to sewers	Potential for inclusion within verges at the EfW CHP Facility Site to pick up runoff from areas of hardstanding.	✓
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from runoff from adjacent areas	Potential for inclusion within verges at the EfW CHP Facility Site to pick up runoff from areas of hardstanding.	✓
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration through the base	Due to the lack of external permeable space and the likelihood of poor infiltration rates, the incorporation of basins is not likely to be feasible	×

Device	Description	Constraints/Comments	✓/✗
Bioretention Systems / Rain Garden (end of pipe treatment)	A shallow landscaped depression which allows runoff to pond temporarily on the surface before filtering through vegetation and underlying soils	Rain gardens are suitable for the EfW CHP Facility Site and options could be explored to incorporate into the design.	✓
Detention Basins	Depressions in the surface designed to store runoff without infiltration through the base	Due to the lack of external permeable space, the incorporation of detention basins is not likely to be feasible.	✗
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level	Used only when the SuDS listed above cannot be installed with sufficient volumes to restrict runoff to the required rate	✓

Proposed Surface Water Drainage Strategy

4.10. The focus of the drainage strategy is on the EfW CHP Facility Site as all other areas of the Proposed Development will not introduce any impermeable area. Any temporary road surfacing or construction compounds will be surfaced using permeable materials so that rainwater can either infiltrate to the ground or be converted to runoff, mimicking the existing situation.

4.11. The EfW CHP Facility Site is currently in a brownfield condition and 100% impermeable. There will be a slight decrease in impermeable surface area relative to the existing condition as additional greenspace will be incorporated along the verges of the EfW CHP Facility Site. The Knighton Stream is an existing watercourse within close proximity of the EfW CHP Facility Site. In line with the drainage hierarchy, the proposed drainage strategy is to discharge directly to the existing watercourse, see Appendix G.

4.12. Runoff from the EfW CHP Facility Site will be drained towards verges where SuDS features such as filter drains or possibly swales will be used to convey flow into the piped drainage network.

4.13. Storage water runoff will be restricted to the QBAR greenfield rate of 2.2 l/s/ha. A surface water storage volume of c.2,500 m^3 will be provided to ensure the capacity of the drainage network is not exceeded for the 1:100 +45% climate change event. Surface water runoff and storage calculations are provided in Appendix H.

Water Quality

4.14. During normal operation of the EfW CHP Facility Site, given the nature of the proposals the pollution hazard as outlined in Table 26.2 of the CIRIA SuDS Manual[7] would be classed as medium to high. It is therefore important that the proposed drainage strategy is designed to mitigate the potential for contamination.

[7] CIRIA, 2017. *The SuDS Manual (C753)*. Available at: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS

4.15. Appropriate treatment would be incorporated into the drainage system to ensure that the quality of water discharged is acceptable. This would be achieved through the incorporation of green roofs, filter drains/swales, pervious surfacing, and filtration of the outflow through existing reed beds before discharging to Knighton Stream.

4.16. Where parts of the EfW CHP Facility Site are not discharged through permeable paving, a biomat filtration system, downstream defender or other hard engineered solution could also be incorporated at the detailed design stage to ensure discharge is appropriately treated.

4.17. The pollution hazard and proposed mitigation indices, based on the CIRIA SuDS manual, are set out in Table 7 below. A worst-case scenario has been assumed, whereby runoff is routed through filter drains, the piped on-site drainage network, the existing downstream ditch and filter beds before discharging to the Knighton Stream. The existing reed beds are arranged as a matrix consisting of three rows and two columns. However, they are considered as three features (one for each row) even though they are more likely cascading and could be considered as six. In reality, a higher level of water quality treatment than presented will be achieved for much of the EfW CHP Facility Site. Despite the conservative assumptions made in this assessment, the quality of water discharged from the EfW CHP Facility Site would be appropriate.

Table 7: Pollution hazard assessment

Pollutant	**Hazard Indices (High)**	**Mitigation Indices Component 1 (Filter drain)**	**Mitigation Indices Component 2 (Bioretention x 3)**	**Total Mitigation Index***	**PASS/FAIL**
Total Suspended Solids	0.8	0.4	2.4	1.6	PASS
Metals	0.8	0.4	2.4	1.6	PASS
Hydro-carbons	0.9	0.4	2.4	1.6	PASS

- *Total mitigation index = Component 1 + 0.5 x (Component 2)*

Sustainable Drainage Systems Management Plan

4.29. The PPG sets out the requirement for developers to consider the operation, management and maintenance of all SuDS.

4.30. Post construction, the EfW CHP Facility Site operator (The Applicant) would be responsible for the SuDS included in the scheme. Table 8 outlines what maintenance would be anticipated for the proposed SuDS features.

Table 8: Sustainable Drainage Typical Maintenance Arrangements

SuDS	
Task	**Frequency**
Green/Brown Roofs	
Inspect system to replace dead plants as required and ensure plants are sufficiently watered (during establishment period)	As required
Inspect system to replace dead plants (post establishment period)	Annually (in autumn)
Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Inspect system to ensure substrate is not eroded and inlet/outlet drains are not blocked	Annually or as required (after severe storms)
Filter drains	
Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Monthly
Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.	Six monthly
Remove sediment from pre-treatment devices	Six monthly or as required
Remove or control tree roots where they are encroaching the sides of the filter drain	As required
At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
Clear perforated pipework of blockages	As required
Pervious Surfacing	
Stabilise and mow contributing adjacent areas and remove any weeds	As required

SuDS	
Task	**Frequency**
Remedial work to any depressions, rutting and cracked or broken surfacing considered detrimental to the structural performance or a hazard to users	As required
Initial sweeping	Monthly for 3 months after installation
Brushing and vacuuming	Annually or as required
Inspect silt accumulation rates and establish appropriate brushing frequencies and monitor inspection chambers	Annually
Rehabilitation of surface and upper substructure removed by remedial sweeping	Every 10-15 years or as required
Rainwater Harvesting	
Inspect system for debris/blockages	Annually or as required
Reed Beds	
Inspect system to replace dead plants (post establishment period)	Annually (in autumn)
Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Underground Attenuation	
Inspection of silt traps, manholes and pipework, and remove any sediment/debris	Quarterly or as required
Jetting of main structure to remove any sediment build up	Annually or as required

5. Foul Water Drainage Strategy

5.1. The proposed foul drainage would be designed in accordance with the appropriate standards.

5.2. It has been calculated that the maximum flow rate to foul sewer from the Proposed Development would be 3.8 l/s. See Appendix I for foul calculations.

5.3. Trade effluent will discharge via the foul drainage network in line with Wessex Water requirements.

5.4. It is proposed to discharge via the existing private network to the Wessex Water pumping station at Magna Road. Any trade effluent will be discharged to the foul water sewer, in line with Wessex Water's requirements. A pre-planning enquiry has been submitted to Wessex Water to confirm the proposed point of connection and that their network has adequate capacity to accommodate the proposed foul water flows from the Proposed Development , see Appendix E. Wessex Water have concerns over the capacity of their network to receive the proposed flows from the Proposed Development, therefore further consultation and potentially a capacity appraisal and detailed process review will be required post planning.

5.5. New connections made to the public sewer system would be made through an S106 Agreement with Wessex Water, under the Water Industry Act 1991.

6. Conclusions

6.1. According to the Environment Agency's (EA) Flood Map for Planning, the Proposed Development is shown to be located wholly within Flood Zone 1, denoting a less than 0.1% annual probability of flooding. As such, the Proposed Development is classified as being at low risk of fluvial and tidal flooding.

6.2. The EA's Surface Water Flood Maps show various areas with medium to high probability of surface water flooding within the Proposed Development. Flood risk is a function of probability and consequence and the Proposed Development has been assessed with consideration for these criteria in Table 9.

Table 9: Summary of Current Flood Risk

Type of Flooding	Summary of surface water flood risk	Risk
EfW CHP Facility	• Offsite surface water runoff will be managed upstream and routed through the EfW CHP Facility Site via an appropriately sized surface water sewer; and • Surface water runoff from the EfW CHP Facility Site will be managed by the proposed drainage strategy.	Low
TCC1 and access roads	• Isolated area at low risk of surface water flooding within TCC1; and • Isolated area with high probability (1 in 30 year return period) of flooding within the access road to the EfW CHP Facility Site from Magna Road due to a depression in the existing CRP access road. The consequence of flooding in this area is classified as low as TCC1 and the construction site would still be accessible during the medium probability event. The medium probability rainfall event is an extreme weather event and, in reality, construction would not be undertaken during such weather conditions. Risk is a function of probability and consequence and although the probability of flooding is high, the consequence of flooding is low. Therefore, the risk from surface water flooding in this area is low.	Low
TCC2 and CHP and DNC connection route	• Very low risk of surface water flooding to TCC2; and • There is a medium probability (1 in 100 year return period) of flooding along the CHP and DNC connection routes, where they cross the Knighton Stream. The proposed works will not affect the probability of flooding at this location. The DNC compound could still be accessed from the east via Provence Drive. TCC2 would not be accessible although, in reality, construction would not be undertaken during a medium probability event due to this being an extreme weather event. Therefore, the risk from surface water flooding is low.	Low

6.3. The risk of flooding from groundwater, sewers and artificial sources has been assessed and the risk to the Proposed Development has been assessed as low.

6.4. In line with the drainage hierarchy, the proposed drainage strategy is to discharge directly to the Knighton Stream, which lies to the south of the EfW CHP Facility Site. Runoff from the EfW CHP Facility Site will be drained towards verges where SuDS features such as swales or filter drains will be used to convey flow into the piped drainage network.

6.5. Surface water runoff will be restricted to the QBAR greenfield rate of 2.2 l/s/ha. A surface water storage volume of c.2,500 m^3 will be provided to ensure the capacity of the drainage network is not exceeded for the 1 in 100 +45% climate change event.

6.6. It is proposed to discharge foul water via the existing private network to the Wessex Water pumping station at Magna Road. It has been calculated that the maximum foul rate to foul sewer from the Proposed Development would be 3.8 l/s. A pre-planning enquiry has been raised with Wessex Water and further consultation will be required, post-outline planning, to confirm capacity in their network.

6.7. It is considered that the information provided within this report satisfies the requirements of the National Planning Policy Framework and local policy.

APPENDICES

A. Topographic Survey

B. Development Proposals

C. National Policy

D. White's Pit Drainage Strategy

E. Wessex Water Correspondence

F. SFRA Mapping

G. Drainage Strategy Drawings

H. Surface Water Drainage Calculations

I. Foul Water Drainage Calculations

UK and Ireland Office Locations