



MIRA Technology Park South Site

Flood Risk Assessment and Outline Drainage Strategy

August 2022

Waterman Infrastructure & Environment Limited

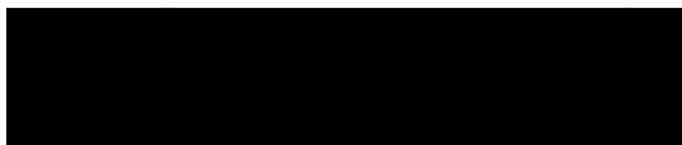
Pickfords Wharf, Clink Street, London, SE1 9DG
www.watermangroup.com

Client Name: ERI MTP Limited
Document Reference: EED13833-118-R-2-4-3-FRA
Project Number: EED13833

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 OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
First	13.01.22	Kirsty Tolson	Brendan McCarthy	Harry Chetty



Comments

Draft

Second	15.03.22	Kirsty Tolson/ Karen Stokes	Peter O'Flaherty	Harry Chetty
--------	----------	-----------------------------	------------------	--------------



Comments

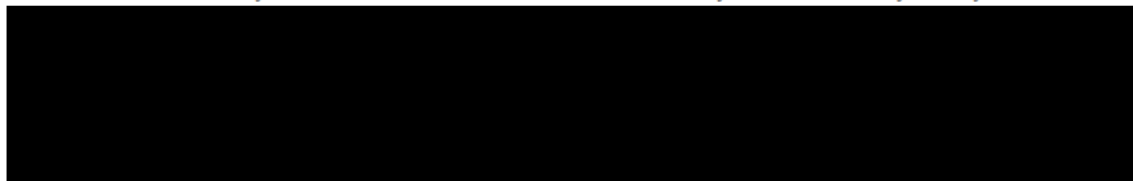
Planning issue

Third	10.05.22	Kirsty Tolson/ Karen Stokes	Peter O'Flaherty	Harry Chetty
-------	----------	-----------------------------	------------------	--------------



Comments

Fourth	02.08.22	Kirsty Tolson	Brendan McCarthy	Harry Chetty
--------	----------	---------------	------------------	--------------



Comments

Updated masterplanning – Planning issue

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

1. Introduction.....	2
2. Planning Policy and Guidance.....	4
3. Sources of Potential Flooding.....	7
4. Surface Water Drainage Strategy.....	12
5. Proposed Foul Drainage Strategy.....	19
6. Conclusions	20
7. References	21

Figures

Figure 1: Site Location.....	2
Figure 2: Environment Agency Flood Risk from Surface Water.....	8
Figure 3: Catchment draining to ordinary watercourse	9

Tables

Table 1: Sustainable Drainage Techniques	13
Table 2: Impermeable area and limiting greenfield discharge rate from the Northern and Southern Catchments.....	15
Table 3: Attenuation Details	15
Table 4: Pollution hazard / mitigation indices	16
Table 5: Indicative SuDS Maintenance Regime.....	17
Table 6: Foul rate from proposed development based on Parameter Plans	19

Appendices

- A. Topographic Survey
- B. Development Proposals
- C. Historic Flood Records from Joint SFRA
- D. ReFH2 Checksheet (1 in 2 year event)
- E. Indicative Surface Water Drainage Strategy
- F. Surface Water Calculations
- G. Foul Water Calculations and Diversion information

Contents

Executive Summary

Waterman was commissioned by ERI MTP Limited to undertake a Flood Risk Assessment and Outline Drainage Strategy to support the planning application for construction of commercial units and access road on MIRA Technology Park South Site.

The proposals for development comprise the Extension of MIRA Technology Park to comprise advanced manufacturing (Class B2); associated office and service uses (Class E); and storage (Class B8); new spine road; car parking; landscaping; and enabling works.

It has been demonstrated there is a low risk of flooding from tidal, pluvial, fluvial, groundwater and artificial sources. The Site is located in Flood Zone 1, however, the Site is bisected by an ordinary watercourse. The relatively impermeable nature of the underlying ground conditions means the ordinary watercourse is predominantly driven by overland flow from the surrounding catchment. The EA's surface water mapping does not accurately represent the watercourse, and overestimates the risk of flooding in this location. Calculations of the flow rate within the channel show that the channel has sufficient capacity to manage the 1 in 100-year event including an allowance for climate change.

Changes to land levels across the Site mean that the area draining to the watercourse near Weddington will reduce as a result of the proposals, thereby reducing the risk of flooding to Weddington. The runoff from the proposed development will be restricted to QBAR through the use of SuDS.

It is proposed to utilise a range of SuDS including permeable paving, swales, filter strip, underground storage and detention basins to attenuate runoff from the development. Two outfalls are proposed into the ordinary watercourse at the Site; one to serve the land north of the watercourse, and the second to serve land south of the watercourse. The volume of attenuation required across the Site has been estimated using MicroDrainage Network based on the indicative masterplan for the Site, though the detailed drainage design will need to be developed further. This will need to accommodate the steeply sloping land levels across the Site with the requirement for check dams.

Using the CIRIA pollution indices methodology, it has been established that the development has a high hazard rating, but that the proposed SuDS will provide sufficient level of treatment for runoff from the development through the use of permeable surfacing and detention basins. In the event that runoff does not flow through both features before reaching the watercourse, additional measures, such as downstream defenders and petrol interceptors, will be required. A company will be appointed to manage the proposed SuDS, and details of typical maintenance measures have been included within this report.

The rate of foul discharge from each zone of the development, as set out in the Parameter Plan, has been calculated to total 24.0l/s. The proposals include the diversion of the existing foul sewer which currently runs alongside the eastern bank of the ordinary watercourse. Severn Trent Water has been consulted on the proposals which include connecting to a new foul trunk sewer being constructed to the south of the development Site.

In conclusion, the Site is at low risk of flooding and will not increase the risk of flooding elsewhere as a result of the proposed SuDS strategy, in line with the requirements of local and national planning policy.

1. Introduction

Waterman was commissioned by ERI MTP Limited to undertake a Flood Risk Assessment and Outline Drainage Strategy to support an outline planning application for construction of commercial units and an access road on MIRA Technology Park South Site.

Site Description

- 1.1. The Site covers an area of approximately 59.5 hectares (ha) and is currently occupied by a single residence in the eastern half, with the remainder of the Site being undeveloped. The Site is bound by the A5 to the north, residential properties to the west, farmland to the east, and the A444 to the south.

Development Proposals

- 1.2. The development proposals comprise the Extension of MIRA Technology Park to comprise advanced manufacturing (Class B2); associated office and service uses (Class E); and storage (Class B8); new spine road; car parking; landscaping; and enabling works. A parameter plan for the development is included in Appendix B. Figure 1 shows the location of the Site and indicative masterplan.

Figure 1: Site Location



Geology and Topography

- 1.3. Based on the Topographic Survey (Appendix A), land levels vary across the Site from 90.0m AOD to 82.2m AOD. Overall, land levels fall from north to south.

- 1.4. Reference to the British Geological Society (BGS) Geology of Britain viewer (1:50,000 scale) the underlying geology at the Site comprises Mercia Mudstone Group with strips of Gunthorpe Member (Siltstone, Dolomitic). This is overlain by a localised area of superficial deposits of Anker Sand and Gravel in the north-western area of the Site, and Alluvium (Clay, Silt, Sand and Gravel) along the course of the ordinary watercourse which bisects the Site.

Scope of Report

- 1.5. This report assesses the potential effects of tidal, fluvial, pluvial, groundwater and artificial sources of flooding upon the 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 to the Site or its surroundings. In addition, an assessment of foul drainage has also been included.

2. Planning Policy and Guidance

National Planning Policy Framework

- 2.1. The National Planning Policy Frameworkⁱ (NPPF) 2021 states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
- 2.2. The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available Sites appropriate for the proposed development in areas with a lower risk of flooding.
- 2.3. If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), it may be necessary to demonstrate through the Exception Test that:
 - The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- 2.4. The NPPF states that when determining planning applications, Local Planning Authorities (LPA) should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a Site-specific Flood Risk Assessment. Development should only be allowed in areas at risk of flooding where it can be demonstrated that:
 - Within the Site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - The development is appropriately flood resistant and resilient;
 - It incorporates Sustainable Drainage Systems (SuDS), unless there is clear evidence that this would be inappropriate;
 - Any residual risk can be safely managed; and
 - Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
- 2.5. Major developments should incorporate SuDS unless there is clear evidence that this would be inappropriate. The systems used should:
 - Take account of advice from the lead local flood authority;
 - Have appropriate proposed minimum operational standards;
 - Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - Where possible, provide multifunctional benefits.
- 2.6. Flood risk vulnerability is split into five classifications in Annex 3 of the NPPF as follows:
 - Essential Infrastructure, e.g. essential transport and utility infrastructure, wind turbines;
 - Highly Vulnerable, e.g. emergency services (those required to be operational during flooding), basement dwellings;
 - More Vulnerable, e.g. residential dwellings, hospitals, schools, hotels, drinking establishments;

- Less Vulnerable, e.g. retail, offices, storage and distribution, leisure, restaurants; and
- Water-Compatible Development, e.g. docks, marinas, wharves.

Planning Practice Guidance

- 2.7. The Planning Practice Guidanceⁱⁱ (PPG) provides additional guidance to LPAs to ensure effective implementation of the planning policies set out within the NPPF regarding development in areas at risk of flooding.
- 2.8. The PPG states that developers and LPAs should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS. Referencing information provided by the Environment Agency (EA), the PPG provides advice on taking account of climate change, setting out recommended contingency allowances for net sea level rise and peak rainfall intensities. It also advises on flood resilience and resistance measures when dealing with the residual risks remaining after applying the sequential approach and mitigating actions.
- 2.9. The PPG also includes advice on flood risk vulnerability and flood zone compatibility. The following flood zones refer to the probability of river and sea flooding, without the presence of defences:
- Zone 1 - low probability: less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year;
 - Zone 2 - medium probability: between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% to 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% to 0.1%) in any year;
 - Zone 3a - high probability: 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability flooding from the sea (>0.5%) in any year; and
 - Zone 3b - the functional floodplain: where water has to flow or be stored in times of flood; identification should take account of local circumstances but would typically flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme 1 in 1,000 (0.1%) flood.

Sequential and Exception Test

- 2.10. The Site is located within Flood Zone 1, and therefore neither the Sequential Test nor Exception Test is required to be applied.

North Warwickshire Local Plan

- 2.11. The North Warwickshire Borough Council Local Plan was adopted in September 2021ⁱⁱⁱ is the current adopted Local Plan and sets out the vision and spatial planning strategy for North Warwickshire and allocates sites for new homes and employment land to meet local community and business needs up to 2033.
- 2.12. Policy LP33 (Water and Flood Risk Management) states that development proposals must not detrimentally affect the ecological status of a waterbody and where appropriate, incorporate measures to improve its ecological value.
- 2.13. Water runoff from new development must be no more than natural greenfield runoff rates and developments should hold this water back on the development site through high quality Sustainable Urban Drainage (SuDS), reducing pollution and flood risk to nearby watercourses. The culverting of

watercourses will only be approved in exceptional circumstances.

- 2.14. In order to improve and protect water quality, infiltration measures are the preferred means of surface water disposal where ground conditions are appropriate and where practicable, the separation of surface water from sewers should be undertaken.

Warwickshire County Council, Stratford-on-Avon District Council, Rugby Borough Council and North Warwickshire Borough Council Level 1 Strategic Flood Risk Assessment

- 2.15. This 2013 Strategic Flood Risk Assessment^{iv} (SFRA) serves as an update to the Level 1 SFRA which was produced by Halcrow consultants for a sub-regional group comprising Coventry City Council, Solihull Metropolitan Borough Council and the County, Boroughs and District Councils of Warwickshire in January 2008. The update was produced in association with Stratford-on-Avon District Council, Warwickshire County Council & Rugby Borough Council.
- 2.16. Key aims of the SFRA include:
- To provide information required to apply the Sequential Test for identification of land suitable for development in line with the principles of the NPPF;
 - Provide sufficient information to allow LPAs within the Study Area to assess the flood risk for specific development proposal sites, thereby setting out the requirements for site specific Flood Risk Assessments (FRAs);
 - Where necessary, provide technical assessments to demonstrate that development located in flood risk areas are appropriate and in line with the requirements of the exception test; and
 - Present sufficient information to inform each of the LPAs within the Study Area of acceptable flood risk in relation to emergency planning capability.

Warwickshire County Council Local Flood Risk Management Strategy

- 2.17. The Warwickshire County Council Local Flood Risk Management Strategy^v (LFRMS) was produced in April 2016. The LFRMS provides an overview and assessment of local flood risk in Warwickshire and how to manage and reduce local flood risk. It covers the county of Warwickshire comprising the five local authorities of: North Warwickshire, Nuneaton and Bedworth, Rugby, Stratford upon Avon, Warwick.

Warwickshire County Council Surface Water Management Plan

- 2.18. Finalised in August 2015, Warwickshire County Council's Surface Water Management Plan^{vi} (SWMP) aims to provide an evidence base for the LFRMS and to take a proactive approach to flood risk reduction through informed decision making.
- 2.19. The SWMP focused on establishing a risk-based assessment process to prioritise flooding locations across Warwickshire and develop a greater understanding of key flooding hotspot areas, risks and associated consequences.

3. Sources of Potential Flooding

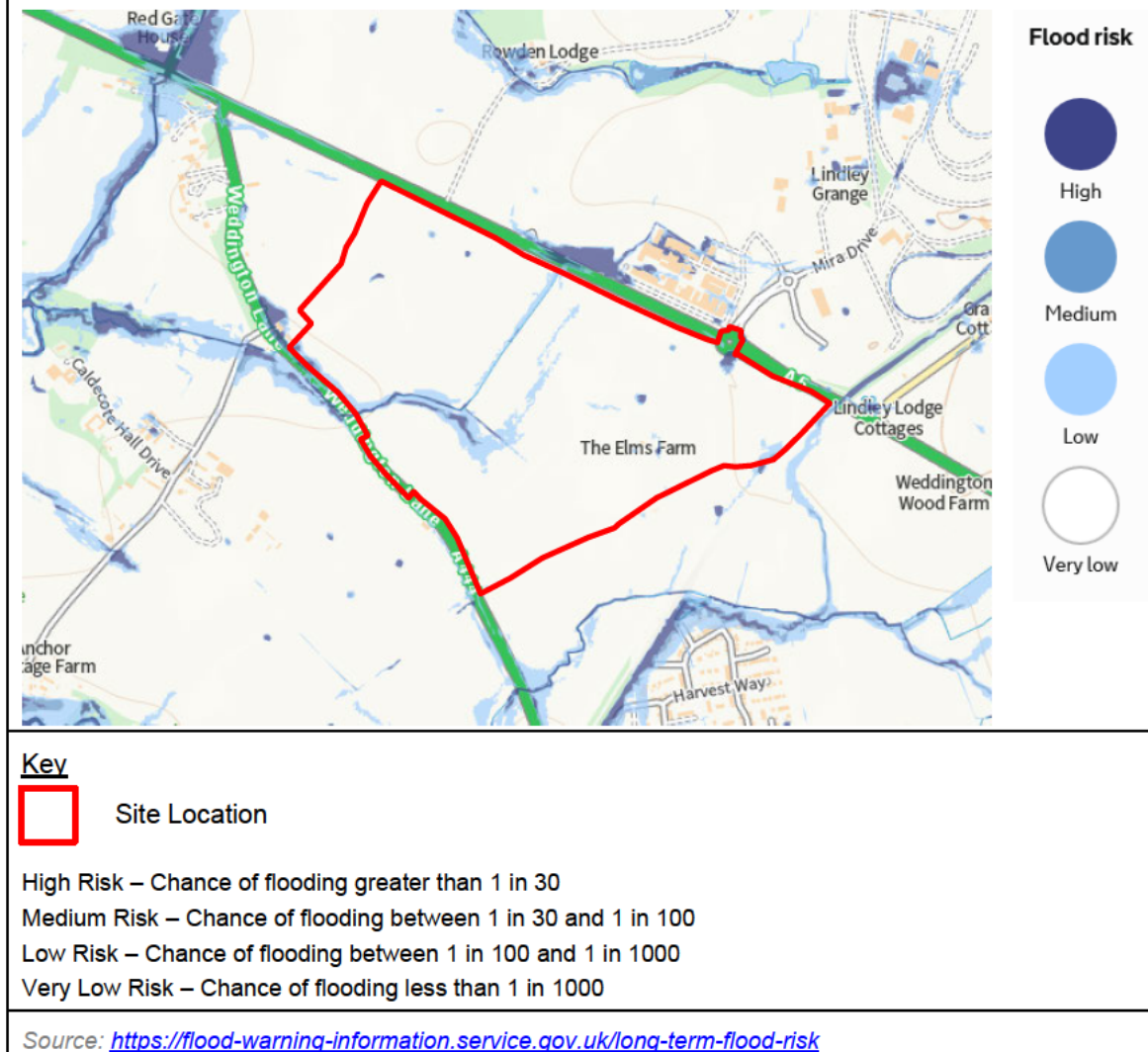
Pluvial

- 3.1. Pluvial flooding occurs when natural and engineered drainage systems lack capacity to manage the volume of rainfall. Pluvial flooding can occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems. This flood water would then be conveyed via overland flow routes based on the local topography.

Overland Surface Water

- 3.2. Review of the EA's Flood Risk from Surface Water maps (Figure 2) indicates that the Site is at 'low' to 'high' risk of surface water flooding.
- 3.3. The topographic survey (Appendix A) confirms the localised areas at risk of flooding in the east of the Site are associated with existing ponds, and the linear extent of flooding at low risk to the east of the watercourse is attributed to artefacts within the EA's LiDAR (Light Detection and Ranging) mapping used to derive the surface water risk maps. Such depressions are not present in the topographic survey.
- 3.4. The mapping indicates that the majority of flood risk is shown alongside the route of the ordinary watercourse on the Site.
- 3.5. The underlying geology in this location (as set out in Section 1) is generally relatively impermeable, meaning that surface water runoff is likely to be generated following a heavy to extreme rainfall event, such as the events shown in Figure 2, as opposed to entirely infiltrating into the ground. The resulting runoff will flow overland following the topography where it is intercepted by the ordinary watercourse which bisects the Site, supported by the extent of flooding shown along the path of the watercourse in the EA's mapping.
- 3.6. However, the strategic nature of the EA's mapping means that the ability of the watercourse to drain the catchment is not inherently picked up with the high-level modelling techniques used to create the surface water risk maps. As a result, the extent of flooding in areas adjacent to watercourses is often over-predicted.
- 3.7. It is therefore concluded that the EA's mapping overestimates the risk of flooding from surface water. The risk of flooding from fluvial sources is examined in further detail below.

Figure 2: Environment Agency Flood Risk from Surface Water

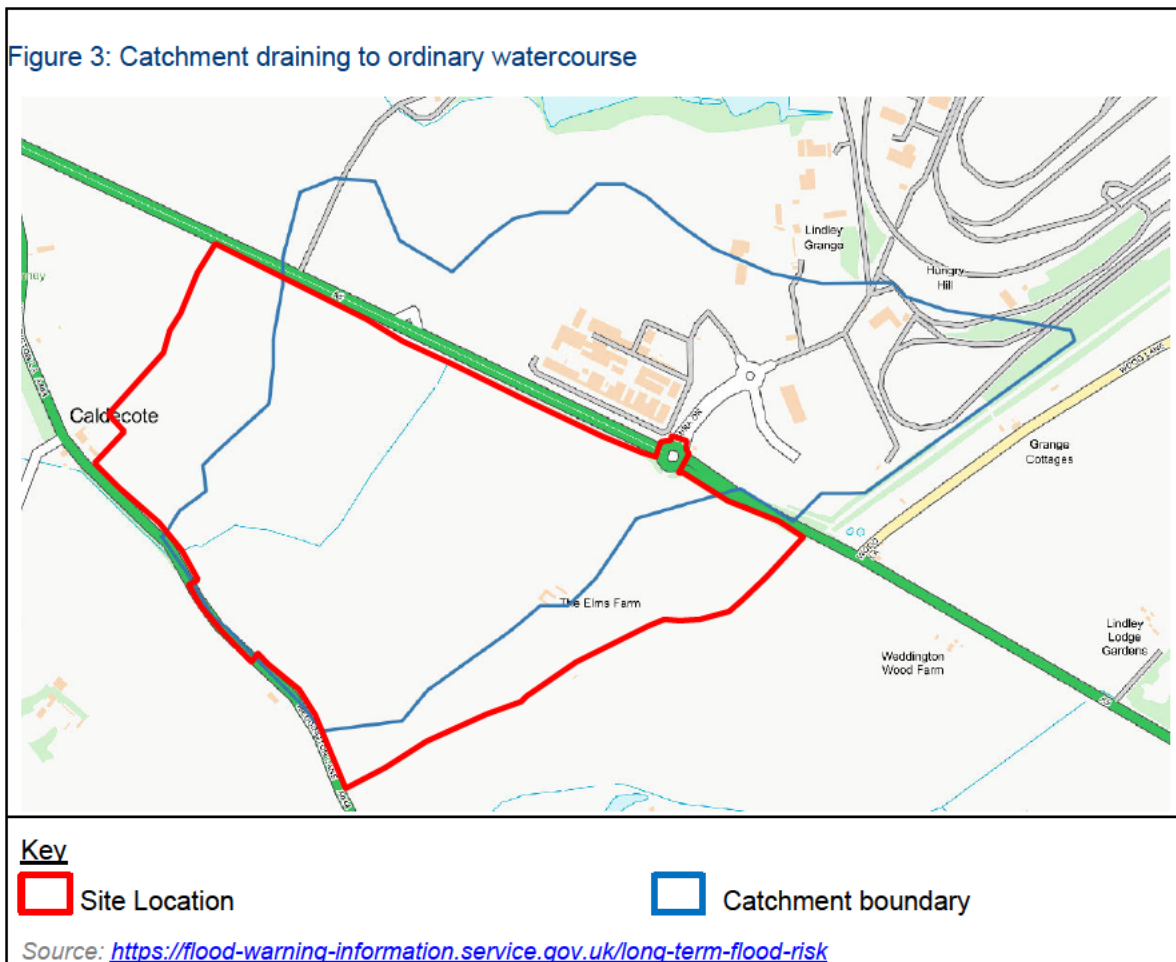


Sewer Flooding

- 3.8. There is an existing 225mm diameter public foul sewer which is located on the eastern side of the ordinary watercourse.
- 3.9. Figure A2 of the joint SFRA shows that there are no historic flooding records at this Site (Appendix C).
- 3.10. The sewer is proposed to be diverted as part of the proposals under a S185 agreement vampire with Severn Trent Water. (refer to Section 5). The new sewer will accept foul flows from the development Site, and discharge into a new Hinckley Trunk sewer proposed by Severn Trent Water to the south of the Site.
- 3.11. The proposals for development also include a surface water drainage system which will be designed to ensure no adverse impact from flooding to users of the Site.
- 3.12. The risk of flooding from sewers is therefore considered to be low.

Fluvial

- 3.13. According to the Environment Agency's (EA) Flood Map for Planning, the Site is located within Flood Zone 1, indicating a low probability (less than 1 in 1000 years) of fluvial flooding. However, as mentioned above, an ordinary watercourse bisects the development Site.
- 3.14. The watercourse flows from MIRA technology park to the north, beneath the A5, through the centre of the development Site. The watercourse exits the Site to the south via 2no. 900mm diameter brick culverts beneath the A444. The hydraulic properties of the watercourse have been assessed below in the absence of hydraulic modelling from the EA.
- 3.15. Based on a high-level review of the underlying geology in the section above, the watercourse is predominantly driven by surface water runoff from the surrounding catchment. The area draining to the watercourse has been established based on catchment information obtained from the Flood Estimation Handbook (FEH) online web service, adjusted based on a more detailed review of land levels using the EA's LiDAR (Light Detection and Radar) land level information (Figure 3).



- 3.16. The peak flow rate has been analysed using the Revitalised Flood Hydrograph method (ReFH2) to be 1.66m³/s for the 1 in 100 year event, including a 22% increase for climate change, as set out in the EA's climate change guidance. The rate is calculated to be 0.97m³/s for a 1 in 30 year event, and 0.43m³/s for the 1 in 2 year event. Calculation records for the 1 in 2 year event are included in Appendix D for reference.

- 3.17. During pre-application discussions, the LLFA raised concerns regarding historic flooding in the area of Weddington to the east of the Site. It can be seen from Figure 3 that part of the application Site sits within the catchment which drains to the east. However, the nature of the proposed industrial units would result in changes to the proposed land levels which will increase the catchment boundary, with the developed areas of the Site draining into the watercourse within the Site. As a result, there would be a reduction in the catchment area and hence volume of overland flow directed towards the watercourse at Weddington, thereby reducing the risk of flooding in this area.
- 3.18. The topographic survey identifies a tributary of the ordinary watercourse in the south of the Site. Given the relatively impermeable underlying ground conditions, and that the tributary follows an established field boundary, it is likely this tributary is a man-made land drainage ditch designed to drain runoff from the surrounding fields. The ditch is proposed to be infilled as part of the development, though any runoff which was managed by the ditch will now be captured by the formal drainage system and attenuated to QBAR.
- 3.19. As part of the proposals it will be necessary to provide a vehicular crossing across the ordinary watercourse. During pre-application discussions, the LLFA has specified that any culverted crossing should form a box culvert to reduce the risk of blockage otherwise attributed to single or double circular culverts. Calculations have confirmed that 1.2m diameter culvert will be sufficient and can be accommodated within the highway design with the appropriate cover.
- 3.20. Further to the above, no buildings are proposed within 8m of the bank of the watercourse, with a green buffer retained within 5m of the watercourse (except for drainage outfalls) as agreed with the LLFA during pre-application discussions.
- 3.21. In consideration of the above, the risk of flooding from fluvial sources is considered to be low.

Tidal

- 3.22. According to the Environment Agency's (EA) Flood Map for Planning, the Site is located within Flood Zone 1, indicating a low probability (less than 1 in 1000 years) of tidal flooding.
- 3.23. The Site is located a significant distance from the coastline and is elevated above predicted tidal levels, now and in the future when considering an allowance for climate change.
- 3.24. The risk of flooding from tidal sources is therefore considered to be low.

Groundwater

- 3.25. Based on the underlying geology at the Site (set out in Section 1), the permeability of the ground will be limited. The EA's aquifer designation mapping shows the Site is located on a Secondary B aquifer, with strips of Secondary (undifferentiated) overlain with localised Secondary A aquifers within the superficial deposits. The aquifer is shown to have a low productivity (fissured) on the BGS hydrogeology mapping.
- 3.26. The above is supported by the absence of historic flooding records at the Site shown in the Level 1 joint SFRA.
- 3.27. The proposals for development also do not include any subterranean elements. On this basis, the risk of flooding due to groundwater sources is low.

Artificial Sources

- 3.28. The EA's Flood Risk from Reservoirs mapping (Figure 4) shows the Site to be outside of the area at

risk of flooding in the unlikely event of a failure of a reservoir. No other artificial sources of flooding have been identified in proximity to the Site from OS mapping or desktop searches.

3.29. The risk of flooding due to artificial sources is therefore considered to be low.

Summary

3.30. The Site is considered to be at a low risk of flooding from pluvial, fluvial, tidal, groundwater and artificial sources.

3.31. The SuDS measures proposed to limit the rate of runoff into the receiving watercourse and ensure no increase risk of pluvial flooding to the surrounding area are presented in Chapter 4.

4. Surface Water Drainage Strategy

Existing Drainage

- 4.1. Severn Trent Water sewer records (Appendix I) indicate that there is a 225mm diameter foul sewer crossing the Site from north to south, running adjacent to the eastern bank of the ordinary watercourse. Given the relatively impermeable underlying ground conditions, it is expected that infiltration of surface water runoff is limited. Therefore, the majority of surface water runoff from the Site currently flows overland and is intercepted by the ordinary watercourse which crosses the Site.

Proposed Surface Water Discharge

- 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 BS EN 752 – Drain and Sewer Systems Outside Buildings, BS EN 12056 – Gravity Drainage Systems Inside Buildings, and Approved Document H of Building Regulations.
- 4.3. In line with Building Regulations and the PPG, the following hierarchy of surface water disposal should be adhered to, in decreasing order of preference.
- i. Discharge to ground;
 - ii. Discharge to surface water body;
 - iii. Discharge to a surface water sewer; and
 - iv. Discharge to a combined sewer.

Discharge to Ground

- 4.4. As noted previously, the underlying geology is considered to have low permeability which is expected to be too low to utilise infiltration. On this basis, management of surface water via infiltration is not considered feasible.

Discharge to a Surface Water Body

- 4.5. As noted previously, there is an ordinary watercourse which bisects the Site and intercepts surface water runoff from the pre-developed Site. It is therefore proposed that surface water would discharge to this watercourse.

Discharge to a Sewer

- 4.6. As noted above, the nearest sewers to the development are designated for foul water. As a preferable solution for managing surface water runoff has been identified, this option has been discounted.

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. The potential for SuDS was considered throughout the design development. Table 2 outlines the potential SuDS devices and their constraints and opportunities at the Site.

Table 1: Sustainable Drainage Techniques

Device	Description	Constraints/Comments	✓/✗
Green/brown/blue roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff	Green roofs are not considered viable for the proposed lightweight commercial units.	✗
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration	The underlying geology precludes the potential for infiltration.	✗
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	Pervious surfacing would be maximised across the proposed car parks to provide a level of treatment for surface water in addition to attenuation within the sub-base. Due to the underlying geology these would likely be lined.	✓
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the Site by reusing water for non-potable uses e.g. toilet flushing or water butts	There is deemed to be insufficient demand for water to facilitate rainwater harvesting.	✗
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting)	Swales can be utilised along the proposed road to convey surface water runoff and should be considered in furthering the drainage design	✓

Device	Description	Constraints/Comments	✓/✗
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	Filter drains will be used as cut off drainage at the toe of any embankments resulting from the proposed changes to land levels.	✓
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from runoff from adjacent areas	Filter strips can be utilised along the proposed road to convey surface water runoff and should be considered in furthering the drainage design.	✓
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration through the base	Due to the underlying geology the inclusion of infiltration basins is not deemed feasible	✗
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	Bioretention systems/rain gardens could be utilised adjacent to the highways and commercial units as an amenity feature though are expected to provide limited attenuation. Can be considered in furthering the drainage design.	✓
Detention Basins	Depressions in the surface designed to store runoff without infiltration through the base	Detention basins are proposed within the scheme to attenuate surface water whilst providing amenity and environmental benefits, including treating surface water runoff before discharging to the watercourse.	✓
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level	A below ground geo-cellular attenuation tank is proposed to attenuate runoff.	✓

Proposed Surface Water Drainage Strategy

- 4.10. This report sets out the principles of the SuDS scheme, and the final strategy would be confirmed at the detailed design stage.
- 4.11. The total Site area within the red line boundary is 59.5ha. As the watercourse bisects the Site, it will be necessary to provide two outfalls which serve the areas to the north and south of the watercourse, henceforth referred to as the 'northern catchment' and 'southern catchment' respectively. The outline drainage strategy layout in Appendix E shows the indicative location of these outfalls.

- 4.12. The following strategy has been developed based on the indicative masterplan (Appendix B) which shows the development will increase the impermeable area within the Site.
- 4.13. All areas which remain permeable (undeveloped) have been excluded from the drainage strategy on the basis that they will continue to discharge to the watercourse at greenfield rates. It is proposed to utilise SuDS to attenuate runoff from the developed parts of the Site to greenfield runoff rates (QBAR).
- 4.14. The greenfield runoff rate calculated for the Site in line with the IoH124 method is 6.2l/s/ha. Based on the proposed impermeable area, the total rate of discharge from the Site should not exceed 248l/s.
- 4.15. To demonstrate whether there is sufficient space within the development to accommodate the appropriate SuDS, this rate has been pro-rated for the impermeable area of each catchment, see Table 2 and Appendix F for calculations.

Table 2: Impermeable area and limiting greenfield discharge rate from the Northern and Southern Catchments

	Impermeable Area (ha)	Greenfield runoff rate (l/s)
Northern Catchment	~13	80.6
Southern Catchment	~27	167.4
Total	~40	248

- 4.16. The required volume of attenuation has been established using MicroDrainage Network module based on a rainfall event of 1 in 100 year storm including a 40% allowance for climate change. The strategy has also been assessed for the 1 in 1 year and 1 in 30 year return period event. Refer to Table 3 below (and Appendix F) for details on the attenuation proposed.

Table 3: Attenuation Details

Catchment	Attenuation Volume Required (m³)
Northern	~12,588
Southern	~34,962
Total:	~50,550

- 4.17. The following assumptions have been made in deriving the outline drainage strategy:
- No urban creep allowance has been applied.
 - For the purposes of this assessment, the estimated total volume of attenuation has been specified in Table 3 above. At the detailed design stage, the volume of attenuation required in each catchment will need to be evaluated based the requirement of check dams for the voided sub base and attenuation tanks located within the steeply bank external car parking areas.
 - No above ground flooding occurs under the 1 in 30 year event. The preliminary calculations indicate flooding under the 1 in 100 year event including a 40% allowance for climate change, however the volumes are limited to <10m³ and can be addressed in the detailed design by either providing additional storage or designated areas within the car park or loading bays to facilitate

shallow flooding under such an event.

- Attenuation and flow restriction will be provided for each of the proposed development units.
- Additional attenuation will be provided in the detention basins to cater for the flow rates from the development units and the access road.

Water Quality

- 4.18. During normal operation of the Site, given the nature of the proposals the pollution hazard as outlined in Table 26.2 of the CIRIA SuDS Manual would be classed as medium to high. It is therefore very important that the proposed drainage strategy is designed to mitigate the potential for contamination.
- 4.19. 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 pervious surfacing and detention basins. Where parts of the Site are not discharged through permeable paving in the detailed design stage, a biomat filtration system, downstream defender or other hard engineered solution could also be incorporated to ensure discharge is appropriately treated. The pollution hazard and proposed mitigation indices, based on the CIRIA SuDS manual, are set out in Table 4 below, this confirms that the quality of water discharged from the Site would be appropriate.

Table 4: Pollution hazard / mitigation indices

Pollutant	Hazard Indices (High)	Mitigation Indices Component 1 Permeable Paving	Mitigation Indices Component 2 Detention Basin	Total Mitigation Index = Component 1 + 0.5 (Component 2)
Total Suspended Solids	0.8	0.7	0.5	0.95
Metals	0.8	0.6	0.5	0.85
Hydro-carbons	0.9	0.7	0.6	1.0

Sustainable Drainage Systems Management Plan

- 4.45. The on-Site drainage network and SuDS would be privately managed and maintained for the lifetime of the development, ensuring that they remain fit for purpose and function appropriately. The management company/operator would be appointed post-planning.
- 4.46. The PPG sets out the requirement for developers to consider the operation, management and maintenance of all SuDS.
- 4.47. Post construction, the MIRA Estates Team is likely to be responsible for the SuDS included in the scheme. Table 5 outlines what maintenance is anticipated for the proposed SuDS features.

Table 5: Indicative SuDS Maintenance Regime

SuDS	
Task	Frequency
Pervious Surfaces	
- Stabilise and mow contributing adjacent areas - Removal/management of weeds - Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving - Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
Initial sweeping	Monthly for 3 months after installation
Inspect for evidence of poor operation and/or weed growth	Three-monthly, 48 hours after large storms in first 6 months
Brushing and vacuuming	Once a year (after autumn) or as required
- Inspect silt accumulation rates and establish appropriate brushing frequencies - Monitor inspection chambers	Annually
Rehabilitation of surface and upped substructure removed by remedial sweeping	Every 10-15 years or as required
Detention Basin	
- Reseed areas of poor vegetation growth - Repair erosion or other damage by reseedling or re-turfing - Repair/rehabilitation of inlets, outlets and overflows - Relevel uneven surfaces and reinstate design levels	As required
- Remove litter and debris - Inspect inlets, outlets and overflows for blockages and clear if needed - Inspect banksides, structures, pipework etc for physical damage - Cut grass for access routes - Manage other vegetation and remove nuisance plants - Inspect inlets and facility surface for silt accumulation	Monthly
Cut grass in and around basin	Six monthly

SuDS	
Task	Frequency
• Check any penstocks and other mechanical devices • Tidy all dead growth before start of growing season • Remove sediment from inlets, outlet and forebay • Manage wetland plants where provided	Annually
• Remove sediment from inlets, outlets, forebay and main basins where required	Every 5 years 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. Proposed Foul Drainage Strategy

- 5.1. The proposed foul drainage would be designed in accordance with BS EN 752 – Drain and Sewer Systems Outside Buildings, BS EN 12056 – Gravity Drainage Systems Inside Buildings, and Approved Document H of Building Regulations.
- 5.2. The existing 225mm diameter foul sewer which follows the eastern bank of the watercourse is proposed to be diverted as part of the proposals under a Section 185 agreement. Severn Trent Water has been consulted on the proposed diversion. It is proposed to connect the diverted sewer into a new length of trunk sewer being constructed by Severn Trent Water. Plans showing the proposed diverted foul sewer are included in Appendix G.
- 5.3. The diverted sewer has been designed to accommodate foul effluent from the proposed development in addition to existing flows from the areas north of the A5. The rate of flow produced by the development has been estimated for each of the Zones indicated on the Parameter Plans shown in Appendix B. The rates are summarised in Table 6 below, and calculations records are included in Appendix G.

Table 6: Foul rate from proposed development based on Parameter Plans

	Area (m ²)	Foul discharge rate (l/s)
Zone 30	81,250	9.1
Zone 1	17,500	2.0
Zone 10	18,500	2.1
Zone 20	96,250	10.8
Total:		24.0

6. Conclusions

- 6.1. It has been demonstrated there is a low risk of flooding from tidal, pluvial, fluvial, groundwater and artificial sources. The Site is located in Flood Zone 1, however, the Site is bisected by an ordinary watercourse. The relatively impermeable nature of the underlying ground conditions means the ordinary watercourse is predominantly driven by overland flow from the surrounding catchment. The EA's surface water mapping does not accurately represent the watercourse, and overestimates the risk of flooding in this location. Calculations of the flow rate within the channel show that the channel has sufficient capacity to manage the 1 in 100 year event including an allowance for climate change.
- 6.2. Changes to land levels across the Site mean that the area draining to the watercourse near Weddington will reduce as a result of the proposals, thereby reducing the risk of flooding to Weddington. The runoff from the proposed development will be restricted to QBAR through the use of SuDS.
- 6.3. It is proposed to utilise a range of SuDS including permeable paving, swales, filter strip, underground storage and detention basins to attenuate runoff from the development. Two outfalls are proposed into the ordinary watercourse at the Site; one to serve the land north of the watercourse, and the second to serve land south of the watercourse. Using MicroDrainage Network it has been estimated that an overall volume of approximately 50,550m³ based on the indicative masterplan for the Site, though the detailed drainage design will need to be developed further. This will need to accommodate the steeply sloping land levels across the Site with the requirement for check dams.
- 6.4. Using the CIRIA pollution indices methodology, it has been established that the development has a high hazard rating, but that the proposed SuDS will provide sufficient level of treatment for runoff from the development through the use of permeable surfacing and detention basins. In the event that runoff does not flow through both features before reaching the watercourse, additional measures, such as downstream defenders and petrol interceptors, will be required. A company will be appointed to manage the proposed SuDS, and details of typical maintenance measures have been included within this report.
- 6.5. The rate of foul discharge from each zone of the development, as set out in the Parameter Plan, has been calculated to total 24.0l/s. The proposals include the diversion of the existing foul sewer which currently runs alongside the eastern bank of the ordinary watercourse. Severn Trent Water has been consulted on the proposals which include connecting to a new foul main sewer being constructed to the south of the development Site.
- 6.6. In conclusion, the Site is at low risk of flooding and will not increase the risk of flooding elsewhere as a result of the proposed SuDS strategy, in line with the requirements of local and national planning policy.

7. References

ⁱ Ministry of Housing, Communities and Local Government, February 2019. *National Planning Policy Framework*

ⁱⁱ Ministry of Housing, Communities and Local Government, March 2014. *Planning Practice Guidance*

ⁱⁱⁱ North Warwickshire Borough Council, September 2021. *Local Plan*

^{iv} North Warwickshire Borough Council. 2013. *Level 1 Strategic Flood Risk Assessment*

^v Warwickshire County Council, April 2016. *Local Flood Risk Management Strategy*

^{vi} Warwickshire County Council, August 2015. *Surface Water Management Plan*



APPENDICES

A. Topographic Survey

Appendices

MIRA Technology Park South Site
Project Number: EED13833
Document Reference: EED13833-118-R-2-4-3-FRA

