



Hydrotec and Engineering Consultants

Develop Design Deliver

Drainage Strategy on the land off Broadholes Ln, Wheaton Aston

August 2022

CLIENT:

Elite Ecology

Reference: 22/Elite/drainage/BroadholesLn

INSTRUCTION:

Hydrotec and Engineering Consultants was commissioned by Elite Ecology to carry out a surface water drainage strategy for the proposed allotment redesign on the land off Broadholes Ln, Wheaton Aston.

SCHEME:

The redesign of the play area into an allotment area with associated landscape amenities.

REQUIREMENT:

Flood risk assessment and drainage strategy for surface water for the proposed redesign of the play area into an allotment area to fulfil the planning application.

DOCUMENT REVIEW & APPROVAL

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Executive Summary

A flood risk assessment (FRA) and drainage strategy for the surface water were conducted to assist the planning application requirement for the proposed development on the land off Broadholes Lane, Wheaton Aston, Stafford, ST19 9NR. The national grid reference number of the development site is SJ 84933 12653 (“the Site”). The proposed development is the redesign of the Site into an allotment area with associated landscape amenity facilities.

The present FRA and drainage strategy of the Site were made with the available information including the Environment Agency’s flood maps, the latest FEH hydrological data, topographic elevation data (LiDAR), and sewer maps data of Severn Trent Water.

The present investigation suggests that the Site is in flood zone 1 and therefore the Site is considered to be out of the fluvial or coastal flood risk. The Site is at no risk from surface water drainage while there is a medium risk on the adjacent side on Broadholes Ln. However, the hydrological and topographic elevation data suggest that the impact of the overland flow from the surroundings of the Site would become very minimal. Moreover, the Site is not at risk of groundwater flow. The Site is also not considered to be a foul water flood risk.

The proposed development is the crop plantation which would naturally consume plenty of water through bio-diversity. Moreover, the proposed layout and eco-friendly landscape amenities including a sufficient number of trees and shrubs would improve the surface water drainage systems and would become better than the existing drainage systems. Therefore, the attenuation requirement for the excess surface water could be avoided. Furthermore, it is highly recommended to adopt rainwater harvesting, a further reduction of the surface water runoff.

The access and egress from the Site during any flooding incident could be at Broadholes Ln located on the westside.

Table of Contents

| | |
|--|----|
| Executive Summary | 2 |
| 1 Introduction..... | 5 |
| 1.1 Background of the project site | 5 |
| 2 The requirement of the drainage strategy | 7 |
| 3 Surface water drainage..... | 10 |
| 4 Flood attenuation storage requirement | 16 |
| 5 Access/egress from the Site | 17 |
| 6 Sewer flood risk | 17 |
| 7 Conclusions..... | 18 |

List of the Figures

| | |
|--|----|
| Figure 1.1: The location and existing condition of the proposed development site. | 6 |
| Figure 1.2: The layout of the proposed development. | 7 |
| Figure 2.1: The fluvial and coastal flood risk at the Site - flood zone 1, the land having flood risk less than a 0.1% AEP of the river or coastal flows (reference – EA’s flood map). | 8 |
| Figure 2.2: Groundwater flow at the Site – a very low flood risk against the groundwater flow (reference – EA’s flood map)..... | 9 |
| Figure 3.1: Surface water drainage at the Site – a low flood risk against the surface water flow (reference – EA’s flood map)..... | 11 |
| Figure 3.2: The hydrological sub-catchments at the Site (indicative overland flow paths in blue arrow-line); reference of the FEH. | 12 |

| | |
|---|----|
| Figure 3.3: The LiDAR topographic elevation at the Site. | 13 |
| Figure 3.4: The location of the ground level on Broadholes Ln and High Street. | 15 |
| Figure 3.5: The elevation of the ground level on Broadholes Ln and High Street. | 16 |

List of the Appendix

| | |
|---|----|
| Appendix I: Sewer network data at the Site, ref. – Severn Trent Water..... | 20 |
|---|----|

Abbreviations

| | |
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| AEP | Annual Exceedance Probability |
| CCA | Climate Change Allowance |
| DWF | Dry Weather Flow |
| EA | Environment Agency |
| FEH | Flood Estimation Handbook |
| FRA | Flood Risk Assessment |
| LLFA | Lead Local Flood Authority |
| mAOD | meter Above Ordnance Datum |
| NGR | National Grid Reference |
| OS Map | Ordnance Survey Map |
| SuDS | Sustainable Drainage Systems |

1 Introduction

Sustainable drainage strategies for the flood risk are now important aspects for the new and existing development sites. The flood, which is being enhanced in the recent time due to the global climate change effects, could make vulnerable to property, community and many aspects of human life. Therefore, it is important nowadays to assess the flood risk of any new developments; and the National Planning Policy Framework¹ (NPPF) guidelines have given the authority to the Environment Agency² (EA) and local councils to make sure that any developments should be considered the flood risk assessment from all possible sources for the planning authorisation. These are not only securing the minimum risk at the proposed development site but also reducing the risk to the other existing developments.

Generally, new development would provide an improvement in the communities, but it should also make a satisfaction that the proposed development would not and should not deteriorate to on-site and/or off-site other existing developments in the surrounding areas during its design life. Therefore, it has been a policy of the NPPF, lead local flood authority (LLFA), water utilities companies and other relevant authorities to assess and manage the sustainable surface water drainage systems of all possible sources for a proposed development before granting the planning permission. The aim of the present assessment is to allow the designers to mitigate the risk to the development as well as other existing and proposed developments in the surrounding areas.

1.1 Background of the project site

The proposed development (hereafter “the Site”) is the redesign of the play area into an allotment area with associated landscape amenity facilities. The Site is located on the land off Broadholes Lane, Wheaton Aston, Stafford, ST19 9NR. The national grid reference number (NGR) of the Site is SJ 84933 12653. The geographical boundary of the project site lies within Staffordshire Council’s remit who are the lead local flood authority (LLFA) providing advice and guidance

¹ [National Planning Policy Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/432424/NPPF_2019.pdf)

² [Flood risk assessments if you're applying for planning permission - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/432424/NPPF_2019.pdf)

for sustainable drainage systems (SuDS) for this development site. The existing condition of the Site comprises a playground with overgrown grasses, trees and shrubs. The surroundings of the Site are well-developed residential areas and Shropshire Union Canal is situated in the east, approximately 650m away from the Site. Generally, the adjacent site contains plenty of open permeable land surfaces. A satellite photograph of the existing condition of the project site is shown in Figure 1.1 and the proposed layout of the development is given in Figure 1.2. The total area of the Site is approximately 1,950m².

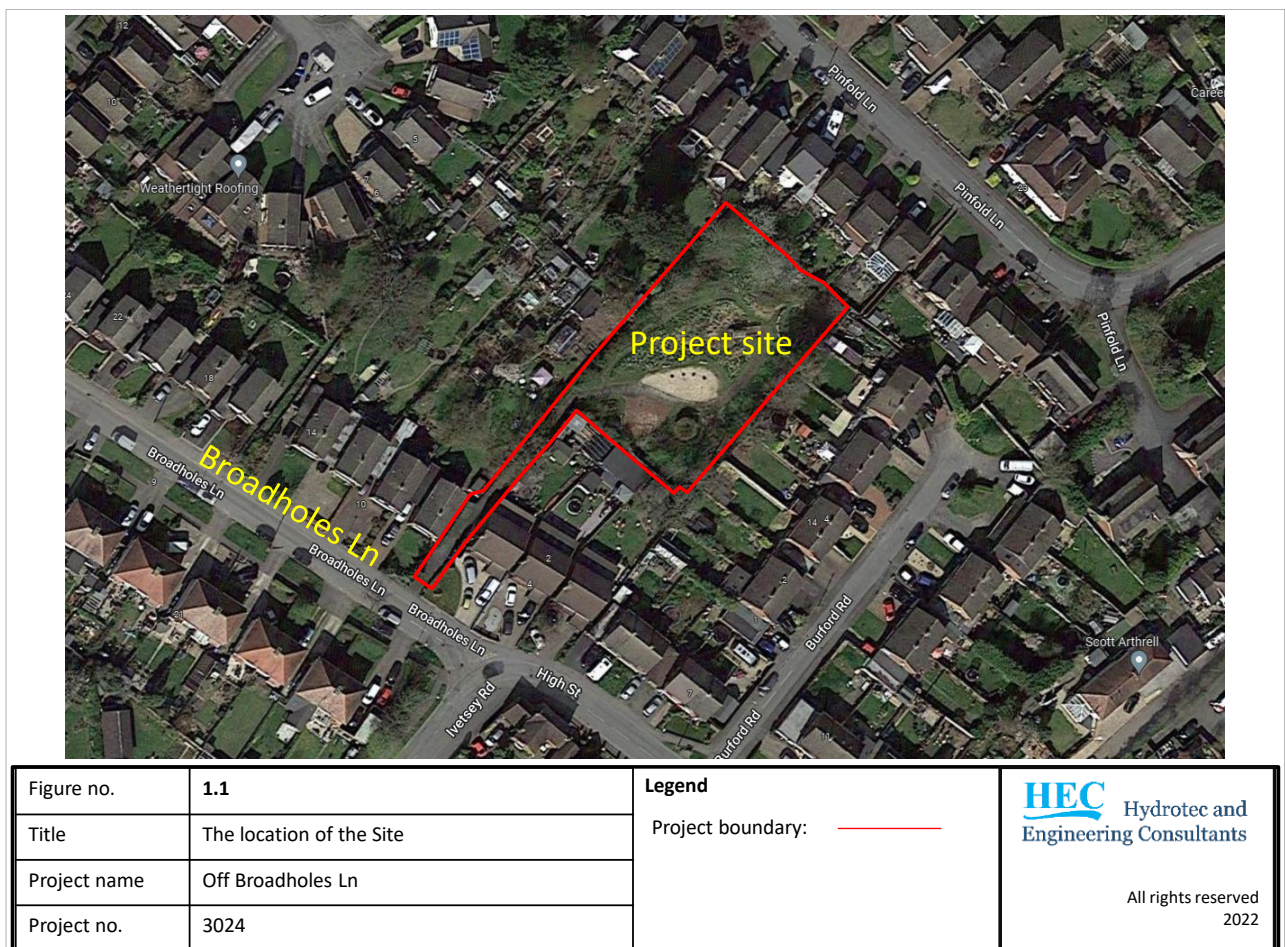


Figure 1.1: The location and existing condition of the proposed development site.

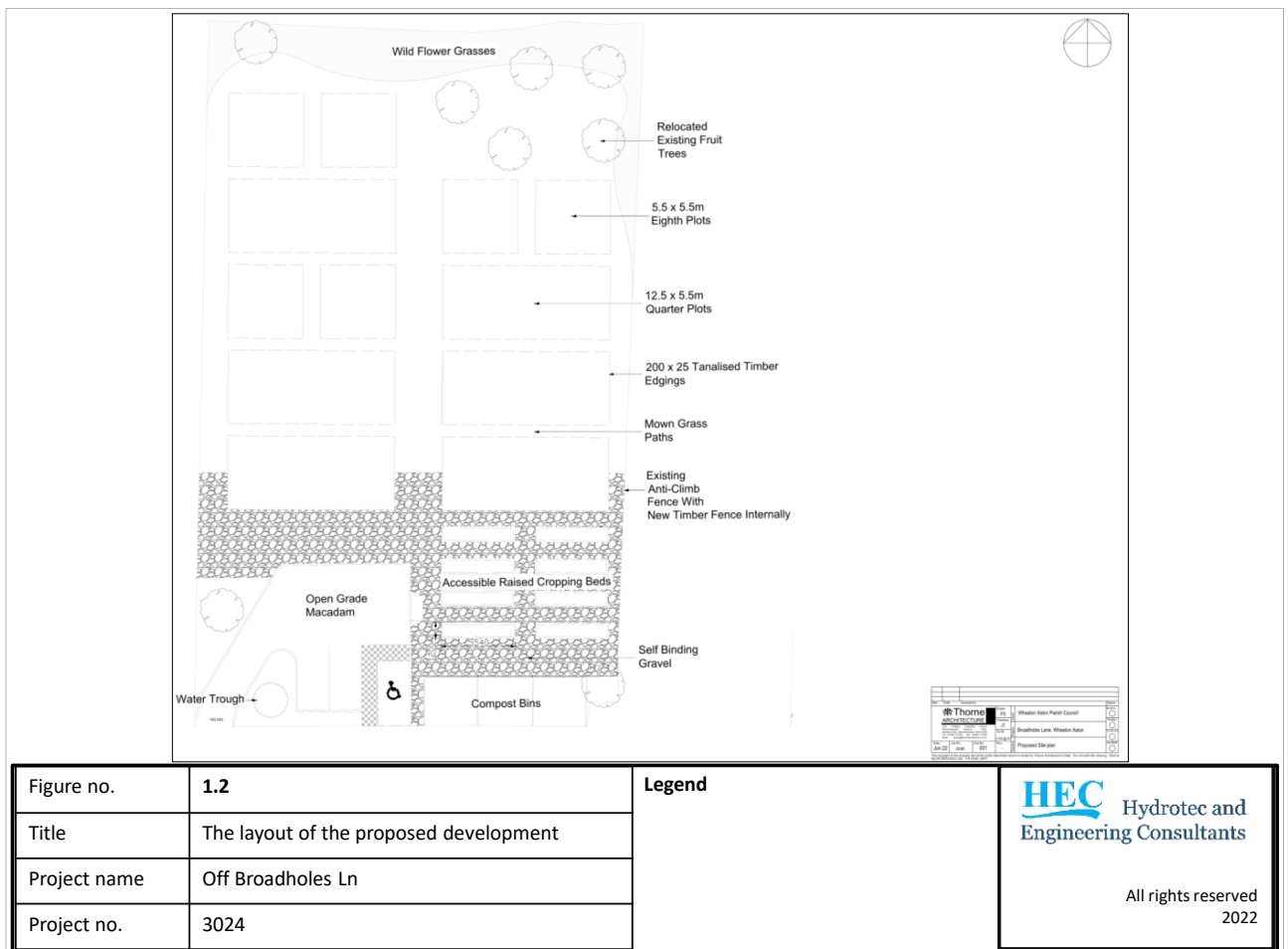


Figure 1.2: The layout of the proposed development.

2 The requirement of the drainage strategy

Since the proposed development is the redesign of the play area into a new allotment area with associated landscape amenities, it is a requirement of the LLFA to ensure the provision of appropriate sustainable flood risk management within the development, to promote safe and resilient communities, assisting by Environment Agency³ (EA).

³ Flood risk assessments if you're applying for planning permission - GOV.UK (www.gov.uk)

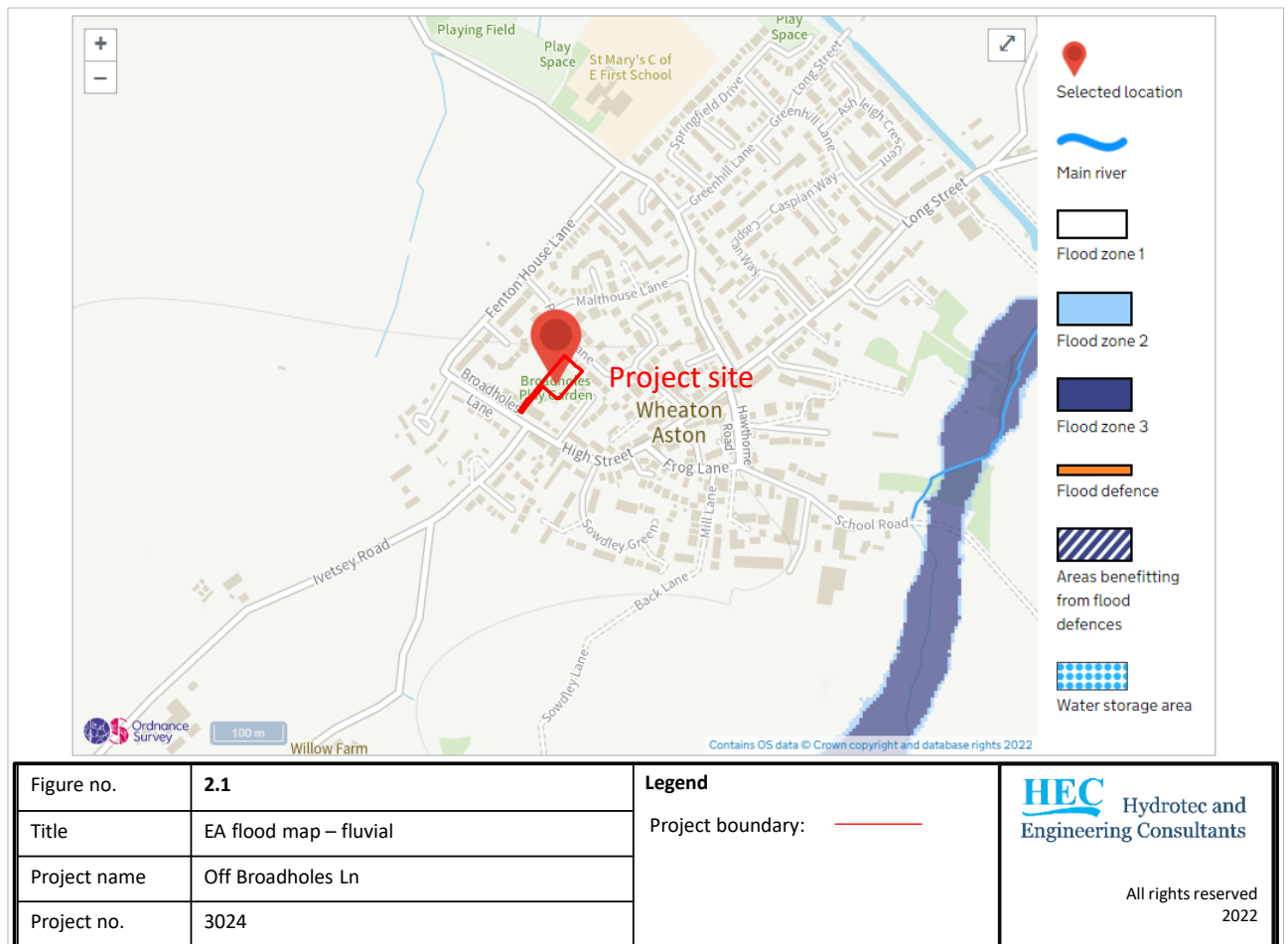


Figure 2.1: The fluvial and coastal flood risk at the Site - flood zone 1, the land having flood risk less than a 0.1% AEP of the river or coastal flows (reference – EA’s flood map⁴).

The Environment Agency’s flood map⁵ indicates that the Site is located in flood zone 1, a risk of flooding less than 0.1% AEP (Annual Exceedance Probability, i.e. less than 1 in 1000-year flood event) for the fluvial or coastal flows (Figure 2.1). Therefore, the proposed development site is not a risk to either fluvial or coastal flows. In addition, the EA's flood map⁶ also suggests that the Site is not at flood risk from the groundwater or reservoir flows (Figure 2.2). However, the

⁴ [Flood map for planning - GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://flood-map-for-planning.service.gov.uk/)

⁵ Op.cit.

⁶ [Check the long term flood risk for an area in England - GOV.UK \(flood-warning-information.service.gov.uk\)](https://flood-warning-information.service.gov.uk/)

surrounding site is a risk from surface water drainage. Therefore, the present flood risk investigations were mainly concentrated on surface water drainage, i.e. pluvial flow.

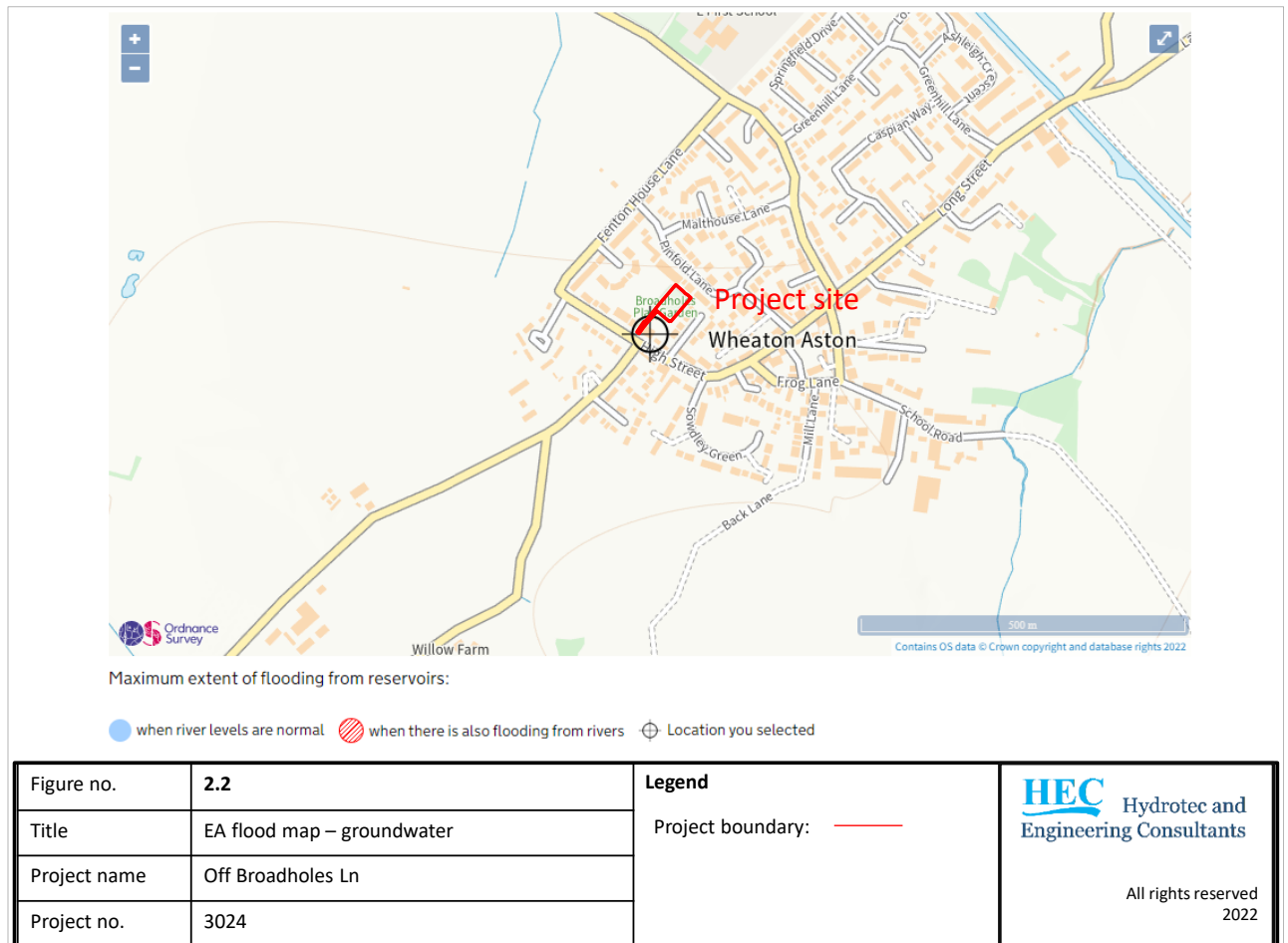


Figure 2.2: Groundwater flow at the Site – a very low flood risk against the groundwater flow (reference – EA’s flood map⁷).

⁷ Op.cit.

3 Surface water drainage

The guidance of the Environment Agency and LLFA based on the national planning policy framework⁸ (NPPF) recommends the avoidance of the increase in surface water flooding through requirements for sustainable drainage systems (SuDS) and minimising the area of impermeable surface. Moreover, the NPPF para 167 suggests that “when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment.” Therefore, the surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking into account rain falling on the site and runoff from adjacent areas.

NPPF and EA guidance takes a presumption against development in the 1 in 30-year hydrological event to the surface water drainage. Development should only be allowed in an area at risk from a 1 in 100-year (with climate change allowance (CCA)) if surface water drainage is manageable without any major risk to the development itself or other surrounding areas. It should be shown that in such cases surface water flows can be contained within the development and any flooding flood volumes do not affect third-party lands, flood the property or obstruct the key access/egress routes.

Therefore, to achieve the guidance requirements of the surface water drainage at the Site, the surface water flooding mechanism at the on-site and off-site was assessed with appropriate consideration.

The EA’s surface water flood map⁹ (Figure 3.1) indicates that the Site is at a low risk to the surface water drainage (i.e. a low risk means that each year this area has a chance of flooding of between 0.1% AEP and 1% AEP). While Broadholes Ln located in front of the Site on the west side would have a medium flood risk, i.e. each year this area has a chance of flooding between

⁸ Op. cit.

⁹ Op.cit.

1% AEP and 3.3% AEP. The central part of the development site is also a minor floor risk, i.e. a low flood risk.

Generally, the surface water overland flow is highly affected by the topographic conditions which define hydrological sub-catchments. For a better understanding of the surface water runoff around the Site, the hydrological sub-catchments were obtained from the Flood Estimation Handbook¹⁰ (FEH) and the data are presented in Figure 3.2.

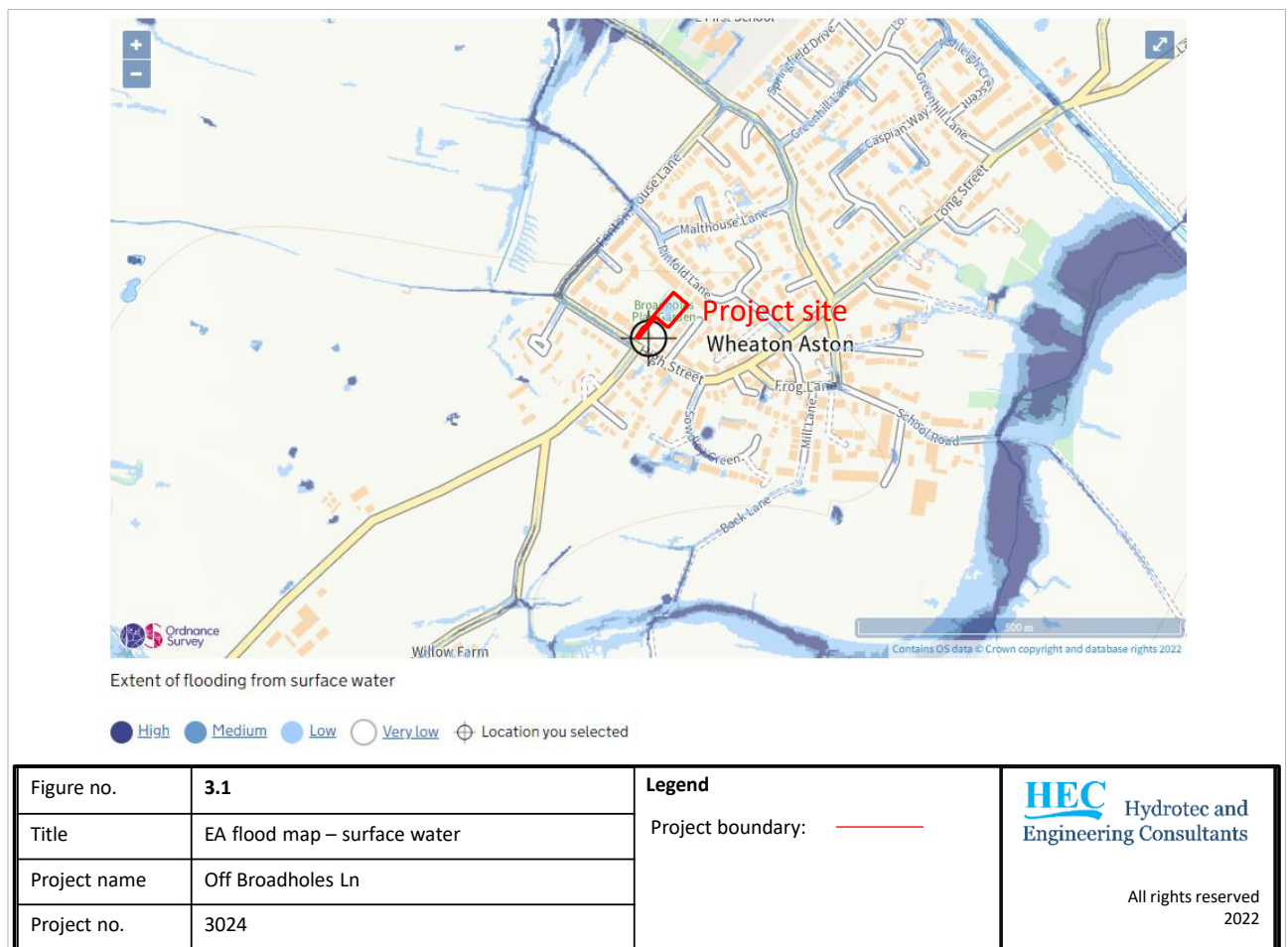


Figure 3.1: Surface water drainage at the Site – a low flood risk against the surface water flow (reference – EA’s flood map¹¹).

¹⁰ [Home Page - FEH Web Service \(ceh.ac.uk\)](http://www.ceh.ac.uk)

¹¹ Op.cit.

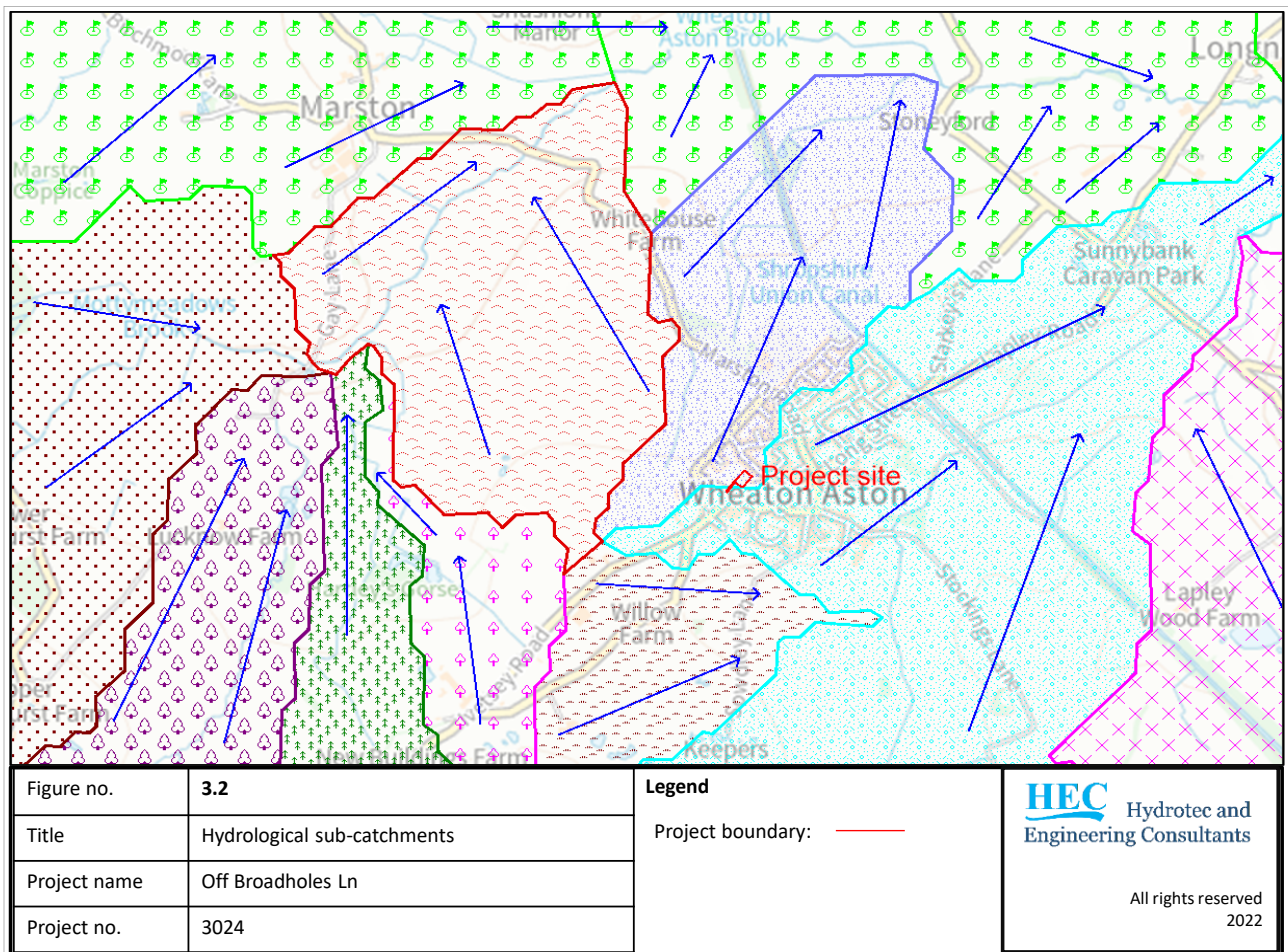


Figure 3.2: The hydrological sub-catchments at the Site (indicative overland flow paths in blue arrow-line); reference of the FEH¹².

The hydrological sub-catchments that could have a possible impact on the Site are presented in Figure 3.2 and the indicative flow paths of the surface water runoff are shown in the blue arrow-line. The Site is located close to the boundary of the two hydrological sub-catchments and both sub-catchments drain the overland flow towards the northeast. Thus, the contributing surface area of the sub-catchment that could have a possible impact on the Site is very small. The overland flows of the sub-catchment located in the south drain easterly, further away from the Site. Thus, there would not have any overland flow contribution to the Site by this sub-catchment.

¹² op. cit.

The adjacent sub-catchments situated in the east drain the overland flow northerly and would not have any flow contribution to the Site. Finally, the sub-catchments situated on the further northern sides drain northeasterly and would not have any overland flow towards the Site. Therefore, the effective surface water overland flow contribution at the Site would have been relatively small.

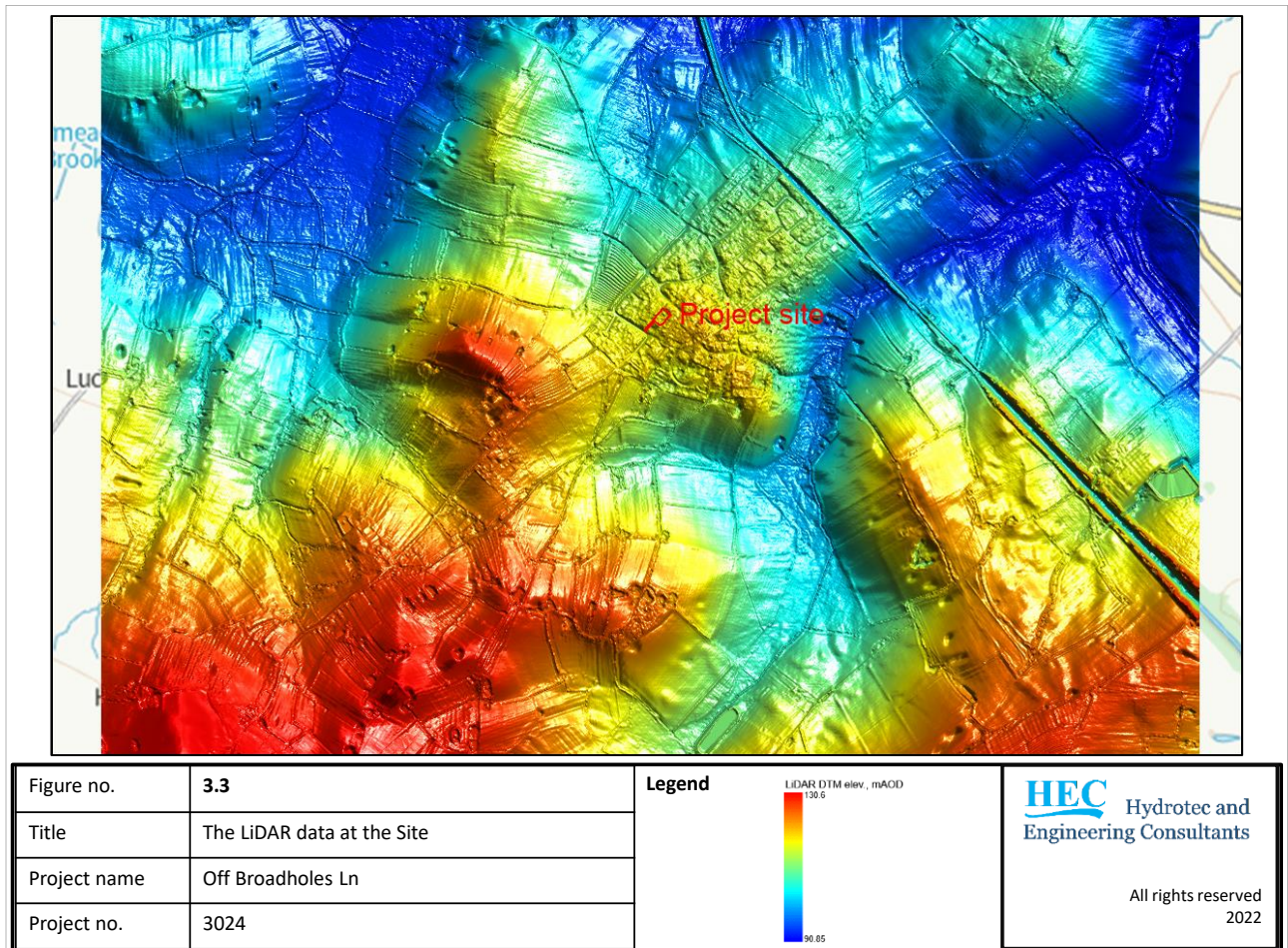


Figure 3.3: The LiDAR topographic elevation at the Site.

The intensity and magnitude of the overland flow paths on the ground surface would have a significant effect due on the ground elevation. Therefore, for an understanding of the complexity of the overland flow mechanisms, the topographic elevation at the Site was assessed based on

the recent LiDAR¹³ (Light Detection and Ranging) DTM (Digital Terrian Model) data (Figure 3.3). The elevation data suggest that the ground levels on the Site are slightly higher compared with the adjacent areas and bulging in shape, therefore the contributing surface areas for overland flow to the Site are relatively very small. Subsequently, the generated surface water runoff would be very small from the surrounding areas. Moreover, for a better understanding of the ground level adjacent to the Site, the elevations along the selected line on Broadholes Ln (see also Figure 3.4) were obtained from the LiDAR DTM data and presented in Figure 3.5. The elevation data suggest that the ground level inclines towards the northwest (i.e. from High Street to Broadholes Ln) with a relatively steep gradient and therefore the overland flow from the southeast would flow relatively quickly and away from the Site. Subsequently, the impact of the surface water runoff from the adjacent areas would be very minimal, taking into account the contributing surface area of the upstream sub-catchment. Subsequently, the surface water runoff generated by the Site would be mainly been by the rainfall on the Site. Therefore, a drainage strategy for this generated runoff would be required to be managed by sustainable drainage systems (SuDS), according to the LLFA guidance.

¹³ [Defra Data Services Platform](#)

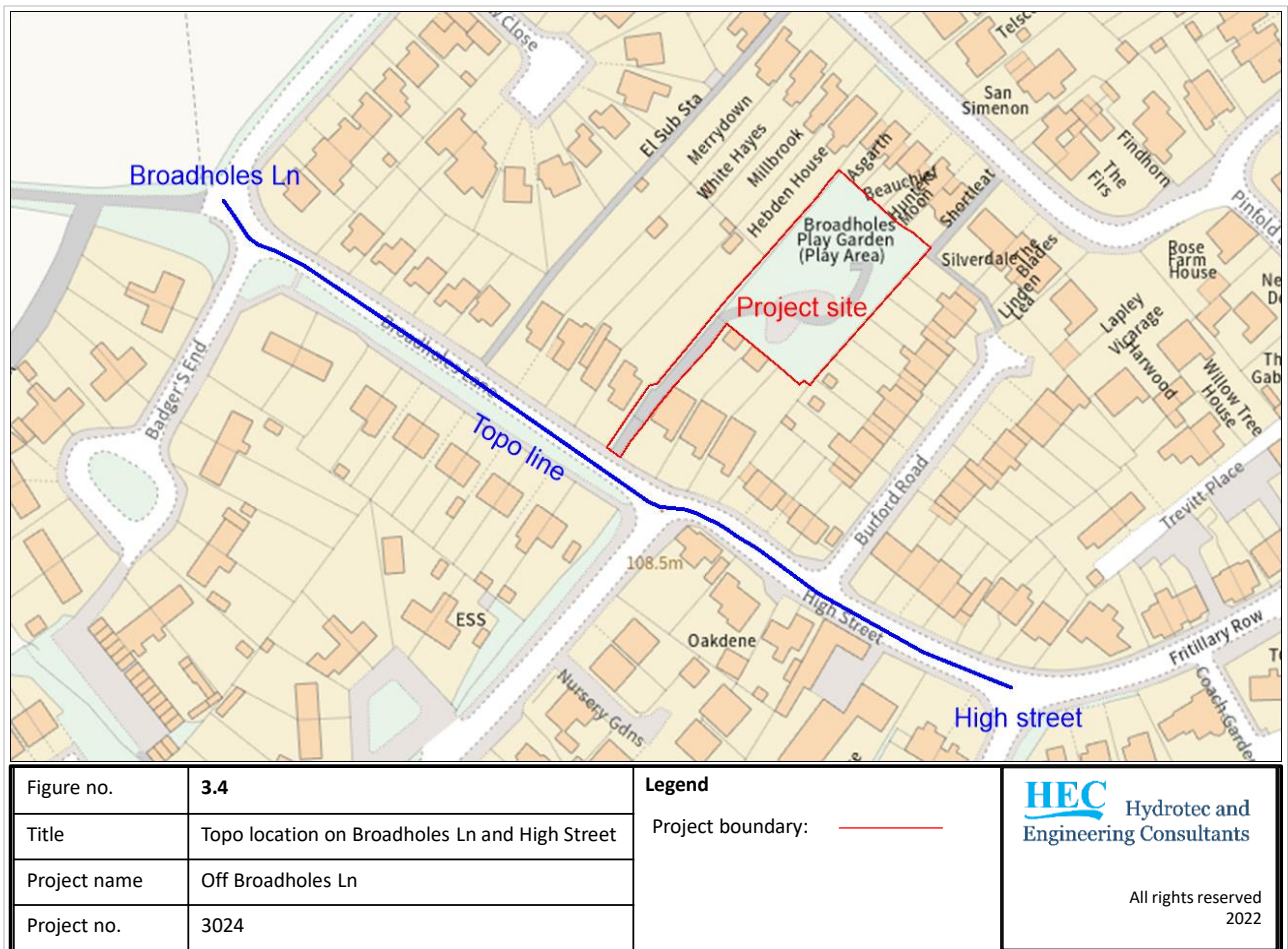


Figure 3.4: The location of the ground level on Broadholes Ln and High Street.

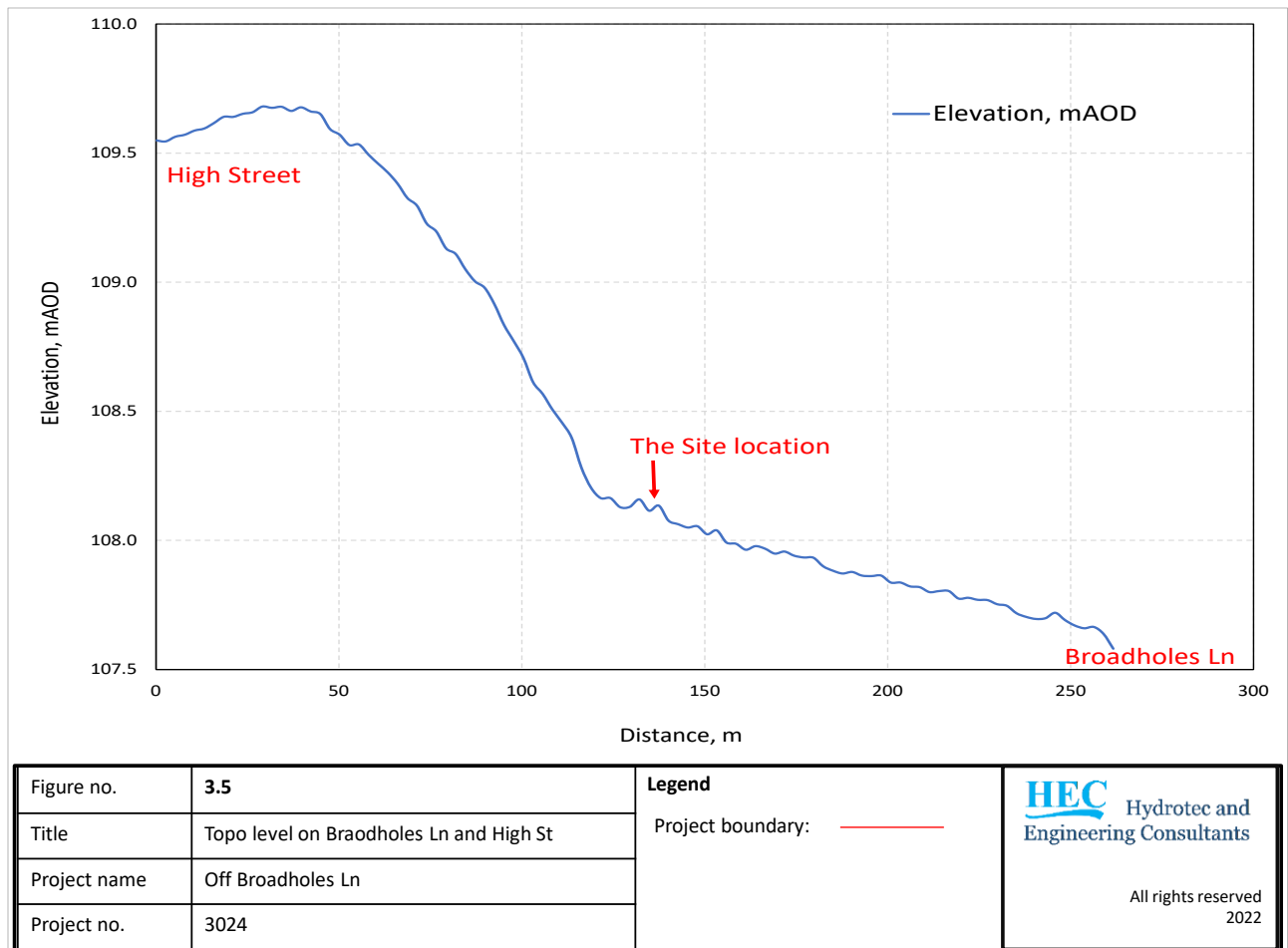


Figure 3.5: The elevation of the ground level on Broadholes Ln and High Street.

4 Flood attenuation storage requirement

The proposed development is the redesign of the Site into an allotment area with associated access paths and landscape amenity facilities. Thus, the Site would modify the existing land surface conditions and however, there would have rather a positive impact on overland flow compared with the present condition. Generally, the existing surface area of the Site is a mix of permeable and impermeable land with some patchy overgrown grasses, trees and shrubs at the boundaries. The proposed development is mostly permeable areas and it will consume water most of the year due to the crop plantation. Moreover, top soils would be highly porous and permeable, holding quite a lot of water temporarily. These features would reduce the excess

surface water generation. In addition to that, the layout of the Site was considered well-thought eco-friendly and sustainable drainage systems including plenty of permeable amenity spaces and a sufficient number of trees and shrubs plantation around the boundaries including a water trough at the front. These proposed features would assist to reduce the surface water runoff to a considerable level including through bio-diversity and would be better than the existing drainage system. Subsequently, the attenuation requirement for the excess surface water runoff could be avoided. Furthermore, it is highly recommended to adopt rainwater harvesting, a further reduction of the surface water runoff.

5 Access/egress from the Site

The actual land surface of the proposed allotment area would not have a flood risk from fluvial, coastal or surface water flows. Therefore, it would not be any issues with the access and egress from the proposed development site, and Broadholes Ln located on the west of the Site could be used as an access and egress during any unexpected flooding incident.

6 Sewer flood risk

The proposed development is the redesign of the existing playing area into the allotment area. Therefore, the proposed development would not generate any foul water flow. However, due to the crop plantation, there could be the utilisation of some pesticides and/or fertiliser but the environmental impact of these substances would be very minimal and would be reduced through bio-degradation over time. Consequently, any surface water drainage in the drainage network system would not have a detrimental impact. In addition to that, the surface water quality within the allotment area would be well improved through filtration (e.g. porous materials).

The sewer network data (see also Appendix I) obtained from Severn Trent Water indicate that the existing drainage network systems are separate, i.e. surface water and foul water. However, adjacent to the Site the drainage networks are foul water and the foul water drainage networks

(i.e. 150mm diameter pipes) pass along High Street and Broadholes Ln towards the northwest. The general observation of sewer drainage networks suggests that there would not have any foul water flood risk at the Site.

7 Conclusions

A flood risk assessment and drainage strategy were conducted to assist the sustainable drainage systems (SuDS) design on the land off Broadholes Ln, Wheaton Aston, Stafford, ST19 9NR. The existing condition of the Site comprises a mix of brownfield and greenfield land – mostly patchy overgrown grasses, trees and shrubs. The proposed development is the redesign of the Site into an allotment area with associated landscape amenities. The Site lies within Staffordshire Council's remit who are the LLFA, providing advice and guidance for sustainable drainage systems for this development site.

The present flood risk assessment and drainage strategy for SuDS which are the requirement for the planning application were made with available information including the latest EA's flood maps data, FEH hydrological data, topographic elevation data (LiDAR) and sewer network data.

The Site is currently in flood zone 1 and therefore it is not a risk from river or coastal flows. The Site also is not a risk from groundwater flow. Generally, the surface water runoff around the Site drains towards the northeast and the contributing sub-catchment area that could have an impact on the Site is relatively small, and therefore the risk of the surface water drainage at the Site is very minimal.

In the proposed development, the existing land surface would be altered however these changes would not deteriorate the surface water drainage to the Site itself or surroundings. Moreover, the proposed layout and eco-friendly landscape amenities including a sufficient number of trees and shrubs would improve the surface water drainage systems at a considerable level and would assist in improving the existing drainage systems. In addition to that, the proposed development is the crop plantation which would perhaps consume plenty of water through bio-diversity. Therefore,

the attenuation requirement for the excess surface water could be avoided. Furthermore, it is highly recommended to adopt rainwater harvesting, a further reduction of the surface water runoff.

Since the Site is not at risk of surface water flow, the access and egress from the Site during any flooding incident could be on Broadholes Ln located in front of the Site (west side).

The present sewer network data obtained from Severn Trent Water suggest that the existing sewer drainage systems are separate, i.e. surface water and foul water. The general observation suggests that the Site would not have a risk to the foul water flow and there would not have any foul water generation by the proposed development.

Appendix I: Sewer network data at the Site, ref. – Severn Trent Water.



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