

# Flood Risk Assessment

East Cliff Business Park, Hallen, Avonmouth, Bristol

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## 1 INTRODUCTION

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### 1.1 Terms of Reference

This Flood Risk Assessment report was commissioned by Montgomery Developments through their agent Whittaker and Watts Architects to support a planning application for a car auction storage site at East Cliff Business Park, Hallen, Avonmouth, Bristol.

The assessment determines potential sources of flooding within the application site and their associated risk to life and property, determines the suitability of the site for development in relation to flood risk from sources other than rivers and sea, and proposes appropriate design and mitigation measures where appropriate.

### 1.2 Statement of Authority

This report and assessment have been prepared and reviewed by qualified professionals with appropriate experience in the fields of flood risk, drainage and hydraulic modelling studies. The key staff members involved in this project are as follows:

- Sophie Taylor BSc, MSc - Consultant specialising in development and flood risk and surface water management.
- Iain Black BEng (Hons) = Civil engineer with experience in surface water management.

### 1.3 Approach

Consideration has been given to the sources and extent of flooding of the site from fluvial, tidal and pluvial sources, infrastructure failure, overland flow and ponding of localised rainfall within the site.

Stakeholders who hold data relating to flooding events in the area were contacted, and information gathered from responses received is incorporated in the following assessment.

The detail and complexity of the study required should be appropriate to the scale and potential impact of the development.

For the purposes of this study, the following have been considered:

- Available information on historical fluvial, tidal and surface water flooding in the area
- Site level information based on a 3rd party survey (see in Appendix A)
- Available data provided by the Environment Agency
- Available information provided by the LLFA (South Gloucestershire)
- Available information provided by the Lower Severn IDB
- Assessment of the existing runoff characteristics and the potential impact the proposed development will have on the surface water runoff.
- Allowances for increased flows resulting from the effects of climate change, or additional allowances for freeboard.

The approach is informed by the practice guidance published in relation to Flood Risk and Coastal Change to supplement the National Planning Policy Framework (NPPF).

Further guidance is also provided in the CIRIA Research Project 624 "Development and Flood Risk: Guidance for the Construction Industry", and 'Flood Risks to People Methodology' (FD2321/TR11).

Consideration has also been given to the South Gloucestershire Local Flood Risk and Management Strategy, the South Gloucestershire SPD and Level 1(2021) and Level 2 SFRA (2011) for the Severn and Avonmouth.

## 2 SITE INFORMATION

### 2.1 Site Location

The application site at BNG 354250 181650 is located within the East Cliff Business Park, Hallen, Avonmouth, part of the Avonmouth and Severn Enterprise Area (ASEA). The site is positioned between Minors Lane and Severn Road as shown on Figure 2-1.

The planning application boundary has an area 1.68 Ha (1680 m<sup>2</sup>). The site context and location are shown on drawings submitted in support of the application as shown in Appendix A. An aerial view is provided in Figure 2-2.



**Figure 2-1: Site Location**





**Figure 2-2 Aerial View / Existing Land Use**

## 2.2 Previous Land Use

The site has had no prior development and contains arable grassland which may have previously been farmed.

## 2.3 Proposed Development

The development comprises of a car auction storage facility which will be predominantly developed using laid unbound stone aggregate onto the existing site which will be raised 200-300mm above existing ground levels, with areas of concrete to facilitate a washdown area, lorry turning area and access into the site. There will also be provision for two future small non-residential cabins. The area to the north which contains the existing electrical pylons will remain undeveloped grass land.

The existing topographical survey indicates that levels within the application boundary lie at approximately between 5.8-8m Ordnance Datum (OD). The highest part of the site (8.26m AoD) is located along the east boundary of the site and the lowest part of the site is located to the north where the existing pylons are located (5.87m AoD). Most of the site where the development is proposed is relatively flat ranging between 7.30-7.50m AoD. It is proposed to alter the levels of the site, so they range between 7.5 and 7.7m AoD.

There are two watercourses, known locally as Rhines, outside of the north-east and north-west boundaries of the site and a small pond just outside the northwest corner of the site.

The Severn Estuary is located 1.35km to the northwest.

## 2.4 Existing Drainage

There are no existing drainage services within the boundary of the site. There is a surface water sewer located within the existing access road to the south of the site as indicated on the topographical survey and site plan (see Appendices A and B).

### 3 BACKGROUND INFORMATION REVIEW

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As part of the study data collection phase, several available sources of information were investigated to build an understanding of the potential risk of flooding to the site. The following review highlights the key findings of the anecdotal evidence collection exercise.

#### 3.1 Background Search

##### 3.1.1 [Internet / Media](#)

A brief media search informed the ASEA area has not been affected by recent historical flood events from tidal, surface water, rivers, groundwater and sewers.

All media reports are regarding the current ongoing development and upgrade of the existing tidal flood defences along the Severn Estuary. The upgrade and improvement work consists of raising defences, installation of concrete walls and embankments to protect against the risk of rising sea levels because of climate change. The scheme also includes the creation of an 80ha wetland site between the two ASEA areas.

#### 3.2 Environment Agency

The location of the site was reviewed with reference to the Environment Agency (EA) flood mapping through its web portal, in addition to receiving extracts from best available Product 4 and 8 data (reference 324589-wx) dated 21st of September 2023, which is included in Appendix C. The consultee response received from the EA is summarised as follows:

- The Flood Map for Planning indicates that the site lies in Flood Zone 3 of the Severn Estuary
- Flood Zone 3 is showing the flood risk to the area without defences in place.
- The data provided is taken from the ASEA Coastal Inundation Model which was undertaken as part of a flood defence project which was provided in 2018 to represent the impact of the new flood defences.
- The model does not take into account the new updated UKCP18 climate change allowances as it predates this.
- The breach scenario of the proposed defences in 2098 was also modelled in 2018.
- The model represents for present day and future events (2076 and 2098).
- The site is provided tidal protection from the existing ASEA flood defences which are currently being upgraded to provide an increased level in protection. The contractors have been on site since the summer of 2019 undertaking this project.
- Detailed maps provided by the EA of the flood defences which benefit the site, and their current condition can be found in Appendix C.
- Due to changes in the flood defence design and a requirement to re-run breach scenarios in the Bristol City Boundary, the EA can only provide the post development 2098 depths and levels and post development 2098 breach scenarios from the 2018 version of the modelling, as this is currently the best available data.
- The Design Water Level (DWL) is 0.00mAoD (1 in 200 year for the 2098 scenario). It is stated that the modelling is in the process of being updated and will be ready by the end of 2023, so was not available at the time of writing this report.
- For extreme event (1 in 1000 year for the 2098 scenario), the predicted level is 7.75mAoD.
- The surface water risk maps for the site indicate the site is not at risk from of flooding from surface water.
- EA historical records show the site has not been affected by historical flooding.

<sup>1</sup> <https://www.asea-flood-ecology.co.uk/flood-defence/>  
<https://sites.southglos.gov.uk/newsroom/environment/improved-flood-defences-to-protect-homes-avonmouth-severnside-enterprise-area-and-create-80-hectares-of-wetland-habitat/>  
[https://www.asea-flood-ecology.co.uk/wp-content/uploads/2023/01/The-Environment-June-2022\\_ASEA.pdf](https://www.asea-flood-ecology.co.uk/wp-content/uploads/2023/01/The-Environment-June-2022_ASEA.pdf)

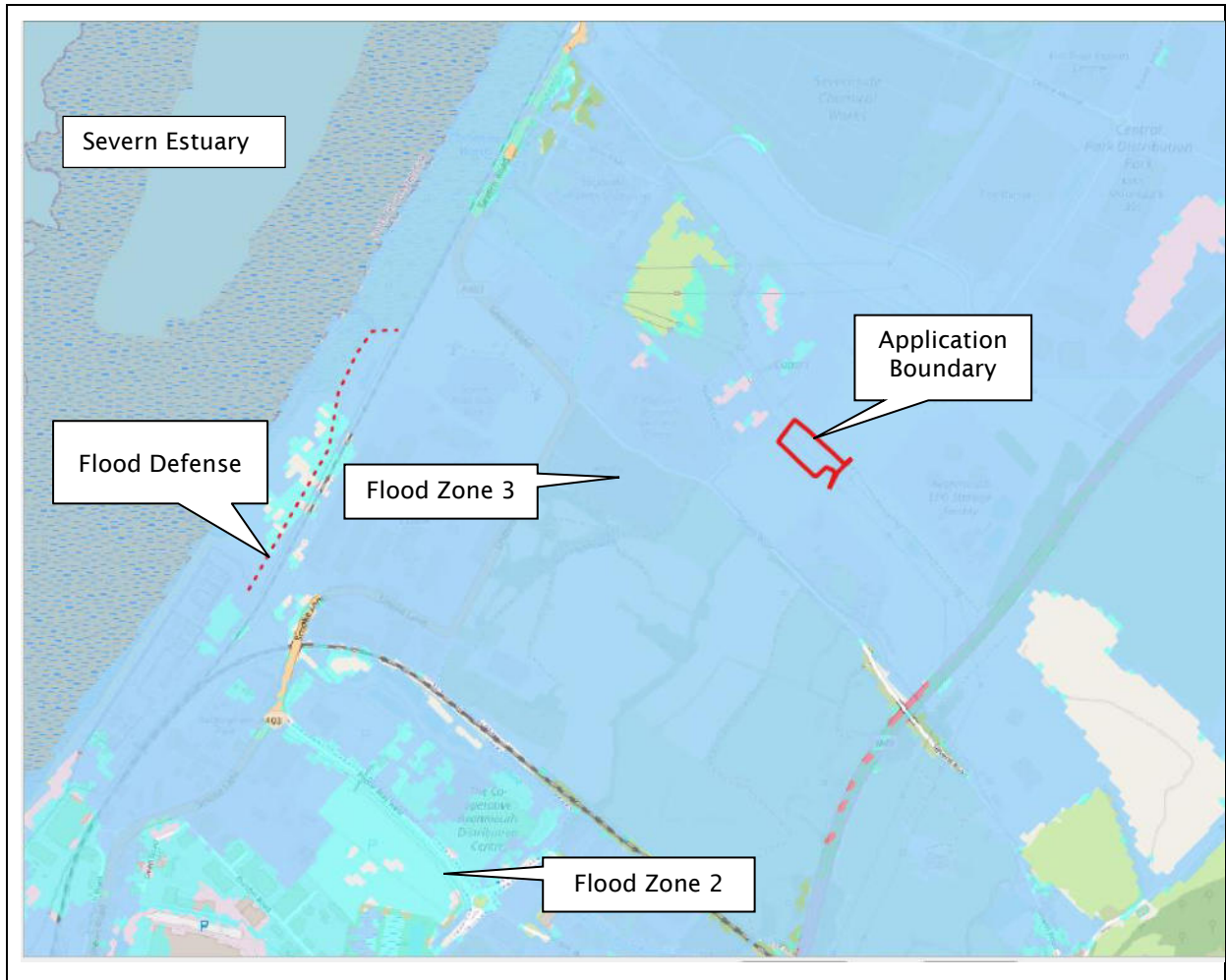


Figure 3-1 Environment Agency Predicted Flood Zone Map



**Figure 3-2 Environment Agency Risk of Flooding from Surface Water**

### 3.3 Lead Local Flood Authority

The site lies within the District of South Gloucestershire (Planning Authority and Lead Local Flood Authority).

The district has published an updated level 1 (November 2021)<sup>1</sup> and level 2 Strategic Flood Risk Assessment specific to the Severnside and Avonmouth area<sup>2</sup>, which predates the updated level 1, which was published in March 2011.

The level 2 SFRA divides an area referred to as ASEA (Avonmouth and Severnside Enterprise Area) in which the site lies and is divided into 'strategic zones' outlining different development and flood management and mitigation objectives. The application site is in Strategic Zone 4, which is in Flood Zone 3a.

A summary of the objectives within Strategic Zone 4 are outlined below in Figure 3.4 taken from the Avonmouth and Severnside Level 2 SFRA.

**Table 9.2 Summary of outcomes of multi criteria assessment**  
 ((colours indicate relative suitability: Green = recommended for detailed consideration & likely to provide suitable mitigation, Orange = recommended for further consideration however may prove to be unsuitable or difficult to implement)

Flood Risk Management Measure	SZ1	SZ2	SZ3	SZ4	SZ5	SZ6	SZ7	SZ8
Improvements to defences to increase SoP and keep pace with climate change	✓	✓	✓	✓	✓	✓	✓	✓
Change of use*		✓				✓		✓
Strategic land raising			✓	✓	✓		✓	
Recommendation of local scale land raising	✓	✓	✓	✓	✓	✓	✓	✓
New / improved access routes	✓	✓	✓	✓	✓	✓	✓	✓
Property resilience / resistance measures^	✓	✓	✓	✓**	✓**	✓		
Flood warning / flood event management	✓	✓	✓	✓	✓	✓	✓	✓
Improvements to the Rhine network (local & strategic)			✓***	✓***	✓	✓	✓***	✓

\*Policy measures to discourage highly vulnerable development and essential infrastructure  
 \*\* Includes local flood defence schemes  
 \*\*\*Including strategic rhine improvements and storage to reduce fluvial flooding  
 ^ Thorough assessment of the feasibility of these options will be needed on a site-specific level taking into account local flood depths & velocities & the vulnerability of the proposed land use

**Figure 3-3 Summary of Flood Risk Management objectives**

The updated Level 1 SFRA dated 2021 refers to the ASEA Flood Defence scheme which states the following;

‘The Avonmouth and Severnside Enterprise Area (ASEA) Ecology Mitigation and Flood Defence Project is currently under construction and is intended to support the growth of the Avonmouth Severnside Enterprise Area. The ASEA scheme will upgrade existing defences along a 17 km stretch of coastline, including the defences from Severn Beach to Aust in the Local Plan area.

The flood defences to be constructed by the consented ASEA scheme are designed to offer a 1 in 200-year (0.5% AEP) standard of protection over a 60-year design life, this considers the following factors:

- For existing development applies a 2076 design life (i.e. 60-year design life relative to a “present day” 2016 base year);

<sup>1</sup> <https://www.southglos.gov.uk/documents/pte110072.pdf>

<sup>2</sup> [https://beta.southglos.gov.uk/static/777cfdc6b8907d8ab9e1e4f97e59474e/Main-Report-Level\\_1\\_SFRA-2021-1.pdf](https://beta.southglos.gov.uk/static/777cfdc6b8907d8ab9e1e4f97e59474e/Main-Report-Level_1_SFRA-2021-1.pdf)

- For anticipated new development in the ASEA area: applies a 2098 design life (i.e. 60-year design life relative to a 2038 base year, assuming associated future development within the ASEA area is completed by 2038)’

The LLFA currently have a draft Local Flood Risk Management Strategy 2022-2027 which will update the previously published LFRMS dated 2015-2020<sup>1</sup>.

Both the SFRA Level 1 and Level 2 and Local Flood Risk Strategy are consistent with the EA data provided that show the site to lie in flood zone 3a<sup>1</sup> however is currently protected from the 1 in 200-year event with the existing and future upgraded defences and there are no other natural and artificial sources of flood risk to the site.

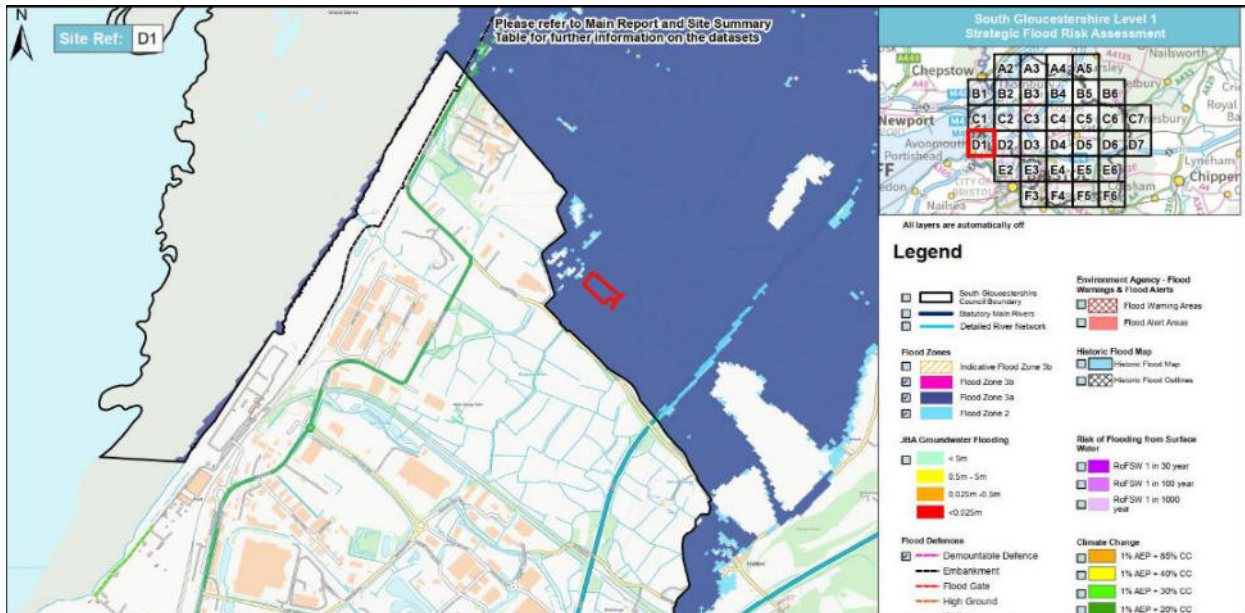


Figure 3-4 Level 1 SFRA (2021) Grid D1 Flood Map

### 3.4 Groundwater

The site has been reviewed in relation to British Geological Survey (BGS) Geology of Britain Viewer<sup>1</sup>. The site is shown to be situated on the Mercia Mudstone Group with superficial deposits consisting of tidal flat deposits consisting of sandy and silty clayey soils.

The level 1 SFRA (2021) indicates that the majority of the South Gloucestershire District is not at risk from ground water flooding and geological information is consistent with the BGS information.

<sup>1</sup> British Geological Society: Geology of Britain Viewer <http://www.bgs.ac.uk/data/mapViewers/home.html>

<sup>2</sup> New Local Plan evidence base | BETA - South Gloucestershire Council ([southglos.gov.uk](http://southglos.gov.uk))

<sup>3</sup> <https://consultations.southglos.gov.uk/gf2.ti/-/1363618/124726277.1/PDF/-/Local%20Flood%20Risk%20Management%20Strategy%202022-2027.pdf>

## 4 FLOOD RISK ASSESSMENT

### 4.1 NPPF Vulnerability Classification

The NPPF outlines Government policy on development and flood risk. It aims to ensure that flood risk is considered throughout the planning process for any new development. Where there is a risk, this should be reduced through the strategic planning process, without increasing flood risk elsewhere. In areas benefitting from flood defences, under the NPPF it is required to assess the site based on if the defences were not in place as a precautionary approach. Therefore, the site is in Flood Zone 3a based on the EA flood zone maps for planning.

The development is classified as 'less vulnerable' within Flood Zone 3a. Based on Table 4-1 an Exception Test is not required, and the sequential approach is satisfied.

**Table 4.1: Flood Risk Vulnerability and Flood Zone 'Compatibility'**

Flood Zone	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	✗	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	✗	✗	✗	✓

As the site is in Flood Zone 3a and is a less vulnerable development, a Flood Risk Assessment is required in accordance with the NPPF, NPPG and local planning policy to demonstrate that the development will be safe for its lifetime and not increase flood risk elsewhere. The site is also over 1ha which also requires a surface water drainage assessment to be carried out. The following shall be undertaken:

- i. Use the latest information available to assess the flood risk.
- ii. State the relevant modelled flood levels (in metres above Ordnance Datum, m AOD)
- iii. State the finished levels within the site to determine impacts on flood storage and flood flows.
- iv. Identify any residual risk to the site.
- v. Identify any required flood mitigation and management measures
- vi. Demonstrate the development and users of the site will be safe for its lifetime.

### 4.2 Screening of Potential Flood Mechanisms

The following screening assessment is based on the information gathered in the preceding sections. Sources of flood hazard identified as being potentially significant are assessed in greater detail in subsequent report sections.

Table 4.2: Possible Flooding Mechanisms

Source/Pathway	Significant / Assess Further?	Comment/Reason
Fluvial (Rivers)	No	The site is shown in flood zone 3a area benefitting from flood defences associated with the risk of tidal flooding from the Severn Estuary. There is no historical information of this affecting the site based on EA fluvial historical data, LLFA LFRMS and a review of the Level 1 and 2 SFRAs.  Surface water flood mapping which is a useful indicator of flooding coinciding with small watercourses indicates no flood risk coinciding with watercourses adjacent to the site.
Blockage / Failure of Culverts	No	No significant structures on watercourses in the vicinity of the site.
Tidal	Yes	The site lies within Flood Zone 3a and is at risk of tidal flooding from the Severn Estuary. A modelled flood level of 0.00mAoD for the defended 1 in 200-year 2098 scenario and 7.75mAoD for the defended 1 in 1000-year 2098 scenario has been provided as the best available data due to changes to the flood defence design and the 2018 model not including the updated 2018 UKCIP Climate Change allowances.
Flood Defence Failure	Yes	The site is possibly located within the breach/overtopping zone of the current tidal flood defences. However, these defences are currently being upgraded and raised. This will be assessed in more detail in preceding sections.
Surface water	No	EA Surface Water Flood Maps indicate the site is unaffected by surface water flooding.  Development is located on a greenfield site so a separate surface water drainage assessment will be undertaken to determine any increase in surface water run-off rates and volumes and how this will be managed using appropriate SuDS measures.
Urban Drainage / Sewer Incapacity	No	There are no onsite sewers, and the land is set higher than the surrounding access road where the closest surface water sewers are located.
Groundwater	No	The Level 1 SFRA (2021) informs the site is not located within an area susceptible to groundwater flooding based on the JBA ground water model.
Reservoirs	No	The EA national flood maps for risk from reservoirs shows no risk of flooding.



### 4.3 Coastal / Tidal Flooding

The Severn Estuary is located 1.35 km to the north-west of the site.

The EA Severn Estuary ASEA modelled flood levels have been provided within the Product 4 data for the Severn Estuary. The ASEA model level (DWL) applicable to the site are extracted and provided below as referenced in the Product 4 data (see appendix B)

The ASEA model reflects a defended scenario which differs to the EA flood zone maps which show the site to be in flood zone 3a which is mapped assuming no defences are in place.

**Table 4.3: Tidal Flood Levels**

Scenario	Modelled event	Level
Pre-development (2076) (existing defences)	1 in 200 year (defended)	0.00mAoD
	1 in 1000 year (defended)	7.70mAoD
Post development (2076) (new defences)	1 on 200 year (defended)	0.00mAoD
	1 in 1000 year (defended)	0.00mAoD
Post development (2098) (new defences)	1 in 200 year (defended)	0.00mAoD
	1 in 1000 year (defended)	7.75mAoD

The EA have advised that the best available data to use as the DWL is for the post development (new defences) 2098 scenario, which for the 1 in 200-year scenario, shows there is no risk of tidal flooding to the site. Whilst the 1 in 1000-year level is at 7.75mAoD, the lifetime of the development is up to 50 years and as this is an extreme event, it is very unlikely the site would be at risk from this scenario. As a precaution we have assessed below the possible risk under a 1 in 1000 year defended scenario using the 2098 data.

#### 4.3.1 Flood Risk to the Development

There is no risk of tidal flooding for the 1 in 200-year DWL (2098) ASEA model.

The site has a maximum lifetime of 50 years, but as a precaution we have assessed the extreme 1 in 1000-year 2098 scenario below, based on the flood level 7.75mAoD.

Comparing the 7.75 m AoD DWL to the pre-development site topographical survey data, the lowest part of the site contains 2 electrical pylons, and it is not proposed to develop in this area. The ground levels range in this area between 5.87-6.55m AoD so may be subject to flood depths up to 1.2m- 1.88m. As stated, there is no proposed development in this area (refer to Appendix A for site survey data).

The area to be developed, existing ground levels range from 7.32-8.22m AoD so may be subject to flood depths 0m- 0.43m AoD. Based on the proposed development area as shown in Appendix B it is proposed to amend the site levels between 7.5m-7.7m AoD. This contains some of the lowest parts of the developable area. Therefore, based on post development levels below the DWL, the residual flood risk depths would be between 0m-0.25m AoD within the site.

In summary the area to be developed is not at risk of tidal flooding, as it is above the DWL (1 in 200-year new defences- 2098) and is beyond the lifetime of the development, but in the absence of the updated

climate change data within the modelling, is advised as the best available data. The lifetime of the development is 50 years, so the assessment included of the 1 in 1000-year flood level is precautionary.

The EA ASEA DWL of 0.00m AoD for the 1 in 200-year event demonstrates the site is not at risk of tidal flooding with the new defences in place and therefore does not increase flood risk elsewhere. It is shown that the site would be at risk under the 1 in 1000-year scenario and as a precaution an assessment was carried out which concluded, based on post development levels, the site may be subject to a maximum depth of 0.25m AoD of flooding. As the use of the site is for a car auction facility with no built development, the risk to the site is low and given the lifetime of the development at 50 years, the risk of flooding in its lifetime is unlikely and would not impact on flood risk elsewhere.

4.3.1.1 Low Probability Flooding

In the event of a 1 in 1000-year tidal event under the 2098 new defence scenario, this would leave a residual maximum flood depth of 0.25m. Based on the 'Flood Risk To People Defra supplementary note, Table 4 (see extract below in Fig 5.2.1) with a depth of 0.25 + 0.5 debris factor, this gives a hazard rating of 0.75 which is at the 0.75 rating between very low hazard and Danger to Some. This can be managed within the flood management plan. However, this flood event is very unlikely given the lifetime of the development of 50 years.

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03+0.5 = 0.53	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.13+0.5 = 0.63	0.15+1.0 = 1.15	0.20+1.0 = 1.20	0.25+1.0 = 1.25	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25
0.1	0.03+0.5 = 0.53	0.06+0.5 = 0.56	0.12+0.5 = 0.62	0.15+0.5 = 0.65	0.18+1.0 = 1.18	0.24+1.0 = 1.24	0.30+1.0 = 1.30	0.36+1.0 = 1.36	0.48+1.0 = 1.48	0.60+1.0 = 1.60	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50
0.3	0.04+0.5 = 0.54	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.19+0.5 = 0.69	0.23+1.0 = 1.23	0.30+1.0 = 1.30	0.38+1.0 = 1.38	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	1.13+1.0 = 2.13	1.50+1.0 = 2.50	1.88+1.0 = 2.88
0.5	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.25+0.5 = 0.75	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.50+1.0 = 2.50	2.00+1.0 = 3.00	2.50+1.0 = 3.50
1.0	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.38+0.5 = 0.88	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	2.25+1.0 = 3.25	3.00+1.0 = 4.00	3.75+1.0 = 4.75
1.5	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.50+0.5 = 1.00	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.20+1.0 = 2.20	1.60+1.0 = 2.60	2.00+1.0 = 3.00	3.00+1.0 = 4.00	4.00+1.0 = 5.00	5.00+1.0 = 6.00
2.0	0.13+0.5 = 0.63	0.25+0.5 = 0.75	0.50+0.5 = 1.00	0.63+0.5 = 1.13	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.75	6.00	7.25
2.5	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.60+0.5 = 1.10	0.75+0.5 = 1.25	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	1.80+1.0 = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18+0.5 = 0.68	0.35+0.5 = 0.85	0.70+0.5 = 1.20	0.88+0.5 = 1.38	1.05+1.0 = 2.05	1.40+1.0 = 2.40	1.75+1.0 = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.80+0.5 = 1.30	1.00+0.5 = 1.50	1.20+1.0 = 2.20	1.60+1.0 = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23+0.5 = 0.73	0.45+0.5 = 0.95	0.90+0.5 = 1.40	1.13+0.5 = 1.63	1.35+1.0 = 2.35	1.80+1.0 = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25+0.5 = 0.75	0.50+0.5 = 1.00	1.00+0.5 = 1.50	1.25+0.5 = 1.75	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28+0.5 = 0.78	0.60+0.5 = 1.10	1.10+0.5 = 1.60	1.38+0.5 = 1.88	1.65+1.0 = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
Less than 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.0		Danger for most – includes the general public
More than 2.0		Danger for all – includes the emergency services

Figure 4-1 Extract from Defra Flood Risk to People Supplementary Guidance Note (2008)

4.4 Flood Defence Breach

Based on the product 8 data provided by the EA (Appendix C) for the ASEA modelled breach scenarios, this site is not at risk of flooding following a breach of the new defences which are currently under construction.

Based on EA modelled data, the site is not located within an area which would be subject to flood defence breach/failure.

As a precaution to manage any residual flood risk for the 1 in 1000-year event, it is recommended the site signs up to the EA flood warning and alert system that covers this area. We also recommend the site be subject to a flood evacuation plan, ensuring all occupants of the site are prepared in the event of an extreme flood event and breach and failure. Even though the site is not located in an area at risk from breach, it would be useful for the users of the site to be aware of areas to avoid in the event of a breach.

#### 4.5 Surface Water Run-off

The development site is 1.68ha and therefore requires a surface water drainage assessment to determine any increase in surface water run-off rates and volumes can be managed taking into account the effects of climate change. The existing site is greenfield, therefore the areas of unbound stone aggregate, access road and concrete areas will need to be managed and mitigated.

Based on the development proposals, the required volume of attenuation is 486m<sup>3</sup> with a post development greenfield rate of  $Q_{bar}$  5.48l/s which will be achieved through the appropriate use of sustainable drainage measures and viable discharge mechanism to not exceed the pre-development greenfield run-off rate and to manage surface water run-off from the site to cater for all rainfall events up to the 1 in 100 year + 20% climate change rainfall event.

A drainage strategy is detailed in the following Section 5.

## 5 DRAINAGE STRATEGY

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### 5.1 Purpose

The objective of this strategy is to summarise the approach taken for the preliminary design of the site drainage, attenuation, flow control and discharge locations in order to comply with the NPPF, National SuDS Design Standards and local policy and guidance provided by South Gloucestershire District Council.

The preliminary design referred to is developed for planning and informative purposes only and the level of detail presented reflects this. It is therefore important to note that layouts and details provided, unless noted otherwise, will be subject to detailed design at a later stage prior to commencement of any works.

This section details the design philosophy and methodology behind the surface water and attenuation concept design for the proposed Car Auction Storage Facility at East Cliff Business Park, Hallen, Bristol. The drainage design adopts a SuDS approach for the permanent site drainage strategy.

The primary objective of this report is to demonstrate that the surface water drainage design provided meets the requirements of South Gloucestershire District Council and demonstrate the following:

- That permanent surface water drainage at the development is designed to a sufficient hydraulic capacity to transport or contain pre-determined return period rainfall events up to and including the 1 in 100 year + climate change event.
- That storm drainage design has been undertaken in accordance with the requirements stipulated South Gloucestershire District Council (as the LPA and LLFA) and National Design Standards.
- That site run-off rates have been limited to the predevelopment greenfield rate taken  $Q_{bar}$  as stipulated by SGC and demonstrate how  $Q_{bar}$  was calculated.
- Demonstrate a viable discharge location following the SuDS hierarchy for discharge mechanisms.
- To identify potential exceedance flow routes
- That the SuDS design incorporates a treatment train appropriate to the use and scale of the site.
- To outline the maintenance requirements in relation to drainage features.

### 5.2 Policy and Guidance

#### 5.2.1 [NPPF and NPPG](#)

For sites over 1ha, it is a requirement to carry out an FRA and Drainage strategy to address the increase in surface water run-off and volumes and how this will be managed and mitigated for the lifetime of the development in accordance with the NPPF. This report addresses the management of on-site drainage and how this will be managed in principle through appropriate application of SuDS measures.

#### 5.2.2 [Non-Statutory National SuDS Standards](#)

The Non-statutory National SuDS standards<sup>2</sup> were produced to be used alongside the NPPF to assist local authorities and LLFAs in fulfilling their duty under the Flood and Water Management Act 2010 to respond to all major planning applications in matters of managing surface water drainage and other sources of flood risk. The standards provide thresholds for managing surface water run-off rates, volumes, exceedance flows and following the SuDS hierarchy. Where local authority policy requires more than these standards then this should be applied. Where applicable these standards will be provided.

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<sup>2</sup>[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf)

### 5.2.3 South Gloucestershire District Council policy and guidance

South Gloucestershire District Council have provided guidance in response to an information request (see appendix D). This guidance includes a Supplementary Planning Document (SPD) SuDS Guide (2021)<sup>3</sup> which focuses on SuDS for their area.

The key principles extracted from the SPD are:

*'Successful SuDS designs will need to take into account water quality, water quantity, amenity and biodiversity and have a positive impact on each in order to achieve a sustainable design.*

- *The discharge hierarchy must be followed when considering options to deal with runoff that cannot be used, prevented or dealt with at source. Evidence that the hierarchal approach has been applied must be provided before a SuDS application will be approved.*
- *Development on Greenfield sites must limit runoff to the Qbar Greenfield rate for all rainfall events up to and including the 1 in 100-year event.*
- *Development on Brownfield sites must also look to limit runoff to or as close as possible to the Qbar Greenfield runoff rate for all rainfall events up to and including the 1 in 100-year event. Where this is not possible then an allowable discharge rate is to be agreed based on a reasonable reduction from existing rates.*
- *SuDS should be specifically designed so that:*
  - *in a 1 in 30-year rainfall event there will be no flooding on site.*
  - *in a 1 in 100-year rainfall event (plus allowance for climate change), there will be no flooding of any building on the site or any off-site flooding; and*
  - *for any rainfall event above 100 year, the drainage design should demonstrate how exceedance flows generated within the site will be managed including overland flow routes, protection of buildings to prevent entry of water, and protection of access routes.*
- *An allowance for climate change needs to be incorporated as part of SuDS design, which means adding an extra amount to peak rainfall (20% for commercial development and 40% for residential as per current industry requirements, which may be subject to change in the future).*
- *SuDS features are expected to be designed in accordance with CIRIA C753 the SuDS Manual and CIRIA C698 Site handbook for the construction of SuDS.*
- *Swales, infiltration basins, retention and detention basins and ponds must be designed with side slopes with a gradient of 1:3 or less. Basins and ponds must also be designed to incorporate a minimum freeboard of 300mm between the top water level and the top of bank.*
- *Suitable management arrangements must be put in place for all the SUDS features constructed in South Gloucestershire covering future operation and maintenance. In addition, adequate access must be provided to all SuDS features to allow for the required maintenance and operational activities to be carried out unimpeded.'*

Depending on the use, size and discharge receptor of the site will determine the number of water quality treatment stages required as part of the drainage design. The catchment area forms part of the Severn Estuary which is designated as a SSSI.

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<sup>3</sup> [Sustainable Drainage SPD \(southglos.gov.uk\)](https://www.southglos.gov.uk)

## 5.3 Design Parameters

### 5.3.1 [Project Drivers](#)

The key aspects driving the project design are as follows:

- Investigate available surface water discharge mechanisms from the site.
- To ensure there is no increase in surface water run-off rates and any increase in surface water volumes can be attenuated for all rainfall events up to and including the 1 in 100 year + climate change event (20%) for the lifetime of the development (50 years).
- The requirement to limit the rate of discharge prior to discharge from all impermeable surfaces to that of Qbar greenfield run-off rate as stipulated by SGDC.
- Demonstrating the principal feasibility of compliance with the requirements of NPPF, National Standards and SGDC.
- Demonstrate surface water quality can be managed proportionate to the use, size and receptor of the site with a minimum of 2 SuDS treatment stages.
- Provide sufficient detail for a concept drainage strategy to demonstrate in principle the site can be drained and not increase flood risk elsewhere, with a detailed drainage design and calculation to be provided at a later stage.

### 5.3.2 [Design Criteria](#)

The design adopts the following in conformity with the required drainage standards:

- Demonstrate no flooding during a 100-year return period / 1% AEP event plus climate change allowance.
- Demonstrate that the design can facilitate the reduction of surface water run-off to the greenfield rate, discussed subsequently.
- Demonstrate that the site can attenuate the required volume of surface water on site through the appropriate application of the SuDS hierarchy.

The design includes a 20% allowance for climate change as per the UKIP18 Climate change allowances for a development lifetime of 50 years. Application of urban creep (typically 10% increase in private impermeable areas) is not applicable to this site.

### 5.3.3 [Discharge mechanism](#)

The site currently has no formal drainage, so the viability of each discharge mechanism has been explored.

- Infiltration

Based on the geological conditions on site with poor permeability and proximity to the Severn Estuary SSSI the use of infiltration into the underlying ground is not explored further at this stage. The IDB were consulted to establish if there is a principle against infiltration in this location but at the time of writing this report, a response was not provided. The use of infiltration could be assessed in more detail if required at a later stage during the detailed design stage and infiltration tests to be undertaken if permitted.

- Watercourse

There are two Rhines (local watercourses) near the site, along the northwest and northeast boundaries. This method of discharge would be preferred following the discharge hierarchy. Subject to the IDB confirming in principle this method of discharge is acceptable, we would propose a formal discharge located to the northwest of the site to allow for a gravity system based on the proposed levels. The area between the two pylons is exempt due to the exclusion zone around the pylons. The discharge would be restricted to the calculated Qbar greenfield run-off rate (see section 4.5). The IDB have not responded at the time of writing this report to confirm if discharge to the northwest Rhine is permitted. However, the watercourse is located outside of the red line boundary of the application site, therefore landowner permission may need to be secured for the outfall.

- Surface water sewer

The closest existing surface water sewer to the site is located within the existing access road to the southeast of the site (see Appendix A). This asset is maintained by Wessex Water. Should discharge to the watercourse to the northwest not be permitted, the remaining option would be to connect on site drainage to the existing surface water sewer (MH3) within the access road at the pre-development Qbar greenfield discharge rate (see section 4.5). Permission to connect would need to be obtained from Wessex Water (see Appendix D). Sewer levels adjacent to the site would constrain drainage at the site, or a connection may be required to be routed to a part of the downstream sewer network in order to allow sufficient structural cover to pipe and drainage assets.

#### 5.3.4 Peak Discharge

Peak discharge from the site has been set at the greenfield equivalent Qbar for the site as per South Gloucestershire District Council's requirements. The Qbar rate was adopted as the greenfield rate, calculated as 5.48l/s/Ha (see Appendix C)

#### 5.3.5 Surface Water Attenuation

Based on the calculated Qbar greenfield run-off rate and a site area of 1.68ha, with most of the site proposed to be laid with compacted unbound stone and concrete, a total attenuation volume of 486m<sup>3</sup> required has been calculated (see Appendix B). It should be noted the washdown area will drain to the foul drainage. To achieve this on-site SuDS will need to be provided following the SuDS hierarchy where feasible based on-site characteristics, constraints and use of the site.

The following table screens SuDS options which may be viable within the site.

**Table 5.1: SuDS Component Selection**

SuDS Component	Feasible?	Comment / Reason
Rainwater Harvesting	No	No proposed roof
Green-Blue Roofs	No	No proposed roof
Infiltration Systems	Possible	Viable, would require infiltration testing to confirm feasibility.
Permeable Pavement	Possible	<p>Selection dependent on proposed trafficking.</p> <p>Options are.</p> <ul style="list-style-type: none"> <li>• Block paving</li> <li>• Porous asphalt</li> <li>• Unbound aggregate (gravel) in geogrid cells (suitability may only be applicable to car parking areas only)</li> <li>• Heavy duty geogrid cells - see e.g., Truckcell 80.</li> </ul> <p>Potential to site permeable paving under the proposed car parking areas experiencing light trafficking areas. Water from elsewhere may be direct water onto those areas - depending on level design.</p>
Attenuation Tanks	Yes	Viable as a means of attenuating runoff; however, reduced / no benefit in relation to wider SuDS objectives.
Geocellular Storage	Yes	Viable as a means of attenuating runoff; however, reduced / no benefit in relation to wider SuDS objectives

SuDS Component	Feasible?	Comment / Reason
Swales	Yes	Viable as a means of collecting runoff from hardstanding for conveyance to attenuation feature.
Filter Strips	No	No permeable surfaces proposed that allow for filter strips – majority of green areas are around exclusion zone around the pylons
Filter Drains	Yes	Viable as a means of collecting runoff from hardstanding for conveyance to attenuation feature.
Bioretention Systems	No	No permeable surfaces suitable for wetland.
Tree Pits	Possible	Will be dependent on the nature of landscaping proposals.
Detention Basins	No	No suitable permeable surfaces for detention basin – majority of green areas located around exclusion zone around the pylons

## 5.4 Selected Drainage Proposal

The drainage of the proposed site is expected to comprise an under drained swale and perforated filter drains along the boundaries of the hardstanding to convey run-off to the surface water attenuation. The attenuation will be provided by using an oversized tank sewer, along with permeable car parking.

These features will provide attenuation and conveyance with flows discharging from the site via a new surface water sewer to the watercourse northwest of the site, which will be controlled by a flow control manhole (Hydrobrake or similar).

A bypass oil Separator has been proposed before the outfall due to the volume of parking and on-site traffic.

The proposed storm drainage layout is included in Appendix E.

### 5.4.1 [Water Quality](#)

Referring to South Gloucestershire Sustainable Drainage Systems: Guidance for new developments, based on the use, scale and receptors a minimum of 2 surface water treatment stages is required.

This will be achieved through the use of swales and filter drains, along with permeable parking areas which will provide two stages of treatment prior to discharge to the watercourse to the north. The detailed design of the SuDS measures and associated infrastructure will be provided at the detailed design stage.

Car parking exceeds 800 sq. m and as such permanent drainage pollution control shall include measures per guidance for Pollution Prevention (GPP3) – use and design of oil separators in surface water drainage systems, adopted as industry best practice.

### 5.4.2 [Amenity and Biodiversity](#)

The site is a private development consisting of a car auction storage facility which will consist of a large area of raised compacted unbound stone, concreted areas for lorry turning, parking, a vehicle washdown area. Therefore, public amenity is not considered. A boundary of permeable surface will be retained along the site boundary will be retained.

Swales can include a variety of planting (including wildflower grass seed mixes where grass length is not required to be regularly maintained) that will help make a positive contribution to urban biodiversity by providing a habitat and food for insects, invertebrates, and birds. Native plant species should normally be used in providing a dense and durable cover of vegetation that creates appropriate habitat for indigenous species.

The filter drain's gravel media can host microorganisms and provide breeding grounds for insects and amphibians.



### 5.4.3 Access & Safety

The proposal is a private site. Potential for the public to interact with drainage is not a consideration.

Swales are generally shallow surface features that do not present significant risk or danger to the health and safety of site users. Any residual risks can be mitigated through the design of shallow side slopes and shallow depths.

No aspect of the proposal causes any abnormal access requirement. Normal precautions will be required in relation to any access to confined spaces to maintain flow controls and attenuation tanks.

### 5.4.4 Surface Water Exceedance

Surface water exceedance is where the designed drainage system is overwhelmed above the 1 in 100 year +20% climate change event. Should this occur, based on the proposed levels of the site, surface water would either remain on site or flow to the north and northwest of the site over existing greenfield buffer which is not to be developed prior to flowing towards the existing Rhines. There is no risk of flooding from exceedance to the site or the surrounding area. The exceedance will be assessed in more detail for the detailed drainage design.

## 5.5 Maintenance Requirements

The developer is to ensure that maintenance of the drainage system is provided for as part of the overall management plan for the site.

Maintenance plans for drainage features are detailed on the following tables.

**Table 5-2 Drainage System Maintenance Requirements**

Inlets, Outlets, Controls, and Inspection Chambers		
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly
	Remove debris and sediment from chambers	Monthly for first six months, then quarterly or after significant storm
Remedial actions	Repair/rehabilitate where required	As required
	Routine rodding/ jetting of pitch subbase drainage as required	Annual/ after significant storm
Monitoring	Check all structures to ensure all is in good condition and operating as designed.	Annually
	(Flow controls) check for evidence of blockage	Monthly or after significant storm.
	(Flow controls) check for damage to components	Annually or after significant storm.
Permeable Pavement / Permeable Surfacing		
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly

	Remove debris, vegetation and sediment from surfaces and inspection of inlets, outlets and control structures.	Monthly for first six months, then quarterly or after significant storm
Remedial actions	Repair/rehabilitate where required	As required
	Routine rodding/ jetting of subbase drainage as required. Inlet/outlet repair, erosion repairs, reinstatement of edgings, reinstatement following pollution and removal of silt build up.	Annual/ after significant storm As required
Monitoring	Check all structures to ensure all is in good condition and operating as designed.	Annually
	Silt control around components, vegetation management around components and suction /sweeping of permeable paving	Annually
	(Flow controls) check for evidence of blockage	Monthly or after significant storm.
	(Flow controls) check for damage to components	Annually or after significant storm.
<b>Filter Drains</b>		
Regular Maintenance	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	Monthly
	Remove sediment from pre-treatment devices	Six monthly
Occasional Maintenance	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
<b>Swale</b>		
Regular Maintenance	Remove litter and debris	Monthly, as required
	Cut grass - to retain grass height within specific design range Manage other vegetation and remove nuisance plants	Monthly, as required
	Inspect inlets, outlets, and overflows for blockages, and clear if required	Monthly

	Inspect filtration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, as required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or re-seeding	As required
	Relevel uneven surfaces and reinstate design level	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

## 5.6 Drainage Summary

The proposed development shall be resilient to surface water flooding. Site drainage design shall ensure the site is drained and flood resilient. Drainage design shall be as per the requirements of SGDC. Runoff shall be limited to the pre-development greenfield Qbar rate of 5.48l/s and shall not affect flooding elsewhere.

Attenuation for surface run off will be provided with the use of an under drained swale, filter drains, permeable surfaces, and an oversized tank sewer for a total volume of 486m<sup>3</sup>.

## 6 FLOOD RISK SUMMARY

### 6.1 Summary of Findings

Initial screening identified three sources of flooding requiring more detailed assessment, those being tidal flood risk, flood defence breach/failure and surface water drainage. No other sources of flood risk pose a significant risk to the site.

Detailed EA data confirms that the site is in a defended tidal floodplain that may be at risk of shallow flooding in the event of a 0.1% flood, and the site is not in an area at significant risk in the event of a flood defence breach. No further mitigation is essential; however, awareness of flood management measures is recommended to address the residual risk of low probability flooding.

The vulnerability of the site is appropriate in defended Flood Zone 3 and the sequential approach is satisfied.

Surface water run-off will be managed to the pre-development greenfield run-off rates with appropriate application of SuDS to attenuate the calculated surface water volume to ensure there is no flood risk to the site and the surrounding area.

### 6.2 Residual Risk

The following table summarises the mechanisms of flooding identified during this study, their associated hazards, and proposed measures to mitigate the possible residual risk.

Residual risk are the effects of a flood with a magnitude greater than that for which the defences have been designed to alleviate. This can result in overtopping and/or failure of defences to perform their intended duty. It has been shown that the risk from breach does not impact the site as shown in the EA modelled breach data.

**Table 6.1: Summary and Mitigation**

Identified Flood Mechanism	Mitigating Measure
Tidal flooding	<p>The development would not be at risk of flooding for the DWL (1 in 200-year new defences) unless there is an extreme flood event with the new defences in place. However, it is reiterated that the lifetime of the development would predate both the 1 in 200-year and the 1 in 1000-year (2098) scenario but is applied as a precaution and the best available data in the absence of the up-to-date climate change allowances in the EA modelled data.</p> <p>The site is to be registered with the Environment Agency Flood Warning Scheme and a flood evacuation plan to be provided by the applicant to all users of the site.</p>
Breach/ Failure of flood defences	<p>It is recommended the flood warning and evacuation plan includes advice for users of the site on what to do in the event of breach/failure of the flood defences in order to avoid certain areas even though the site is not shown to be at risk based on the EA modelled data.</p>

## 6.3 Recommended Mitigation

### 6.3.1 Emergency Access & Egress / Flood Management Plan

It is recommended that the site operator with a flood management plan, to be aware of what to do in the event of a flood event/ defence breach. Even though the site is only at risk during an extreme flood event, should this unlikely event occur, the site may be subject to flooding.

A detailed evacuation management plan should be implemented for the site that will be adhered to throughout the lifetime of the development.

In addition, the following recommendations are made:

- The site will be registered with the Environment Agency, under the 'Flood Warnings Service (<https://www.fws.environment-agency.gov.uk/app/olr/register>)' scheme, with key personnel to be alerted in the event of significant flood risk warning in the area of the site.
- The Site operator shall provide a site egress / access plan as part of the Health and Safety file for the site.
- All site personnel shall be made aware of the risk / potential for flooding as part of site induction.
- All site personnel shall be provided with information relating to site evacuation.

Given the tidal nature of flooding at the site and the likelihood of reliable flood warnings, it is suggested that the flood management plan should primarily function as a means to ensure organised evacuation of the site well in advance of any onset of flooding.

## Appendix A

# Survey Drawing

**UTILITY SURVEY DRAWING KEY****Additions and Symbols**

1207	Spot Height	880	Vertical Curve
1208	Spot Height	121	Vertical Curve
1209	Spot Height	122	Vertical Curve
1210	Spot Height	123	Vertical Curve
1211	Spot Height	124	Vertical Curve
1212	Spot Height	125	Vertical Curve
1213	Spot Height	126	Vertical Curve
1214	Spot Height	127	Vertical Curve
1215	Spot Height	128	Vertical Curve
1216	Spot Height	129	Vertical Curve
1217	Spot Height	130	Vertical Curve
1218	Spot Height	131	Vertical Curve
1219	Spot Height	132	Vertical Curve
1220	Spot Height	133	Vertical Curve
1221	Spot Height	134	Vertical Curve
1222	Spot Height	135	Vertical Curve
1223	Spot Height	136	Vertical Curve
1224	Spot Height	137	Vertical Curve
1225	Spot Height	138	Vertical Curve
1226	Spot Height	139	Vertical Curve
1227	Spot Height	140	Vertical Curve
1228	Spot Height	141	Vertical Curve
1229	Spot Height	142	Vertical Curve
1230	Spot Height	143	Vertical Curve
1231	Spot Height	144	Vertical Curve
1232	Spot Height	145	Vertical Curve
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1234	Spot Height	147	Vertical Curve
1235	Spot Height	148	Vertical Curve
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1237	Spot Height	150	Vertical Curve
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1239	Spot Height	152	Vertical Curve
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1247	Spot Height	160	Vertical Curve
1248	Spot Height	161	Vertical Curve
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1267	Spot Height	180	Vertical Curve
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1276	Spot Height	189	Vertical Curve
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1279	Spot Height	192	Vertical Curve
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1281	Spot Height	194	Vertical Curve
1282	Spot Height	195	Vertical Curve
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1284	Spot Height	197	Vertical Curve
1285	Spot Height	198	Vertical Curve
1286	Spot Height	199	Vertical Curve
1287	Spot Height	200	Vertical Curve
1288	Spot Height	201	Vertical Curve
1289	Spot Height	202	Vertical Curve
1290	Spot Height	203	Vertical Curve
1291	Spot Height	204	Vertical Curve
1292	Spot Height	205	Vertical Curve
1293	Spot Height	206	Vertical Curve
1294	Spot Height	207	Vertical Curve
1295	Spot Height	208	Vertical Curve
1296	Spot Height	209	Vertical Curve
1297	Spot Height	210	Vertical Curve
1298	Spot Height	211	Vertical Curve
1299	Spot Height	212	Vertical Curve
1300	Spot Height	213	Vertical Curve

**UTILITY SURVEY SITE NOTES**

1. Utility lines are shown for information only. They are not to be used for design or construction purposes. The design and construction of the utility lines should be based on the latest available information and the design of the utility lines should be based on the latest available information.

**General Notes**

1. This drawing is for information only and does not constitute an offer of any service. It is intended to provide a general overview of the site and its utility infrastructure. It is not to be used for design or construction purposes. The design and construction of the utility lines should be based on the latest available information and the design of the utility lines should be based on the latest available information.

**Disclaimer**

The Survey People Limited and its staff and employees are not liable for any loss or damage of any kind arising from the use of this drawing or any information contained herein. The Survey People Limited and its staff and employees are not liable for any loss or damage of any kind arising from the use of this drawing or any information contained herein.

**Vertical & Horizontal Position**

The horizontal and vertical positions of the utility lines are shown for information only. They are not to be used for design or construction purposes. The design and construction of the utility lines should be based on the latest available information and the design of the utility lines should be based on the latest available information.

**RESPONSIBLE PARTIES & ASSOCIATED DETAILS**

Draw No	By	Date

**CLIENT**  
MCR Property Group

**SHEET NO. & SCALE**  
A0 @ 1:500

**DATE SIGNED**  
September 2021

**DRAWING NUMBER**  
6063

**DRAWING BY**  
RL

**DATE**

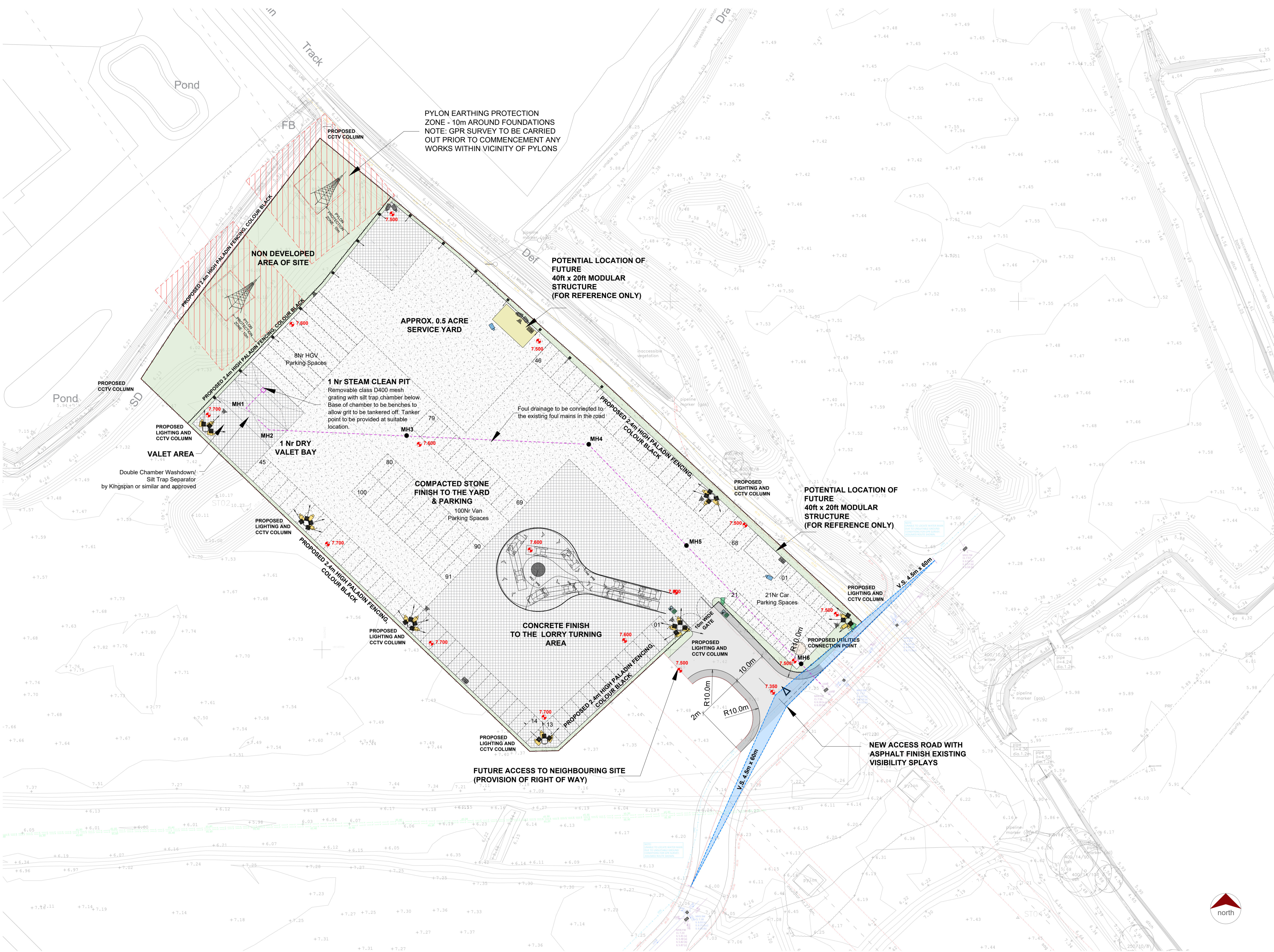
**LANDMARK SURVEYS WALES**  
THE SURVEY PEOPLE

101 Oldfield Road, Aberystwyth, Ceredigion, SA23 3LW

## Appendix B

# Development Proposal Drawing





**DRAWING KEY**

	SITE BOUNDARY SITE AREA 16,868m <sup>2</sup> / 1.68ha
	PROPOSED VISIBILITY SPLAYS
	PROPOSED FENCING
	PROPOSED FOUL DRAINAGE
	PROPOSED ASPHALT ACCESS ROAD
	PROPOSED ASPHALT FOOTPATHS
	PROPOSED CONCRETE FINISH
	PROPOSED COMPACTED STONE FINISH
	PROPOSED GRASSED AREAS
	FUTURE TEMPORARY UNITS

**DRAWING KEY**

	AVIGILON 4MP BULLET 4.0C-H5A-B01-IR
	AVIGILON 4MP BULLET 8.0C-H5A-B01-IR
	AVIGILON 4MP BULLET 5.0C-H5SL-B01-IR
	ANPR CAMERA
	SELF-AMPLIFIED SPEAKER IP-A1SC15 IP
	THORN 210W
	THORN 40W
	AVIGILON H4A INTERCOM 3.0C-H4V1-R01-IR
	PAXTON NET2 SHORT RANGE READER 390-747
	CABINET
	12-15 METER POLE TBC
	10-15 METER POLE TBC

**DRAWING NOTES**

Do not scale from drawings. All discrepancies to be reported to the Architect immediately. All dimensions to be verified by the Contractor on site prior to any works, manufacture, or ordering of materials.

Any small changes made on site may not be reflected on record drawings. Please refer to the Contractor's as-built fabrication drawings.

**DRAWING REVISIONS**

REV	DATE	DRAWN	CHECK	CHANGE	STATUS
A	04.16.2023	HS	JB	PROPOSED SITE LEVELS AND PYLON EARTHING PROTECTION ZONE INDICATED.	

**whittakerandwatt architects**

project **CVA @ EAST CLIFF BUSINESS PARK  
SEVERN ROAD, HALLEN  
AVONMOUTH  
BRISTOL BS10 7GD**

client **BALLYVESEY HOLDINGS**

dwg name **PROPOSED SITE LAYOUT**

scale **1:500** page **A1** date **19.07.2023** drawn **HS** checked **JB**

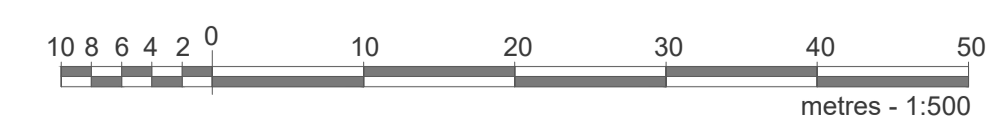
**PLANNING DRAWING**

**23.88(09) - P03A**

SK - Sketch / P - Planning / BC - Building Control  
T - Tender / C - Construction / F - Final Revision

**whittakerandwatt**  
379 Antrim Road, Newtownabbey, Co. Antrim, BT36 5EB  
W - www.warch.co.uk / T - 028 9084 1029

**PROPOSED SITE LAYOUT**  
1:500 @A1



## Appendix C

### EA Flood Data Product 4 and 8

Sophie Taylor  
 Mccloy Consulting Ltd  
 sophie.taylor@McCloyConsultingLtd.onmicrosoft.com  
 Kyle.somerville@mccloyconsulting.com

**Our ref:** 324589-WX  
**Date:** 20th September 2023

Dear Sophie Taylor,

Thank you for your enquiry which was received on 31st August 2023. We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

#### Abstract

Name	Product 4
Description	Detailed Flood Risk Assessment Map for <b>East Cliff Business Park, Hallen, Avonmouth, Bristol, BS10 7GD</b> <b>NGR: ST5425481645</b>
Licence	<a href="#">Open Government Licence</a>
Information Warnings	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights.  Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

#### Flood Map for Planning

The Flood Map for Planning is now classed as Open Data. It can be downloaded free of charge under an open data licence from the following weblink:

<https://data.gov.uk/publisher/environment-agency>

If you search for the 'flood map for planning' in the search box the following datasets will be available for you select and download the data:

- Flood Map for Planning (Rivers and the Sea) – Flood Zones 2 and 3
- Flood Map for Planning (Rivers and Sea) – Areas Benefiting from Defences
- Flood Map for Planning (Rivers and Sea) Flood Storage Areas
- Flood Map for Planning – Spatial Flood Defences (without Standard attributes)
- Recorded Flood Outlines
- Historic Flood Map
- Risk of Flooding from Surface Water Extent for:
  - 3 percent annual chance
  - 1 percent annual chance
  - 0.1 percent annual chance

If you have requested this information to help inform a development proposal, then you should also note the detail in the attached advisory text on the use of Environment Agency Information and Further Guidance for FRAs.

### **Flooding History**

We no longer produce pdf copies of the Historic Flood Map. This information is available to search select, and download free of charge as part of the Government's 'open data' as

- Recorded Flood Outlines
- the Historic Flood Map

These are GIS layers and can be downloaded from: <https://data.gov.uk/publisher/environment-agency>

Please note we cannot guarantee that this is an exhaustive list of all past flood events in this location. All reasonable care has been taken to ensure that the historical flood event data is as accurate as possible. The Environment Agency will update its records if new evidence emerges.

### **ASEA Coastal Inundation model**

South Gloucestershire Council, Bristol City Council and the Environment Agency are working together to improve flood defences and create new habitats for important wildlife species as part of the Avonmouth Severnside Enterprise Area (ASEA) Ecology Mitigation and Flood Defence Project. For further details about this project, including progress to date, please see the following link:

<https://www.asea-flood-ecology.co.uk/>

Contractors BMMjv have been on site since summer 2019 and have commenced work at each sub section area. Please refer to our [website](#) for the latest programme for completion dates.

As part of this project, a new coastal inundation model was produced in 2018 for the Avonmouth/Severnside area to represent the impact of the new flood defence.

The 2018 version of the model includes pre development (i.e. representing the defences as they were before work commenced in 2020) and post development (representing the impact of the defences currently in construction) scenarios, for both present day and future dates (2076 and 2098). A scenario representing the breach of the proposed flood defences in 2098 was also modelled in 2018. However, the 2018 version of the model used UKCP09 sea level rise allowances, which have been superseded by UKCP18 allowances.

Please let us know if you wish to obtain a copy of the modelling report or model.

Due to changes in the flood defence design and a need to re-run breach scenarios in the Bristol City Council local authority boundary, we are only supplying post development 2098 depths and levels and post development 2098 breach scenarios from the 2018 version of the model as this is currently the best available data.

A further update of the ASEA coastal inundation hydraulic model is underway with post-development scenarios (including 0.5% AEP / 1 in 200 year) representing the final detailed design of the flood defence scheme (Defended) in the present day and future epochs (2083, 2098 and 2123) and separate breach scenarios. The model will include the latest UKCP18 sea level rise guidance. The results from this modelling update are required later in 2023.

We understand that Bristol City Council are updating their SFRA Level 2 and it depends on timing as to whether the updated modelled results will be available or have to be added in at a later date.

Customer & Engagement, Wessex  
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS  
Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

## Flood Levels

From the ASEA model we have provided the flood level and depth for the pre and post development 2076, post development 2098 and breach 2098 for your proposed site:

### Pre-Development 2076 (with existing defences)

Pre-Development 2076 0.5% (1 in 200 year) AEP Depth	0.00m	Depth
Pre-Development 2076 0.1% (1 in 1000 year) AEP Depth	1.78m	Depth
Pre-Development 2076 0.5% (1 in 200 year) AEP Level	0.00mAOD	Level
Pre-Development 2076 0.1% (1 in 1000 year) AEP Level	7.70mAOD	Level

### Post Development 2076 (new defences in place)

Post Development 2076 0.5% (1 in 200 year) AEP Depth	0.00m	Depth
Post Development 2076 0.1% (1 in 1000 year) AEP Depth	0.00m	Depth
Post Development 2076 0.5% (1 in 200 year) AEP Level	0.00mAOD	Level
Post Development 2076 0.1% (1 in 1000 year) AEP Level	0.00mAOD	Level

### Post Development 2098 (new defences in place)

Post Development 2098 0.5% (1 in 200 year) AEP Depth	0.00m	Depth
Post Development 2098 0.1% (1 in 1000 year) AEP Depth	2.00m	Depth
Post Development 2098 0.5% (1 in 200 year) AEP Level	0.00mAOD	Level
Post Development 2098 0.1% (1 in 1000 year) AEP Level	7.75mAOD	Level

### Post Development Breach of new defences 2098

Post Development 2098 0.5% (1 in 200 year) AEP Depth (Breach Composite)	0.00m	Depth
---	-------	-------

N.B. Levels and depths have been extracted based upon the site boundary plan provided.

## Strategic Flood Risk Assessment (SFRA)

When preparing your Flood Risk Assessment (FRA) to support the planning application, you should also refer to South Gloucestershire's Level 1 SFRA available to download at the following link:

<https://www.southglos.gov.uk/documents/pte110277.pdf>

As outlined above we understand that in due course the SFRA Level 2 for Bristol will be updated by the Local Planning Authority but currently there are no timescales for this.

Customer & Engagement, Wessex  
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS  
Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

## Planning

If you have questions regarding the planning nature of your enquiry, or require advice on floor levels, please contact our Sustainable Places team on [NWX.SP@environment-agency.gov.uk](mailto:NWX.SP@environment-agency.gov.uk). Please be aware that we now charge for planning advice when consulted on pre-application enquiries. This new approach provides advice to developers in two ways. Firstly, there is the provision of 'free' advice available to everyone where we give a preliminary opinion on a proposed development. This sets out the environmental constraints together with any issues this raises for us. Should you wish us to review in detail any of these issues then we can do this through a chargeable scheme aimed at recovering our costs.

## Flood Defences

Please find enclosed details of Flood Defences within the vicinity of the site boundary. This information has been taken from our Asset Information Management System database (AIMS).

Please note that flood defences can increase water levels elsewhere e.g., through channels being restricted by defences, or because defences prevent flood water flowing back into the river channel.

## Extreme Tide Level (Still Water) Information

**IMPORTANT.** If you are carrying out a Flood Risk Assessment you should also review the Still Water Tide Level data from the Coastal Flood Boundary Study 2018. You should be mindful that in some locations the predicted Still Water Tide Levels are higher than the locally modelled water levels provided above. When this is the case the higher water levels should be taken into account in your Flood Risk Assessment.

For more information on climate change allowances please see guidance on the Gov.UK website here: [Flood risk assessments: climate change allowances - GOV.UK](#)

The updated Still Water Tide Level Data (baseline 2017) from the Coastal Flood Boundary Study 2018 is also available to download from our [data.gov.uk](#) site. Please search for 'Coastal Design Sea Levels'.

For your information you can view the Coastal Flood Boundary Study 2018 technical summary report and the user guide below.

<https://www.gov.uk/government/publications/coastal-flood-boundary-conditions-for-uk-mainland-and-islands-design-sea-levels>

## Environmental Permit for Flood Risk Activities

In addition to any other permission(s) that you may have already obtained e.g., planning permission, you may need an environmental permit for flood risk activities (formerly known as Flood Defence Consent prior to 06 April 2016) if you want to do work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

For further information and to check whether a permit is required please visit:

<https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>.

For any further advice, please contact your local Environment Agency Office, at [bridgwater.frap@environment-agency.gov.uk](mailto:bridgwater.frap@environment-agency.gov.uk).

## Further Information

We advise that you also contact the Flood Risk Management Team, by email [LeadLocalFloodAuthority@southglos.gov.uk](mailto:LeadLocalFloodAuthority@southglos.gov.uk), or by telephone, 01454 868000, at South Gloucestershire

Customer & Engagement, Wessex  
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS  
Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

Council, Council Offices, Badminton Road, Yate, Bristol, BS37 5AF, as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for FRAs:

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We hope you find this information helpful, and it is provided subject to the guidance below, which we strongly recommend you read.

Yours sincerely

Dawn Fullthorpe

Customer & Engagement, Wessex

Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS

Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)

**Enc:** Use of Environment Agency Information for Flood Risk Assessments (below)  
324589-WX Product 8 Letter  
324589-WX Defence Map  
324589-WX Defence Data

Customer & Engagement, Wessex

Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS

Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

VAT No: 662 4901 34

## **Use of Environment Agency Information for Flood Risk Assessments (FRAs)**

### **Important**

Use of Environment Agency data: you should note that

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but the use of Environment Agency information does not constitute such an assessment on its own.
2. As part of your data request, we have provided all of the modelled data we hold for your location. Please note that some of our modelled information may have been produced for purposes other than for flood zone generation. This may mean that some of the modelled data you have been provided with has a lower confidence level, and has not been used in producing our flood map, nor definitively reflects the predicted flood water level at the property/development site scale. To check the suitability of the use of this information in your FRA please contact your local Partnership & Strategic Overview (PSO) team.
3. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. The information produced by the Local Planning Authority and the Lead Local Flood Authority (LLFA) may assist in assessing other sources of flood risk.
4. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection.
5. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your Local Planning Authority.

### **Pre-Planning Advice from the Environment Agency**

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:

Pre-application Preliminary Opinion:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Pre-application Charged Service:

<https://www.gov.uk/government/publications/planning-advice-environment-agency-standard-terms-and-conditions>

Depending on the enquiry we may also provide advice on other issues related to our responsibilities, including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

### **Flood Risk Assessment (FRA) Guidance**

You should refer to the Planning Practice Guidance of the National Planning Policy Framework (NPPF) and the Environment Agency's Flood Risk Standing Advice for information about Flood Risk Assessment (FRA) for new development in the different Flood Zones. These documents can be accessed via:

National Planning Policy Framework Planning Practice Guidance:

<http://planningguidance.planningportal.gov.uk/>

Environment Agency advice on FRAs:

Customer & Engagement, Wessex  
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS  
Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)



<https://www.gov.uk/flood-risk-assessment-for-planning-applications#when-to-follow-standing-advice>

<https://www.gov.uk/government/publications/planning-applications-assessing-flood-risk>

Sophie Taylor  
McCloy Consulting Ltd  
sophie.taylor@McCloyConsultingLtd.onmicrosoft.com  
Kyle.somerville@mccloyconsulting.com

**Our ref:** 324589-WX  
**Date:** 20th September 2023

Dear Sophie Taylor,

Information request for:

**East Cliff Business Park, Hallen, Avonmouth, Bristol, BS10 7GD**

Thank you for your enquiry which was received on 31st August 2023.

The attached Product 8 data is based upon breach/asset failure modelling that was commissioned in 2014 using our Wessex North Coast Tidal 2012 model. This analysis has sought to provide the Environment Agency with an indication of risk associated with the breach/failure scenarios as well as an indication of the risk mitigation significance of a defence or structure at the 200yr still water level.

The Product 8 format shows the **combined** maximum of depth, hazard and velocity for individual breach/asset failure scenarios. The locations of the breach/asset failure are shown on the maps and further details may be found in the accompanying data table.

This study does not address the impact of wave overtopping on the scenarios modelled and presented here. Wave data, where applicable can be viewed in the Somerset North Coast Flood Warning Improvements (JBA, 2012). Models have been run to simulate low frequency events (200 yr still water level). When an asset failure is added to the event, the scenario becomes less likely in accordance with the strength of the structure simulated to fail. In addition, many structures are fitted with secondary defences such as penstocks on the landward side and these structures provide additional mitigation that has not been modelled in the scenarios.

Please be aware, the selection of the breaches and assets is not an indication of a probability of failure and breaches or failures could occur at any point of our coastal defences. As such, it is unlikely that the modelling and mapping will be representative of the highest potential source of breach hazard for your specific site. Please also note that the modelled scenarios will also include residual risk which exists in a 200yr still water event without any breach or failure.

As the modelling was not commissioned for the purposes of site-specific Flood Risk Assessments, we can make no guarantee that the results are suitable for this purpose. We do, however, hope that you will find it useful in your overall assessment of flood risk at your site.

**Please also refer to the data Conditions and Information Warnings below**

Name	Product 8
Description	North Coast Tidal Model 2014 Breach Hazard Map and Data
Sharefile Link	<a href="https://ea.sharefile.com/d-sac83be6231c445bc9fbbf847b7f19975">https://ea.sharefile.com/d-sac83be6231c445bc9fbbf847b7f19975</a>
Conditions	<p>1.0 You may use the Information for your internal or personal purposes and may only sublicense others to use it if you do so under a written licence which includes the terms of these conditions and the agreement and in particular may not allow any period of use longer than the period licensed to you.</p> <p>2.0 Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of 5 years at the end of which it will terminate automatically without notice.</p> <p>3.0 We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentiality of others. In this instance it is because of sensitive data.</p>
Licence	<a href="#">Open Government Licence</a>
Information Warnings	<p>1.0 This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.</p> <p>2.0 The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.</p> <p>3.0 The map only considers the consequences of a breach; it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.</p> <p>4.0 Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.</p>
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	<p>Contains Ordnance Survey data © Crown copyright 2021</p> <p>Ordnance Survey 100024198. Contains Environment Agency information © Environment Agency and/or database rights.</p>

## Further Information

We advise that you also contact the Flood Risk Management Team, by email [LeadLocalFloodAuthority@southglos.gov.uk](mailto:LeadLocalFloodAuthority@southglos.gov.uk), or by telephone, 01454 868000, at South Gloucestershire Council, Council Offices, Badminton Road, Yate, Bristol, BS37 5AF, as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

We hope you find this information helpful.

Yours sincerely

Dawn Fullthorpe

Customer & Engagement, Wessex  
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS  
Email: [wessexenquiries@environment-agency.gov.uk](mailto:wessexenquiries@environment-agency.gov.uk)

**Enc:** 324589-WX - Breach hazard map  
324589-WX - Breach depth map  
324589-WX - Breach velocity map  
Asset Summary Table

Product 4 - AIMS Information

324589-WX

Date:

01/09/2023

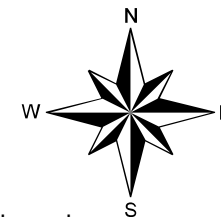
Map Ref	Asset ID	Asset Type	Right or left bank	Asset Description	Approx length (m)	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
1	184339	Embankment	Coastal	Embankment Defence formed from rail embankment	635.20	9.44	4 - +/- 0.75m or more vertical accuracy	9.44	4 - +/- 0.75m or more vertical accuracy	9.49	2 - +/- >0.05m to 0.15m vertical accuracy (Typically LIDAR or Photogrammetry)	ST53268254	18/02/2019	2 - Good
3	25168	Embankment	Coastal	Earth Embankment Defence	172.35	9.50	4 - +/- 0.75m or more vertical accuracy	9.50	4 - +/- 0.75m or more vertical accuracy	9.90	1 - +/- 0.01m to 0.05m vertical accuracy (Typically on site survey)	ST52808182	22/11/2018	2 - Good
4	39397	Embankment	Coastal	Earth Embankment Defence incorporating Mitchells O/F	569.20	9.50	4 - +/- 0.75m or more vertical accuracy	9.50	4 - +/- 0.75m or more vertical accuracy	9.44	1 - +/- 0.01m to 0.05m vertical accuracy (Typically on site survey)	ST52718154	22/11/2018	2 - Good
5	39398	Embankment	Coastal	Earth Embankment Defence	72.02	9.00	4 - +/- 0.75m or more vertical accuracy	9.00	4 - +/- 0.75m or more vertical accuracy	9.12	1 - +/- 0.01m to 0.05m vertical accuracy (Typically on site survey)	ST52958202	18/02/2019	3 - Fair
8	51387	Embankment	Coastal	Embankment Defence formed from rail embankment	260.76	9.06	4 - +/- 0.75m or more vertical accuracy	9.40	4 - +/- 0.75m or more vertical accuracy	9.49	2 - +/- >0.05m to 0.15m vertical accuracy (Typically LIDAR or Photogrammetry)	ST53048213	18/02/2019	2 - Good
9	55699	Embankment	Coastal	Earth Embankment Defence	177.46	9.00	4 - +/- 0.75m or more vertical accuracy	9.00	4 - +/- 0.75m or more vertical accuracy	9.64	1 - +/- 0.01m to 0.05m vertical accuracy (Typically on site survey)	ST52858194	22/11/2018	3 - Fair
10	77118	Embankment	Coastal	Earth Embankment Defence, around rail opening	43.93	9.65	4 - +/- 0.75m or more vertical accuracy	9.65	4 - +/- 0.75m or more vertical accuracy	9.48	1 - +/- 0.01m to 0.05m vertical accuracy (Typically on site survey)	ST53128224	18/02/2019	3 - Fair

**Notes**




- \* Overall Condition has been taken from the most recent inspection
- \* Inspections are of a purely visual nature and do not necessarily reflect the true condition of the asset
- \* Condition: 1 = very good, Condition 2 = good, Condition 3 = fair, Condition 4 = poor, Condition 5 = very poor
- \* Crest level accuracy: 1 = ± 0.01 to 0.05m, 2 = ± 0.05 to 0.15m, 3 = ± 0.15 to 0.75m, 4 = ± 0.75 or greater
- \* DNR = data not recorded



Scale:1:10,000 At A3













**Legend**

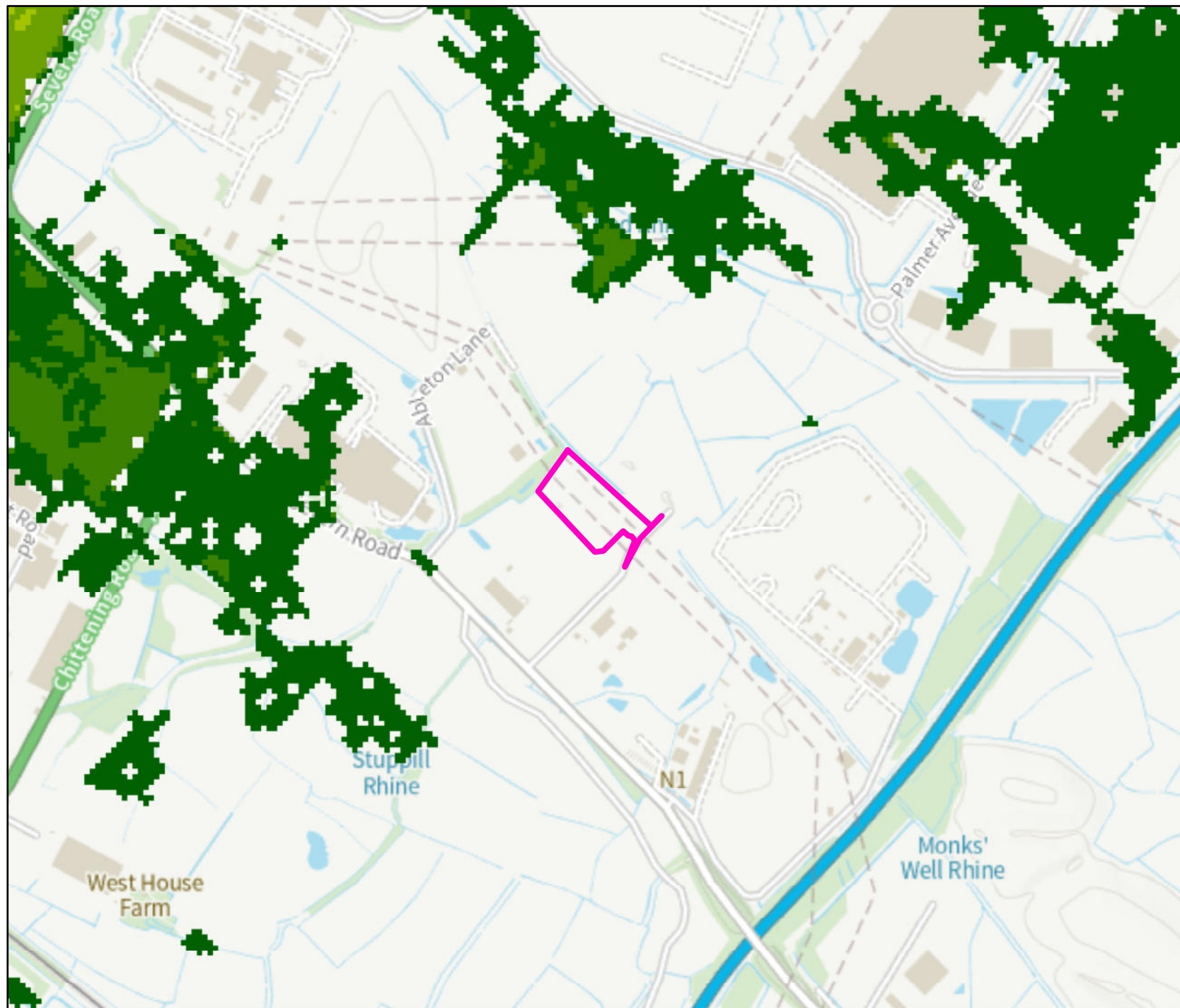
-  324589-WX\_site\_boundary
-  Asset\_failure\_locations
-  Statutory\_Main\_Rivers

**Avonmouth\_39to49\_Depth**

**Depth (m)**

-  0.000024 - 0.5
-  0.51 - 1
-  1.1 - 1.5
-  1.6 - 2
-  2.1 - 2.5
-  2.6 - 3
-  3.1 - 3.5
-  3.6 - 4
-  4.1 - 4.5
-  > 4.6




We strongly advise that you refer to the caveats in the letter accompanying this map, regarding the usability and appropriateness of the information contained within the map.

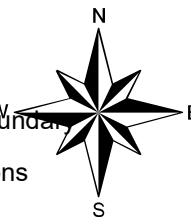




Scale:1:10,000 At A3













Legend

-  324589-WX\_site\_boundar
-  Asset\_failure\_locations
-  Statutory\_Main\_Rivers

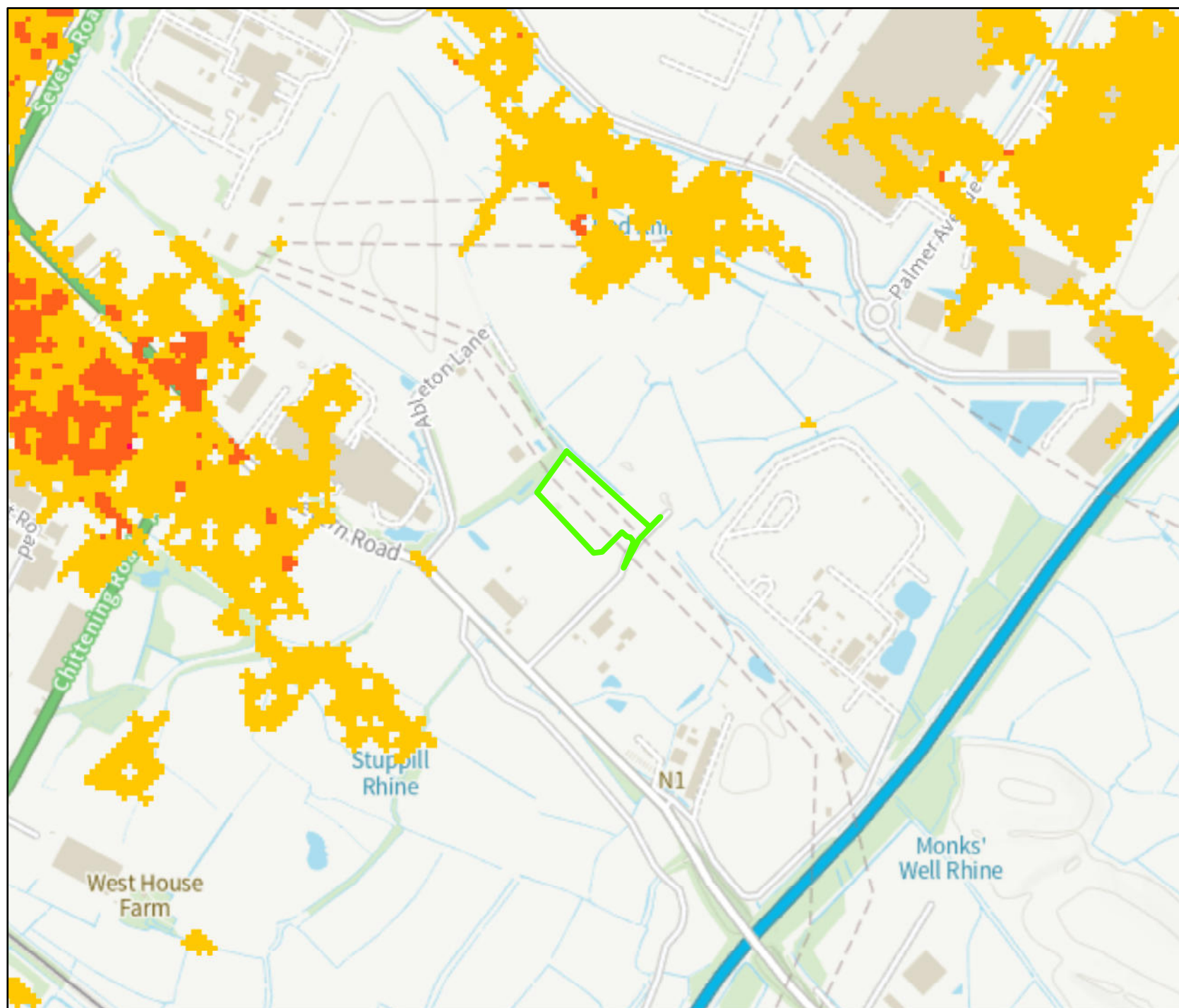


Avonmouth\_39to49\_Velocity

Velocity (m/s)

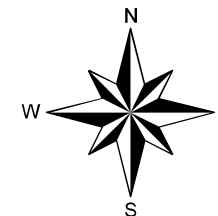
-  0 - 0.1
-  0.11 - 0.25
-  0.26 - 0.5
-  0.51 - 1
-  1.1 - 1.5
-  1.6 - 1.9
-  2 - 2.4
-  2.5 - 3
-  3.1 - 3.5
-  3.6 - 4
-  4.1 - 4.5
-  4.6 - 5

We strongly advise that you refer to the caveats in the letter accompanying this map, regarding the usability and appropriateness of the information contained within the map.








Scale:1:10,000 At A3







**Legend**

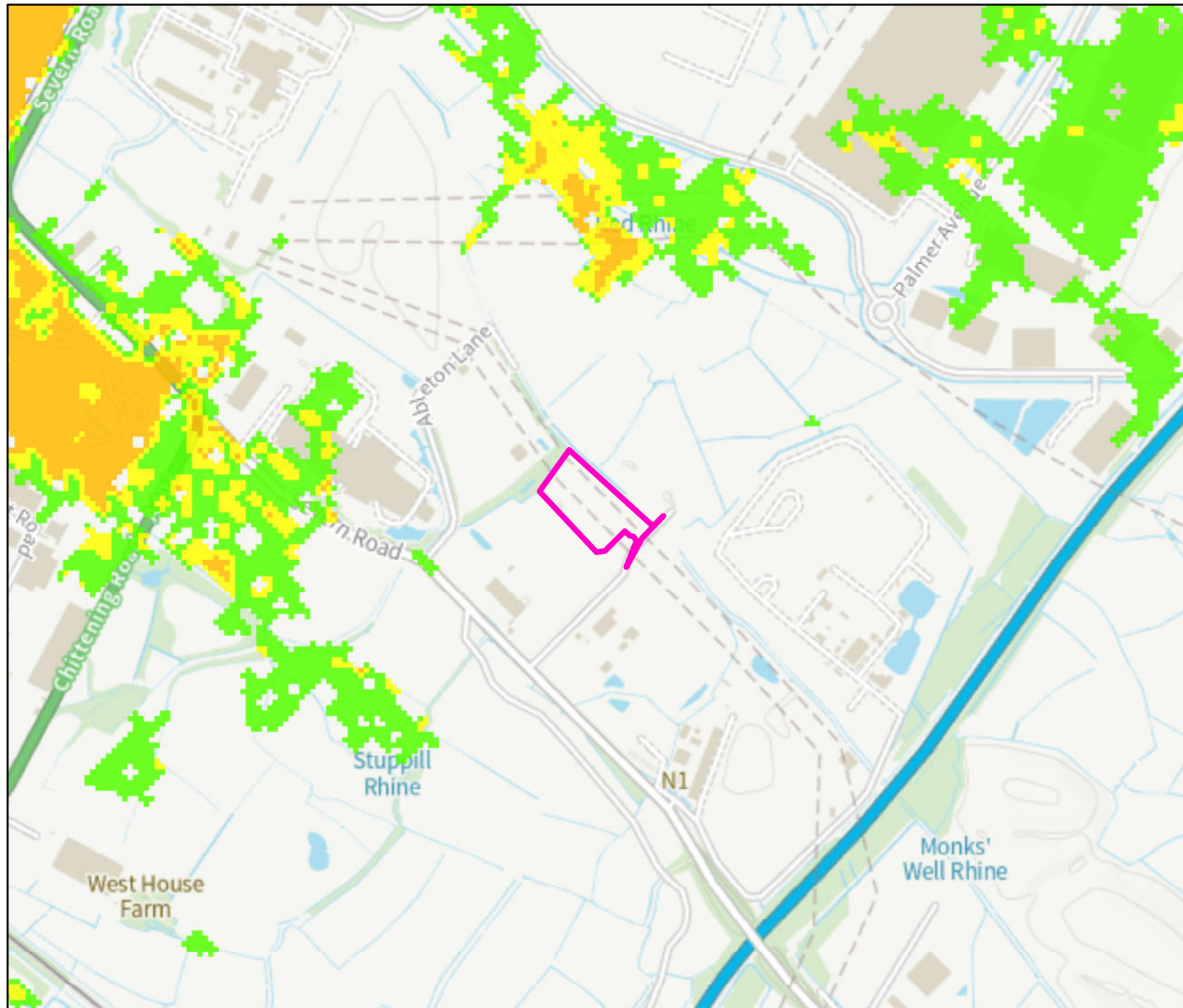
-  324589-WX\_site\_boundary
-  Asset\_failure\_locations
-  Statutory\_Main\_Rivers

**Avonmouth\_39to49\_Hazard**

<VALUE>

-  <0.75 (Very low hazard)
-  0.75 - 1.25 (Danger for some)
-  1.25 - 2.0 (Danger for most)
-  >2.0 (Danger for all)

We strongly advise that you refer to the caveats in the letter accompanying this map, regarding the usability and appropriateness of the information contained within the map.







Scale: 1:10,000

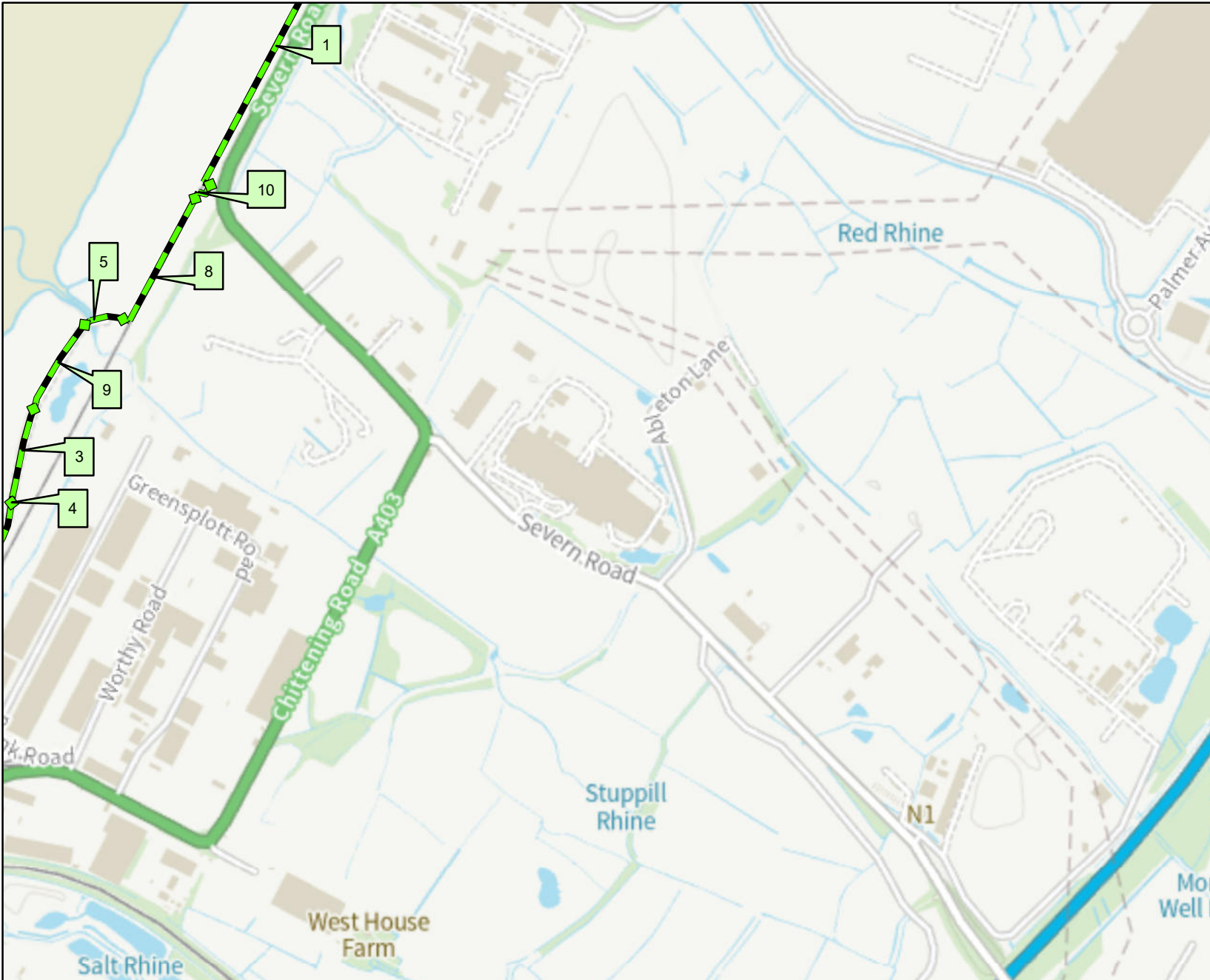


**Legend**

**Defences**

- Barrier Beach
- Beach
- Bridge Abutment
- Cliff
- Demountable Defence
- Dunes
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Promenade
- Quay
- Spillway
- Wall

This data has been extracted from the Asset Information Management System (AIMS OM) which was created to draw various data sources into one database and has been populated with information of varying quality.



ID	Name	Description	Community	Grid Reference
<a href="#">1</a>	Quay Street Flood Gate	Flood Gate in concrete flood wall. Gate approximately 4m wide and 1m high.	Minehead	SS 97197 46721
<a href="#">2</a>	Minehead Seawall, Warren Road	Minehead Seawall. Seawall with 15m width esplanade is approximately 1m higher than the road behind. Ground level decreases landwards from the road to 5.8mAOD.	Minehead	SS 97886 46335
<a href="#">3</a>	Warren Point (Butlin's Moat) Outfall	The asset drains Butlin's Moat through the sea defences to a culverted offshore outfall with a diameter of 5m approximately 125m from the sea wall. A triple penstock exists on the outward face of the moat.	Minehead	SS 98334 46429
<a href="#">4</a>	Warren Point Flood Gate	Flood Gate in concrete flood wall. Gate approximately 4m wide and 1m high. Flood gate is the link between the Minehead Seawall and a cob and concrete wall.	Minehead	SS 98405 46488
<a href="#">5</a>	Earth Bank, Dunster Marsh	Earth embankment reinforced with stone. Structure has a height of 8.6m, more than 2.5m higher than golf course behind.	Minehead	SS 99331 46246
<a href="#">6</a>	Flapped Outfall, Dunster Beach	Flapped outfall. The asset drains water through the sea defences to a culverted offshore outfall approximately 33m from the earth embankment.	Minehead	SS 99731 45454
<a href="#">7</a>	Earth Bank, Dunster Beach	Earth embankment with holiday homes located on top of structure. Crest height of 8.8m, approximately 2.8m higher than ground level behind.	Minehead	SS 99940 45025
<a href="#">8</a>	Flapped Outfall, Pill Bridge, Blue Anchor	Flapped outfall adjacent to caravan park. The asset drains water through the sea defences to a culverted offshore outfall approximately 25m from the earth embankment.	Minehead	ST 02728 43468
<a href="#">9</a>	Little Arch Outfall	Flapped outfall. Water is drained through the primary sea defences (earth embankment) with a shingle ridge in front acting as a secondary defence. Dimension unavailable in NFCDD and have therefore been estimated.	Stolford	ST 23390 45796
<a href="#">10</a>	Combwich Common Flapped Outfall	Flapped Outfall. The asset drains water through an earth embankment into the River Parrett.	Combwich	ST 26056 42509
<a href="#">11</a>	Combwich Common Earth Embankment	Earth Embankment. Embankment was described as being resistant to a 1 in 200yr flood event. It is approximately 2m higher than the road behind.	Combwich	ST 26067 42428

<a href="#">12</a>	Combwich Pill Outfall	Outfall. Manually operated steel sluice gate controls flow into culvert.	Combwich	ST 26012 42181
<a href="#">13</a>	Huntspill Sluice Sea Outfall	Flapped Outfall. Water level control structure. The asset drains water of the River Huntspill into the River Parrett.	Huntspill	ST 29269 45731
<a href="#">14</a>	Highbridge Clyce	Flood Gate in sluice. Structure controls water level of River Brue. Right bank of river populated. Asset is approximately 14m wide and 2m high.	Newton	ST 31356 47248
<a href="#">15</a>	Brue Pill (Right Bank)	Flood wall. Earth embankment with 1m high concrete wall on top. Asset approximately 2.5m higher than land behind.	Burnham-On-Sea	ST 30343 47964
<a href="#">16</a>	Burnham on Sea (Pier) Flood Gate	Flood Gate set within a concrete wave return wall with esplanade behind. Gate is approximately 6m wide and 1.5m high.	Burnham-On-Sea	ST 30304 48814
<a href="#">17</a>	Burnham Esplanade Sea Wall, Pavilion	Sea Wall. Esplanade sea wall is approximately 1m higher than the road behind.	Burnham-On-Sea	ST 30350 49114
<a href="#">18</a>	Maddocks Slade Floodgate	Flood Gate. Gate is incorporated in vertical concrete wall adjoining wave return defence. Asset approximately 4m wide and 1m high.	Burnham-On-Sea	ST 30361 49693
<a href="#">19</a>	Warren Farm	Dune with gabion and block work walling. 1m higher than the properties behind.	Brean	ST 29657 57110
<a href="#">20</a>	Brean Cove Flood Gate	Twin flood gates plus single pedestrian flood gate. Assets within armoured seawall section. Approximately 3m wide and 1.2m high.	Brean	ST 29634 58556
<a href="#">21</a>	River Axe (Left Bank)	Earth Embankment. Embankment protects a significant area of agricultural and recreational land. Asset is approximately 2m higher than the land behind.	Brean	ST 30423 58344
<a href="#">22</a>	Brean Cross Sluice	Sluice. Asset within an earth embankment, adjacent to a caravan park, which controls water levels on the River Axe. Sluice is approximately 16m wide and 3m high.	Brean	ST 30858 56233
<a href="#">23</a>	Uphill Sluice	The sluice is a water level control structure with only one eye. Approximately 5m wide. Dimension unavailable in NFCDD and have therefore been estimated.	Uphill	ST 31441 58490
<a href="#">24</a>	Uphill Dunes	Dune system. The end of dune system marks the Interface between natural defences and man-made structures. The dunes are approximately 5m higher than the land behind.	Uphill	ST 31191 58807

<a href="#">25</a>	Sandbay	Dune system. This natural defence is approximately 2m higher than the road behind. Ground level decreases landwards by further 1.5mAOD.	Kewstoke	ST 32976 63526
<a href="#">26</a>	New Bow Sluice	Sluice, in earth embankment. Controls water levels on the River Banwell. Surroundings agricultural. Asset approximately 4m wide and 6m high.	Wick St Lawrence	ST 35311 66008
<a href="#">27</a>	Hurditch's Sea Wall South	Sea wall. The sea wall is a major defence. Its crest is approximately 2.4m higher than the land behind.	Wick St Lawrence	ST 37789 67876
<a href="#">28</a>	Kingston Seymour Mid 2 – Sea Wall	Sea wall with concrete toe. Adjacent to Kenn Outfall. Asset is approximately 3m higher than the land behind.	Clevedon	ST 38505 68775
<a href="#">29</a>	Gullhouse Point	Sea wall with rock armoured toe. Asset is approximately 4m higher than the land behind.	Clevedon	ST 38715 69739
<a href="#">30</a>	Blind Yeo Outfall	Outfall. Water level control structure for Nailsea, Tickenham & Kenn Moors SSSI. Penning controlled by tilting weir in RH Channel.	Clevedon	ST 39218 70221
<a href="#">31</a>	Land Yeo Outfall	2 x flapped outfall. This is a water level control structure for Nailsea, Tickenham & Kenn Moors SSSI.	Clevedon	ST 39207 70532
<a href="#">32</a>	Clevedon Marine Lake	Sea wall. Borders Marine Lake basin. Asset is approximately 3m higher than the land behind (recreational ground).	Clevedon	ST 39851 71161
<a href="#">33</a>	Portbury Ditch Sea Outfall	Outfall. Water level control structure with 2x flaps and penstocks.	Portishead	ST 47793 77216
<a href="#">34</a>	Portishead (Ashlands concrete Wall)	Concrete wall. Connects two earth embankments. Structure is approximately 3.2m higher than the land behind and permits local land drainage through the defence line.	Portishead	ST 48210 76474
<a href="#">35</a>	Drove Rhyne Outfall	Tidal control structure adjacent to industrial area. Asset includes a 1.8m diameter steel flap.	Portishead	ST 49350 77247
<a href="#">36</a>	Pill Flood Wall	Tidal flood wall. Masonry wall with raised pedestrian walkway behind. Road level at lower ground level.	Pill	ST 52501 76190
<a href="#">37</a>	Pill Tidal Flood Gate	Flood Gate. Gate in masonry flood wall with pedestrian way and road behind. Approximately 2m wide and 1m high.	Pill	ST 52548 76101
<a href="#">38</a>	Tidal Flood Gate	Flood Gate. Gate in masonry flood wall which is integrated into earth embankment structures. Road level behind wall is at a lower ground level. Flood gate is approximately 4m wide and 0.5m high.	Shirehampton	ST 52693 76265

<a href="#">39</a>	Embankment	Earth Embankment. Adjacent to industrial area. Asset is approximately 1.7m higher than the land behind.	Avonmouth	ST 51678 77480
<a href="#">40</a>	Avonmouth Docks Gates	Sluice in entrance lock of Avonmouth Docks. Approximately 30m wide.	Avonmouth	ST 50801 78670
<a href="#">41</a>	Avonmouth Docks Outfall	Flapped twin outfall. The asset drains water through the sea defences. The structure is located underneath pipes and an access road.	Avonmouth	ST 51325 79834
<a href="#">42</a>	Avonmouth Docks Northern Outfall	Flapped Outfall. The asset drains water through the sea defence at the northern end of Avonmouth Docks. The structure runs underneath the road and the outfall is adjacent to the refinery.	Avonmouth	ST 52531 81219
<a href="#">43</a>	Chitting Industrial Estate Northern Outfall	Flapped twin outfall. The asset drains water through the sea defences.	Avonmouth	ST 52917 82008
<a href="#">44</a>	New Pill Outfall, Severn Side	Flapped twin outfall. The asset underneath road drains water out through the sea defences.	Avonmouth	ST 53570 83072
<a href="#">45</a>	Embankment, Severn View Industrial Park	Rail embankment. There is some evidence of geotextile material beneath stone ballast covering the embankment. The embankment is approximately 1.5m higher than the land in front.	Avonmouth	ST 53641 83255
<a href="#">46</a>	Sea wall, Severn Beach	Sea wall. Concrete sea wall is approximately 2.3m higher than the land behind.	Severn Beach	ST 53860 84762
<a href="#">47</a>	The Binn Wall Embankment	Earth Embankment. Concrete revetted earth embankment. Crest height of 10.2mAOD is approximately 3.5m higher than the populated area behind.	Severn Beach	ST 53952 85588
<a href="#">48</a>	Chestle Pill Outfall	Flapped twin outfall. The asset allows water to drain through the earth embankment.	Northwick	ST 54614 86306
<a href="#">49</a>	Cake Pill Outfall	Flapped outfall. The asset allows water to drain through the earth embankment.	Aust	ST 56105 88130
<a href="#">50</a>	Littleton Pill Outfall	Flapped outfall. The asset drains water through an earth embankment.	Littleton-upon-Severn	ST 58797 91038
<a href="#">51</a>	Oldbury Pill Outfall	Flapped twin outfall. The asset water drains through the sea defences.	Oldbury-on-Severn	ST 60285 92670
<a href="#">52</a>	Oldbury Pill Embankment	Earth Embankment. Embankment is approximately 2m higher than the land in front.	Oldbury-on-Severn	ST 60129 93476

<a href="#">53</a>	Oldbury Power Station Embankment	Earth Embankment. Embankment includes a 900mm diameter flapped outfall. The embankment is approximately 3.4m higher than the land behind. Adjacent to power station.	Oldbury-on-Severn	ST 60412 94328
<a href="#">54</a>	Hill Pill Earth Embankment	Earth Embankment. Embankment is approximately 2m higher than the land behind.	Nupdown	ST 61646 96634
<a href="#">55</a>	Hill Pill Outfall	Flapped outfall with penstock. The asset drains water through the earth embankment.	Nupdown	ST 62719 97199
<a href="#">56</a>	Worlds End Embankment	Earth Embankment with inward stone revetment, concrete upstand and part concrete crest. Embankment approximately 3.5m higher than the land behind.	Nupdown	ST 64028 98253
<a href="#">57</a>	Berkeley Pill Outfall	Outfall. Outfall within earth embankment. Controls water level of Berkeley Pill. Asset approximately 7m wide.	Berkeley	ST 66666 99886
<a href="#">58</a>	Sanigar Outfall	Flapped outfall. The sheet piled asset drains water through the earth embankment.	Sharpness Docks	SO 66659 01309
<a href="#">59</a>	Tutshill Sluice	Water level control structure for Congresbury Yeo. Twin eyes/flaps with secondary penstocks.	Tutshill	ST 38153 65834

## Appendix D

# Correspondence

## Kyle Somerville

---

**To:** LeadLocalFloodAuthority  
**Subject:** RE: [EXTERNAL EMAIL] - Surface Water enquiry- East Cliff Business Park, Severn Road, Hallen, Avonmouth, Bristol BS10 7GD

---

**From:** LeadLocalFloodAuthority <LeadLocalFloodAuthority@southglos.gov.uk>  
**Sent:** Thursday, September 7, 2023 11:52 AM  
**To:** Sophie Taylor <sophie.taylor@McCloyConsultingLtd.onmicrosoft.com>  
**Cc:** Kyle Somerville <Kyle.Somerville@mccloyconsulting.com>  
**Subject:** RE: [EXTERNAL EMAIL] - Surface Water enquiry- East Cliff Business Park, Severn Road, Hallen, Avonmouth, Bristol BS10 7GD

Morning Sophie,

In response to your enquiry outlined below, I can confirm that the Lower Severn Internal Drainage Board (**LSIDB**) are the land drainage authority for this area and as such all matters pertaining to surface water management and related discharge methods will require final approval from them. Having said that, we too as a statutory consultee would review any such planning related proposals, to ensure that any intended development, fulfils our design standards.

To that end, please also find outlined, additional information related to our design standards which no doubt you will find useful in forming the basis for any such detailed design packages, respectively.

Further planning related information may be found through the following links to our website;

SuDS Supplementary Planning Document [Sustainable Drainage SPD \(southglos.gov.uk\)](https://www.southglos.gov.uk)

West of England Developer Guide [West of England Sustainable Drainage Developer Guide Section 1 \(southglos.gov.uk\)](https://www.southglos.gov.uk)

Flood Risk & Sustainable Drainage for Planning and Development [Flood risk and sustainable drainage for planning and development | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://www.southglos.gov.uk)

I trust this resolves you query appropriately.

Best Regards

**Lynton Seymour EngTech MICE**  
**Assistant Engineer (Drainage)**  
**(Flood & Water Management Team)**  
**Department for Place (Streetcare)**

**Tel:**01454 86 3523 **M:** 07824-081080 **E:** [Lynton.Seymour@southglos.gov.uk](mailto:Lynton.Seymour@southglos.gov.uk) [leadlocalfloodauthority@southglos.gov.uk](mailto:leadlocalfloodauthority@southglos.gov.uk)

**Postal Address:** South Gloucestershire Council, PO BOX 1954, Flood and Water Management Team, Bristol, BS37 0DD

<http://www.southglos.gov.uk/environment/drainage-and-flood-risk-management/>



## Appendix E

# Drainage Plan



ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	IB	DKS	12/10/23	FOR REVIEW

STATUS: FOR REVIEW

**McCloy Consulting**

T: 028 9084 8694  
 F: 028 9084 1525  
 E: info@mcclloyconsulting.com  
 W: www.mcclloyconsulting.com

Mosley Mill, Lower Ground (West)  
 Carrumore Road North  
 Newtownabbey  
 Co. Antrim, BT36 5QA

PROJECT: EASTCLIFF BUSINESS PARK HALLEN, BRISTOL

CLIENT: MONTGOMERY DEVELOPMENTS LTD

DRAWING TITLE: PROPOSED SURFACE WATER DRAINAGE LAYOUT GENERAL ARRANGEMENT

SCALE: 1:500	ORIGINAL SIZE: A1	
DRAWN: IB	CHECKED: DKS	DATE: 12/10/2023
PROJECT No: M03342-02	DRAWING No: DWG_100	ISSUE No: 1