



Flood Consequence Assessment

Lidl Lampeter

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Report Details

Client	Lidl
Report Title	Flood Consequence Assessment
Site Address	Land off Cwmann Terrace, Cwmann, Lampeter SA48 8DR
Contract Reference	119796.642269
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Quality Assurance

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Reference of Terms

Canal Failure

Canal failure can include a breach or overtopping of a canal system due to the effects of a high intensity rainfall event or structural failure that is not associated with a rainfall event. Such failure can be very dangerous as it can involve the rapid release of large volumes of water at high velocity, however, it is typically limited to reaches of canal that are raised above the surrounding ground level on one or both side and where watercourses or other structures pass beneath the canal. The size and nature of canals themselves can also have a hydraulic control on the mechanisms of flooding associated with a failure, resulting in a rapid peak in flow followed by a gradual reduction as the flow becomes restricted by the capacity of the canal itself to rapidly pass flow to the breach or failure point.

Fluvial Flooding

Fluvial flooding typically occurs when a river's capacity is exceeded, and the excess water overtops the river banks. It can also occur when the watercourse has a high level downstream, perhaps due to structures or blockage, thus limiting conveyance. This creates a back-up of water which can overtop the banks. Typical flooding issues occur when the natural floodplain has been urbanised and the river has been confined.

Groundwater Flooding

Groundwater flooding is caused by the emergence of water from beneath the ground at either point or diffuse locations when the natural level of the water table rises above ground level. This can result in deep and long-lasting flooding of low-lying or below-ground infrastructure such as underpasses and basements. Groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

Reservoirs Failure

Reservoir failure can be a particularly dangerous form of flooding as it results in the sudden release of large volumes of water that can travel at high velocity. This can result in deep and widespread flooding, potentially resulting in significant damage. The likelihood of reservoir flooding occurring is generally extremely low given that all large reservoirs are managed in accordance with the Reservoirs Act 1975. Under the Reservoirs Act 1975, a large raised reservoir is defined as one that holds over 25,000 cubic metres of water above the level of the surrounding land. The EA's online reservoir inundation map illustrates the maximum flood extents that could potentially occur in the event of a reservoir failure.

Sewer Flooding

Flooding from sewers primarily occurs when flow entering a system exceeds available capacity or if the network capacity has been reduced through blockage or collapse. In the case of surface water sewers that discharge to watercourses, the same effect can be caused as a result of high water levels in the receiving watercourse. As a result, water can begin to surcharge the sewer network, emerging at ground level through gullies and manholes and potentially causing flooding to highways and properties. If this occurs flooding can represent a significant hazard to human health due to the potential for contaminants in flood water.

Surface Water Runoff

Surface water runoff is defined as water flowing over the ground that has not yet entered a drainage channel or similar. It usually occurs as a result of an intense period of rainfall which exceeds the infiltration capacity of the ground. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable either naturally due to the soil type or geology, or due to development which places impervious material over the ground surface (e.g. paving and roads).

Tidal Flooding

Tidal flooding is caused by high tides coinciding with a low-pressure storm system which raises sea and tidal water levels, overwhelming coastal and river defences. This may be made worse by gale force winds blowing the raised body of water up tidal river basins some distance from the coast, due to floodwater being forced up the tidal reaches of rivers and estuaries. Such flooding may become more frequent in future years due to rising sea levels.

Table of Contents

1.0	INTRODUCTION	1
1.1	Appointment.....	1
1.2	Project Understanding.....	1
1.3	Scope of Works	1
1.4	Sources of Information	2
1.5	Project Limitations	2
2.0	SITE DESCRIPTION.....	3
3.0	RELEVANT PLANNING POLICY AND GUIDANCE.....	5
3.1	Introduction	5
3.2	Assessment of Flood Risk.....	5
3.3	Planning Policy Wales	5
3.4	Local Policy.....	6
3.5	Climate Change.....	6
3.6	Consultation.....	8
4.0	ASSESSMENT OF FLOOD RISK	9
4.1	Historic Flood Risk.....	9
4.2	Tidal Flood Risk	9
4.3	Fluvial Flood Risk.....	9
4.4	Surface Water Flood Risk	13
4.5	Groundwater Flood Risk	14
4.6	Artificial Sources Flood Risk	15
4.7	Summary of Flood Risk	15
4.8	Mitigation	15
4.9	Residual Risks.....	16
5.0	JUSIFICATION	17
5.2	Conclusions	19
5.3	Recommendations	19

Appendices

- APPENDIX A – LIMITATIONS
- APPENDIX B – TOPOGRAPHIC SURVEY (PROVIDED SEPARATELY)
- APPENDIX C – SEWER PLANS (PROVIDED SEPARATELY)
- APPENDIX D – PROPOSED DEVELOPMENT PLANS (PROVIDED SEPARATELY)
- APPENDIX E – NRW HISTORIC MAPPING (PROVIDED SEPARATELY)
- APPENDIX F – NRW DEPTH MAPPING (PROVIDED SEPARATELY)
- APPENDIX G – NRW VELOCITY MAPPING (PROVIDED SEPARATELY)
- APPENDIX H – DRAINAGE STRATEGY (PROVIDED SEPARATELY)
- APPENDIX I – SEQUENTIAL TEST (PROVIDED SEPARATELY)
- APPENDIX J – NRW CORRESPONDENCE (PROVIDED SEPARATELY)

1.0 Introduction

1.1 Appointment

1.1.1 Lucion Delta-Simons Limited (“Lucion”) was instructed by Lidl (the “Client”) to carry out a Flood Consequences Assessment (FCA) of Land off Cwmann Terrace, Cwmann, Lampeter SA48 8DR (the “Site”) for the development of a supermarket with associated parking and access.

1.2 Project Understanding

1.2.1 The Site is shown to be located within Flood Zone C2 (an area without significant flood defence infrastructure) on the Development Advice Map and Defended Flood Zone 3 (High Probability) on the NRW Flood Map for Planning therefore a FCA is required to support the development.

1.2.2 The aim of this report is to assess the potential flood risk to the Site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk. This report has been prepared in accordance with the guidance contained in Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15): Development and Flood Risk.

1.2.3 Lucion have also produced a Detail Drainage Strategy under the Ref:119796.642269 and is attached in Appendix J. The Drainage Strategy report should be read in conjunction with the FCA.

1.2.4 Hydraulic modelling is to be undertaken to support this FCA at a later stage and will evidence the potential impact of the development and any mitigation required.

1.3 Scope of Works

- Assess flood risk from all sources using best available information, including review of NRW data and mapping, topography and historical records;
- Outline sequential approach to site selection;
- Assess previous relevant available third-party studies, local authority plans or strategies;
- Advise on flood mitigation measures;
- Assess residual risks;
- Assess access and egress routes;
- Advise on availability of flood warnings;
- Assess compensatory storage requirements; and
- Prepare FCA report.

1.3.1 This report takes into account the following national and local policies:

- Planning Policy Wales (PPW) (2018)¹;
- Technical Advice Note 15: development and flood risk (TAN15) (2004)²;
- CL-03-16 Flood Consequence Assessments: Climate change allowances.³
- Carmarthenshire County Council Local Development and Planning Policies.

1 <https://gov.wales/Sites/default/files/publications/2019-02/planning-policy-wales-edition-10.pdf>

2 <https://gov.wales/Sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf>

3 <https://gov.wales/climate-change-allowances-and-flood-consequence-assessments-cl-03-16>

1.4 Sources of Information

1.4.1 The following sources of information have been reviewed and assessed for the purpose of this FRA:

- NRW Development Advice Map⁴;
- NRW Flood Map for Planning⁵
- British Geological Society (BGS) Interactive Map⁶;
- MAGIC Interactive Map⁷;
- Carmarthenshire & Pembrokeshire Council Strategic Flood Consequences Assessment (SFCA);
- South West Wales Strategic Flood Consequences Assessment; and
- Carmarthenshire Council Local Flood Risk Management Strategy (LFRMS).

1.5 Project Limitations

1.5.1 Site specific hydraulic modelling is in progress with the methodology having been agreed with NRW therefore updated outputs were not available at the time of writing this FCA. This report therefore currently relies upon hydraulic model data provided by NRW, specifically the NRW Lampeter Llanybydder 2016 model. This report will be updated in due course with the outputs of the updated hydraulic model which will include an updated baseline, with scheme impacts and with mitigation scenarios (if required).

1.5.2 The wider Lucion limitations are contained within Appendix A.

⁴ https://gisgeoext.cyfoethnaturiolcymru.gov.uk/Geocortex/Viewers/Html5Viewer_4145/index.html?viewer=FloodRisk

⁵ <https://flood-map-for-planning.naturalresources.wales/>

⁶ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁷ <http://www.magic.gov.uk/>

2.0 Site Description

2.1.1 The aim of this section of the report is to outline key environmental information associated with the baseline environment.

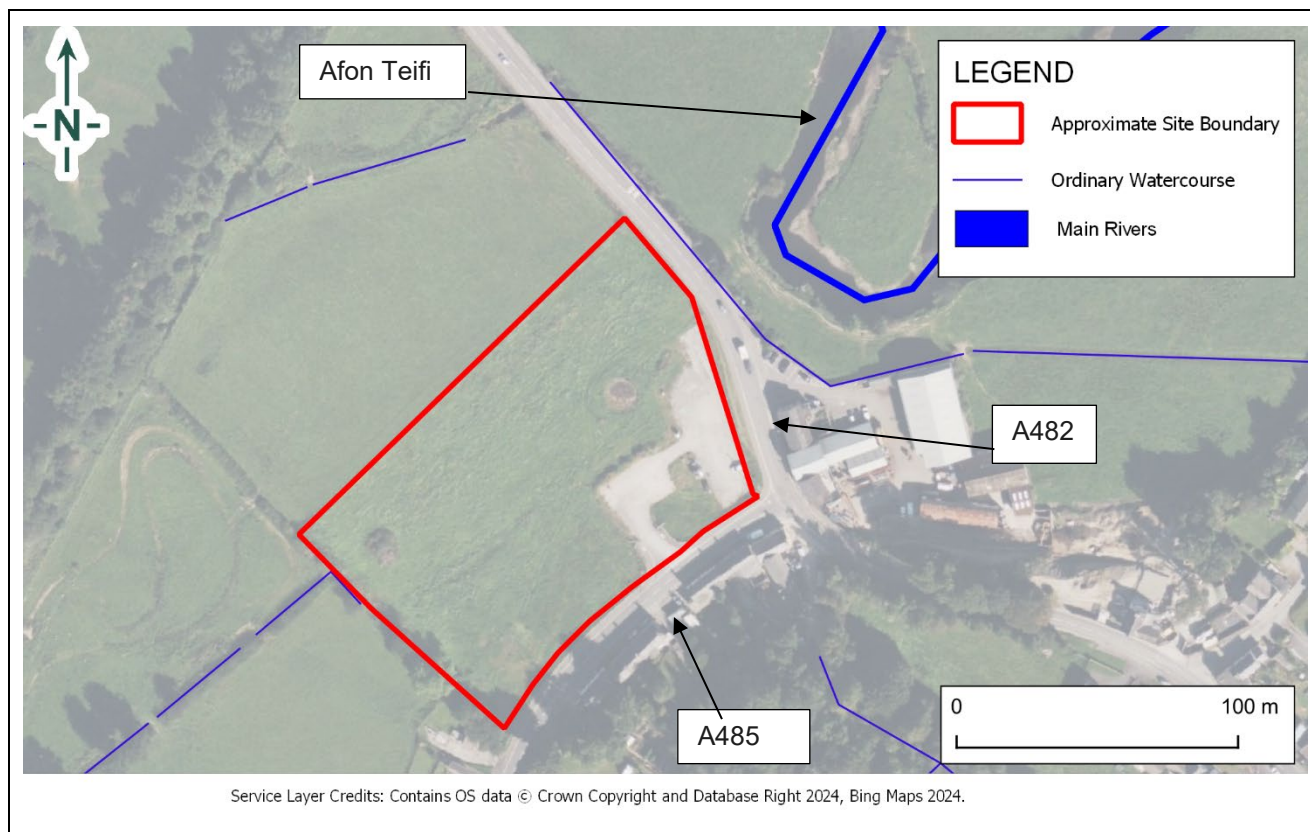


Figure 1: Site Location Plan

Co-ordinates	Centred approximately at E: 258210, N:247359.	Area (approx.)	1.45 ha
Site Location	The Site is located between the towns of Lampeter and Cwmann, approximately 860 m southeast from Lampeter Town Centre.		
Existing Site Conditions	Online mapping (including Google Maps / Google Streetview imagery, accessed September 2024) shows that the Site is a mix of greenfield land and previously developed brownfield land. The Site is bordered by greenfield land to the north and west, the A482 and the Afon Teifi beyond to the east and A485 with residential properties beyond to the south. Access to the Site is provided from the A485 to the south of the Site.		
Topography	A topographical survey has been undertaken by EMP Surveys Ltd in August 2024 and is included in Appendix B. The topographical survey shows that the Site slopes from 115.92 metres Above Ordnance Datum (m AOD) at the entrance to the Site from the A485 to 113.09 m AOD in the northwestern corner of the Site.		
Hydrology	The nearest watercourse is an unnamed ordinary watercourse located along the western boundary of the Site. There is a second unnamed ordinary watercourse located approximately 12 m north of the Site. The unnamed watercourse is a tributary of the Afon		

	<p>Teifi and joins the Afon Teifi approximately 200 m north east of the Site. Afon Teifi, a Main River (responsibility of NRW to maintain), is located approximately 30 m north of the Site at its closest point. Afon Teifi flows around the Site before flowing in a southerly direction.</p>
Geology	<p>Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the Site is underlain by superficial deposits of Alluvium generally comprising gravel, sand, silt and clay. The superficial deposits are identified as being underlain by Devils Bridge Formation consisting of mudstone and sandstone, interbedded.</p> <p>The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis.</p> <p>There are no publicly available BGS boreholes in the vicinity of Site.</p>
Hydrogeology	<p>According to the NRW's Aquifer Designation data, obtained from MAGIC Map's online mapping [accessed September 2024], the Alluvium is classified as a Secondary A Aquifer.</p> <p>Secondary A Aquifers are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.</p> <p>The underlying Devils Bridge Formation is described as a Secondary B Aquifer.</p> <p>Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.</p> <p>Soils mapping [accessed September 2024] indicates that the Site lies in freely draining floodplain soils.</p>
Local Drainage	<p>Sewer plans have been obtained from a survey provided by htc architects and are included in Appendix C. The sewer plans show that there is a 225 – 300 mm diameter surface water sewer within the A482. There are also historic sewers on Site at the proposed entrance of the Site that connect into the A485.</p>
Proposed Site conditions	<p>The proposed development is for a supermarket unit with associated access and parking. Proposed development plans are included in Appendix D.</p> <p>Based on the current proposed development plans the Finished Floor Level (FFL) will be set to 115.050 m AOD. With the Car parking to be kept as close to grade as practicable</p>

3.0 Relevant Planning Policy and Guidance

3.1 Introduction

3.1.1 The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the Site and relevant guidance and legislation.

3.2 Assessment of Flood Risk

3.2.1 The flood risk from fluvial (Main Rivers) and coastal flooding is assessed using the Welsh Government, TAN15, Development Advice Maps and the NRW 'Flood Map for Planning' (flood risk from rivers or the sea).

The Development Advice Maps define three development advice zones as follows:

- Zone A: Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- Zone B: Areas known to have been flooded in the past evidenced by sedimentary deposits.
- Zone C: Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal) (i.e: greater than 1 in 1,000 chance of flooding in any one year).

Zone C is divided into C1 and C2.

- C1 is areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
- C2 is Areas of the floodplain without significant flood defence infrastructure.

3.2.2 The NRW 'Flood Map for Planning' (FMfP) defines three zones of different flood risk, the third of which is subdivided into two categories:

- Zone 1 "Low probability of flooding" – This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river, sea flooding or surface water and small watercourses (<0.1%);
- Zone 2 "Medium probability of flooding" – This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river or surface water and small watercourse flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
- Zone 3a "High probability of flooding" – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river or surface water and small watercourse flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year; and
- Zone 3b "Functional floodplain" – A sub-part of Zone 3, this zone comprises land where water has to flow or be stored in times of flood. This zone is not normally included within the national Flood Map for Planning and is calculated where necessary using detailed hydraulic modelling.
- The FMfP is considered the best available data and therefore has been utilised to inform this assessment. The FMfP will inform the future updates of TAN15 which was due to be released 2021. This is currently going through a final round of consultation therefore the current TAN15 Policy has been adhered to..

3.3 Planning Policy Wales

Development Vulnerability Classification

3.3.1 The proposed development is considered to be 'less vulnerable' development in accordance with Figure 2 of the Welsh Government's Technical Advice Note 15 – Development and Flood Risk (TAN15).

3.3.2 TAN15 states that less vulnerable development can be considered in Flood Zone C2 subject to the application of the TAN15 Justification Test and satisfying specific TAN15 acceptability criteria. The specific TAN15 'acceptability criteria' are assessed in the following sections.

3.4 Local Policy

- 3.4.1 The Carmarthenshire County Council Local Development Plan contains the following policies relating to flood risk and drainage.

Strategic Policy – SP 16: Climate Change

- 3.4.2 Avoid, or where appropriate, minimise the risk of flooding including the incorporation of measures (such as SuDS and flood resilient design);
- 3.4.3 Development proposals which are located within areas at risk from flooding will not be permitted unless they accord with the provisions of Planning Policy Wales TAN 15.
- 3.4.4 The potential impact of flood risk forms an important consideration in the assessment of the appropriateness of sites for inclusion within the LDP. In this regard, a precautionary approach will be adopted in the identification of sites for inclusion in the Plan. The consideration of any proposals in respect of flooding have regard to the provisions of PPW and TAN15: Development and Flood Risk which provides guidance on assessing developments at risk from flooding.
- 3.4.5 Proposals affected by flood risk will be required to submit a Flood Consequences Assessment as part of any planning application and the Council will consult with Natural Resources Wales (NRW). Where a site is in part impacted upon by flood risk, the developer will need to consider the impact of the risk on the developability of the remainder of the site. Where appropriate they should undertake the necessary evidential work (including a flood consequences assessment) to the satisfaction of NRW. Only less vulnerable development will be permitted within Zone C2. Regard should be had to Policy CCH4: Flood Risk Management and Avoidance as contained within this Plan.

CCH4: Water Quality and Protection of Water Resources

- 3.4.6 Development proposals must make efficient use of water resources and, where appropriate, contribute towards improvements in water quality. Proposals will be permitted where they do not have an adverse effect upon water resources, water quality, fisheries, nature conservation, public access, or water related recreation use in the County.
- 3.4.7 Where appropriate, SuDS must be implemented with approval required through the Sustainable Drainage Approval Body (SAB).
- 3.4.8 Proposals will be supported if they promote the safeguarding of watercourses through ecological buffer zones or corridors, protecting aspects such as riparian habitats and species, water quality, and providing for flood plain capacity.
- 3.4.9 Development will only be permitted if it can be demonstrated that there is no adverse effect on the integrity of phosphorus sensitive riverine Special Areas of Conservation (SACs). In the hydrological catchment area designated for riverine SACs, development creating wastewater discharges will be required to demonstrate there is no increase in phosphorus levels in the SAC. This can be achieved through implementation of mitigation measures and associated supplementary planning guidance. Where evidence demonstrates that adverse effects on the integrity of river SAC can be avoided or offset using mitigation, these must be agreed with the Council on a case-by-case basis, in consultation with NRW.

3.5 Climate Change

Context

- 3.5.1 Planning Policy Wales (PPW) requires site specific FRA's accompanying planning applications to assess the risk of all sources of flooding to and from the development whilst also taking climate change into account.
- 3.5.2 NRW published updates to their climate change guidance in 2021 for fluvial flows and rainfall intensity. This indicates that climate change is likely to increase peak river flows, sea levels, rainfall intensity, wave height and wind speed in the future. Therefore, allowances need to be considered when developing Schemes and associated mitigation, such as: drainage strategies, flood alleviation measures, and flood storage and compensation areas to account for the enhanced severity and magnitude associated with future flood events.

Peak River Flow Allowances

3.5.3 The Proposed Development lies within the West Wales district. Table 1 shows the climate change allowances for the West Wales District for peak river flow allowances.

Table 1 - West Wales District Peak River Flow Allowances

Allowance Category	Total Potential Change Anticipated for '2020s' (2015 to 2039)	Total Potential Change Anticipated for '2050s' (2040 to 2069)	Total Potential Change Anticipated for '2080s' (2070 to 2115)
Upper End	25%	40%	75%
Central	15%	25%	30%
Lower End	5%	20%	15%

Peak River Flow for the Proposed Development

3.5.4 The Welsh Government Draft 'Flood Consequence Assessments: Climate Change Allowances' guidance states that the projected peak river flow change is a range, with the highest estimate equally likely to occur as the lowest estimate. For this reason, it is recommended that the central estimate, or change factor, for the 2080s for the relevant river basin district is used to assess the potential impact of climate change as part of a flood consequence assessment (FCA) and to inform design levels.

Table 2 - Proposed Development Climate Change Assessment Criteria

Scheme	Criteria
River Basin District	West Wales
Management Catchment	Afon Teifi
Advice Zone	Zone C2
Flood Risk Vulnerability	Low Vulnerability
Lifetime of Development	50 years
Climate Change Allowance to be Assessed	30% Central (Design Event)

Peak Rainfall intensity Allowances for the Proposed Development

3.5.5 The predicted increase in the frequency and intensity of storm events as a result of climate change could increase the volumes and rates of water entering the surface water and foul drainage network. Table 3.4 shows the allowance which needs to be made for increases in peak rainfall intensity for a 1% AEP rainfall event which applies for all of Wales.

1% AEP Peak Rainfall Intensity Allowances for the Scheme

Climate change Epoch Allowance Category	Total Potential Change Anticipated for '2050s' (2040 to 2069)	Total Potential Change Anticipated for '2080s' (2070 to 2115)
Upper End	20%	40%
Central	10%	20%

3.5.6 A drainage strategy has been developed for the Proposed Development to support the planning application (see Appendix J). This sets out how allowances for increases in rainfall intensity (up to 40%) have been taken into account in the design approach for drainage ensuring runoff rates from the Proposed Development do not increase beyond runoff rates for the existing land use. The strategy sets out the approach to managing drainage via the use of SuDS and has been used to develop the drainage design for the scheme.

3.6 Consultation

- 3.6.1 A pre-planning opinion request was submitted to NRW in September 2024 with regards to requirements for the updated hydraulic model. Correspondence with NRW is outlined within Appendix J.
- 3.6.2 A consultation request was submitted to the LLFA in September 2024. A response was received on 27/09/24 and is outlined below;

Flooding & Drainage

- 3.6.3 *The council note that the Site is located within the floodplain of the Afon Teifi. the entire site is located with the C2 flood zone under the Development Advice Maps, with only a sliver of the site's southern boundary with the A485 located outside of Flood Zone 2 and 3 of the updated Flood Map for Planning. The site is therefore at high risk of flooding and represents a significant constraint to the site's development.*
- 3.6.4 *Whilst not classed as a highly vulnerable development, it remains that development can only be justified if the proposal complies with the tests set out in paragraph 6.2 of the current Technical Advice Note 15.*
- 3.6.5 *The site has previously been granted planning permission following submission of detailed Flood Consequence Assessments in support of the relevant development.*
- 3.6.6 *However, those proposal were of a significantly smaller scale and regarded as being of a suitable scale for the adjoining settlement.*
- 3.6.7 *The application site, the subject of the proposal, is not part of a local authority regeneration initiative, and given the concerns raised above there are doubts as to whether the proposal would serve to sustain an existing settlement.*
- 3.6.8 *In addition, the majority of the site cannot be classed as previously developed land. As such there is current doubt as to whether the proposal would comply with either criterion i, ii and iii of paragraph 6.2 of TAN15. These considerations are matters that need to be directly addressed in any submission.*

4.0 Assessment of Flood Risk

4.1 Historic Flood Risk

- 4.1.1 The NRW 'Historical Flood Map' (Appendix E) indicates that the Site has previously historically flooded in 1987, however no further historic events were noted on the historic mapping. There is no further information on the historic flooding from the other sources in the relevant third-party documents.

4.2 Tidal Flood Risk

- 4.2.1 The Site is situated at a minimum of 113.09 m AOD and is significantly above sea level. Furthermore, the Site lies approximately 19.6 km southeast of the coastline at the nearest point. Therefore, the risk of tidal flooding to and from the proposed development is considered Negligible.

4.3 Fluvial Flood Risk

Existing Fluvial Flood Risk

- 4.3.1 The nearest watercourse is the unnamed tributary of the Afon Teifi which is located along the western boundary of the Site hereby referred to as Unnamed Ordinary Watercourse 1. Unnamed Ordinary Watercourse 1 joins the Afon Teifi approximately 295 m west of the Site. A second unnamed tributary located approximately 12 m north of the Site hereby referred to as Unnamed Ordinary Watercourse 2. Unnamed Ordinary Watercourse 2 is culverted under the A482 and converges with the Afon Teifi approximately 200 m northeast of the Site. Afon Teifi is located approximately 30 m north of the Site at its closest point. Afon Teifi flows around the Site before flowing in a southerly direction.
- 4.3.2 A review of the DAM indicate the Site is located within Zone C2 which is defined as areas of the floodplain without significant flood defence infrastructure. When consulting the Flood Map for Planning indicates that the majority of the Site is situated within Flood Zone 3 which is defined as land that has a high probability of flooding without defences. The southern extents of the Site are located within Flood Zone 2 and Flood Zone 1, both of which have a moderate and low probability of flooding respectively.
- 4.3.3 The Carmarthenshire & Pembrokeshire Council Strategic Flood Consequences Assessment does not provide any further information on the flood risk to the Site but does confirm that the Site lies within Flood Zone 3 and Flood Zone 2.
- 4.3.4 Access and Egress from the Site via the A485 of which is located within Flood Zone 1 as indicated on the Flood Map for Planning.

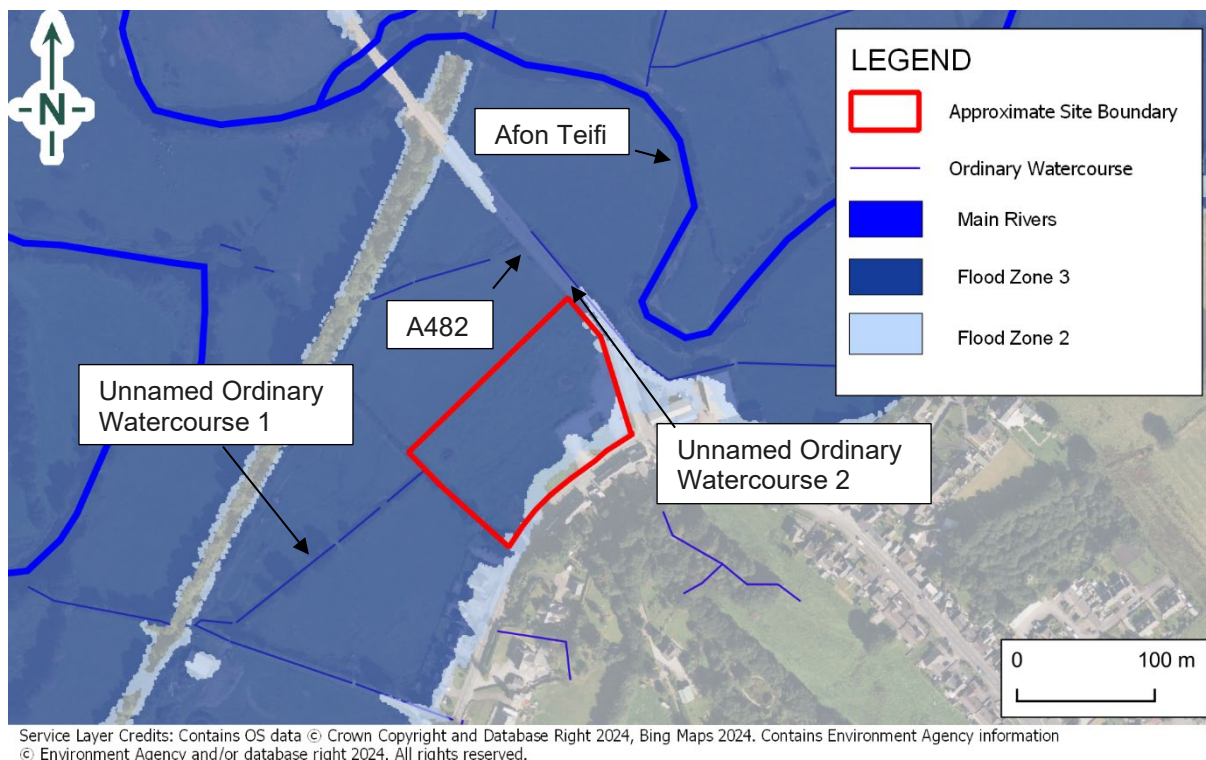


Figure 1: EA's Flood Map for Planning

4.3.5 Fluvial flooding likely occurs due to the Afon Teifi overtopping its banks during or following an extreme rainfall event and flood water working its way under the A485 in the lower return period events and over it in the higher return periods however more clarity may be provided once the hydraulic modelling has been finalised. Flood waters are then impounded by the railway line to the north and back up both Ordinary watercourses 1 and 2 slowly entering the Site. The Site is indicated to be a natural low point in the surrounding area. The Site and the nearby fields are bound by the railway line to the north, the A485 to the east, and the A482 to the south all of which are raised above the Site levels based on LiDAR data.

4.3.6 When consulting the DAM the Site is located within Zone C2.

NRW Baseline Model data

4.3.7 Site specific hydraulic modelling is currently being progressed which will eventually feed into this FCA. Through consultation with NRW a new baseline will be defined along with any potential impact posed from the development and impacts of any mitigation measures (if required). Final Floor Levels will be located above design flood levels and any mitigation, if required, will be explored in greater detail. Prior to the modelling been finalised the current Afon Tiefi outputs provided by NRW have been utilised to inform this assessment.

NRW Maximum Water Level

4.3.8 Estimated maximum water levels for the Afon Tiefi have been obtained from the NRW in September 2024. Maximum water levels have been taken from the NRW Lampeter Llanybydder 2016 model. Based on TAN15 guidance the range of values from the onset of flooding which in this case is within the northwestern most corner of the Site within the 1 in 2 year event (50% AEP event) up to the 0.1% AEP event have been provided.

4.3.9 As depicted in Table 4 the proposed development will have a finished floor level of 115.05 m AOD which sits 0.76 m AOD and 0.67 m AOD above the design flood and the 0.1% AEP event respectively and as such would remain flood free. This is within tolerable limits of the TAN15 guidance. The associated parking facilities will however likely experience some flooding from the 1 in 10 year event on due to the proposed car park levels ranging from 113.18 m AOD towards the north, 112.98 to the west and 113.73 to the south towards the location of the proposed food store.

4.3.10 A summary of the water levels on Site are outlined in Table 4 below.

Table 4: NRW Maximum Water Levels

Maximum Water Level (m AOD)							
50% AEP*	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1% AEP CC**	0.1% AEP
113.26	113.72	113.88	13.96	114.05	114.12	114.29	114.38

*Annual Exceedance Probability

** Climate Change allowance of 30% applied

NRW Depth Mapping

- 4.3.11 Depth mapping has been included as part of the NRW data. Modelled outputs are included in Appendix F. Onset of flooding occurs within the 50% AEP (1 in 2 year annual probability) event. The northwest corner of the Site is indicated to flood only with flood reaching 0.15 m.
- 4.3.12 In the 20% AEP (1 in 5 year annual probability) event flood extents are indicated to increase across the northwest of the Site with flood depths ranging from 0.05 m in the centre of the Site and in the northeastern extents to 0.604 m in the northwestern corner of the Site. The car park and loading bay are shown to be at risk from this event onwards with depths below 0.2m.
- 4.3.13 In the 10% AEP (1 in 10 year annual probability) flood depths are indicated to range from 0.05 m in the centre of the Site around the periphery of the proposed carpark and in the northeastern extents to 0.604 m in the northwestern corner of the Site. The proposed vehicular entrance to the Site is indicated to be at risk from this event onwards.
- 4.3.14 In the 5% AEP (1 in 20 year annual probability) flood depths are indicated to range from 0.05 m – 0.4 m in the centre of the Site around the carpark and up to 0.815 m in the northwestern corner of the Site.
- 4.3.15 In the 2% AEP (1 in 50 year annual probability) flood depths are indicated to range from 0.05 m – 0.3m within the proposed footprint of the store and along the vehicular access point. Depths in the northeastern extents to reach 0.9 m. Flood depths in the centre of the Site within the carpark are indicated to be approximately 0.55 m.
- 4.3.16 In the 1% AEP (1 in 100 year annual probability) event flood extents are indicated to increase further across the Site. Flood depths are indicated to range from 0.05 m – 0.3 m along the vehicular entrance in the east of the Site. Depths within the carpark are shown to reach up to 0.65 m. Depths ranging from 0.05 m to 0.4m are located within the proposed store footprint with the latter on the periphery. Depths of 1 m in the northwestern corner of the Site are shown.
- 4.3.17 In the 0.1% AEP (1 in 1000 year annual probability) event flood extents are indicated to cover the majority of the Site. Flood depths are indicated to range from 0.05 m – 0.6 m in the eastern extents of the Site along the vehicular access point. Depths of up to 0.8 m and 1.21 m are shown within the carpark and land to the north west respectively.
- 4.3.18 In the 1% AEP CC event flood extents are indicated to cover the majority of the Site. Flood depths are indicated to range from 0.05 m – 0.5 m in the eastern extents of the Site along the vehicular access point. Depths of up to 0.8 m and 1.1m are shown within the carpark and land to the northwest respectively.
- 4.3.19 Given the lower ground levels associated with the loading bay, it is possible that greater depths could be experienced here.

NRW Max Velocities

4.3.20 Within the NRW hydraulic model data, velocities have been provided. In all events up to and including the 1 in 1000 year event velocities on Site are indicated to be at approximately 0.02 ms⁻¹(Appendix G). This is below the recommended maximum of 0.3 ms⁻¹ and 0.15 ms⁻¹ for property access and deemed acceptable. This indicates that the water which inundates the Site is slow moving. This is likely a result of the site sitting lower compared to the surrounding area and it been bounded by the railway line to the south and A458 to the east.

NRW Inundation Rates

4.3.21 Inundation rates (Table 5) obtained from the NRW model highlights the time it takes for inundation to occur. Table 5 highlights the time taken for full inundation of the Site in the 1 in 100, 1 in 100 + CC and the 1 in 1000 year events take over 13 hours. This is above the maximum of 2 hours as outlined in the Tan15 guidance and therefore satisfies this element of the TAN15 Guidance.

Table 5: NRW Inundation rates

Return Period	Time to peak (hours)
1 in 2	12.80
1 in 5	14.37
1 in 10	14.30
1 in 20	14.09
1 in 50	13.88
1 in 100	13.77
1 in 1000	13.53
1 in 100 + CC	13.63

NRW Hazard Mapping

4.3.22 Hazard mapping outputs provided by NRW highlight that safe access and egress would be possible in all flood risk events. Safe vehicular and pedestrian access and egress is achievable up to and including the 1 in 20 year event via the main vehicular access point and through the raised ramp access to the east of the store leading into the A485. Safe pedestrian access and egress is achievable in all flood risk events via the ramped pedestrian access to the east of the store. This is a result of the middle platform of this access point been situated at 14.750 m AOD which is above all flood levels.

Summary

4.3.23 Considering the majority of the Site has a high probability of experiencing relatively deep flooding, the risk of fluvial flooding to the majority of the Site is considered High. Given the proposed design of the food store the risk of flooding and ingress is considered Low. The risk across the Site can be managed effectively by adopting a flood response plan and signing up for local flood warnings. Given the inundation rate is above 13 hours for most events there would be enough time to evacuate the Site prior to inundation.

Development Impact on Fluvial Flood Risk Elsewhere

4.3.24 The proposed design will accommodate stilts towards the front elevation to ensure minimal interaction with flood waters. This will limit the amount of floodplain storage loss and ensure conveyance impacts are limited. The latter is less likely to be an issue given the conditions at the Site. Some physical elements of the design will reduce floodplain storage and will be modelled at a later stage and fed into this report. The impact of the scheme and impacts of any relevant mitigation will be hydraulically modelled. This section will be updated upon receipt of model results.

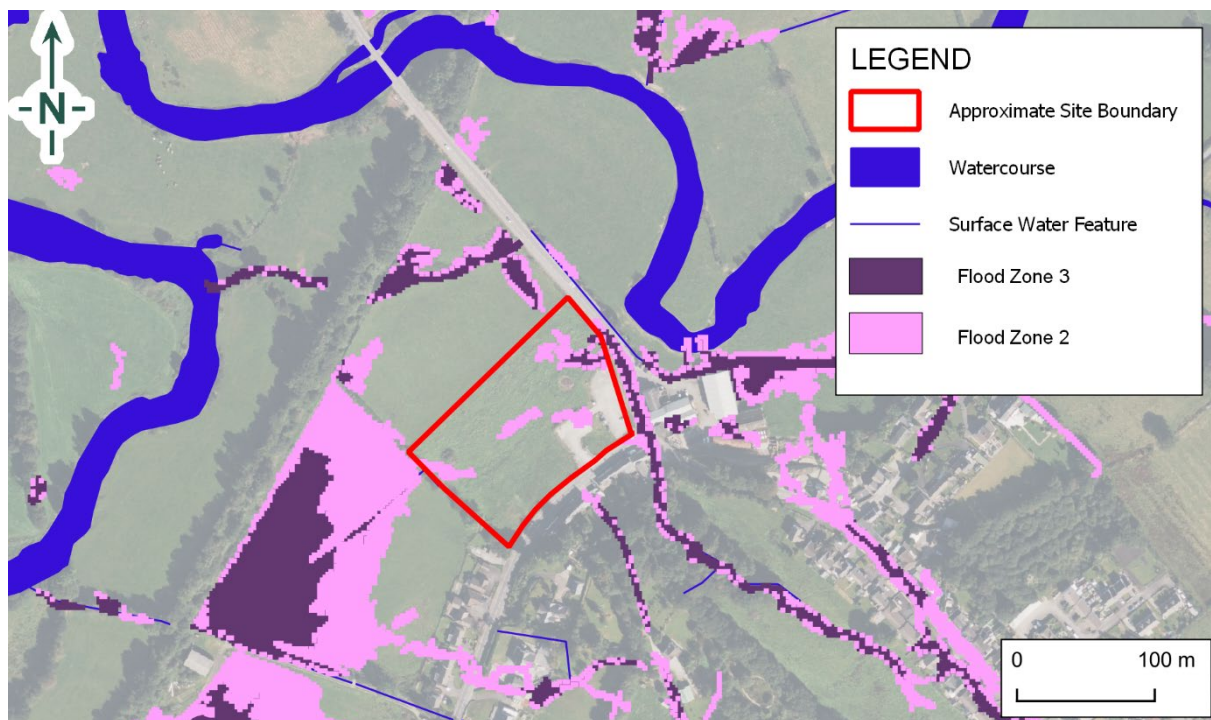
4.4 Surface Water Flood Risk

Existing Surface Water Flood Risk

4.4.1 The flood map for planning indicates that the majority of the Site is within Flood Zone 1 associated with surface water and small watercourse. There is one area in the north of the Site that is indicated to be in Flood Zone 3 with associated areas of Flood Zone 2. There are further areas of Flood Zone 2 in the centre and west of the Site. The maps do not account for climate change.

4.4.2 There is no further evidence of surface water flooding in the SFCA reports.

4.4.3 Given the close proximity to the Afon Teifi it is believed that surface water flooding would be dominated by fluvial influences within the 1 in 20 year event onwards.



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Figure 2: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

4.4.4 The NRW National Flood Hazard and Risk Maps has been utilised to indicate potential surface water depths for the Site for the various return periods. The Site is indicated to be wholly flood free in the high risk scenario (>3.3% annual probability). In the medium risk scenario (1 – 3.3% annual probability) there is an isolated area in the north of the Site where depths are indicated to be between 0.15 and 0.3 m. Lastly, in the Low risk scenario (0.1 – 1% annual probability) the Site is largely flood free with isolated areas in the centre and north with depths indicated to be between 0.15 and 0.3 m.

4.4.5 It can therefore be concluded that the Site is at Low risk of surface water flooding.

Development Impact on Surface Water Flood Risk

- 4.4.6 The Proposed Development would lead to an increase in hardstanding area (0.58 ha) through the construction of the store and associated car park and loading bay. As a result, the rate of surface water runoff generated would increase without mitigation. In order to manage this, a drainage strategy has been developed (Appendix H).
- 4.4.7 The drainage strategy indicates the surface water generated by the Scheme can be drained by gravity and proposes to provide an above ground SuDS solution (detention basin) which provides 1370m³ including an allowance for freeboard equivalent to the 1 in 100 + 40% CC. Infiltration was not deemed appropriate due to the high groundwater levels which are unlikely to be able to support a deep enough dry zone beneath an infiltrating SuDS feature to ensure infiltration remains effective (see Appendix H for further detail).
- 4.4.8 These proposed SuDS measures will be designed in accordance with The SuDS Manual (CIRIA C753) and have been sized to attenuate the 1 in 100-year event (plus 40% climate change allowance for rainfall intensity) event. Outfalls from the pond will discharge to Unnamed Watercourse 1 at a rate of 2.3 l/s equivalent to the 1 in 1 year greenfield rate.
- 4.4.9 Provided that the drainage strategy is sufficiently designed and implemented to manage post-scheme surface water runoff, the Scheme will not result in a material change surface water flood risk. The risk to surface water flooding from the Scheme is therefore considered Low.
- 4.4.10 It should be noted that the SuDS features will likely provide a dual function and will provide some surface water quality benefits alongside providing an increase in habitat availability.
- 4.4.11 It is therefore concluded that the risk on surface water flooding as a result of the development is Low.

4.5 Groundwater Flood Risk

Existing Groundwater Flood Risk

- 4.5.1 Hydrogeological information has been obtained from Defra's online Magic Map, British Geological Survey (BGS) mapping and Soilscales Mapping. Reference to the BGS online mapping indicates that the Site is underlain by superficial deposits of Alluvium generally comprising gravel, sand, silt and clay. The superficial deposits are identified as being underlain by Devils Bridge Formation consisting of mudstone and sandstone, interbedded.
- 4.5.2 The SFCA states that the Site lies within an area where groundwater levels are either at or very near (within 0.025m of) the ground surface during a 1% event.
- 4.5.3 Given the spatial proximity to the Afon Teifi, groundwater levels may be hydraulically linked with river levels. As such groundwater flooding could occur during periods of prolonged high water levels in the Afon Teifi
- 4.5.4 The proposed building will be raised to a FFL of 115.05 m AOD which is above the surrounding ground level, however, the loading bay will be located below ground level, this area should be appropriately tanked to minimise ingress of groundwater.
- 4.5.5 Due to the potential for groundwater levels to be elevated at times, as a precautionary measure the risk from groundwater flooding is considered to be Moderate.

Development Impact on Groundwater Flooding

- 4.5.6 The foundations for the building will likely include piles therefore, there is a possibility for some interaction with groundwater flow. However given the lateral extent of the underlying aquifers compared to the scale of the works it is unlikely that ground water flood risk will be exacerbated.
- 4.5.7 The impact of the development on groundwater flooding is considered Low.

4.6 Artificial Sources Flood Risk

Existing Risk of Sewer Flooding

- 4.6.1 There is no evidence of historic sewer flooding at the Site in the SFCA. Any potential flooding arising from the 300 mm sewer in Bridge Street would be directed south, into the Site, which acts as a low point in the surrounding area. The SCFA notes that failures of trunk sewers may surcharge manholes within the catchment affecting low lying land that may already be suffering from other sources of flooding.
- 4.6.2 It can therefore be concluded that the risk of sewer flooding is Low.

Existing Reservoir and Canal Flood Risk

- 4.6.3 There are no canals within the vicinity of the Site and there is no associated flood risk to or from the development.
- 4.6.4 The NRW 'Flood Risk from Reservoirs' map shows that the Site is not at risk of flooding from reservoirs and therefore the risk to site is considered Negligible.

Development Impact on Artificial Sources Flooding

- 4.6.5 The Proposed Development will not discharge to a public or private sewer system therefore the risk from the development on Sewer flooding is Low.
- 4.6.6 It can be concluded that the risk to and from the site with regards to both canal and reservoir flooding is Low

4.7 Summary of Flood Risk

- 4.7.1 It can be concluded that fluvial flooding is the main source of flood risk to the Site. The associated risk has been used to inform mitigation design as discussed further in this report.

4.8 Mitigation

- 4.8.1 The Site is identified at risk of fluvial flooding with a maximum flood level of 114.297 m AOD during the 1% AEP plus CC and 114.378 m AOD during the 0.1% AEP event.
- 4.8.2 It is proposed to set FFL's levels at a minimum of 115.05m AOD with the front elevations of the food store been on stilts and therefore will allow free movement of flood waters. This will ensure that the building will remain flood free during the 1% AEP plus CC and the 0.1% AEP event.

Flood Warnings and Evacuation

- 4.8.3 The Site lies within the Afon Teifi at Lampeter Flood Warning Area. Site management should register to receive flood warnings. Flood Warnings Alerts is a free service that provides prior warning of a fluvial / flood event.
- 4.8.4 The Site management should prepare a flood response plan to inform Site users of the flood risk and to provide advice on what to do in the event of a flood. The flood plan should include details of a safe evacuation route to be used upon receipt of a flood warning. Safe evacuation should be provided via the A482, an area shown outside of the extreme fluvial flood extent on NRW mapping. It is also considered acceptable for Site users to remain within the building and seek refuge at first floor level. Residents should not evacuate the building into flood water unless instructed to do so otherwise by the emergency services.

Flood Warnings and Evacuation

- 4.8.5 Flood Warnings / Flood Alerts [do not] cover this area. Residents / Site users should register to receive flood warnings / alerts. Flood Warnings Alerts is a free service that provides prior warning of a fluvial / tidal flood event.

4.8.6 The Site owner / management should prepare a flood plan to inform residents / Site users of the flood risk and to provide advice on what to do in the event of a flood. The flood plan should include details of a safe evacuation route to be used during a flood event / upon receipt of a flood warning. Safe evacuation should be provided via, an area shown outside of the extreme fluvial flood extent on EA mapping. Where no flood warning is received.... / It is also considered acceptable for Site users to remain within the building and seek refuge at first floor level. Residents should not evacuate the building into flood water unless instructed to do so otherwise by the emergency services.

4.9 Residual Risks

4.9.1 The residual risk to the property will be discussed once Site specific hydraulic modelling has been completed.

5.0 Jusification

- 5.1.1 Section 6 of TAN15 states that *'New development should be directed away from zone C and towards suitable land in zone A, otherwise to zone B'* as such a sequential approach to Site selection has been undertaken. See Appendix I for further details.
- 5.1.2 In accordance with TAN15, less vulnerable development will be justified in Flood Zone C2 if it can be demonstrated that:
- i. Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy to sustain an existing settlement; or
 - ii. Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region.
- and,
- iii. It concurs with the aims of Planning Policy Wales (PPW) and meets the definition of previously development land (PPW Fig 2.1); and
 - iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and Appendix 1 [of TAN15] found to be acceptable.
- 5.1.3 If a development proposal in zone C1, or in C2 if it is defined as being of low vulnerability, meets the test outlined in section 6, the justification will be in the knowledge that those developments will flood and will need to be planned accordingly.
- 5.1.4 Where development is justified the assessment can be used to establish whether suitable mitigation measures can be incorporated within the design to ensure that development is as safe as possible and there is:
- minimal risk to life;
 - minimal disruption to people living and working in the area;
 - minimal potential damage to property;
 - minimal impact of the proposed development on flood risk generally; and;
 - minimal disruption to natural heritage.
- 5.1.5 Any new development on the flood plain will generally result in additional risks. The main criteria for deciding whether such a development is acceptable will depend on whether those factors can be effectively managed.
- 5.1.6 The advice to planning authorities suggests that development should be designed to be flood free during the 1% fluvial flood (i.e that fluvial flood with a 1 in 100 chance of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event) with an allowance for climate change.
- 5.1.7 Beyond the threshold frequency, proposed development would be expected to flood under extreme conditions. However, even with adequate mitigation measures in place it may still not be sensible to allow particular development to take place.
- 5.1.8 Where development is allowed in flood risk areas local planning authorities should impose conditions that require the incorporation of physical features at flood defence locations that will draw attention to the flood risk
- 5.1.9 A summary of the adherence of the development with the requirements of Section 7 and Appendix A1 of TAN 15 is summarised in Table 6 below.

Table 6: Adherence with Section 7 and Appendix A1 of TAN 15

	Requirement	Comment
1	Is the development flood free during a 0.1% AEP event	Yes, the food store will be flood free based on FFL's of 115.050 m AOD. This is to be confirmed upon receipt of updated site-specific hydraulic modelling
2	Is the flood depths at the development less than 600 mm during a 0.1% AEP event	Yes, the development should be flood free based on FFL's of 115.050 m AOD. This is to be confirmed upon receipt of updated site-specific hydraulic modelling
3	Is the flood velocity at the development less than 0.15 ms ⁻¹ during a 0.1% AEP event	Yes, velocities are below 0.01 ms ⁻¹ . This is to be confirmed upon receipt of updated site-specific hydraulic modelling.
4	Is the flood depths on the access route less than 600mm during a 0.1% event	Yes, the access route should be flood free based on FFL's of 115.050 m AOD. This is to be confirmed upon receipt of updated site-specific hydraulic modelling.
5	Is the flood velocity on the access route less than 0.3 ms ⁻¹ during a 0.1% event	Yes, velocities are below 0.01 ms ⁻¹ . This is to be confirmed upon receipt of updated site-specific hydraulic modelling.
6	Is the maximum rate of rise of flood waters less than 0.3m/hr	Yes, maximum speed of inundation is indicated to be 13 hours. This is to be confirmed upon receipt of updated site-specific hydraulic modelling.
7	Is the maximum speed of inundation of flood risk area less than 2hrs	Yes, maximum speed of inundation is indicated to be 13 hours. This is to be confirmed upon receipt of updated site-specific hydraulic modelling.
8	Will the development have an impact on third parties	To be confirmed upon completion of Site specific hydraulic modelling
9	Will there be a loss of flood storage capacity	To be confirmed upon completion of Site specific hydraulic modelling

5.1.10 A FFL of 115.05 m AOD complies with the TAN15 guidance which states that commercial and retail properties can have a maximum depth of flooding of 600 mm. The building is set above the 0.1% AEP event. The car park is indicated to have areas of flooding with depths above 600 mm however pedestrian access from the Site will still be achievable in the 0.1% AEP event along the A482 to the east of the Site which is indicated to remain flood free. It is recommended that signage is posted in the car park that there is a risk of flooding to the car park and users will park at their own risk.

5.2 Conclusions

5.2.1 The proposed development is for Supermarket with proposed parking and access.

5.2.2 The Site is located within Flood Zone C2 on the Welsh Government Development Advice Map - an area considered to be at flood risk, without significant defence infrastructure, with a 0.1% (1 in 1000) or greater annual probability of flooding. The Site is located partially within Flood Zone 3 on the NRW Flood Map for Planning.

5.2.3 The main potential source of flooding at this Site is fluvial flooding from the Afon Teifi which is the dominant source of flooding in the area.

5.2.4 Estimated flood levels have been obtained from NRW and show that proposed building will be set above the 1% AEP + 30% CC maximum flood levels. The flood depths, velocities and time to max peak are within the tolerable limits permitted by A1.15 of TAN15.

5.2.5 Safe evacuation is available from the Site for pedestrians via the A482 to the east of the Site which is indicated to remain flood free in the 0.1% AEP event.

5.2.6 The Site is in an area which is served by flood warnings.

5.3 Recommendations

Flood Risk

- Set finished floor levels above the design flood level (1% AEP + CC).
- Complete the Site specific hydraulic modelling to ensure that the risk off Site is not exacerbated by providing flood compensatory storage where necessary.
- Site management sign up to Floodline flood alerts and warnings to receive updates on flood events.
- Implement an appropriate Site management plan inclusive of a flood response plan, which recognises the residual risks and details what action is to be taken by staff in the event of a flood to put Site users in a place of safety.
- Include for an enhanced surface water drainage maintenance programme to ensure the hydraulic performance of the system remains fully functional particularly after a flood event.
- Appropriate signage within the car park highlighting the risks of flooding

Other

- Flood Risk Permit for works within the floodplain
- Land Drainage Consents for discharges to a watercourse

Appendix A – Limitations

Limitations

The recommendations contained in this Report represent Lucion professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Lucion does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Lucion obtained, reviewed and evaluated information in preparing this Report from the Client and others. Lucion conclusions, opinions and recommendations has been determined using this information. Lucion does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Lucion has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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Appendix B – Topographic Survey (Provided Separately)

Appendix C – Sewer Plans (Provided Separately)

Appendix D – Proposed Development Plans (Provided Separately)

Appendix E – NRW Historic Mapping (Provided Separately)

Appendix F – NRW Depth Mapping (Provided Separately)

Appendix G – NRW Velocity Mapping (Provided Separately)

Appendix H – Drainage Strategy (Provided Separately)

Appendix I – Sequential Test (Provided Separately)

Appendix J – NRW Correspondence (Provided Separately)