

Flood Consequence Assessment and Drainage Strategy

Glan Llyn Local Retail Centre Development
Site, Glan Llyn, Newport

Presented
to: **Lidl**

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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 riverbanks. 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.

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1.0 Introduction

1.1 Appointment

- 1.1.1 Lucion Delta-Simons Ltd ("Lucion") was instructed by Lidl (the "Client") to carry out a Flood Consequence Assessment (FCA) and Drainage Strategy (DS) of Glan Llyn Local Retail Centre Development Site, Glan Llyn, Newport (the "Site"), to inform a planning application for a new retail-led development, with associated car parking, nursery and commercial units.

1.2 Project Understanding

- 1.2.1 The Site is shown to be located within Flood Zone C1 (an area served by significant infrastructure, including flood defences) on the Development Advice Map and defended Flood Zone 3 on the Natural Resources Wales (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 Newport City Council (NCC) as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

1.3 Scope of Works

- 1.3.1 The scope of works has been as follows

FCA:

- Assess flood risk to and from the proposed development from all sources using best available information including review of NRW data and mapping, topography and historical records;
- Assess relevant local authority plans or strategies;
- Advise on flood mitigation measures and residual risks;
- Assess evacuation routes;
- Advise on availability of flood warnings; and
- Prepare FCA report.

- 1.3.2 DS:

- Review available existing conditions including sewer plans, British Geological Survey information and topographical information;
- Review Lead Local Flood Authority (LLFA) drainage policies where publicly available;
- Analyse existing and proposed (post development) impermeable areas;
- Calculate existing runoff rates (excluding existing drainage system modelling);
- Assess potential method of surface water runoff disposal (soakaway/watercourse/sewer);
- Contact LLFA/sewerage provider to establish surface water discharge rate (where appropriate), reasonable assumptions will be made where no response has been received;



- Provide a fully drawn and detailed design of the storm & foul drainage systems;
- Undertake the detailing and design of any attenuation, SuDS features and flow control devices. Provide typical specifications and sections where required;
- Undertake a manual assessment of overland flow routes for exceedance events;
- Assess and advise on suitable forms of SuDS;
- Advise on drainage system maintenance measures;
- Advise on surface water treatment methods (in line with the CIRIA SuDS Manual); and
- Prepare detailed drainage strategy section.

1.3.3 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
- Newport City Council Local Development and Planning Policies.

1.4 Sources of Information

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

- NRW online flood maps⁴;
- British Geological Society (BGS) Interactive Map⁵;
- MAGIC Interactive Map⁶;
- Newport Local Development Plan (2011-2025);
- Newport City Council Preliminary Flood Risk Assessment (2011 PFRA);
- Newport City Council Local Flood Risk Management Strategy (2014 LFRMS);
- Severn Estuary Shoreline Management Plan (2017 SMP);
- Sustainable Drainage Systems Standards for Wales (2018)⁷;
- South East Wales Level 1 Strategic Flood Consequences Assessment (2022 SFCA);
- Phase 2 Ground Investigation on Lidl Store Zone by Ramada Geo Consultants, June 2024 ref. 1261.03.01 (2024a GI); and
- Phase 2 Ground Investigation on Disposal Zone [community uses] by Ramada Geo Consultants, June 2024 ref. 1261.04.01 (2024b GI).

1.5 Project Limitations

1.5.1 The wider Lucion limitations are contained within Appendix A.

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>

4 <https://flood-map-for-planning.service.gov.uk/>

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

6 <http://www.magic.gov.uk/>

7 <https://www.gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf>



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: Illustrative Site Layout Plan

Co-ordinates	Centred approximately at E: 335554, N; 186568	Area (approx.)	1.12 ha
Site Location	The Site is located off Queen's Way/A4810, within the former Glan Llyn Business Park, approximately 5.1 km south-east of Newport city centre.		
Existing Site Conditions	Online mapping (including Google Maps / Google Streetview imagery, accessed 06/06/2024) shows that the Site is largely brownfield land, consisting of a parking area and storage yard to the north-east, and grassed and wooded areas to the south and west. The Site is bordered by: • Bessemer Drive and residential properties under construction to the north; • Kings Wall Drive, a pub (Llanwern Bull) and a residential estate to the east; • Queen's Way/A4810 and agricultural fields to the south; and • A residential estate to the west. Hardstanding areas on Site currently occupies 4960 m² of the total Site area. The remaining permeable, soft landscaped areas occupy 6305 m² of the total Site area. Existing hardstanding areas have been estimated from Google Maps aerial imagery.		

Topography	A topographical survey has been undertaken by EMP Surveys Ltd in May 2024 and is included in Appendix B. The topographical survey shows that the Site is at an average of approximately 6.72 m AOD, and slopes from 5.31 metres Above Ordnance Datum (m AOD) in the north-west to 7.32 m AOD in the south-west Topographic levels to metres Above Ordnance Datum (m AOD) have also been derived from a 1m resolution Natural Resources Wales (NRW) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR ground elevation data shows that the Site slopes from approximately 7.56 m AOD in the south to approximately 5.87m AOD in the west. A LiDAR extract and topographical survey are included in Appendix B.
Hydrology	The Site is located within the Caldicot Levels which is characterised by an extensive network of Reens (surface water drains) that were historically constructed to drain the surrounding land. The Reen network generally drains in a southerly direction, discharging into the Severn Estuary via a series of outfalls including a number of unidirectional flapped tidal outfalls. The Caldicot Levels are managed and maintained the Caldicot and Wentlooge Internal Drainage Board (IDB). The nearest watercourse is Julian's Reen, an Ordinary Watercourse (under the jurisdiction of the Caldicot and Wentlooge IDB) which is located approximately 10m west of the Site. The watercourse drains in a northerly direction and discharges into the North East West Ditch approximately 795 m north of the Site. Other nearby watercourses include Lliswerry Pill and Monks Ditch (both Main Rivers under the jurisdiction of NRW) which are located approximately 1.1 km west and 1.2 km east of the Site respectively. The River Usk is located approximately 2.8 km south-west of the Site.
Geology	Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the Site is underlain by superficial Tidal Flat Deposits, generally comprising of clay and silt. The superficial deposits are identified as being underlain by Mercia Mudstone Group, predominantly comprised of mudstone. The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis. The 2024a GI details that 9 boreholes were drilled across the proposed Lidl store zone. The following underlying geology was recorded from borehole no. WS101: • Made Ground (Reddish-brown, slightly sandy, gravelly clay) to 0.8 m below ground level (bgl); • Made Ground (Soft, bluish-grey, gravelly clay. Gravel is angular to subangular, fine to medium of brick and concrete) to 1.2 m bgl; • Very soft, bluish-grey mottled brown clay to 2.0 m bgl; • Very soft, bluish-grey clay to 4.6 m bgl; • Brown, pseudo-peat to 5.0 m bgl; and • Dark brown, clayey, pseudo-fibrous peat to the end of the borehole at 7.0 m bgl.
Hydrogeology	According to NRW's Aquifer Designation data, obtained from MAGIC Map's online mapping [accessed 10/06/24], the superficial Tidal Flats Deposits are classified as an 'Unproductive Stratum'. These are 'rock layers or drift deposits

	with low permeability that have negligible significance for water supply or river base flow'. The underlying Mercia Mudstone is classified as a Secondary B Aquifer. These 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'. The NRW's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 10/06/2024], indicates that the Site is not located within a Groundwater Source Protection Zone. The Soilsmap mapping obtained from MAGIC Map's online mapping (accessed 10/06/2024) shows the Site to be located in 'loamy and clayey soils of coastal flats with naturally high groundwater'. The 2024a GI revealed that no groundwater was detected in the 9 boreholes that were drilled to depths of up to 7.0 m bgl. However, groundwater monitoring detected levels of between 0.38 and 1.80 m bgl. In the 2024b GI groundwater was not encountered during intrusive investigation but subsequent monitoring detected levels between 0.41 and 2.60 m bgl.
Local Drainage	Public sewer records have been obtained from Welsh Water in June 2024 and are included in Appendix C. The public sewer records indicate the following: • There is a 225 mm diameter foul sewer which originates to the east of the Site, located within Kings Wall Drive, 5 metres to the east of the Site. The sewer discharges in a west to east direction, away from the Site; • A 150 mm diameter surface water sewer is located within Bridling Crescent, 45 m to the west of the Site. The sewer drains in north-west to south-east direction, before draining at a surface water sewer outfall into Julian's Reen, approximately 10 m west of the Site; and • Invert and cover levels for the surface water manhole are not known. A Topographic and Utilities Survey undertaken by EMP Surveys Ltd in May 2024 indicates that the foul sewer manhole has an invert level of 4.43 m AOD and a cover level of 6.62 m AOD. The invert and cover levels of the surface water were not provided.
Proposed Site conditions	Outline planning permission (Ref: 06/0471) has been granted for the former Tata Steel Llanwern Works, to redevelop the area to provide new homes, offices, workshops, factories, warehouses, community facilities, leisure facilities and public open space, amongst other elements. The Site forms part of this Outline planning permission, identified for use as a Local Centre. The proposed development is for a new Lidl store in the west, associated parking in the south and east, a nursery in the north-west, and three commercial units in the north-east, to cumulatively comprise Glan Llyn Local Retail Centre. The proposed development is a part of the wider Glan Llyn Development Site. The proposed finished floor levels (FFLs) for the supermarket and nursery will be 7.19 m AOD. FFLs for the commercial units will be 6.99 m AOD. A proposed development and elevation plan is included in Appendix D. The proposed development will result in an increase in hardstanding areas in the form of building, parking areas, and access. Hardstanding will comprise

	approximately 9714 m ² or 86% of the total Site area. The remaining permeable, soft landscaped areas will occupy 1486 m ² or 14% of the total Site area.
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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's 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' 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 or pluvial flooding (<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 pluvial 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 pluvial 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 included within the national Flood Map for Planning and is calculated where necessary using detailed hydraulic modelling.

3.3 Planning Policy Wales

Development Vulnerability Classification

- 3.3.1 The proposed development is comprised of a supermarket, nursery and three commercial units. In accordance with Figure 2 of the TAN15, the supermarket and commercial units are considered to be 'Less Vulnerable' development. The nursery is considered to be a 'Highly Vulnerable' development.
- 3.3.2 TAN15 states that 'Less Vulnerable' and 'Highly Vulnerable' development can be considered in Development Advice Zone C1 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 and discussed further in Section 6.

3.4 Local Policy

3.4.1 The Newport City Council Local Development Plan (2011 – 2026) contains the following policies relating to flood risk and drainage:

3.4.2 **STRATEGIC POLICY 1: SUSTAINABILITY** states:

- *Proposals will be required to make a positive contribution to sustainable development by concentrating development in sustainable locations on brownfield land within the settlement boundary. Sites will be assessed as their potential contribution to minimising the risk of and from flood risk, sea level rise and the impact of climate change, among other contributions.*

3.4.3 **STRATEGIC POLICY 3: FLOOD RISK** states:

- *Newport's coastal and riverside location necessitates that development be directed away from areas where flood risk is identified as a constraint and ensure that the risk of flooding is not increased elsewhere.*
- *Where appropriate a detailed technical assessment will be required to ensure that the development is designed to cope with the threat and consequences of flooding over its lifetime. Sustainable solutions to manage flood risk should be prioritised*

3.4.4 **GENERAL DEVELOPMENT PRINCIPLE 1: CLIMATE CHANGE** states:

- *Sites should be designed to withstand the predicted changes in the local climate and to reduce the risk of flooding on site and elsewhere by demonstrating where appropriate that the risks and consequences of flooding can be acceptably managed, including avoiding the use of non-permeable hard surfaces;*
- *Development will be directed away from flood risk areas, and layouts and buildings will be expected to incorporate high quality, sustainably designed systems. The use of Sustainable Drainage Systems (SUDS) is encouraged where appropriate.*

3.5 Data Requests

3.5.1 A request was submitted to NRW on 26th April 2024 for Product Data. A response was received on 6th June 2024 and is included in Appendix E.

3.5.2 A request was submitted to Welsh Water on 17th June 2024 for Sewer Plans. A response was received 19th June 2024 and is included in Appendix C.

4.0 Assessment of Flood Risk

4.1 Tidal Flood Risk

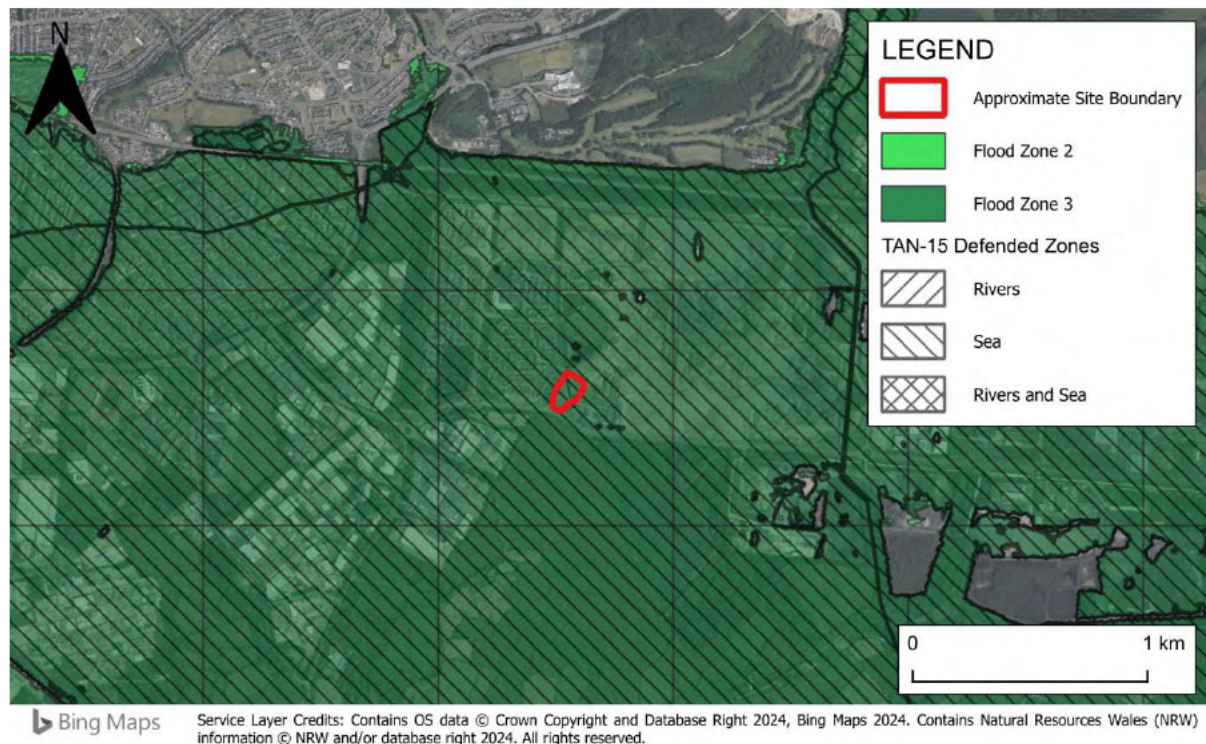


Figure 2: NRW Flood Map for Planning - Tidal

NRW Online Mapping

- 4.1.1 As the Site is 2.8 km north-east of the tidally influenced River Usk, the flooding mechanism within the vicinity of the Site is likely to comprise a joint tidal and fluvial component.
- 4.1.2 The Site is situated at a minimum of 5.87 m AOD, is located approximately 4.1 km north of the coastline and 2.8 km north-east of the tidally influenced River Usk. According to the NRW Flood Map for Planning (Figure 2), the Site is shown to be situated entirely within Tidal Flood Zone 3, whereby there is a 0.5% (1 in 200) chance or greater annual chance of tidal flooding, including an allowance for climate change. However, the Site is shown to be located within a TAN-15 Defended Zone (Sea) therefore the risk of tidal flooding is considered to be residual and would only occur in the event of breach or overtopping of coastal defences.
- 4.1.3 According to NRW's Flood Risk Assessment Wales (FRAW) mapping, which takes into account local flood defences, the Site is entirely at a Low risk of tidal flooding, whereby the annual probability of tidal flooding is between 1 in 200 (0.5%) and 1 in 1000 (0.1%). Furthermore, the Site is located within Zone C1 of NRW's Development Advice Map (DAM). Zone C1 is defined as areas at risk of flooding from fluvial or tidal sources but are currently developed and served by significant infrastructure, including flood defences.
- 4.1.4 NRW mapping identifies the presence of defences, in the form of raised embankments, along the northern bank of the Severn Estuary from Newport to the Severn Tunnel. The condition of the defences is recorded as 'Fair', however, no further information (i.e. crest level or standard of protection) is provided on the NRW mapping.
- 4.1.5 The Site is also within the Caldicot Levels (CALD 1) policy unit of the Severn Estuary 2017 SMP. The SMP states that a Hold the Line policy is in effect along the coastline to the south of the Site, meaning that existing defences are proposed to be upgraded and maintained up to the year 2105.

- 4.1.6 According to the NRW Recorded Flood Extents Map (Appendix F) there have been no historic tidal/fluvial flood events within the Site or within the surrounding area.
- 4.1.7 The Site is located in the Usk Estuary at South Liswerry Flood Warning Area. It is recommended that Site management sign up to alerts on quick dial number 502005 and warnings on quick dial number 197009 to receive updates on flood events. Alternatively contact Floodline on 0345 988 1188.

Third Party Reports

- 4.1.8 The 2022 SFCA identifies that the defences within the vicinity of the Site typically comprise earthen embankments which provide a 1 in 200 year Standard of Protection (SoP). The SFCA states that on account of the formal flood defences situated along the Severn Estuary, the extent of the flood zones is likely precautionary, with the area remaining at residual risk from potential breaches or overtopping of these defences. No assessment of residual risk following a breach or overtopping of the flood defences is provided within the SFCA.
- 4.1.9 A review of the 2014 LFRMS indicates that the proposed development Site is not located within an area that is considered to be at an elevated risk of tidal flooding. There is also no evidence of historic flooding in the LFRMS or other third-party reports.

NRW Modelled Flood Data

- 4.1.10 Based on the nature of flood risk identified on the NRW Flood Map for Planning, Site-specific modelled flood level data was requested from NRW who subsequently provided data from Caldicot and Wentlooge Flood Model, a TUFLOW (1D-2D) model produced by JBA Consulting in 2016. The modelling includes present day and breach scenarios, including climate change scenarios up to the year 2115, across the Caldicot and Wentlooge Levels. Modelled outputs are included in Appendix E.

Modelled Scenario	Maximum on-Site flood depths (m)*	Maximum on-Site flood levels (m AOD)
20% AEP (1 in 5 year)	0	0
5% AEP (1 in 20 year)	0	0
2% AEP (1 in 50 year)	0	0
0.5% AEP (1 in 200 year)	0	0
0.1% AEP (1 in 1000 year)	0	0
0.5% AEP + CC (1 in 200 year + CC)	0.72	6.89
0.1% AEP + CC (1 in 1000 year + CC)	1.72	7.90
0.5% AEP Breach (1 in 200 year)	0	0
0.1% AEP Breach (1 in 1000 year)	0	0
0.5% AEP Breach + CC (1 in 200 year + CC)	1.31	7.50
0.1% AEP Breach + CC (1 in 1000 year + CC)	2.25	8.43

*These depths are based on existing Site levels and therefore would reduce significantly as a result of the proposed development.

Defended Scenario

- 4.1.11 The results of the hydraulic modelling study indicate that the Site will remain flood free up to and during both the defended 1 in 200 year and 1 in 1,000 year extreme sea-level events taking into account the impacts of wave overtopping.
- 4.1.12 The Site is shown to be impacted by flooding during the defended 1 in 200 year and 1 in 1,000 year climate change scenarios, with depths of up to 0.72 m and 1.72 m respectively. Lucion notes that the design standard for new developments is the 1 in 200 year plus climate change tidal event.
- 4.1.13 According to TAN-15, both highly vulnerable and less vulnerable development must be shown to be flood free up to the 0.5% plus climate change tidal event.
- 4.1.14 The proposed FFL of the supermarket and nursery will be 7.19 m AOD, 300 mm above the predicted 0.5% AEP plus climate change flood level. The proposed FFL of the three commercial units will be 6.99 m AOD, 100 mm above the 0.5% AEP plus climate change level. It is recommended that flood resilience and resistance measures be applied to all ingress routes, this will ensure that the buildings will remain flood free during the 0.5% AEP plus climate change event. It is also recommended that consideration is given to flood resistance and resilience measures for the commercial units, up to 7.19 m AOD, 300 mm above the flood level.
- 4.1.15 It must be noted that the development platform (almost the entire Site area) will also be raised to a minimum of 6.5 m AOD for flood resilience purposes.
- 4.1.16 Safe access and egress is not considered achievable during the climate change scenario, with flood depths exceeding 300 mm across Queen's Way/A4810 and King's Wall Drive. This residual risk can be managed through a Flood Warning and Evacuation Plan (FWEP).

Breach Scenario

- 4.1.17 The Caldicot and Wentlooge Flood Model also provides flood depths and levels for the breach scenario in the event that there was a breach in the raised embankment approximately 3.8 km south of the Site. Breach modelling indicates the Site would remain free from flooding in the event of a breach of defences up to and during the present day 1 in 200 year and 1 in 1000 year in scenario.
- 4.1.18 However, the Site is shown to be impacted by flooding during the 1 in 200 year and 1 in 1000 year climate change breach scenarios. Depths are estimated to reach 1.31 m during the 1 in 200 year climate change scenario. However, the a breach event is very unlikely and is considered to be a residual risk when considering NRW inspect and maintain their defences. A Flood Warning and Evacuation Plan is recommended to manage the residual risk to guide any Site users to a place of safety during a residual risk event
- 4.1.19 In order to ensure that the site remains flood free during the breach scenarios, ground levels for the entire site would need to be raised by approximately 2 m. This is not considered to be an achievable or reasonable requirement for this Site on the balance of risk and probability.
- 4.1.20 Safe access and egress is not considered achievable during the breach scenario, this residual risk can be managed by a FWEP.

Summary

- 4.1.21 Based on the above, the risk of tidal flooding to the proposed buildings is considered to be **Low**. The proposed development is located outside the tidal flood extents up to and including the present day 0.5% AEP scenario, with access and egress shown to be unaffected. However, the Site is expected to flood during the 0.5% AEP (2115) climate change scenario with levels of up to 6.89 m AOD. The Site is also shown to be at risk when considering a breach in the costal defences to the south of the Site. However, the likelihood of the breach event is very unlikely and is considered to be a residual risk when considering NRW inspects and maintain their defences. A FWEP is recommended to manage the residual risk to guide any Site users to a place of safety during a flood event.

4.2 Fluvial Flood Risk



Figure 3: NRW Flood Map for Planning - Fluvial

- 4.2.1 The nearest watercourse is Julian's Reen which is located approximately 10 m west of the Site. The Reen drains in a northerly direction.
- 4.2.2 According to the NRW Flood Map for Planning, the Site is situated wholly within Fluvial Flood Zone 1, whereby the annual probability of fluvial flooding is less than 0.1% including an allowance for climate change. The site is situated approximately 35 meters north of the boundaries of fluvial Flood Zones 2 and 3, which include an allowance for climate change.
- 4.2.3 It can therefore be concluded that the Site is at a **Low** risk of fluvial flooding.

4.3 Surface Water Flood Risk

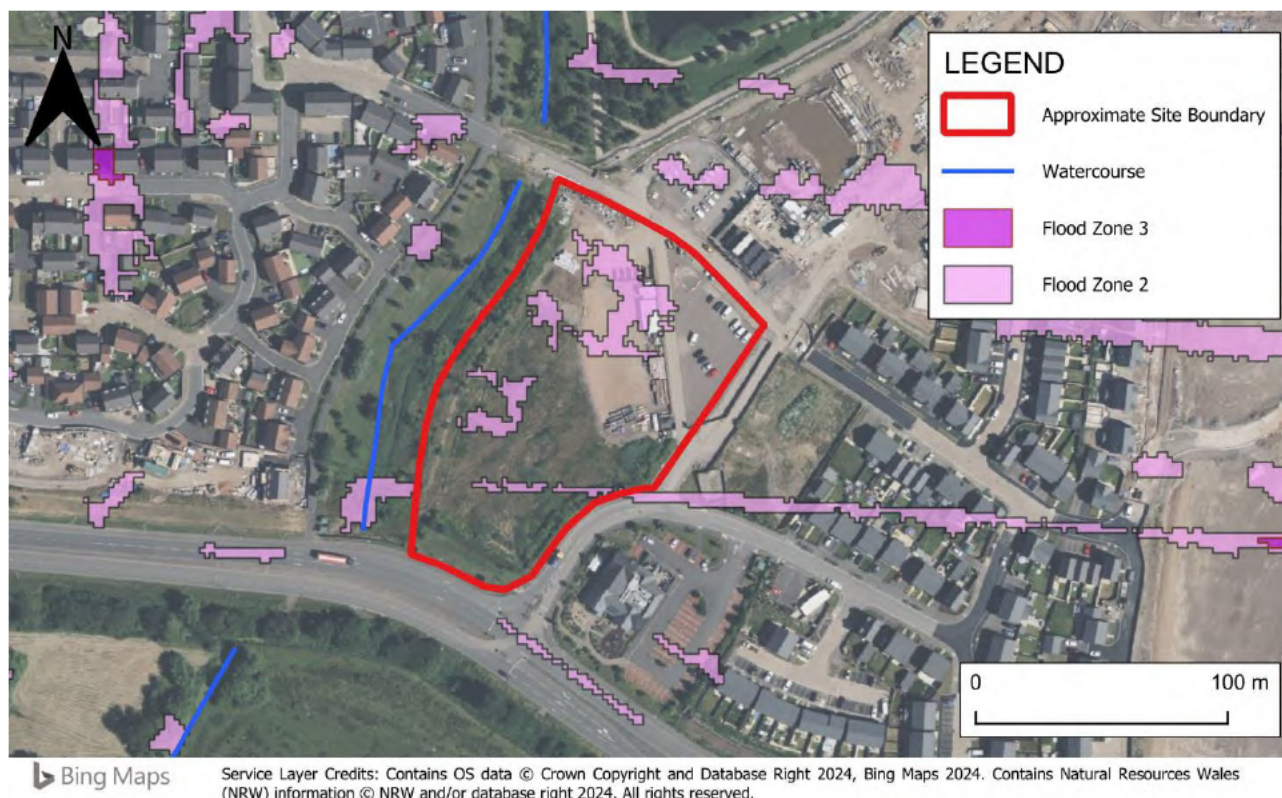


Figure 4: NRW Flood Map for Planning - Surface Water

NRW Online Mapping

- 4.3.1 The NRW Flood Map for Planning (Figure 4) indicates that the majority of the Site is within Flood Zone 1 for surface water and small watercourses, whereby there is a less than 0.1% (1 in 1000 year) annual chance of flooding, including an allowance for climate change. There are small areas of the Site within Flood Zone 2 in the north-west and south-east of the Site. Areas in surface water Flood Zone 2 have a 0.1% to 1% (1 in 1000 to 1 in 100 year) annual chance of flooding, including an allowance for climate change.
- 4.3.2 According to NRW's Flood Risk Assessment Wales (FRAW) mapping, the majority of the Site is at a Very Low risk of surface water flooding, whereby the annual probability of flooding is less than 0.1%. There are small areas at a Low risk of surface water flooding in the north, west, and south-east of the Site, whereby the annual probability of flooding is between 0.1% and 1%. There are also small, isolated areas of Queen's Way/A4810 and Kings Wall Drive that are at a Low risk of flooding. The pockets of surface water ponding across the site are associated with existing (pre-development) topographic depressions on Site.
- 4.3.3 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. While the Site is not at risk during the High risk (>3.3% annual probability or 1 in 30 year) and Medium risk (between 1% and 3.3% annual probability or between 1 in 100 year and 1 in 30 year) scenarios. During the Low risk (between 0.1% and 1% annual probability or between 1 in 1000 and 1 in 100 year) scenario flood depths are shown to remain below 300 mm across the Site.
- 4.3.4 Flood depths along Queen's Way/A4810 and Kings Wall Drive are expected to remain below 300 mm. This is considered passable by people and vehicles. Access and egress is suggested via Kings Wall Drive onto Queen's Way/A4810, via any direction.

Third Party Reports

- 4.3.5 The Newport City Council PFRA (2011) identifies that the primary flood risks in the Newport area are fluvial and tidal, while flooding from surface water and Ordinary Watercourses is not considered significant in the local area. The Newport City Council Flood Risk Management Plan (2015) suggests that there have been no reported instances of surface water flooding at the Site.

Summary

- 4.3.6 Based on the above information and as the Site is free from ponding in the 100 year plus climate change event, it can be concluded that the Site is at a **Low** risk of surface water flooding.

4.4 Groundwater Flood Risk

BGS Mapping

- 4.4.1 Reference to the British Geological Survey (BGS) online mapping indicates that the Site is underlain by superficial Tidal Flat Deposits. The 2024a GI indicates that the Site is predominantly underlain by clay, which is generally considered impermeable and therefore will limit groundwater emergence at the surface. Groundwater monitoring identifies the presence of shallow, fluctuating groundwater across the Site (2024a GI and 2024b GI). Groundwater levels likely fluctuate with tidal influence.
- 4.4.2 The proposed development on-Site will predominantly be hardstanding. This will reduce the probability of vertical migration of groundwater to the surface through the presence of a permanent impermeable layer. It is understood that there are no basement levels proposed at the Site.

Third Party Reports

- 4.4.3 On a strategic scale in Newport, the 2011 PFRA concludes that groundwater is not considered to be a significant flood risk. The 2011 PFRA further states that the local geology is not considered to yield significant volumes of groundwater, thus it is considered unlikely that water within the underlying deposits will outcrop. The LFRMS states that there are no recorded groundwater flood incidents within the Llanwern Ward, in which the Site is situated.
- 4.4.4 There are no records of groundwater flooding at or near to the Site within third-party reports.

Summary

- 4.4.5 Finished ground floor levels will be elevated above external ground levels for tidal mitigation, which will additionally afford protection against groundwater emergence.
- 4.4.6 Based on the above information, it can be concluded that the risk of groundwater flooding to the proposed buildings is **Low**.

4.5 Artificial Sources Flood Risk

Sewer Flooding

- 4.5.1 There is no data provided by the Integrated Surface Water Management Group to indicate the area has suffered from historic surface water or sewer flooding incidents.
- 4.5.2 The 2014 LFRMS indicates that there are 3 reported instances of DG5 sewer flooding in Llanwern Ward. There are no records of sewer flooding at or near to the Site within third-party reports.
- 4.5.3 The proposed FFLs for the supermarket and nursery will be elevated to 7.19 m AOD. FFLs for the commercial units will be 6.99 m AOD. This may offer additional protection against sewer surcharging if it were to occur.
- 4.5.4 It can therefore be concluded that the risk of sewer flooding is **Low**.

Reservoir and Canal Flooding

- 4.5.5 There are no canals within the vicinity of the Site.
- 4.5.6 The NRW 'Flood Risk from Reservoirs' map shows that the Site is not at risk of flooding from reservoirs.
- 4.5.7 It can therefore be concluded that there is a **Low** risk of flooding from artificial sources.

4.6 Summary of Flood Risk

- 4.6.1 Based on the information above, it can be concluded that tidal flooding is the main potential source of flood risk to the Site, however, following the inclusion of the proposed mitigation, the overall risk of flooding to the proposed buildings is considered to be **Low**.

4.7 Flood Warnings and Evacuation

- 4.7.1 NRW Flood Warnings and Flood Alerts cover this area. Site management should register to receive flood warnings and alerts. NRW Flood Warnings is a free service that provides prior warning of a tidal flood event.
- 4.7.2 In order to manage the residual risk posed to Site users when safe access is unavailable, it is proposed that a robust Flood Warning and Evacuation Plan is produced for the Site. The Flood Warning and Evacuation Plan would inform Site users of the correct actions to take following receipt of Flood Alerts and Warnings, to be prepared should flood waters reach the Site. Site users are to remain within the building and should not evacuate the building into flood water unless instructed to do so otherwise by the emergency services.

4.8 Residual Risks

- 4.8.1 A residual risk is an exceedance event, such as a failure of the existing coastal defences. As the likelihood of defence failure is low, no further mitigation beyond what is proposed is required.
- 4.8.2 In the event of the defences failing or an exceedance event occurring, the residual risk to people within the Site can be managed through the implementation of an appropriate Flood Warning and Evacuation Plan as outlined above.

4.9 Impact on Flood Risk Elsewhere

- 4.9.1 The proposed development is at not at risk of fluvial flooding during all events up to and including the 0.1% AEP event for both undefended and defended scenarios. Therefore, the development does not remove flood storage space from the floodplain and will not result in an increase in flood risk elsewhere. Floodplain compensation is not required for tidal flood risk.
- 4.9.2 Surface water from on-Site sources and the provision of SuDS are considered in Section 5.0. below.

5.0 Drainage Strategy

5.1 Introduction

- 5.1.1 The Site currently comprises brownfield land which is not formally drained and is therefore considered to be 100% permeable.
- 5.1.2 The proposed development is for the construction of a new Lidl store, associated parking, a nurse, and three commercial units. The proposed development will comprise 9,714m² of hardstanding in the forms of buildings and car parking areas.
- 5.1.3 The increase in hardstanding area will, unmitigated, result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the Site will be controlled.
- 5.1.4 The development provides opportunities to implement SuDS which will contribute towards an overall reduction in surface water runoff from the Site. The use of SuDS within the Site has been considered further below in general accordance with the Welsh Government Non-Statutory Technical Standards for SuDS.
- 5.1.5 The proposed development Site is within an area benefiting from an outline planning approval 06/0471 to deliver a mixed-use development, comprising circa 4,000 dwellings, a local centre, a school and a business park.
- 5.1.6 The overall Llanwern development covers an area of approximately 242 ha, incorporating 4 sub catchments:
- Western sub area – 57ha;
 - Central sub area – 63ha;
 - Eastern sub area – 49ha; and
 - Celtic Business Park – 45ha.
- 5.1.7 The Site is located within the western sub catchment of the outline approval 06/0471 with the drainage arrangements previously approved as part of the later 2016 Site Wide Drainage Strategy for St Modwen. Overall, the area offers a total attenuation capacity of 398,570 m³ with surface water runoff from the development pumped into the Monks Ditch, instead of the Severn Estuary, which is the current situation. This occurs at a greenfield runoff rate of 3.5l/s/ha, which for a 214 ha impermeable area equates to a maximum pump rate of 750l/s. Specifically for the Site, discharge for surface water is to be into Julian's Reen at an unrestricted rate as approved through the PJA Estate Strategy Plan 02554-E-22D for St Modwen Developments. The Site can then avail of the existing surface water attenuation constructed for the Western sub area.

5.2 Drainage Hierarchy

- 5.2.1 Standard S1 of the Welsh Government: 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales' (2018) sets out the following hierarchy of drainage options:
- Priority Level 1: Surface water runoff is collected for use;
 - Priority Level 2: Surface water runoff is infiltrated to ground;
 - Priority Level 3: Surface water runoff is discharged to Waterbody;
 - Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system; and
 - Priority Level 5: Surface water runoff is discharged to a combined sewer.



Priority Level 1: Surface Water Collected for Use

- 5.2.2 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the system was not full. However, rainwater harvesting techniques (i.e. water butts) could be retrofitted into the development to provide water for irrigation where appropriate.

Priority Level 2: Surface Water Infiltration

- 5.2.3 The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above the Site is underlain by superficial deposits of Tidal Flat Deposits, described as unproductive strata, which are unlikely to be suitable for the discharge of surface water runoff. Soils Mapping indicates the Site has 'loamy and clayey soils of coastal flats with naturally high groundwater' with naturally wet drainage. The groundwater monitoring completed as part of the 2024a GI and 2024b GI indicates that shallow groundwater is present (0.38 m to 2.60 m bgl), which fluctuates with tidal levels.
- 5.2.4 Surface water infiltration into clay is not feasible due to the low permeability of clay soils. Based on the available evidence, surface water infiltration is not viable.

Priority Level 3: Surface Water Discharge to Watercourse

- 5.2.5 Where soakaways are not suitable, a connection to watercourse is the next consideration.
- 5.2.6 The nearest watercourse is Julian's Reen, which is located 10 m west of the Site boundary, in accordance with the 2016 Site Wide Drainage Strategy for the St Modwen development, it is proposed to discharge surface water into Julian's Reen. For reference, Julian's Reen flows directly into Monk Ditch and connects into the previously agreed surface water drainage strategy for the entirety of the Llanwern development.
- 5.2.7 The proposed drainage plan for the Site is located within Appendix G.

Priority Level 4: Surface Water Discharge to Watercourse or Highway Drain

As described above, a connection to Julian's Reen is feasible and therefore a connection to the public surface water sewer / highway drain is not required.

Priority Level 5: Surface Water Discharge to a Combined Sewer

- 5.2.8 As described above, a connection to Julian's Reen is feasible and therefore a connection to the public combined sewer is not required.

5.3 Surface Water Discharge and Attenuation Storage

- 5.3.1 The LPA have agreed that surface water runoff from the entire Llanwern development (within which the Site is located) be attenuated and discharged at a maximum discharge rate of 3.5l/s/ha up to and including a 1 in 100 year plus climate change event, which equates to a peak discharge rate of 750 l/s. Each phase of the Llanwern development is to have un-restricted discharge into the Reen network, which itself is restricted downstream, and avail of the significant attenuation provided for the entire scheme through a series of attenuation ponds.
- 5.3.2 It is understood that the existing attenuation scheme for the entire masterplan area (including the Site) has been sized to accommodate the 1 in 100 year plus 30% climate change event. As design standards have since changed and the target climate change allowance is 40%, attenuation will be provided on-Site for the difference between the 30% and 40% climate change allowances.

5.4 Sustainable Drainage Systems

- 5.4.1 Attenuation storage should be provided in the form of SuDS where practical. The following SuDS options have been considered:

Soakaways

- 5.4.2 As described above, the use of soakaways is not considered to be feasible given the impermeable stratum underlying the Site.

Swales, Detention Basins and Ponds

- 5.4.3 The Site will be occupied by buildings and carparking and there is limited space to accommodate above ground storage features such as ponds and basins. However, the Site will avail of the attenuation ponds provided as part of the wider residential development, of which the Site is within the masterplan area.

Rainwater Harvesting

- 5.4.4 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the tanks were not full. However, rainwater harvesting techniques such as water butts could be incorporated within the final design

Green Roofs

- 5.4.5 Green roofs are not identified on development plans. Given the nature of the proposed development, the significant additional cost involved in installing and maintaining green roofs and the additional works required to allow for the additional loading on the building, green roofs are not considered a practical option. The benefits achieved through installing a green roof would be disproportionate to the significant ongoing maintenance and construction costs involved.

Porous/Permeable Paving

- 5.4.6 Permeable paving is proposed to be incorporated within car parking areas. Storage would be provided within the sub-grade material prior to controlled release to the receiving watercourse.
- 5.4.7 Based on an external paved area of approximately 1,712 m², a sub-grade depth of 0.4 m and a void ratio of 30%, there is potential to accommodate 321 m³ of attenuation storage (sufficient to accommodate the 1 in 100 year plus 40% climate change event) within the sub-grade of permeable paving (assuming the base of the sub-grade will be formed at a level gradient).
- 5.4.8 **Oversized Pipes / Attenuation Tanks**
- 5.4.9 Storage is to be provided within the wider Western sub-catchment attenuation ponds and permeable paving. As such, tanks and oversized pipes aren't required.
- 5.4.10 Proposed drainage passing through new foundations to be sleeved with cast-in pipework.

5.5 Preferred Drainage Scheme

- 5.5.1 Surface water runoff will be discharged to Julian's Reen located to the west of the Site. Surface water runoff up to the 1 in 100 year plus 40% climate change allowance event will be attenuated within permeable paving on Site and predominantly within the attenuation ponds of the wider development, of which the drainage has already been constructed.
- 5.5.2 The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development. The on-Site scheme is illustrated in Appendix G. The network calculations to demonstrate the on-Site drainage network are included in Appendix H.

5.6 Event Exceedance

- 5.6.1 Storage will be provided for the 1 in 100 year plus 40% CC event. Storm events in excess of the 1 in 100 year plus 40% CC event should be permitted to produce temporary shallow depth flooding within low vulnerability areas. Finished floor levels for the supermarket and nursery will be set at a minimum of 7.19 m AOD, and 6.99 m AOD for the commercial units, helping to ensure exceedance flooding will not affect the buildings.

5.6.2 For reference, potential exceedance routes are illustrated in Appendix G.

5.7 Surface Water Treatment

5.7.1 In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), other roofs have a 'Low' pollution hazard level. Moderately trafficked road and delivery yards have a 'Medium' pollution hazard level. Table 6 below shows the pollution hazard indices* for each land use.

Table 6: Pollution Hazard Indices*

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (typically commercial/industrial roofs)	Low	0.5	0.2**	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals. Retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

** up to 0.8 where there is potential for metals to leach from the roof

5.7.2 Runoff from roofs and roads will be directed to permeable paving. The highest risk elements originate from the commercial yard/delivery areas, and car parks. It is proposed to route surface water through an Klargester NSBPE015 bypass separator to ensure efficient removal of pollutants.

5.7.3 Table 7 below demonstrates that permeable paving and a separator provides sufficient treatment. It is also noted that additional treatment will be provided by the attenuation ponds which form part of the attenuation network on which the Site will discharge into.

Table 7: SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement*	0.7	0.6	0.7
Klargester NSBPE015 bypass separator**	0.8	0.6	0.9
Pond*	0.7	0.7	0.5

*Taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

**Taken from the Klargester bypass separator product specification sheet - Appendix I.

- 5.7.4 It can be concluded that the inclusion of permeable paving will provide sufficient treatment for the development. For the delivery and car parking areas, treatment will also be provided by a Klargestor NSBPE015 bypass separator. Downstream of the Site, where the majority of attenuation is located, further treatment will be provided by the attenuation pond. Three stages of treatment have been proposed in accordance with Newport City Council's SuDS Approval Board (SAB) requirements. It is noted that in a SuDS treatment train, subsequent feature is considered to provide 50% of their maximum treatment capacity.
- 5.7.5 The manufacturers specification sheets for the proprietary treatment systems stated above are located within Appendix I.

5.8 Maintenance

- 5.8.1 Maintenance of communal drainage features such as attenuation ponds will be the responsibility of the management company of the wider Glan Llyn development. Maintenance of the permeable paving and gullies (Site drainage) will be the responsibility of the Site owner and undertaken by an appointed Site maintenance company.
- 5.8.2 Maintenance schedules for the above features are included in Appendix J. Maintenance of the separator will be as per the manufacturer's guidance.
- 5.8.3 Non return valves
- 5.8.4 If / where included, a non-return valve should be checked on a regular basis to ensure optimum performance. Key checks that should be performed during maintenance include checking that the valve flap opens freely and has not become caught or dislodged. The valve should also be cleaned of any debris that could be affecting the sealing or closing.

5.9 Foul Water Discharge

- 5.9.1 A new connection should be made to allow foul flows to be discharged to the 225 mm private foul sewer in Kings Wall Drive. Manhole ExF1 has an invert level of 4.43 m. Therefore, a gravity connection can be achieved. This private sewer is part of the wider estate development and as the Site forms part of that estate, the 2016 Sitewide Drainage Strategy has allowed for connection.
- 5.9.2 The foul water drainage layout proposed is illustrated within Appendix G.

6.0 Justification Test

- 6.1.1 In accordance with TAN15, Less Vulnerable and Highly Vulnerable development will be justified in Flood Zone C1 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 developed 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.
- 6.1.2 With regards to point 'i and 'ii' above, the purpose of the proposed development is to facilitate businesses to support growing demand. The proposed development Site is within an existing urban area and has been granted Outline Planning Permission under application reference 06/0471.
- 6.1.3 With regards to point 'iii' the Site is a brownfield Site, and the proposed development seeks to regenerate it.
- 6.1.4 With regards to point 'iv' the proposed development is located in an area shown to be outside of all modelled present day flood events up to and including the 0.1% AEP event. The Site is identified at risk during the 0.5% AEP + CC event and if a breach of the defences occurred. The proposed development includes mitigation for the 0.5% + CC event and management of residual risk that will ensure that the Site is safe for its intended use in the design flood event and therefore considered to satisfy point 'iv' of the Justification Test.
- 6.1.5 The acceptability of the consequences of a flooding event have been considered in this FCA and it can be concluded that the development satisfies the criteria contained in sections 5 and 7 and Appendix 1 of TAN15.

7.0 Conclusions and Recommendations

7.1 Conclusions

- 7.1.1 The proposed development is for the construction of a new Lidl store, associated parking, nursery, and commercial units.
- 7.1.2 The Site is located within Zone C1 (an area served by significant infrastructure, including flood defences) on the Development Advice Map and Tidal Flood Zone 3 (High Probability) on the NRW Flood Map for Planning.
- 7.1.3 The main potential source of flooding to the Site is tidal. The Site is flood free up to and including the present day 1 in 1000 year (0.1% AEP) event.
- 7.1.4 The Site is expected to flood during the 1 in 200 year (0.5% AEP) plus climate change event, with levels of 6.89 m AOD. The Site is also expected to flood during the corresponding climate change defence breach scenario.
- 7.1.5 The proposed finished floor levels (FFL) for the supermarket and nursery will be 7.19 m AOD, which is 300 mm above the 1 in 200 year (0.5% AEP) + CC flood level. The proposed FFL for the three commercial units will be 6.99 m AOD, 100 mm above the 0.5% AEP + CC flood level.
- 7.1.6 The risk of flooding from all sources has been assessed and the flood risk to the proposed development is considered to be Low and Acceptable. Any residual risk will be managed by an appropriate Flood Warning and Evacuation Plan.
- 7.1.7 The proposed development will introduce impermeable drainage area in the form of new buildings and car parking areas. This will result in an increase in surface water runoff if unmitigated. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, permeable paving will be provided on Site and the development will avail of off-Site attenuation ponds to accommodate storm events up to and including the 1 in 100 year 40% plus climate change event.
- 7.1.8 Agreed in principle with Natural Resource Wales (NRW), each phase of the Llanwern development is to have un-restricted discharge into the Reen network, utilising the wider attenuation provided in the estate.
- 7.1.9 A new connection should be made to the 225 mm private foul sewer in Kings Wall Drive. It is anticipated that a gravity connection can be achieved.

7.2 Recommendations

Flood Risk

- Finished ground floor levels to be set at 7.19 m AOD for the supermarket and nursery and 6.99 m AOD for the commercial units. The development platform will also be raised to a minimum of 6.5 m AOD;
- Consideration of flood resistance and resilience measures for the buildings up to 7.19 m AOD;
- A Flood Warning and Evacuation Plan be prepared to guide those on Site to a place of safety during a climate change or residual risk event; and
- Site management sign up to Floodline flood alerts and warnings to receive updates on flood events.

Drainage Strategy

- Include permeable paving and an interceptor in the drainage network as illustrated.

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 Information



Legend
 Approximate Site Boundary
NRW LiDAR 1 m DTM
Elevation (m AOD)

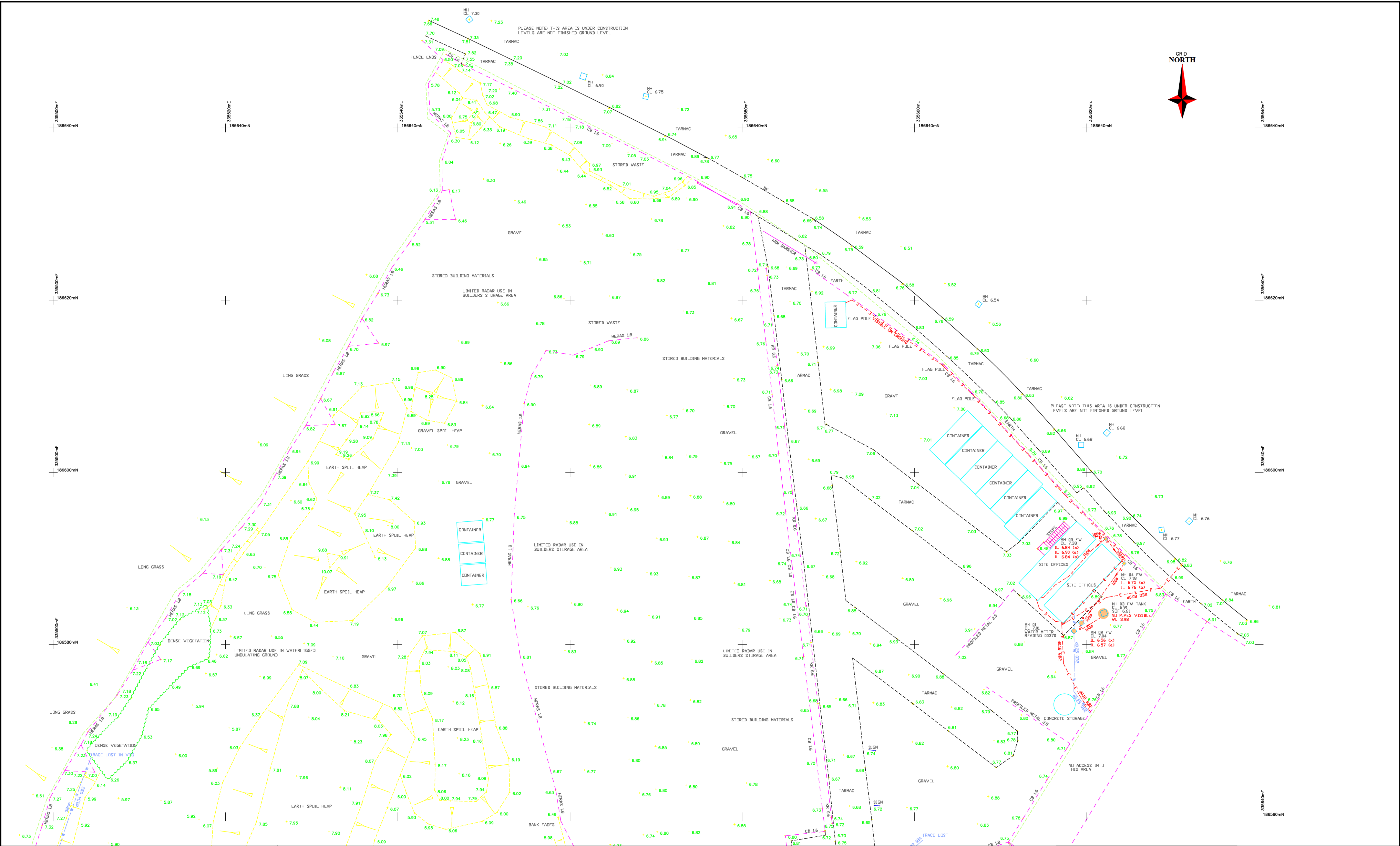
	<= 1.00
	1.00 - 2.00
	2.00 - 3.00
	3.00 - 4.00
	4.00 - 5.00
	5.00 - 6.00
	6.00 - 7.00
	7.00 - 8.00
	8.00 - 9.00
	9.00 - 10.00
	10.00 - 11.00
	11.00 - 12.00
	12.00 - 13.00
	13.00 - 14.00
	> 14.00

Figure NRW LiDAR 1 m DTM

Job	Glan Llyn Local Retail Centre Development Site, Glan Llyn, Newport	
Client	Lidl	
Appendix:	Revision	Date
B	1	30 August 2024
Drawn by	Checked by	Scale
AB	RS	1:800
Job No.	114526.628016	

Site Plan Provided by Client.

Contains OS data from, © 2023 Landmark Information Group Ltd



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NOTES:-
The accuracy and content of this drawing are dependent on the original specification and EMP should be consulted before use at other scales.
Where underground services are shown, all reasonable care has been taken within the original specification and requirement. Before use of this information the user should satisfy themselves of the completeness and accuracy of such detail and consult EMP before undertaking any works. Due to the nature of this work and limitations imposed by ground conditions and the detection equipment, no guarantee can be given that all services have been recorded. PAS128 Type A Trial holes/excavations should be dug at critical locations.
Our aim is to produce the best possible results for our clients, within the agreed specification and cost constraints. All reasonable care has been taken in the survey detail represented on this drawing. Any discrepancies must be reported immediately to EMP and any other comments are most welcome.
Levels shown at kerbs are channel level unless stated.

Control: All levels and co-ordinates are related to the datums described.
The horizontal and vertical control of this survey is based on the Ordnance Survey National Grid and level datum via Network RTK GPS.
We have applied no reverse scale factor to this survey.

Original Drawing Size: A1

LEGEND

Features	LP Lamp Post	Surfaces & Finishes
AD Drainage Channel	MP Marker Post	BW Barbed Wire
AV Air Valve	OM Overhead Meter	CB Close Boarded
AB Air Brick	PM Parking Meter	CH Chainlink
BD Base Depth	PO Post	CI Corrugated Iron
BO Bollard	PP Power Pole	CP Overhead Paving
BR Brick	PT Road Sign	IS Iron Railing
BT British Telecom Cover	RD Road Name Plate	KL Knee Rail
CD Cable Duct	RD Road Sign	LN Larch Lap
CL Cover Level	SD Rain Water Pipe	LU Linoleum
CK Drop Kerb	SD Rain Water Pipe	PA Brick Pavers
CS Disposed	SV Stop Valve	REN Render
DC Drop Proof Course	TS Telephone Cabinet	RTW Road Traffic Wall
DE Electricity	TS Telephone Cabinet	T Tarmac
DT End of Track	UTL Unable to Trace	TSF Tarmac Safety Fencing
EB Earth Rod	UTL Unable to Trace	VMF Wire Mesh Fence
ET End of Track	UTL Unable to Trace	
EV Vent	UTL Unable to Trace	
GV Gas Valve	UTL Unable to Trace	
GU Gully	UTL Unable to Trace	
IC Invert Level	UTL Unable to Trace	
IL Invert Level	UTL Unable to Trace	
JK Junction Box	UTL Unable to Trace	
KO Kerb Outlet	UTL Unable to Trace	

Boundary Types

RM Barbed Wire	CB Close Boarded	CH Chainlink	CI Corrugated Iron	CP Overhead Paving	IS Iron Railing	KL Knee Rail	LN Larch Lap	LU Linoleum	PA Brick Pavers	REN Render	RTW Road Traffic Wall	T Tarmac	TSF Tarmac Safety Fencing	VMF Wire Mesh Fence
-----------------------	-------------------------	---------------------	---------------------------	---------------------------	------------------------	---------------------	---------------------	--------------------	------------------------	-------------------	------------------------------	-----------------	----------------------------------	----------------------------

Services

CH CATV cables	CS Combined Sewer	DA Ducts	EC Electric cables	FW Foul water	GS Gas pipes	EM Empty duct	SD Service ducts	SW Storm water	TC Telecom cables	UN Unidentified	WP Water pipes	PD Pipe Diameter/flow	OV Overhead Lines	SD Service depth
-----------------------	--------------------------	-----------------	---------------------------	----------------------	---------------------	----------------------	-------------------------	-----------------------	--------------------------	------------------------	-----------------------	------------------------------	--------------------------	-------------------------

Survey Station

Fence	Pointed Road Markings	Edge of Vegetation	Kerb/Drop Kerb	Tree	Bank	Building	Overhead Building Detail	Wall
--------------	------------------------------	---------------------------	-----------------------	-------------	-------------	-----------------	---------------------------------	-------------

PAS 128:2014 Quality Level Guide

Quality Level	Description
QA	A utility is required to assist but cannot be detected - 100% Assured route
Q1	A utility is required to assist but cannot be detected - 100% Assured route
Q2	A utility is required to assist but cannot be detected - 100% Assured route
Q3	A utility is required to assist but cannot be detected - 100% Assured route
Q4	A utility is required to assist but cannot be detected - 100% Assured route

Sheet Layout

Sheet 1	Sheet 2
---------	---------

Job No.	1113	Surveyor	M.Cable	Checked	M.Wood	Date	May 2024	Scale	1:200
Drawing No.	1113/T&U/01-02	Revision							
Rev		Job No.		Date		Revision Detail		Surveyor	Checked

CLIENT DETAILS

Lidl Waterton Industrial Estate
Off Cowbridge Road
Bridgend
CF31 3PH

PROJECT DETAILS

Local retail centre development site
Glan Llyn
Newport
NP19 4TZ

Appendix C - Local Sewer Plans

LAND - Glan Llyn, Newport NP19 4TZ



LEGEND(Representative of most common features)

 Waste network:	 Outfall
 Surface water chamber	 Lamphole
 Combined chamber	 Storm Overflow
 Combined sewer overflow	 Rising main
 Special purpose chamber	 Gravity sewer
 Treatment works	 Private sewer
 Pumping station	 Private sewer subject to Sect. 104 adaption agreement
NB: Sewer symbol colour indicates the type.	
RED	- Combined
GREEN	- Surface Water
BROWN	- Foul
Purple	- Former S24 sewers (for indicative purposes only)
	 Private Sewer Transfer
	 Lateral Drain
	 Inspection Chamber

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

Dŵr Cymru Cyfyngedig (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 335520,186580
Map scale: 1:1000
Printed by: Warren Rees
Printed on: 19 Jun 2024

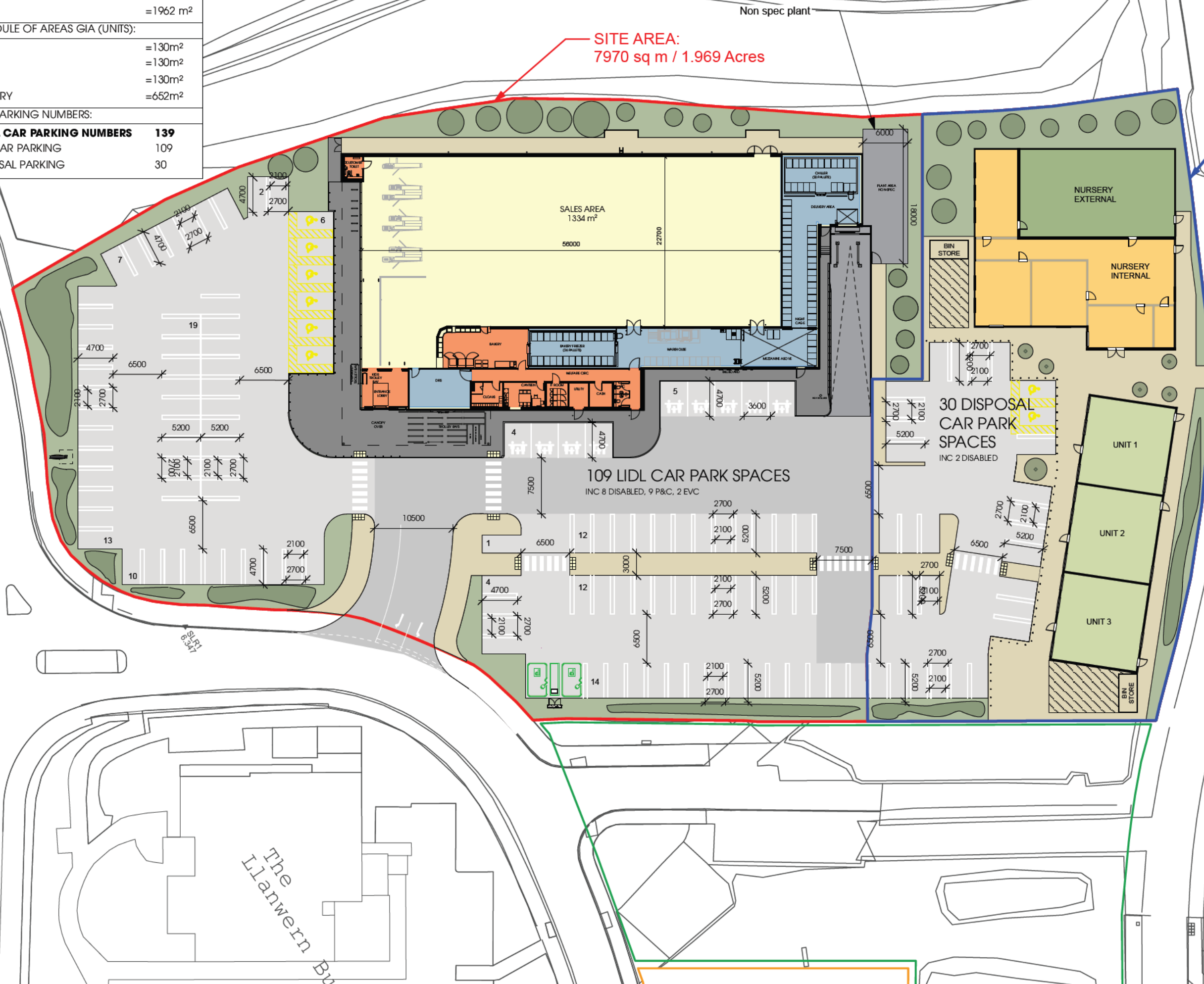
Appendix D - Proposed Development Plan



SCHEDULE OF AREAS (TYPE 1300):	
SALES	=1334 m ²
WAREHOUSE	=410 m ²
ANCILLARY	=218 m ²
GIA	=1962 m ²
SCHEDULE OF AREAS GIA (UNITS):	
UNIT 1	=130m ²
UNIT 2	=130m ²
UNIT 3	=130m ²
NURSERY	=652m ²
CAR PARKING NUMBERS:	
TOTAL CAR PARKING NUMBERS	139
LIDL CAR PARKING	109
DISPOSAL PARKING	30

SITE AREA:
7970 sq m / 1.969 Acres

DISPOSAL SITE AREA:
3295 sq m / 0.814 Acres



0	05/03/2024	Updated to latest Lidl Specification received 26.02.24	BM
1	06/02/2024	Site entrance updated as per highways engineers	BM
2	04/10/2023	Updated disposal land	BM
3	03/10/2023	Amended Plant area, Red line adjusted	BM
4	28/09/2023	Disposal land design updated to sketch design	BM
5	28/09/2023	Updated site plan - key added	BM
6	03/08/2023	Car parking and store updated	KA
Rev	Date	Description	Drawn

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Leeds
LS1 2DZ

T: (0113) 244 3457

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E: info@htcarchitects.co.uk

client
Lidl GB Ltd.



project
**Glan Llyn
Newport**

drawing title
**Proposed Site Plan - Option
14**

date **July 2023**
status **Feasibility**
scale **1:500**
drawn **KA** checked **BM**
job no. **3211** dwg no. **F414** rev. **G**

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DO NOT SCALE
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

BOUNDARY BASED ON MASTERPLAN FROM SGP ARCHITECTS

BASED ON TYPE 1300 BASE PLAN 26.02.24

DISPOSAL LAND AS PER SKETCH DESIGN BY CORSTORPHINE & WRIGHT ARCHITECTS



RAMP IN ACCORDANCE WITH APPROVED DOCUMENT M AND APPROVED DOCUMENT K

PROPOSED LEVELS SUBJECT TO WIDER DEVELOPMENT SCHEME AND PROPOSED ROAD



C	16/04/2024 FFL updated to 7.19m to mitigate flood risk	KA
B	11/07/2024 Site updated to latest scheme	KA
A	02/07/2024 Drawing title updated	KA
Rev.	Date	Description

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client
Lidl GB Ltd.



project
**Glan Llyn
Newport**

drawing title
**Master Proposed Levels
and Gradients**

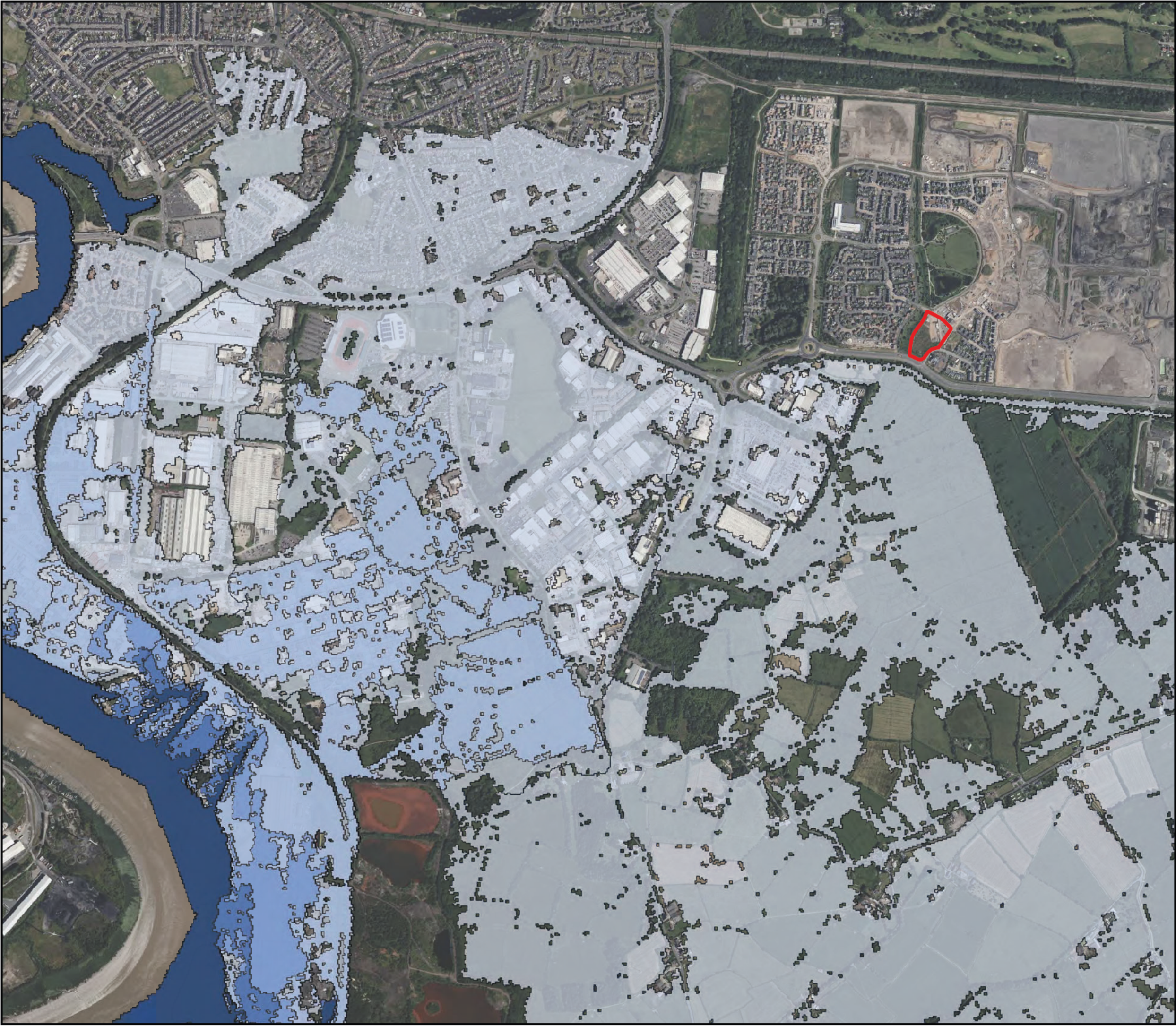
date July 2024
status Planning
scale 1:500 @ A3
drawn CP checked LS
job no. 3211 dwg no. P406 rev. C

KEY:

- +0.00 PROPOSED LEVELS
- +0.00 ESTIMATED LEVELS
- +0.00 EXISTING LEVELS
- INDICATIVE GULLY

(SUBJECT TO DRAINAGE CONSULTATION)

Appendix E - NRW Product Data



Legend

- Approximate Site Boundary
- 20% AEP (1 in 5 year)
- 5% AEP (1 in 20 year)
- 2% AEP (1 in 50 year)
- 0.5% AEP (1 in 200 year)
- 0.1% AEP (1 in 1000 year)

0500 m

N

Figure

Baseline Defended Modelled Flood Extents

Job

Glan Llyn Local Retail Centre Development Site,
Glan Llyn, Newport

Client

Lidl

Appendix:	Revision	Date
B	1	13 August 2024
Drawn by	Checked by	Scale
AB	RS	1:12,000

Job No.

114526.628016

Bing Maps

DeltaSimons

Site Plan Provided by Client.



- Legend**
-  Approximate Site Boundary
 -  0.5% AEP (1 in 200 year)
 -  0.1% AEP (1 in 1000 year)

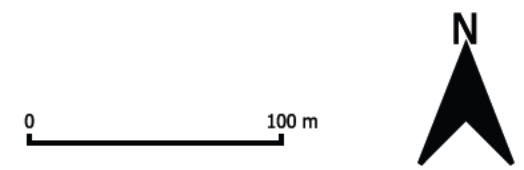
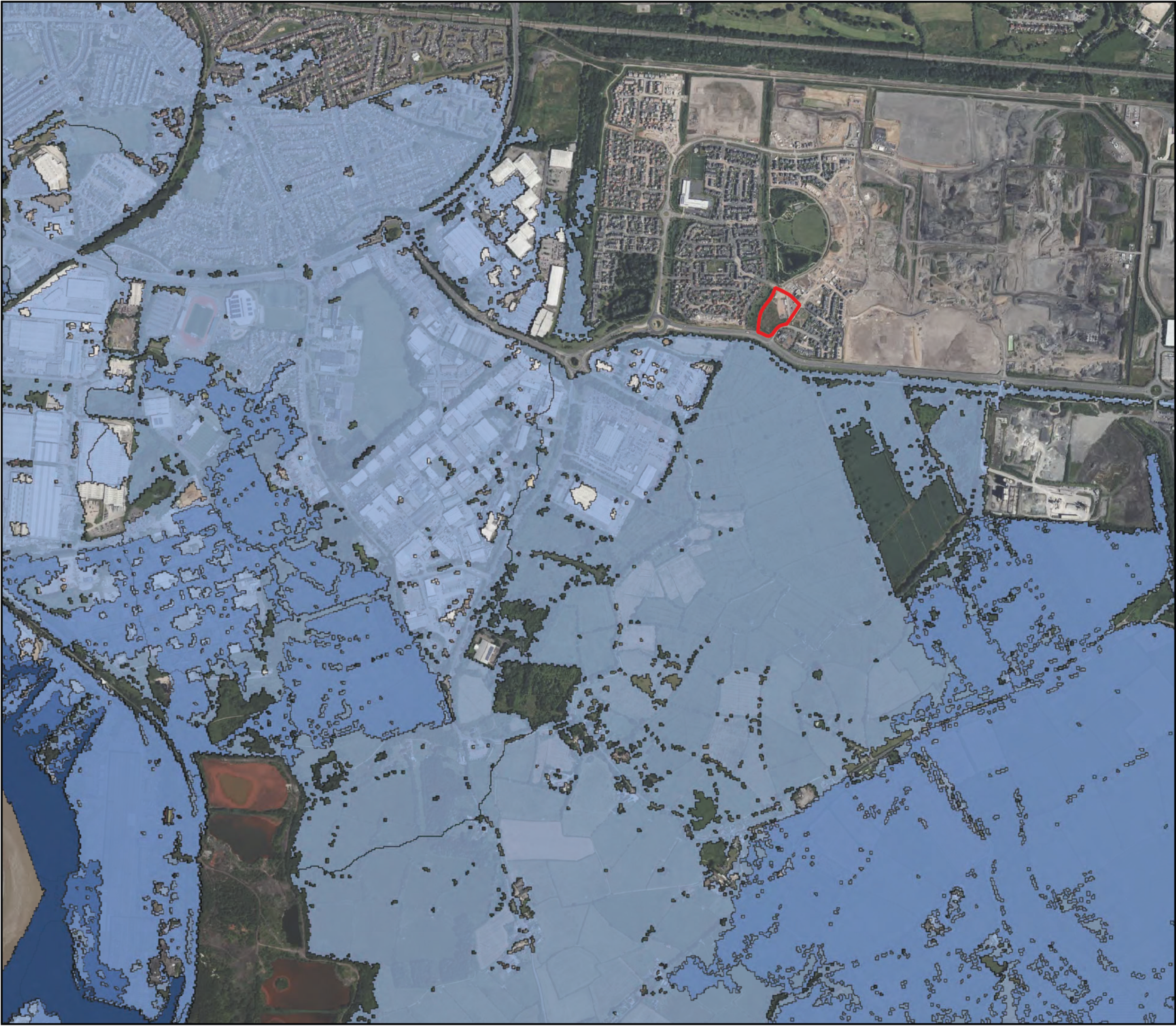


Figure Defended Modelled Flood Extents Plus Climate Change		
Job Glan Llyn Local Retail Centre Development Site, Glan Llyn, Newport		
Client Lidl		
Appendix:	Revision 1	Date 13 August 2024
Drawn by AB	Checked by RS	Scale 1:3,000
Job No. 114526.628016		





Legend

- Approximate Site Boundary
- 20% AEP (1 in 5 year)
- 5% AEP (1 in 20 year)
- 0.5% AEP (1 in 200 year)
- 0.1% AEP (1 in 1000 year)

0100 m

Figure

Modelled Baseline Breach Scenario Flood Extents

Job

Glan Llyn Local Retail Centre Development Site,
Glan Llyn, Newport

Client

Lidl

Appendix:	Revision	Date
	1	13 August 2024
Drawn by	Checked by	Scale
AB	RS	1:12,000

Job No.

114526.628016

Bing Maps

DeltaSimons

Site Plan Provided by Client.



Legend

-  Approximate Site Boundary
-  0.5% AEP (1 in 200 year + CC)
-  0.1% AEP (1 in 1000 year + CC)

0 50 m



Figure **Modelled Climate Change Breach Scenario Flood Extents**

Job **Glan Llyn Local Retail Centre Development Site, Glan Llyn, Newport**

Client **Lidl**

Appendix:	Revision 1	Date 13 August 2024
-----------	----------------------	-------------------------------

Drawn by AB	Checked by RS	Scale 1:1,816.093694
-----------------------	-------------------------	--------------------------------

Job No.	114526.628016
---------	----------------------



Appendix F - NRW Historic Flood Map



Legend

Approximate Site Boundary

NRW Historic Flood Map

0

500 m

N

Figure

NRW Historic Flood Map Extents

Job

Glan Llyn Local Retail Centre Development Site,
Glan Llyn, Newport

Client

Lidl

Appendix

F

Revision

1

Date

30 August 2024

Drawn by

AB

Checked by

RS

Scale

1:7,000

Job No.

114526.628016

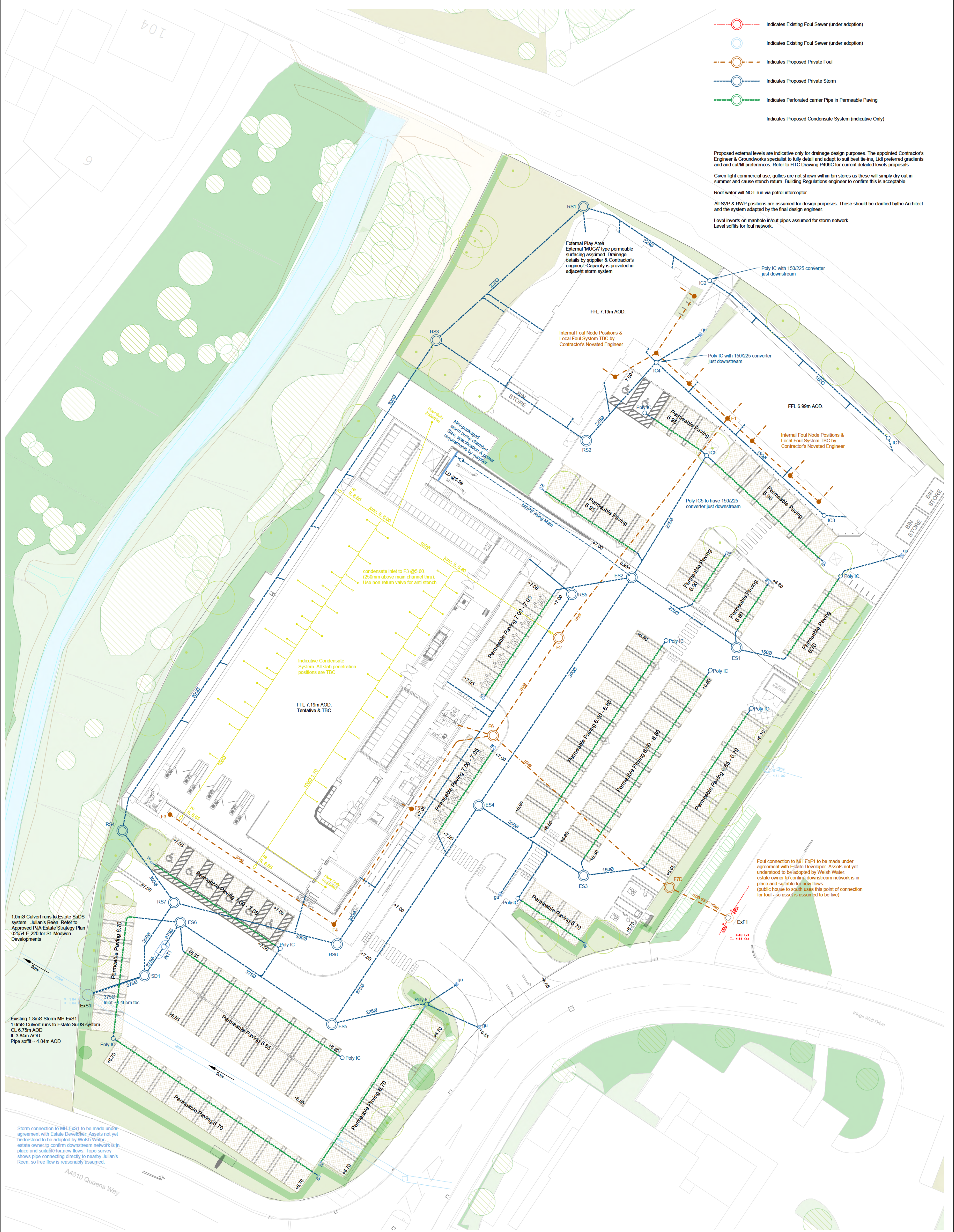
Bing Maps

DeltaSimons

Site Plan Provided by Client.

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Appendix G - Drainage Plan, Schematic and Specifications



- Indicates Existing Foul Sewer (under adoption)
- Indicates Existing Storm Sewer (under adoption)
- Indicates Proposed Private Foul
- Indicates Proposed Private Storm
- Indicates Perforated carrier Pipe in Permeable Paving
- Indicates Proposed Condensate System (indicative Only)

Proposed external levels are indicative only for drainage design purposes. The appointed Contractor's Engineer & Groundworks specialist to fully detail and adapt to suit best lie-ins, Lidl preferred gradients and and cut/fill preferences. Refer to HTC Drawing P406C for current detailed levels proposals

Given light commercial use, gullies are not shown within bin stores as these will simply dry out in summer and cause stench return. Building Regulations engineer to confirm this is acceptable.

Roof water will NOT run via petrol interceptor.

All SVP & RWP positions are assumed for design purposes. These should be clarified by the Architect and the system adapted by the final design engineer.

Level inverts on manhole in/out pipes assumed for storm network.
Level soffits for foul network.

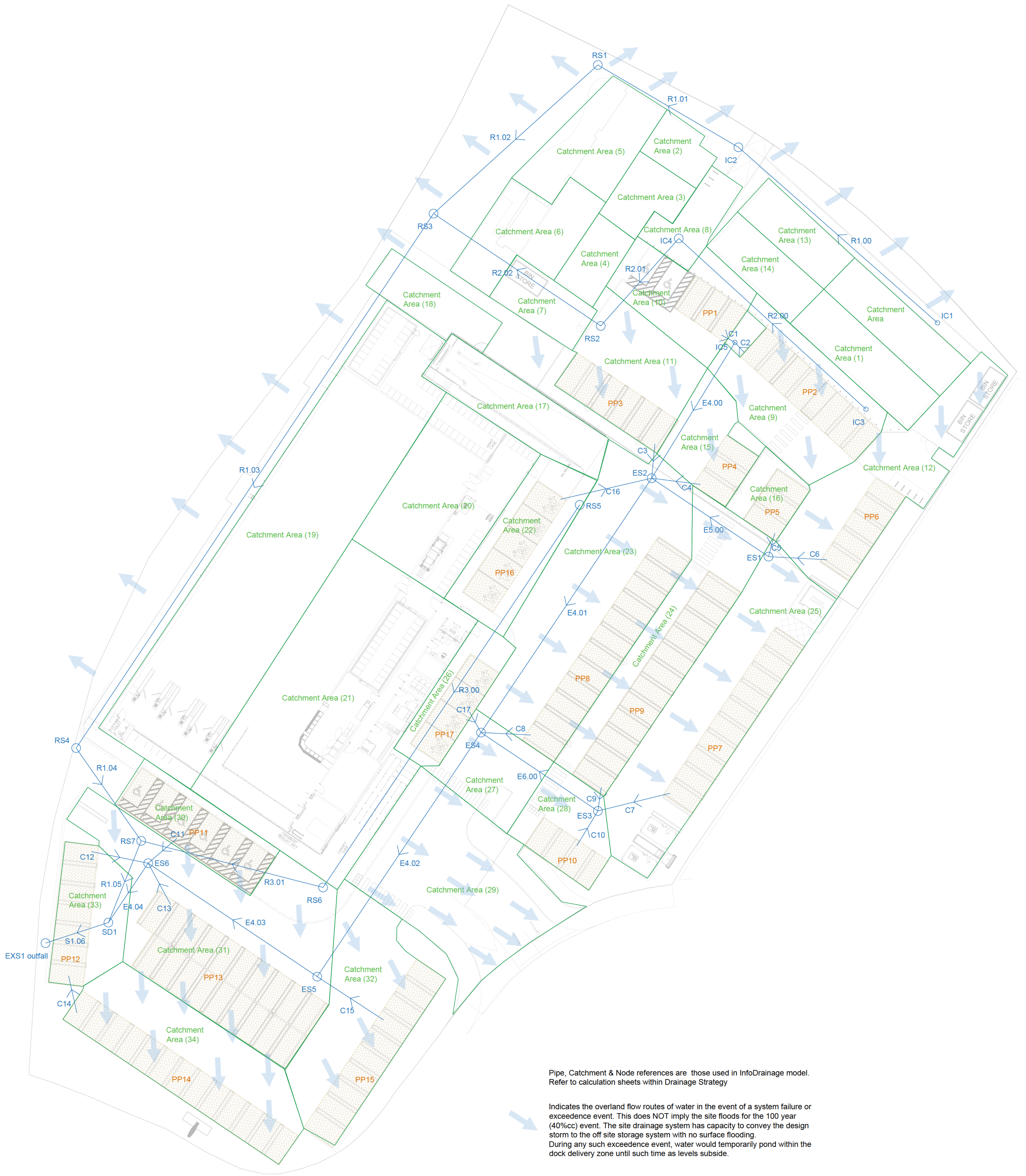
1.0mØ Culvert runs to Estate SuDS system - Julian's Reën. Refer to Approved FJA Estate Strategy Plan 02554-E-220 for St. Modwen Developments

Existing 1.0mØ Storm MH ExS1
1.0mØ Culvert runs to Estate SuDS system
CL 6.75m AOD
IL 3.84m AOD
Pipe soffit - 4.84m AOD

Storm connection to MH ExS1 to be made under agreement with Estate Developer. Assets not yet understood to be adopted by Welsh Water - estate owner to confirm downstream network is in place and suitable for new flows. Topo survey shows pipe connecting directly to nearby Julian's Reën, so free flow is reasonably assumed.

Foul connection to MH ExF1 to be made under agreement with Estate Developer. Assets not yet understood to be adopted by Welsh Water - estate owner to confirm downstream network is in place and suitable for new flows. (public house to south uses this point of connection for foul - so assets is assumed to be live)

Revision: Date: Revision Description:			Client:  Lidl Great Britain Ltd.		Project: Glan Llyn Newport	
			 Lucion Delta Simons Ltd. The Arrow, Fifth Avenue, Team Valley Trading Estate Gateshead NE11 0NG		Drawing Title: Proposed Drainage Layout	
			Drawing Number: 114526, 628016, 50		Revision:	
			Drawn By: SN		Checked By: SC	
			Drawing Status: Planning Approval		Date: August 2024	
			Scale: 1:250		Sheet Size: A1	



Revision:	Date:	Revision Description:

Client:

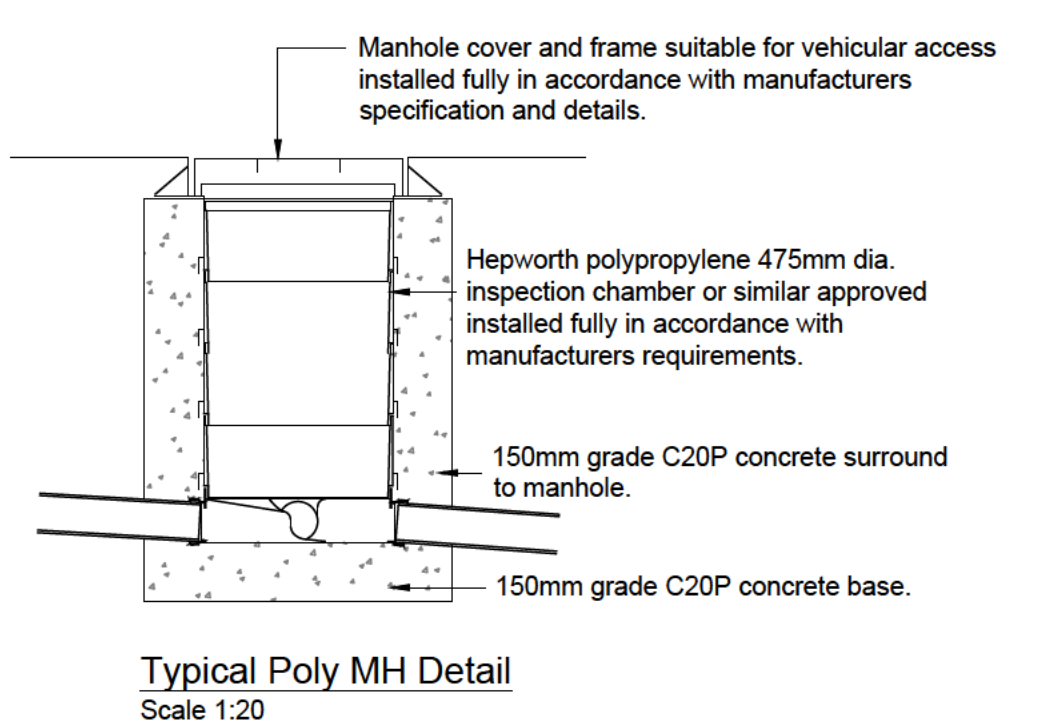
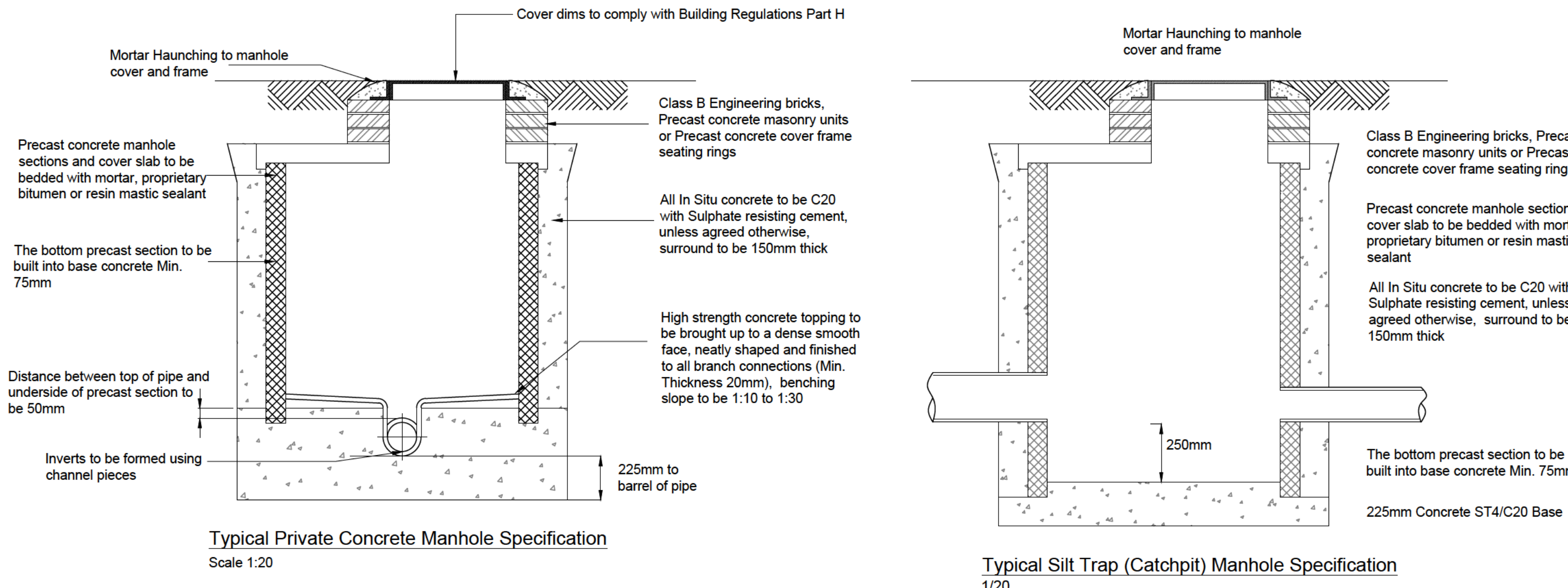
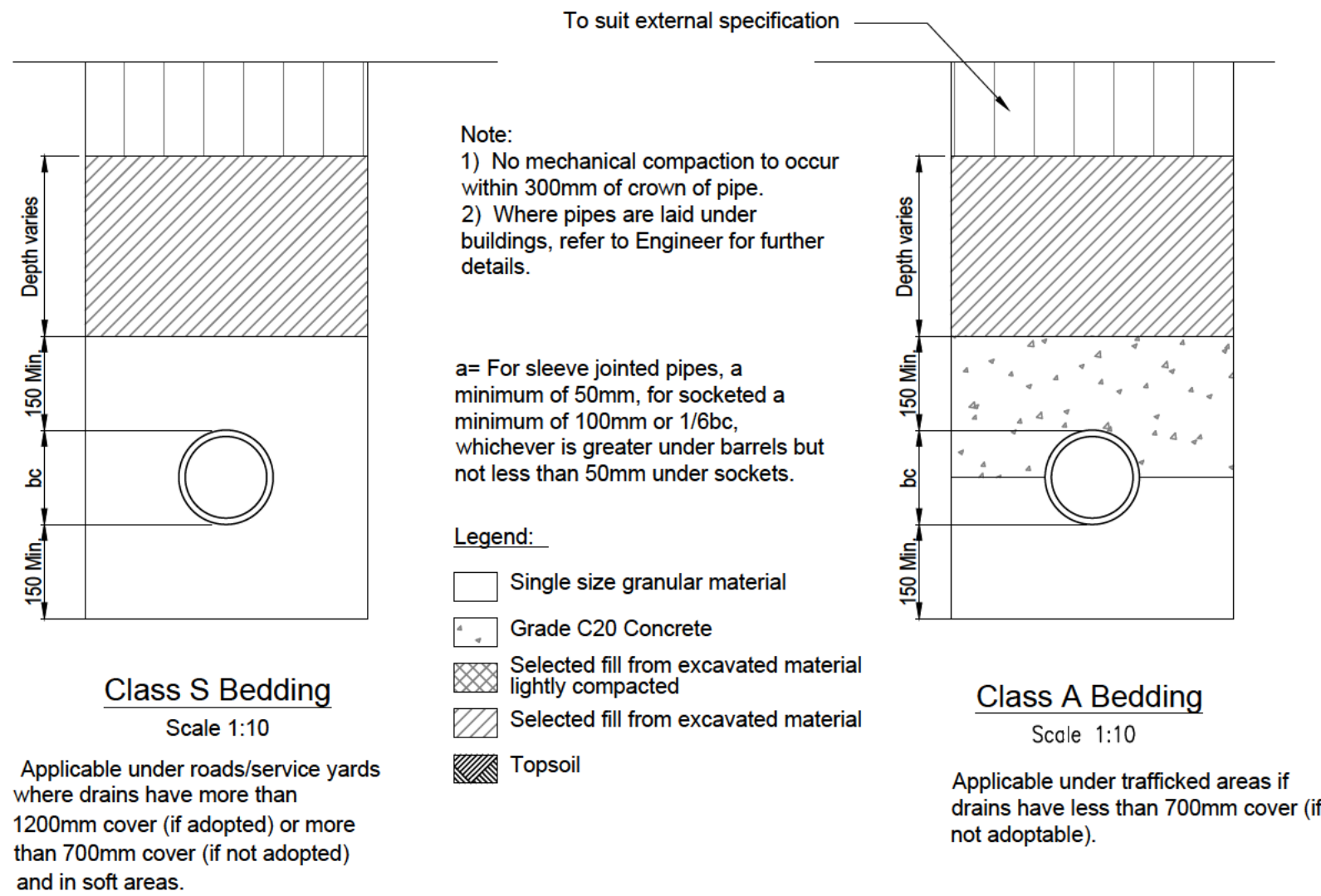
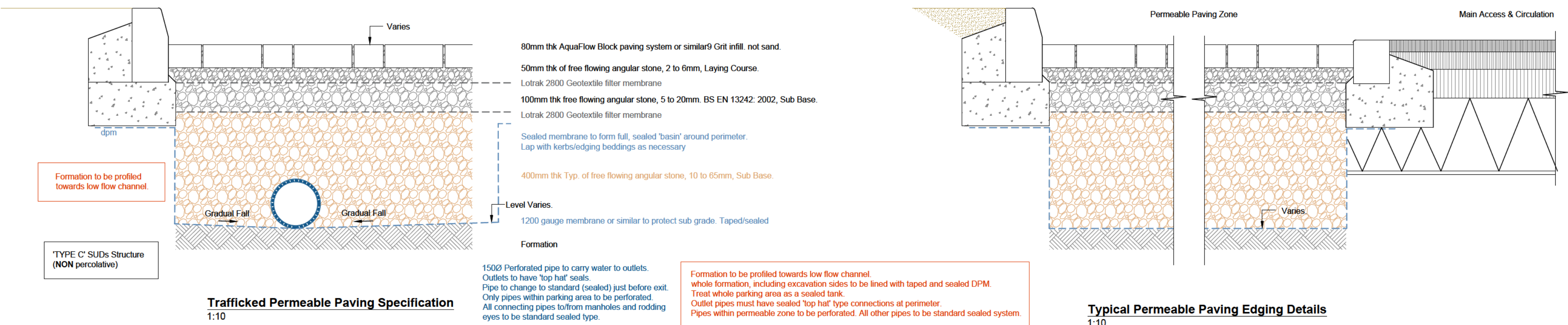


Lidl Great Britain Ltd.



Lucion Delta Simons Ltd.
The Arrow, Fifth Avenue.
Team Valley Trading Estate
Gateshead
NE11 0NG

Project:	Glan Llyn Newport
Drawing Title:	Schematic Drainage Layout Showing Model References And Exceedence Flow Routes
Drawing Number:	114526. 628016. 52
Revision:	
Drawn By:	SN
Checked By:	SC
Date:	August 2024
Drawing Status:	Information
Scale:	1:250
Sheet Size:	A1



Standard Drainage Notes

Do not scale this drawing. All dimensions must be checked / verified on site. If in doubt ask.

ALL DISCREPANCIES NOTED ON SITE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise

This drawing to be read in conjunction with all other relevant Engineers and Architects details.

All work is to be carried out in accordance with the current British Standards, Codes of Practice and Building Regulations.

The exact position, level, size and use of existing sewers to be confirmed on site. Any discrepancies to be reported to the Engineer PRIOR TO COMMENCEMENT OF WORKS.

All uncovered and shallow pipework to be protected against construction traffic as part of the Contractors temporary works requirements.

Proposed drainage passing through new foundations to be sleeved with cast-in oversized pipework.

Exact location line and level of existing stubs to existing manholes in the road to be confirmed on site prior to construction.

Cover levels shown are approximate only, subject to the finalised external works and landscaping scheme.

The number and location of all RWP's is shown indicative only, all to be confirmed by Architect / M&E Contractor prior to commencement of works.

Pop-up positions for foul water appliances are shown approximate only for the purposes of under-slab drainage. Exact locations to Archt's setting out to suit interior layouts etc.

All above ground and internal Surface and Foul Water pipework to specialist's design / detail. Not shown here.

Where no WC's are connected upstream, under-slab FW drainage to be laid at 1:40 min. After the connection of at least 1 No WC, a min. fall of 1:80 applies.

Water seal on Foul Water traps receiving condensate from freezers and other very low flow appliances, to be maintained on a regular basis to avoid drying out and subsequent passage of foul air to internal premises.

See Architect's details for all setting out dimensions to buildings and boundaries etc

All RWP's and SVP's to be fitted with roddable access plates. All foul drains to have roddable access.

All connections to road gullies and channels shall be 150mm nominal bore pipework. Connections to RWP's to be 100mm nominal bore pipework subject to confirmation of RWP sizes and/or design flow. No pipe work to be downsized in the direction of flow.

Connections to foul terminal fittings to be 100mm nominal bore pipework subject to confirmation of above ground pipe diameters and/or design flow. No pipe work to be downsized in the direction of flow.

All foul connections to be vented to atmosphere. All pop-up's located at the head of drains to be vented above ground. Above ground drainage details to be confirmed by the M+E contractor.

All un-noted buried foul pipework to be 100mm dia. unless subject to the notes above. All un-noted Storm buried pipework to be 150mm dia.

All buried pipework to be U-PVC type in accordance with Wis 4-35-01 unless otherwise noted.

As an alternative to U-PVC, buried pipework up to and including 150mm dia. may be 28kN/m strength clayware to BS EN 295; 1991.

As an alternative to U-PVC, buried pipework above 150mm dia. up to and including 300mm dia. may be 36kN/m strength clayware to BS EN 295; 1991.

As an alternative to U-PVC, buried pipework above 300mm dia. may be Class 120 (SRPC) concrete pipes to BS 5911 with spigot and socket flexible joints.

All new drainage to be constructed adjacent new and proposed tree planting to be protected against root activity using 'Rootcontrol' root barrier material by Green-tech. All in accordance with the manufacturer's recommendations.

Any non-architectural pipework and fittings noted as Cast Iron, to be from the 'Ensign' range by Saint Gobain Pipelines suitable for above or below ground use as appropriate, or similar approved. All to comply with the requirements of BS EN 877.

All pipework entering and exiting manholes to be connected with pipe soffits level.

Pre-formed channels to be used at all manholes.

High strength concrete benching to be steel trowelled to a dense smooth face neatly shaped and finished to all branch connections and laid in accordance with the Specification.

Pipe bends to be provided to suit direction of flow.

All manhole covers and frames to be Ductile Iron Heavy Duty Grade D400 double triangular to BS EN 124 unless otherwise noted.

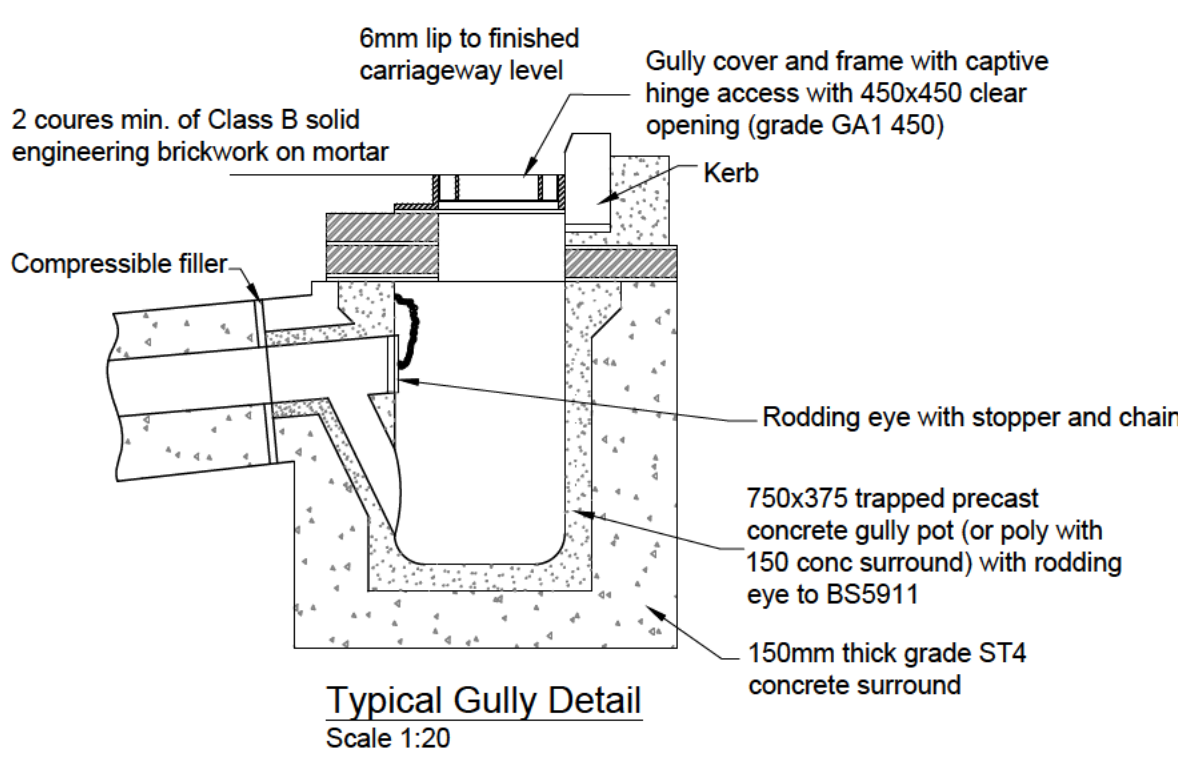
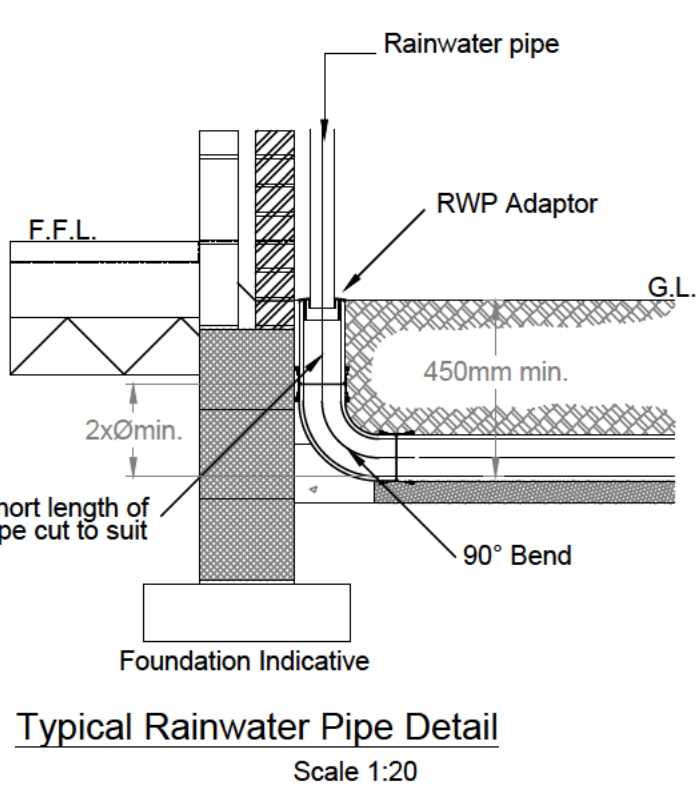
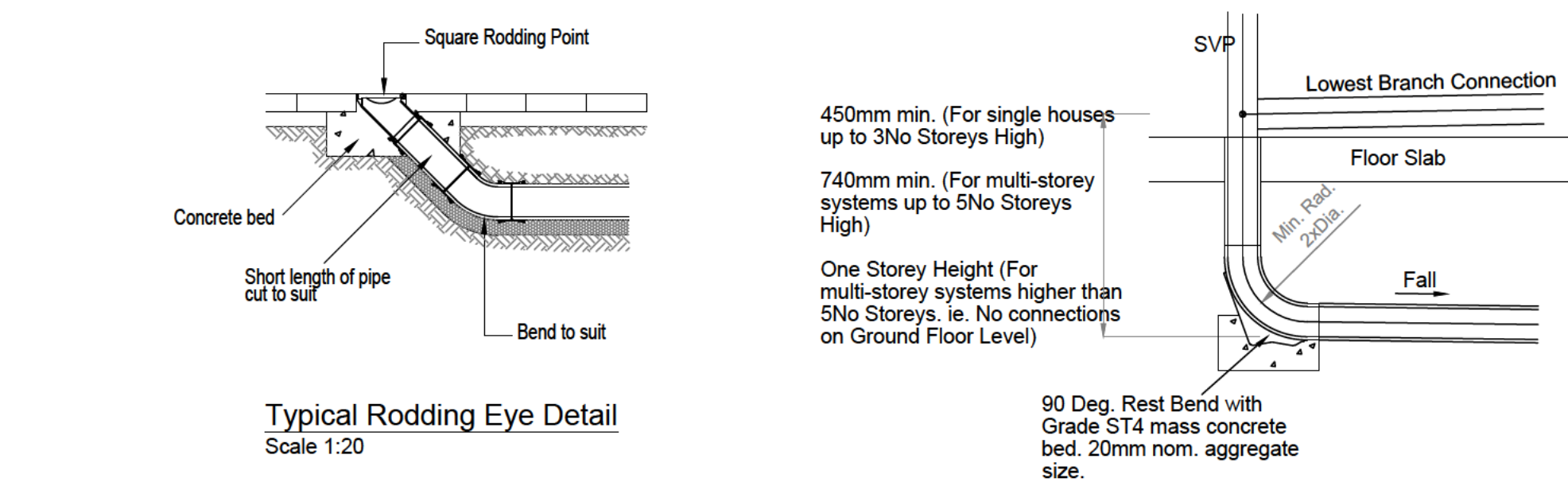
Gully tops and manhole covers to be provided in accordance with BS EN124...

Group 1 (min. class A15). Areas used and accessible by pedestrians and cyclists only. NO EMERGENCY VEHICLES.

Group 2 (min. class B125). Footways, pedestrian areas, car parks. NO HGV's.

Group 4 (min. class D400). All other areas including carriageways and HGV trafficked areas.

All manhole covers located internally, to be recessed, double seal, airtight type, aluminium or steel. Recess depth to Archt's requirements to suit finishes etc.



Storm Manhole Schedule					
Ref	Cover L	Invert L	MH Type	Cover	Notes
Roof					
IC1	6.950	6.200	475Ø Poly	D400	
IC2	6.950	5.900	475Ø Poly	D400	150/225 converter just downstream
RS1	7.000	5.750	1200Ø PCC	D400	300mm sump/catchpit
IC3	6.950	6.200	475Ø Poly	D400	
IC4	6.950	5.900	475Ø Poly	D400	150/225 converter just downstream
RS2	7.000	5.750	1200Ø PCC	D400	300mm sump/catchpit
RS3	7.000	5.550	1200Ø PCC	D400	300mm sump/catchpit
RS4	7.000	5.000	1200Ø PCC	D400	300mm sump/catchpit
RS5	6.975	5.750	1200Ø PCC	D400	300mm sump/catchpit
RS6	7.050	5.300	1200Ø PCC	D400	300mm sump/catchpit
RS7	7.000	4.900	1200Ø PCC	D400	300mm sump/catchpit
Externals					
IC5	6.900	6.000	475Ø Poly	D400	150/225 converter just downstream
ES1	6.800	5.850	1200Ø PCC	D400	300mm sump/catchpit
ES2	6.900	5.700	1200Ø PCC	D400	300mm sump/catchpit. Incoming MDPE rising main to have downturn knuckle
ES3	6.775	5.700	1200Ø PCC	D400	300mm sump/catchpit
ES4	6.950	5.400	1200Ø PCC	D400	300mm sump/catchpit
ES5	6.900	5.150	1200Ø PCC	D400	300mm sump/catchpit
ES6	6.900	4.950	1200Ø PCC	D400	300mm sump/catchpit
Demarc.					
SD1	6.900	4.750	1200Ø PCC	D400	300mm sump/catchpit
INT 1	Klargester NSB/PE15 bypass separator or similar approved. Will require power supply and silhydrocarbon alarm located on panel within building at location of the landowners choice. Installation to be fully in accordance with manufacturer's guidelines and insuring all correct anti-float measures are taken. Bypass type assumed acceptable.				

Foul Manhole Schedule					
Ref	Cover L	Invert L	MH Type	Cover	Notes
F1	6.950	5.900	475Ø Poly IC	D400*	* non access 300mm cover
F2	6.950	5.350	1200Ø PC Conc	D400	Condensate inlet set higher @ 5.600m with light flap valve to prevent stench backing up to fridge units. Bench MH to suit.
F3	7.150	6.500	475Ø Poly IC	D400	
F4	7.150	6.025	475Ø Poly IC	D400*	* non access 300mm cover
F5	7.150	5.700	475Ø Poly IC	D400*	* non access 300mm cover
F6	7.050	5.100	1200Ø PC Conc	D400	
F7D	6.800	4.800 b/c	1200Ø PC Conc	D400	Demarcation MH
ExF1 ext	6.600	4.440	Existing conc. MH		Adoption status unknown

Client/End user specifications over-rule these details in all cases if different

Revision:

Date:

Revision Description:

Client:



Lidl Great Britain Ltd.



Lucion Delta Simons Ltd.
The Arrow, Fifth Avenue,
Team Valley Trading Estate
Gateshead
NE11 0NG

Project:

Glan Lyn
Newport

Drawing Title:

Drainage Specifications Sheet 1

Drawing Number:

114526. 628016. 51

Revision:

Drawn By:

SN

Checked By:

SC

Date:

August 2024

Drawing Status:

Planning Approval

Scale:

As Shown

Sheet Size:

A1

Appendix H - Drainage Calculations

Storm Drainage Design Calculations

Project: 114526. 628016.

Retail & Commercial Development

Llanwern

Newport

Client: Lidl Great Britain Ltd.

Date Issued: 27th August 2024

Context and Purpose

To display calculations in support of the drainage design for the proposed supermarket, nursery facility and commercial building.

To ensure that the development will not increase flood risk elsewhere and satisfy LLFA & Welsh Water criteria.

A drainage management plan is at the rear of this calculation report.

Parameters

There are existing storm and foul drainage systems serving the plot. This surrounding drainage and SuDS scheme is part of an estate wide system, provided by the estate developer, St. Modwen Developments.

The off-site system is designed to restrict flows to the Monks Ditch at a pre-agreed rate. This has been approved as part of the wider network installation and design by others. The system is designed to take free storm discharge from all development plots.

Refer to approved plans and drainage strategies ref 02554 by PJA Consultants, on behalf of St. Modwen.

This plot has a storm connection pipe already installed that will take water directly to the Julian's Reen. Part of the newly installed SuDS system.

Designer's Notes & Comments

Whilst the drainage system is designed to accept free discharge from each plot, it is still incumbent on the designer to ensure the plot does not flood or overspill for the 100 year event with allowance for 40% climate change. Calculations in attachments and later chapters prove this to be achieved.

The drainage systems are designed to accommodate flows and volumes for the **100 year** design event with no overspill to surrounding areas. An allowance of **40% climate change** is made, based upon the type and design life of the project.

No factor for Urban Creep is taken in the calculations as the off site system already accounts for this.

The off site system has several SuDS treatment trains, however, more can be added within the plot design.

Permeable Paving is used to collect almost all runoff from external areas. This offers both water quality treatment processes and reduces the rate at which water enters the system, taking burden from the pipe network. All permeable paved zones will be 'Type C' structures with a sealed base and sides to protect the building and prevent any detriment to the cohesive formation.

A petrol interceptor with adequate silt capacity for the catchment area will be installed. NO roof water will pass through this interceptor.

The new storm connection to the existing outfall pipe will be made at pipe soffit level. As such, a surcharged outfall is unlikely and would not affect the design.

Design Software Notes For Checking Engineer/LLFA

The software used is Innovyze's InfoDrainage (now part of AutoDesk). This is the latest version of Microdrainage. The original, manual input version is to be phased out in the coming year. The software uses the same Microdrainage formulae/engine as the manual input version, but is now a graphical input system with greater accuracy and features. The output results are more concise and show the critical results per item, to significantly reduce information overload – at the request of checking engineers. I.e. instead of a table for each storm of each duration, a single table will show the differing critical duration affecting each pipe for the chosen return period and climate change value.

Full, detailed simulation results showing all storms per system item are in accompanying documents.

1, 2 & 30 Year Storms

The entire underground drainage system is found to be capable of holding the volumes for the 30 year storm events – all durations. No flooding/ponding is evident anywhere on the system.

Condensed 'Critical storm' calculations are provided in later chapters. A full, detailed set of calculations showing all storms for all items is appended with this report for all 1, 30 & 100 year storms.

Storm Network Details

Project: Lidl Newport	Date: 22/08/2024			
	Designed by: SN	Checked by:	Approved By:	
Report Details: Type: Junctions Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd			

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
IC1	Manhole	1453.162	1321.182	6.950	0.750	6.200	Circular	0.600
IC2	Manhole	1426.357	1344.818	6.950	1.050	5.900	Circular	1.200
RS1	Manhole	1407.426	1355.907	7.000	1.250	5.750	Circular	1.200
IC3	Manhole	1443.532	1309.552	6.950	0.650	6.300	Circular	0.600
IC4	Manhole	1418.325	1332.549	6.950	1.050	5.900	Circular	1.200
RS2	Manhole	1407.816	1320.763	7.000	1.250	5.750	Circular	1.200
RS3	Manhole	1385.303	1335.890	7.000	1.450	5.550	Circular	1.200
RS4	Manhole	1338.177	1262.189	7.000	2.000	5.000	Circular	1.200
RS5	Manhole	1405.685	1297.714	6.975	1.225	5.750	Circular	1.200
RS6	Manhole	1370.420	1245.151	7.050	1.750	5.300	Circular	1.200
RS7	Manhole	1345.935	1251.429	7.000	2.100	4.900	Circular	1.200
IC5	Manhole	1425.883	1318.552	6.900	0.900	6.000	Circular	0.600
ES1	Manhole	1430.409	1289.701	6.800	0.950	5.850	Circular	1.200
ES2	Manhole	1414.673	1300.258	6.900	1.200	5.700	Circular	1.200
ES3	Manhole	1407.431	1255.453	6.775	1.075	5.700	Circular	1.200
ES4	Manhole	1391.696	1266.011	6.950	1.550	5.400	Circular	1.200
ES5	Manhole	1369.644	1233.144	6.900	1.750	5.150	Circular	1.200
ES6	Manhole	1346.881	1248.416	6.900	1.950	4.950	Circular	1.200
SD1	Manhole	1341.518	1240.422	6.900	2.150	4.750	Circular	1.200
EXS1 outfall	Manhole	1333.057	1237.658	6.750	2.910	3.840	Circular	1.200

Name	Lock
IC1	None
IC2	None
RS1	None
IC3	None
IC4	None
RS2	None
RS3	None
RS4	None
RS5	None
RS6	None
RS7	None
IC5	None
ES1	None
ES2	None
ES3	None
ES4	None
ES5	None
ES6	None
SD1	None
EXS1 outfall	None

Project: Lidl Newport	Date: 22/08/2024			
Report Details: Type: Junctions Storm Phase: Phase	Designed by:	Checked by:	Approved By:	
	SN			
	Company Address: Lucion Delta Simons Ltd			

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
IC1	Inlet	Catchment Area	(None)	No Restriction
IC2	Inlet	R1.00	(None)	No Restriction
	Inlet (1)	Catchment Area (13)	(None)	No Restriction
RS1	Inlet	R1.01	(None)	No Restriction
	Inlet (1)	Catchment Area (5)	(None)	No Restriction
IC3	Inlet (1)	Catchment Area (1)	(None)	No Restriction
IC4	Inlet	R2.00	(None)	No Restriction
	Inlet (1)	Catchment Area (3)	(None)	No Restriction
	Inlet (1)	Catchment Area (14)	(None)	No Restriction
RS2	Inlet	R2.01	(None)	No Restriction
	Inlet (1)	Catchment Area (7)	(None)	No Restriction
	Inlet (2)	Catchment Area (4)	(None)	No Restriction
RS3	Inlet	R1.02	(None)	No Restriction
	Inlet (1)	R2.02	(None)	No Restriction
RS4	Inlet	R1.03	(None)	No Restriction
	Inlet (1)	Catchment Area (19)	(None)	No Restriction
RS5	Inlet	Catchment Area (20)	(None)	No Restriction
RS6	Inlet	R3.00	(None)	No Restriction
	Inlet (1)	Catchment Area (21)	(None)	No Restriction
RS7	Inlet	R1.04	(None)	No Restriction
	Inlet (1)	R3.01	(None)	No Restriction
IC5	Inlet	C1	(None)	No Restriction
	Inlet	C2	(None)	No Restriction
ES1	Inlet	C5	(None)	No Restriction
	Inlet	C6	(None)	No Restriction
ES2	Inlet	E4.00	(None)	No Restriction
	Inlet (1)	C3	(None)	No Restriction
	Inlet (2)	C4	(None)	No Restriction
	Inlet (1)	E5.00	(None)	No Restriction
	Inlet (2)	Catchment Area (17)	(None)	No Restriction
ES3	Inlet (3)	C10	(None)	No Restriction
	Inlet	C9	(None)	No Restriction
	Inlet (1)	C7	(None)	No Restriction
	Inlet (2)	C10	(None)	No Restriction
	Inlet	E4.01	(None)	No Restriction
FS4	Inlet	E6.00	(None)	No Restriction
	Inlet (1)	C8	(None)	No Restriction
	Inlet (2)	C17	(None)	No Restriction
ES5	Inlet	Catchment Area (27)	(None)	No Restriction
	Inlet	E4.02	(None)	No Restriction
	Inlet (1)	C15	(None)	No Restriction
ES6	Inlet	Catchment Area (29)	(None)	No Restriction
	Inlet	E4.03	(None)	No Restriction
	Inlet (1)	C12	(None)	No Restriction
	Inlet (1)	C14	(None)	No Restriction
SD1	Inlet	C11	(None)	No Restriction
	Inlet (1)	C13	(None)	No Restriction
	Inlet	E4.04	(None)	No Restriction
EXS1 outfall	Inlet	R1.05	(None)	No Restriction
	Inlet	S1.06	(None)	No Restriction

Project: Lidl Newport		Date: 22/08/2024			
		Designed by: SN	Checked by:		Approved By:
Report Details: Type: Junctions Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd			

Outlets				
Junction	Outlet Name	Outgoing Connection	Outlet Type	
IC1	Outlet	R1.00	Free Discharge	
IC2	Outlet	R1.01	Free Discharge	
RS1	Outlet	R1.02	Free Discharge	
IC3	Outlet	R2.00	Free Discharge	
IC4	Outlet	R2.01	Free Discharge	
RS2	Outlet	R2.02	Free Discharge	
RS3	Outlet	R1.03	Free Discharge	
RS4	Outlet	R1.04	Free Discharge	
RS5	Outlet	R3.00	Free Discharge	
RS6	Outlet	R3.01	Free Discharge	
RS7	Outlet	R1.05	Free Discharge	
IC5	Outlet	E4.00	Free Discharge	
ES1	Outlet	E5.00	Free Discharge	
ES2	Outlet	E4.01	Free Discharge	
ES3	Outlet	E6.00	Free Discharge	
ES4	Outlet	E4.02	Free Discharge	
ES5	Outlet	E4.03	Free Discharge	
ES6	Outlet	E4.04	Free Discharge	
SD1	Outlet	S1.06	Free Discharge	

Project: Lidl Newport	Date: 22/08/2024			
	Designed by: SN		Checked by:	Approved by:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd			



PP1

Type: Porous Paving

Dimensions

Exceedance Level (m)	6.950
Depth (m)	0.630
Base Level (m)	6.320
Paving Layer Depth (mm)	130
Membrane Percolation (m/hr)	4.0
Porosity (%)	35
Length (m)	5.156
Long. Slope (1:X)	1000.00
Width (m)	8.303
Total Volume (m³)	7.492

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (10)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	C1
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	400.0
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All Permeable Paving Zones are a common depth and specification. Only one shown in report to avoid data overload. A full, detailed list is contained within the accompanying data set.

Project: Lidl Newport	Date: 22/08/2024		
	Designed by: SN	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd		



Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
R1.00	35.738	Pipe	119.126		0.6	150	6.950	6.200
R1.01	21.940	Pipe	146.266		0.6	225	6.950	5.900
R1.02	29.834	Pipe	149.171		0.6	225	7.000	5.750
R2.00	34.121	Pipe	85.302		0.6	150	6.950	6.300
R2.01	15.791	Pipe	105.273		0.6	225	6.950	5.900
R2.02	27.124	Pipe	135.618		0.6	225	7.000	5.750
R1.03	87.480	Pipe	159.055		0.6	300	7.000	5.550
R1.04	13.265	Pipe	132.649		0.6	300	7.000	5.000
R3.00	63.297	Pipe	140.660		0.6	300	6.975	5.750
R3.01	25.276	Pipe	63.191		0.6	300	7.050	5.300
E4.00	21.455	Pipe	71.518		0.6	225	6.900	6.000
E5.00	18.949	Pipe	126.327		0.6	225	6.800	5.850
E4.01	41.242	Pipe	137.472		0.6	300	6.900	5.700
E6.00	18.949	Pipe	63.163		0.6	300	6.775	5.700
E4.02	39.579	Pipe	158.316		0.6	375	6.950	5.400
E4.03	27.412	Pipe	137.059		0.6	375	6.900	5.150
E4.04	9.627	Pipe	48.133		0.6	375	6.900	4.950
R1.05	11.861	Pipe	79.071		0.6	300	7.000	4.900
S1.06	8.901	Pipe	9.781		0.6	375	6.900	4.750
C1	2.036	Pipe	6.361		0.6	150	6.955	6.320
C2	1.812	Pipe	6.712		0.6	150	6.905	6.270
C3	4.613	Pipe	7.440		0.6	150	6.955	6.320
C4	6.598	Pipe	11.576		0.6	150	6.905	6.270
C5	3.238	Pipe	10.118		0.6	150	6.805	6.170
C6	7.861	Pipe	35.734		0.6	150	6.705	6.070
C8	6.683	Pipe	7.681		0.6	150	6.905	6.270
C9	3.200	Pipe	6.809		0.6	150	6.805	6.170
C7	9.981	Pipe	26.975		0.6	150	6.705	6.070
C10	5.449	Pipe	14.727		0.6	150	6.705	6.070
C11	5.107	Pipe	3.597		0.6	150	7.006	6.370
C12	7.799	Pipe	6.964		0.6	150	6.705	6.070
C13	6.322	Pipe	4.978		0.6	150	6.860	6.220
C15	10.636	Pipe	11.561		0.6	150	6.705	6.070
C14	19.849	Pipe	17.722		0.6	150	6.705	6.070
C16	12.583	Pipe	18.780		0.6	150	7.005	6.370
C17	3.169	Pipe	3.267		0.6	150	7.005	6.370

Project: Lidl Newport	Date: 22/08/2024		
	Designed by: SN	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd		



Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Lock
R1.00	6.950	5.900	None
R1.01	7.000	5.750	None
R1.02	7.000	5.550	None
R2.00	6.950	5.900	None
R2.01	7.000	5.750	None
R2.02	7.000	5.550	None
R1.03	7.000	5.000	None
R1.04	7.000	4.900	None
R3.00	7.050	5.300	None
R3.01	7.000	4.900	None
E4.00	6.900	5.700	None
E5.00	6.900	5.700	None
E4.01	6.950	5.400	None
E6.00	6.950	5.400	None
E4.02	6.900	5.150	None
E4.03	6.900	4.950	None
E4.04	6.900	4.750	None
R1.05	6.900	4.750	None
S1.06	6.750	3.840	None
C1	6.900	6.000	None
C2	6.900	6.000	None
C3	6.900	5.700	None
C4	6.900	5.700	None
C5	6.800	5.850	None
C6	6.800	5.850	None
C8	6.950	5.400	None
C9	6.775	5.700	None
C7	6.775	5.700	None
C10	6.775	5.700	None
C11	6.900	4.950	None
C12	6.900	4.950	None
C13	6.900	4.950	None
C15	6.900	5.150	None
C14	6.900	4.950	None
C16	6.900	5.700	None
C17	6.950	5.400	None

Project: Lidl Newport	Date: 22/08/2024			
	Designed by:	Checked by:	Approved By:	
Report Details: Type: Inflow Summary Storm Phase: Phase	SN			
	Company Address: Lucion Delta Simons Ltd			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	IC1		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (1)	IC3		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (2)	IC2		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (3)	IC4		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (4)	RS2		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (5)	RS1		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (6)	RS3		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (7)	RS2		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (8)	IC4		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (9)	PP2		Time of Concentration	0.030	100	0	100	0.030
Catchment Area (10)	PP1		Time of Concentration	0.018	100	0	100	0.018
Catchment Area (11)	PP3		Time of Concentration	0.024	100	0	100	0.024
Catchment Area (12)	PP6		Time of Concentration	0.033	100	0	100	0.033
Catchment Area (13)	IC2		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (14)	IC4		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (15)	PP4		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (16)	PP5		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (17)	ES2		Time of Concentration	0.018	100	0	100	0.018
Catchment Area (18)	RS3		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (19)	RS4		Time of Concentration	0.096	100	0	100	0.096
Catchment Area (20)	RS5		Time of Concentration	0.035	100	0	100	0.035

Project: Lidl Newport		Date: 22/08/2024					
		Designed by:	Checked by:	Approved By:			
		SN					
Report Details: Type: Inflow Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd					
Catchment Area (21)	RS6	Time of Concentration	0.089	100	0	100	0.089
Catchment Area (22)	PP16	Time of Concentration	0.021	100	0	100	0.021
Catchment Area (23)	PP8	Time of Concentration	0.060	100	0	100	0.060
Catchment Area (24)	PP9	Time of Concentration	0.035	100	0	100	0.035
Catchment Area (25)	PP7	Time of Concentration	0.050	100	0	100	0.050
Catchment Area (26)	PP17	Time of Concentration	0.013	100	0	100	0.013
Catchment Area (27)	ES4	Time of Concentration	0.014	100	0	100	0.014
Catchment Area (28)	PP10	Time of Concentration	0.014	100	0	100	0.014
Catchment Area (29)	ES5	Time of Concentration	0.044	100	0	100	0.044
Catchment Area (30)	PP11	Time of Concentration	0.015	100	0	100	0.015
Catchment Area (31)	PP13	Time of Concentration	0.064	100	0	100	0.064
Catchment Area (32)	PP15	Time of Concentration	0.036	100	0	100	0.036
Catchment Area (33)	PP12	Time of Concentration	0.016	100	0	100	0.016
Catchment Area (34)	PP14	Time of Concentration	0.036	100	0	100	0.036
TOTAL			0.908				0.908

Project: Lidl Newport		Date: 22/08/2024		
		Designed by: SN	Checked by: Approved By: 	
Report Details: Type: Outfall Details Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd		

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
EXS1 outfall	Free Discharge		

Storm Network Simulation Results (Critical Storms Per Item – Condensed Results)

100 Year + 40% climate change

Project: Lidl Newport	Date: 22/08/2024			
	Designed by: SN	Checked by:	Approved By:	
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd			



Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FSR: 100 years: +40 % 15 mins: Winter	0.01	7.2	3.330
Catchment Area (1)	FSR: 100 years: +40 % 15 mins: Winter	0.01	7.7	3.578
Catchment Area (2)	FSR: 100 years: +40 % 15 mins: Winter	0.01	3.2	1.473
Catchment Area (3)	FSR: 100 years: +40 % 15 mins: Winter	0.01	4.5	2.090
Catchment Area (4)	FSR: 100 years: +40 % 15 mins: Winter	0.01	3.8	1.746
Catchment Area (5)	FSR: 100 years: +40 % 15 mins: Winter	0.02	10.0	4.602
Catchment Area (6)	FSR: 100 years: +40 % 15 mins: Winter	0.02	9.8	4.518
Catchment Area (7)	FSR: 100 years: +40 % 15 mins: Winter	0.01	4.9	2.282
Catchment Area (8)	FSR: 100 years: +40 % 15 mins: Winter	0.01	4.8	2.204
Catchment Area (10)	FSR: 100 years: +40 % 15 mins: Winter	0.02	10.4	4.794
Catchment Area (11)	FSR: 100 years: +40 % 15 mins: Winter	0.02	13.5	6.252
Catchment Area (9)	FSR: 100 years: +40 % 15 mins: Winter	0.03	17.3	7.992
Catchment Area (12)	FSR: 100 years: +40 % 15 mins: Winter	0.03	19.1	8.824
Catchment Area (13)	FSR: 100 years: +40 % 15 mins: Winter	0.01	5.5	2.530

Project: Lidl Newport	Date: 22/08/2024		
	Designed by: SN	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd	



Catchment Area (14)	FSR: 100 years: +40 % 15 mins: Winter	0.01	5.6	2.569
Catchment Area (15)	FSR: 100 years: +40 % 15 mins: Winter	0.01	7.3	3.375
Catchment Area (16)	FSR: 100 years: +40 % 15 mins: Winter	0.01	4.3	1.988
Catchment Area (17)	FSR: 100 years: +40 % 15 mins: Winter	0.02	10.2	4.728
Catchment Area (18)	FSR: 100 years: +40 % 15 mins: Winter	0.01	6.0	2.773
Catchment Area (19)	FSR: 100 years: +40 % 15 mins: Winter	0.10	55.1	25.461
Catchment Area (20)	FSR: 100 years: +40 % 15 mins: Winter	0.03	19.8	9.154
Catchment Area (21)	FSR: 100 years: +40 % 15 mins: Winter	0.09	50.9	23.515
Catchment Area (22)	FSR: 100 years: +40 % 15 mins: Winter	0.02	12.2	5.629
Catchment Area (23)	FSR: 100 years: +40 % 15 mins: Winter	0.06	34.4	15.882
Catchment Area (24)	FSR: 100 years: +40 % 15 mins: Winter	0.03	19.9	9.172
Catchment Area (25)	FSR: 100 years: +40 % 15 mins: Winter	0.05	28.5	13.160
Catchment Area (26)	FSR: 100 years: +40 % 15 mins: Winter	0.01	7.4	3.420
Catchment Area (27)	FSR: 100 years: +40 % 15 mins: Winter	0.01	8.3	3.815
Catchment Area (28)	FSR: 100 years: +40 % 15 mins: Winter	0.01	7.9	3.641
Catchment Area (29)	FSR: 100 years: +40 % 15 mins: Winter	0.04	25.0	11.552
Catchment Area (30)	FSR: 100 years: +40 % 15 mins: Winter	0.02	8.8	4.060

Project: Lidl Newport	Date: 22/08/2024		
	Designed by: SN	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd		



Catchment Area (31)	FSR: 100 years: +40 % 15 mins: Winter	0.06	37.0	17.089
Catchment Area (32)	FSR: 100 years: +40 % 15 mins: Winter	0.04	20.6	9.513
Catchment Area (33)	FSR: 100 years: +40 % 15 mins: Winter	0.02	9.4	4.318
Catchment Area (34)	FSR: 100 years: +40 % 15 mins: Winter	0.04	20.9	9.633

Project: Lidl Newport	Date: 22/08/2024		
	Designed by: SN	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd		



Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Status
IC1	FSR: 100 years: +40 %: 15 mins: Winter	6.950	6.200	6.268	0.068	0.000	6.9	OK
IC2	FSR: 100 years: +40 %: 15 mins: Winter	6.950	5.900	5.994	0.094	0.000	14.7	OK
RS1	FSR: 100 years: +40 %: 15 mins: Winter	7.000	5.750	5.869	0.119	0.000	23.3	OK
IC3	FSR: 100 years: +40 %: 15 mins: Winter	6.950	6.300	6.365	0.065	0.000	7.5	OK
IC4	FSR: 100 years: +40 %: 15 mins: Winter	6.950	5.900	6.012	0.112	0.000	21.4	OK
RS2	FSR: 100 years: +40 %: 15 mins: Winter	7.000	5.750	5.887	0.137	0.000	28.8	OK
RS3	FSR: 100 years: +40 %: 15 mins: Winter	7.000	5.550	5.736	0.186	0.000	60.3	OK
RS4	FSR: 100 years: +40 %: 15 mins: Winter	7.000	5.000	5.470	0.470	0.000	103.2	Surcharge d
RS5	FSR: 100 years: +40 %: 15 mins: Winter	6.975	5.750	5.840	0.090	0.000	18.6	OK
RS6	FSR: 100 years: +40 %: 15 mins: Winter	7.050	5.300	5.444	0.144	0.000	66.5	OK
RS7	FSR: 100 years: +40 %: 15 mins: Winter	7.000	4.900	5.298	0.398	0.000	159.3	Surcharge d
IC5	FSR: 100 years: +40 %: 30 mins: Winter	6.900	6.000	6.067	0.067	0.000	12.3	OK
ES1	FSR: 100 years: +40 %: 15 mins: Winter	6.800	5.650	5.925	0.075	0.000	11.1	OK
ES2	FSR: 100 years: +40 %: 30 mins: Winter	6.900	5.700	5.838	0.138	0.000	41.1	OK
ES3	FSR: 100 years: +40 %: 30 mins: Winter	6.775	5.700	5.784	0.084	0.000	25.0	OK
ES4	FSR: 100 years: +40 %: 30 mins: Winter	6.950	5.400	5.615	0.215	0.000	88.6	OK
ES5	FSR: 100 years: +40 %: 30 mins: Winter	6.900	5.150	5.360	0.230	0.000	106.1	OK
ES6	FSR: 100 years: +40 %: 30 mins: Winter	6.900	4.950	5.153	0.203	0.000	124.7	OK
SD1	FSR: 100 years: +40 %: 30 mins: Winter	6.900	4.750	4.944	0.194	0.000	237.5	OK
EXS1 outfall	FSR: 100 years: +40 %: 30 mins: Winter	6.750	3.840	3.997	0.157	0.000	237.6	OK

Project: Lidl Newport		Date: 22/08/2024		
		Designed by: SN	Checked by:	
		Approved By:		
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd		



Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Percentage Available (%)	Status
PP1	FSR: 100 years +40 % 30 mins: Winter	6.720	6.346	0.394	0.026	3.151	0.000	57.940	OK
PP2	FSR: 100 years +40 % 30 mins: Winter	6.576	6.306	0.301	0.036	6.367	0.000	66.270	OK
PP3	FSR: 100 years +40 % 30 mins: Winter	6.627	6.349	0.301	0.029	4.899	0.000	66.975	OK
PP4	FSR: 100 years +40 % 30 mins: Winter	6.591	6.293	0.316	0.023	2.488	0.000	66.033	OK
PP5	FSR: 100 years +40 % 60 mins: Winter	6.402	6.187	0.227	0.017	1.784	0.000	75.691	OK
PP6	FSR: 100 years +40 % 30 mins: Winter	6.505	6.133	0.431	0.063	5.495	0.000	50.629	OK
PP7	FSR: 100 years +40 % 30 mins: Winter	6.429	6.139	0.354	0.069	9.352	0.000	58.128	OK
PP8	FSR: 100 years +40 % 30 mins: Winter	6.623	6.319	0.347	0.049	11.913	0.000	60.335	OK
PP9	FSR: 100 years +40 % 60 mins: Winter	6.422	6.204	0.247	0.034	8.326	0.000	71.992	OK
PP10	FSR: 100 years +40 % 30 mins: Winter	6.353	6.098	0.278	0.028	2.639	0.000	69.398	OK
PP11	FSR: 100 years +40 % 60 mins: Winter	6.560	6.385	0.184	0.015	4.488	0.000	80.128	OK
PP12	FSR: 100 years +40 % 60 mins: Winter	6.288	6.092	0.213	0.022	3.689	0.000	76.476	OK
PP13	FSR: 100 years +40 % 60 mins: Winter	6.659	6.251	0.428	0.031	23.218	0.000	50.858	OK
PP14	FSR: 100 years +40 % 30 mins: Winter	6.317	6.114	0.242	0.044	8.250	0.000	71.312	OK

Project: Lidl Newport		Date: 22/08/2024				
		Designed by: SN	Checked by:	Approved By:		
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd				

PP15	FSR: 100 years: +40 %: 30 mins: Winter	6.354	6.111	0.280	0.041	7.160	0.000	67.936	OK
PP16	FSR: 100 years: +40 %: 30 mins: Winter	6.636	6.405	0.261	0.035	4.501	0.000	70.383	OK
PP17	FSR: 100 years: +40 %: 60 mins: Winter	6.589	6.386	0.215	0.016	2.839	0.000	76.943	OK

Project: Lidl Newport	Date: 22/08/2024			
	Designed by: SN	Checked by:	Approved By:	
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: Lucion Delta Simons Ltd			



Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
R1.00	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	IC1	IC2	6.950	6.268	0.081	3.330	0.7	0.43	6.9	OK
R1.01	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	IC2	RS1	6.950	5.994	0.106	7.320	0.8	0.34	14.7	OK
R1.02	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS1	RS3	7.000	5.869	0.152	11.908	0.8	0.55	23.3	OK
R2.00	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	IC3	IC4	6.950	6.365	0.089	3.578	0.7	0.39	7.5	OK
R2.01	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	IC4	RS2	6.950	6.012	0.124	10.432	0.9	0.42	21.4	OK
R2.02	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS2	RS3	7.000	5.887	0.162	14.441	0.9	0.65	28.8	OK
R1.03	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS3	RS4	7.000	5.736	0.300	33.460	0.9	0.69	60.3	OK
R1.04	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS4	RS7	7.000	5.470	0.300	58.935	1.5	1.07	103.2	Surcharged
R3.00	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS5	RS6	6.975	5.840	0.117	9.143	0.7	0.2	18.6	OK
R3.01	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	RS6	RS7	7.050	5.444	0.271	32.607	1.0	0.48	66.5	OK
E4.00	FSR: 100 years: +40 %; 30 mins: Winter	Pipe	IC5	ES2	6.900	6.067	0.103	14.861	0.7	0.2	12.3	OK
E5.00	FSR: 100 years: +40 %; 15 mins: Winter	Pipe	ES1	ES2	6.800	5.925	0.103	7.772	0.6	0.24	11.1	OK
E4.01	FSR: 100 years: +40 %; 30 mins: Winter	Pipe	ES2	ES4	6.900	5.838	0.176	51.583	1.0	0.43	41.1	OK
E6.00	FSR: 100 years: +40 %; 30 mins: Winter	Pipe	ES3	ES4	6.775	5.784	0.149	29.777	0.7	0.18	25.0	OK

Project: Lidl Newport	Date: 22/08/2024				
	Designed by:	Checked by:	Approved By:		
	SN				
Report Details: Type: Connections Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd			

E4.02	FSR: 100 years: +40 % 30 mins: Winter	Pipe	ES4	ES5	6.950	5.615	0.222	108.313	1.3	0.56	88.6	OK
E4.03	FSR: 100 years: +40 % 30 mins: Winter	Pipe	ES5	ES6	6.900	5.380	0.217	134.856	1.6	0.62	106.1	OK
E4.04	FSR: 100 years: +40 % 30 mins: Winter	Pipe	ES6	SD1	6.900	5.153	0.190	163.936	2.3	0.43	124.7	OK
R1.05	FSR: 100 years: +40 % 15 mins: Winter	Pipe	RS7	SD1	7.000	5.298	0.285	91.492	2.3	1.27	159.3	Surch arged
S1.06	FSR: 100 years: +40 % 30 mins: Winter	Pipe	SD1	EXS1 outfall	6.900	4.944	0.176	289.687	4.7	0.37	237.5	OK
C1	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP1	IC5	6.955	6.530	0.047	5.813	1.1	0.07	4.8	Surch arged
C2	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP2	IC5	6.905	6.439	0.052	9.083	1.4	0.11	7.4	Surch arged
C3	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP3	ES2	6.955	6.485	0.083	7.103	0.6	0.09	5.7	Surch arged
C4	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP4	ES2	6.905	6.440	0.081	3.917	0.3	0.06	3.2	Surch arged
C5	FSR: 100 years: +40 % 60 mins: Winter	Pipe	PP5	ES1	6.805	6.292	0.044	3.211	0.4	0.03	1.6	OK
C6	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP6	ES1	6.705	6.317	0.068	11.041	1.3	0.33	9.9	Surch arged
C8	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP8	ES4	6.905	6.468	0.132	18.532	0.9	0.24	15.5	Surch arged
C9	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP9	ES3	6.805	6.309	0.059	9.733	1.2	0.11	7.6	OK
C7	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP7	ES3	6.705	6.279	0.076	15.866	1.5	0.4	13.7	Surch arged
C10	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP10	ES3	6.705	6.223	0.056	4.266	0.6	0.08	3.5	Surch arged
C11	FSR: 100 years: +40 % 60 mins: Winter	Pipe	PP11	ES6	7.006	6.469	0.109	5.962	0.2	0.03	2.5	OK
C12	FSR: 100 years: +40 % 30 mins: Winter	Pipe	PP12	ES6	6.705	6.187	0.113	4.717	0.3	0.05	3.7	OK

Project: Lidl Newport		Date: 22/08/2024				
		Designed by:	Checked by:	Approved By:		
		SN				
Report Details: Type: Connections Summary Storm Phase: Phase		Company Address: Lucion Delta Simons Ltd				

C13	FSR: 100 years: +40 %: 60 mins: Winter	Pipe	PP13	ES6	6.860	6.466	0.113	22.094	0.9	0.1	8.1	Surcharged
C15	FSR: 100 years: +40 %: 30 mins: Winter	Pipe	PP15	ES5	6.705	6.230	0.136	11.098	0.6	0.18	9.3	Surcharged
C14	FSR: 100 years: +40 %: 30 mins: Winter	Pipe	PP14	ES6	6.705	6.213	0.124	10.678	0.6	0.2	8.7	OK
C16	FSR: 100 years: +40 %: 30 mins: Winter	Pipe	PP16	ES2	7.005	6.518	0.086	6.390	0.5	0.13	5.2	OK
C17	FSR: 100 years: +40 %: 30 mins: Winter	Pipe	PP17	ES4	7.005	6.485	0.115	3.761	0.2	0.03	2.9	OK

Appendix I - Separator Specification Sheets

Water Management Solutions

Klargester

AquaTreat Full Retention GRP Surface Water Treatment Separators

Mitigation Indices

TSS	Metals	Hydrocarbons
0.8%	0.6%	0.9%



Why choose an AquaTreat separator?

- Larger silt storage capacities (compared to vortex separators)
- Our indices cater for high polluted lands (single piece solution)
- Reduced risk of silt build up
- Lesser risk of downstream pollution in SuDS solution due to high capacity silt storage
- Easier servicing, with maintenance from ground level
- SmartServ Pro remote monitoring solution (available as optional extra)



Our range has been tested against full flow

Our units have been tested at their maximum flow rate (10l/s), unlike some products which have been tested based on bypass and therefore only 10% of the flow. This ensures total accuracy of our silt retention results, by replicating the full effect of the silt wash through.

As part of our Planet Passionate programme, Kingspan are dedicated to delivering innovative surface water management technologies, developed on the back of 65 years' experience.

*Terms and conditions apply. View online at <https://www.kingspan.com/gb/en-gb/products/wastewater-management/warranty-terms>



Klargester AquaTreat

Full Retention GRP Surface Water Treatment Separators

Technical Specifications

Model	10 l/s Low Risk		6 l/s Medium Risk			
	Treated Flowrate [l/s]	Connectable Surface Area [m²]	Treated Flowrate [l/s]	Connectable Surface Area [m²]	Length (mm)	Diameter (mm)
SWT001	10	1333	6	800	2610	1225
SWT002	15	2004	9	1202	3910	1225
SWT003	19	2535	11	1524	3230	2010
SWT004	23	3105	14	1863	3960	2010
SWT005	28	3747	17	2248	4750	2010
SWT006	34	4563	21	2738	5970	2010
SWT007	44	5814	26	3489	7365	2010
SWT008	48	6368	29	3821	5744	2820
SWT009	52	6880	31	4128	6200	2820
SWT010	61	8177	37	4906	7365	2820
SWT011	72	9635	43	5781	8675	2820
SWT012	83	11082	50	6649	9975	2820
SWT013	94	12535	56	7521	11280	2820
SWT014	100	13362	60	8017	11994	2820
SWT015	106	14183	64	8510	12766	2820
SWT016	113	15029	68	9017	13528	2820
SWT017	119	15897	72	9538	14300	2820
SWT018	126	16754	75	10053	15071	2820
SWT019	132	17601	79	10560	15833	2820

Low		
CoP at 10 l/s	% Removal	Mitigation Index
Total Suspended Solids (TSS)	75.6%	0.7
Metals*	57%	0.5
Hydrocarbons	99.6%	0.9
* Reduction of heavy metals by collecting and retaining suspended solids is assumed as 7.5%		

Medium		
CoP at 6 l/s	% Removal	Mitigation Index
Total Suspended Solids (TSS)	81.8%	0.8
Metals*	61.4%	0.6
Hydrocarbons	99.6%	0.9
* Reduction of heavy metals by collecting and retaining suspended solids is assumed as 7.5%		

For more information on any of our products: T: +44 (0)1296 633 033
E: accivilsales@kingspan.com or visit kingspan.co.uk/klargestar

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Appendix J - Maintenance Schedules

Permeable Paving Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on Site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually



DeltaSimons

Protecting people and planet

Pond and Wetland Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass - public areas	Monthly (during growing season), or as required
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage, and / or physical damage.	Monthly
	Inspect water body for signs of poor water quality	Monthly (May - October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options.	Half yearly
	Check any mechanical devices e.g. penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Remove sediment from any forebay	Every 1 - 5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g. 25-50 years
Remedial actions	Repair erosion or other damage	As required
	Replant where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate of Inlets, outlets and overflows	As required

Ref. Table 23.1 CIRIA C753 'The SuDS Manual'

Site Drainage Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut grass in public areas	Monthly (during growing season, or as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage, and / or physical damage	Monthly or after heavy rainfall events
	Remove manhole covers and inspect the pit, ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt where necessary	Monthly
	Gratings on any gullies, box drains and channel drains to be kept clear of debris. Extra care should be taken to ensure drains are kept clear of debris during autumn leaf fall	Monthly
	Periodic jetting or rodding of pipework as required to clear any blockages	Every 3 - 6 months (or as required)
Remedial Actions	Repair / rehabilitate inlets, outlets and overflows	As required