

Technical Note

JBA Project Code	2025s0904
Contract	Neath Abbey Road Flood Modelling
Client	Alpha Building Group Limited
Date	March 2026
Author	Bethany Adams BSc
Reviewer / Sign off	Paul Redbourne BSc PGCert, MCIWEM, C.WEM
Subject	Neath Abbey Road Flood Modelling

1 Introduction

1.1 Terms of reference

JBA Consulting (JBA) were commissioned by Alpha Building Group Limited in June 2025 to assess the flood risk associated with the proposed development of additional units at an existing commercial premises in Neath, Port Talbot. Hydraulic modelling has been undertaken to provide an improved understanding of flood risk to the site, considering both fluvial and tidal sources. This technical note has been prepared to provide an overview of the model schematisation, model performance, and any outstanding assumptions and limitations with the model outputs. The technical note does not include any analysis of the model results as this is discussed within the Flood Consequence Assessment (FCA).

1.2 Study area

The proposed commercial units are located on brownfield land to the south of Neath Abbey Road, Port Talbot. The site is approximately 0.8ha and is bound to the north and west by commercial development, to the east by residential development and to the south by open greenspace and the Vale of Glamorgan railway.

The main pedestrian and vehicular access and egress route crosses through the northern site boundary, via an unnamed road that links to Neath Abbey Road.

The site is at risk of flooding from both tidal and fluvial sources. Fluvial flooding originates from the River Neath via the Tennant Canal to the south of the site and from the River Clydach to the northwest of the site. The River Neath is a Natural Resources Wales (NRW) designated Main River that is located approximately 180m south-east of the site. The River Clydach, an NRW-designated Main River, is located approximately 600m to the west of the site and discharges into the River Neath. The Tennant Canal is located approximately 80m to the south of the site boundary and is culverted beneath the A465.

A location plan is provided in Figure 1-1.

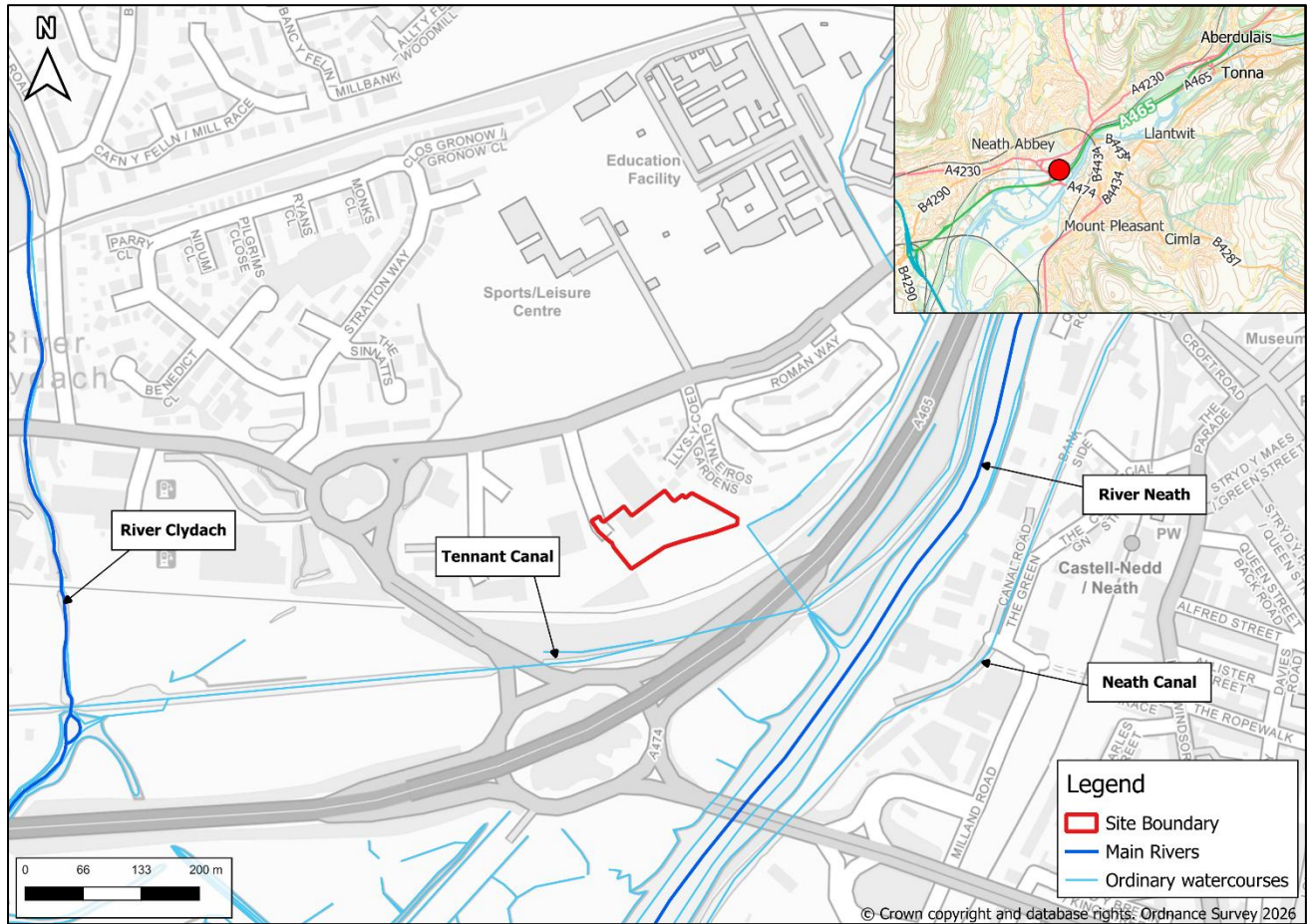


Figure 1-1: Site location plan.

2 Baseline modelling

2.1 Data availability

The existing 1D-2D ESTRY-TUFLOW River Neath model has been licensed from Natural Resources Wales (NRW) for use within this study. The River Neath model was created by JBA Consulting in 2017 on behalf of NRW to derive new flood mapping products under the Water and Environmental Management Framework (WEM). The model was based on detailed channel and bank survey collected in 2015. The model extends from Melincourt to the confluence with the sea at Swansea Bay. As well as the River Neath, the model includes several tributaries, including the River Clydach and the Neath and Tennant canals.

2.2 Model build and updates

The existing Neath modelling has been updated to provide an improved understanding of flood risk to the site. The revised model has been simulated using the latest available TUFLOW version at the time this project was commissioned (2025.1.0-iSP).

The model grid resolution and model timesteps have been retained from the original model as these are considered appropriate and provide an acceptable balance between model run times and providing a detailed representation of overland flow routes.

New LIDAR data has been collected for much of Wales and consideration has been given for including this 2023 dataset within the updated model. The 2023 LiDAR DTM dataset was subtracted from the original model LiDAR DTM data to assess its suitability. The results are shown in Figure 2-1.

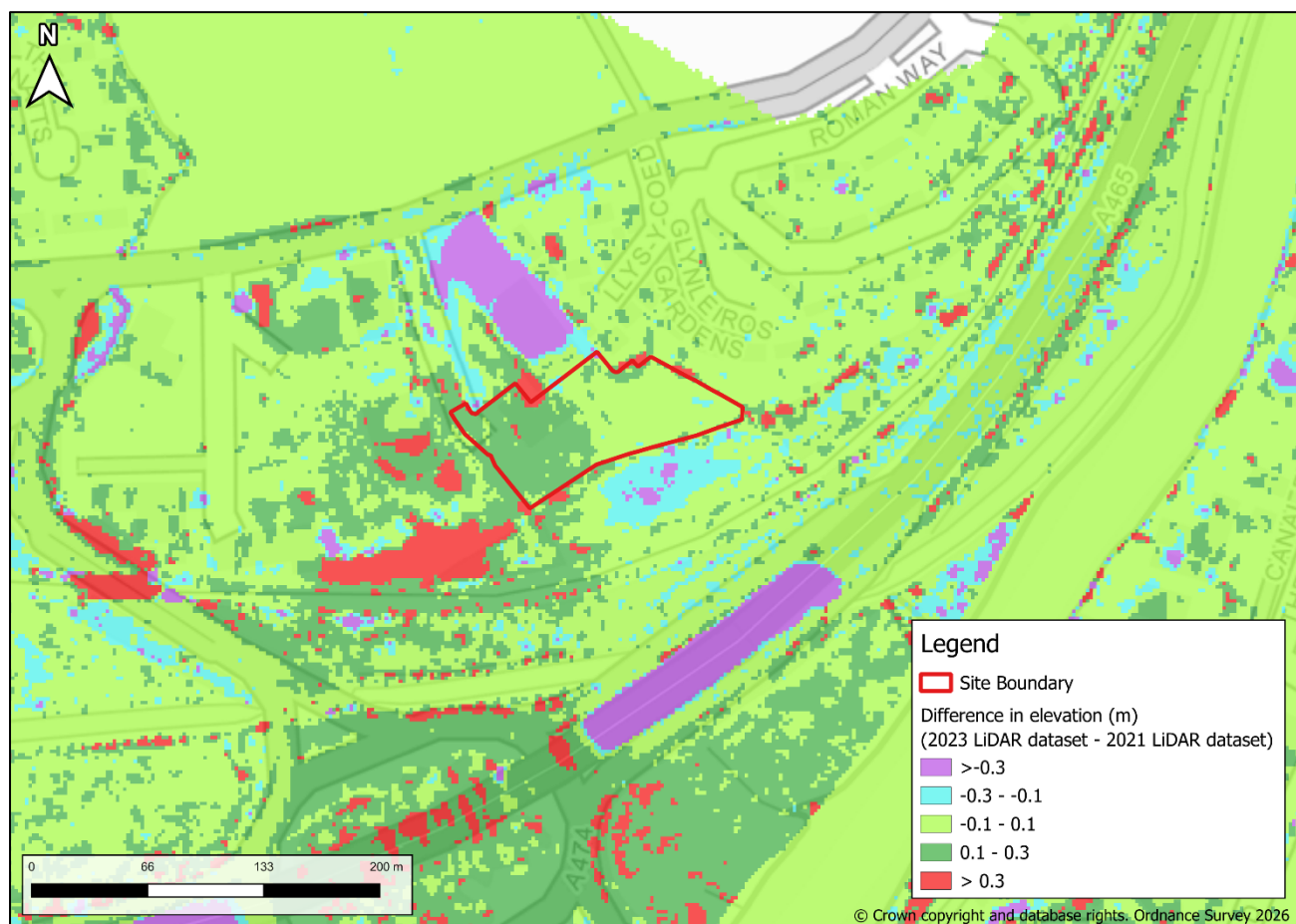


Figure 2-1: Difference in elevation between the original model LiDAR and 2023 LiDAR datasets

Analysis of the 2023 LiDAR revealed significant inaccuracies, particularly in its representation of tidal flow paths through key structures including the A465. Therefore, the original model LiDAR dataset was used throughout most of the model domain.

To account for the recent Aldi development immediately north of the site, the 2023 LiDAR dataset was used to supplement the original model LiDAR dataset in this area. While the surrounding ground levels appeared appropriate, the filtering of the Aldi building footprint was poor in the 2023 dataset. Therefore, a 2D Z-Shape polygon was also introduced to set the Aldi building to an elevation of 7.41mAOD based on the surrounding ground levels.

The model has incorporated site-specific topographic survey undertaken by Healer Surveys in June 2025 to better represent the ground levels at the site, shown in Appendix A. The topographic survey was added into GIS and converted into a Triangular Irregular Network (TIN) file, before being converted into an Ascii DTM file to read into the model, as shown in Figure 2-2. The topographic survey also includes the finished floor level (FFL) of the existing CSN Precision Engineering building in the north-western part of the site. The FFL was set to 6.97m AOD as specified in the survey and was represented in the model by

enforcing a 2D Z-Shape region polygon that was read into the model using the 'NO MERGE' shape command.

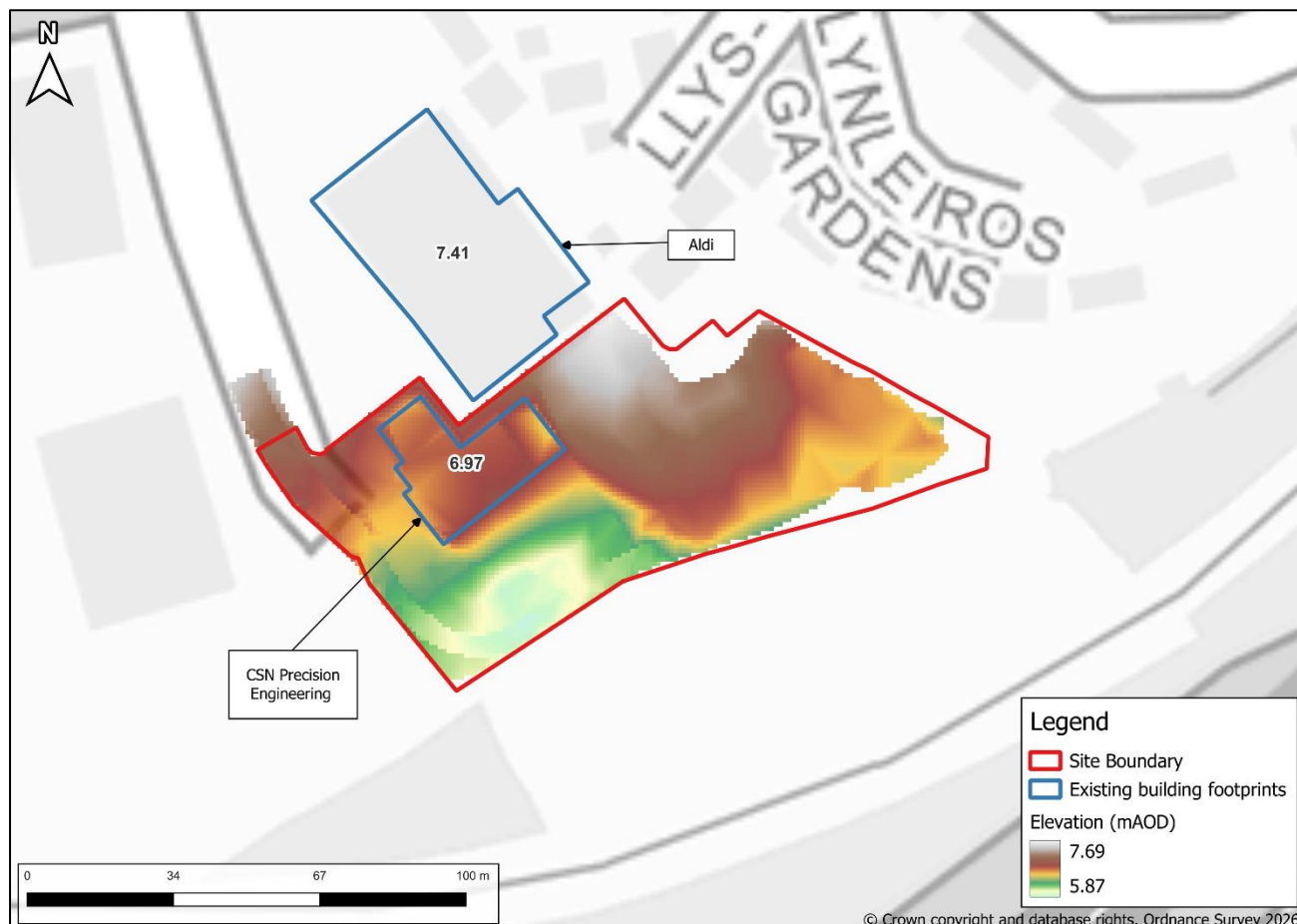


Figure 2-2: Baseline topographic modifications

The 2d_mat file was updated to reflect changes in roughness associated with the recent Aldi development, located immediately to the north of the site. For this building, the Manning's roughness coefficient 'n' has been set to 0.7, consistent with the values applied to other buildings within the model. A review of aerial imagery confirmed that no other new major developments have occurred in the immediate vicinity of the site. Therefore, no further changes to the baseline 2D roughness were required.

The model updates also involved minor amendments to the representation of the various structures within the model. The representation of all bridge structures was updated to use the TUFLOW BB Bridge unit, with the redundant BG loss tables removed. This approach to bridge schematisation is now considered best practice as it removes the potential for human error associated with the calculation of structure losses. Additionally, all weir structures have been updated to use the WW weir unit, which is preferred in comparison to the now outdated W weir unit.

Due to stability issues encountered during the baseline simulation, the following updates were undertaken. These are discussed in further detail in Section 4.2:

- The addition of energy losses using the HX 'a' factor in places on the Tennant Canal to help reduce velocities across the 1D-2D linkage.
- The open channel unit at node TCAN4454D has been converted to a non-inertial channel using the unit type (SN) in the 1d_nwke layer due to the presence of 1D negative depths.
- A stability patch along the River Neath with a Manning's 'n' roughness coefficient of 1 was incorporated into the model to help to reduce the number of negative depths.

2.3 Boundary conditions

2.3.1 Fluvial model

The new baseline fluvial model was simulated for the 1% AEP and 0.1% AEP events, with and without the application of climate change. The original modelling study only applied fluvial climate change to the 1% AEP event. The existing Neath model was not originally simulated for the 0.1% AEP (1000-year) plus climate change event due to known stability problems present within the model. To support an assessment under the new TAN15, climate change has also been applied to the 0.1% AEP design event, following the resolution of these instabilities.

The climate change uplift has been updated from 20% to 30% to align with the latest Welsh Government climate change guidance for the central estimate for the West Wales River basin district. As the development proposals are for commercial use, a 50-year operational lifetime has been simulated (2075). Therefore, the 30% climate change uplift for the 2080's epoch was adopted as a precautionary approach.

2.3.2 Tidal model

The new tidal model was simulated for the present day (2025) and 50-year lifetime (2075) scenarios, for the 0.5% and 0.1% AEP flood events. An assessment of the impact of climate change has been completed based on the higher central (70th percentile) projections for the 2075 epochs.

The tidal boundary conditions have been updated to use the latest Coastal Flood Boundary (CFB) dataset¹ and the latest Welsh Government climate change guidance for sea level rise².

1 Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018). July 2025. Environment Agency.

2 Flood Consequences Assessments: Climate change allowances. September 2021. Welsh Government.

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The tidal boundary conditions were uplifted from the CFB dataset base year of 2017, using the Higher Central allowance (70th percentile) of the UK Climate Projections (UKCP18) for 2075 for Representative Concentration Pathway 8.5 (RCP 8.5). The peak water levels associated with these tide curves is displayed on Table 2-1.

Table 2-1: Tide curve peak levels - CFB 482

AEP event	Peak water level (mAOD)
0.5% 2025 (base year)	6.41
0.1% 2025 (base year)	6.71
0.5% 2075 (High central)	6.84
0.1% 2075 (High central)	7.14

Tidal boundary conditions were applied at the downstream boundary of the model using a Head-Time (HT) boundary. The timing of the tidal boundary conditions were offset by 74 hours to align with the peak fluvial input and was ran for a total of 36 hours to include three tide cycles.

3 Post-development modelling

Post development modelling has been completed and simulated for the suite of fluvial and tidal design event scenarios. The proposed development involves the construction of eight industrial units in the eastern part of the site, with associated parking and vehicular access. The proposed units will be two-storey and will be arranged in two blocks of four units. Development proposals also include a bin store located in the north-western corner of the site.

External ground level changes are proposed adjacent to the buildings to provide access into the units where required. The proposed external ground levels in the parking and hardstanding area range from 6.45mAOD to 7.20mAOD to provide a more level surface and ramped access into the buildings.

The proposed ground level changes have been represented based on the post development ground model provided by the client, contained in Appendix B. Survey elevation data was converted into a TIN file and subsequently converted into an Ascii DTM file to read into the hydraulic model (Figure 3-1). Within the ground model, the FFL of the proposed commercial units has been set to an elevation of 7.2mAOD.

The client decided to change the FFL of the bin store, lowering the elevation from 7.2mAOD as originally set in the ground model to 7.05mAOD. To represent the lowering, a 2D Z-Shape layer has been introduced and set to an elevation of 7.05mAOD and read into the model using the 'NO MERGE' shape command.

The post development modelling also accounted for changes in roughness associated with the proposed commercial units and bin store. The Manning's 'n' of the proposed building footprints and bin store was set to 0.7, consistent with the other buildings in the model. The roughness of the parking and hardstanding areas has remained the same as in the baseline scenario as this is broadly similar to the existing ground conditions.

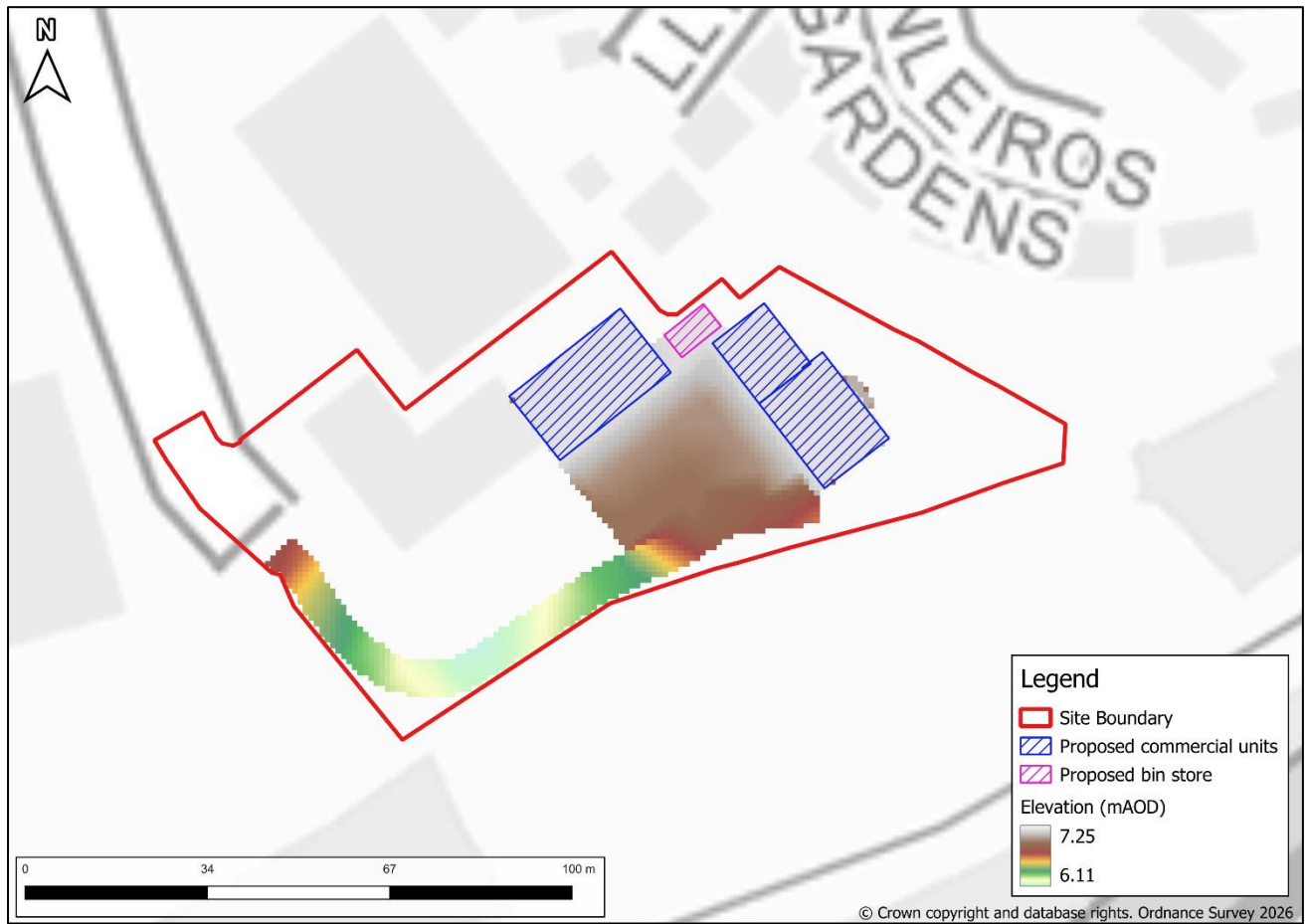


Figure 3-1: Post development topographic modifications

4 Model performance, assumptions and limitations

4.1 Model performance

The peak cumulative mass error during the fluvial 1% AEP plus climate change flood event was 0.80% which is within the acceptable range of $\pm 1\%$ (Figure 3-1). Additionally, the peak cumulative mass error during the tidal 0.5% AEP plus climate change flood event (2075) was 0.83% which is within the acceptable range of $\pm 1\%$ (Figure 3-2).

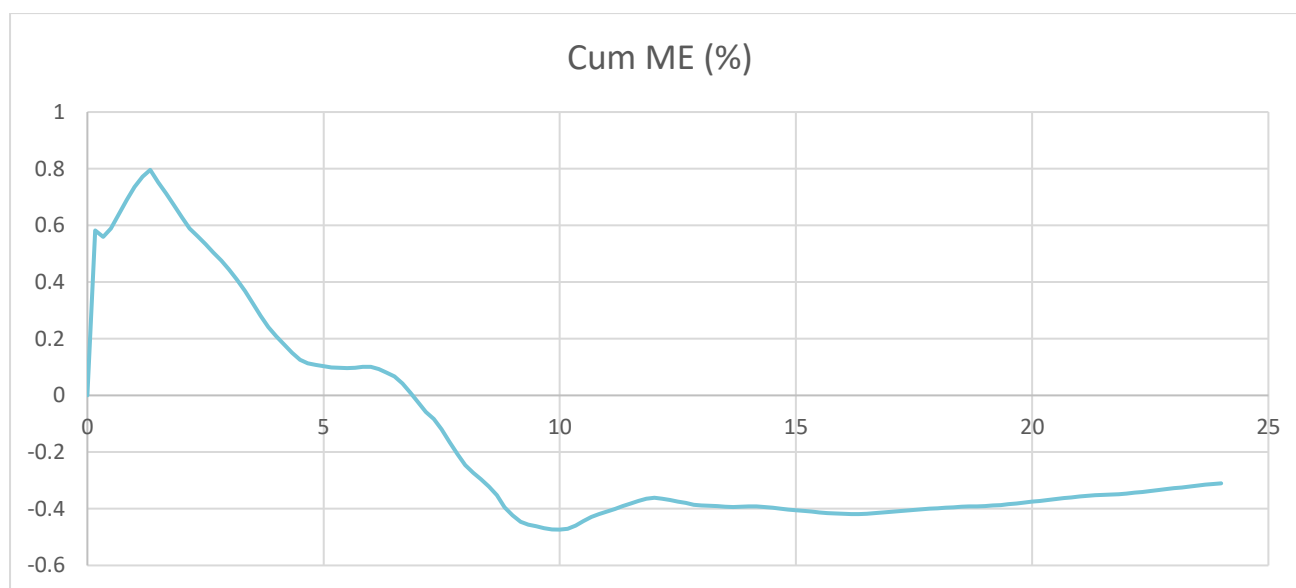


Figure 4-1: Cumulative mass balance for the fluvial 1% AEP plus climate change event

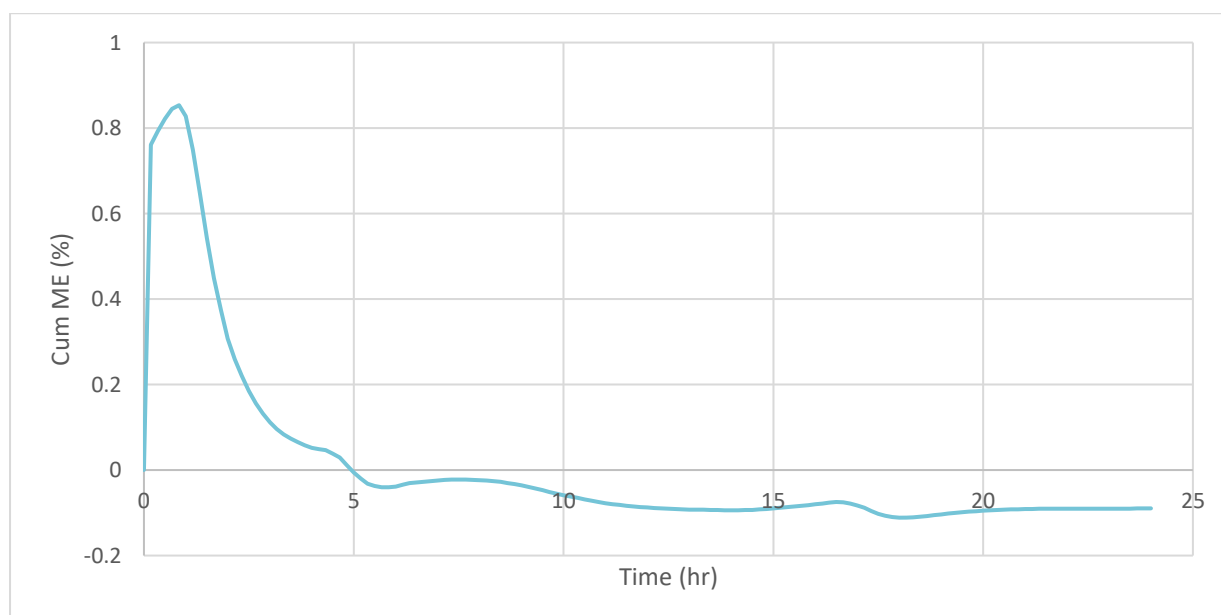


Figure 4-2: Cumulative mass balance for the tidal 0.5% AEP plus climate change event

A series of other stability checks have been completed to assess the performance of the hydraulic model. The volume error for the 1% AEP plus climate change (30%) fluvial flood event was -237947m^3 , representing -0.3% of the total volume. The volume error for the 0.5% AEP plus climate change (2075) tidal flood event was -72707m^3 , representing -0.1% of the total volume. This is within an acceptable range and thus suggests the model is relatively stable.

Within the updated flood model, negative depths were observed in the 1D domain for the Neath Canal at multiple cross sections. Upon further examination, all 1D negative depths occur within the first 9 minutes of the simulation and are located approximately 1km south of the proposed development site. Negative depths are therefore not expected to impact the peak model results or the assessment of flood risk at the site.

4.2 Limitations, uncertainties and assumptions

The Neath flood model has a relatively coarse grid size of 4m and features below 4m in size may not be fully represented. The 4m grid size, however, provides a balance between representing sufficient detail of the floodplain/flow routes across the model domain and model run times; whilst also limiting the computational size of model outputs. Consideration was given to cutting the model down coupled with the adoption of a 2m resolution but due to the interaction between the River Neath and the Tennant Canal, the existing model extent and the 4m grid resolution have been retained.

1D negative depth were present in the 0.1% AEP plus climate change fluvial design event on the Tennant Canal at node TCAN4454D. To address this, the open channel unit has been converted to a non-inertial channel using the unit type (SN) in the 1d_nwke layer. This bypasses the Courant stability condition, and the inertial terms are ignored (eliminating inertial effects) and the stability control procedure is automatically applied. This change resulted in a more stable flow down the canal and had a negligible effect on flood extents.

Energy losses using the HX 'a' factor were applied in certain places on the Tennant Canal to help reduce velocities across the 1D-2D linkage and in turn remove instabilities associated with circulating flow that were present in the 0.1% AEP plus climate change fluvial event. The application of the 'a' factor has negligible impact on the flood depths or extent.

A stability patch was added along the River Neath with a Manning's 'n' roughness coefficient of 0.1. This roughness patch was added because out-of-bank flows were circulating and re-entering the channel, resulting in negative depths during the 0.1% AEP plus climate change fluvial flood event. As the stability patch is located approximately 4km upstream of the site, it is expected to have negligible impact on the results at the development site.

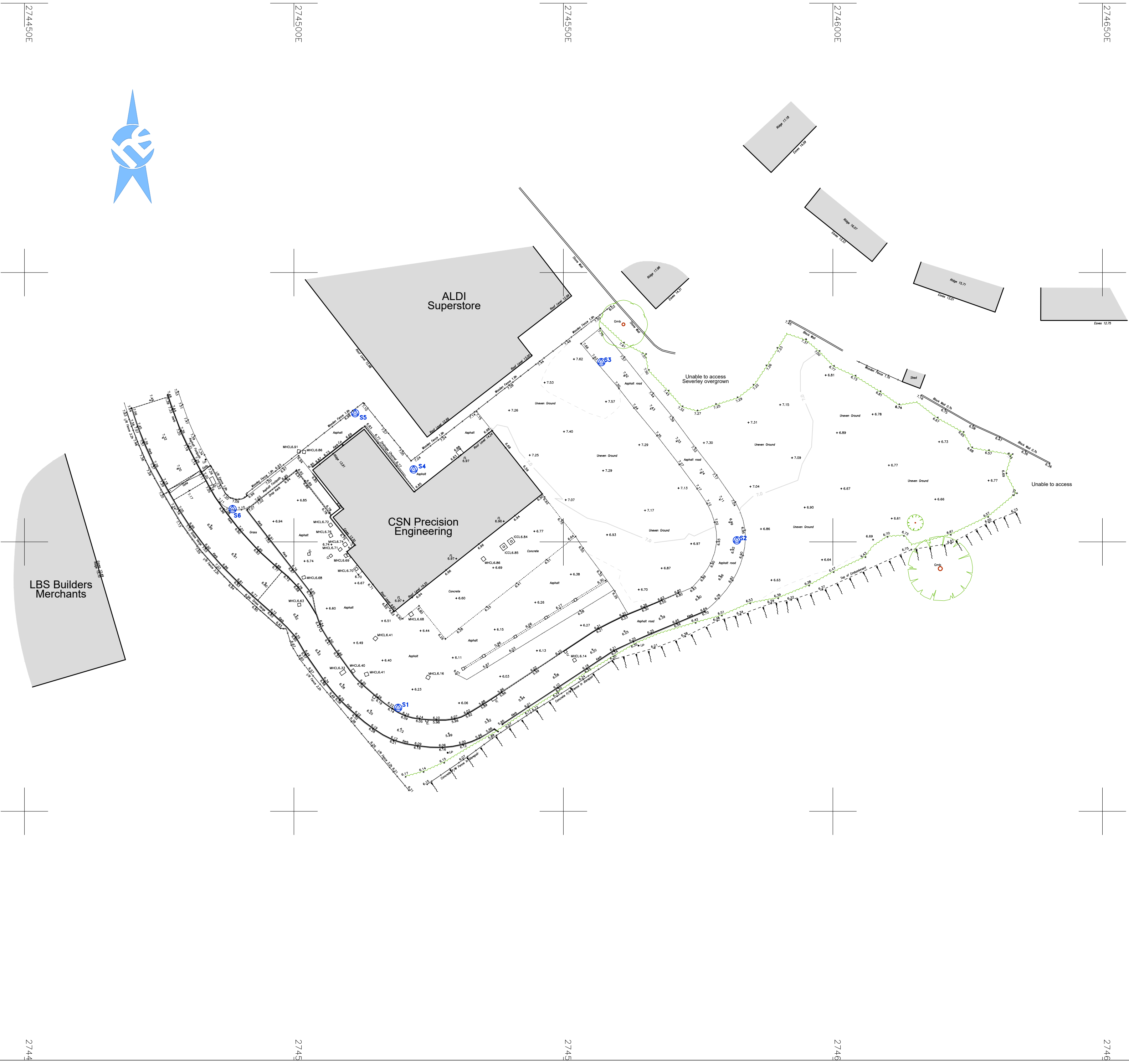
A review of the initial conditions indicates that there is no immediate out-of-bank flooding within the vicinity of the site. However, initial spilling is unexpectedly observed between nodes NCAN0575M6 and NCAN0575D. This issue appears to influence the 2D time-to-peak potentially linked to incorrect initial water levels, poor overtopping schematization, or initial instability. Nevertheless, this occurs downstream of the site and very early in the simulation and is therefore not expected to impact the results at the site of interest.

In the original Neath model, several bridges close to the site were not included in the model. This was due to water levels being below the soffit levels of these structures in all modelled events. As shown in Table 4-1, the peak water levels in the updated model do not reach the soffit of these bridges during either the 0.1% AEP plus climate change (30%) fluvial flood event nor the 0.1% AEP plus climate change tidal flood event for the 2075 epoch. However, peak water levels reach the soffit at node TCAN_1372 during the 0.1% AEP plus climate change tidal flood event for the 2125 epoch. Given that the proposed development has a 50-year lifetime of development, this is not considered an issue for this study but wanted to highlight that this analysis has been completed.

Table 4-1: Peak water levels at 1D nodes for structures not represented in the model.

1D node	Soffit level (mAOD)	Peak water level (mAOD)		
		Tidal 0.1% AEP plus climate change event (2075)	Tidal 0.1% AEP plus climate change event (2125)	Fluvial 0.1% AEP plus climate change event
TCAN_1495	8.86	7.28m	7.81m	6.85m
TCAN_1372	7.81	7.27m	7.81m	6.95m
NCAN_0871	8.88	7.28m	7.8m	6.77m
NEAT_0324	9.40	7.32m	7.84m	8.74m
NEAT_0286	11.39	7.32m	7.84m	8.66m
TCAN_2157	11.91	7.32m	7.84m	8.74m
TCAN_2203	10.81	7.32m	7.84m	8.67m

A Topographic Survey



- Notes:
- SURVEYED FEATURES ARE ANNOTATED APPROPRIATELY.
 - TREE SPECIES IS ONLY ANNOTATED WHERE KNOWN.
 - SERVICE COVERS ARE SURVEYED WHERE ACCESSIBLE
 - DRAINAGE PIPE SIZES HAVE BEEN VISUALLY INSPECTED/ASSESSED FROM GROUND LEVEL ONLY AND SHOULD BE TREATED AS APPROXIMATE
 - HEALER SURVEYS CANNOT ACCEPT LIABILITY FOR MISSING COVERS DUE TO THEM BEING BURIED OR OBSCURED BY PARKED VEHICLES AT THE TIME OF THE SITE VISIT.

Station Table:

Stotion	Easting	Northing	Level
S1	274519.335	197469.200	6.216
S2	274582.175	197500.290	6.961
S3	274557.022	197533.373	7.623
S4	274522.203	197513.444	6.885
S5	274511.353	197523.872	6.925
S6	274488.610	197506.091	7.108

Grid Origin and Level Datum:
Ordnance Survey GPS OSGB36(15) Grid and Levels used.
GPS Grid to Ground Scale Factor used 1.000
For TPS measures use Ground to Grid Mean
Scale Factor 0.99980035

Revisions:

A:	
B:	
C:	
D:	
E:	
F:	
G:	
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Client:

RWP Properties

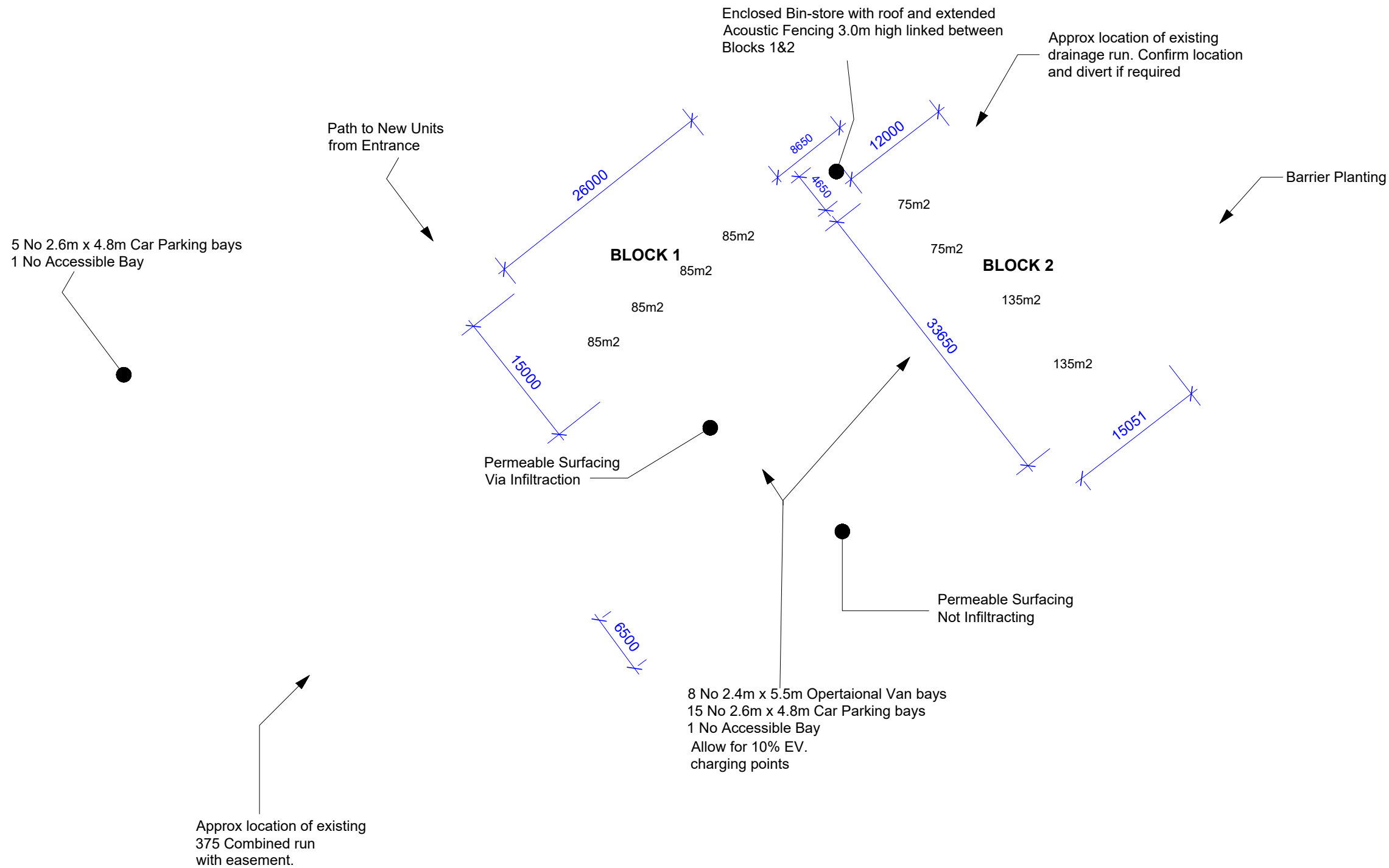
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Project:	CSN Engineering, Neath	
Drawing:	Topographic Survey	
Date:	June 2025	
Surveyed:	JAE	
Drawn:	JAE	
Checked:	RE	
Scale:	Sheet Size:	Sheet No:
1:500	A2	1 of 1
Job No:	P4034	
Rev.		

B Post-development proposals





Planning

Where dimensions are not given, drawings should not be scaled, and in the event of any dimensional conflict, the matter must be referred to Thorpe Building Consultancy Ltd for clarification. The Contractor must also refer to any separate Thorpe Building Consultancy Ltd specification document to be read in conjunction with this drawing.	
Revisions	
Bitmap3857392971.png www.thorpebc.co.uk	
Client	
RwP Properties	
Project	
CSN Engineering Site, Neath	
Drawing	
PLanning Site Plan	
Job No.	DWG No.
PLANNING	01B
Scale	Date
Drawn	Checked