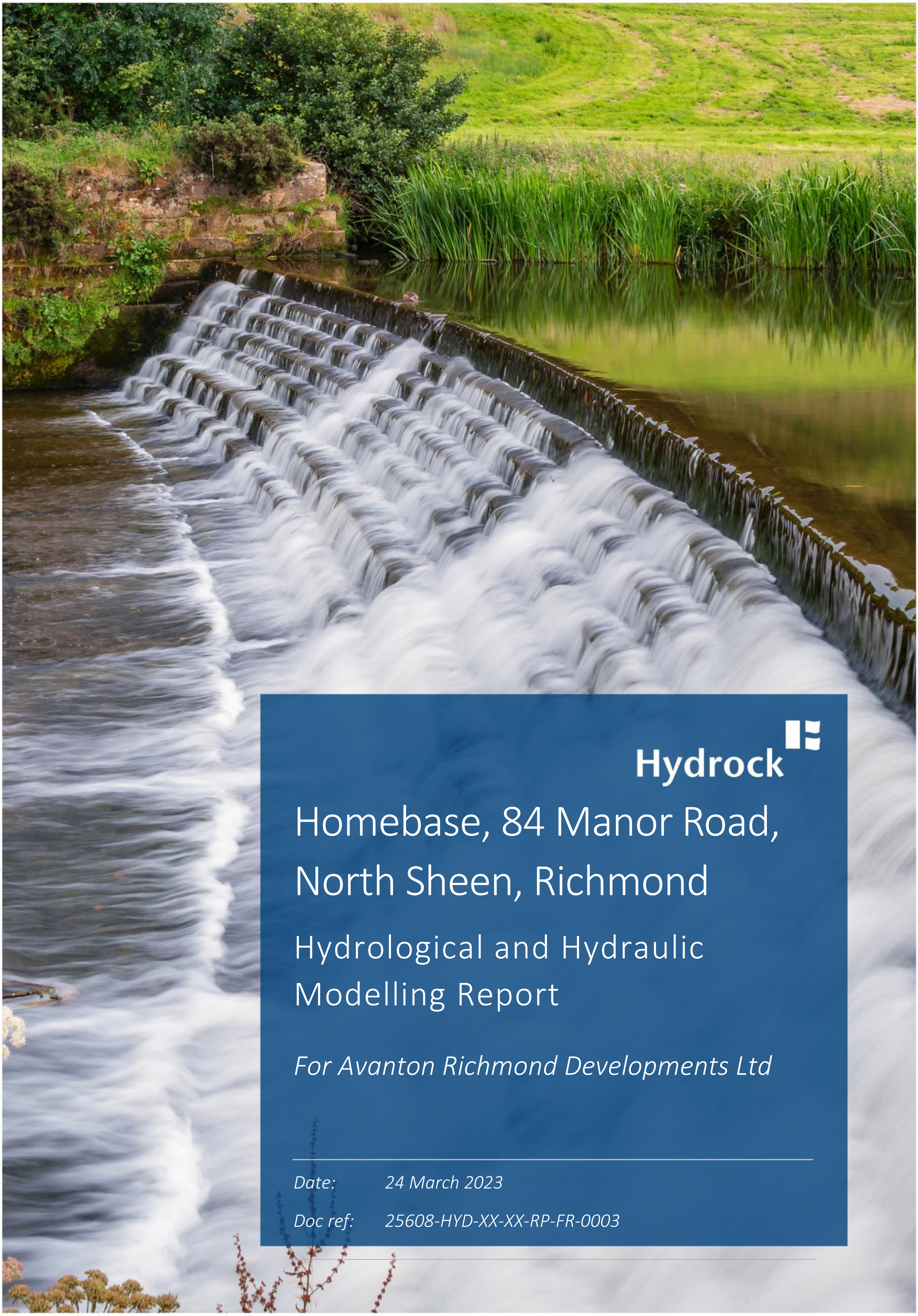

Hydrock

Homebase, 84 Manor Road, North Sheen, Richmond

Hydrological and Hydraulic Modelling Report

For Avanton Richmond Developments Ltd

Date: *24 March 2023*

Doc ref: *25608-HYD-XX-XX-RP-FR-0003*

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1. INTRODUCTION

This report has been prepared by Hydrock on behalf of Avanton Richmond Developments Ltd to assess the current surface water flood risk to Homebase, 84 Manor Road, North Sheen, Richmond.

A Planning Application (the 'Application') for the site was originally submitted to the London Borough of Richmond upon Thames ('LBRuT') on 14.02.2019 (Application Ref. 19/0510/FUL). LBRuT resolved to refuse the Application in July 2019 and the Application was referred to the Mayor of London (the 'Mayor') for his Stage 2 review. The Mayor set out, in his Stage 2 Report, that the Proposed Development is of a nature or scale that it would have a significant impact on the implementation of the London Plan policies on housing and affordable Housing. On 29 July 2019, the Mayor issued a Direction pursuant to Article 7 of the Oder and Powers conferred by Section 2A of the Town and Country Planning Act (1990) that he would act as the Local Planning Authority for the purposes of determining the application.

Since July 2019, amendments were submitted to the Mayor in July 2020. In October 2020, the Mayor granted conditional planning permission subject to the completion of a Section 106 Agreement.

In November 2021, following the adoption of the 2021 London Plan, the scheme was revised for conformity to the new policies as discussions regarding the Section 106 Agreement with the GLA and LBRuT had not been finalised. The current amendments include the amendments considered in November 2021.

This report is to serve as an update to those submitted as part of previous submissions. All elements within this report have been discussed with the GLA.

An initial review of current Environment Agency (EA) mapping, as part of the updated Flood Risk Assessment (FRA) (25608-HYD-XX-XX-RP-FR-0002) has identified the site is in an area of up to 'High' risk from surface water flooding with a potential overland flow path through the site and around the exiting developments.

Given the identified level of risk, Hydrock have undertaken a hydrological and hydraulic modelling study to identify and address existing overland surface water flows through a direct rainfall runoff model and provide recommended mitigation where needed to ensure the proposed development would be safe across its design life.

This modelling report aims to provide details of the hydraulic modelling undertaken and quantitively assess the risk of surface water flooding, identified within the FRA, to the site in both existing and proposed conditions. This report should be read in conjunction with the prepared FRA.

2. SITE INFORMATION

2.1 Location and Setting

Table 1 provides a summary of site referencing information with the site location and approximate red line plan shown in Figure 1.

Table 1. Site Referencing Information

Site Referencing Information	
Nearest Site Address	84 Manor Road, Richmond, London, TW9 1YB
OS Grid Reference	TQ 18914 75421
Easting, Northing	518914,175421

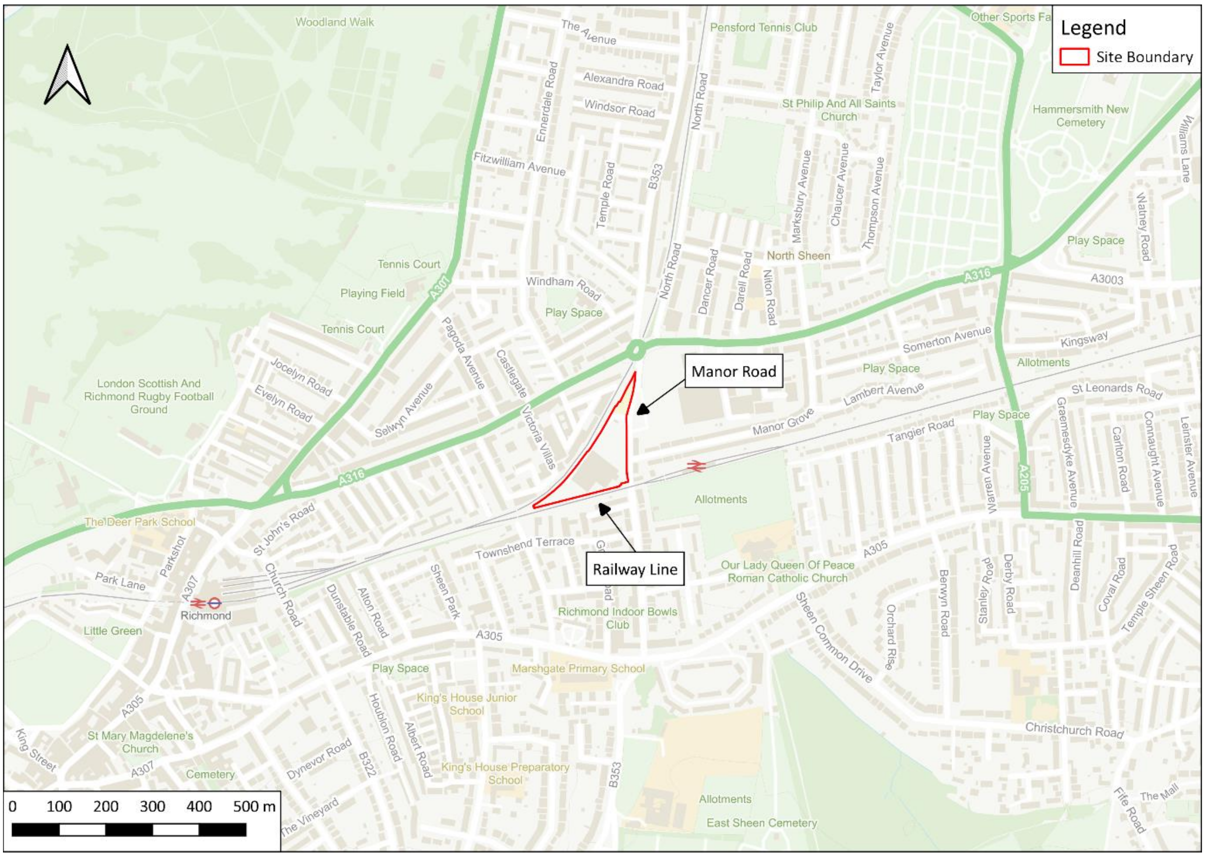

Figure 1. Site Location

The site is located at the former Homebase site in Richmond. It is triangular in shape and bound by the railway line to the south and north west boundaries and by Manor Road to the East. The site is surrounded by a combination of residential and commercial developments.

2.2 Topography

The Topographical Survey indicates the site to be approximately 7mAOD at the east of the site, sloping to approximately 6mAOD at the south west of the site. The south west of the site is contained by a retaining wall with the railway alongside the site at approximately 7.3mAOD.

3. HYDROLOGICAL & HYDRUALIC ASSESSMENT

3.1 Background

The site is indicated to lie within a potential surface water flow path as shown by the Environment Agency (EA) Surface Water Flood Risk Mapping (produced in 2013). The existing mapping indicates a potential flow route entering the site via the south-west corner, overtopping the railway, and proceeding through the site eventually exiting onto the railway again along the north west boundary. Flooding is also predicted to pond around the existing Homebase building with deeper and higher risk areas indicated around the building footprint. Figure 2 shows the drainage catchment for which the site sits within and is approximately 1.99km^2, as calculated by the Flood Estimation Handbook (FEH) Web Service.

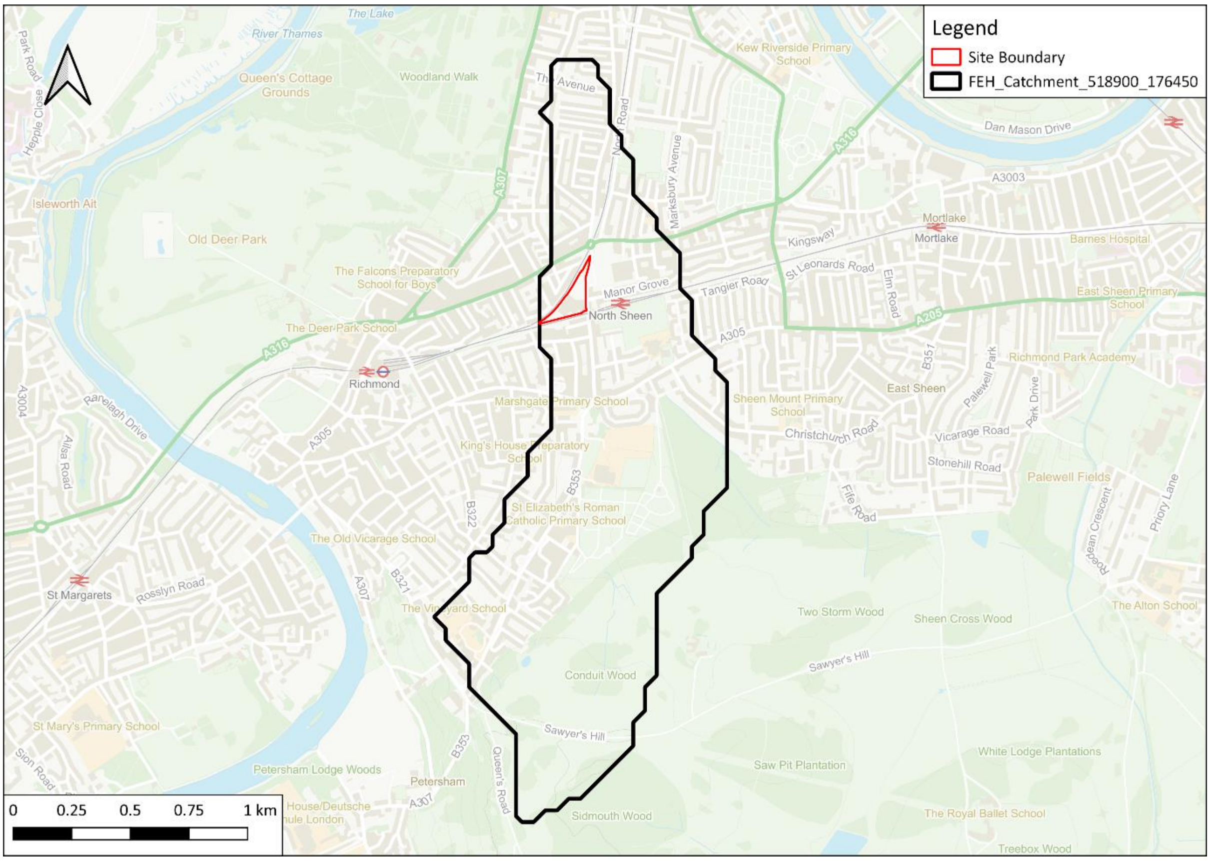

Figure 2. FEH Catchment

A Flood Risk Assessment undertaken by Fairhurst (Ref: 126782-RP-X-0001, Date: 15/07/2020) classified the site to be at low risk of surface water flooding however comments from the Greater London Authority (GLA) have requested further assessment of the surface water risk to the site given its location within a significant flow path in accordance with EA mapping. The EA Mapping indicates the majority of flooding onsite to be between 300-900mm however this data is considered to be coarse whilst also not using accurate site levels (i.e., from a topographical survey).

As such, Hydrock have undertaken a detailed rainfall run-off modelling exercise due to the coarse nature of the EA model data and to quantitatively assess the level of risk to the existing developments and to ensure appropriate mitigation and resilience measures for the proposed development to manage any onsite risk.

3.2 Rainfall Modelling

3.2.1 Rainfall

Rainfall depths are derived from the FEH DDF (Depth Duration Frequency) model with catchment parameters taken from the FEH Web Service from an outlet point at grid reference 518900, 176450.

The following storm events were modelled: 1 in 5-year, -30-year, -30-year + 35% allowance for climate change, -100-year, -100-year + 40% allowances for climate change and -1,000-year rainfall events. Each were run for a duration of 12 hours which is the required storm length for calculating runoff volume as specified in guidance documents[1]. Initially, a 6 hour duration was selected as a baseline storm event however, following sensitivity testing with the 9 hour and 12 hour storm events, the 12 hour storm was identified to cause deeper and larger extents of surface water flooding on site and as such has been used as the critical storm duration.

The events considered critical for the surface water drainage design are the 1 in 30-year and 1 in 100-year plus 40% climate change. The 1 in 30-year is the typical design standard under Sewers for Adoption Eighth Edition where no flooding of the system should occur. The 1 in 100-year plus 40% climate change event is the extreme storm which new developments should be designed to withstand, whereby flooding of the network may occur but it must be safely contained away from buildings or key access / egress routes. The 1 in 5-year event has also been run to represent the expected conditions in a more commonly occurring storm event.

3.2.2 Run-off Calculation

Factors which can affect runoff calculations are as follows:

- Permeability of soils, with runoff less accurately predicted in highly permeable soils. The soils in the wider catchment for the site were assessed to be of an average permeability (SPRHOST of 30.21%).
- Small drainage catchments can result in small rainfall depths. Runoff calculated by models with an initial storage component (such as the PDM model used in ReFH) may therefore be very sensitive to storage parameters and initial conditions. Total runoff estimates may therefore be uncertain.
- Urbanisation resulting in different surface characteristics and runoff coefficients to the natural catchment.

Given the complex nature of the issues outlined above, the following method has been used to address the limitations identified above and provide a robust runoff parameterisation for modelling:

- Runoff calculated from ‘rural’ areas calculated by taking the SPRHOST value from the FEH Catchment Descriptors as a representative percentage run-off value for the site of interest.
- Runoff calculated from ‘urban’ areas using a hybrid approach which takes the weighted average of the rural runoff (as described above) and a 90% run-off from impermeable areas. The weighting factor is the Percentage Impermeable (PIMP) value as used in the Wallingford procedure. The majority of the study area however was considered to be ‘rural’ with no significant urban developments within the study area.
- It has been assumed for the purpose of the direct rainfall modelling that no water enters the sewer system. This is considered to be a conservative approach as this system will help to alleviate

[1] Defra / Environment Agency (2013) Rainfall runoff management for developments, pg. 7.

ponding in low-lying areas. This approach is not considered to impact the predicted flow routes as all flows will be routed via the topography and ultimately into the watercourse.

The results of applying these methods are summarised in Table 2.

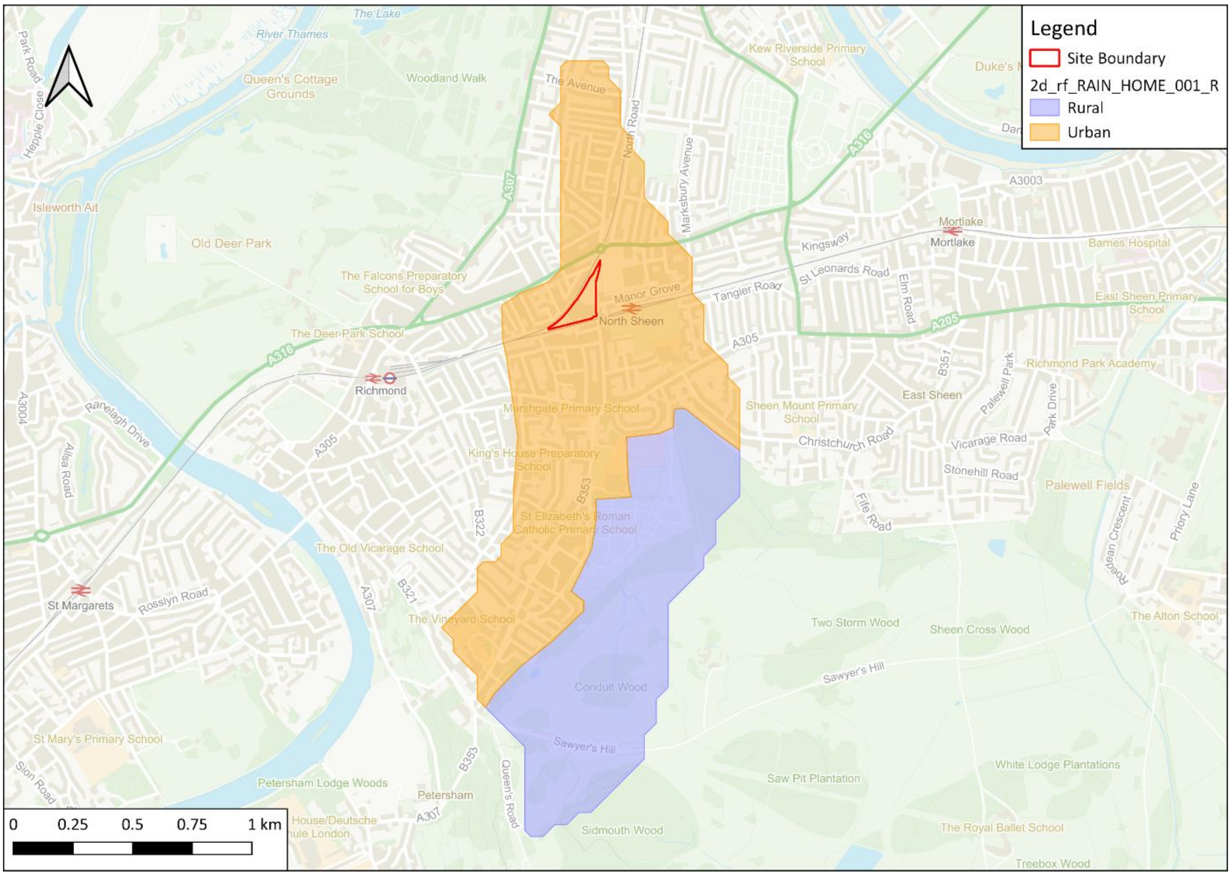

Figure 3. Urban / Rural Catchment De-lineation

Method	Percentage Run-off Values
SPRHOST	0.302
PIMP Weighted Rural/Urban	0.529

Table 2. Runoff Parameterisation, Rural and Urban

3.3 Baseline Hydraulic Assessment

3.3.1 Model Type

Based on the identified need to consider overland flow routes, a linked 2D model has been developed using TUFLOW HPC v2020-10-AB and uses TUFLOW's Sub-Grid Sampling.

3.3.2 Model Grid

The majority of the 2D model is based on LiDAR data flown in 2020 which is at 1m resolution. This was converted within TUFLOW to a 2m grid. This is the latest available information and comparison of this with the OS / satellite mapping suggests that no significant ground level changes have taken place within the area affecting the site since this data was obtained.

Within the site boundary a site-specific topographical survey has been undertaken (LS2024/T/01RevA) in 2018 and the ground levels are not expected to have changed since. As such, to convey accurate levels across the site, the survey was converted to an ASC grid to be used within the model as well as the LiDAR.

Buildings were also included within the ground model as these are an important factor in determining surface water pathways. The building footprints were determined from OS Open Map Local vector files and were raised above immediately surrounding ground levels by 300mm to represent typical flood levels but also to deflect flows.

Road networks have been lowered by 125mm in accordance with the national guidance for surface water modelling and to provide a direct comparison with the national surface water flood risk maps on the EA's Long Term Flood Risk Service. The road networks have been taken from OS Local Vector mapping and applied using a 2D Z Shape (2d_zsh_HOME_roads_R.shp) with the 'ADD' shape option (a -0.125mm Z attribute has been applied).

3.3.3 2D Shapefiles

Figure 4 shows the model schematic and GIS layers which constitute the 2D model. The watershed area (i.e., the model domain ‘2d_code_HOME_001_R’) was determined from the FEH catchment boundary which was checked against LiDAR contours. On review of LiDAR, and also when viewing EA Surface Water Mapping, that an area to the west of the site that was not included within the FEH boundary was indicated to drain east into the existing FEH catchment boundary. As such, the extent of the domain was increased marginally to include this area to allow any resulting off-site flows to follow the existing topography. The extent of the domain was greater than the area of interest for this assessment to ensure that all areas draining to the site would be accounted for. The file ‘2d_rf_R_HOME_001’ follows the domain boundary and references the percentage runoff values for the rural areas as shown in Table 2, the majority of the site area is heavily urbanised with a clear and obvious rural area located in the southern portions of the site.

No further hydraulic structures have been included within the area of interest.

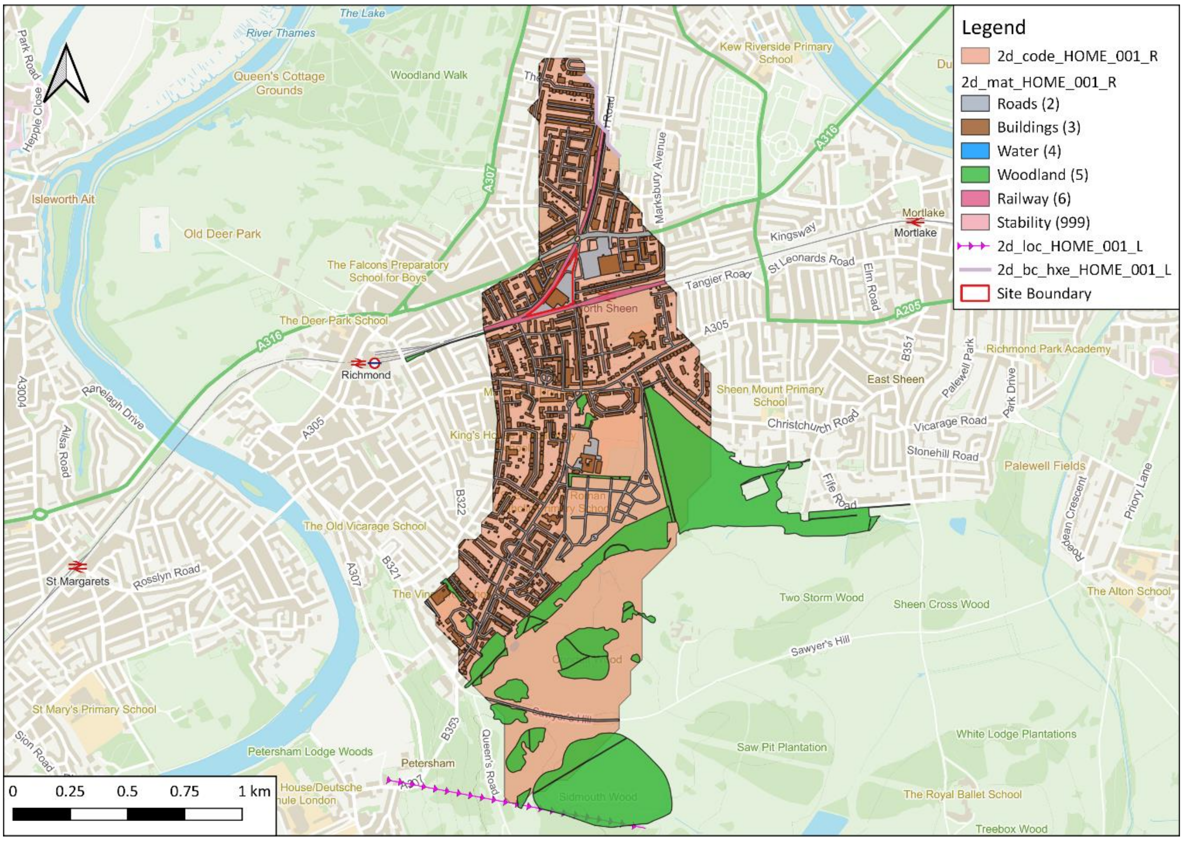

Figure 4. 2D Model Schematic

3.3.4 Boundary Conditions

The model domain was extended some distance downstream of the site (approximately 600m) to limit the potential for any backwater effects from the downstream boundary impacting on the modelled flooding regime in the vicinity of the site. '2d_bc_hxe_HOME_001_L' represents the downstream boundary which was an assumed 'normal depth' with a gradient of 1:1000, to allow water to drain freely at this location.

3.3.5 Roughness Coefficients

The 2D roughness values are represented within the 'Materials.csv' file referenced in the 2D read file (.TRD) which links to the model shapefile '2d_mat_HOME_001_R'. This is based on manning's 'n' roughness values specified by Chow (1959) which is the industry standard approach. Within the 2D code, observed land uses included woodlands, railway, roads, tarmac and buildings and ponds / other water. All other space was assumed as 'pasture' with a Manning's 'n' value of 0.06, which follows the standard modelling approach, (see Table 3).

The materials file is largely based on OS Open Map Local vector files which provides a good basis for existing land uses.

The roads /railway have been modelled as a single centre line with a buffer applied to them to represent their width. A buffer distance of 4m was applied to minor roads and 6m for dual carriageways and railways, which was checked against aerial photography and found to be suitable.

Table 3. Manning's 'n' Roughness Values

Feature	Manning's 'n'
Roads	0.022
Pasture	0.060
Buildings	0.300
Woodland	0.070
Railway	0.040
Ponds and other water	0.030
Stability	1.000

3.3.6 Model Run Parameters

The model was run at a 2m grid resolution with a 1 second timestep which was considered to provide an appropriate balance between model run times and resolution of results. A 24-hour run time was specified for the 12-hour rainfall events which was sufficient time to observe the runoff affecting the site.

3.3.7 Results

Depth and velocity surface water flood maps for the key return periods are included in Appendix A. This includes the following:

- 1 in 5-year, 12-hour Depths - drawing 25608-HYD-XX-XX-DR-FR-0001 P02.
- 1 in 30-year, 12-hour Depths - drawing 25608-HYD-XX-XX-DR-FR-0002 P02.
- 1 in 100-year plus Climate Change, 12-hour Depths - drawing 25608-HYD-XX-XX-DR-FR-0003 P02.
- 1 in 1000-year, 12-hour Depths - drawing 25608-HYD-XX-XX-DR-FR-0004 P02.
- Hydrock Model and EA RoFSW Comparison, 1 in 1,000-year - drawing 25608-HYD-XX-XX-DR-FR-0007 P01.

All model depth grids have been filtered, in accordance with national guidance, removing all areas with a hazard value <0.575 in the ZuK0 mapping and removing all areas of flooding with an area less than $10m^2$.

The results of the mapping show that in the baseline scenario, flooding from surface water is expected to impact the site and confirm, in all scenarios except the 5-year and 30-year event, the site lies within a key surface water flow route and matches that of the existing EA Mapping. A comparison between the 1 in 1000-year modelled results and the EA's Risk of Flooding from Surface Water (RoFSW) is shown in drawing 25608-HYD-XX-XX-DR-FR-0007 (Appendix A). The comparison confirms the extents of the hydraulic modelling to be similar to the EA mapping however, the EA Mapping suggests around the existing Homebase building there is more predicted deeper flooding. The extents of the EA RoFSW indicate larger areas of flooding between 0.3-0.6m and 0.6-0.9m along the southern and eastern boundaries of the existing developments. It is likely that these differences in extents and depths are due to the baseline modelling scenarios inclusion of more detailed topographical survey rather than EA LiDAR, used in the RoFSW mapping. To the west and south of the developments and along the railway line to the north west of the site, flood depths from the hydraulic modelling show a similar result to the EA RoFSW and therefore indicate the chosen critical storm duration of 12 hours to be correct.

In line with the EA Mapping, flooding is shown to enter the site via the south west corner and via the southern boundary of the site from the railway line in all events modelled except the smallest 1 in 5-year event. The flow path from the south-west of the site is indicated to be the primary flow route into the site and is shown to be more prevalent in the largest events (1 in 100yr + 40%cc and -1000yr). In all events, whilst there is a flow route indicated through the site, there is also flooding predicted to pond around the existing building with maximum depths up to 0.45m in the critical design event. The results confirm that in all events, excluding the 1 in 5yr and 1 in 30yr, the surface water flow path is indicated to continue off site following local topography to the north and exit the site via the north western boundary and onto the existing railway. Flows are predicted to continue along the railway with maximum depths indicated to be approximately 0.15-1.03m.

The results of the modelling also confirm the risk of surface water ponding along Manor Road, however as expected, this is as a result of a locally lower lying area on Manor Road causing water to pond with maximum depths of 0.23m in the critical design event.

Whilst majority of the flooding onsite is indicated to be slow flowing (i.e., <=0.2m/s) along the northern boundary the existing flow route is predicted to be slightly faster flowing with velocities ranging between 0.2-0.6m/s.

3.3.7.1 Model Stability

On review of the model log file, a number of Warning 2550 were output during the simulation with two HPC NCN Repeated Timesteps occurring during the simulation. Through further inspection, these timesteps occurred within the first hour of the model simulation and no further repeated timesteps occurred during the simulation or across the peak of the hydrographs. No negative depths occurred throughout the simulation and the results seem sensible with no extreme spikes in levels across the area of interest.

As the model was run using HPC, a review of the dt, Nu, Nc and Nd (Figure 5 - Figure 8) plots has also been undertaken. The dt value for the simulation, whilst it falls to approximately 0.15 sec, remains above the recommended 1/10 of the timestep which would be considered to be a low value and shows not erratic spikes throughout the model simulation. The Nu and Nd plots remain well below the acceptable maximum values of 1 and 0.3 respectively which would otherwise indicate unusually high velocities or poor boundary setup. The Nc plot reaches a value of 1 which suggests an erroneously low cell elevation resulting in an artificially large water depth. On review of the model results, "low-spots" in the model DTM were found approximately 550-800m south of the site causing deep flooding of approximately 2m. These deeper spots of flooding are shown to be localised areas with no connectivity to the wider area and are a significant distance up catchment of the site that they are not deemed to impact flooding on or cause erroneous results on site. No "low-spots" or significantly deeper areas of flooding were found on site or in the immediate proximity of the site.

A review of the model 2D Mass Balance output indicates the models mass balance to lie well within the ±1% and therefore the model is concluded to be stable.

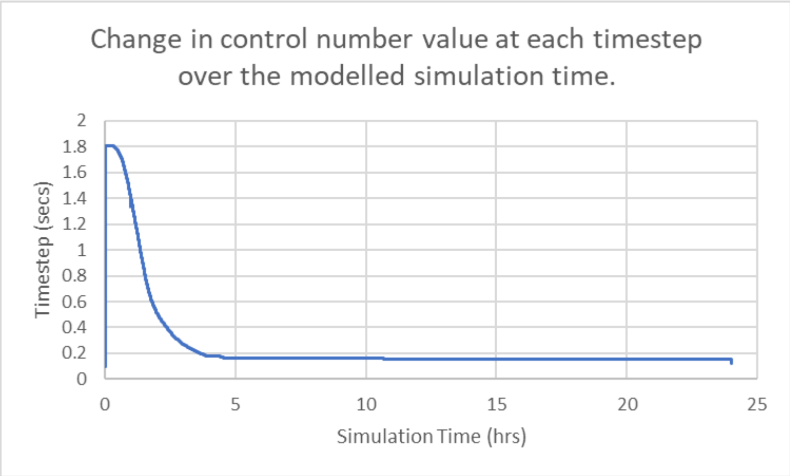

Figure 5. dt Plot for the 1 in 100-year plus 40% CC design event - Baseline

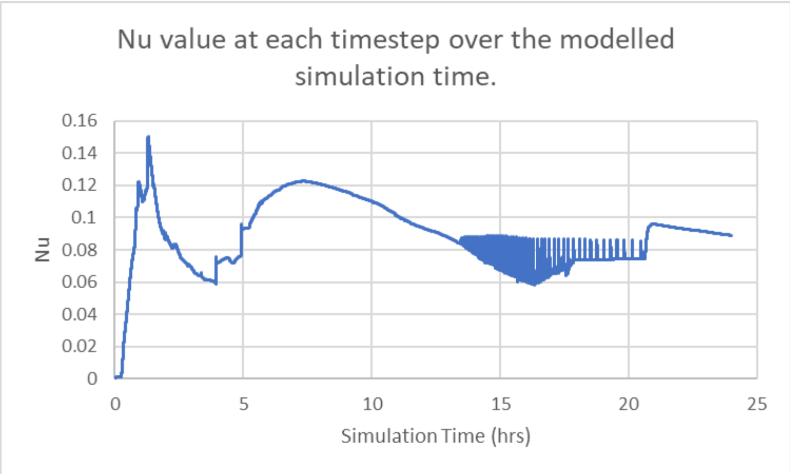

Figure 6. Nu Plot for the 1 in 100-year plus 40% CC design event - Baseline

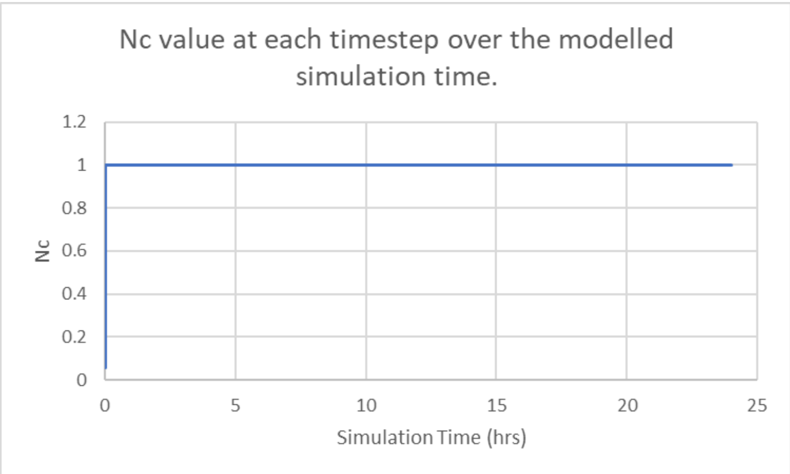

Figure 7. Nc Plot for the 1 in 100-year plus 40% CC design event - Baseline

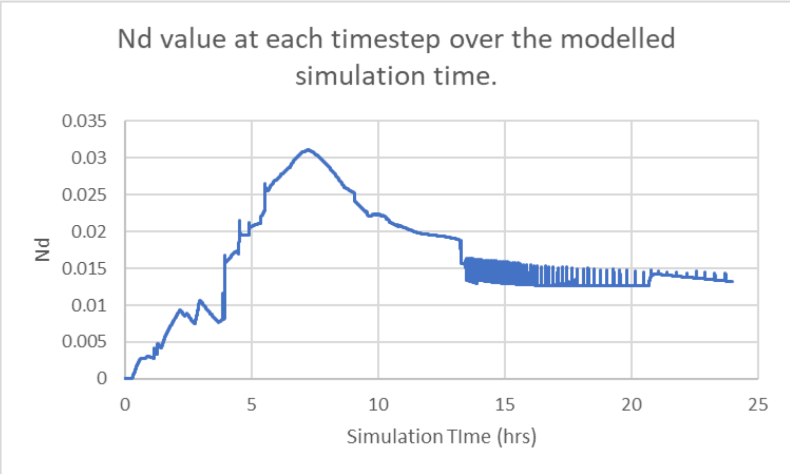

Figure 8. Nd Plot for the 1 in 100-year plus 40% CC design event - Baseline

3.4 Post-Development Modelling

3.4.1 Model Build

Given the identified risk of surface water flooding currently indicated on the site with EA Mapping and confirmed through the hydraulic modelling, there is a need to confirm the proposed development to be appropriate and the surface water risk within the site to be adequately managed.

Every aspect within the model, except those discussed below, has been maintained between the baseline and post-development scenarios to ensure a direct comparison between results.

Initial levels for the post-development scenario have been taken from a now superseded technical layout (Appendix B) provided by Manhire Associates (ref: MNR-MA-XX-00-DR-C-1060 P6, dated: May 2022) with the cover levels from this drawing used to create a basic surface for the flood model and read into the modelling through use of region and point GIS Z Shapes.

In order to manage the existing flow path through the site, levels have been lowered throughout the development to create a preferential flow route for any overland flows which may occur and direct them back towards the railway in the north of the site as is what occurs the existing scenario. Where possible, levels have been lowered to allow for more onsite storage, particularly in the main courtyard area in the centre of the proposed development and in the south west corner of the site, and limit any increase in flood depths offsite whilst also ensuring a gradient so that flows are not predicted to be "pond" onsite to a significantly worse extent than is indicated in the baseline scenario.

Proposed building finished floor levels (FFLs) have been included as a separate 2D Z Shape to enforce the levels within the model. Levels have been set as below:

- Block A (Northern Portion) - 6.45mAOD.
- Block A (Southern Portion) - 6.6mAOD
- Block B - 6.45mAOD
- Block C - 6.45mAOD
- Block D - 6.75mAOD

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Due to limitations as a result of tight boundaries, building FFLs and ensuring level access, various gradients and ground lowering has been kept to a minimum to ensure a feasible design with regards to landscaping among other disciplines (fire etc).

It should be noted that the hydraulic modelling undertaken by Hydrock does not account for any existing drainage features that may be serving the area, in line with standard modelling practice, and is an overestimation to current levels of risk on site.

3.4.2 Results

Depth and velocity surface water flood maps for the key return periods are included in Appendix A. This includes the following:

- 1 in 100-year plus Climate Change, 6-hour Depths - drawing 25608-HYD-XX-XX-DR-FR-0005.

The results of the post development modelling confirm that with the proposed levels, the key flow route entering the site from the south west corner is maintained in the post-development scenario ensuring no flows are held back in the developments to the south.

As flows enter the site via the south western and southern boundaries, flows are indicated to follow the preferential flow routes through the lowering of local topography towards the central courtyard or along the north western boundary. The deepest areas of flooding are predicted in the south western corner with maximum depths indicated to be approximately 0.50m in the 1 in 100-year plus climate change design event. Throughout the site, deeper areas of flooding 0.17-0.40m are predicted in the central courtyard and to the north of Block B however, these deeper areas are no worse than the existing "deeper" areas shown in the baseline modelling.

The maintained flow route continues through the site as it does in the existing scenario and proceeds to discharge to the railway in the north western boundary of the site. The modelling indicates a slight increase (17mm or 1.7cm) on the land to the north however given the extremely conservative nature of the modelling (i.e., no onsite drainage features or infiltration) and the current experienced depths on this area of flooding (i.e., over 1m) this increase is considered to be negligible and fall within model tolerances. It is concluded that this increase is considered negligible and would ultimately be mitigated through the surface water drainage strategy.

As mentioned, building FFLs have been included within modelling to ensure a coherent design with multiple disciplines. The results of the modelling confirm all buildings remain out of the maximum flooded extents and therefore free from any predicted internal flooding.

3.4.2.1 Model Stability

Similarly, to the baseline model a review of model results and log file indicated a number of Warning 2550 were output during the simulation with two HPC NCN Repeated Timesteps occurring the simulation. Again, these repeated timesteps occurred within the first hour of the model with no further occurrences throughout the simulation. The model results seem sensible and no negative depths were indicated.

As with the baseline assessment, a review of the dt, Nu, Nc and Nd plots (Figure 9 - Figure 12) have been undertaken to assess model stability in the post-development scenario. The plots show a similar result / negligible difference from the baseline assessment with dt, Nu and Nc all within / below acceptable model tolerances. The post-development scenario also indicates a high Nc value of 1 which are attributed to the "low spots" located approximately 550-800m south of the site and are not predicted to impact onsite flood levels.

A review of the model 2D Mass Balance output indicates the models mass balance to lie well within the ±1% and therefore the model is concluded to be stable.

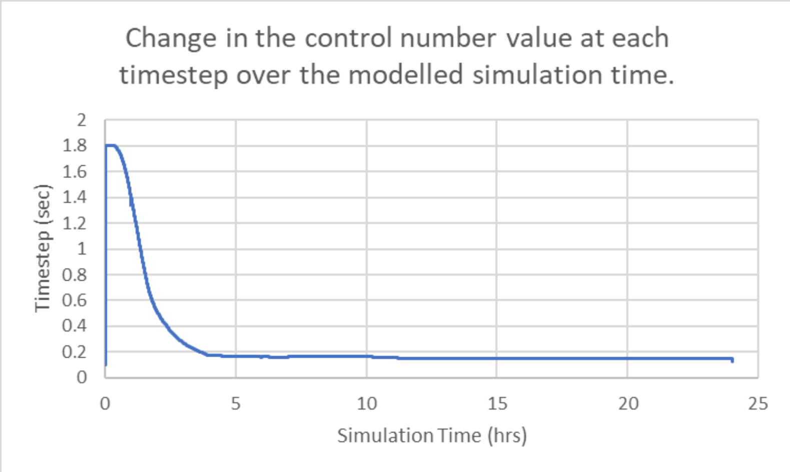


Figure 9. dt Plot for the 1 in 100-year plus 40% CC design event - Post Development

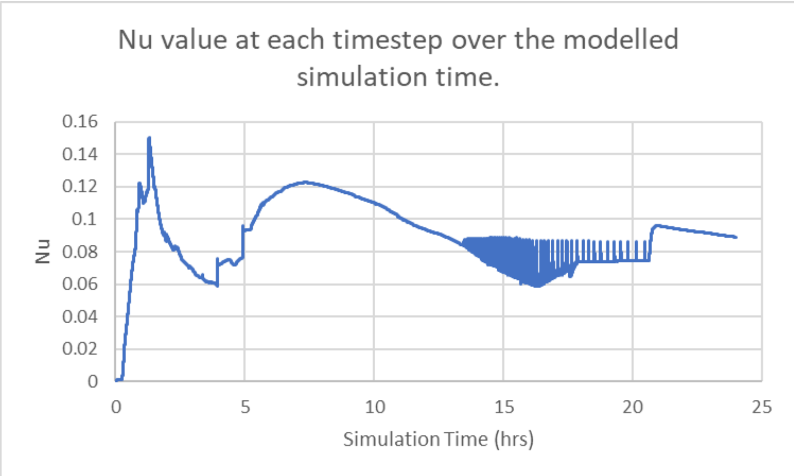


Figure 10. Nu Plot for the 1 in 100-year plus 40% CC design event - Post Development

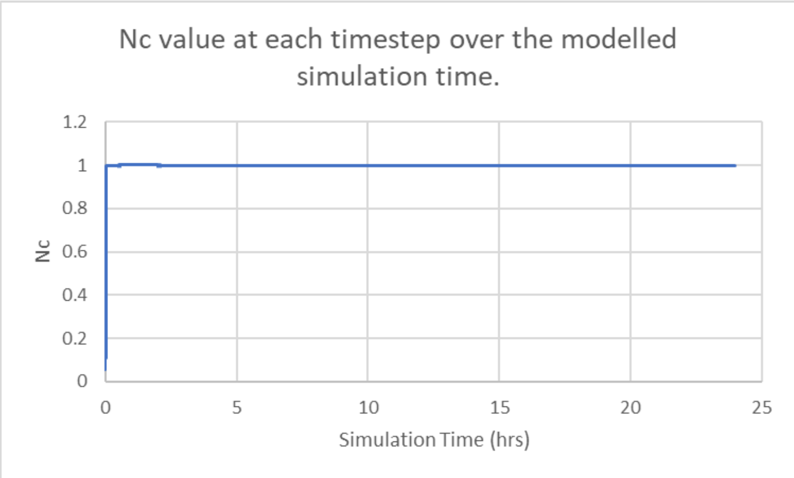


Figure 11. Nc Plot for the 1 in 100-year plus 40% CC design event - Post Development

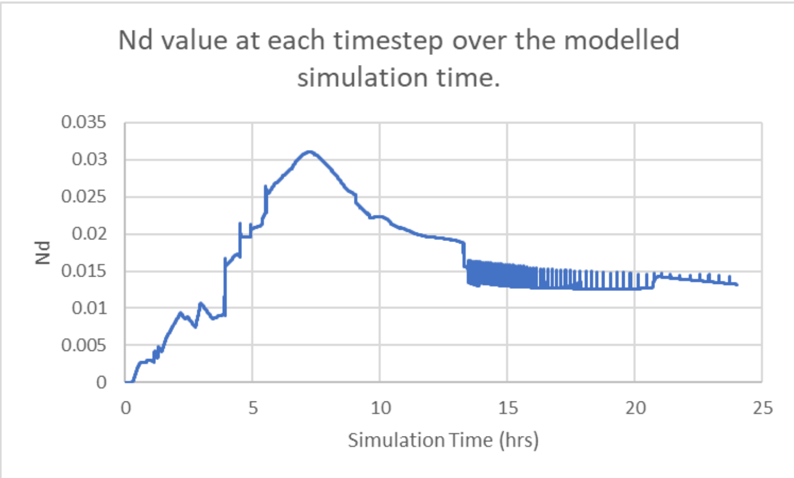


Figure 12. Nd Plot for the 1 in 100-year plus 40% CC design event - Post Development

4. SUMMARY

A 2D Rainfall-Runoff model has been undertaken by Hydrock on behalf of Avanton Richmond Developments Ltd due to the predicted risk of surface water flooding the existing Homebase Site, Manor Road, Richmond as indicated by the current EA Surface Water Flood Risk Mapping.

The direct runoff model confirmed the site to lie directly in the path of a surface water flow route in the existing scenario with predicted flooding shown to enter the site via the south west and southern boundaries and proceed to flow around existing developments and discharging offsite to the adjacent railway. The modelling indicated some flooding is also stored on the site around the existing developments with maximum depths up to 0.45m in places.

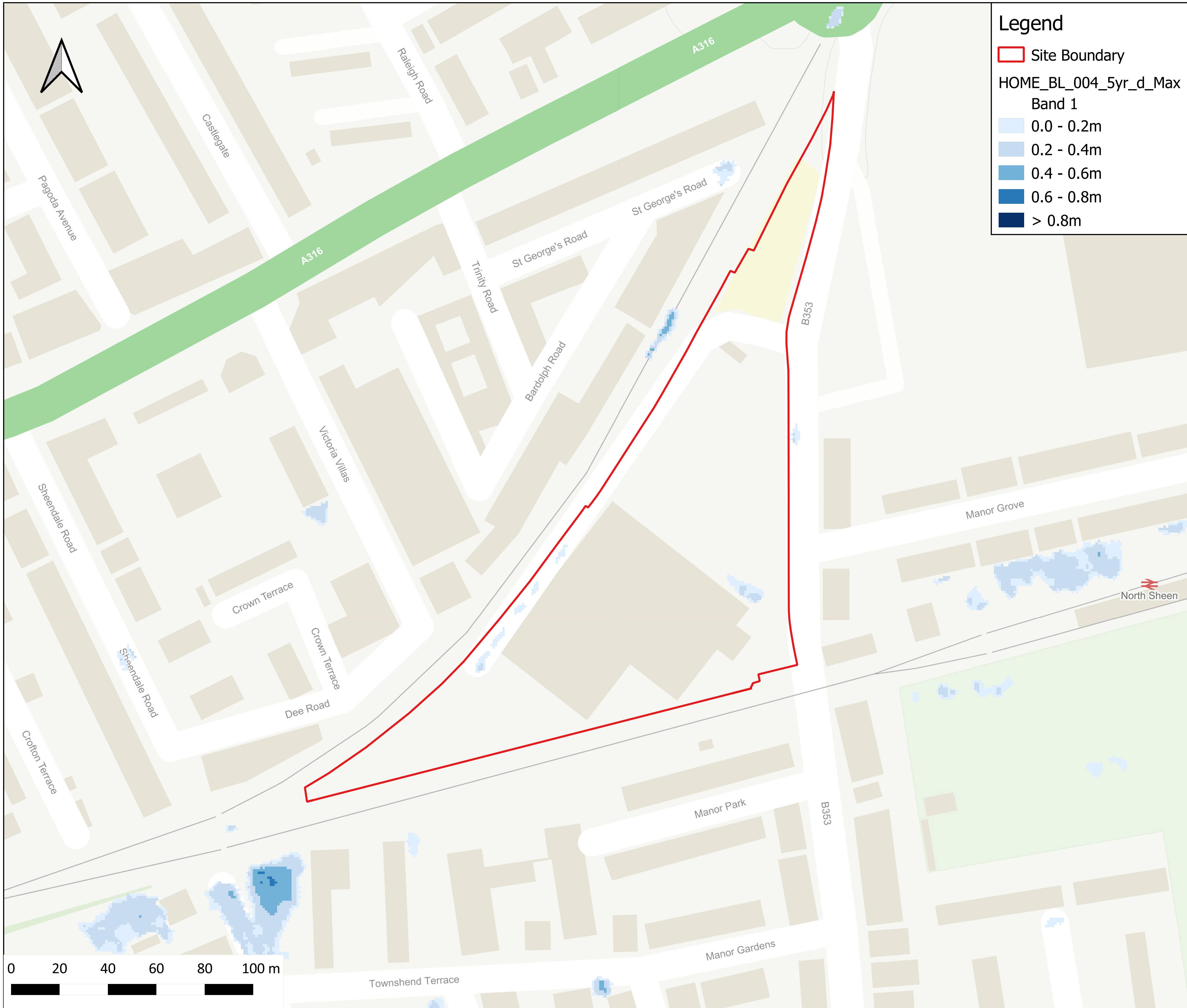
A post-development scenario was also undertaken by Hydrock to confirm the potential risk to the site following the proposed residential and commercial development on site. Proposed building and landscaping finished levels were included within the modelling to align with various other disciplines. Through lowering of site levels, the existing flow route was maintained on site and where possible flows were "stored" in the public realm areas as is what occurs in the existing scenario. It should be noted however that the modelling described within this report is considered to be a worst-case scenario and assumes no additional drainage.

The results of the modelling, as is predicted within EA Mapping, that the site is at risk of surface water flooding lying directly in the path of a surface water flow route. A post -development scenario has confirmed this surface water risk will be maintained and managed through lowering of ground levels with further mitigation measures provided. The mitigation measures are considered further in the accompanying Drainage Strategy Addendum prepared by Manhire Associates.

Hydrock Consultants Limited

Appendix A

Reference	Title	Type	Originator
25608-HYD-XX-XX-DR-FR-0001	Homebase, Manor Road, Richmond Flood Depths - 1 in 5yr Event, Baseline	Drawing	Hydrock
25608-HYD-XX-XX-DR-FR-0002	Homebase, Manor Road, Richmond Flood Depths - 1 in 30yr Event, Baseline		
25608-HYD-XX-XX-DR-FR-0003	Homebase, Manor Road, Richmond Flood Depths - 1 in 100yr + 40% CC Event, Baseline		
25608-HYD-XX-XX-DR-FR-0004	Homebase, Manor Road, Richmond Flood Depths - 1 in 1000yr Event, Baseline		
25608-HYD-XX-XX-DR-FR-0005	Homebase, Manor Road, Richmond Flood Depths - 1 in 100yr + 40% CC Event, Post Development		
25608-HYD-XX-XX-DR-FR-0007	Hydrock Model and EA RoFSW Comparison, 1 in 1,000-year		



Notes

Manor Road, Richmond Baseline (Existing) Model - 5 year Maximum Depths (m)

REVISIONS

P01 - First Issue

P02 - Second Issue - Updated Output Following Model Review

P01	FIRST ISSUE			
	DRAWN BY LW	CHECKED BY SM	APPROVED BY SM	DATE 11/11/22
P02	REVISION NOTES/COMMENTS			
	DRAWN BY JT	CHECKED BY LW	APPROVED BY SM	DATE 24/03/23

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Avanton Richmond Developments Ltd

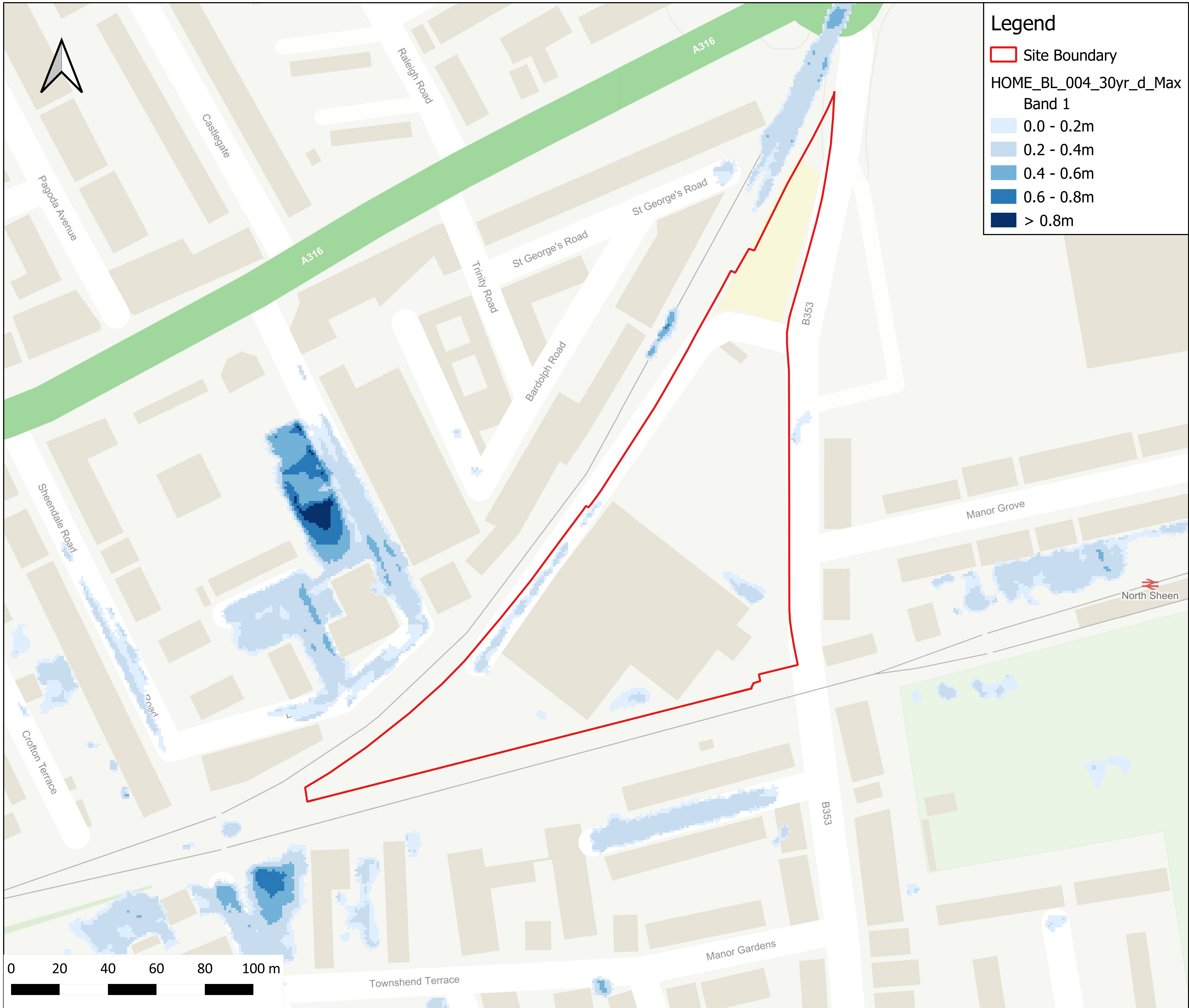
PROJECT
Homebase, 84 Manor Road, North Sheen, Richmond

TITLE
Baseline Scenario, 1 in 5 year Maximum Flood Depths

HYDROCK PROJECT NO.	SCALE @ A3
25608-IOCB	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISION
25608_HYD-XX-XX-DR-FR-0001	P02



Notes

Manor Road, Richmond Baseline (Existing) Model - 30 year Maximum Depths (m)

REVISIONS

P01 - First Issue

P02 - Second Issue - Updated Output Following Model Review

P01	FIRST ISSUE			
	DRAWN BY LW	CHECKED BY SM	APPROVED BY SM	DATE 11/11/22
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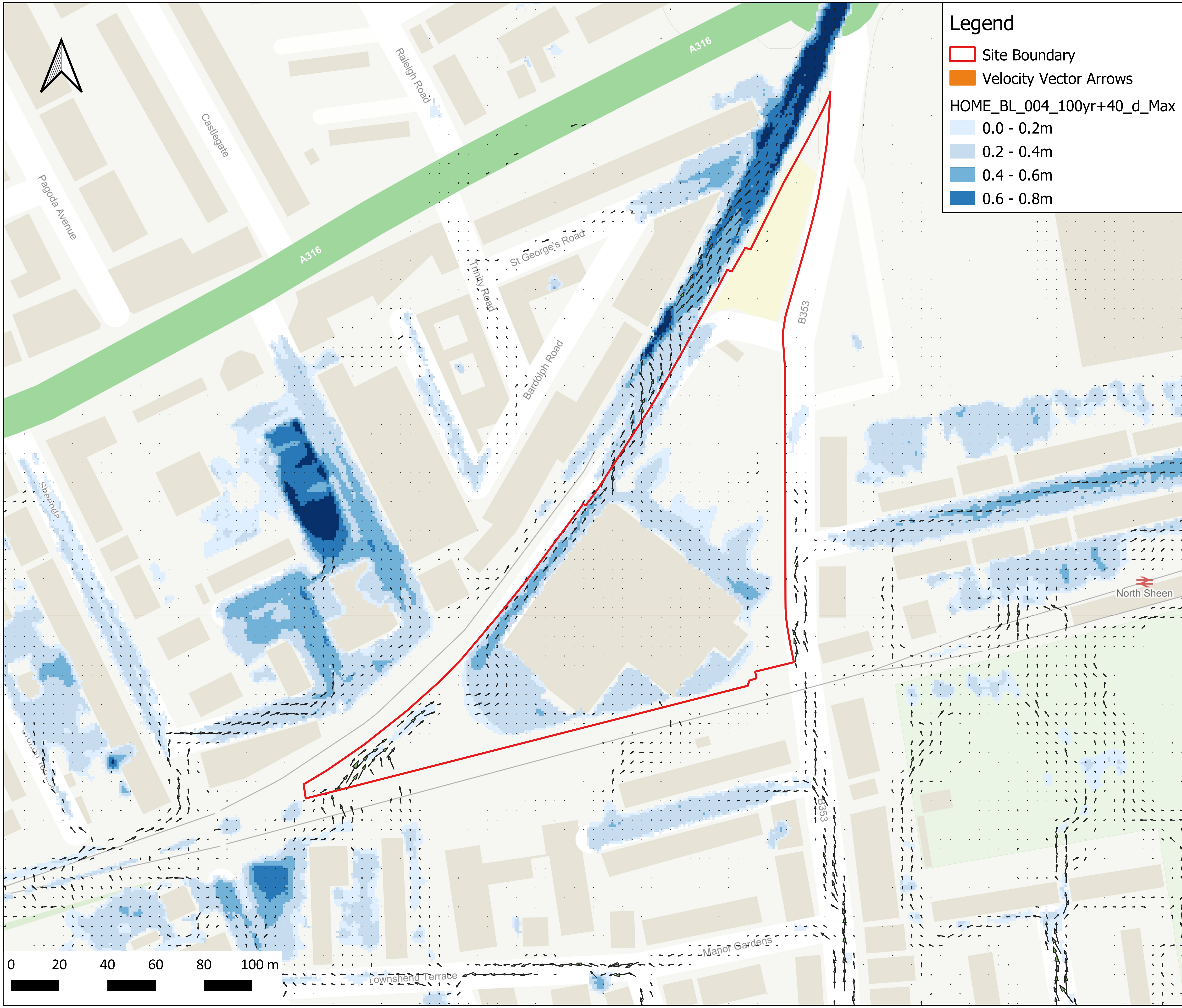
HYDROCK PROJECT NO.	SCALE @ A3
25608-IOCB	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISION
25608-HYD-XX-XX-DR-FR-0002	P02



Notes

Manor Road, Richmond Baseline (Existing) Model - 100 year plus 40% Climate Change Maximum Depths (m) with Velocity Vector Arrows

REVISIONS

P01 - First Issue

P02 - Second Issue - Updated Output Following Model Review

P01	FIRST ISSUE			
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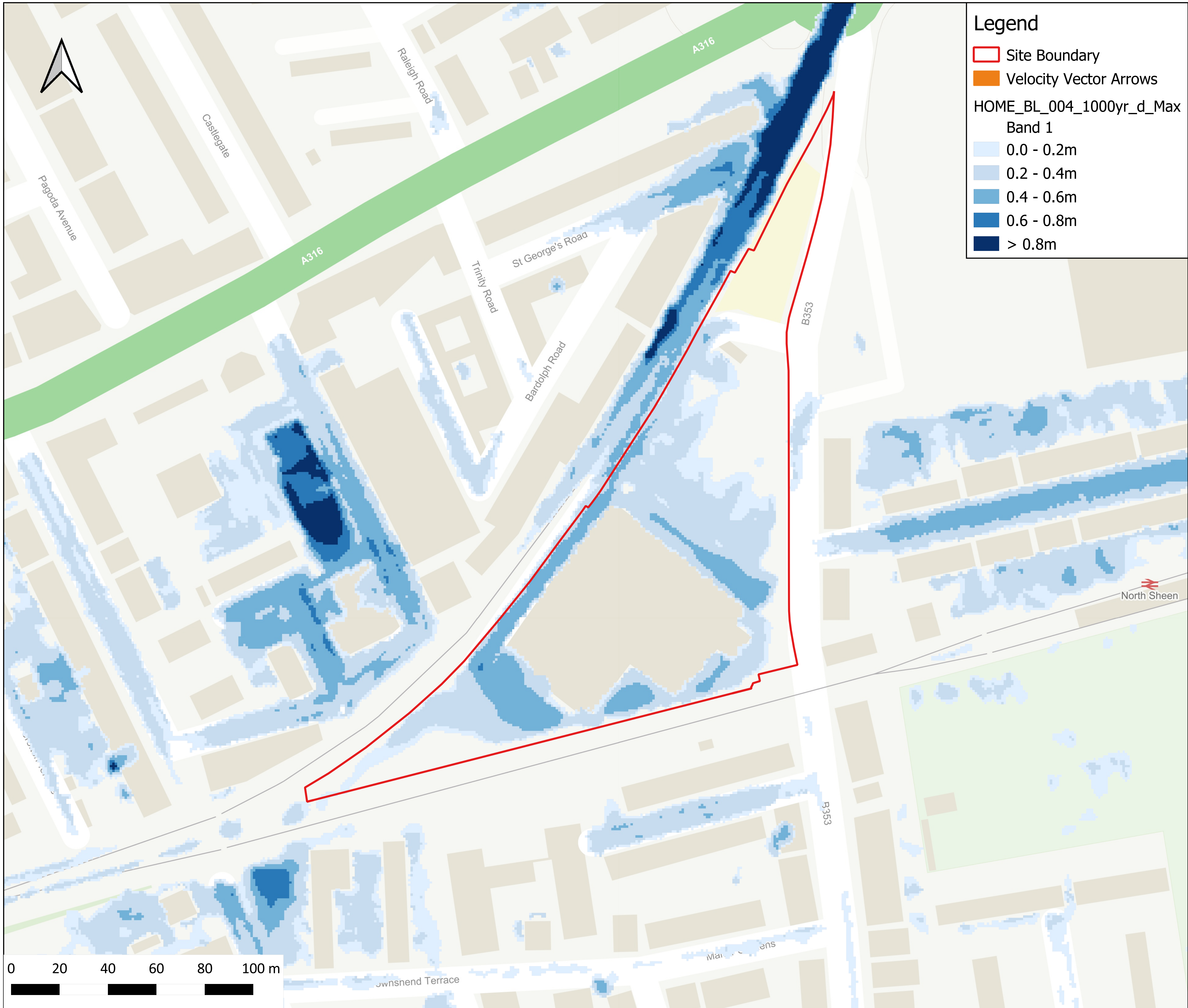
Homebase, 84 Manor Road, North Sheen, Richmond

TITLE
Baseline Scenario, 1 in 100 year + 40% CC Maximum Flood Depths

HYDROCK PROJECT NO.	SCALE @ A3
25608-IOCB	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISION
25608-HYD-XX-XX-DR-FR-0003	P02



Notes

Manor Road, Richmond Baseline (Existing) Model - 1000 year Maximum Depths (m) with Velocity Vector Arrows

REVISIONS

P01 - First Issue

P02 - Second Issue - Updated Output Following Model Review

P01	FIRST ISSUE			
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P02	REVISION NOTES/COMMENTS			
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PROJECT
Homebase, 84 Manor Road, North Sheen, Richmond

TITLE
Baseline Scenario, 1000yr Maximum Flood Depths

HYDROCK PROJECT NO.	SCALE @ A3
25608-IOCB	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISION
25608-HYD-XX-XX-DR-FR-0004	P02