

Technical design note

Project name	Barnsley Road, Goldthorpe		
Design note title	Response to EA Comments		
Document reference	23451-HYD-XX-XX-TN-WENV-0002		
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Revision	P01		
Date	21 January 2025	Approved	✓

1. Introduction

This Technical Note has been produced in response to comments and requests for additional information made by the Environment Agency (EA) in relation to the outline planning application located off Barnsley Road, Goldthorpe (ref: 2023/1105).

2. Background

A hybrid planning application was submitted in December 2023 for the construction of a storage and distribution facility, along with ancillary offices and associated infrastructure. Supporting hydraulic modelling was then submitted to the EA in February 2024, with a model review response received in September 2024. Following the receipt of comments from the EA on the hydraulic model and hydrological assessment, updates were carried out to address these comments and the model was resubmitted to the EA in October 2024. A further round of comments was received from the EA in January 2025 and a meeting was arranged to discuss these comments and the overarching feedback on the scheme, relating to the proposed Flood Mitigation System. In particular, the EA have raised requests for further information regarding:

1. Fill and drain times of the proposed eastern Flood Conveyance Area (FCA) and the western Flood Storage Area (FSA) in comparison with the baseline scenario
2. Larger scale maps depicting the results of blockage sensitivity testing on flood extents
3. Further detail on the management and maintenance plan for the proposed culverts linking the proposed Flood Storage Areas.

Items 1 and 2 are discussed further below, and item 3 is addressed by a separate maintenance plan submitted alongside this Technical Note.

3. Fill and Drain Times

In order to demonstrate that the impact of the proposed Flood Mitigation System upon flood mechanisms and flow regimes within the catchment is negligible, an assessment has been carried out on the fill and drain times of both the existing floodplain onsite and the proposed Flood Mitigation System.

During the baseline scenario, the primary flood mechanism affecting the site is high flows exceeding the capacity of the channel, in particular at locations where bank levels are lower than surrounding levels. As depicted in Figure 1 below, flows are predicted to spill out of the western (right) bank of the Carr Dike in the north of the site at approximately 09:00:00 hours into the flood event. flows then expand across the site to the west, with the eastern (left) bank being breached approximately 12:40:00 hours into the flood event. At

approximately 17:20:00 hours into the event, the floodplain volume onsite reaches its peak, following which flood waters recede back into the Carr Dyke until approximately 56:00:00 hours into the event.

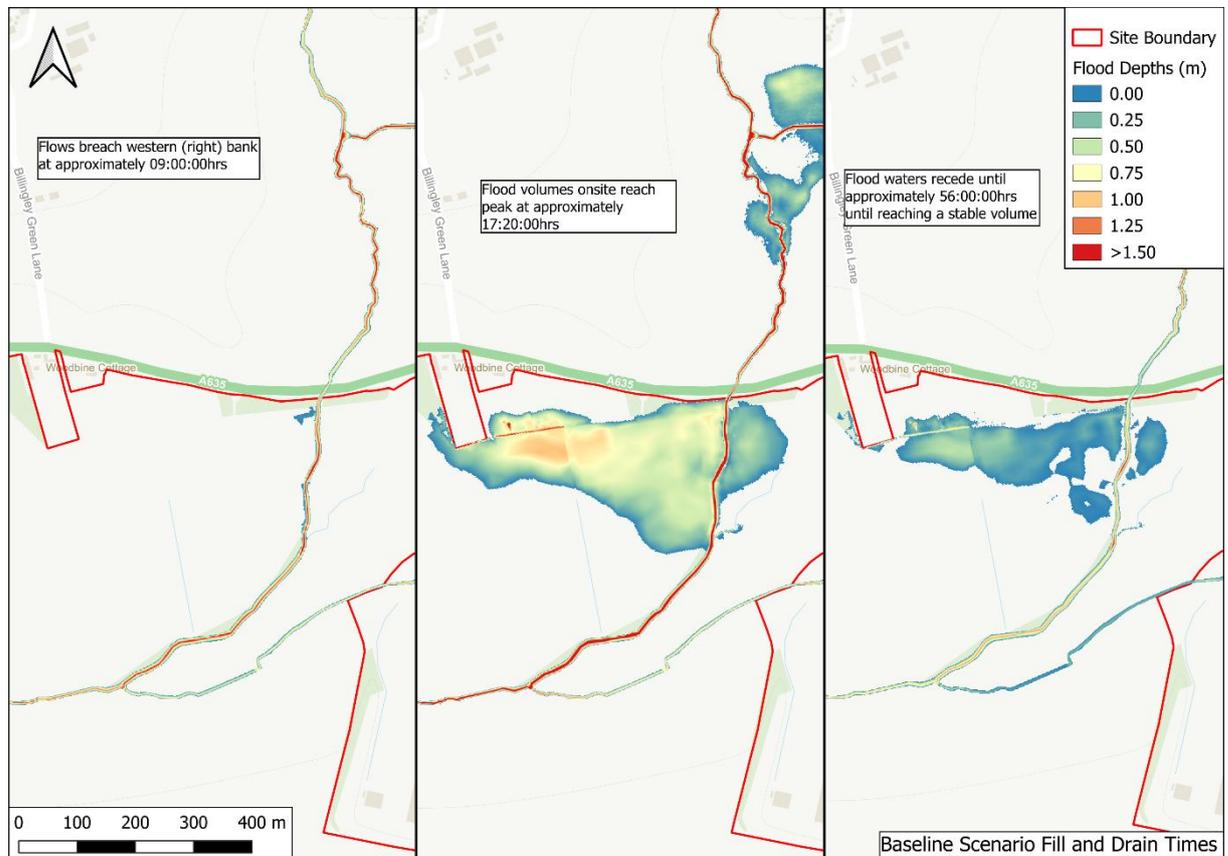


Figure 1: Baseline Scenario Fill and Drain Times

During the proposed scenario, the flood mechanisms onsite remain as per the baseline scenario, with the Flood Mitigation System relying on the same mechanism of flows spilling out of the western (right) bank in order to reach the proposed FCA and FSA. As seen in the baseline scenario, flows spill out of bank in the north of the site at approximately 09:00:00 hours into the event and travel westwards towards the inlet of the mitigation culverts into the FCA. Flows then travel through the FCA and into the FSA (Figure 2). At approximately 22:10:00 hours into the flood event, the FSA is shown to reach its maximum volume following which flood waters recede back into the Carr Dike. In order to ensure that there is minimal impact on the flow regime within the Carr Dike, the restricted outfall from the FSA discharges flood waters at a slow rate with shallow depths of approximately 0.50m remaining within the FSA after 56:00:00 hours.

Figure 3 presents a hydrograph for model cross-section CARR_020, located just downstream of the outlet of the Flood Mitigation System. It can be seen from this hydrograph that in the proposed scenario there is a reduction in peak flows within the Carr Dike of approximately $1.5\text{m}^3/\text{s}$ at this location, with the reduced peak in the proposed scenario occurring approximately 2 hours ahead of the peak in the baseline scenario. As the flood event continues, the slope of the hydrograph reduces in steepness so that flows are shown to remain slightly higher in the proposed scenario while the FSA drains, until reaching baseflow at approximately 75:00:00 hours into the event.

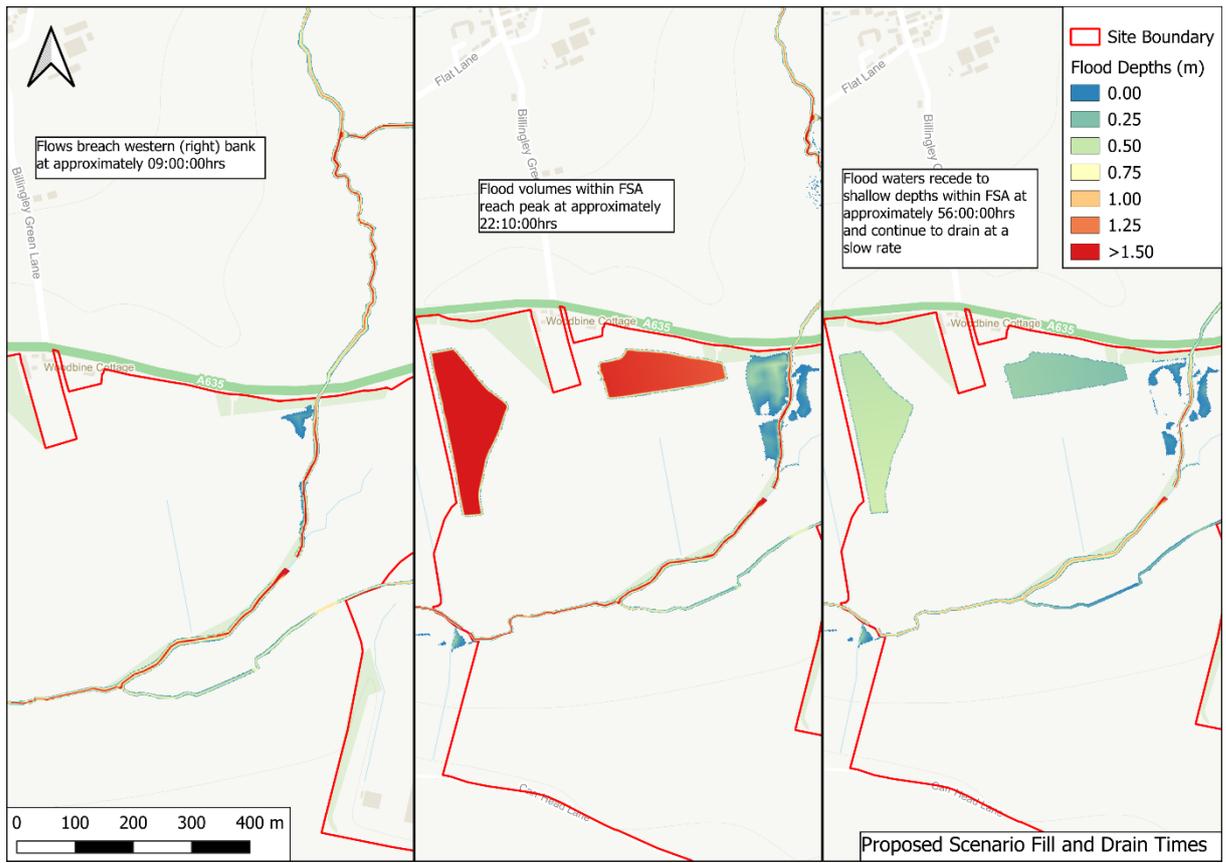


Figure 2: Proposed Scenario Fill and Drain Times

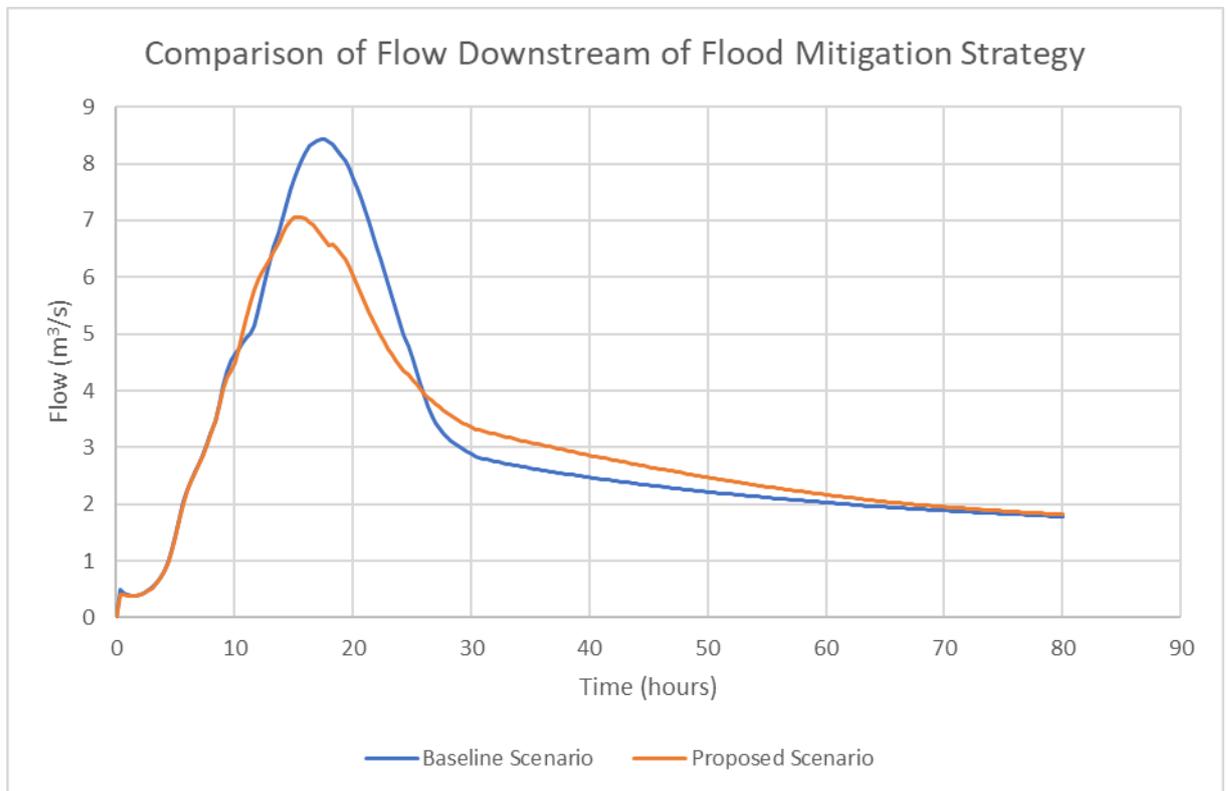


Figure 3: Comparison of Flow Downstream of Flood Mitigation System

As seen above, while there is some delay in flood volumes onsite reaching their peak when compared to the baseline scenario, this delay is minor at approximately 4.7 hours. The drain time is shown to be increased within the proposed scenario; however, this is intended to minimise the impact on flows downstream of the site within the Carr Dike.

Therefore, it can be concluded that the impact of the proposals on flood mechanisms onsite and within the wider catchment is minor.

4. Blockage Sensitivity Testing

Please refer to Appendix A for full size maps of the blockage sensitivity scenarios. Three scenarios were tested on the proposed Flood Mitigation System to assess the impact of potential blockages of the culverts between the proposed FCA, FSA and the Carr Dike. The scenarios are as follows:

1. Scenario R3 - 50% blockage to the 4x 900mm diameter intake culverts into the FCA
2. Scenario R4 - 50% blockage to the 1800mm diameter culvert between the FCA and FSA
3. Scenario R5 - 90% blockage to the 900mm diameter outlet culvert from the FSA

In Scenario R3 (Appendix A), it can be seen that onsite and upstream of the site there is negligible impact predicted when assessing a 50% blockage to the intake culverts, with flood extents remaining as seen in the proposed scenario model. Downstream of the site there is some increase to flood extent observed, however, this is shown to be minor.

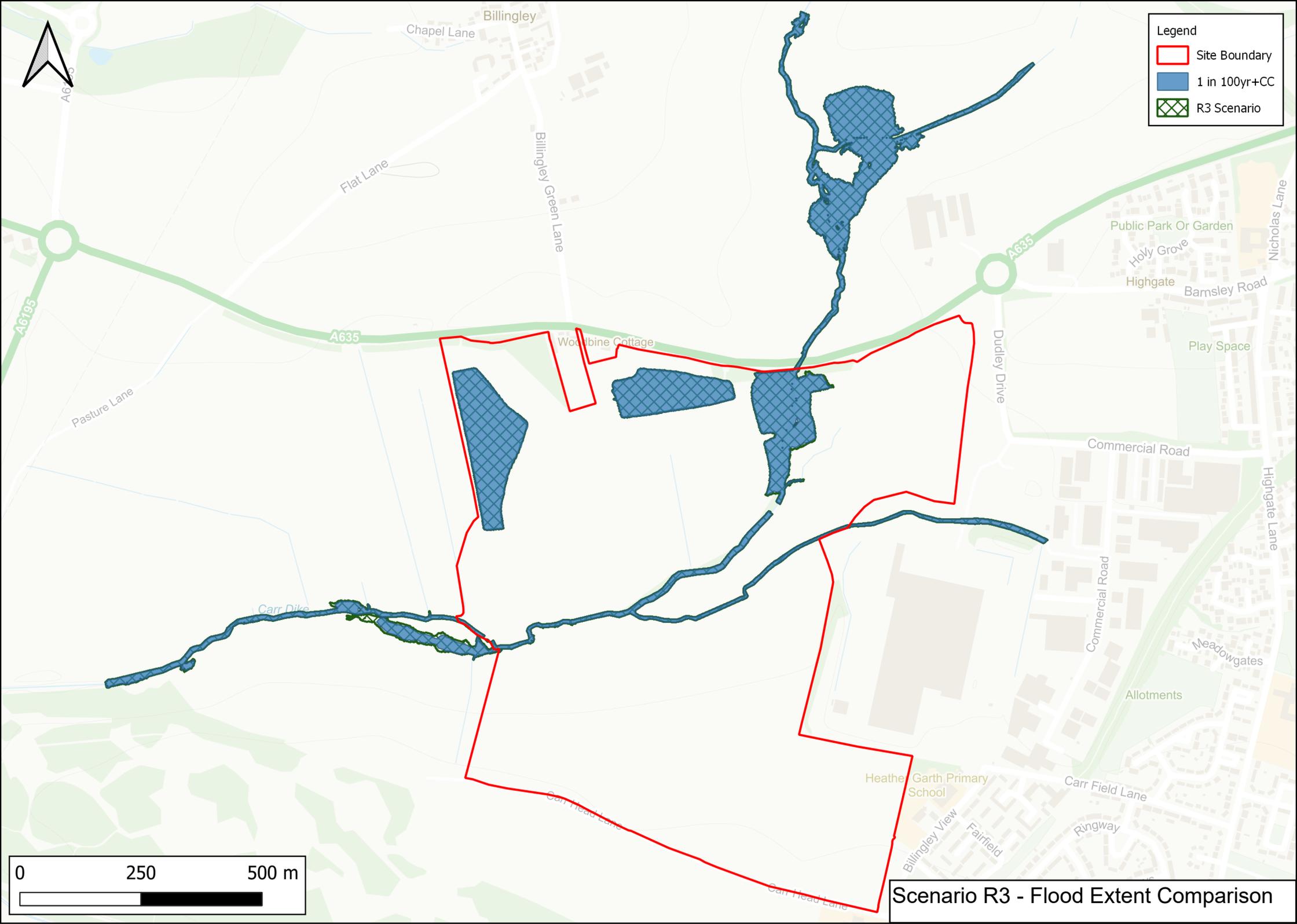
The results of Scenario R4 (Appendix A), assessing a 50% blockage to the culvert connecting the FCA and FSA indicate no change in flood extent offsite upstream or downstream. Onsite, there is a minor increase in flood extent to the southwest of the FCA, with some flows shown to overtop the FCA and pond along its western edge. However, the proposed development platforms remain flood free during this scenario.

In Scenario R5, it can be seen that again there is no change in flood extent upstream or downstream of the site (Appendix A). Some increase in flood extent can be seen onsite, to the southwest of the FCA and to the south of the FSA, where flows overtop these features and pond within areas of adjacent landscaping. The proposed development platforms remain free of flooding during this scenario.

5. Conclusion

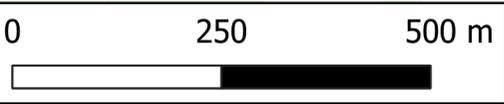
Based on the above information, it has been demonstrated that the impacts on fill and drain times are negligible and do not impact wider flood mechanisms and flow regimes within the catchment. The results of the blockage scenarios indicate that largely, there is no impact to flood risk offsite as a result of the proposals and there is no increased risk of flooding to the proposed development.

Appendix A Blockage Sensitivity Analysis

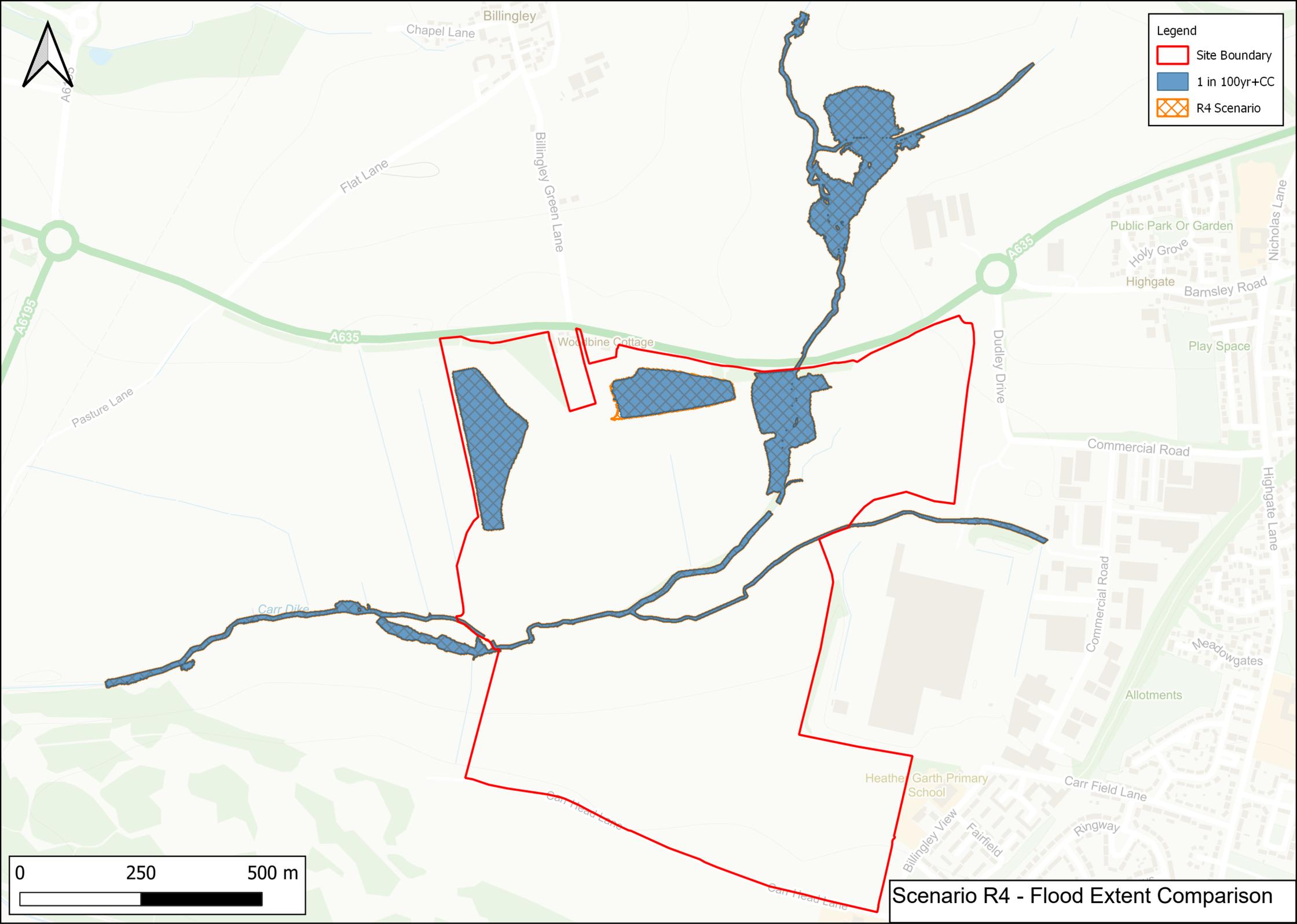


Legend

- Site Boundary
- 1 in 100yr+CC
- R3 Scenario

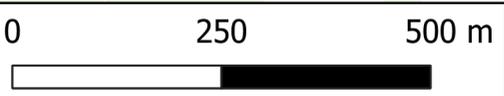


Scenario R3 - Flood Extent Comparison

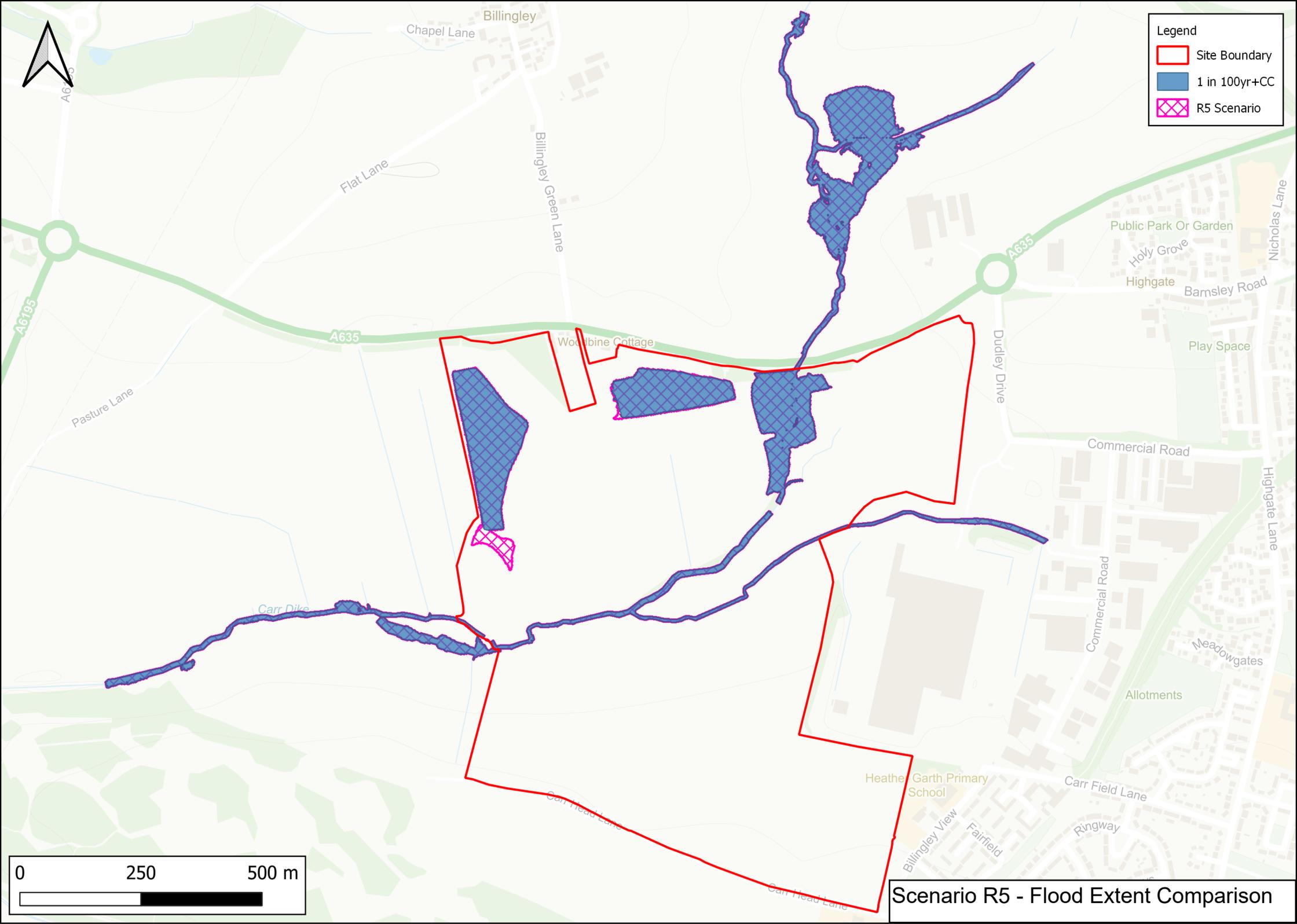


Legend

- Site Boundary
- 1 in 100yr+CC
- R4 Scenario

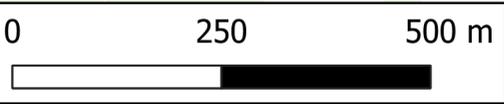


Scenario R4 - Flood Extent Comparison



Legend

- Site Boundary
- 1 in 100yr+CC
- R5 Scenario



Scenario R5 - Flood Extent Comparison