



West Winch Housing Access Road Detention Basin Survey Update Technical Note

Author: WSP

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1 Introduction

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westwinchhar@norfolk.gov.uk

- 1.1.1 WSP have developed a drainage strategy and preliminary drainage design for the West Winch Housing Access Road (WWHAR) scheme, as presented in the Flood Risk Assessment (FRA) ref: ncc/3.11.01. The proposed drainage strategy comprises a series of 7 attenuation basins to collect surface water runoff from the highway, which will discharge into existing watercourses.
- 1.1.2 During the development of the drainage design, WSP have been in regular discussions with Norfolk County Council's (NCC) Lead Local Flood Authority (LLFA) to seek approval for the proposals.
- 1.1.3 Due to the lack of availability of topographical survey data during design development, parts of the drainage design, including the 7 detention basins, had initially been developed using LiDAR data. The LLFA have now stipulated that all basin designs should be based on surveyed topographical data and not LiDAR. It should be noted that outfall levels into existing watercourses for each basin were already based on topographical data.
- 1.1.4 The additional topo survey for each basin location was commissioned and undertaken between October 2023 and January 2024 and the design of the drainage basins has now been revised based on this data. WSP have prepared this technical note to present the findings of a comparison exercise between the basin design from LiDAR and the updated design based on topographical data.

2 Survey Data

2.1 LiDAR

- 2.1.1 The LiDAR data used for the planning submission design is open-source data obtained through the Environment Agency's Composite Digital Terrain Model (DTM).



2.2 Topographical Survey Data

2.2.1 The topographical survey covering basins 1 to 6 has been undertaken by Nick Parish Land Surveys in October 2020. This has been carried out independently of previous topographical surveys produced for this scheme and has been produced using GPS rather than local control stations.

2.2.2 The topographical survey covering basin 7 forms part of a wider survey undertaken by Survey Solutions in Summer 2023. This is tied into a local grid and has been validated by WSP surveyors. Additional Survey was undertaken by WSP in January 2024 to supplement the Survey Solutions data and fully cover the required area. Plans showing the surveys can be found in Appendix O of the FRA document ref: ncc/3.11.01.

3 Changes between LIDAR-based and Topographical Survey based Basin Designs

3.1.1 There follows a high level assessment of the differences between the two survey data sets within the extents of the basins, the changes to the basin extent required to tie into the latest topographical data and any impacts on the proposed drainage strategy and design of the housing access road as a whole. The assessment has been conducted on a basin by basin basis.



3.2 Basin 1

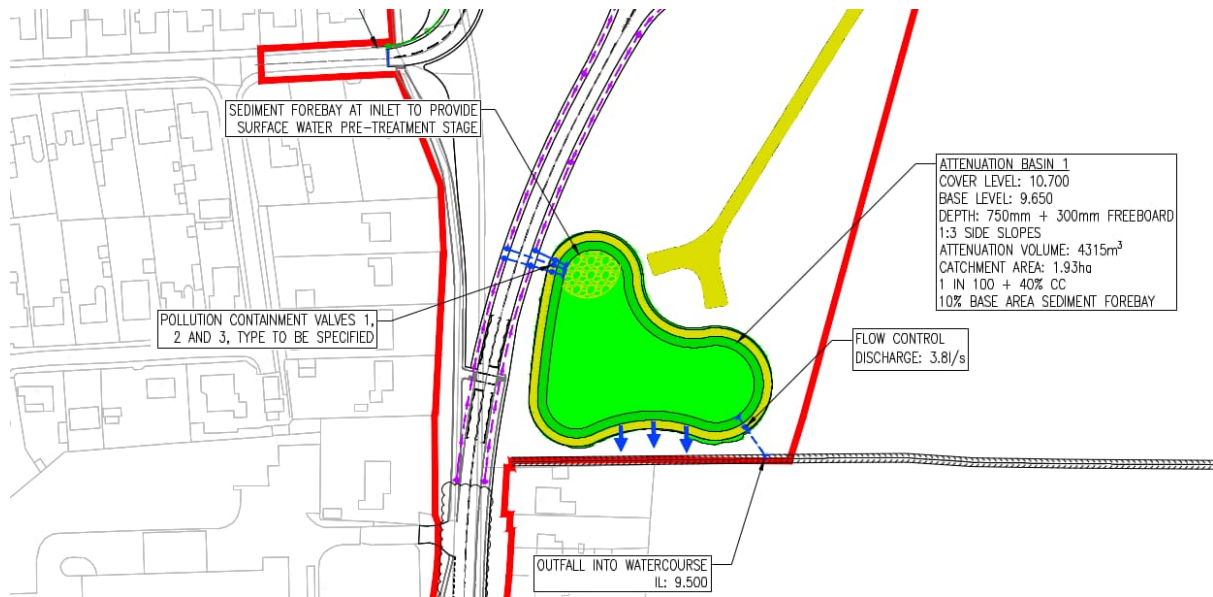


Figure 1 - Basin 1 design based on LiDAR

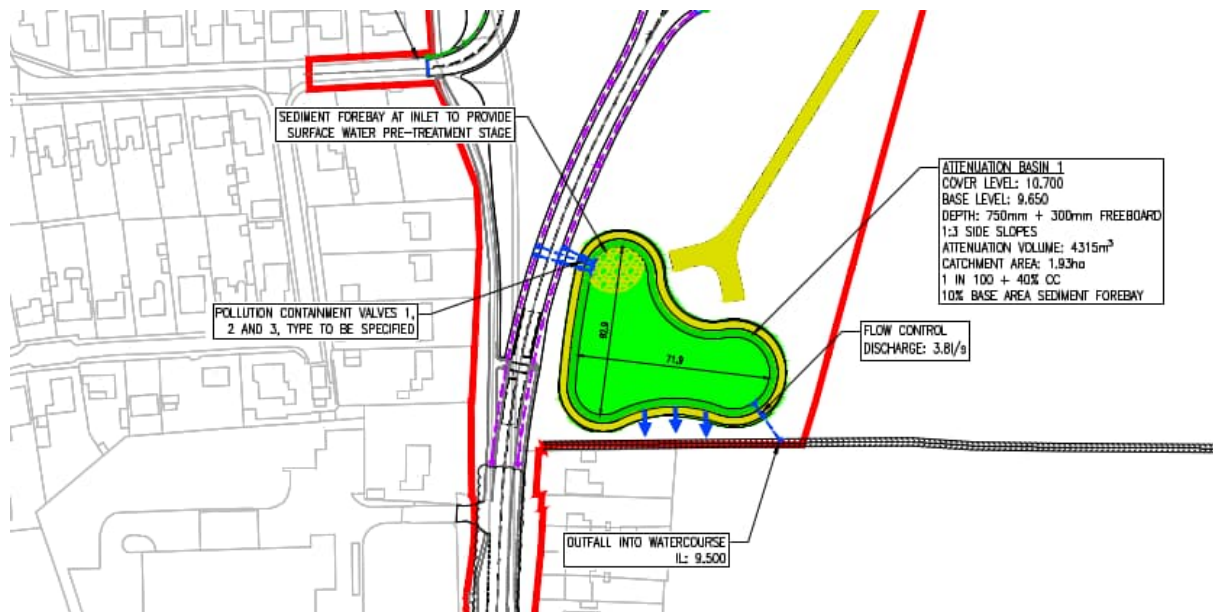


Figure 2 - Basin 1 design based on topographical survey data



3.2.1 For basin 1 comparison shows that the level differences between the LiDAR and Topographical Survey are typically less than +/- 50mm. The small level differences measured do not have a big impact on the design of the basin.

3.2.2 Due to the similarity in levels, both the cover levels and invert levels have remained unchanged. The only modification made is to the earthworks extents required to tie into existing levels, which have experienced a slight decrease (10%) in area from approximately 115m² to 103m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.

3.3 Basin 2

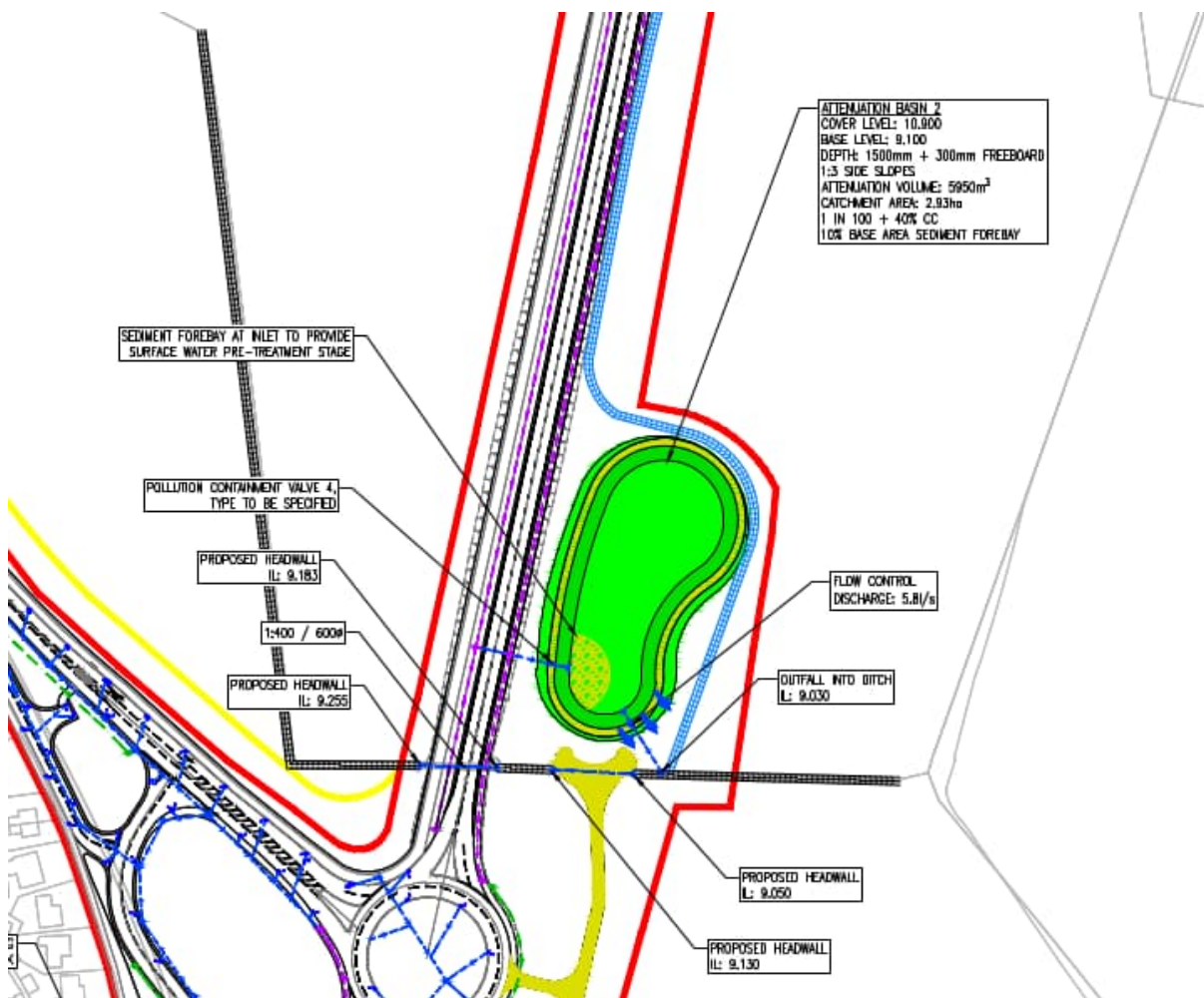


Figure 3 - Basin 2 design based on LiDAR

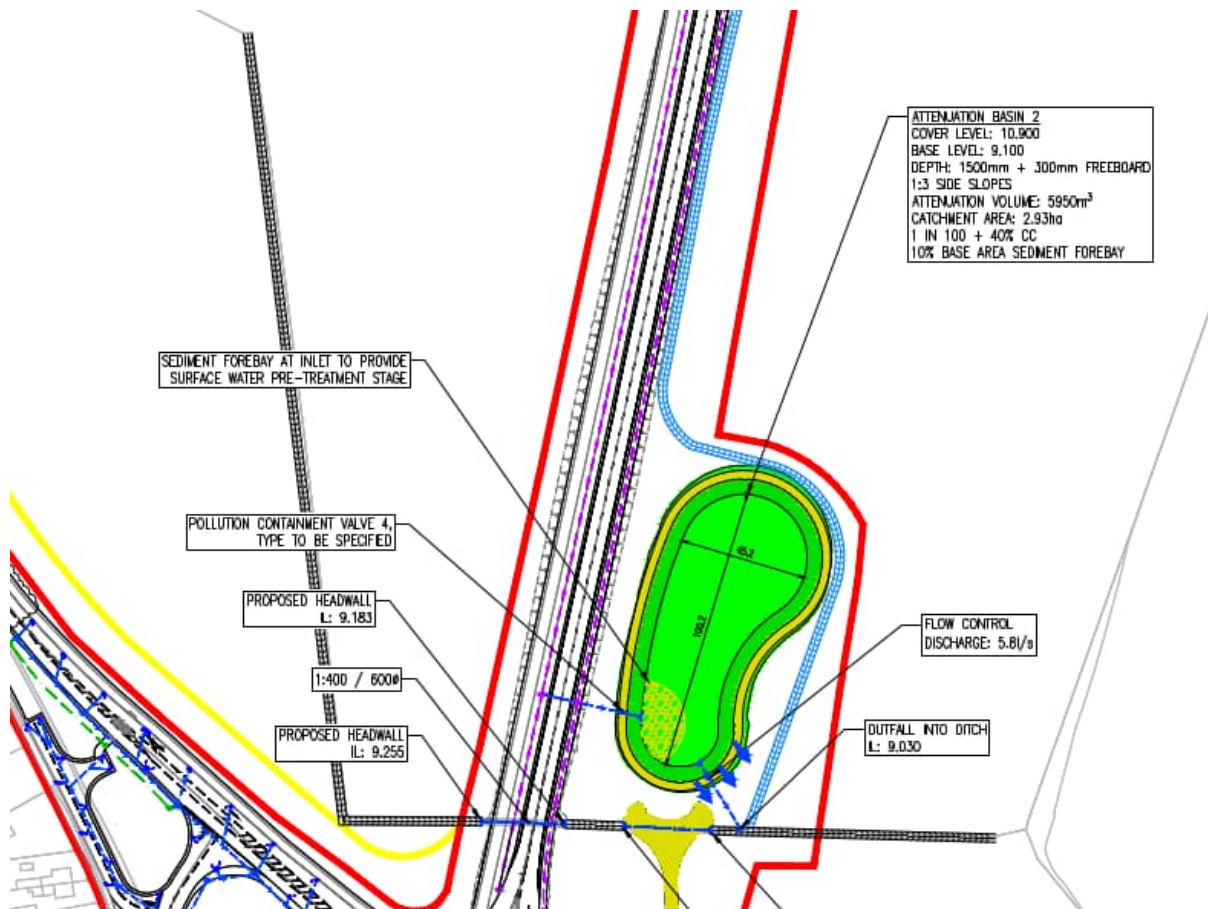


Figure 4 - Basin 2 design based on topographical survey data

3.3.1 As with basin 1, the difference in levels in basin 2 are typically less than +/- 50mm, with one localised area where level differences are between 100mm and 300mm. The small level differences measured have not impacted the drainage strategy, with measured levels within 50mm of design levels for most of the basin area.

3.3.2 Due to the similarity in levels, both the cover levels and invert levels have remained unchanged. The only modification made is to the earthworks extents required to tie into existing levels, which has experienced an increase (3%) in area from 287m² to 296m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.



3.4 Basin 3

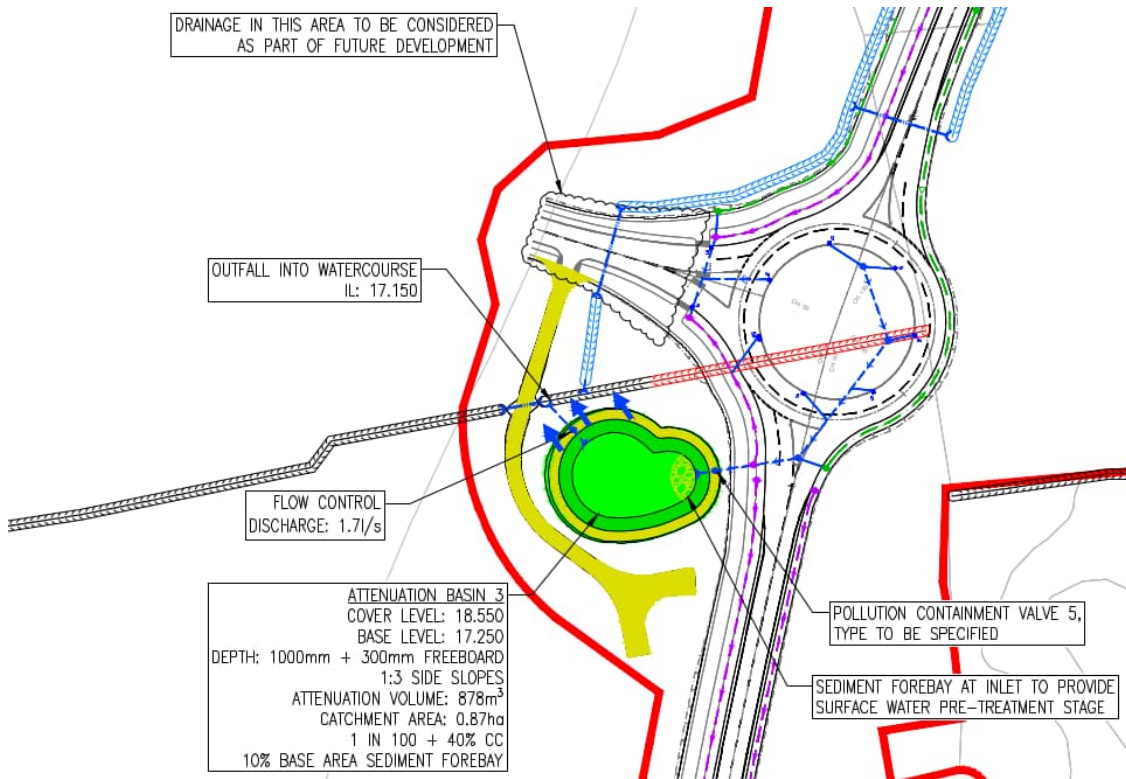


Figure 5 - Basin 3 design based on LiDAR

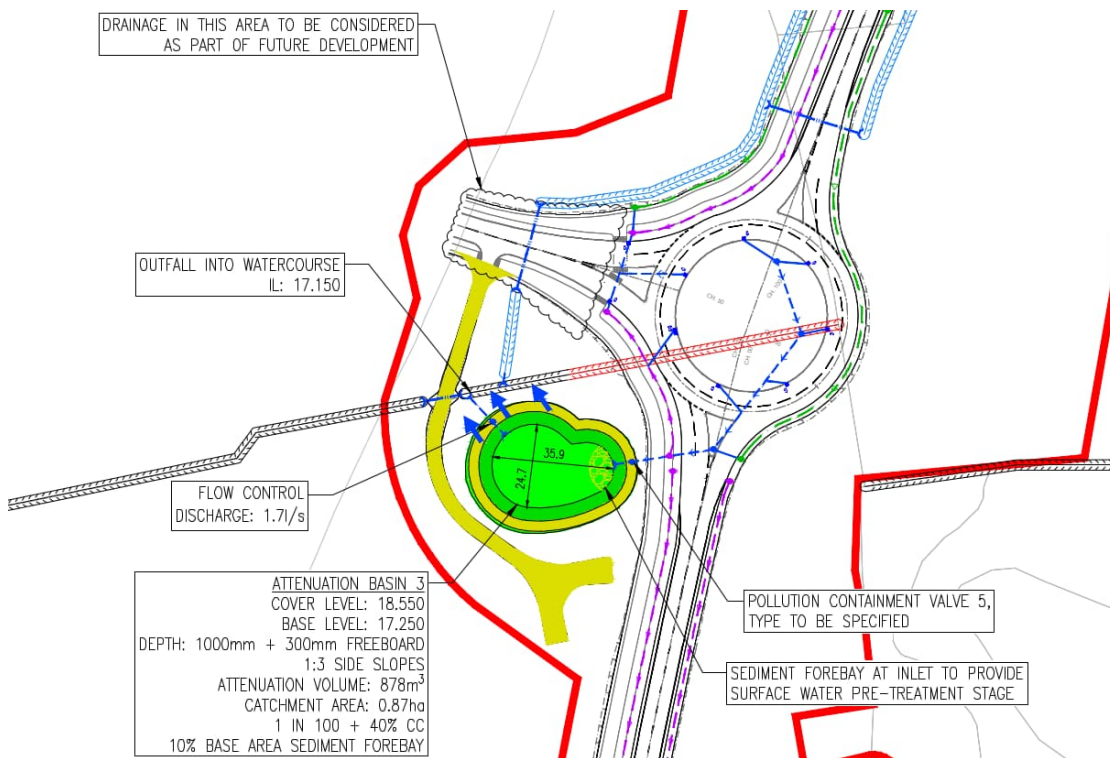


Figure 6 - Basin 3 design based on topographical survey data



- 3.4.1 Level differences in this area are typically +/-50mm with some localised areas of differences up to 100mm. The small level differences measured have not impacted the drainage strategy, with measured levels within 50mm of design levels for most of the basin area.
- 3.4.2 Due to the similarity in levels, both the cover levels and invert levels have remained unchanged. The only modification made is to the earthworks area, which whilst the extents have changed – the overall area has remained consistent at 58m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.



3.5 Basin 4

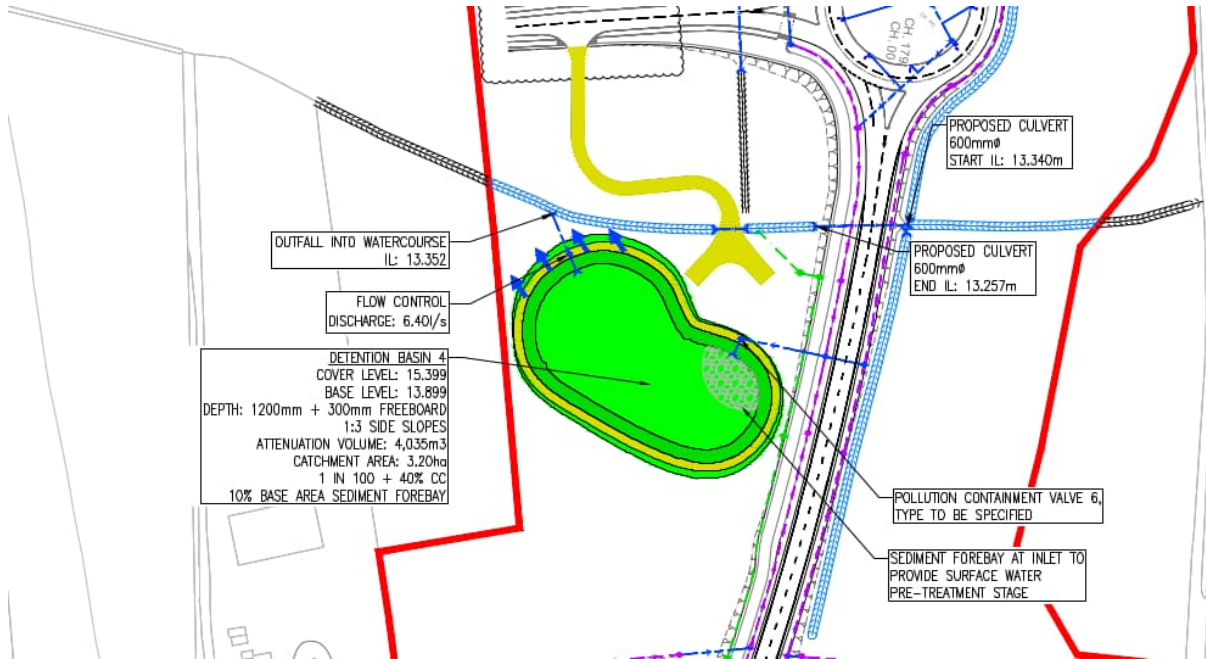


Figure 7 - Basin 4 design based on LiDAR

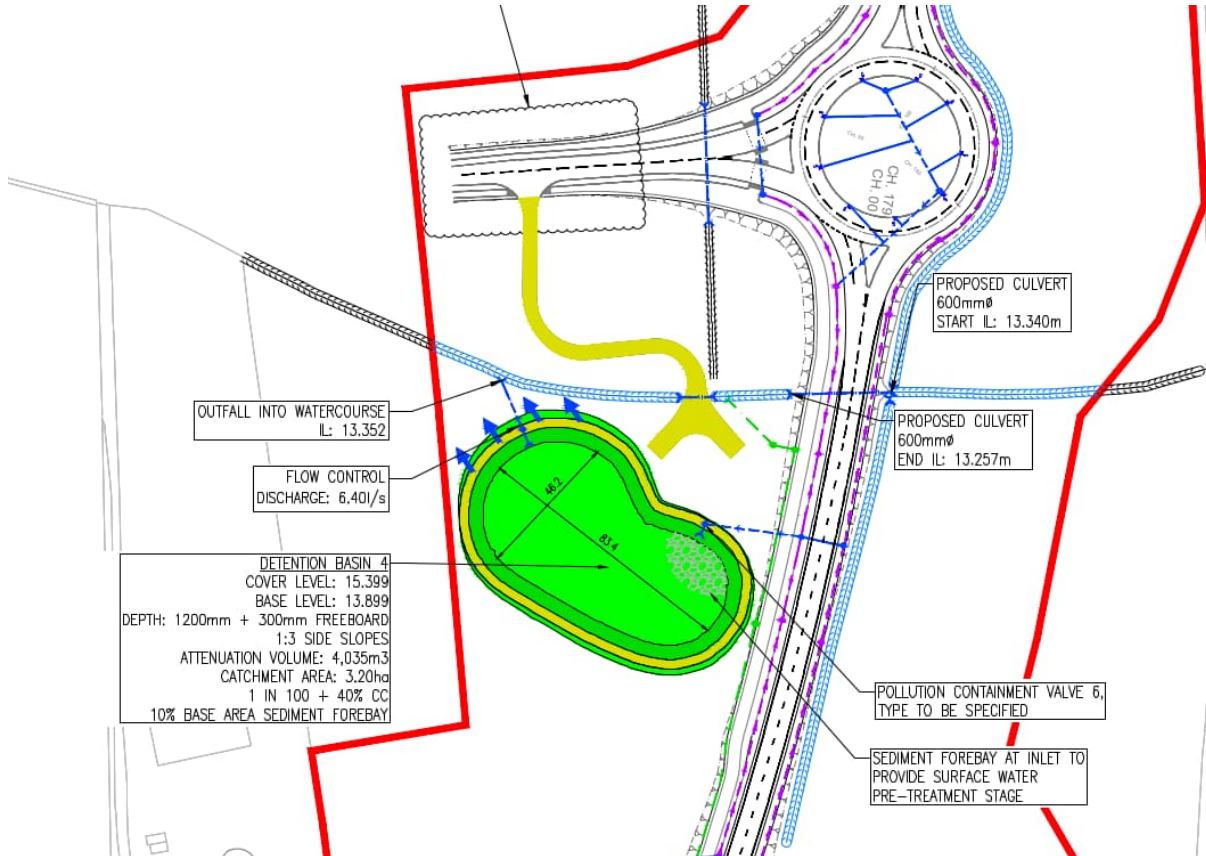


Figure 8 - Basin 4 design based on topographical survey data



- 3.5.1 For the area available, differences are predominantly +/-50mm with a band of slighter higher differences up to 100m across the centre. The small level differences measured have not impacted the drainage strategy, with measured levels within 50mm of design levels for most of the basin area.
- 3.5.2 Due to the similarity in levels, both the cover levels and invert levels have remained unchanged. The outfall levels were initially determined based on a topographic survey. The only modification made is to the earthworks extents required to tie into existing levels, which have experienced a slight decrease (5%) in area from approximately 411m² to 394m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.



3.6 Basin 5

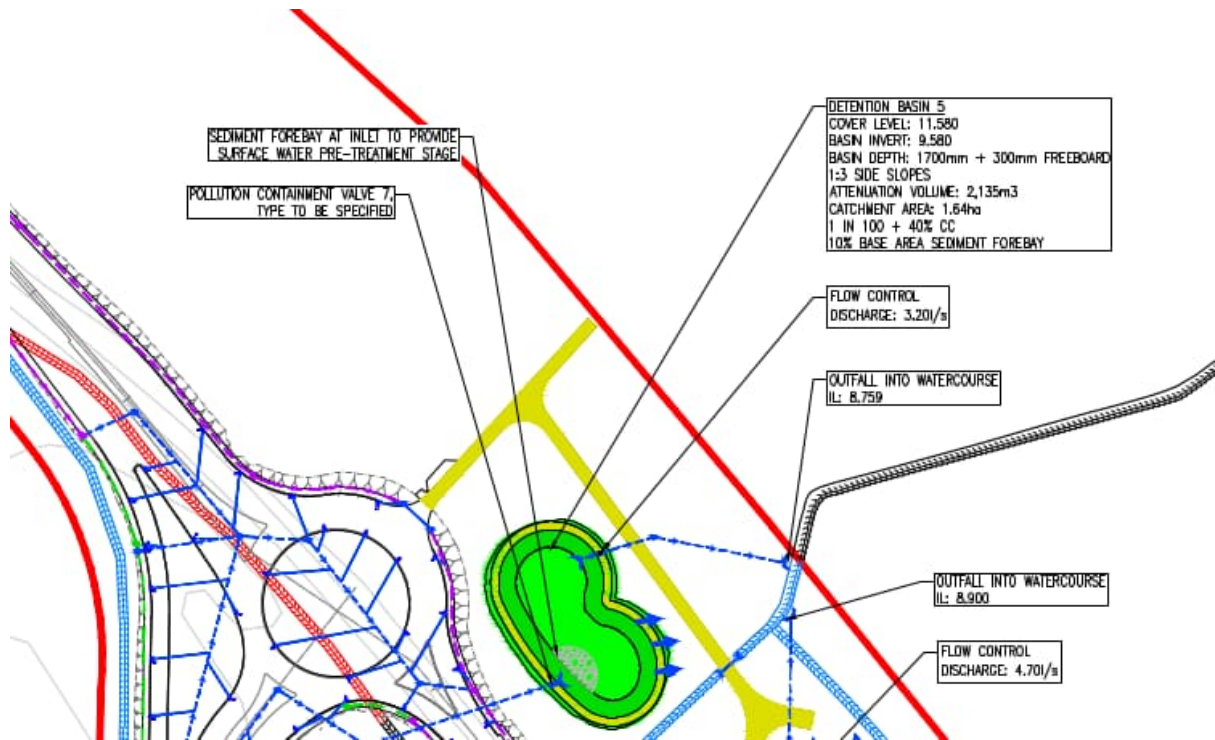


Figure 9 - Basin 5 design based on LiDAR

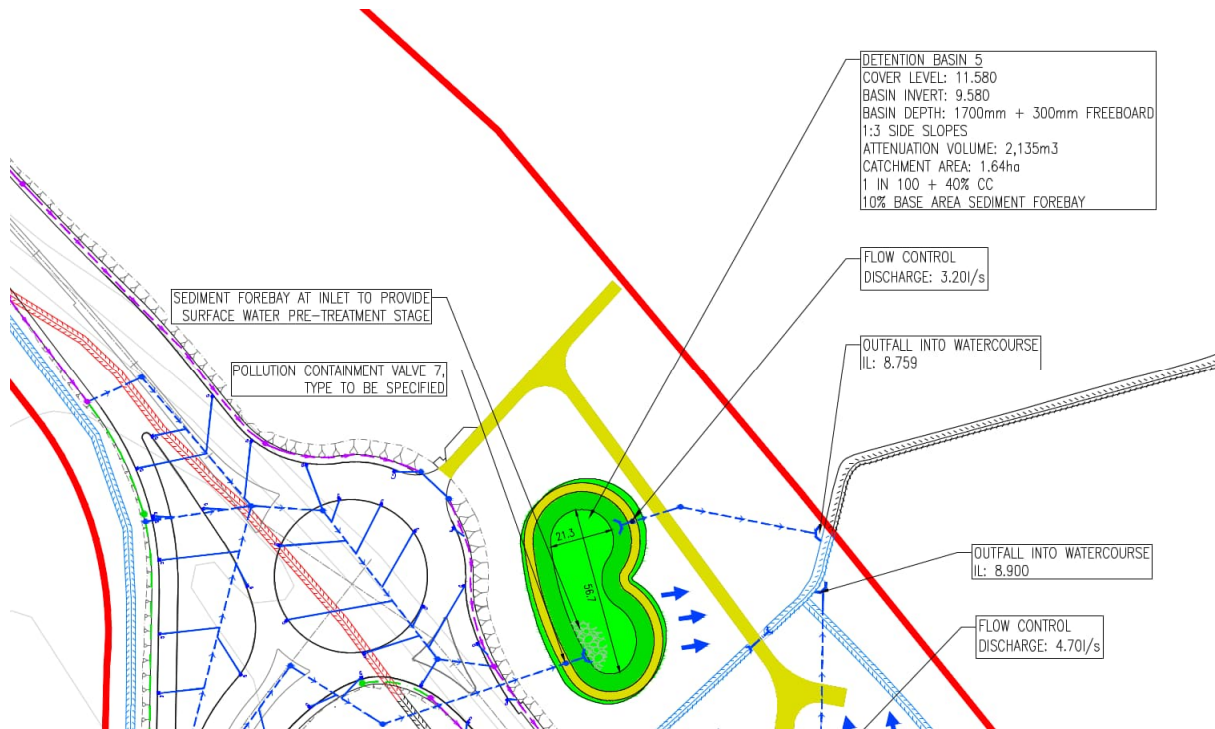


Figure 10 – Basin 5 design based on topographical survey data



- 3.6.1 For basin 6, differences between the two surveys are differences predominantly between 50 and 100mm with some areas in the southern part of the basin between 100 and 300mm.
- 3.6.2 Due to the similarity in levels across the area of the basin and in order to preserve the required attenuation volumes, both the cover levels and invert levels have remained unchanged. The outfall levels were initially determined based on a topographic survey. The only modification made is to the earthworks extents required to tie into existing levels, which have experienced a slight decrease (4%) in area from approximately 273m² to 262m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.



3.7 Basin 6

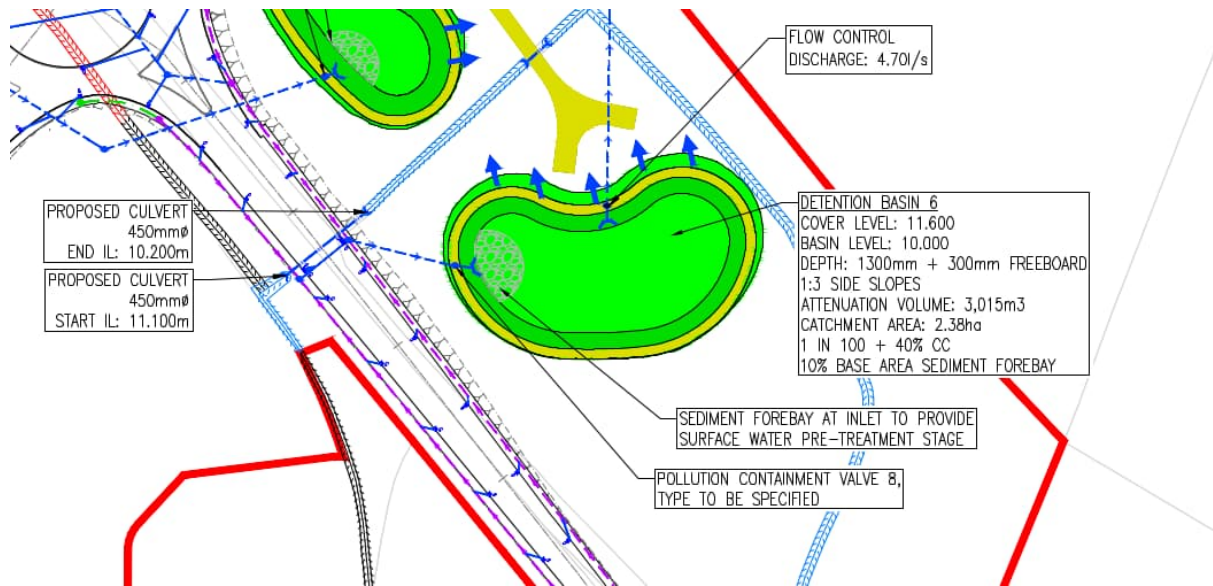


Figure 11 - Basin 6 design based on LiDAR

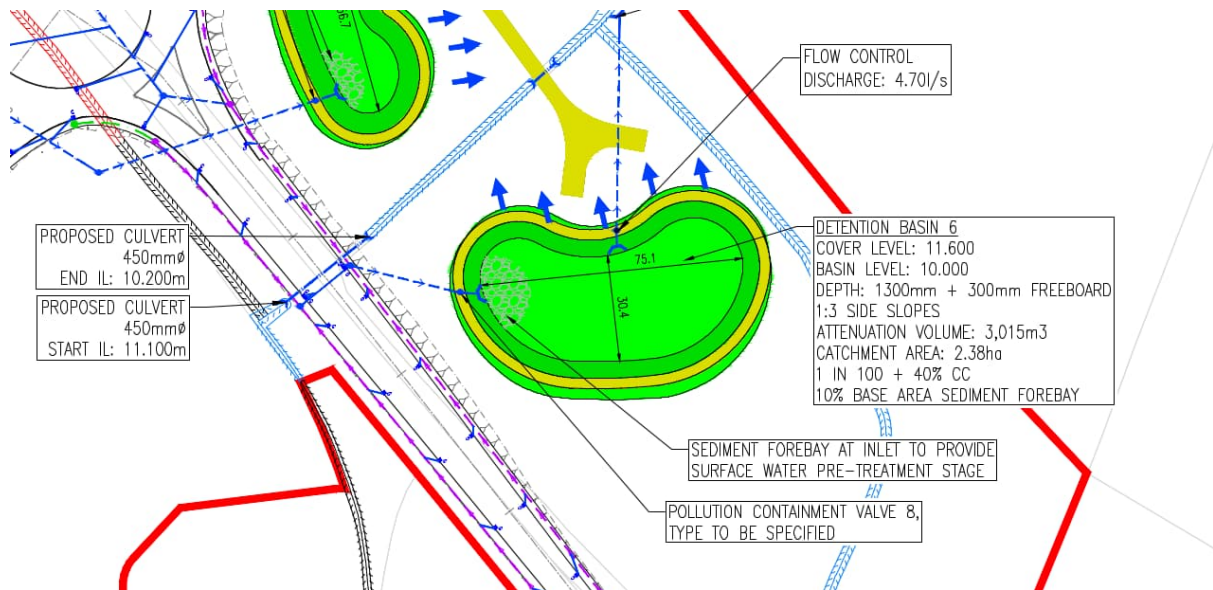


Figure 12 - Basin 6 design based on topographical survey data

3.7.1 For basin 6, to the south, level differences between the two surveys are minimal, typically between 50 and 100mm, with some areas less than +/- 50mm.



3.7.2 Due to the similarity in levels, both the cover levels and invert levels have remained unchanged. The only modification made is to the earthworks area, which whilst the extents have changed – the overall area has remained consistent at 426m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.



3.8 Basin 7

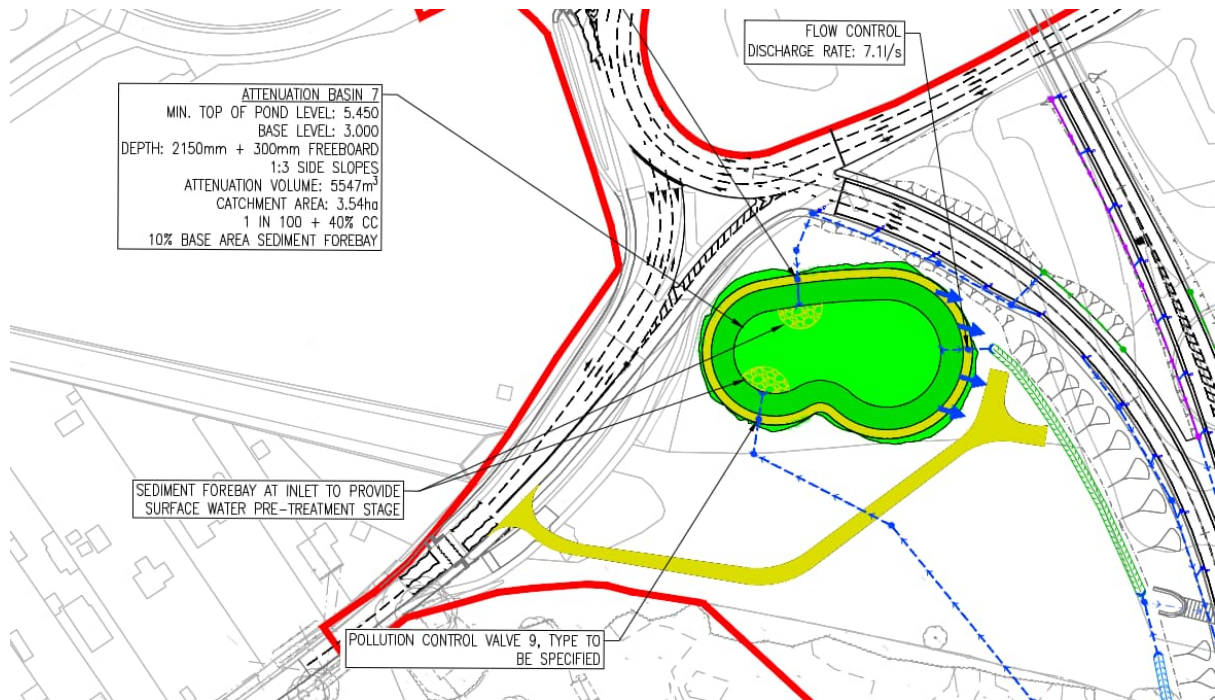


Figure 13 - Basin 7 design based on LiDAR

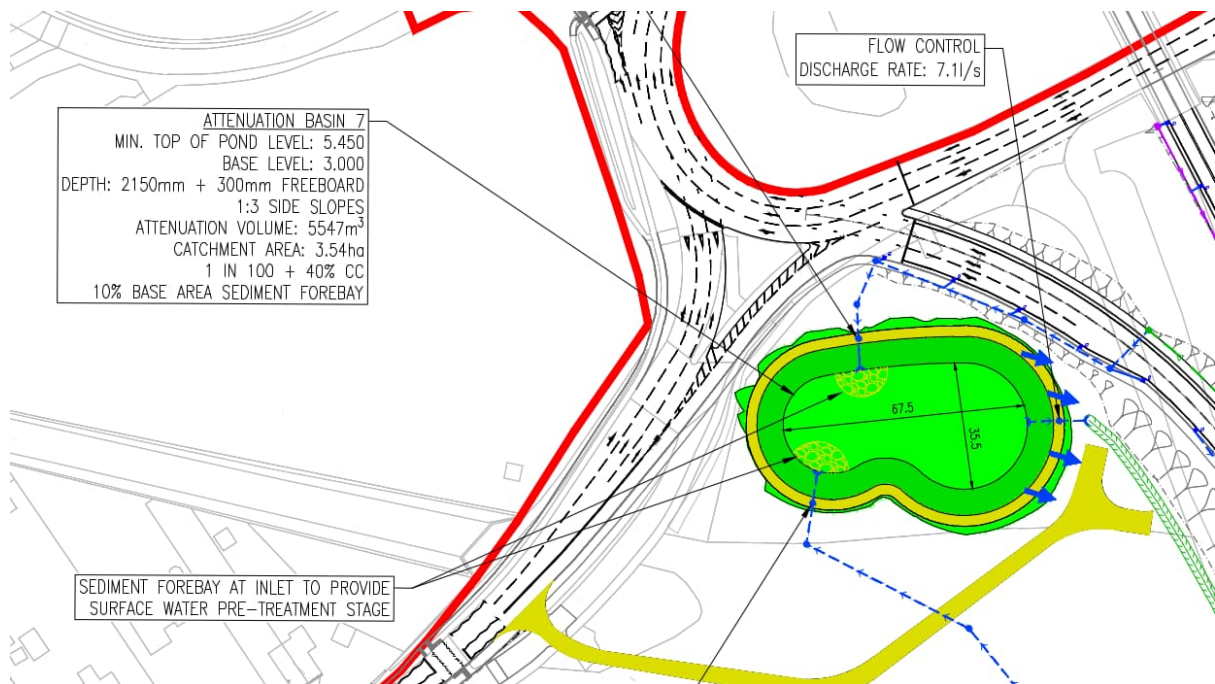


Figure 14 - Basin 7 design based on topographical survey data

3.8.1 Basin 7 is where the greatest differences between the two surveys are found, with level differences typically up to 300mm, with some small, isolated peaks



where differences are in excess of 500mm, likely due to the presence of vegetation which has been picked up at surface of the LiDAR survey. This was expected in this area due to the dense vegetation on the ground and the presence of mature trees, which will have reduced the accuracy of the LIDAR survey in isolated areas.

- 3.8.2 As levels for Basin 7 are different to the LiDAR survey, this is likely to impact on the earthworks design of the basin. Most surveyed levels are in the range of up to 300mm lower than the design levels, therefore the cover level of the basin has stayed the same and the footprint of the basin has increased in some areas to tie into the existing in-situ levels.
- 3.8.3 Both the cover levels and invert levels have remained unchanged to achieve the required attenuation volumes. The only modification made is to the earthworks extents required to tie into existing levels, which have experienced a slight increase (12%) in area from approximately 332m² to 373m². The change in extents shown does not detriment the drainage strategy nor other design aspects of the proposed Access Road.

4 Conclusion

- 4.1.1 Additional topographical survey has been undertaken for the location of each basin at the request of the LLFA to understand the limitations of the LiDAR ground model and for the design of the basin and its earthworks.
- 4.1.2 In conclusion most of the drainage strategy is unaffected by the additional topographical information, with the drainage principals and levels proposed still achievable. The outfall levels from each basin to receiving watercourse were initially determined based on a topographic survey so have not been impacted. The only modification made is to the required extents of the earthworks to tie into existing levels. The changes required are modest with surface area requirements changing between approximately 0-12%. The change in extents illustrated do not detriment the drainage strategy nor other design aspects of the proposed Access Road.