

The development SoWL, which proposes introducing a roundabout and clear span bridge, fails to meet **Arun Local Plan Policy W DM2 Flood Risk** criteria **b), d) and f) .**

The applicant does not satisfactorily demonstrate that introduction of the clear span bridge and roundabout to the north of the site will not increase flood risk elsewhere, or if potential mitigation or exceedance measures, such as creating temporary storage, areas may be needed.

THE ROUNDABOUT: Fig 1 shows the new embankments (green squiggles) required to accommodate the new roundabout will result in loss of storage capacity to both the Black Ditch flood plain south of Water Lane, and the Surface Water Balancing Pond to the north. See Appendix A.

The Edenvale Young Associates (EVA): Roundabout Hydraulic Modelling covered a 2.6km length of the water course. The report ONLY concerns itself with the impact of the proposed roundabout, and reaches the conclusion that *"the proposed roundabout has negligible impact on catchment storage."* EVA did not use any local hydrological evidence (for example from photographs), to verify the accuracy of its model and thus its conclusions.

THE CLEAR SPAN BRIDGE: Fig 2 shows the proposed earth embankments WILL ALSO encroach into the Black Ditch flood plain south of Water Lane, further reducing it's capacity. The modelling done by EVA is used to demonstrate the bridge meets the 600mm clearance required by the EA. The Applicant seems to have achieved this.

The **Stantec Technical Note** point 6 considers the encroachment *"will only reduce flood plain storage by a small amount."*

It is not clear however, what the cumulative impact of the loss of flood storage capacity is, what a "small" reduction to flood plain storage equates to, or if any compensation measures or mitigation may be required, regardless of the type of bridge design.

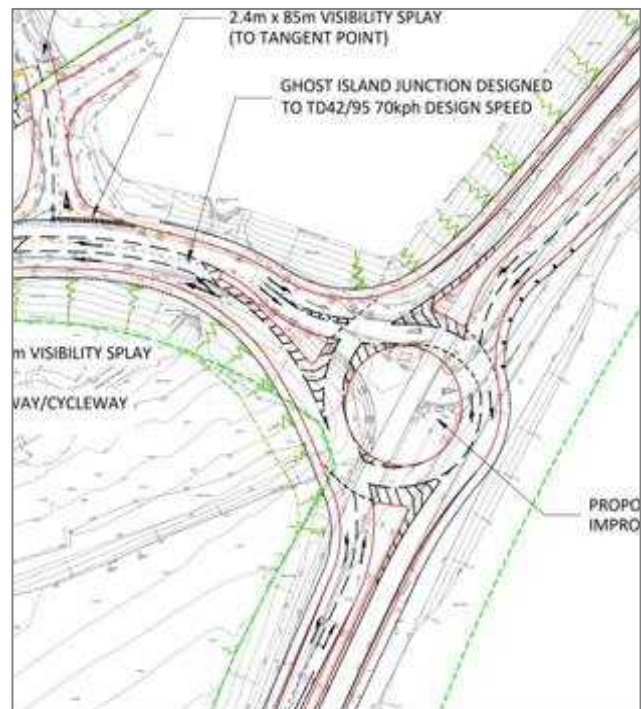


Fig 1. Extract from the plan submitted with A/110/20/RES

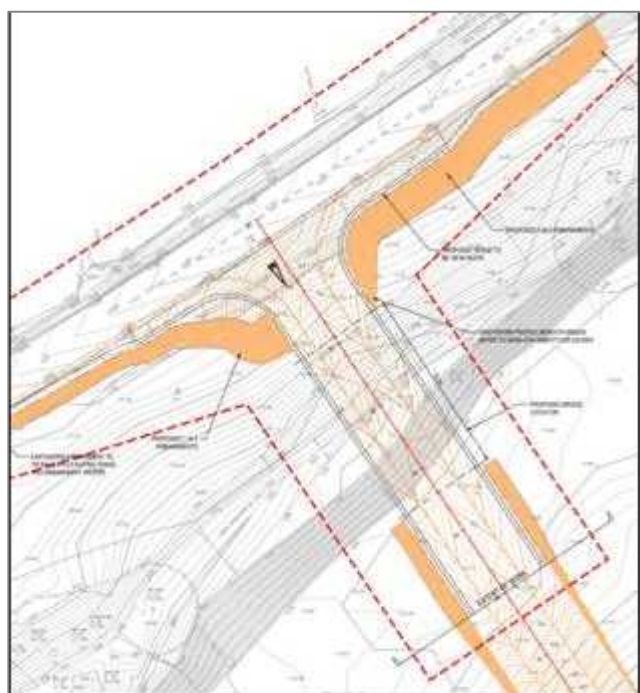


Fig 2. Extract from Bridge Contour Plan submitted with A/40/18/OUT

FLOODING HISTORY:

The consultation response from the EA says: *“For the purposes of the reserved matters, at this stage the EA are satisfied that based on the flood modelling there will be no significant flood storage loss.”* This is worrying, as EVA chose to build their hydraulic model without including any observational evidence or historical data on natural and storm flooding events in Angmering against which the various Climate Change scenarios could be tested and validated.

It is unclear why this information was not seen to be relevant. Especially as it would add the local dimension needed to give the community of Angmering (as well as “non-hydrology experts” who will be asked to approve the application based on the resultant flood mitigation measures) confidence that the model when tested, would behave similarly under the recorded rainfall conditions of 1980, 2002 and 2012 and also reflect natural flooding events seen in Angmering.

Also, with so many pinch points such as culverts and weirs downstream, it would have been reassuring to see simple long sections showing water levels through the system for the different Climate Change scenarios.

Photographic evidence of flooding along the 2.6km stretch of the Black Ditch has been sent to the EA, WSCC and Arun over a number of years. It has also attracted press coverage, as acknowledged in the A/99/17/OUT idom Merebrook FRA May 2017 Flood Risk Assessment.

Angmering Flood Events: The EA recorded major flooding in 1980 and 2012, missing the 2002 flood event. The following photos taken on 18th March 2002, show the sequence of events as flood water overtops the Black Ditch catchment and Balancing Pond upstream, causing the flood plain to expand diverting the Black Ditch down Water Lane (its natural route) and into the village centre.



Avenals Farm pond overflows as the flow exceeds the capacity of the culvert under the access road



Water pours onto the road from Avenals Pond (left) and the SoWL site



Entrance to Weavers Hill culvert overflowing onto Water Lane



Water Lane.



Homes flooded



View of village centre from Station Rd

The Avenal's Farm picture also shows additional water flowing in through the access, as water that has run off the fields to the north and down Water Lane finds its level.

The Black Ditch Catchment: The winter water levels we see on a regular basis as the channel spreads across the flood plain, seem to have been ignored in EVA's hydraulic modelling.

However, WSCC (the LLFA) have recently requested images from APC on upstream flood events, saying they ***"may be helpful to ground truth the natural flood extents that have occurred associated with known storm events."***



5th March 2020 (13:06)



17th January 2014



14th Feb 2014 (16:07)

Comparing the flood profile at the northern edge of the bank against the contours in the various Plans provided, it appears that natural winter water levels frequently spread out across the shallow basin to reach 11m+ above sea level (AOD). See Appendix C .

Surely, when building an hydraulic model to predict the effect of Climate Change, you would want to measure the available capacity between the typical peak water levels regularly reached on the flood plain, and the maximum level the catchment could take. As well as the need to make allowances to accommodate the capacity of the culverts and weirs downstream and the water that runs off the fields to the north of Water Lane and Dappers Lane to get into the Black Ditch.

The Black Ditch Culvert (Weavers Hill): Images from 5th March 2020 show the water level at the "Weavers Hill" culvert captured by the EA Webcam, as well as the Black Ditch catchment water levels have been forwarded to WSCC. No flooding resulted from this rainfall event.



Black Ditch flood plain (13:06)



Weavers Hill culvert (12:54)



EA Webcam image (12:34)

Strategic Development: The **North of Water Lane site** has outline approval. An email from WSCC Flood Engineer (Ray Drabble) to APC in response to A/40/18/OUT on 27th June 2019, says:

*“ there appear to be two discharges from the site. The main discharge is north east of Water Lane into the Highway Attenuation area [the triangular Balancing Pond] which is **not** main river. This is shown as a max flow rate of 28.5l/s” . . . plus. . . “There is a downstream smaller discharge to Main River to the south west of Water Lane that is restricted to a flow rate of 10.5 l/s that would require a permit from the EA to discharge.”*

Any Climate Change hydrological modelling needs to take this site into consideration as well as the third **strategic site at Dappers Lane**. Many photographs exist that show water flowing down the southern part of Dappers Lane reach the Black Ditch, if and when it can. These include the following taken on 18th March 2002.



Water flows along Water Lane and is joined by flows (top) from Weavers Hill and (right) from Dappers Lane

Water flowing south down Dappers Lane.

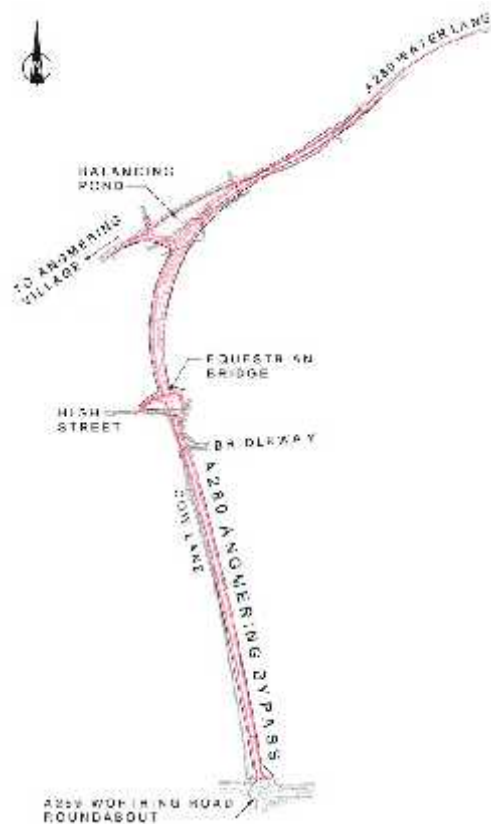
HYDRAULIC MODELLING:

A/99/17/OUT idom Merebrook FRA May 2017 confirms the report is the result of “a Desktop Study” and that “The information does not purport to be a detailed design and a quantitative assessment” and that “a quantitative assessment can not been undertaken at this time.”

Independent hydrological modelling was not carried out. Instead the flood levels and extents used were taken from the 2010 Lower Tidal River Arun Flood Modelling study, which was too early to take into account the 2012 flood event. The FRA raises doubts about the integrity of some of the EA figures, but continues to use the bits they believed were correct anyway.

Neither does it make allowances for the impact of the encroachment of the proposed construction of the roundabout and bridge onto the Black Ditch catchment / floodplain. Therefore the 2017 FRA can not be considered sound. See also Appendix C, page 3.

Edenvale Young Associates Modelling Report July 27, 2018: was also commissioned by Rydon Homes and superseeds the modelling data use by the 2017 FRA. It is clearly competent in its execution, however, its accuracy and acceptance by the community relies on proving that the model replicates what happens in reality. As WSCC says, it will “**be helpful to ground truth the natural flood extents that have occurred associated with known storm events**” against which the various Climate Change scenarios can be tested and validated.



The location of the Surface Water Balancing Pond shown in the image on the left is from a presentation by Peter Brett Associates (PBA). See Appendix B. It was constructed during the building of the A280 by-pass, which required the Black Ditch to be re-routed via the culvert introduced under this part of Water Lane to the catchment basin north of the SoWL site.

Photos taken 14 Feb 2014 at 16:07 and 16:08 at the entrance to the Oval Raceway show flooding from the land north of Water Lane and the upper Black Ditch . On the far right hand side of the 2nd photo (taken a few minutes later) you can just make out the Pond is level with the road. With nowhere else to go water continues to collect as can be measured by the road markings.



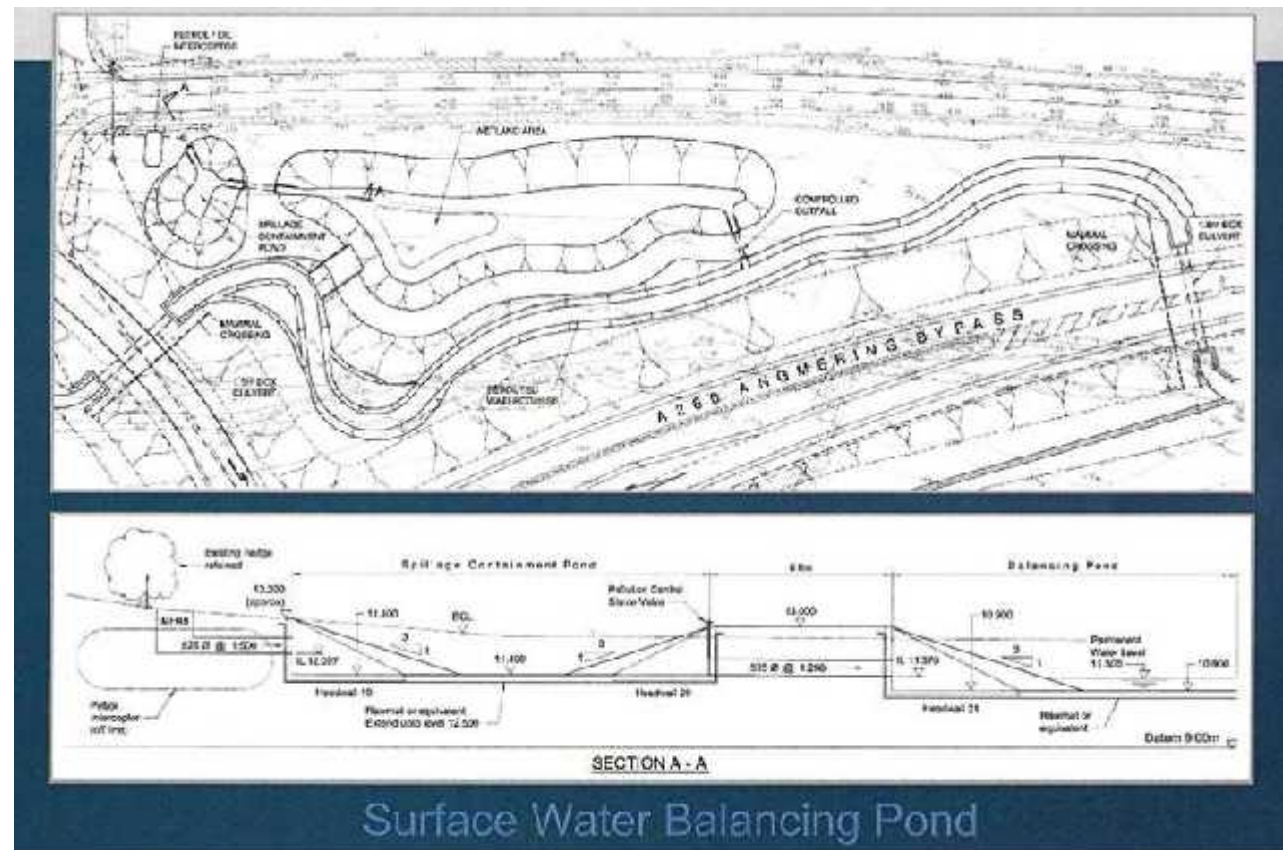
Avenals Farm Pond

Black Ditch Catchment

Surface Water Balancing Pond



The following slide is from the Peter Brett Associates presentation for the Roundstone Lane (Bramley Green) drainage solution. It gives technical details, contour heights etc of the proposed upstream Surface Water Balancing Pond at the junction of the Angmering A280 bypass and Water Lane. Labelled as a “balancing pond”, the diverted Black Ditch can be seen running through from right to left.



The run off from the Oval Raceway and to the fields north of Water Lane enter top right, as well as some drainage from the highway.

It passes first through the petrol / oil interceptor. This operates just like a road gully so oil sits on the top and petrol sits there and evaporates. It then flows into a spillage containment pond. If a tanker overturned and spillage went into the road drainage system, an outlet valve on the pond would be closed with the hope it could be recovered because of damage it could cause.

The Wetland Area is environmental. It also cleans up what comes in and exits through the controlled outfall to the Black Ditch. If that is overwhelmed, it appears to exit through a spillway on the south west of the Wetland Area.

In periods of heavy rainfall (as shown in the above photos) the area floods across the entrance to the Oval Raceway.

Black Ditch Floodplain: Google Earth 6 Aug 2018 looking West



Extract from site layout plans



Comparing the images left to actual photographic evidence (below) suggests normal winter water levels reach to the bottom of the bank below the fence line at the north east corner of the site, somewhere between the 11m and 11.5m AOD marks.

The contour of the water line and topography of the site suggests the water level was slightly higher than the 11m AOD, which dips away sharply from the bank at this point. This can be seen more clearly on the next page.

17 Jan 2014



14 Feb Feb 2014

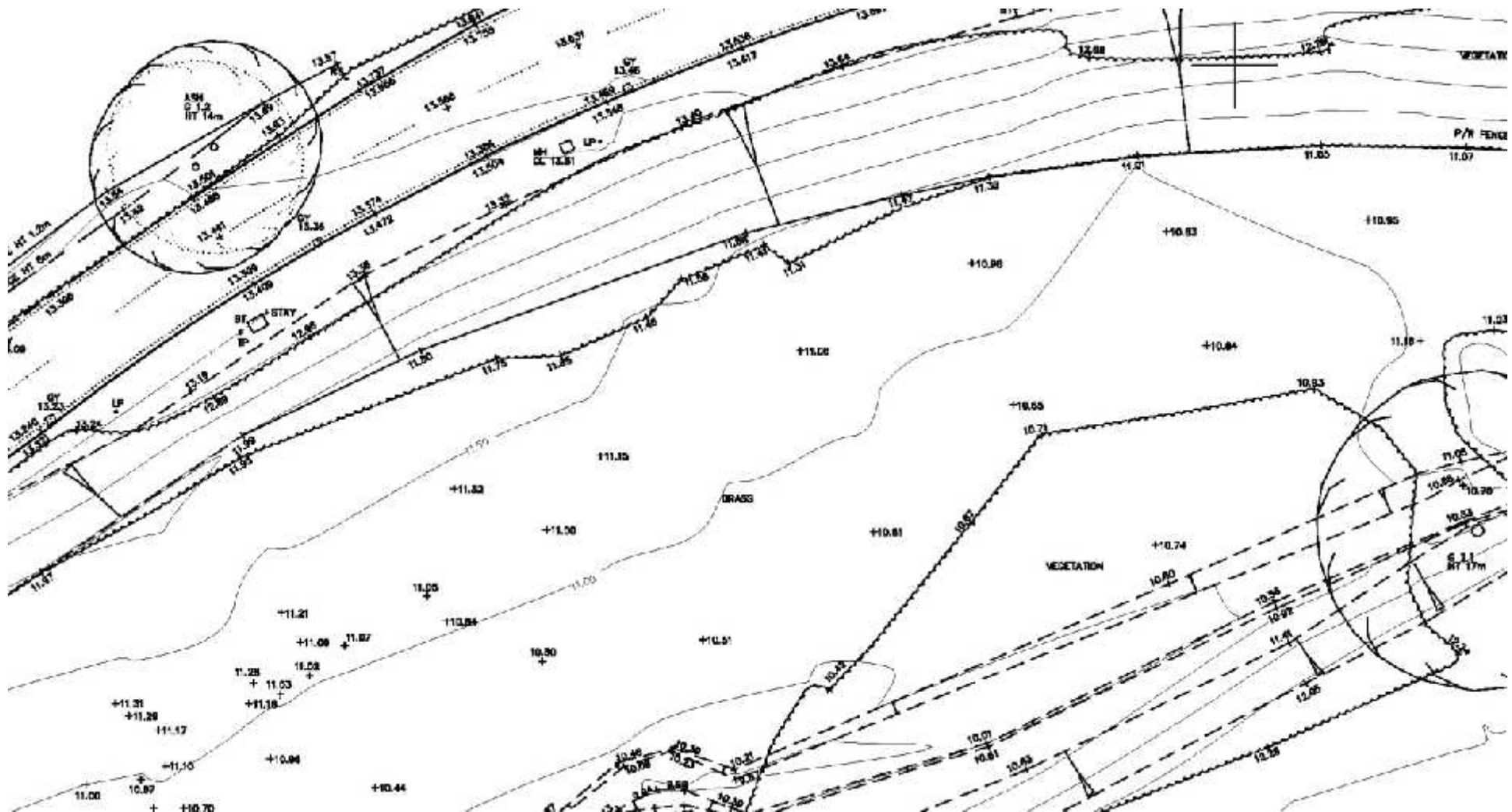


5 March 2020



The direction the 1st and 2nd photos were taken from can be judged by the shadow of the sign post in front of the black car on the satellite image above. The 3rd picture would have been taken roughly opposite the silver car.

You can see the contour heights more clearly in the extract from the “mksurveys Topographical Survey 2015” on P47 of the A/99/17/OUT idom Merebrook FRA May 2017:, which overlays the traditional contour map with the more accurate Lidar (satellite) data that pinpoints and records elevations on the earths surface. The 11.5m AOD line mirrors almost exactly regular winter water levels.



The resolution of most scanned documents uploaded onto the Arun planning portal is poor, including the EVA modelling report depth maps Figs 3.1 thru 3.30. This makes the detailed topographical images especially difficult to read, especially as they provide the factual detail, which is often lost in the reams of technical reports.



A/99/17/OUT idom Merebrook FRA May 2017.

A good example that shows the importance of using up to date modelling data, as well as actual historical flood events, to test and validate the conclusion reached, can be seen in the A/99/17/OUT idom Merebrook FRA May 2017.

In this extract from Dwg Sth-301-001, dated Aug 2016 on page 86 of the FRA, the shaded area shows the *“1000 year (0.1 AEP) flood risk envelope. 2010 Infoworks fluvial levels supplied by EA superimposed on detailed topographic survey.”*

AEP = Annual Exceedence Probability

It looks suspiciously like the regular winter water levels experienced now, that show Angmering appears to be at risk from a 1 in 5 to 1 in 10 year flood event and casts severe doubts on the integrity of the FRA.

Hopefully the extracts in this Appendix are clear enough when enlarged to demonstrate our point.