Scheme Wide Drainage Strategy Report - Project number: 60606782

The report provides an initial high level basis for development into detailed design. Initial comments are noted in the below against the relevant sections, in *italics*.

4.1 A4130 Widening

4.1.1 The exceedance flows, from the proposed highway, for the A4130 Widening section will be connected into the highway drainage system and will be managed within the highway extents. *Is this overland surface water exceedance flow or highways water exceedance flow - Confirm? Assumed on carriageway highways exceedance. What RP, depth, extent, duration, system capacity to manage?*

AECOM Response – No overland contributing catchment, all runoff highway generated (i.e. within Red Line Boundary). Drawings reflect exceedance routes where flooding for manholes occurs during 1 in 100 year plus 40% cc event. Routing carries flooding within highway to existing basins/swales which have freeboard. Freeboard designed in line with local and national standards.

4.1.3 In order to reduce the build-up of flood water, south of the existing A4130, a flood relief culvert is proposed south of Meadow Brook under the eastern link road. *Is this to be constructed? To be removed and reinstated if not required. Consents required?*

AECOM Response – Part of Flood risk Modelling, not drainage related. FRA advises this is kept in and constructed (permanent), despite no requirement for flood modelling with climate change at 35%. To reduce risk of flooding to future development should the watercourse get blocked for example, and for exceedance flows.

4.2 Didcot Science Bridge

4.2.1 The exceedance flows, from the proposed highway, for the Section will be connected into the highway drainage system and will be managed within the highway extents. *Is this overland surface water exceedance flow or highways water exceedance flow - Confirm? What RP, depth, extent, duration, system capacity to manage?*

AECOM Response – No overland contributing catchment, all runoff highway generated (i.e. within Red Line Boundary). Drawings reflect exceedance routes where flooding for manholes occurs during 1 in 100 year plus 40% cc event. Routing carries flooding within highway to existing basins/swales which have freeboard. Freeboard designed in line with local and national standards.

4.3 Didcot to Culham River Crossing

Overview

4.3.1 Exceedance flows from the proposed highway for the Section, will follow the falls on the highway and the associated drainage network toward low points of the highway alignment. Exceedance may be temporarily contained within the highway low point area before connecting back into the highway drainage system. Otherwise, in the case of even more extreme events, overflow will be to the attenuation ponds provided (or existing) and ultimately to the existing ditch systems and directing to the River Thames.

All above – new scheme build – no exceedance flooding to any part of the highway. Further demonstration of exceedance and overflow to receptors required.

AECOM Response – The proposed drainage has been designed to accommodate a 1 in 100 + 20% design storm as per agreement with OCC. Sensitivity checks have been undertaken for the 1 in 100 +40%CC and where flooding occurs, the volume and flow directions have been noted on the drawings.
Exceedance events above those modelled are outside the requirements of planning and the resultant volume of flood water is unknown. These would need to be determined on a case by case basis.

Culverts

4.3.3 To maintain the watercourses within the section, a number of culverts have been proposed. These culverts can be seen within the drainage layout drawings within Appendix A.

Are culverts absolutely necessary, can they be replaced with open ditch?

AECOM Response – these are absolutely necessary and have only been used for road crossings or where alternative open swales cannot be provided.

4.4 Clifton Hampden Bypass

Overview

4.4.1 It is important that the overland flow is separated from the highway drainage, where practicable, in the design of the new highway drainage system.
4.4.2 It is proposed to install intercepting drainage parallel to Clifton Hampden Bypass where required to protect the proposed earthworks and carriageway from surface water runoff from adjacent land. At this stage, it is proposed that this intercepting drainage will generally be open ditches.
4.4.3 The flows from the intercepting drainage are generally from permeable areas, usually adjacent lands and will directed to the nearest watercourses via proposed ditches.

Where is the evidence of design, drawings, calcs etc required?

AECOM Response – See Appendix A – Drawings and Documents and Appendix B – Simulation Results

4.4.4 These flows will not be connected into the highway drainage system or the ponds except the locations between chainages CH200 and CH570 to the south of the CHB (see drawing CHB_PD-ACM-HDG-SW_ZZ_ZZ_ZZ-DR-CD-0001) and between chainages CH1300 and CH1700 (see drawing CHB_PD-ACM-HDG-SW_ZZ_ZZ_ZZDR-CD-0002) to the north of the Clifton Hampden Bypass between Farm Access and west of the CSC Secondary Access.

4.4.5 The flow from the natural catchment between chainages CH200 and CH570 will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is constrained by the existing utilities.
4.4.6 The flow from the natural catchment between chainages CH1300 and CH1700 will

be collected in ditches and then will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is located in close proximity to the Culham Science Centre boundary and therefore it is constrained by the Red Line Boundary.

Cannot have overland surface water flow paths intercepted then directed into highways drainage network – no mixing surface water/highways drainage.

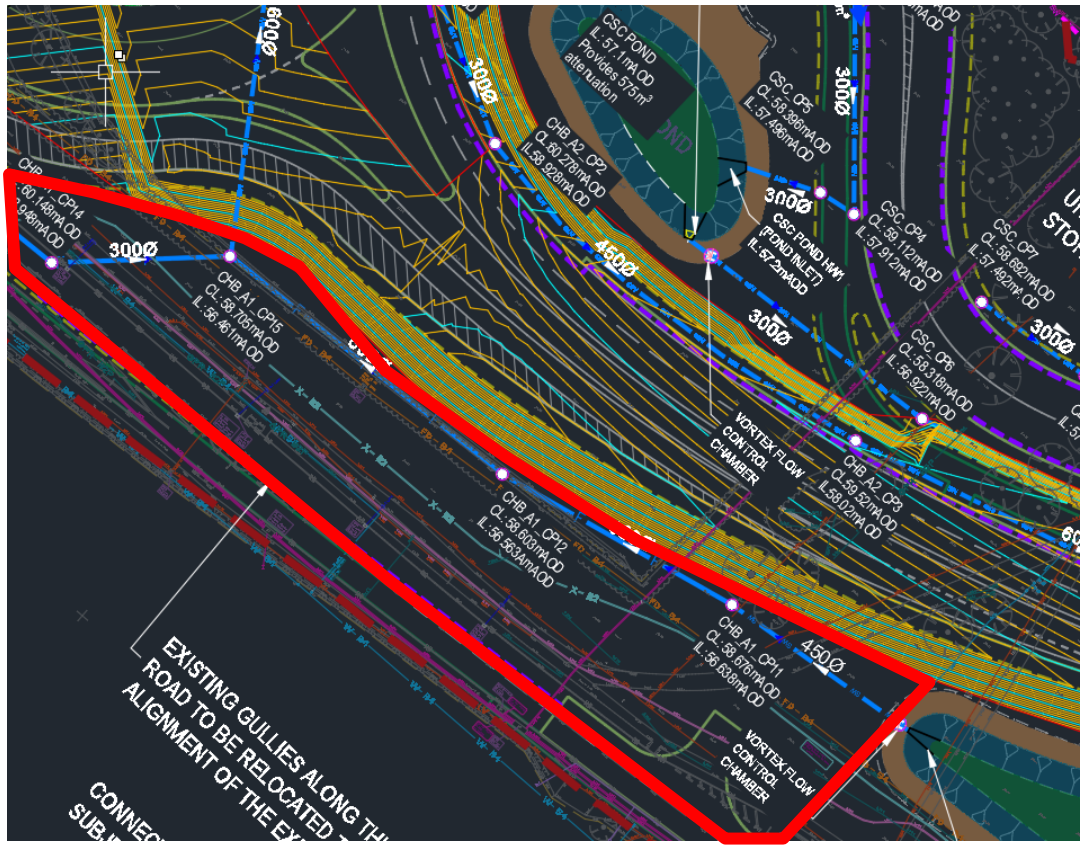
This approach will need agreement, if permissible with OCC HA.

4.4.5 The flow from the natural catchment between chainages CH200 and CH570 will be connected to the highway drainage system due to the ground falling from east to west. There is no feasible solution to separate the overland from the highway drainage as this area is constrained by the existing utilities.

4.4.7 There is another small area of natural catchment on either side of the realigned B4015 which will be also be connected to the highway drainage due to insufficient space to provide separate open ditches to collect the surface water runoff from the natural catchment.

This will need further justification why the natural drainage regime of the catchment cannot be replicated and why there is a need to divert overland surface water flows into a highways drainage network.

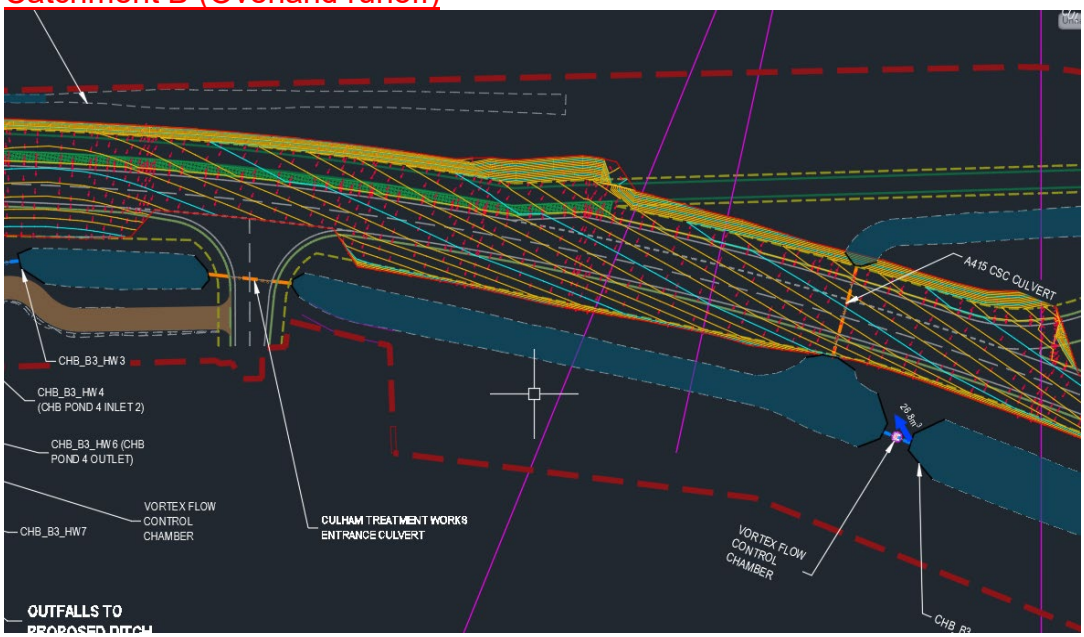
AECOM Response –
Catchment A and roundabout – Overland runoff (highlighted in red)



Constraints considered during preliminary stage:
Utilities and proposed road EW extents. Therefore, no space is available to provide separate ditch to convey the overland runoff.

Solution to separate the overland from highway: Connect 600mm pipe from CHB_A1_CP16 directly to the CH_A1_CP18 (existing SW sewer). This will have a cost implication by adding additional 100m long (approximate) 600mm carrier pipe and an additional MH (1.5m dia).

Catchment B (Overland runoff)



As per OCC requirement over the edge drainage has been used to collect the runoff from road between 985 and 1690 using SuDS.
In order to separate natural and highway runoff:

- Additional gullies will be required to collect the road runoff from Ch 1100 and 1300 this needs to be conveyed via carrier pipes to pond (additional cost).
- Runoff from shared access (between Ch 1100 and 1300) – will be collected in a combined grassed surface water channel. The flow from the grassed channel will be discharged into the pipe system underneath the channel and then into another carrier pipe system before discharging to CHB Pond 3. Additional carrier pipes and MH will be required (additional cost).
- CSC Secondary access require separate carrier pipe system between mainline and the CSC secondary access. This needs to be conveyed underneath the mainline using separate pipe system to discharge to pond.

5. Highway Drainage Strategy

5.1.2 The highway drainage strategy covers the surface water runoff from the A4130 Widening section. The surface water runoff from the A4130 Widening section will be

treated and attenuated prior to discharging into the receiving watercourses.

Where are the drawings, design, calculations, detailed explanation/technical note to support the above statement?

AECOM Response - Please see the combined Drainage Strategy Report GEN_PD-ACM-HDG-DGT_DRG_ZZ_ZZ-RP-CD-0001 and associated drawings listed in the appendices.

5.2 Overview – Didcot Science Bridge

5.2.1 A surface water drainage network will be required to accommodate the increased impermeable area resulting from the proposals, discharging at Qbar runoff rates to proposed outfalls. Where outfalls discharge into shared third party basins, these have been designed to agreed Qbar rates, so as not to increase the overall discharge rates from all the sections combined.

Have third party agreements been obtained? Where are the drawings, design, calculations, detailed explanation/technical note to support the above statement? Who is responsible for maintenance of the third party basins? (Commuted sums??)

AECOM Response - Brookbanks as a third-party designer has planning approval for the proposed scheme we are tying into for DSB. Agreed with Brookbanks and OCC separately for our design to tie into. Do not have detail of commuted sums, this is something OCC will have to provide. Drawings are overlaid in our GA drawings, with all drainage details and levels. If original drawings required, these should be requested to Brookbanks separately by OCC.

5.2.2 The highway drainage strategy covers the surface water runoff from the Didcot Science Bridge section. The surface water runoff from the section will be treated and attenuated prior to discharging into the receiving watercourse.

Where/how/discharge rate and location?

AECOM Response – Discharge to swales and basins design to intercept runoff prior to discharge eto waterbody. In line swales in existing ditches will have weirs/flow controls to control flows and filter out pollution. Refer to combined Drainage Strategy Report GEN_PD-ACM-HDG-DGT_DRG_ZZ_ZZ-RP-CD-0001 for details on drainage proposals. Refer to drawings GEN_PD-ACM-HDG-DGT_DRG_ZZ_ZZ-DR-T-0023 to 025 for layout proposals (within appendices).

5.3.2 The highway drainage strategy covers the surface water runoff from the Didcot to Culham section. The surface water runoff from the section will be treated and attenuated prior to discharging into the receiving watercourse.

Where/how/discharge rate and location?

AECOM Response – Refer to above point for 5.2.2 query. Refer to drawings GEN_PD-ACM-HDG-DGT_DRG_ZZ_ZZ-DR-T-0020 to 022 for layout proposals.

5.4 Overview – Clifton Hampden Bypass

5.4.2 The surface water runoff from the Clifton Hampden Bypass will be treated and attenuated prior to discharging into the receiving watercourse or sewer.

Where/how/discharge rate and location? WaSC agreements in place?

AECOM Response – Section 9 of the combined DSR describes where and how each catchment discharging to receiving watercourse or sewer. This section includes a summary table for each catchment with discharge rates areas etc.

5.5 Methods of Discharge for Surface Water Runoff

5.5.1 As detailed within CIRIA 753 'The SuDS Manual'; Section 3.2.3, the destination for offsite surface water runoff that is not collected for use should be prioritised in the following order:

- Firstly, to filter drain infiltration/soakaway
- Secondly, to a watercourse or highway ditch (with permission)
- Thirdly, to a surface water sewer or highway drain (with permission).
- Lastly, to a combined sewer (with permission)

Clear demonstration/justification as to where/why, why not above outlined approaches have been adopted.

AECOM Response - See section 5.5 of the combined DSR which explains this.

5.9 Attenuation of highway runoff – Didcot to Culham River Crossing

5.9.2 The section of proposed highway between the Collett roundabout and Hartwright House runs through the future DTECH development. The carrier swales provided alongside the carriageway at the bottom of the embankment have been sized with a future inflow consideration from the development and also for the amount of land take-up is made. The DTECH developer had expressed concern that the latter should be limited as far as practicable. The carrier swale profile is therefore a compromise between the two interests and maintains a reasonably shallow profile to account for expected ground water levels.

Evidence that this issue has been resolved with DTECH development.

AECOM Response – DTECH development site is ongoing. The Bypass scheme assumes that the DTECH development may never come forward and therefore the highway drainage through this section currently washes its own face. Should the DTECH site come forward, the drainage will need to be integrated and re-designed to accept the additional flows and a change in ownership / maintenance agreed between OCC and the DTECH site Developer.

Catchment Comparison for Collet Road Roundabout Catchments A & B

Catchment B will therefore require an area of 504m^2 to be attenuated in oversized pipes and the discharge controlled to 2.0l/s by means of hydrobrake.

Oversized pipes are contrary to Local Standards – design should be reviewed and revised.

AECOM Response - OCC design guide doesn't stipulate that oversized pipes are contrary to Local Standards. Please advise where this is stated as we are aware that for other applications the proposal to use oversized pipes has been accepted by OCC. The oversized pipes serving catchment B are not within the highway and therefore don't form part of a continuous drainage system.

5.10 Attenuation of Highway Runoff – Clifton Hampden Bypass

5.10.2 Proposed new connections to existing surface water sewers have been attenuated to Q1. Initial contact has been made with CSC regarding this, in principle they are happy for us to connect, but this will be subject to the detailed design satisfying their conditions.

Has further progress been made on this? Why Q1 only? This needs to be resolved to ensure viable discharge.

AECOM Response – See Appendix C of the combined DSR

5.10.3 In accordance with OCC Local Standards and Guidance, surface water attenuation has been designed to accommodate the 1 in 100 year storm event with a 20% allowance for climate change. A sensitivity analysis has been undertaken to understand the flooding implication in a 1 in 100 year storm event with a 40% allowance for climate change.

Has 40% sensitivity analysis been undertaken, what are the outcomes? Justification of 20% required.

AECOM Response – Yes. See Appendix B – Simulation Results for 100 Year Return Period. 20% design value agreed with LLFA at outset of project feasibility, in line with OCC guidance.

5.14.6 A runoff coefficient of 0.45 has been applied to overland catchment areas and embankments where there has been insufficient GI data available. The runoff coefficient has been determined from The Wallingford Procedure Volume 3: Maps; *Winter rain acceptance potential*.

The LLFA would query the use of Cv of 0.45. The applicant must justify why they consider this appropriate and provide a suitable evidence base for the proposed value. The LLFA are unlikely to accept this given the uncertainties mentioned for the catchment.

AECOM Response – At LLFA request, we used Cv =1 for the calculations to run the MicroDrainage model.

0.45 value was used for the soft landscape area to calculate the effective impermeable area (45% Percentage Impervious) for each catchment. This value was determined from *The Wallingford Procedure Volume 3: Maps; Winter rain acceptance potential* using the location coordinates of the site.

5.15 Surface Water Drainage

5.15.4 Combined kerb drainage units have been proposed where the gully spacing is not economical to construct relative to a combined kerb drainage unit, and where levels do not suit gullies.

As with 5.15.9 and other references to combined kerb drainage.

The LLFA are highly unlikely to accept any form of "beaney block" gully system. LS advocate over the edge drainage or side entry.

AECOM Response: Combined kerb drains (CKD) have been used in select locations where absolutely necessary to facilitate gravity drainage to the attenuation features, where not suited to piped drainage (utilities avoidance and available levels). Bridge deck drainage also proposes to use CKD for access and risk of piped drainage beneath deck above rail track. Not enough width for a suitable v-channel system. CKD are accepted and adoptable systems. Oxfordshire Highways team aware of design constraints for use of CKD.

Management and Maintenance plan includes regime for CKD to ensure they operate effectively. As with any gully / road drainage system, they all require maintenance to operate effectively.

5.16 Subsurface Drainage

The LLFA recommend a minimum monitoring of six months in areas identified as having a high ground water table where sub-surface drainage is proposed. Agreed

5.16.3 It is noted that road levels in some locations do not allow for the required depth of sub-base drain with available fall left to discharge to a receiving watercourse. In two locations there is a backfall to the sub-base drain effectively providing a reverse effect to what is required. Further design updates are needed to allow the highway and drainage interface to work. Current designs have been checked with the outfalls being modelled. This paragraph should be omitted.

5.16.4 Further design of the subsurface drainage is a task to be carried out in the detailed design, however, checks have been carried out at the highway low points to ensure that an outfall from the subsurface drainage system would be able to connect into the surface water drainage watercourse or basin.

What progress has been made on conceptual design to address the above?
Preliminary design has been submitted which addresses this issue.

5.18 Grassed Surface Water Channels

5.18.1 Grassed surface water channels have been designed to collect the surface water runoff the mainline carriageway where possible in the Clifton Hampden Bypass section in accordance with CD521. These channels shall be triangular in cross section with maximum depth of 200mm.

Reasoning for triangular design required – erosion potential, bank slippage.

AECOM Response: a triangular shape was used due to cross-sectional width constraints. During detailed design any erosion protection measures for the ditches can be assessed.

5.18.3 The surface water channels will accommodate a 1 in 1 year storm within channel and checked to ensure the 1 in 5 year storm +20%cc does not encroach into the adjacent lane.

Why only the stated RP's? Has sensitivity testing been undertaken for 40%?

AECOM Response - Sensitivity testing has been completed for 40% CC

5.19.5 All new drainage outfalls will be subject to discharge consent or environmental permits as required.

What stage is consenting/permitting at?

AECOM Response – Detailed design stage

6.13 Climate Change Assessment

Justification/explanation as to where 30% (incorrect – drainage report doesn't mention 30%) CC allowance has been derived from. There seems to be a mix and match approach to using 20%, 30% and 40% for pluvial CC allowance. Clarification required.

AECOM Response – Attenuation design is for the 1in100+20% Climate Change with sensitivity testing for 1in100+40%. 30% Climate Change allowance is not considered in the drainage designs.

Any identified flooding, as suggested in the text, relating to the above CC allowances must be validated and full explanation provided.

As per above for:
Didcot Science Bridge section
A4130 Widening Section
Didcot to Culham River Crossing

Other:

Standard methodology needs discussion relating to Qbar/Qmed, in relation to use of FEH data.

E.G. DWG GEN_PD ACM HDG DGT_DRG_ZZ_DZRZ T 0003 Rev P01 *AEC Pond 7, discharge rate 3.8l/s – agreed rates are 2l/s?*

AECOM Response – Agreed rate was 3.8l/s/ha as qbar for DSB/A4130. Pond 6 proposed as 2.0l/s pro-rata as less than 1ha contributing area. Pond 7 has a 1ha contributing catchment. No change to drawings required.

As built plans and details of any management and maintenance company will need to be provided on completion.

AECOM Response – These are established at the Detailed Design stage and should form part of the post construction requirements from the appointed Contractor.