A14 Flood Risk Design Criteria

As sent ot EA for agreement (see their letter in reponse dated 26 February 2014)

Ref	Description	Summary	Adopted Approach	Previous FRA Conclusion	PoE Ref	FRA Ref
OVERALL APPROACH						
1	**FRA Approach**	Follows DMRB Vol.11 Sec.3 Pt.10 Annex I Methods E and F Adopted three stage assessment approach: 1) Importance of flood risk 2) Magnitude of flood risk 3) Significance of flood risk	**To achieve a NEGLIGIBLE MAGNITUDE of impact for flood risk the peak water level for the 100yr event should not exceed a 10mm increase. If this is exceeded, mitigation measures will be required.**		3.4.1	
2	**'Importance' of Flood Risk**	Determines the extent of flood risk to land and property considered from baseline modelling results *See table in 'importance' tab*	**Boundaries of impact taken as:** **a) Upstream and downstream extent to which hydraulic modelling concluded there was no change in flood levels as a result of the scheme** **b) Upstream and downstream urban areas**		3.4.9	
3	**'Magnitude' of Flood Risk**	Determines the impact to surface water, groundwater and flood risk	**Based on the 100yr event**		3.4.11	
4	**'Attribute' of Flood Risk**	Importance combined with Magnitude	**Determines whether impact is:** **Negligible, Slight, Moderate, Large, Very Large**			
5	**Climate change**	In accordance with PPS25 / DMRB Vol.4, Sec.2, Pt.3 HD33/06 + Vol.11, Sec.3, Pt.10 HD45/09: Rainfall / Peak Flow 1990 to 2025 = 5% / 10% 2025 to 2055 = 10% / 20% 2055 to 2085 = 20% / 20%	**Allowance adopted is +20% for design horizon up to the year 2085**		2.1.3	
6	**Sequential Test**	Considered as part of the Cambridge to Huntingdon Multi-Modal Study (Aug,2001). All considered routes crossed floodplain	**Taken into account at time of preferred route decision**		3.4.3	
7	**Exception Test**		**The proposed road is deemed 'Essential Infrastructure'**			3.17
HYDRAULIC MODELLING						
8	**Critical watercourses**	Discussions with EA identified critical watercourses (Each modelled as existing and modified to determine the impact of the road)	**The following watercourses were agreed as critical** **a) Brampton Brook and its northern tributaries** **b) River Great Ouse including the Internal Drainage Board Drain No. 1 to the west** **c) Western and Eastern Award drains, tributaries of West Brook** **d) West Brook** **e) Oxholme Drain** **f) Covells Drain** **g) Oakington Brook**	All modelled	3.4.5	
9	**Additional modelling**	Utton's Drove Drain	**Modelled at request of an objector**	Modelled	3.4.6	
10	**Flood defences**	No formalised flood defences in vicinity of the scheme	**Models ignored effect of defences**			
11	**Sensitivity**	Test for impact of climate change	**+20% flows added to proposed (with-scheme) hydraulic models to ascertain impact of climate change and results discussed with the EA**		3.4.7	
12	**Hydraulic modelling NOT required**	Discussions with EA determined those watercourses that did not require hydraulic modelling assessments. Not modelled because a) No impact b) EA has an existing model c) Impact not considered critical Where the scheme would impact on the floodplain an assessment of peak water levels was undertaken using Flood Zone maps or modelled levels (or a combination)	**Watercourses not modelled were:** **a) Ellington/Alconbury Brook, impact on the floodplain not critical** **b) Grafham Road Drain, peak flood water level assessment undertaken** **c) Utton's Drove Drain, peak flood water level assessment undertaken** **d) Longstanton Brook, peak flood water level assessment undertaken** **e) Beck Brook, peak flood water level assessment undertaken** **f) Washpit Brook, peak flood water level assessment undertaken** **g) Award watercourses north of Cambridge, impact on the floodplain not critical** **h) River Cam, peak flood water level assessment undertaken**	Not modelled	3.4.13	

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CONSIDERATION OF NON-FLUVIAL SOURCES OF FLOOD RISK						
13	**Groundwater**	No discharge to ground via soakaway of indirectly through seepage	**No water discharged to ground during the operation of the road**		3.3.1	
14	**Pluvial flood risk**	Flooding from surface water ponding on the ground surface	**Risk assessed based on engineering experience.**	Considered to be 'negligible', no records of overland flow flooding from IDBs and local authorities		
15	**Groundwater flood risk**		**Proposed as a review of the Site Investigation**	Low permeability boulder clay with permeable pockets. No known historical occurrences of groundwater flooding. Assessed as LOW risk		
16	**Sewer Flood Risk**	No recorded instances of sewer flooding	**Review Anglian Water records**	No known flood risk		
17	**Other sources of flooding**		**Based on a review of available data**	No significant impact from Lakes, Ponds, Reservoirs or Canals		
IMPACT MITIGATION						
18	**Floodplain Compensation**	FpC required to compensate for some of floodplain	**Floodplain compensation proposed where there is loss of floodplain on non-modelled watercourses and where impact not negligible on modelled watercourses (>10mm increase in 100yr water level)** **FpC to be Level-for Level**	Identified for: a) Brampton Brook b) Grafham Road Drain c) Longstanton Brook d) River Cam	5.2.8	
19	**Culverts**	Modelling	**No modelling where no new culverts proposed (only extensions of existing). Providing the existing culvert cross-sectional area and dimensions are maintained.** **Culverts sized using FEH or IH124 methods to derive catchment areas and then 'Hydraulic Charts for the Selection of Highway Culverts', Hydraulic Engineering Circular No.5 by US Bureau of Public Road (Dec 1965) - which has been used and accepted on similar road schemes**			4.1
20		New culverts	**a) Designed to convey the 100yr+climate change flow** **b) Provide freeboard = 1/4 of the pipe diameter and 500mm for box culverts** **c) Depressed inverts below existing bed = 1/4 of the pipe diameter and 600mm for box culverts to allow for future re-grading of the watercourse**	Agreed with EA and Alconbury and Ellington IDB		4.74
21		Existing culverts	**Where extended, designed to convey the 1% (1 in 100yr) storm**			4.1
22		Trash Screens	**Only to be installed where "absolutely necessary"**	In effect only considered in urban areas, or where on existing culverts		4.6
23		Blockage Risk	**Criteria for assessing blockage risk:** **a) If no existing screen risk assessed using EA Culvert Blockage Risk Assessment spreadsheet.** **b) If Low risk no blockage run undertaken** **c) If Medium risk 20% blockage applied** **d) If High risk 50% blockage applied** **(Where required model runs undertaken for 10, 50 & 100yr events)**	Used Version 1.4 (Jan 1998) All culverts found to be low risk		4.7
24	**Highway drainage**	Drainage	**No flooding for the 5yr storm event, plus allowance for climate change**			
25		Attenuation	**Ponds provided for highway attenuation prior to discharge to existing watercourses**	36 ponds proposed		

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26		Runoff rates	**a) For existing paved highway areas, the 1 in 1 year and 1 in 5 year run-off flow.** **b) For new areas of highway, the 1 in 1 year, 1 in 5 year and 1 in 100 year green field run-off rate for the same land area.** **c) For both existing paved highway and additional new areas of highway, the 1 in 1 year and 1 in 5 year run-off flow for existing paved areas and the 1 in 1 year, 1 in 5 year and 1 in 100 year green field run-off rate for the new highway areas** **Any increase in peak flows against existing will be at Greenfield rates**	Agreed with the EA as drainage authority for the scheme	5.1.9	
27		Greenfield Runoff Rates	**Calculated based on Institute of Hydrology Report 124 (for catchments <50ha)**			4.14
28		Ponds	**Sized to:** **a) store flows up to the 1 in 100yr storm plus allowance for climate change** **b) provide a vegetative system of reed bed and other wetland planting for pollutant removal prior to discharge to the receiving watercourse**			
OTHER						
29	**Minor Roads**	Minor road diversions	**Maintain existing drainage on minor roads and make re-connections, no attenuation or pollution measures provided on these roads as there will be no change from existing**		5.1.14	
30	**Construction**	Temporary works	**Wherever possible haul roads and working platforms will not be raised above the existing ground level to avoid introducing a barrier or obstruction to flood flows** **Reworking of soil will be minimised in the floodplain and suitably protected against erosion in the floodplain**		6.1.12	