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15th October 2021



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For the attention of: **Amechi Karl Dafe**

TOWN AND COUNTRY PLANNING ACT 1990

Re: HS2 Application Ruislip Golf Course Ickenham Road (Ref: 10737/APP/2020/3359) – Drainage

Dear Karl,

Further to the meeting held on 9th September between Victoria Boorman (LBH), Nigel Phelps, Pascual Pery and Sophie Hart (SCS), we submit herewith revised documents and information relating to the drainage design for the HS2 Application Ruislip Golf Course Ickenham Road (Ref: 10737/APP/2020/3359) (as listed below).

The overall nature of the formal comments received (dated November 2020) were such that the hydraulic model developed to accompany the design for which full permission is being sought needed to be progressed to completion. This has now successfully been achieved, thereby allowing us to produce the additional detail required (either in the form of text within the Drainage Report, or in additional illustrations or drawings) to respond to / answer each individual comments.

For clarity, Appendix A to this letter contains a summary table of how we have responded to each individual comment, together with a reference to the relevant section within the drainage report or to the accompanying plan or other document. For completeness, the hydraulic model is also being issued to you, however as it is not a plan or report as such, it does not form part of the planning application.

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OFFICIAL

Document Title: Submission Letter – Ruislip Golf Course S2

Document no.:

Revision: Co1

The documents submitted are detailed in the following tables.

Reports and Hydraulic Modelling		
Doc. Number	Document Title	Comments
1MCo4-SCJ-DR-REP-SS05_SL07-000003	Drainage Report - Ruislip Golf Course S2	Resubmitted. Updated due to LBH comments
1MCo4-SCJ-DR-ASM-SS05_SL07-000001	Flood Risk Assessment - Ruislip Golf Course S2	Resubmitted. Updated due to LBH comments
1MCo4-SDH-EV-REP-SS05_SL07-000001	Flood Levels Analysis Report - Ruislip Golf Course S2	New Report. Submitted due to LBH comments
Reports and Hydraulic Modelling – Submitted for Information Only		
1MCo4-SDH-EV-MOD-SS05_SL07-000001	Hydraulic Model - Ruislip Golf Course S2	New Model. Submitted due to LBH comments. This is submitted for information only.

Drawings		
Drawing Code	Drawing Title	Comments
1MCo4-SCJ_SDH-DR-DDE-SS05_SL07-564501	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Piped Drainage System and Chamber Detail. Typical Cross Sections and Details	New Drawing. Submitted due to LBH comments
1MCo4-SCJ_SDH-DR-DDE-SS05_SL07-564502	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Pipe Culverts. Typical Sections And Details	New Drawing. Submitted due to LBH comments
1MCo4-SCJ_SDH-DR-DDE-SS05_SL07-564503	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Pond Details	Resubmitted Drawing with a new Drawing Code. Updated due to LBH comments. Old Drawing Code: 1MCo4-SCJ-DR-DDE-SS05_SL07-244002

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Drawings		
Drawing Code	Drawing Title	Comments
1MCo4-SCJ_SDH-DR-DPL-SS05_SL07-561101	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Drainage Plan. Sheet 1 of 2	Resubmitted Drawing with a new Drawing Code. Updated due to LBH comments. Old Drawing Code: 1MCo4-SCJ-DR-DPL-SS05_SL07-241001
1MCo4-SCJ_SDH-DR-DPL-SS05_SL07-561102	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Drainage Plan. Sheet 2 of 2	Resubmitted Drawing with a new Drawing Code. Updated due to LBH comments. Old Drawing Code: 1MCo4-SCJ-DR-DPL-SS05_SL07-241002
1MCo4-SCJ_SDH-DR-DPL-SS05_SL07-561103	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Existing Drainage Plan	Resubmitted Drawing with a new Drawing Code. Updated due to LBH comments. Old Drawing Code: 1MCo4-SCJ-DR-DPL-SS05_SL07-241003
1MCo4-SCJ_SDH-DR-DSE-SS05_SL07-562251	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Ditches and Swales. Cross Sections. Sheet 1 of 2	New Drawing. Submitted due to LBH comments
1MCo4-SCJ_SDH-DR-DSE-SS05_SL07-562252	Ruislip Golf Course. Water Resources and Flood Risk Drawing. Ditches and Swales. Cross Sections. Sheet 2 of 2	New Drawing. Submitted due to LBH comments

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We trust the above gives you sufficient information to determine the Full Planning Application. Should you have any queries, please do not hesitate to contact Lucy Neal (Lucy.Neal@scsrailways.co.uk).

Yours Faithfully,

Mark Fewster
HS2 Town Planning Manager
High Speed Two (HS2) Limited

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Appendix A – Comment Sheet

	Officer Comment	Applicant Response
1	Drainage outfalls are not clearly identified within the submitted report, nor are the actual areas that drain to these points made clear.	All run-off from catchment areas which discharge into the existing and proposed ditches and swales have now been considered in the hydraulic calculations. Thames Water has provided information regarding sewer system discharges from Eastern and Northern urban areas. Section 3.3.4 of the updated Drainage Report (Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003) includes figures showing catchment areas and discharge points for these urban areas.
2	The catchment to the south of the Chiltern Mainline is acknowledged but not included in calculations. In reality, no assessment has been made of the Thames Water Network in this area which it is stated has been used to inform this catchment area. It is not therefore clear that the appropriate catchment areas have been used to estimate run off though the golf course.	Areas located to the south of the Chiltern Mainline and to the north of Greenway Road (which partially drains to the north of the application site) have been considered in the hydraulic modelling for Baseline Scenario. Due to the proposed HS2 works in this area, run-off from this catchment area will be drained to the Ickenham Stream stretch located at the south of the HS2 line. The existing available information for the Thames Water Sewer system shows that run-off in this area is conveyed by the sewer system and connected with the Greenway Sewer Pipe that drains to the South from the Chiltern line. Section 4.3.3 of the updated Drainage Report (Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003) describes impact on the catchment to the south of the Chiltern Mainline due to the HS2 scheme.
3	It is not clear why conveyance of only 1 in 5 and 30 year events have been used. No evidence has been provided to justify this, or demonstrate that this is adequate to receive all flows from Thames Water sewers and above ground flows across the site.	The updated drainage design has considered the following criteria: The pipe system within playable areas are 1 in 30 as proposed in the Sustainable Drainage Design and Evaluation Guide (Hillingdon). For Ordinary Water Courses Ditches and Swales this is 1 in 100 + CC. This was defined following the criteria for culverts design in LBH <i>Technical Specifications and Guidance for works affecting Watercourses</i> . In order to assess the flooding conditions in the area for different return periods (1 in 2, 1 in 5, 1 in 30, 1 in 100, 1 in 100+CC and 1 in 1000 years), a detailed 2D hydraulic model of the area has been developed. The final drainage network has been designed in accordance with the flood analysis results of this model. A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) showing results of the hydraulic modelling for the above return periods is submitted alongside this document.
4	A large area drains to the River Pinn via this site so it thusly provides significant opportunity to slow the flow to the River Pinn. Accordingly, it is an area in which the Environment Agency are actively leading a Flood Alleviation scheme - rather than just maintaining the status quo.	Based on the results of the hydraulic modelling in the area, attenuation is being provided due to the proposed ponds and Ickenham Stream Diversion. In order to assess the flooding conditions in the area for different return periods (1 in 2, 1 in 5, 1 in 30, 1 in 100, 1 in 100+CC and 1 in 1000 years), a detailed 2D hydraulic model of the area has been developed. The final drainage network has been designed in accordance with the flood analysis results of this model. A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) showing results of the hydraulic modelling for the above return periods is being submitted alongside this document. Please refer to sections 5.2.8 and 5.2.9.
5	It is not clear which areas within the reports are to be raised affecting drainage, and this should be included in the flood and drainage reports or clearly cross referenced for review.	Please refer to the Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001), this shows the flooding conditions for both baseline and HS2 scenarios. Clarification was given on this at a Coordination Meeting with LBH on 09/09/2021 where the Flood and Water Management Officer (Vicky Boorman) confirmed that the flood extents should be clearly shown.
6	As the site is designed only to a 1 in 30-year event it is not clear where exceedance flows would occur across the wider area and site and these flow paths need to be assessed.	In order to assess the flooding conditions in the area for different return periods (1 in 2, 1 in 5, 1 in 30, 1 in 100, 1 in 100+CC and 1 in 1000 years), a detailed 2D hydraulic model of the area has been developed. The final drainage network has been designed in accordance with the flood analysis results of this model. A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) showing results of the hydraulic modelling for the above return periods is being submitted alongside this document.
7	The proposals to drain the car park involve formal gullies and pipework. However, it is not clear why the least sustainable solution has been provided or how other more sustainable alternatives have been considered i.e. rain gardens and open swales as, unlike gullies and pipe, these would not require additional cost to the Council to inspect and maintain.	The drainage system described for the car park is the existing system rather than any new intervention. As the car park extents and materiality are to be retained in their current configuration, reviewing the potential for a new drainage system here is not within the scope of the Ruislip Golf Course works. This existing drainage system has been removed from the submitted drawings.
8	3 ponds for water reuse are proposed along with the provision of pumping. The outlets proposed are large and no detail of these or their safety features has been provided.	The cross sections for the proposed outlets in the main ponds is shown on drawings 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562251 and 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562253.
9	Section 5.3.11 Table 22 details the proposed ditches which appears to suggest a 0.5 % side slope. The preference however is for 1 in 3 side for a ditch where possible. A cross section of existing and proposed should be provided indicating how this impacts on the landscaping alongside existing features.	Further information on proposed swales and ditches is provided in table 3 of the updated Drainage Report (Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003) Cross sections for existing ditches are shown in drawing 1MC04-SCJ_SDH-DR-DPL-SS05_SL07-561103. Proposed cross sections are shown in drawings 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562251 to 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562252.

	Officer Comment	Applicant Response
10	<p>The realigned Ickenham Stream will discharge into the River Pinn; and is also to be used as an attenuation basin and as an ecological corridor. It is not clear however how this will attenuate flows in higher events and no level details have been provided.</p>	<p>In order to assess the flooding conditions in the area for different return periods (1 in 2, 1 in 5, 1 in 30, 1 in 100, 1 in 100+CC and 1 in 1000 years), a detailed 2D hydraulic model of the area has been developed. The final drainage network has been designed in accordance with the flood analysis results of this model.</p> <p>A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) showing results of the hydraulic modelling for the above return periods is being submitted alongside this document.</p>
11	<p>The FRA refers to LB Hillingdon's sustainable drainage requirements as set out in the Sustainable Drainage Design and Evaluation Guide. Additionally, a summary of the drainage system notes that the irrigation needs of the site are to be met entirely by drained water. A water harvesting system is designed as part of the drainage network. Additionally, the designed drainage network will reduce the current runoff flow rates to the River Pinn. The 1 in 100 rainfall event plus 40% of climate change allowance is attenuated to the Greenfield rates. The attenuation is achieved providing additional volume in the water harvesting ponds and tanks. The Drainage Strategy presented however does not mention this or adhere to its requirements.</p>	<p>The submitted Drainage Report indicates that the drainage system consists of basins, ponds and swales. These are connected to the water harvesting system in order to collect as much water as possible. As such, this system provides a higher runoff attenuation than the current situation, which has been observed in the results of the hydraulic modelling (see section 9.3.24 of Doc. number 1MC04-SCJ-DR-ASM-SS05_SL07-000001).</p> <p>The description of the proposed drainage network has been updated in the FRA to ensure that it is consistent with the Drainage Report.</p>
12	<p>It is not clear which modelling report the flood risks have been based on. The Council are aware the HS2 has updated the Environment Agency mapping, but the extracts from the FRA shown are what is publicly available so it is not clear if the proposal has used the best available data. There are concerns that the original modelling does not represent accurately the most recent large event in 2016 or inflows from ordinary watercourses or Sewers, which is critical in this area.</p>	<p>In order to assess the flooding conditions in the area for different return periods (1 in 2, 1 in 5, 1 in 30, 1 in 100, 1 in 100+CC and 1 in 1000 years), a detailed 2D hydraulic model of the area has been developed. The final drainage network has been designed in accordance with the flood analysis results of this model.</p> <p>A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) showing results of the hydraulic modelling for the above return periods is being submitted alongside this document. It shows the hydraulic modelling baseline and HS2 scenarios, updated to reflect the flooding conditions in the area.</p>
13	<p>The watercourses within the Golf Course do not freely discharge to the River Pinn when it is high, backing up within the golf course and causing disruption to residents and the Celadine Walk. There are no proposals which appear to address this issue as promised.</p>	<p>Flood risk elsewhere will not be increased due to the Ruislip Golf Course works. It should be noted that the Celadine Walk is already affected by River Pinn flood levels in some areas. Therefore, avoiding footpath flooding entirely is not possible without affecting the River Pinn flood conditions through the inclusion of additional mitigation measures.</p> <p>Flood mitigation measures included in the proposals are:</p> <ul style="list-style-type: none"> - A 600mm pipe culvert to replace the existing 300mm diameter pipe culvert under the Celadine Route in the North-West area; and - A new ditch has been provided on the right hand side of Clacks Lane to improve flooding conditions in this area. <p>The hydraulic model results show an improvement of flooding conditions in this area for more frequent events (1 in 2 and 1 in 5 years) as a result of the proposal's flood mitigations. Minor improvements have also been obtained for more extreme events despite the area being within the River Pinn's floodplain.</p>
14	<p>The FRA does not acknowledge springs within the site and how this applicants and import of spoil will affect these.</p>	<p>Please refer to sections 8.4.12 to 8.4.14 of the updated Flood Risk Assessment (Doc. Number 1MC04-SCJ-DR-ASM-SS05_SL07-000001) for further information regarding the proposal's potential effect on springs.</p>
15	<p>No information on the indicative cross section and design of the watercourses proposed through the site has been provided. The Clacks lane watercourses, which are the main continually fed streams on the site, appear to be proposed to be captured by the basins - which will disrupt the continuity of ecological corridor and any migration. These streams must remain free from obstruction. This proposal is therefore not considered to meet Water Framework Directive objectives to provide a better water environment. A consideration of the existing and proposed watercourses gained and lost need to be provided.</p>	<p>Further information on proposed swales and ditches is provided in table 3 of the updated Drainage Report (Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003)</p> <p>Cross sections for existing ditches are shown in drawing 1MC04-SCJ_SDH-DR-DPL-SS05_SL07-561103.</p> <p>Proposed cross sections are shown in drawings 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562251 to 1MC04-SCJ_SDH-DR-DDE-SS05_SL07-562252. A walkover survey of the Clacks Lane watercourses indicates that they are small artificial channels connected to the River Pinn via a pipe and outfall. This current configuration results in very limited potential for migration of fish, providing little ecological connectivity to the wider Pinn catchment. The proposed design will connect the majority of the Clacks Lane catchment into the realigned Ickenham Stream, where alternative ecological areas will be created within the Golf Course Area to compensate for the reduction in flow to the 150m section of Clacks Lane watercourse downstream of the Ickenham stream crossing. The watercourse will flow through several basins, where suitable planting will result in ecological benefit, before discharging to the River Pinn approximately 200m downstream of its current outfall location. The 150m section of the Clacks Lane watercourses not intercepted by the Ickenham Stream diversion will be maintained.</p> <p>Overall, no adverse effects are anticipated as the impacted habitat area is of low value and disconnected from the wider Pinn catchment, and will be compensated by the ecological benefits proposed as part of the Ickenham Stream diversion. Flows to the River Pinn will be maintained, albeit discharging 200m downstream of the current position, which is not anticipated to result in any adverse effects to the wider Pinn catchment.</p> <p>As Lead Local Flood Authority, LB Hillingdon will retain the consenting right for the proposed Ickenham Stream diversion, the application for which will be brought forward under the Land Drainage Act in the months following the receipt of the planning consent, which will include an overarching WFD Compliance Report that will cover both the stream diversion, the catchment and the new discharge point into the River Pinn.</p>
16	<p>The Clacks lane watercourses, which are the main continually fed streams on the site, appear to be proposed to be captured by the basins - which will disrupt the continuity of ecological corridor and any migration. These streams must remain free from obstruction. This proposal is therefore not considered to meet Water Framework Directive objectives to provide a better water environment. A consideration of the existing and proposed watercourses gained and lost need to be provided.</p>	<p>A walkover survey of the Clacks Lane watercourses indicates that they are small artificial channels connected to the River Pinn via a pipe and outfall. This current configuration results in very limited potential for migration of fish, providing little ecological connectivity to the wider Pinn catchment. The proposed design will connect the majority of the Clacks Lane catchment into the realigned Ickenham Stream, where alternative ecological areas will be created within the Golf Course Area to compensate for the reduction in flow to the 150m section of Clacks Lane watercourse downstream of the Ickenham stream crossing. The watercourse will flow through several basins, where suitable planting will result in ecological benefit, before discharging to the River Pinn approximately 200m downstream of its current outfall location. The 150m section of the Clacks Lane watercourses not intercepted by the Ickenham Stream diversion will be maintained.</p> <p>Overall, no adverse effects are anticipated as the impacted habitat area is of low value and disconnected from the wider Pinn catchment, and will be compensated by the ecological benefits proposed as part of the Ickenham Stream diversion. Flows to the River Pinn will be maintained, albeit discharging 200m downstream of the current position, which is not anticipated to result in any adverse effects to the wider Pinn catchment.</p>

	Officer Comment	Applicant Response
17	<p>Section 6.1.3 of the Drainage Report notes the intention to redefine the Clacks Lane's channels downstream of the Ickenham Stream, crossing and replacing the existing culverts at Hill Lane and Celandine Route to improve channels capacity up to 1 in 30 years return period (420 l/s). These historic bridges provide historic value and it is not clear what these will be replaced with.</p>	<p>The design intent for the footbridge crossing between Clacks lane and the golf course (as highlighted in section 4 of the drainage report, Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003) is for these features to be retained where possible. The feasibility of these retentions will be assessed during construction phase. Where these features need to be replaced it is intended to propose crossings which are in keeping with the existing crossing type and character along Clacks Lane.</p>  <p>Historic bridges that have been identified in the Ruislip Golf Course area are shown in drawing 1MC04-SCJ_SDH-DR-DPL-SS05_SL07-561103. The updated drainage report indicates that the initial approach is to keep existing historic bridges that are in satisfactory condition (section 4.3.5 and 3.2.5 Doc. number 1MC04-SCJ-DR-REP-SS05_SL07-000003)</p>
18	<p>There is no acknowledgement of the wider changes being undertaken nearby which may affect the golf course, its access to and across, and wider public access along the Celandine Walk.</p>	<p>The impact of nearby HS2 development has been incorporated into the hydraulic modelling. The results of this confirm that flooding risk conditions in the vicinity will not be worsened due to the Ruislip Golf Course works. In terms of flood risk impact on access to and across the golf course, it should be noted that the Celandine Walk is already affected by River Pinn flood levels in some areas. Avoiding flooding in the footpath will not be possible without affecting the River Pinn flooding conditions and the potential inclusion of additional mitigation measures.</p> <p>The crossing structures for existing and proposed new accesses to the Ruislip Golf Course have been designed to avoid impacts due to flooding conditions. A Flood Levels Analysis Report (Doc. number 1MC04-SDH-EV-REP-SS05_SL07-000001) shows the results of the hydraulic modelling for different return periods and is submitted alongside this document.</p>