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PLANNING DEVELOPMENT REGENERATION

RESPONSE TO EXAMINERS QUESTION 2.13.5
On behalf of
GREENSFORGE SAILING CLUB

In respect of
Application for Development Consent Order for
West Midlands Interchange
By Four Ashes Ltd

JULY 2019

Response to Examiners Additional Question 2.13.5

"Can the applicant and the Sailing Club please provide a position statement on the further assessment work that has been carried out re the effect of the proposed development on wind condition on the reservoir and the ongoing negotiation between the two parties"

1.0 WORK UNDERTAKEN

1.1 The Sailing Club has been liaising with WMI since the submission of the responses to EXQ1, the work involving the following timeline:

24th April 2019	WMI provide details of the work they propose to undertake in relation to a Sailing Impact assessment. A two report approach was proposed - one to look at Computational Dynamic Flow modelling (undertaken by RWDI), and a further report to interpret that data in relation to Sailing Quality by Wolfson Unit. It was noted that the methodology had been determined.
8th May 2019	Reports issued by WMI. It is specifically noted that the RWDI report was dated 21st March 2019. The Wolfson Unit report is issued as a draft report dated May 2019. Request for meeting following week also received.
20th May 2019	Meeting held between the parties to discuss content of the reports. A number of issues were raised by Greensforge Sailing Club (detailed below)
28th May 2019	Revised reports and WMI Notes of meeting issued with post-meeting updates included. The dates of the RWDI report is changed to May 2019
17th June 2019	Reports published for issue on PINS Website
4th July 2019	Applicants summary of progress and explanatory note regarding work forwarded to the Club and advised that this would be submitted to the Inspectorate to meet with the Deadline 5 submission (due 5th July 2019)

2.0 CONSIDERATION OF SUBMITTED REPORTS:

2.1 The Sailing Club remain concerned that the impact of the proposed development on Sailing Conditions has not been fully or properly assessed despite the reports being undertaken. Specifically we offer the following concerns:

RELEVANT EXPERIENCE OF ADVISORS

2.2 RWDI appear to have engineering experience in relation to designing buildings whilst accommodating comfort at the ground level for pedestrians (see references in Section 1 of the report). They also make reference to generalised windflow patterns in Section 5 of the report which refer to down-washing, channelling and acceleration around corners. All of these conditions refer to the impact of obstacles such as buildings on its windward side. This is not applicable in this case, as the reservoir is located on the leeward side of the proposed buildings.

2.3 We note that the applicant has previously disputed the earlier submissions by Greensforge Sailing Club which shows the potential impact on windflow on the leeward side of an obstacle on the basis that this is identified as being relevant to wind turbines only. This shows a misunderstanding of the point being made, which is not how to ascertain clean wind for a wind turbine, but to identify the impact of the windflow once an obstacle is placed upwind.

2.4 Specifically, whilst references generally relate to where to place a wind turbine, what they do show is the impact on the windflow on the leeward side of an obstruction. Previous submissions provide appropriate references, but this is also supported by the evidence in the following:

2.5 *The Wind Exchange* is a platform supported by the Wind Energy Technologies Office at the US Department of Energy. It focuses on the dissemination of quality and unbiased information to the public, communities, businesses, organisations and state and local government about wind technologies.

2.6 A key publication from this organisation is the "Small Wind Guidebook" (https://windexchange.energy.gov/small-wind-guidebook). Whilst this provides a detailed level of guidance on determining whether the use of wind energy is achievable, it specifically provides detailed guidance on choosing the best site for the location of a turbine. Within this section, details of how the wind becomes more turbulent on the leeward side of an obstruction is identified. Importantly, it advises that the further away from the obstruction the less turbulence will be encountered.

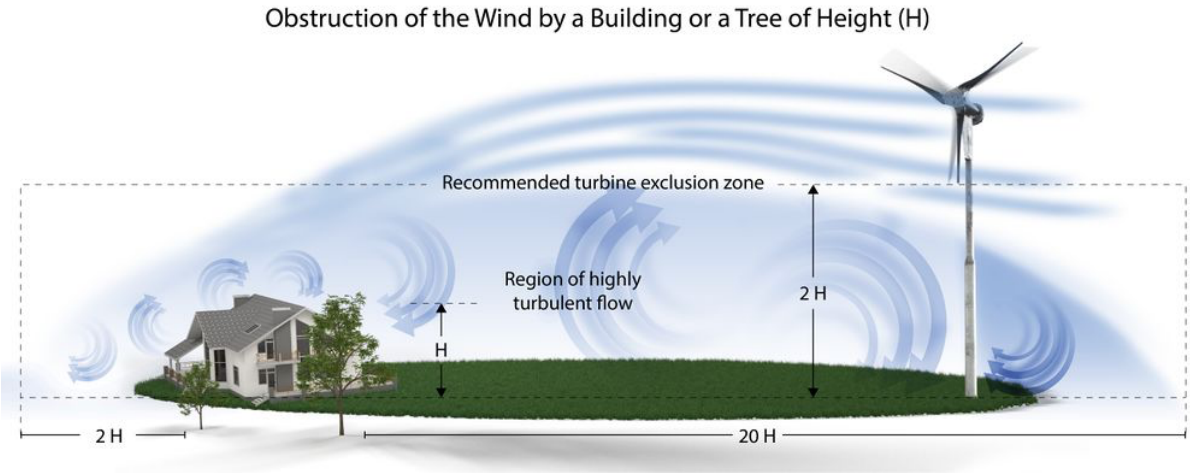

Figure 1 Extract from "The Small Wind Guide"
Ref https://windexchange.energy.gov/small-wind-guidebook#enough

2.7 Further advice from the Danish Wind Industry Association explains clearly what happens to the wind when an obstacle is put in its path and is shown in Figure 2 below. Specifically, it suggests the level of turbulence generated from an obstacle can be as much as three times the height, and that turbulence is more pronounced behind the obstacle than in front of it. It advises that major obstacles should be avoided, especially if they are upwind.

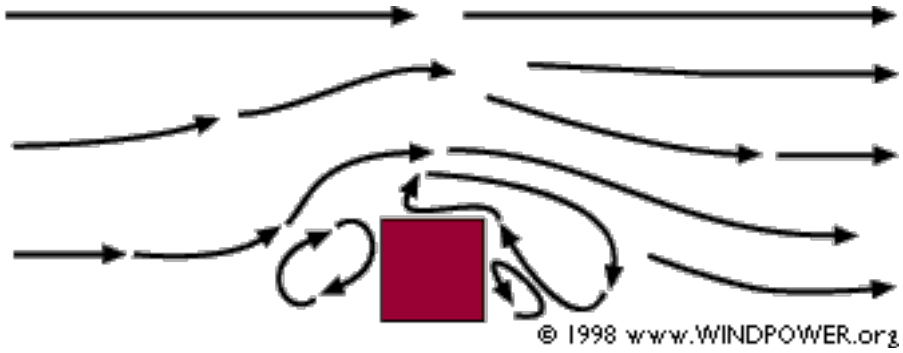

Figure 2 Extract from Danish Wind Industry Association
http://drømstørre.dk/wp-content/wind/miller/windpower%20web/en/tour/wres/obst. [htm)](htm)

2.8 The above reflects a similar situation to the impact being realised at Greensforge Sailing Club, where a building (or more) will be placed upwind of the reservoir, creating changes in the windflow and increased turbulence over the reservoir itself.

Approach to Computational Analysis

2.9 It is noted that the RWDI report, despite discussion with the applicant, makes no specific reference to the wind speed utilised in the modelling. This is of significant concern, given that the overall purpose of the report is to identify the potential impact on windflow arising from the proposed development.

2.10 At the meeting held on 20th May (see Appendix 1), Sailing Club members advised the applicant about the 'usual' wind conditions on the reservoir. This was intended to assist their understanding of the conditions usually realised, and to ensure that the model accurately reflected this position. It is noted that RWDI nor Wolfson Unit have chosen to visit the site prior to the issue of the reports, in order that they can confirm that the conditions identified in the modelling accurately reflect site reality.

2.11 In a post-meeting note prepared by the applicant (See Appendix 1) it is noted that RWDI have not been able to confirm "anecdotal evidence' in relation to wind conditions offered by sailors who have regularly sailed on the reservoir over the last 30 -40 years, quoting that the computational model doesn't identify this as the reasoning for their response.

2.12 This suggests the applicant would rather rely on computational analysis over local knowledge and site experience, without the benefit of having visited the site to ensure the computational baseline conditions accurately reflect the conditions experienced on site.

Calming Effect of Computation

2.13 It is noted, and confirmed by the applicant, that the computational analysis reflects 'steady state conditions', i.e. that the wind is constant across the reservoir at all times and wind speeds are effectively 'averaged". However, in reality the wind is very seldom in steady state, and gusts do occur. The consideration of steady state conditions result in a 'smoothing' or calming impact on the wind conditions in all pre- and post-development scenarios.

2.14 Such an approach will result in a distortion of the results in a beneficial manner. Particularly, it will not consider the potential turbulent effects arising from the changes in wind flow following the installation of an obstacle such as a building for example. Again, this was discussed at the meeting on 20th May, and whilst it is accepted that the impact of turbulence on the reservoir is difficult to assess, it is this turbulence that will make the conditions for sailing more challenging.

2.15 In particular turbulent wind conditions the changes in wind speed and direction become a significant challenge for any sailor. More experienced sailors can usually overcome such challenges although this does depend on the circumstances. For less experienced sailors, turbulent conditions are likely to act as a deterrent to enjoyment, if not a potential danger. The applicants have made no attempt to demonstrate what

impact turbulence will have on sailing conditions. The use of 'steady state' assumptions will result in 'steady state' outcomes.

Determination of Wind Speed

2.16 The RWDI report was prepared to provide an assessment of the wind conditions in and around the proposed development, in order to provide initial estimates of the effects of the development on sailing conditions across the reservoir. In doing so, it makes reference to the determination of wind speed as being that of the 80th percentile wind speed for each direction studied. However, it fails to specifically state exactly what that speed is.

2.17 The Wolfson Unit report identifies that their assessment has considered wind speeds in a range between 3 and 9 knots (5.5km/hr and 16km/hr or 3.5miles/hr and 10miles/hr). It makes no specific reference as to whether these speeds have been derived from the assumptions in the RWDI report. It is also noted that the RWDI report does not provide any results of assessment which show consideration of a range of wind speeds as well as directional analysis. The lack of evidence base in this regard generates a great degree of uncertainty as to how this information has been sourced and determined, and the speeds utilised in their assessment.

2.18 The Wolfson Unit report suggests that speeds of 3 to 9 knots are suitable for beginners and novice sailors. Figure 3 shows the physical conditions felt in relation to wind speed. Specifically, at an equivalent of 3 knots, light air conditions would be noted. At this point, sailing becomes difficult due to the lack of sufficient wind to fill the sail to generate movement, even for experienced sailors.

2.19 At an equivalent of 9 knots, a gentle breeze is noted - the point at which leaves and twigs will move and flags flutter. Sailing is more feasible at this wind speed and is considered appropriate for beginners. However, it is still considered to be a light sailing wind by experienced sailors, who can feasibly and frequently sail in wind speeds up to 15 - 20 knots (28km/hr – 37km/hr or 17miles/hr - 23miles/hr).

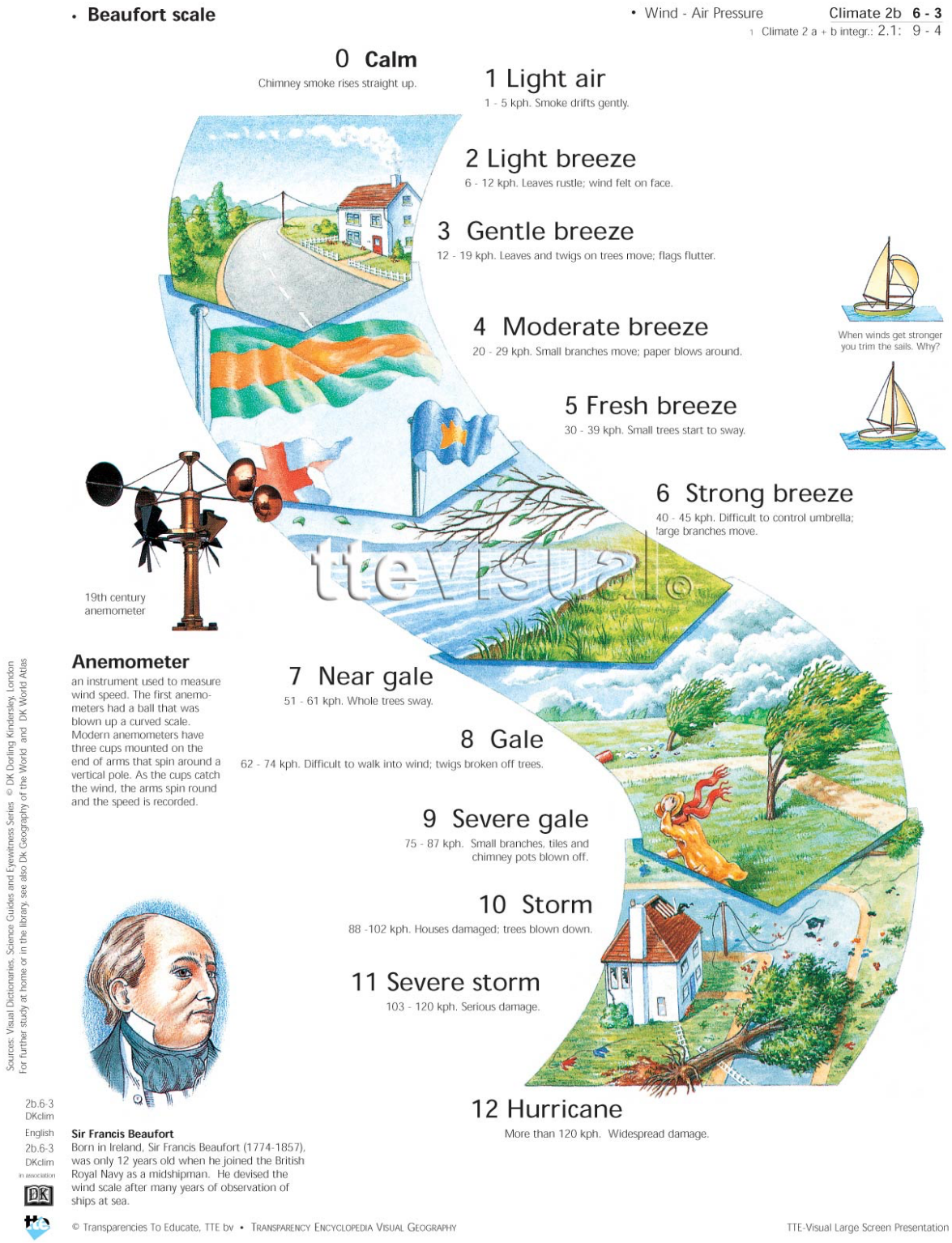

Figure 3 Wind Speed and Identified Conditions

2.20 As described above, the assessment has been undertaken in what could be considered to be the lightest of conditions where sailing would normally occur. The meeting notes in Appendix One state:

"The 80th percentile was chosen to provide an indication of the speed patterns under high (but not overly rare) wind conditions".

2.21 On the basis of the evidence in Figure 3, it is clear that RWDI are incorrect in their assertion that wind speeds of between 3 and 9 knots can be considered as 'high' wind conditions (see post meeting note in Appendix 1).

2.22 The assessment has only considered a range of speeds which only reflect very light wind speeds, and therefore very gentle sailing conditions. We note that the Wolfson Unit indicate that their assessment is based upon conditions for beginners and novice sailors. However, this approach fails to recognise a significant number of experienced sailors who are also Club members. Consequently, the analysis fails to provide a robust assessment of the potential impact on a wide range of sailing conditions.

Consideration of a wider range of wind speed

2.23 The applicant was requested to consider providing an assessment of a wider range of wind speeds at the meeting on 20th May, in order that a fuller range of sailing conditions that may be understood in the context of the proposed development, and to identify the potential impact arising for a broader range of sailing experience within the Club.

2.24 The applicant responded on the basis that they felt such an approach would be arbitrary given that the 80th percentile for each angle of wind had been used, and that they considered the outcome would not be significantly different from that identified. The post meeting note in Appendix 1 confirms that RWDI agreed with this assessment:

"RWDI have confirmed that the analysis was conducted using steady state (i.e. time averaged) Computational Fluld Dynamic modelling, therefore increasing the speed of the ambient wind condition would only change the speeds in the report, the patterns (and thus the conclusions about the relative changes from the baseline) would not change. Therefore, RWDI confirm that it is correct to say that the choice of speed is arbitrary".

2.25 It is noted in the quotation above that the applicants assert that consideration of a different wind speed would be arbitrary, and that the results overall would not change. The Sailing Club disagree with this statement and consider that when greater wind-speeds are realised the impact of obstructions would be greater.

2.26 The Danish Wind Industry Association indicate that obstacles will decrease the wind downstream, and that this decrease will depend upon the porosity of the obstacle. They show that the slowdown effect increases with height and length from the

obstacle, with the greatest impact being realised closest to the obstacle and the ground.

2.27 The Association have produced a Wind Shadow Calculator (http://drømstørre.dk/wp-content/wind/miller/windpower%20web/en/tour/wres/shelter/index.htm) which indicates the percentage reduction in wind speed in the leeward side of an obstacle. The parameters of the proposed scheme have been considered at differing wind speeds utilising this model.

2.28 It is noted that in the RWDI report, building heights of 34m have been utilised, with the applicant advising the Club that this figure was used in the model "*to ensure there was a conservative bias adopted in the assessment.*" (see post meeting note in Appendix 1). The Club note that the height selected for the RWDI assessment outweighs that identified in the parameters plan. Such an approach effectively deflects the wind at a greater height, and this will result in dispersed impacts on the leeward side. Consequently, this approach generates a result which favours the applicants' assertions.

2.29 Greensforge Sailing Club have utilised the Wind Shadow calculator to demonstrate what the impact of the proposed development would be at higher wind speeds/ Specific inputs include assumptions of a 30m high building extending 50m in width, at wind speeds of 9, 15 and 20 knots, thus reflecting a range of typical conditions that will be found should the development proceed. A height of 10m has been assumed to represent the top of a mast – although this is a maximum height above the water level that could be expected for dinghy sailing. Whether or not the resultant impact would be greater with buildings of lower height has not been determined, although considered possible.

2.28 The results are shown in Appendix 2 and are summarised in the table below. In short, the numbers on the grids shown in Appendix 2 represent the percentage of the original wind speed that will be achieved once an obstacle is put in place compared to that prior to its installation. Where the figures are blank there is insufficient wind to be measured.

Wind Speed	**% of wind speed without obstacle @114m distant**	**Resultant wind speed**
9 knots (16km/hr)	18%	1.6 knots (3km/hr)
15 knots (28km/hr)	1%	0.26 knots (0.5km/hr)
20 knots	N/A	Not determined

Table 1 Summary of Wind Speed percentage after obstacle

2.29 The above evidence clearly shows that that at greater wind speeds the distance impacted by an obstacle increases. In short, in higher wind speeds, a greater proportion of the reservoir will be impacted. The utilisation of low wind speeds in the RWDI model fails to recognise this.

2.30 The applicant's assertion that considering differing wind speeds is arbitrary to the study on the basis that it would not result in any impact on the patterns of windflow are therefore incorrect. Additionally, this assessment demonstrates that consideration of relatively light wind-speeds only does not adequately assess the full impact on sailing conditions, and that at higher wind speeds, the impact of the proposed development will be worse than the applicants have asserted.

Assessment of Sailing Quality

2.31 The Sailing Club accept that there are no regulatory parameters or guidelines that can be used to assess the sailing quality of a particular location and note that the Wolfson Unit report seeks to apply quantitative parameters to relatively qualitative considerations. The Wolfson Unit stress that failure to meet the defined criteria does not prevent sailing in the associated area, but signifies a challenging element to it, resulting in a potential lowering of enjoyment, and this point is noted by the Club.

2.32 The report indicates that the 'baseline' average sailing quality on the reservoir is calculated/scored at 19.7%, and considers this to be relatively low, but not uncommon for inland sailing locations. It is not clear how the baseline calculation has been made, but when compared to a significant expanse of open water with uninterrupted wind, it is accepted that sailing conditions at Greensforge Sailing Club are not ideal.

2.33 Nevertheless, the Club has operated at the site over the last 45 years. Had the conditions for sailing not been suitable for a range of competencies across sailors, the Club would not exist today. Whilst the sailing quality assessment (however it is derived) suggests it is low, it does not mean that sailing cannot be undertaken successfully.

2.34 The extent of success of sailing is currently being realised at Club attendance levels. The Sea Scouts regularly attend with approx. 20 members, and Sea Cadets have 5 regular boats training on the water, and recently hosted a Regatta involving circa 40 individuals. Taster days have resulted in approx. 35 individuals participating in sailing in the last four to six weeks, and a further 20 people have either attended, or intend to attend an RYA course. This is all in addition to sailing regular members as detailed in our previous submission.

2.35 The applicant has kindly forwarded their submission in advance of Deadline 5 responding to the EXQ2. In it, it is implied that the overall sailing quality is poor, and hints that better sailing conditions are available locally elsewhere are made (reference to South Staffordshire Sailing Club).

2.36 Irrespective of other sailing locations locally, the number of people regularly attending this sailing club to participate in sailing is the clearest indication that the conditions on site are suitable to maintain an active club over a long period of time. The implied requirement for perfect sailing conditions are therefore not a precursor to sailing

enjoyment - indeed, it is the imperfection in the sailing environment that generate enjoyable sailing experiences.

Reduction in Sailing Quality

2.37 The Wolfson Unit report determines that a 15% reduction in sailing quality (as determined by wind speed, changes in wind speed between specific locations, and direction) is deemed as having a 'significant' impact.

2.38 It is noted that the assessment calculates/scores conditions under the two tested scenarios as 16.5% and 15.6% respectively. The differences in these scores are identified as being 3.2% and 4.1%, although this does not identify the proportional reduction in sailing quality, which is calculated as follows:

	Sailing Quality Assessment Score (a)	Reduction from baseline(b)	% of sailing quality reduction (b/a*100)
Baseline	19.7%		
Configuration 1	16.5%	3.2%	16.24%
Configuration 2	15.6%	4.1%	20.8%

Table 2 Impact of Average Sailing Quality Reduction

2.39 The results of the Wolfson Unit assessment therefore show that there would be a proportional reduction of sailing quality of up to one-fifth (20%) of the current conditions. The report goes on to identify that the reductions in sailing quality are identified in the central and northern portions of the reservoir, and state that

"*Both development options are predicted to result in local or point reductions in sailing quality which are significant (i.e. in excess of 15% delta)……. The percentage of usable sailing area affected is 11.3% and 13.5% for C2 and C3 respectively. This will make it more challenging for novice sailors to navigate those zones due to a combination of lower wind speeds making transiting slower and more difficult to assess wind direction; and larger variation in wind speed and direction during navigation that will be more onerous to react to…….*
Most sailing is expected to take place in the central and northern areas of the reservoir…..and this is where the most detrimental effects (from a sailing perspective) of the development options are predicted to occur."

2.40 In summary, therefore, the Wolfson Unit report indicates that there will be a reduction in sailing quality overall by approximately 20%, that the useable sailing area impacted will be 10 – 15%, and that it is most likely to occur in what is currently considered to be the best parts of the reservoir in which to sail.

2.41 The Sailing Club do not concur with the applicants response to EXQ2 at paragraph 1.8 which concludes that*:*

"the percentage of time during which the reservoir achieves good quality sailing conditions on average would be reduced by about 2%".

2.42 The applicants' assertion has arisen as a result of an incorrect mathematical calculation, which merely considers the difference between current average and expected average sailing quality as calculated in Table 6 of the Wolfson Unit report. This mathematical error fails to consider what the difference in those two numbers represents as a proportion of the current sailing conditions, and thus under-represents the impact of the development. By the Wolfson Units own parameters, the impact of the reduction in average sailing quality is significant.

Impact of Sailing Quality Reduction on Sailing Enjoyment

2.43 It is noted that the Wolfson Unit report has considered the impact on sailing conditions and the potential impact that would have on novice sailors. However, the assessment has completely failed to consider what impact this would have on more experienced sailors, who make up a significant part of the Club membership.

2.44 As detailed above, when sailing in light winds, which is the basis of the assessment, frustration is generated with beginners/novice sailors, who find it difficult to assess wind direction. Any further reduction in wind speed, as implied by the analysis will result in greater frustration, and potentially loss of interest in the sport.

2.45 Similarly, sailing in lighter winds also frustrates more experienced sailors, who generally require stronger winds. Whilst the impact of greater wind speeds has not been analysed as detailed above, the evidence utilised from the Danish Wind Industry Association indicates that there is likely to be a significant reduction on higher wind speeds. Consequently, experienced sailors will not be able to realise previously achieved wind speeds. The impact of light wind speeds to the experienced sailor represents the difference between "sailing' and "floating" which will also give rise to significant de-moralisation and frustration.

2.46 In either situation, the impact of the development will result in significantly lighter wind speed than is currently achieved. Due to the frustrations that occur as a result, there will be a detrimental impact on the willingness to sail at Greensforge Sailing Club, and the Club's concerns regarding its long term viability following the implementation of the proposed development will be realised.

Mitigation Proposals

2.47 The assertion from the applicant that the impact on sailing conditions on the reservoir is negligible arises from an error in mathematical calculation, and consequently the wrong conclusion is drawn as a result. The analysis undertaken on behalf of the applicants consistently show that there will be a reduction in sailing quality over Calf Heath Reservoir, and as shown above, the details in the Wolfson Unit report indicate, that the overall impact of the proposed development is anticipated to be significant.

2.48 In our original submissions in April, we indicated that a zone where buildings of the heights proposed would have an effect on the reservoir due to the direct impacts on wind speeds. This followed our response to the Draft ES published in 2017 which also raised similar concerns.

2.49 The more detailed analysis undertaken by the applicants continue to show that building heights of up to 30m will have a significant impact upon the sailing conditions on the reservoir, and we note that the applicants have been aware of the report findings since March (in the case of the RWDI report), and early May for the Wolfson report. Our conversation with them in late May also indicated to them our concerns regarding impact.

2.49 Despite this, the applicant has not yet provided any details regarding any proposed mitigation which would overcome the identified impacts, despite them having considerable time to do so.

2.50 This issue was discussed at the meeting on 20th May, when the Club asked if consideration could be given to locating buildings of greater height in other parts of the application site in order that the impact on sailing could be mitigated. It is noted that the applicant declined to consider this, stating that building heights would need to be determined by occupier requirements and had been informed by the visual impact strategy.

2.51 The Club was not party to the conversations relating to the development of that Strategy, and it is considered likely that the impacts that arise from that strategy were not fully assessed at the time it was undertaken. Whilst the applicants ultimately agreed to consider the issues raised on 20th May, to date no alternative proposals have been put forward.

2.52 Given the clear significant negative impact on sailing quality that arises from the proposed configurations, as an absolute minimum the developer should be considering how any impact can be mitigated and ensuring that appropriate amendments are made to the Parameters plan. To date, there has been no evidence to suggest that such an issue has been given any consideration.

2.53 It is a key principle of the planning system to ensure that where significant negative impacts are identified, appropriate action is secured through the consenting process to ensure those negative impacts are not realised. Should the Consent Order be

granted as currently proposed, and the negative impacts realised on the sailing club at a later date, there is no recompense for the sailing club. We believe that this would be an unfair outcome for present and future sailors.

3.0 CONCLUSIONS

In summary therefore the following points can be concluded:

a) The key consideration in this case is the impact of undertaking a development of significant height on the upwind side of Calf Heath reservoir, with prevailing winds generally from a south-westerly direction. It is the impact on the leeward side that is critically important to understand in terms of assessing the impact of the proposed development.

b) Whilst it is accepted that identification of wind flow dynamics is difficult, the use of computational fluid dynamic modelling has a 'calming' effect on any conclusions, and any results are therefore conservative.

c) Whilst there is no evidence to support the claim, it is understood that the model has assumed wind speeds of between 3knots and 9knots in its assessment. As the Club has demonstrated, this relates to very light winds only

d) The applicants has taken no account of the wind turbulence that would be created by the development. The Club believes that the wind turbulence resulting from the proximity to the buildings to the reservoir will have a significant detrimental impact on sailing conditions, and the evidence above would support this view. The lack of any submissions from the applicant on this issue results in an inadequate appraisal of the conditions that are likely to arise.

e) The evidence presented in paragraph 2.38 above shows that there is a greater impact on wind speeds for higher wind speeds, although it is noted that the applicants do not support this view. Utilising low wind speeds and the 'calming' effect of the modelling results in outcomes that are more positive. The applicants have refused to demonstrate the impact on higher wind speeds in their analysis. The assessment therefore does not adequately reflect the full impact of the proposed development.

f) The assessment of the impact of sailing quality undertaken by the Wolfson Unit indicates a reduction in average sailing quality of 15% - 20%. By their own parameters this is considered significant. Not only is the average sailing quality reduced, it impacts approx. 13% of the currently usable sailing area and is located where sailing conditions are currently favourable.

g) Mathematical errors in the calculations result in the applicants determining that the overall impact is negligible. On the basis of the above, Greensforge Sailing Club do not agree with this interpretation.

h) It is a key principle of the planning system to ensure that where development has negative and significant impacts, it seeks to ensure that such impacts are mitigated appropriately. To date, there is no evidence that such mitigation has been considered.

i) Greensforge Sailing Club remain concerned that the proposed development will have a significant impact upon the sailing conditions across the reservoir and have sought to demonstrate the inadequacy of the assessments undertaken by the applicants.

j) Such an impact will ultimately result in frustration and demoralisation amongst sailors, which will ultimately threaten the long-term viability of this Club. Greensforge Sailing Club do not believe that it is appropriate for the applicant to impose this threat.

k) Should the development proceed as currently proposed, and the impacts identified by Greensforge Sailing Club are realised, there will be no recompense to the Club. It is therefore vitally important that appropriate mitigation measures are sought within the parameters plan prior to any granting of the Development Order consent.

APPENDIX 1
APPLICANTS NOTE OF MEETING ON 20TH MAY

RAMBOLL

COMMUNICATION FORM – WEST MIDLANDS INTERCHANGE

Mark (x) as appropriate		
Telephone	☐	**Contract no. UK15-22821**
Minutes	☒	

Conversation between/present (initials)

[redacted]

Date 20th May 2019, Greensforge Sailing Club

Subject

West Midlands Interchange (WMI) – Sailing Issues

The Agenda for the meeting was to discuss the findings of 2 reports provided to GSC in advance of the meeting (RWDI project report 1901388, dated March 21, 2019 and Wolfson Unit Report No. 2748, dated May 2019).

Summary of discussion	***Action***

Everyone present introduced themselves. Everyone had met previously with the exception of MP who outlined his role in the assessments undertaken and his sailing experience. MP's experience is outlined below:
• PhD in naval architecture
• Over 20 years experience as consultant engineering at the Wolfson Unit for Marine Technology and Industrial Aerodynamics conducting consultancy and applied research
• Specialist areas:
  ○ Yacht performance prediction
  ○ Experimental hydrodynamics and aerodynamics
• Clients include America's Cup teams, race yacht and superyacht designers, national and governing bodies
• Previous Positions held:
  ○ Royal Yachting Association (RYA): Technical Committee Member
  ○ Royal Institute of Naval Architects (RINA): Small Craft Group Member
  ○ J Class Association: Technical Director
• Current Positions:	

○ Royal Ocean Racing Club (RORC): Technical Sub-committee member ○ University of Southampton: Lecturer "Sailing yacht design" module ○ Club dinghy sailor	
There was general discussion about sailing on the reservoir. It was generally accepted by members of GSC that sailing at present can be 'tricky' as conditions aren't always ideal for sailing. GSC described their open day held the previous day which was well attended. MRo described the rationale behind the RWDI report and how these findings fed into Wolfson Unit's assessment. MP then described the assessment which Wolfson Unit had undertaken and outlined the general conclusions. IC commented he felt that the wind 'curved' around the reservoir which wasn't shown in the assessments undertaken. MRo undertook to raise this query with RWDI. *[Post meeting note – RWDI have confirmed that they can't comment on the anecdotal 'curving' of the wind, this isn't identified from the modelling undertaken.]* There was much discussion about the wind speeds selected for the RWDI assessment. Also representatives of GSC stated that faster speeds could have been used in the assessment. MRo did note that the assessments were primarily looking at effects for novice sailors. GSC asked whether set speeds such as 10, 15 and 20 knots could be assessed. MRo noted that this approach seemed arbitrary when the assessment used the 80th percentile for each angle of wind. MP outlined that changes to the existing findings, if increased wind speeds were used, would not be significant. MRo agreed to consider this point and liaise with RWDI. *[Post meeting note – RWDI have confirmed that the analysis was conducted using steady-state (i.e. time-averaged) Computational Fluid Dynamic modelling, therefore increasing the speed of the ambient wind condition would only change the speeds in the report, the patterns (and thus the conclusions about the relative changes from the baseline) would not change. Therefore, RWDI confirm it is correct to say that the choice of speed is arbitrary. The 80th percentile was chosen to provide an indication of the speed patterns under high (but not overly rare) wind conditions. Furthermore, MP has confirmed that modelling different wind speeds would not change the sailing quality % results significantly, as the relative difference in % wind speed and direction criteria are independent of the ambient wind speed.]* GSC asked that the building heights used in the RWDI assessment be clarified. MRo agreed to liaise with RWDI and ask that the report be updated.	**Actioned – see post meeting note.** **Refer to post meeting note on this issue.** **Refer to post meeting note on this issue.**

[Post meeting note – RWDI have confirmed the height of buildings used in the assessment. An updated RWDI and Wolfson Unit report have been sent to GSC. Due to the uncertainty regarding topographic levels buildings of up to 34m in height have been modelled. It should be noted that buildings of this height are not proposed and are contrary to the parameters plans. However, RWDI confirmed they used the heights stated in page 4 of their updated report to ensure there was a conservative bias adopted in the assessment.	
KK, IC and others queried if there could be uplift 'eddy' effects from north-easterly winds which could affect the reservoir. AB asked if this effect could potentially be modelled. MRo agreed to ask RWDI about this query. *[Post meeting note – RWDI have confirmed that this sounds like a phenomenon called 'down-draughting' or 'down-washing' (see Figure 5a on page 6 of the RWDI report). This is typically more of a tall building concern and RWDI wouldn't expect the proposed warehouses to create significant down-draughting.]* MC and others queried whether turbulence effects had been assessed. MP outlined that the impact due to turbulence was a difficult issue to assess, especially as the layout and configurations of proposed buildings was unknown. AB queried whether building heights meant that a 30m tall building could be located across the entirety of development phase A4a. PF and MRo confirmed that this was not the case and described that the building heights would have to be in accordance with the relevant parameter plan (document 2.6) and therefore the maximum heights would be governed by the parameter plans.	**Refer to post meeting note on this issue.**
Following comments from MRe and AB there was general discussion about the parameter plans and MRe wondered if there could be a set-off for proposed buildings. AB queried whether the 30m high buildings could be located in development zones A5a and A5b instead. PF outlined that building heights would need to take account of occupier requirements. Also the location of the 30m building height zone was developed based on a visual impact strategy and following consultation with parties such as the County Council. PF confirmed that comments raised by GSC would be considered. IC asked whether proposed earth bunds associated with the development were really necessary. MRo and PF outlined they were necessary and had been developed following rigorous assessment and liaison with stakeholders. The bunds were necessary for visual impact and noise mitigation purposes. Subsequent discussion highlighted that in reality the bunds were probably a less significant issue when compared to the proposed warehouse buildings.	**PF / WMI team to re-visit parameter plans in light of GSC comments and see if any amendments were feasible noting other constraints (such as visual impact)**
GSC asked whether the existing quarry bund had been considered in the assessment. MRo confirmed he would clarify this point with RWDI.	**Refer to post meeting note on this issue.**

[Post meeting note – RWDI confirmed that an existing bund around the reservoir was used in the modelling. The surrounding terrain was generated based on LiDAR scans of the site in 2015 by Defra.]	
There was discussion about the existing tree line to the south of the reservoir. It was noted by GSC that sailing conditions aren't helped by these trees (and effects will only worsen over time as these trees further establish). Whilst these trees aren't under the control of the WMI Applicant, PF noted that comments about potentially 'thinning' the trees (not removing the trees entirely) could be passed onto the Canal & Rivers Trust on behalf of GSC.	**PF to try and raise comment about 'thinning' trees with CRT**
There was a general comment about the shape of the proposed warehouse buildings and whether roof shape could mitigate effects (i.e. a curved roof). MRo agreed to ask RWDI about this query. *[Post-meeting note – RWDI have stated that the roof shape wouldn't play a large role in the overall wind patterns since the facades act as an obstruction to flow.]*	**Refer to post meeting note on this issue.**
AB queried whether the 2 assessment reports had been issued to PINS. MRo confirmed they hadn't but would be shortly.	
It was agreed that MRo would prepare an initial draft of a Statement of Common Ground (SoCG) and issue this draft to AB for comment.	**MRo to prepare and issue draft SoCG**

APPENDIX 2.

ASSESSMENT OF WIND IMPACT

WIND SPEED IMPACT AT 9 KNOTS

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Wind Speed in per cent of Wind Speed Without Obstacle

m height															
15	11	23	33	42	49	57	63	68	72	76	79	81	83	85	
15	10	23	33	42	50	58	64	69	73	76	79	81	83	85	
14	10	23	34	42	50	58	64	69	73	76	79	82	84	85	
14	10	23	34	43	51	58	65	69	73	77	80	82	84	85	
13	10	24	35	43	51	59	65	70	74	77	80	82	84	86	
13	11	24	35	44	52	59	66	70	74	78	80	83	84	86	
12	11	25	36	45	53	60	66	71	75	78	81	83	85	86	
12	12	26	37	46	53	61	67	72	75	79	81	83	85	87	
11	13	27	38	47	54	62	68	72	76	79	82	84	86	87	
11	14	28	39	48	55	63	68	73	77	80	82	84	86	87	
10	16	30	40	49	56	64	69	74	77	80	83	85	86	88	
10	18	31	42	50	58	65	70	75	78	81	83	85	87	88	
9	2	20	33	44	52	59	66	71	75	79	82	84	86	87	89
9	4	22	35	45	53	60	67	72	76	80	82	85	86	88	89
8	7	24	37	47	55	62	68	73	77	81	83	85	87	88	90
8	10	27	40	49	57	64	70	75	78	81	84	86	88	89	90
7	14	30	42	52	59	65	71	76	79	82	85	87	88	90	91
7	18	34	45	54	61	67	73	77	81	83	86	87	89	90	91
6	22	37	48	57	63	69	74	79	82	84	87	88	90	91	92
6	6	27	41	52	60	66	71	76	80	83	86	87	89	90	92	92
5	12	32	45	55	63	68	73	78	82	84	87	88	90	91	92	93
5	19	37	50	59	66	71	76	80	83	86	88	89	91	92	93	94
4	1	26	43	54	63	69	74	78	82	85	87	89	91	92	93	94	94
4	11	34	49	59	67	72	77	81	84	87	89	90	92	93	94	94	95
3	22	42	55	64	71	76	80	83	86	88	90	92	93	94	94	95	96
3	4	33	51	62	70	76	80	83	86	88	90	92	93	94	95	95	96	96
2	22	46	60	69	76	80	84	86	88	91	92	93	94	95	96	96	97	97
2	5	40	58	69	77	81	85	88	90	91	93	94	95	96	96	97	97	98	98
1	35	59	72	79	84	87	90	92	93	94	95	96	97	97	98	98	98	98	99
1	37	67	79	86	90	92	94	95	96	96	97	98	98	98	99	99	99	99	99	99
	14	29	43	57	71	86	100	114	129	143	157	171	186	200	214	229	243	257	271	286	300	m

= Obstacle height 30 m = Hub height 10 m

Roughness length = 0.055; Porosity = 0; Obstacle width = 50 m
Note: Vertical and horizontal scales are different. Horizontal scale shows distance from obstacle.

WIND SPEED IMPACT AT 15 KNOTS

Wind Energy in per cent of Wind Energy Without Obstacle

m height

15									1	4	7	12	19	25	32	38	44	49	53	57	61				
15									1	4	7	12	19	26	32	39	44	49	54	58	61				
14									1	4	8	13	19	26	33	39	45	50	54	58	62				
14									1	4	8	13	20	27	34	40	45	50	55	59	62				
13									1	4	8	13	20	27	34	40	46	51	56	60	63				
13									1	4	8	14	21	28	35	41	47	52	56	60	64				
12									2	5	9	14	22	29	36	42	48	53	57	61	64				
12									2	5	9	15	23	30	37	43	48	53	58	62	65				
11									2	5	10	16	24	31	38	44	49	54	59	63	66				
11									2	6	11	17	25	32	39	45	51	55	60	64	67				
10									3	7	12	18	26	33	40	46	52	57	61	65	68				
10								1	3	7	13	19	27	35	41	48	53	58	62	66	69				
9								1	4	8	14	20	29	36	43	49	54	59	63	67	70				
9								1	4	9	15	22	30	38	45	51	56	60	64	68	71				
8								1	5	11	17	24	32	40	46	52	57	62	66	69	72				
8								2	6	12	18	26	34	41	48	54	59	63	67	71	73				
7								3	8	14	21	28	36	44	50	56	61	65	69	72	75				
7							1	4	9	16	23	30	39	46	52	58	63	67	70	73	76				
6							1	5	11	18	26	33	41	49	55	60	65	69	72	75	78				
6							2	7	14	21	29	36	44	51	57	63	67	71	74	77	79				
5							3	9	17	25	32	40	48	54	60	65	69	73	76	78	81				
5						1	5	12	20	28	36	43	51	58	63	68	72	75	78	80	82				
4						2	8	16	25	33	40	48	55	61	66	71	74	77	80	82	84				
4						4	12	21	30	38	45	52	59	65	70	74	77	80	82	84	86				
3					1	7	17	27	36	44	51	57	64	69	73	77	80	82	84	86	88				
3					4	13	24	34	43	51	57	63	69	73	77	80	83	85	87	88	90				
2				1	9	21	33	43	52	58	64	69	74	78	81	84	86	88	89	90	91				
2				6	20	33	45	54	61	67	72	76	80	83	86	88	89	91	92	93	94				
1			4	21	37	50	60	67	73	77	80	83	86	88	90	92	93	94	94	95	96				
1		5	30	50	63	72	78	82	85	88	90	91	93	94	95	96	96	97	97	98	98				
	14	29	43	57	71	86	100	114	129	143	157	171	186	200	214	229	243	257	271	286	300	m			

= Obstacle height 30 m = Hub height 10 m

Roughness length = 0.055; Porosity = 0; Obstacle width = 50 m
Note: Vertical and horizontal scales are different. Horizontal scale shows distance from obstacle.

WIND SPEED IMPACT AT 20 KNOTS

Wind Energy in per cent of Wind Energy Without Obstacle

m height																					
15	1															1	1	2	4	5	
15																	1	2	4	5	
14																	1	2	4	6	
14																1	1	2	4	6	
13																1	1	3	4	6	
13																1	1	3	4	6	
12																1	2	3	5	7	
12																1	2	3	5	7	
11																1	2	4	5	8	
11																1	2	4	6	8	
10																1	3	4	7	9	
10															1	2	3	5	7	10	
9															1	2	4	6	8	11	
9															1	2	4	7	9	12	
8															1	3	5	8	11	14	
8														1	2	4	6	9	12	15	
7														1	3	5	8	11	14	17	
7													1	2	4	6	9	13	16	19	
6													1	3	5	8	11	15	18	22	
6												1	2	4	7	10	14	17	21	25	
5												1	3	6	9	13	17	21	25	28	
5											1	2	5	8	12	16	20	24	28	32	
4											2	4	8	12	16	20	25	29	33	37	
4										1	4	7	12	16	21	25	30	34	38	42	
3									1	4	7	12	17	22	27	31	36	40	44	48	
3								1	4	8	13	18	24	29	34	39	43	47	51	54	
2							1	4	9	15	21	27	33	38	43	48	52	55	58	61	
2						2	6	13	20	27	33	39	45	50	54	58	61	64	67	70	
1					4	12	21	29	37	44	50	55	60	64	67	70	73	75	77	79	
1				5	17	30	41	50	57	63	68	72	75	78	80	82	84	85	87	88	89
	7	14	21	29	36	43	50	57	64	71	79	86	93	100	107	114	121	129	136	143	150 m

= Obstacle height 30 m = Hub height 10 m

Roughness length = 0.055; Porosity = 0; Obstacle width = 50 m
Note: Vertical and horizontal scales are different. Horizontal scale shows distance from obstacle.