Appendices: ADD's Evidence from Acknowledged Experts

Reasons for appending the attached material:

General Reason

The last opportunity ADD had to submit evidence relating to the draft Eastleigh Local Plan was at the Regulation 19 Stage in August 2018. Since the end of June 2018 when the Deposit Version of the Local plan was published EBC has issued a very large number of additional reports and updates of earlier reports. While the 'headline' response can be covered in the hearing statements, the 3,000 word limit makes it impossible to include the essential expert support evidence without attaching key appendices.

Appendix	Reason why essential	Page number
Appendix 1: Impacts of Fine Sediments on River Ecology by Prof David Sear	**Report on risk of fine sediments on spawning salmon in the River Itchen SAC from the SGO and link road by a leading national expert, which is an important consideration in determining the impact on this internationally important site.**	**3**
Appendix 2: Fine sediment, pollutants and microplastic impacts on the River Itchen SAC from the proposed development options B and C by Prof David Sear	**Demonstrates the impossibility of the SuDS providing adequate mitigation by removing the fine sediments and preventing them entering the Itchen.**	**15**
Appendix 3: Report on the hydrological impacts of the Eastleigh Borough Submission Local Plan by Dr Matthew Johnson	**Overview of the site drainage characteristics and hydrological impacts of the SGO and associated link road on the River Itchen SAC by an expert hydrologist**	**25**
Appendix 4: An overview of the potential impact on the River Itchen of the Eastleigh Borough Local plan proposals for the development of Options B/C and the building of the north Bishopstoke link road by Professor Ken Gregory	**Overview of potential impacts by an internationally recognized geomorphologist**	**30**

Appendix 5: Hearing Statement on the latest Eastleigh Borough Local Plans and associated documentation by Dr Nick Everall of Aquascience Consultancy Ltd	**Provides an overview from an ecological perspective that reviews more recent council evidence & therefore supplements the statement by Dr Everall that formed appendix 1 to ADD's Regulation 19 representations.**	**32**
Appendix 6: Impact of Option B/C and North Bishopstoke link road development proposals on Southern Damselfly populations by Stephen J. Brooks	**Provides expert evidence on potential impact of SGO on southern damselfly populations by a nationally recognized expert.**	**35**
Appendix 7: A briefing paper prepared by ADD (Action against Destructive Development) on Rail Options and the sustainable transport potential for SGOs D/E and B/C	**Provides evidence of the particular opportunity to serve development on Option D/E land with a rail service in response to EBC's dismissal of this possibility.**	**39**
Appendix 8: Habitats Regulation Assessment – relevant Case Law and Legal Principles by Caroline Daly of Francis Taylor Building	**Provides important additional legal information regarding HRA which there is not sufficient space in the written statement to include.**	**51**

Appendix 1: Impacts of Fine Sediments on River Ecology – Professor David Sear

Dr David Sear is Professor of Physical Geography, at the University of Southampton. He is an advisor to DEFRA and Environment Agency on Flood risk management and sits on the Techical Advisory Group for Strategy and Policy for Flood and Erosion Risk management. He helped develop flood risk guidelines for the Agency, worked on the impacts of recent flooding in Cumbria, and has introduced sediment management procedures across the UK river management sector. David also advises Natural England and EA on river restoration and salmon is habitats, in particular the impact of sediments on spawning habitats. He has authored over 170 academic papers and reports including three books on river restoration, salmonid fisheries management and the management of sediments in rivers. He has worked for a wide range of international engineering and environmental consultancies on projects from large Dams to strategic restoration schemes for SSSI and SAC rivers.

Small headwater streams comprise about three-quarters of the total running water network in the UK and their close connectivity with the terrestrial environment makes them vulnerable to physical and chemical pressures that can have major impacts on conditions downstream (Riley et al., 2018). Thus whatever the outcome, protection and restoration of the headwater streams in any development should be a critical element in the design, and even more so when those streams discharge into a major riverine SAC.

The impact of fine sediments on benthic spawning UK fish species have been reviewed (Kemp et al., 2011), measured in the field (Bateman 2012; Sear et al., 2008; Greig et al., 2005), Laboratory (Sear et al., 2016); and modelled (Sear et al., 2014; Sear et al., 2017). In summary these studies highlight the following:

1) Rate and total amount of fine sediments accumulating in salmon and other benthic spawning fish nests (Redds) in river bed gravels are directly related to the concentration and total load of fine sediment in the river (Greig et al., 2005; Sear et al., 2008).
2) Chalk streams are highly sensitive to minor increases in fine sediment concentration relative to other gravel bed rivers because their river beds are unable to flush fines from gravels – hence the long tradition of cleaning gravel beds in these rivers (Sear et al., 2008; Acornley & Sear, 1999).
3) Excessive fine sediments are lethal to benthic spawning fish species (Salmon, trout, Sea trout, Grayling) Kemp et al., (2011).
4) Atlantic salmon are more sensitive to fine sediment deposition than Brown Trout (Sear et al 2017).
5) Deposition of fine organic matter is more lethal than inorganic fine sediment for incubating salmonid embryos (Sear et al., 2017).
6) The finest sediments (clays) are much more lethal than larger particles (Greig et al 2005).

7) Sediment source is important – fine sediments derived from road verges are more lethal to both Salmon and Trout than those from Agricultural land or river bank erosion (Sear et al., 2016 – Figure 1).
8) Fine sediment exposure during incubation lowers the fitness of Salmon and trout alevins that survive hatching (Sear et al., 2016).

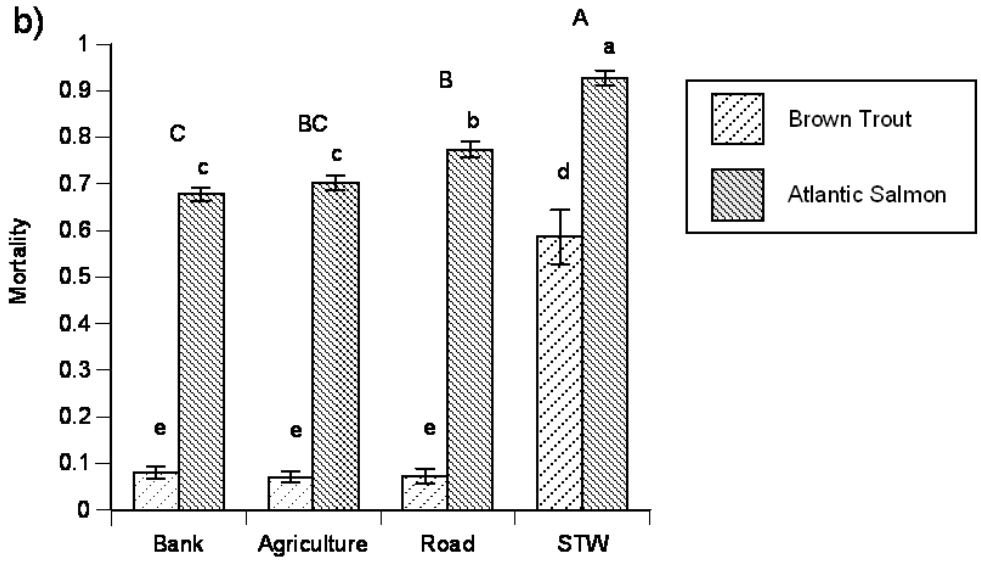

Figure 1: Impact of different fine sediment sources on two species of UK salmonids. Note higher sensitivity of Salmon compared with Brown trout and higher sensitivity of both species to Road and Sewage Treatment tertiary effluent.

One of the key pressures on the Itchen SAC is the delivery of fine sediment from the wider catchment and its accumulation in the river bed. Chalk streams are highly sensitive to fine sediments and although typically they have among the lowest fine sediment yields of any UK river type, they have the highest accumulation of fines in UK river beds (Carling & Crisp 1989; Sear et al., 2008; Sear 2010) resulting in them being highly sensitive to small increases in sediment load (Figures 2; 3) .

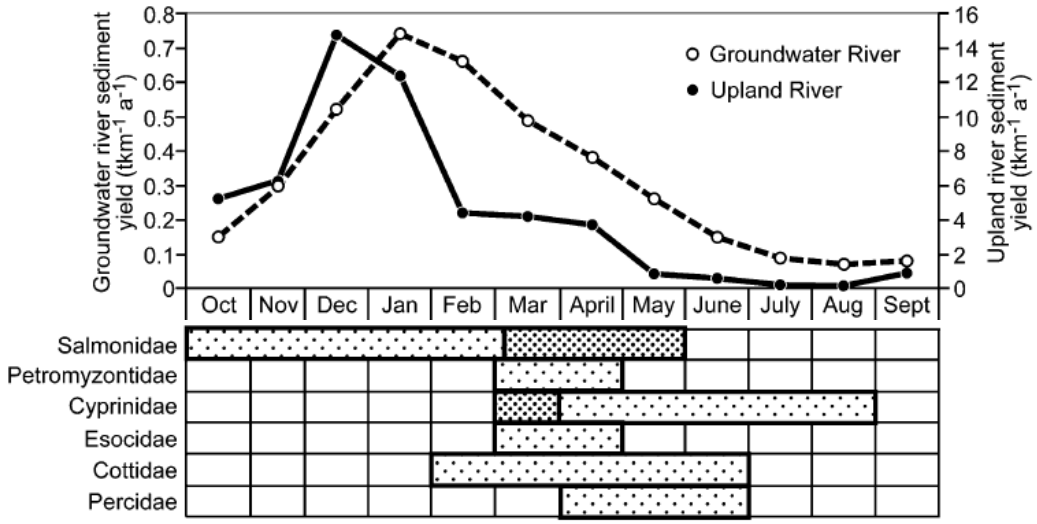

Figure 2 : Relationship between the timing of different fish species spawning and the typical fine sediments loads in groundwater rivers like the Itchen, and runoff rivers like the Bow Stream. Note how the period when fine sediment loads are highest coincides with salmonid spawning season (after Kemp et al., 2011).

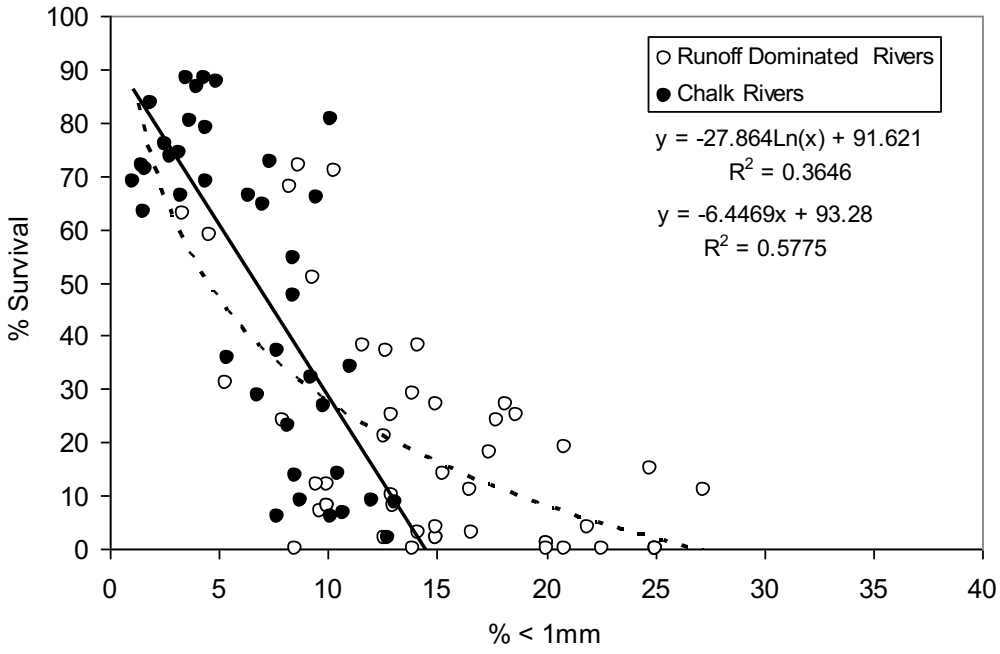

Figure 3: Decline in Salmon embryo survival with increasing proportion (by mass) of fine sediment (<1mm diameter – fine sands, silts and clays) in the spawning gravels. The increased sensitivity of salmon spawning in chalk streams (Black dots and solid line) is evident. These include sites from the River Itchen SAC and underpins evidence that chalk stream salmon are highly sensitive to small increases in sediment accumulation.

Recent research has clarified how fine sediments impact a wide range of species, and notably Atlantic salmon (henceforth referred to as salmon). In summary, fine sediments, their quality, size and composition are a diffuse pollution, that physically impact biological communities throughout the aquatic foodchain, with major impacts on the survival of benthic spawning fish such as salmon and trout.

In the River Itchen, Salmon are a key designated species, owing to their unique genetics, and rare status (rapid decline post 1990, has resulted in fewer than 1000 adults returning to spawn). Spawning habitats for Itchen salmon exist mainly between Winchester and Chickenhall STW, with notable spawning habitats in from Bishopstoke to Winchester (Figure 4). The reach downstream of the Bow stream has good quality spawning habitat with high rates of survival (Bateman 2012). Downstream of Chicken Hall STW, the Itchen spawning gravels are low quality owing to high levels of fine sediment and organic matter with the gravels, and as such survival rates are very low (Bateman 2012 Figure 5; 6).

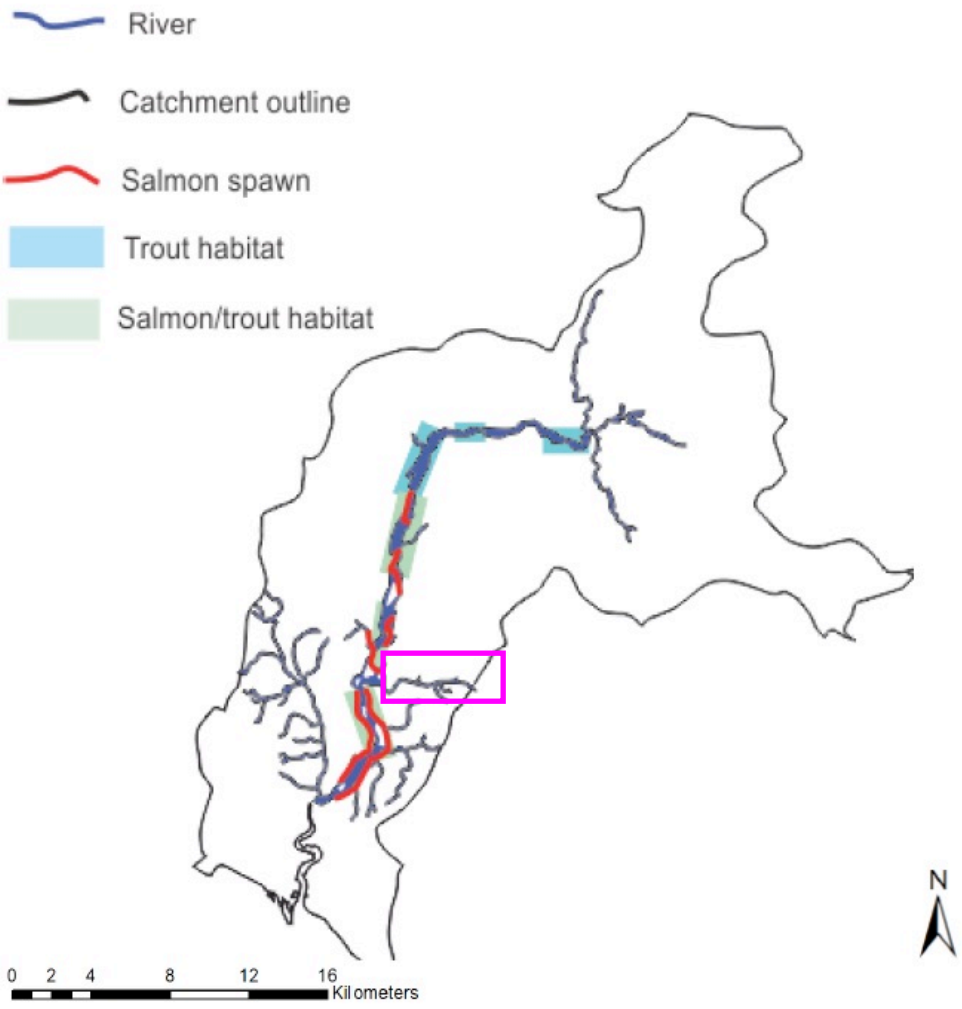

Figure 4: Location of Salmon (Red) and Trout Spawning habitat on the River Itchen. Pink box outlines Bow stream catchment. Spawning quality declines towards lower

reaches of the Itchen particularly downstream of Chicken Hall STW (Bateman 2012; EA 2004).

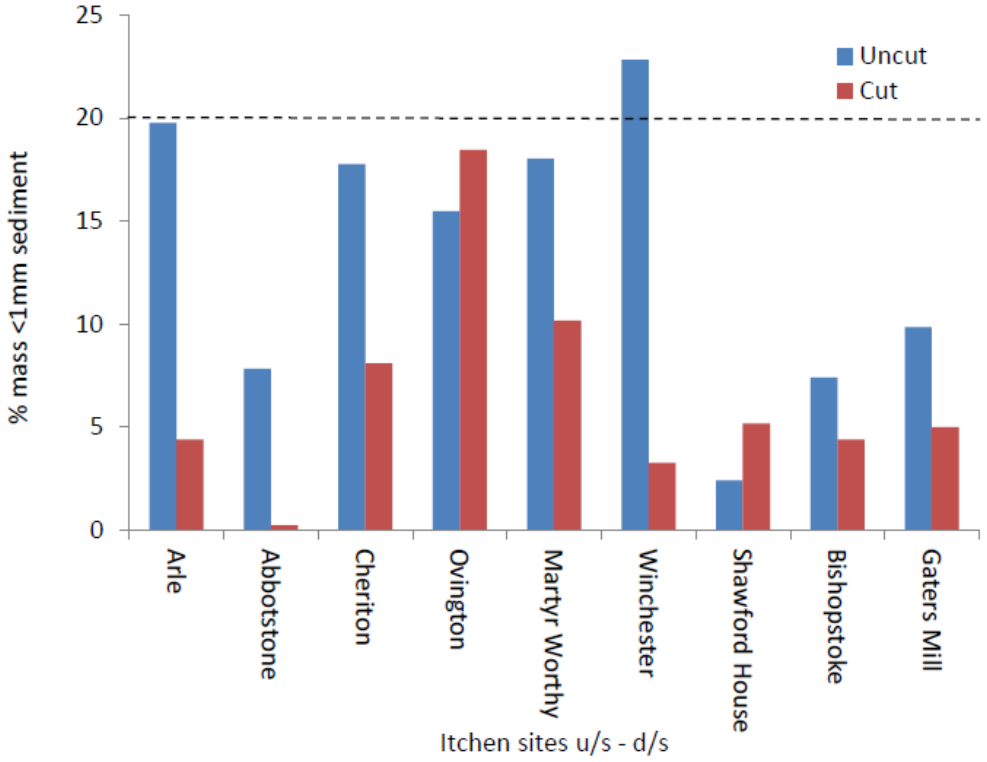

Figure 5: % Fine sediments by mass in Salmon spawning gravels before and after Redd cutting. Note how habitat quality improves through the reaches downstream of Winchester (Lower % fines) but decline towards Gators Mill lower reaches. The Bow stream enters upstream of the Bishopstoke site. The Allington lane stream enters just upstream of Gators mill site. Bateman (2012)

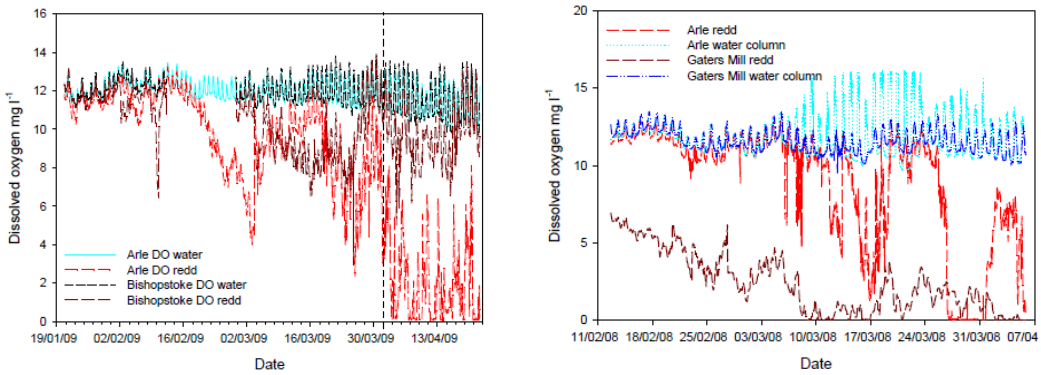

Figure 6: Dissolved Oxygen data from within Salmon spawning redds in the River Arle (Arlesford), Itchen (Bishopstoke) and Itchen (upstream of Gators Mill). The lower Itchen upstream of Gators mill is very poor quality with low DO declining rapidly to lethal limits (<5mg/l). The Spawning habitat in the Arle is affected by upwelling low DO

groundwater which produces the fluctuations. Bishopstoke is very good spawning habitat with DO levels in the egg zone of the Redd consistently high (Bateman 2012).

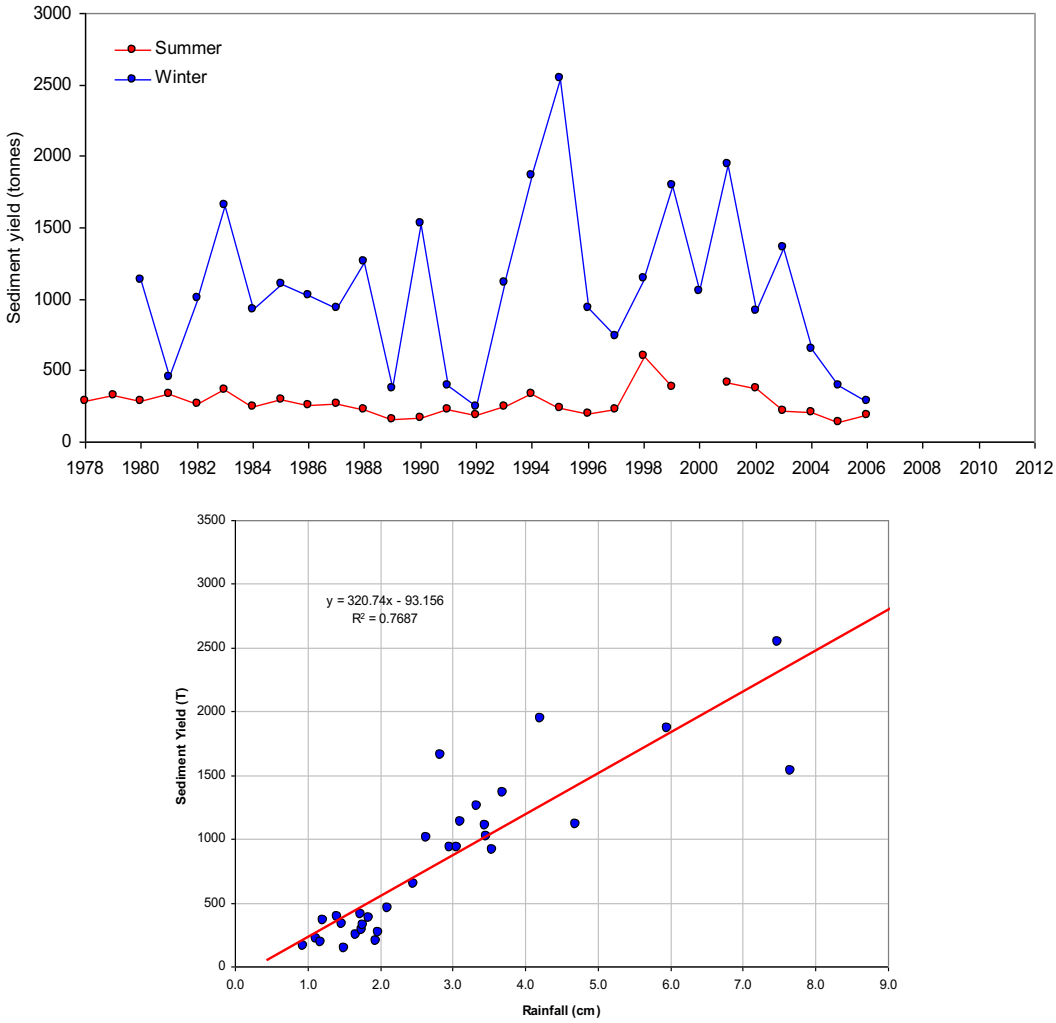

Figure 7: Variations in fine suspended sediment loads in the River Itchen at Gators Mill. The majority of fine sediment transported by the River Itchen occurs in Winter, and is significantly related to total rainfall. This demonstrates the importance of surface runoff as opposed to groundwater in delivering fine sediments into the watercourse. Initial data provided by Portsmouth Water Company.

For the River Itchen, fine sediment loads (suspended in the water column) are generated during winter high flows when the catchment surface is wet and there is a higher proportion of overland runoff (Figure 7). The strong relation between total annual sediment yield and total annual rainfall during winter demonstrates the importance of catchment surface runoff derived from the less permeable soils of the Tertiary geology – including the Bow stream and Colden common stream catchments. This contrasts the statement made in the EBC sustainability assessment report UE0247HRA

-Eastleigh LP_5_181029 (2018) which states in relation to fine sediments:

"Given the low or absent flows within the headwater streams during parts of the year these waters are considered unlikely to make a significant contribution to the hydrological conditions required by the River Itchen SAC. However the primary headwater streams provide functions of retention of sediment water and organic matter, nutrient reduction and wildlife corridors. As such it is considered that the risk of development in the vicinity of the headwater is low subject to the proposed mitigation and design measures".

This statement underpins the lack of understanding of basic hydrology of headwater streams draining impermeable catchments. The peak sediment delivery is during intense summer convective storms (the probability of these increasing with Climate change) and during winter when wet catchments and storms (probability increasing with climate change) makes these systems highly responsive during periods when bottom spawning fish species have eggs incubating in the river gravels.

Proposed Development in Bow Stream catchment

Given that the headwater streams in the proposed development area drain impermeable London clay surface geology, it is likely that clay is an important part of the sediment loads derived form the Bow stream catchment. However, the delivery of fine sediments to the stream network and the propagation of the sediment wave downstream is determined by the roughness of the surface and channel. Changing from a rough surface (grass, woodland) to an urbanised and drained surface will result in more efficient connectivity and pathways for fine sediments to enter the watercourses and be delivered into the river Itchen SAC. Moreover, development will substantially increase the contribution from road verges and urban surfaces which contain additional pollutants, which are known to be more toxic to incubating salmon and trout embryos (Kemp et al 2011; Sear et al., 2017). Road runoff can be a pathway for contamination of streams with heavy metals, hydrocarbons, including PAHs and de-icing salt. Maltby et al. (1995) showed clear effects on diversity and composition of macroinvertebrate assemblages in streams receiving road runoff; the dominant PAHs were phenanthrene, pyrene, and fluoranthene, whilst dominant metals were zinc, cadmium, chromium, and lead (Riley et al (2018). Thus, the direction of change resulting form the proposed development is towards increased fine sediment delivery (clays) and toxicity of these fine sediments (organic matter, pollutants), particularly during the construction phases when plant and disturbance to the sites are highest. Given the importance of the salmon spawning gravels downstream of the entry point of the Bow Stream to the River Itchen, **it is extremely likely (High Confidence) that the quality and productivity of these spawning gravels DURING Winter high flows, will decline, resulting in lower recruitment to an already critical population of genetically unique salmon**. Suggestions that mitigation through SUDs will reduce the impact on fine sediment delivery to the Itchen SAC are unsubstantiated by any evidence. Given the local geology the options available are limited to settling ponds and vegetative strips. Settling ponds and bunds do store fine sediments, but are not able to retain the finest sediments in suspension (Herricks

1995). SuDS are expected to function to a design capacity, for example, sediment volume removal rate for a wetland 55%, pond 80% swale 75%, filter strip 55% (Leisenring et al. 2013) over their life cycle of up to 25 years. This leaves substantial fine sediment delivery to watercourses. Recent analysis of multiple SUDs measures (Allen et al 2017) show that 17% of fine sediment escape a multiple SUDs system under multiple rainfall events, and that this is likely to increase as the performance of the SUDs degrades as they must, over time. They conclude that "The assumption that urban sediment pollution is captured and permanently retained by a SuDS asset during the initial event is therefore inaccurate". Individual SUD's in their study though initially highly effective for coarser sediments (80% -90% capture) educed in effectiveness over 52 weeks (46-70%). A key reason was the remobilisation of deposited sediment from a SUDs asset. This emphasises a key limitation acknowledged for SUDs, which is the absence of long term maintenance. Accumulated fine sediments and associated pollutants from garden herbicides/pesticides, microplastics, dog and cat excrement and oil based spillages, in SUDs assets represents a significant and mobile store that unless removed annually, risks remobilisation and evacuation into the existing watercourses.
The highest fine sediment impacts will occur during construction when all evidence points to the inability of building contractors to maintain fine sediments on site during wet winters and storms – a reason why they have to routinely clean road surfaces of fines with water/sweepers during construction. Given the critically low population of salmon and the location of the Bow stream input upstream of key spawning areas, the risk of even one poor recruitment year is too high.

Additional Ecological Impacts

Runoff from urban surfaces are warmer that natural or agricultural surfaces due to the high heat of artificial materials and the darker mature of the materials (e.g. Tarmac, Roofing (Langan et al., 2001). Rapid runoff and drainage, transfers urban flows faster into receiving watercourses giving little time for thermal amelioration. The short distance between urbanised surfaces and the Itchen SAC means that thermal shocks from the new developments are likely particularly during summer convective storms, but also during winter runoff. Given annual average temperatures for the region are set to increase within the next 30-50 years, the development will almost certainly result in the discharge of warmer water into the existing headwater streams and the Itchen SAC. Salmonids in particular are known to be sensitive to water temperatures, affecting the timing of migration upriver, but also the development times of incubating embryo. Even modest changes of temperature can aggregate into markedly different annual degree-days, with impacts on sensitive species like the mayfly *Ephemera danica* (Everall et al., 2015).

The current proposal and accompanying reports provide little evidence or acknowledgement that this is an issue for the Itchen SAC or headwater streams involved neither do they consider it in any mitigation. With increasing air temperatures predicted over the life time of the proposed development this would at best appear to be an omission and at worse negligence.

Plastics

Plastic is recognised as pervasive within aquatic ecosystems, the result of mass production and the presence of plastics associated with human populations. Larger plastics (litter) are found in watercourses draining urbanised areas. Microplastics are emerging as a significant concern for freshwater systems. Current monitoring only occurs in larger rivers (Horton et al.,2017a), however a recent study has shown that they are found throughout the catchment (Hurley et al., 2018), suggesting that small headwater streams are likely to be contaminated. Important sources of microplastics to streams include road runoff (Horton et al., 2017b) and STW's. Given the longevity of the proposed developments and construction timescales, consideration of microplastics within the mitigation and impact should be made within the assessment as part of a precautionary approach. Microplastics are neutrally buoyant, and are unlikely to settle within existing SUDs systems. Existing woodland and agricultural surfaces are low in plastic relative to urban surfaces and areas that include recycled rubber, and additional plastic waste. IN a forward looking plan (to 2036) lack of recognition of this pollutant is again an omission.

Summary and Consideration

The current Plan and associated reports fail to understand the importance, impact and problem of fine sediment releases from construction sites and urbanised landscapes; in part because those involved are not familiar with the literature/evidence and in part because they assume that SUDs measures can trap all sediments throughout the construction and development period. The limited evidence suggests that SUDs are not as effective at trapping sediments as short term event based studies formerly suggested. Furthermore, the impact of an increasing scale of urban area, coupled with a warming air temperature and growing population over the period to 2036 and beyond, suggest that rather than stabilising, the impacts will increase. **The conclusion must be that the proposed development will have a major impact on the SAC and that this will not be mitigated by existing SUDs systems**.

Given this conclusion it is reasonable and realistic to seek alternative sites that could sustain higher fine sediment loads whilst minimising the impact on the SAC. These sites ideally should lie downstream of the good quality spawning habitats in reaches where naturally fine sediment loads would be higher. Similarly, a site that was not located on highly impermeable geology and was off the chalk groundwater would provide additional options for SUDs based on enhance infiltration. Such a site existed in the development proposed for Allington lane, but which was rejected after only comparatively cursory considerations. That Option D/E drains via a single stream into the Itchen downstream of the spawning habitats.

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Appendix 2:

Fine sediment, pollutants and microplastic impacts on the River Itchen SAC from the proposed Development Options B and C in the Eastleigh Local Plan – Professor David Sear

Dr David Sear is Professor of Physical Geography, at the University of Southampton. He is an advisor to DEFRA and Environment Agency on Flood risk management and sits on the Techical Advisory Group for Strategy and Policy for Flood and Erosion Risk management. He helped develop flood risk guidelines for the Agency, worked on the impacts of recent flooding in Cumbria, and has introduced sediment management procedures across the UK river management sector. David also advises Natural England and EA on river restoration and salmon is habitats, in particular the impact of sediments on spawning habitats. He has authored over 170 academic papers and reports including three books on river restoration, salmonid fisheries management and the management of sediments in rivers. He has worked for a wide range of international engineering and environmental consultancies on projects from large Dams to strategic restoration schemes for SSSI and SAC rivers.

This submission follows on from an earlier one by the author. This new submission deals with the evidence that best practice mitigation based on generic national policy is highly uncertain and challenges the weak generic assessment made in HRA 2019 report. Put simply the evidence does not support the assertion that with mitigation, there will be no negative impact on SAC ecological features.

However, the HRA concludes any adverse impacts can be avoided through appropriate mitigation measures which it states will be installed to protect the Itchen SAC. What this Paper explains is why even the most carefully designed and installed sustainable drainage systems will not prevent fine sediment run-off from the proposed development entering the Itchen with very damaging consequences to the river and the species it contains and supports.

Consider a simple question; is there anywhere in the UK or the world where the riverine waters and ecosystems immediately downstream of an urbanised or urbanising catchment are better or the same as upstream? The answer is no. The impact of urbanisation on river ecosystems and water quality is known to be wholly negative. Recognition of this prompted the UK Government to fund a series of research programmes to investigate measures to improve the environmental impact of urban centres. Some of these have resulted in directly relevant outputs to this planning application, notably the poorer performance than expected of sediment mitigation structures.

Excessive sedimentation in urban rivers lead to a number of adverse ecological and environmental consequences as the loading of suspended sediment from an urban environment is significantly higher than that in rural catchments. This is because

increased impermeable surfaces in the urban environment protect and trap sources of coarse material and disproportionally increase fine materials in stormwater runoff. Fine sediments harbour nutrients, pollutants, microplastics and coliform bacteria which are generated from the urban environment and transported by storm runoff (Sangaralingam et al., 2019; Jartun et al.,2008). This stresses the biological, chemical and physical integrity of the receiving water through eutrophication, toxification, limited permeability and reduced oxygen delivery. Moreover, contaminants associated with suspended sediment particles and dissolved solutes in stormwater runoff are more difficult to manage than those associated with coarse (sand) particles. Allen et al (2018) and Sangaralingham et al (2019) state that despite the recognised multiple benefits, '*there are still concerns over the long-term performance of SUDs in urban catchments as the performance of the features varies considerably with rainfall, flow and site conditions'*, the latter changing with the construction and urbanisation process. Moreover, managing sediments on construction sites is challenging; silt control measures are not 100% effective, and silt fences are frequently damaged, overloaded and fail.

The basis of my concerns as a professional of 28 years practice in research and application of sediment management and fine sediment impacts on chalk and other river ecosystems at local, national and international level, is the extent to which the risk of fine sediment release from construction and subsequent urban runoff with mitigation is in sufficient doubt relative to the sensitivity of the receiving SAC ecosystem, to warrant consideration of alternative options. Fundamentally, I first make the case based on robust scientific evidence, that the sensitivity of the receiving reaches are higher than most river types. Secondly, I demonstrate that the mitigation options outlined in HRA 2019 will fail to trap highly damaging fine sediments and associated pollutants. I therefore conclude that there is sufficient doubt to justify rejection of this plan, and instead trigger consideration of alternative options including alternative areas and or modification of proposed plans to avoid the river catchment areas that drain into the river Itchen SAC.

Sensitivity of Chalk streams to fine sediments.

Chalk stream foodwebs are complex and highly connected (Jones et al., 2012, 2014). The important point is that they are impacted at all levels by fine sediments. Reviews of recent evidence point to the importance of sediment quantity, grainsize, and quality, specifically organic matter. Additional modelling by the author, indicates that increases in fine sediment of <20% relative to background will result in reductions in Atlantic salmon embryo survival of 40-50%. Given the critically low populations of Atlantic salmon in the river Itchen, and the increasing pressures on the species predicted over the next 30+ years as a result of warming ocean temperatures in the N Atlantic, such impacts on recruitment will be damaging to the SAC. Moreover, a recent review of sediment targets for river ecosystems (Collins et al., 2011) in which the authors (of which I was one), concluded that '*Aquatic biota can be adversely affected by extremely low [sediment] concentrations'*.

The accompanying June 2019 report by Urban Edge (HRA 2019) shows a complete misunderstanding of how headwater streams function – stating in section 6.6.31 that headwater streams will store sediment. Rather, headwater streams such as those

impacted by the proposed development are **net sources of sediments, nutrients and organic matter** (e.g. Riley et al., 2018 review). Furthermore, there is no explicit recognition of the importance of fine sediments or their mitigation in this proposal. Instead, high level, generic statements and a focus on nutrients dominate the report. Fine sediments are a key issue for the SAC, but this report fails to address it both in terms of processes (e.g. it does not mention and fails to understand fine sediment accumulation in the receiving watercourse and completely fails to use existing evidence that is widely available and actually relates to fine sediment impacts to the Itchen), impacts and mitigation. The report simply cuts and pastes text without consideration of local context, from national policy level documentation. This submission is an attempt to redress these inadequacies and provide the level of information required to make a balanced decision about an SAC river of international importance.

Efficacy of sediment mitigation treatments

Sediment management in the UK is relatively new and is still in its infancy (HR Wallingford 2011). Current best practice policy for urban areas and agricultural land relies on a range of mechanisms designed to trap sediments and pollutants in runoff. These policy measures are based on very specific design assumptions; notably the measures of sediment (and for that matter water and pollutants) trap efficiency are specifically for a single design rainfall-runoff event with an event mean suspended sediment concentration and for conditions assuming full trap functionality. Two important points need making; **first the assumption of mean SS is an incorrect simplification**; for impermeable catchments such as the ones in this plan, over 80% of the sediment runoff occurs in winter storms when the SUDs manual itself recognises many of the features fail to trap anything like this quantity of sediment. Secondly, **there is no accounting for the different trap efficiencies of variable grainsizes or sediment type** (organic vs inorganic) – fine silts and clays, and particulate organic matter, ie the most damaging components to the SAC features and the dominant load produced by the soil types in the proposed application. Trap efficiency of silts and clays are typically less than 50% and frequently less than 10% for mitigation measures of the type proposed (Verstraeten & Poesen, 2000). This is recognised explicitly in Sediment management manuals in Canada and the US where practice and design are more advanced than in the UK, and which conclude that *"Finer size particles (i.e., clay and fine silt) will require a long time to settle and therefore may not be deposited in the sediment containment facility during the time of retention. As such, targeting clay, fine silt particles and organic silts for sedimentation is not practical",*(Design Manual for sediment control Alberta Transportation Manual 2011). Let us be clear from the outset therefore, that when this application talks about mitigation of sediment it refers to coarse silts and sands only. **The more damaging finer silts and clays to which pollutants and nutrients are chemically bound, and particulate organic matter will NOT be effectively treated by the proposed mitigation options** simply because the mitigation measures are unable to generate the settling conditions necessary to deposit these finer sized particles.

In recent years, and in response to concerns about the sediment trap efficiency of best practice measures, research programmes have been undertaken by UK Research Councils, to update and test the performance of SUDs over a) multiple rainstorms and

b) longer timescales – those that account for reduced efficiency as features mature. In all instances, these new research demonstrate;

1) Far lower efficiency in fine sediment trapping and pollutant reduction than the single event assumptions made in best practice (mean trapping values of 34% ± 17%).
2) Highly variable effectiveness between different rainstorms including increases in sediment released from features (range 69% to -11% ie net export of fine sediments).
3) Progressive reduction (24%) in performance over time as the systems become less effective.

These results caused Sangaralingam et al., (2019) to conclude that "*it is difficult to set water quality standards for stormwater ponds due to randomness in the rainfall events*". Recent analysis of multiple SUDs measures (Allen et al 2017) conclude that "*The assumption that urban sediment pollution is captured and permanently retained by a SuDS asset during the initial event is therefore inaccurate*" (Allen et al., 2017; 2018).

Use of buffer strips another feature proposed for mitigation protect river channels from diffuse overland flow from hillsides but are ineffective where the river runs through them. Moreover, the efficiency of buffers reduces over time and with damage, and they **have to be maintained and managed to attain the higher rates of trapping and nutrient processing quoted in the literature**.

Restoration works on river channels such as the creation of wetlands have multiple benefits if undertaken in concert with a full understanding of the natural systems being modified. Simply stating that creating wetlands or restoration of river channels is a mitigation for fine sediment is too simple an assumption. In two of the only monitored examples in the UK, Sear et al (1998) and Millington (2011) show how during and after construction of the river restoration works, fine sediment loads rose by 152% and 140% of the inputs to the restored reach, generating suspended sediment concentrations that were 300 times higher than natural background loads despite mitigation measures (heather bales and sedimentation traps). Any construction works involving disturbance to a river channel will deliver pulses of fine sediments during rainfall events due to disturbance of the land surface and river channel bed and banks. Note the geology of both sites are the same or similar to the proposed development site in Option B.

The new evidence thus far, clearly points to existing and growing evidence that the assumed effectiveness of the proposed mitigation measures will fail to deliver the protection to fine sediment sensitive SAC species. **The result is substantive and substantial doubt in the assumptions underpinning the mitigation plans based on best practice. This doubt raises the probability of failure to mitigate, and hence the risk of damage to the SAC features of interest above what a range of independent international experts recognise as unacceptable.** In this instance Habitat Regulations (WFD, Habitats Directive) require consideration of alternative options.

Monitoring

River restoration and sediment management projects are seldom monitored and when undertaken are frequently insufficient to address the (often unstated) targets (Skinner et al., 2008). My own personal experience of river and sediment management including natural flood management schemes, comes to the same conclusion. Monitoring is not done effectively if it is done at all. I am therefore highly doubtful that it will be implemented effectively on this proposal. Evidence to the contrary would need to be compelling (e.g. specific, adequate resourcing, careful monitoring design against specific targets). In reviews of monitoring there are important considerations that are common; first to set clear and justified targets (e.g. we will reduce sediment load to the SAC reach by 80%; there will be no reduction in Atlantic salmon embryo survival in the receiving reach spawning redds over a 20+ year period compared to control reaches with no impacts). Secondly, the need for robust before, and control sampling so that natural variability can be quantified and against which the effectiveness of the treatments can be measured; and thirdly, sufficient replication to test the targets to robust levels of statistical confidence (e.g 95% confidence levels). For example, to correctly quantify the target performance of sediment mitigation measures there would need to be continuous sampling of sediment load, grainsize, organic matter and pollutants including microplastics because it is the high magnitude, relatively infrequent rainstorms that generate the sediment pulses (>90% of the sediment load can be transported in <10% of time (Walling and Webb, 1987). Daily, monthly or weekly sampling would be insufficient as these events typically occur over 2 hours, and at night when air temperature drop and rainstorms occur. Furthermore, sampling would need to be undertaken at multiple sites, upstream of treatments, downstream of treatments and upstream of the inflow to the SAC and downstream of the inflow to the SAC river in order to account for potential upstream changes. Samples would need to be processed in laboratories. This sampling and monitoring regime would need to be continued into the future as the scheme develops and evolves, and as the mitigation treatments change over time; resulting in deployments into the 2040's. This is only the sediment and pollutant aspect, and only the data collection. The data would need regular interpretation and reporting, with triggers set at which point activity on site would need to be halted, and additional mitigation implemented including (and I do not know how this would be achieved) mitigating any impacts arising from deleterious releases of sediment and pollutants into the SAC. Monitoring of the ecology would be important across all levels of the food chain and at intervals and with controls and replicates that would enable Statutory bodies to determine level of impacts and potential requirements for remedial/mitigation activities (currently unspecified as to how these would be achieved).

Conclusion

Recourse to best practice as a national policy at local planning scale fails to properly consider the risks associated with runoff from building works where site specificity is important as it is in this case. This is recognised by statutory bodies. It is widely recognised that SUDs and other mitigation measures to reduce sediment runoff from building works and new developments, have efficiencies that are highly variable and

far lower for finer damaging sediments than those cited in existing manuals used to justify planning applications across the UK. At the same time, extensive evidence points to the uniquely sensitive nature of chalk stream ecology to small increases in fine sediment loads. Together, these present unacceptable levels of doubt in the ability of the planning, design and implementation of this development to adequately protect the SAC, SSSI features of interest in the river Itchen. On this basis my recommendation would be that alternative sites are considered that will enable EBC to deliver on its government targets for housing, and that these should avoid direct connectivity into the sediment sensitive SAC chalk stream reaches.

The full evidence underpinning this submission is available on request, is rigorous, peer reviewed and published.

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Appendix 3: Report on the hydrological impacts of the Eastleigh Borough Submission Local Plan

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Date: updated 7th October 2019

1. Introduction

I was asked by John Lauwerys of the ADD Campaign to comment on the Eastleigh Borough Submission Local Plan and, specifically, on the JBA hydrology reports and the HRA.

Chalk streams represent one of very few habitats in the UK that are internationally rare and, as such, our custodianship of such habitat is highly significant, globally. The River Itchen contains a number of protected species and, with all chalk streams, is highly sensitive to pollutants, particularly fine sediment, and changes in water level. Therefore, there is a high risk that development within the catchment of the River Itchen could have significant detrimental impacts without careful consideration and understanding of the hydrological and ecological context.

Below I have labelled the JBA reports as follows:

- JBA1 - Eastleigh Hydrological Sensitivity Study task 1
- JBA2 - Eastleigh Hydrological Sensitivity Study Conceptual Surface Water Drainage Strategy
- JBA3 - Eastleigh Hydrological Sensitivity Study: Geomorphology and Ecology Assessment
- UEEC – Habitats regulations assessment for the Eastleigh Borough Local Plan 2016-2036. HRA Report for the Submission Plan June 2019.

2. Overall comments (updated on 7th October 2019:

The reports do not provide the necessary detail or information to be able to state conclusively that there will be no significantly adverse impact on the River Itchen SAC. SuDS are known to not be 100% effective at mitigating fine sediment or run-off increases. Therefore, it is implausible that SuDS on this site could totally mitigate the impacts on the River Itchen SAC. Given the HRA report (section 0.4.1) states that there will be “no adverse impacts on the integrity of the River Itchen SAC” there is a misunderstanding about the ability of SuDs to mitigate adverse pressures.

There is also a lack of consideration of how sediments, pollutants and run-off will be mitigated *during* construction, when SuDS schemes will not be of value. While these shortcomings are partially acknowledged and Natural England require regular monitoring, there is a lack of detail on what would be monitored and what conditions/thresholds would constitute a problem/issue and how such issues would be mitigated.

SuDS schemes and their efficacy to trap sediment declines through time as they degrade. Regular maintenance is required to maintain their ability to store sediments. There is an acknowledgement of this issue, and there is an expectation that SuDS would be adopted by a 'public body' but, there is a lack of any detail on who will monitor and maintain these schemes, and how that will be achieved in practice. This is very worrying given it is a critical component of the success of any SuDS scheme. Without maintenance, they simply will not work.
On reading these documents, I see no other conclusion than that the River Itchen SAC will be adversely impacted by increased fine sediment deposition due to the proposed development. Based on the report content, I additionally suspect that this impact will be substantial given sediment loads are likely to be much higher than pre-development, even with the incorporation of SuDS.

3. Site drainage and SUDS
Perhaps understandably given the lack of data, the JBA2 report has no detail or practical information about the potential impacts of the development on site drainage. Currently, it is simply stating the required regulations with no information on how these would, or could, be achieved on the specific site of interest, or in the context of the River Itchen.
The report correctly favours the least intrusive options whilst "not ruling out" more detrimental options. However, from available information these more detrimental options, despite not being favoured, appear to be far more likely. For example, the report favours discharge to ground and watercourses (JBA2 section 3.2.1) whilst the potentially detrimental options of "Discharge to public surface water sewer" and "Discharge to public combined sewer" both "cannot … be discounted at this stage." The report acknowledges they "should be avoided" but it seems highly unlikely that in a development of this scale and location that it is technically feasible to avoid these options entirely.
Therefore, some indication of the technical feasibility of SUDS options is needed. This is not a fault of the JBA report which is clearly just indicating site characteristics with limited knowledge of the development itself. However, this does not diminish the importance of such information, especially given the difficulty of developing a SUDS scheme for a site of this size and complexity. More generally, it seems implausible to assume that SUDS on this development can "ensure that discharges mirror greenfield rates and natural hydrological pathways" given the scale and location of the development, which occurs at the source of a number of streams. This is especially true when planning for a 1 in 100 year event in the context of climate change.

4. Runoff and water quality
JBA2 gives options on managing runoff quality which again are vague. More importantly, there is no information on where runoff treatment would need to be located in the development / catchment area. Given the complex drainage of the site, this is important because runoff drains in three different directions (i.e. into Horton Heath, Upper Bow Lake and Lower Bow Lake) and into different tributaries of the River Itchen. Therefore, a single treatment site (i.e. wetland or pond) cannot obviously treat all the runoff from the development area and, instead, multiple runoff treatment sites would be required to individually treat each sub-catchment to ensure run-off quality is not of detriment to the downstream water course.

The lack of detail in the report is problematic in many places and, in my opinion, many of the options presented are unlikely to represent realistic options or outcomes. For example, the report states that “Where green roofs are incorporated into new buildings, these could be used to compensate for the loss of arable habitat” (JBA2 section 3.2.4). Green rooves would have positive impacts over non-green rooves but, it is highly unlikely that green rooves will truly compensate, in terms of runoff attenuation, water storage, ecological functioning or nutrient dynamics, the role of arable habitat. More specific information is needed to understand what aspects of the hydrological regime, and the extent to which, green rooves can mitigate some of the substantial changes that would inevitably occur in this area during and post construction.

5. Woodland

JBA1 section 4.3. indicates the significance of the woodland to water quantity and quality and I strongly agree that removal of any wooded headwater areas could have significant detrimental impacts downstream on both flood potential and water quality.

6. Ephemeral Streams

Given the early stages of plans and the lack of detail in the report, it is not clear what the plans are for the ephemeral streams (i.e those streams that dry up for part of the year). The academic consensus would strongly agree with the statement “Headwaters are closely linked to the overall health of the larger downstream water bodies, like streams, rivers and lakes. Primary headwater streams provide functions of retention of sediment, water and organic matter, nutrient reduction and corridors for wildlife dispersal” (JBA section 2.1.5.3.). It is therefore surprising that the next sentence directly contradicts this by disregarding the ephemeral headwaters on site “given the low or absent flows in the headwater streams during parts of the year, these waters are unlikely to be making a significant contribution to the conditions required by the SAC River Itchen.” This statement seems unsustainable with the available data, especially given that a site visit only occurred during drought conditions. The lack of consideration of the significance of these watercourses is concerning given the likely flashy nature of the watercourses, with these dry channels providing important routes for water after wet weather, and the future impacts of climate change and increased rainfall intensity. They are also likely to harbour a diverse ecological community although admittedly unlikely to include the currently listed species in the wider Itchen area.

7. Lack of data about discharge and drainage of streams

I have concerns about the analysis of tributary contribution to the River Itchen and its interpretation in JBA1 section 3.8.2. The discharge of a river changes through time from minutes to years. Hence, a single spot measure on one day does not provide the necessary information to make assertions about the hydrology of a stream. Similarly, monthly spot measurements for 12 months do not provide an accurate annual average measure or indication of flow range, not least because the likelihood of high flows occurring over a 12 month period is low and, even if they did, the operator would not be able to enter the channel to take measurements and so results are biased to lower flows. As the contribution of the developed area to the River Itchen will be dependent on the time of year, flow intensity, antecedent weather conditions both at the site and

upstream in the Itchen catchment, the results presented cannot provide any reliable information on contribution.
I am also concerned that the contributions that were measured, including a maximum of "< 14% of the Itchen Q95" are deemed insignificant. I would argue based on the data presented, the tributaries could represent an important contribution to the Itchen, particularly to the River Itchen water quality if runoff from the site is polluted.
I also question the unpinning science in this section, particularly where measurements are validated by comparison to the 12-sample mean. The report suggests that because a measurement is of the same order of magnitude as an average, it is likely to be correct. This is not the case and does not indicate in itself that "the observed flow estimates from May 2018 provide a realistic picture of the variation in flows across the catchment area of the NBLR."
Based on the collected data, I do not believe there is currently a realistic picture of the variation of flows across the catchment area and substantial work would need to be done to achieve this. The report itself acknowledges this and states "the … data analysis provides a cautionary overview of flows across the catchment, it could be expected that, following rainfall, there may be relatively more flow from the lower permeability area, which would be likely to generate more runoff."
Therefore, I would argue that the usefulness of the presented analysis in this section is minimal in indicating the likely contribution of tributaries to the Itchen.

8. Mitigation during construction
Given the sensitive nature of the River Itchen and a number of rare and protected species, the impacts of, in particular, fine sediment pollution during construction work could be highly detrimental. The JBA report acknowledges in multiple places the need for mitigation measures to prevent such detriment; however, no details are given as to what these could be. Indeed, it is hard to imagine, given the site location and current drainage system, a mitigation strategy that would be able to prevent fine sediment and other contaminants entering the River Itchen for the duration of the construction period on such a scale, particularly during heavy rain. Based on the information presented, I have serious concerns about the technical feasibility of being able to suitably protect the River Itchen from fine sediment pollution if construction work was to take place on the site.

9. UEEC Habitats Regulations Assessment for the Eastleigh Borough Local Plan 2016-2036.
The UEEC document, released on June 2019, does little to alleviate my concerns, detailed above. Even small increases in fine sediment deposition in the River Itchen SAC have the potential to substantially impact habitat conditions and fish spawning, particularly the spawning of Atlantic Salmon which are already pressured in the UK.
The established academic literature suggests that SuDS can be effective at reducing run-off and fine sediment deposition when compared to traditional developments without SuDS; however, such schemes are not totally effective and there it is still highly likely that run-off and sediment inputs will increase over pre-development levels. For example, a recent study looked at all published datasets on swales and found that they are on average 56% effective at removing total suspended sediment (Fardell et al. 2019). Therefore, a large proportion of the fine sediment load delivered to these schemes is not stored in them and makes its way to the river system. In addition, the

same paper found swales were not effective at removing nutrients (≤ 30% removal) (Fardell et al. 2019). Where run-off, fine sediment and pollutant levels need to be reduced, SuDS can be useful in reducing loadings but, they will not be 100% effective nor should that be an expectation. It is therefore concerning that in Section 9.2 the report states there will be “no adverse impacts on the integrity of the River Itchen SAC”, which simply cannot be supported given the lack of baseline data, lack of detail in the proposal, and the known limitations of SuDS schemes.

Similar studies have also found that material deposited in SuDs schemes can be remobilised at high flows. The work of Allen et al. (2017) shows that 17% of fine sediments eventually move through SuDS schemes after multiple rainfall events. This work presents the findings of research that monitored a network of SuDS for 12 months at the J4M8 Distribution Park in Bathgate, Scotland, which is considered a best-practice example of SuDS implementation. They found that fine sediment, which is supposed to be deposited in the SuDS scheme, preventing it being moved downstream into the river network, is in fact re-mobilised during subsequent rainfall-runoff events. They observed this phenomena occurring across the 52 week study period and, overall, the SuDS schemes underperformed relative to their design expectations because of this movement of fine sediment through the system.

The proportion of fine sediment moving through SuDS systems is also likely to increase through time as the infrastructure degrades and sediments build up. Therefore, maintenance is a critical component of SuDS schemes and I am concerned about the vagueness of how these mitigation strategies will be monitored and maintained in the proposal. A common problem in the UK is the lack of monitoring of SUDS and, therefore, a difficulty in assessing whether they are meeting their design purpose. There is no information in the report about how or whether the performance of these schemes will be monitored, which is critical to identify issues and certain degradation, and instigate remediation before problems develop. In addition, SUDS require regular, long-term maintenance, especially if the aim is to prevent the addition of fine sediment deposition, which will build up in the SUDS. There is a stated expectation that the SuDS will be adopted by a public body but, the lack of detail on this important component is worrying. Without maintenance, the SuDS will not work effectively and run-off and fine sediment inputs into the River Itchen are likely to increase substantially.

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Appendix 4: An overview of the potential impact on the River Itchen of the Eastleigh Borough local plan proposals for the development of Options B/C and the building of the North Bishopstoke link road

By Professor Ken Gregory

After reading the JBA reports prepared for Eastleigh Borough Council, I have considered the submissions received from Aquascience (Dr. Nick Everall), Professor David Sear, Dr. Matthew Johnson, and Professor Rob Wilby and am impressed by the scientific arguments, the evidence referenced and the conclusions reached in those submissions.

The importance of the Itchen, designated as a SAC, is summarized by Dr Johnson who correctly states that '*Chalk streams represent one of very few habitats in the UK that are internationally rare and, as such, our custodianship of such habitat is highly significant, globally. The River Itchen contains a number of protected species and, with all chalk streams, is highly sensitive to pollutants, particularly fine sediment, and changes in water level'*. I fully concur with this assessment and note the evidence that Professor Sear provides with his background of 27 years' experience of leading research in this area including fundamental work on the spawning habitats of the River Itchen. He collates results from a range of research investigations which show very convincingly how the Itchen and other Chalk streams are vulnerable to increases of fine sediment and fine organic matter. He also provides clear evidence, much already published in international journals, showing how fine sediment derived from road verges and urban runoff have disproportionately high impacts on salmon embryo mortality compared to agricultural land and river banks, and also that Chalk rivers are extremely sensitive to small increases in fine sediment loads owing to their low flushing capacity and stable gravel beds. Furthermore he notes that the potential presence of micro plastics (now demonstrated in recent research elsewhere and very difficult to manage) could also have deleterious impacts on fish habitat. Finally, the Aquascience report (Para 2.1) notes how the Highbridge road bridge could be critical in relation to the Southern Damselfly population, and also affirms (P.12) that salmon stock is probably at risk and vulnerable.

It therefore appears that the Itchen could certainly be vulnerable to impacts that could arise: (a) during building activity with sediment and solutes directed to the Itchen (b) as a consequence of increased urban runoff which could be exacerbated by more intense precipitation events, for which we already have indicative evidence elsewhere in the UK. The extent of the impact on the Itchen depends upon the existing network of streams and watercourses, because they are the arteries (even when modified) whereby sediment and increased runoff will be transmitted to the Itchen. Detailed field survey is necessary to ascertain the pattern of sub catchments because the way that these are utilised and integrated into the storm water drainage system after development will determine the sensitivity of the system with regard to the runoff and sediment and solute conveyance to the Itchen. Even with SuDS implemented there would be a considerable increase in runoff, and sediment and solutes could be significantly increased especially during building construction. Although SuDS can

mitigate effects of building activity and urbanisation to some extent, they are unable to provide guarantees because however they are designed they are subject to limits. In fact the watercourses would be subject to channel changes and probably to enlargement similar to that which affected the Monks Brook in Eastleigh (Gregory et al.,1992) which would increase sediment conveyance.

I have now considered the HRA Report for the Submission Plan (2019. Urban Edge Environmental Consulting), and note that their statements that mitigation measures are required (6.6.13; 6.6.20) and that control of impacts is necessary (8.6) do not alter the conclusions above. I therefore conclude that the Itchen SAC would be vulnerable to deleterious effects of increased runoff, sediment, solute and microplastic conveyance and that no guarantees are offered to completely minimise impacts.

Professor K. J. Gregory October 2019

Professor Ken Gregory obtained his BSc, PhD and DSc from the University of London, was made CBE in 2007 for services to geography and higher education, and was the first President of the British Society for Geomorphology. He is Emeritus Professor University of London and Visiting Professor of Geography and Environment, University of Southampton. He has published more than 190 papers and authored and edited 30 books and his research interests include river channel change and management and palaeohydrology. He was a member of three HEFCE Research Assessment Panels and chaired two of those. He has four Honorary degrees, and received the Founders Medal of the Royal Geographical Society (1993), the Linton award of the BGRG (1999) and the Geographical medal of the Royal Scottish Geographical Society (2000).

Reference

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Appendix 5

AQUASCIENCE Consultancy Limited

Hearing Statement on the latest Eastleigh Borough Local Plans and associated documentation

October 7th, 2019

On behalf of the Add Campaign

Prepared by: Dr. Nick Everall MIFM C Env

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AQUASCIENCE Consultancy Limited

Hearing Statement

I have examined the updated HRA reporting from EBC allegedly addressing the issues raised by a number of organisations with the proposed development (UEEC, 2019). The key thrust of the arguments forwarded by EBC are that generic proposed mitigation measures at this stage will provide adequate protection to the receiving River Itchen Special Area of Conservation (SAC). These proposals fall under the umbrella of sustainable drainage systems (SuDS) but without a scrap of factual published evidence saying that such assets will provide 100% protection from future e.g. fine sediment and nutrient incursion. The evidence that is presented independently, e.g. by both Dr. Sears and Dr. Everall, shows that SuDS have been documented to under-perform against design expectations (e.g. Herrick, 1995 and Allen *et. al*., 2017).

In a lowland industrial river where fairly sediment and nutrient enriched might be the norm then less than 100% mitigation measures might be acceptable, but the River Itchen is an internationally renowned SAC which currently teeters on a knife edge of nutrient and sediment challenge. The smallest increase in nutrient and sediment levels in SAC chalk rivers are documented to be deleterious to the iconic fauna from these watercourses (e.g. Everall *et. al*., 2017 and 2019). All of these peer reviewed and published facts were presented by independent scientists in their reports which are not refuted because they appear to have been ignored by EBC in their updated HRA of June 2019.

In the face of submitted factual scientific evidence that any proposed SuDS scheme runs a documented risk of failing to deliver 100% mitigation of increased pollutant incursion to a watercourse and the sensitivity of the receiving SAC chalk ecology to those pollutants, then I fail to see how the existing HRA justifies the conclusion that the proposed development will have 'no adverse effects on the integrity of the River Itchen SAC'.

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Appendix 6: Eastleigh Local Plan

Impact of Option B/C and North Bishopstoke link road development proposals on Southern Damselfly populations

Stephen J. Brooks

14 October 2019

I confirm that I have considered and reviewed the most up to date evidence from the Council and the June 2019 HRA in coming to my view as to the impact.

Executive summary

The Itchen Valley contains a site of international importance for the rare Southern Damselfly.
The proposed development poses a threat to the population of the Southern Damselfly in two respects:

- The construction of a new bridge on the B3335 Highbridge Road and additional traffic following the proposed development may introduce silts and pollutants into the River Itchen and affect the hydrology of the River Itchen.
- The increased demands for water, which are inevitable given the scale of the housing development, could reduce water availability at Highbridge Farm.

The Southern Damselfly population has declined in recent years in the Itchen Valley. Any additional pressure on this population, such as that from the proposed housing development, could have serious negative consequences, even if the mitigation plan is implemented. Given the importance of this site for Southern Damselfly, and the risks that the proposed developments pose, this development appears ill-advised from an ecological perspective.
I endorse the view of the British Dragonfly Society that it is not possible to predict that the local plan will have no adverse impacts on the southern damselfly and its habitat associated with the SAC, even with the described mitigation plans in place.

Southern damselfly status

The River Itchen Valley is one of only eight localities in Britain that contains an internationally important population of Southern Damselfly (SD). Therefore, conservation and enhancement of these populations in the Itchen Valley are key to its continued survival in Britain and potentially in Europe.
The Southern Damselfly is one of the rarest species of dragonflies in Britain. It is endemic to Western Europe and is declining or has become extinct in many parts of its European range (Cham et al 2014 *Atlas of Dragonflies in Britain and Ireland*). It is listed as near threatened in the European Red List, Endangered in the British Red List and is a UK BAP priority species. It is one of only two species of dragonflies protected under the 1981 UK Wildlife and Countryside Act.
Most species of dragonflies are currently increasing their ranges in Britain in response to climate warming, however, SD is not among those. This is because it is a habitat

specialist (so suitable habitat is at a premium): the larval stages require shallow, moderately flowing, unshaded streams; and because the adult damselfly is poor at dispersing. Between 1985 and 2001 its range in Britain contracted by 38% and its population is still declining (Cham et al 2014).

Southern damselfly in the Itchen Valley

The River Itchen SAC/SSSI is one of the most important sites for the southern damselfly in Britain and the site's continued suitability for populations of SD is vital for the conservation of the species in Britain. Within the River Itchen SAC/SSSI are two main centres of population as detailed by Rushbrook (2018). These are located to the south at Itchen Valley Country Park and Allington Manor Farm, and to the north at Highbridge Farm. Between these two areas are other sites that support SD at lower densities (e.g. Ashtrim Nursery). These sites are important in linking the two main populations and maintaining the integrity of the whole population.

As Rushbrook (2018) makes clear, while the populations of SD in the River Itchen SAC/SSSI are relatively robust, at least in parts of the area, much of the habitat is suboptimal for SD, even within the two core areas. Indeed, survey work makes clear that even within this core area, and despite habitat management work, the SD population has declined in recent years.

The southern population located at Itchen Valley Country Park and Allington Manor Farm supports a relatively strong population of SD. For this reason, every effort should be made to secure the Itchen Valley Country Park and Allington Manor Farm population through habitat enhancement and any degradation of the habitat should be prevented.

At Highbridge Farm a strong population of SD is supported on the River Itchen, although many of the ditches and channels in this area are suboptimal either because they are shaded or because they dry out during summer. It is essential that this population is not allowed to decline further or put under any extra pressure. For this reason it is vital that water quality in the River Itchen is maintained or improved and grazing is allowed to continue in the surrounding meadows. Grazing, especially by cattle, helps to keep the channels unshaded and when cattle access the channel they poach the banks keeping them shallow. This provides ideal habitat for SD larvae and adults.

Possible impacts of proposed developments

Roads

Road works, particular the construction of a new bridge, and increased traffic flow on the B3335 Highbridge Road have potential to threaten SD populations at Highbridge Farm. This problem is likely to be particularly acute where the road crosses the River Itchen at the northern end of the site. Road runoff (e.g. salt, heavy metals, particulate hydrocarbons) should not be allowed to enter the River Itchen as these are likely to adversely affect water quality with detrimental effects on SD populations. Storm drains are currently present on both sides of the road at the eastern end of the bridge which appear to drain directly into the river. Such untreated drainage water could have serious consequences on SD populations and the risks of pollution could be expected to increase with increased traffic flow. There currently appears to be no measures proposed in the Local Plan to prevent damaging road run off entering the River Itchen and associated ditches. In addition, construction of a new bridge and upgrading of the

road is likely to lead to incursion of silt into the river, with associated pollutants, resulting in reduced water quality which may result in negative impacts of the SD populations. Road run off into the River Itchen may jeopardise any mitigation measures that were to be put in place. The new bridge may also affect the hydrology of the River Itchen resulting in changes in flow regime which may negatively impact SD populations.

The proposed realignment of the B3335 as it passes under the railway below Allbrook Hill could also result in reduced water quality of the River Itchen Navigation through ingress of silt and pollutants. Although this part of the site does not currently support a large SD population, nevertheless, the Itchen Navigation appears to act as an important corridor enabling subpopulations throughout the Itchen Valley to remain linked, which is vital in maintaining the SD metapopulation. For example, the channel at Ashtrim Nursery was created as recently as 2010 and already supports a small but thriving population of SD. This illustrates the ability of SD to colonise new sites within the Itchen Valley and underlines the importance of the Itchen Navigation to act as a corridor allowing SD adults to disperse through the Itchen Valley. Consequently the integrity of all sites throughout the valley that potentially could supporting SD should be maintained and enhanced. Any building developments at Ashtrim Nursery have the potential to damage the SD populations here and sever the links between the northern and southern population of SD in the Itchen Valley.

The meadows adjacent to the railway bridge at Allbrook Hill, across which the new road will be built, at present do not support populations of SD as the ditches are currently unsuitable. Nevertheless, they do have potential to support SD if habitat management enhancement were carried out. This would have the advantage of boosting the SD population in the western part of the site. A new road in this position would likely compromise this part of the site, unless careful remediation was carried out.

Water resource

SD requires shallow, moderately flowing, good quality water in which to breed and for the larvae to live. As SD has a two-year life cycle it is vital that the water channels contain water year round. Because SD requires shallow water this makes these channels particularly vulnerable to encroachment by vegetation and drying out during the summer. Much of the Itchen Valley is no longer suitable for SD because potentially suitable channels become dry during the summer and overgrown by vegetation.

The large-scale housing development proposed, and consequent demands on water supply, risks reducing water availability within the Itchen Valley which might compromise the viability of sites suitable for SD. It is essential for the long-term survival of SD in the Itchen Valley that sufficient water supply is maintained to keep the current breeding sites and sites proposed for habitat enhancement suitable for SD. I note that plans appear in the current proposals to address potential problems of adequate water supply but I would emphasise the need to safeguard SD sites by providing sufficient water flow.

Steve Brooks was a Research Entomologist at the Natural History Museum from 1979 till his retirement in 2017. He continues as a Scientific Associate at the Museum and is an honorary reader in the department of geography at University College London. He is a member of the Dragonfly Conservation Group of the British Dragonfly society, former editor of the BDS journal and former board member of the Society. Since 1996 he has been co-supervisor of 26 PhD students and has authored 245 scientific papers and 5 books including Brooks S.J., Cham S., Lewington, R. 2014. Field Guide to the Dragonflies and Damselflies of Great Britain.

Appendix 7: Eastleigh Borough draft local plan 2016-36
A briefing paper prepared by ADD (Action against Destructive Development)

Notes on Rail Options and the sustainable transport potential for SGOs D/E and B/C

1. INTRODUCTION

1.1 The EBC local plan Strategic Growth Option – Public Transport Accessibility background paper (SGOPTA) sets out options for public transport for the SGOs including investigating rail options 1.

1.2 The Strategic Growth Option – Comparative Assessment Paper (SGOCAP) compares possible public transport provision between Option B/C, D and E including rail 2. The paper dismisses undertaking a comparison between Options B/C and D/E which had been identified in earlier drafts of the EBC local plan. This is stated to be because were Option D and Option E to both be developed together no significant countryside gap could be established between the major urban area of Southampton / West End and Bishopstoke / Fair Oak / Horton Heath. Action Against Destructive Development (ADD) has shown this is incorrect. A development of 3500 houses could be delivered in Allington Lane while maintaining a development gap of almost one km between the new development and West End. The balance in the number of houses required to be delivered in the plan period to 2036 is 3350 so the comparison between the public transport opportunities between the two SGOs should have been on this number of houses. This paper investigates rail options for D/E combined.

1.3 In addition, the Allington Vision Document produced by the developers for Option E contains proposals for a gap strategy, 'Allington village provides an opportunity to provide clearly defined and well managed gaps which would be entirely within West End Parish Council's administrative boundary. These gaps would retain the sense of separation between settlements and reinforce and enhance the distinct character and sense of place of each settlement'.

1.4 The National Planning Policy Framework (NPPF) emphasises the need for developments to be sustainable 4 and one important aspect of this is a sustainable multi modal approach to transport provision.

1.5 The NPPF sets out the government's expectations regarding transport provision at developments. It states that "*the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel*" [5].

1.6 Eastleigh Borough Council (EBC) assumes the promoters of each site are responsible for determining the transport provision, when it is the planning authority's responsibility under the NPPF to investigate the options for sustainable transport [6].

The paper (SGOCAP) has a total lack of ambition in relation to the provision of rail, particularly with SGO Options D and E.

1.7 There is no feasible location within reasonable distance for a station to serve Option B / C, with the nearest station at Eastleigh 5km away leaving only bus and cycle provision as an alternative to cars. Providing feasible regular bus and cycle routes to Eastleigh station would be problematic. If options B/C are implemented bus services would have to run on already congested roads that would become much more so, particularly in the Woodside Avenue /Romsey Road/ Allbrook Way / Highbridge Road area. At a recent meeting of the Chamber of Commerce transport/infrastructure group on the Eastleigh plan, the Bus Company Bluestar/Unilink representatives who are Committee Members expressed doubts about the effectiveness of new bus services serving Option B/C because the buses would inevitably get stuck in the increased traffic congestion caused by the development. Finding a new dedicated cycle route would be difficult without significant investment given the probable lack of road space between B/C and Eastleigh station. The planning distance for cycle commuting is 5km [7].

1.8 However for Options D/E, the Eastleigh – Fareham railway line runs straight through the middle of the potential development, therefore there is a strong case for investigating the provision of a new station at Allington Lane. The same route could be used for a cycle track running beside the rail tracks connecting Hedge End, Allington and Eastleigh. This provision is **currently** being pursued by EBC even though they are opposed to the more sustainable developments Options D/E.

1.9 The SGOPTA states that a full feasibility study compliant with Network Rail's GRIP or DfT WebTAG would need to be undertaken [8]. This is surely what EBC should have done to fully investigate the feasibility of sustainable transport options at SGO D and E. The current Network Rail Continuous Modular Strategic Plan (CMSP), investigates both new stations on the Fareham-Botley line and increased frequency of services.

1.10 The promoters of Option E confirm that there is an opportunity to utilise underused rail capacity with the provision of a new station [9].

1.11 The SGOCAP states that the promoter only recognises the possibility of a station in the future [10] and is only safeguarding the land. However, the promoters in their "Allington Vision" document seem to be significantly more positive. They have provided some information on potential public transport linkages to Option E contained in the access & movement strategy section.

1.12 It is stated that the site will:
"utilise under-used rail capacity on the Eastleigh-Fareham railway line including improving links to Hedge End railway station and potentially enabling the future provision of a new railway station" [11]
"The proximity to the railway line combined with future visions for the upgrade of the Eastleigh- Fareham line suggest that a new station/transport hub could be delivered on site, with fast and frequent connections to Eastleigh and the wider network." [12].

This statement implies that the station could be delivered concurrently with the housing.

1.13 The promoters also state, in relation to bus service provision:
"The development will utilise under-used bus capacity within the area and provide new bus routes so as to provide direct and easy links to Eastleigh, Hedge End, Bishopstoke, Fair Oak, Horton Heath, West End and Southampton as well as Southampton Airport Parkway railway station." [13]

1.14 EBC in the SGOPTA have also understated the Promoter's vision to provide a robust rail transport solution for Option E (and equally Option D) [14].

1.15 It is clear that EBC have already discounted developing both options D and E for other reasons and appear not to want to acknowledge the transport opportunities of options D / E. The SGOCAP study fails to record D and E would score much better than B and C for sustainable transport options.

1.16 This is further illustrated by the fact that EBC is currently exploring creating a cycle track running besides the rail line from Hedge End to Eastleigh via Allington Lane, which would provide a very direct and sustainable link from a development In the Option D/E area to the town centre.

2. DEMAND

2.1 Demand has been growing at nearby stations – Hedge End has grown 231% between 97/98 to 15/16 and the Wessex Route Study forecasts there will be a 40% increase in mainline to Waterloo passenger numbers by 2043 [15].

2.2 The SGOPTA states that no demand analysis has been undertaken for a new station at Allington Lane and bizarrely dismisses demand [16] by stating that there are currently few people living in close proximity to a new station ignoring completely the potential for about 5000-7000 houses within 2 km!

2.3 The SGOCAP quotes present day figures for trips to work using public transport, ignoring that future investment in rail and bus infrastructure would increase use, as is shown in the Hedge End figure of 6.2% for rail [17]. Potentially a higher proportion of the future local residents clustered around Allington station would be likely to use it than in the case of Hedge End station. In the latter case the population catchment is skewed to one side as there is no local housing immediately north of the station. This could create greater passenger use of Allington station. It is also a very short ride straight into Eastleigh for easy access to shops and employment.

2.4 Looking at demand for a station at Allington Lane – assuming a radius of 1km for walking [18] and 5km for cycling [7]. Options D/ E together with the West Horton Heath and Firtree Lane developments would comprise about 4670 houses within walking distance and 7147 within cycling distance. The basis for demand can be assumed with a not unreasonable figure of 5% using rail to work, with about 75% of homes

having 2 of working age either walking or cycling to the station undertaking 2 train journeys each day for 40 weeks in the year. This would represent a range of 170,000 – 250,000 (assuming about 5000 – 7000 houses) passenger entry and exits to the station in a year (more than Botley, less than Hedge End). Clearly the demand would be there for a station.

2.5 The calculation is detailed in the table below:

Housing	Option D No. Houses	Option E No. Houses	West Horton No. Houses	Fir Tree No. Houses	TOTAL No. Houses	2 Workers (75%) per home	1 Worker (25%) per home	Total Workers	Commuters 5% per day	2 journeys 5 day / wk 40 week / yr
Max	2744	3003	950	450	7147	10721	1787	12507	625	250145
Min	2744	756	950	450	4900	7350	1225	8575	429	171500

2.6 The SGOPTA also states that Hedge End station would be viable as a rail access for point for options D/E via bus/cycle and pedestrian links [19]. However given the distance of 2km from Hedge End with no direct route it is unlikely that pedestrian use would provide significant demand.

Figure 1 Map of Area

3. RAIL OPTIONS

3.1 With vision and ingenuity there are a number of options that could be feasible to provide enhanced rail services through Options D and E. Given the real necessity and Government policy drive to provide sustainable solutions in the future to mitigate climate change and increasing levels of air pollution, EBC are remiss in not investigating at all the viability of multi modal solutions for Options D and E.

3.2 In relation to funding the SGOCAP is contradictory [20], stating the station could be funded by the developer and that patronage has grown considerably with the provision of a station at Hedge End but then that a business case analysis would have to be undertaken to prove the viability of a station at Allington. It states this would be unclear with 3000 dwellings in SGO D or E, ignoring that Option D and E, West Horton Heath and Firtree Lane developments could provide between 5300 – 7147 dwellings. It does state that examples of recent station openings are associated with larger developments (e.g. 4,270 – 6,550 dwellings) and are on single track lines requiring only one platform (and so substantially reduced costs).

3.3 Costing for these options also needs to be viewed in the light of the estimate for North Bishopstoke Relief Road and associated capacity enhancements, particularly at M3 Junction 12. As EBC must spend money on road infrastructure to accommodate Option B and C (£60-80m) then it is only reasonable that an equivalent sum is available for Option D and E to allow for a level playing field in terms of assessment. The impact of a new road on the Itchen Valley will be immense and there will be issues regarding the routeing of the road under the rail bridge at Allbrook Hill/Itchen Navigation to contend with too.

3.4 The following options have been considered with the advice of a former strategic rail planner. These options could be developed in phases as demand increases and investment money becomes available and will be considered as part of the current CMSP referred to in para: 1.9.

3.5 Option 1

3.5.1 *Minimum provision station at Allington*: Platform both sides for 6 carriage train, pedestrian bridge with access for restricted mobility, small ticket office, traffic signalise existing bridge on Allington Lane, reduced size car park to encourage commuting to station by foot/cycle/bus. Cost likely to be in region of £15m. As the railway line is on a straight alignment with good clearance either side, the station can be compact requiring little extra land take.

View from Allington Lane road bridge looking towards Eastleigh

(note space available for constructing a station)

3.5.2 The cost has been determined from reviewing Cranbrooke Station, Devon [21] completed in 2015,Reading Green Park [22] proposed to be completed in 2019 and, proposed station at Welbourne on Fareham-Botley line:

Cranbrooke Station, Devon

The station has a single platform with a usable length of 150 metres to accommodate six-car trains. There is a car park with 150 spaces. The station is unmanned, however there is a Ticket Machine so tickets must be purchased before travel. The station cost £5m to build.

Reading Green Park
The station is planned to be opened in Summer 2019. The station will have two platforms, each long enough for a five-coach train, platform canopies and a footbridge. There will be an access road and shared cycle and footway to the station. The station will have three bus bays, a five-vehicle taxi rank, cycle hire hub and cycle parking with an unspecified number of spaces and a ground-level car park with 103 spaces. The total project cost is estimated as £16.5m.

Proposed Welbourne station
A number of options to provide a single platform station, eventually to become a 2 platform station if/when the route is doubled between Botley and Fareham. The station will be provided with car parking, ticket vending machine, access road, cycle parking and car parking.

3.5.3 Therefore an estimate of £15m seems reasonable.

3.5.4 Network Rail has confirmed that if a new station were built at Allington an additional stop could be made at that station within the current timetabled service of two trains per hour at peak times and one train per hour off peak.

3.5.5 The SGOCAP states a new station would be required to have long platforms for 12-car trains [23]. This again shows a lack of vision as 12 carriage trains can be catered for on a reduced length platform – automated announcements and non-opening doors are standard procedures utilised at many stations including Botley, Shawford and Clapham Junction.

3.5.6 Rail Future have stated their support for this option.

3.6 Option 2

3.6.1 *Enhanced capacity through redoubling of track between Botley and Fareham*: Redoubling the 7km single track between Botley and Fareham would provide the opportunity to reintroduce a 30-minute frequency service, that was reduced in 2007 owing to the Franchise renewal at that time for South West Trains, as directed by the DfT. Network Rail in their meeting with EBC on 28th Feb 18 confirmed that a half hourly service in each direction could be possible with review of timetabling and redoubling the single-track section .This is also confirmed in the SGOCAP [24] which states 'Network Rail will be pursuing various strategic studies over the next 2 years, including on Solent Connectivity. A half hourly service is likely to be possible on the Eastleigh to Fareham line'.

3.6.2 Rail space is available on the single line section between Botley and Tapnage Tunnel to re double the track. There is a gauging issue at the three tunnel sections on the line at the 122yd.Tapnage tunnel, the 147yd. Fareham No1 tunnel and the 563 yd. Fareham No.2 tunnel. This is due to movements within the tunnel reducing clearances between trains which could potentially be solved by providing a concrete base to the track and reducing the speed through the tunnels. This would reduce the required clearances. Assuming the trains normally travel at up to 70 mph, then reducing to 30mph would add about 1 ½ minutes to the journey. Redoubling the track could cost in the region of £35m excluding the tunnel modifications.

3.7 Option 3

3.7.1 *Creation of Eastleigh – Fareham shuttle:* Providing increased dedicated service with a new platform south of Eastleigh station with a pedestrian link to Eastleigh Station and onwards connections both towards Southampton and London. This could further provide an increased service throughout the day as demand increases.

3.7.2 Rolling stock would need to be provided involving additional operational cost. Given a 2 train per hour shuttle in each direction, assuming the infrastructure were upgraded, and with 2 new stations on the route, would probably require 3 additional units of rolling stock, with associated staffing and maintenance costs.

3.7.3 The Three Rivers Community Rail Partnership[25] champions rail travel and station enhancement in the areas between Salisbury, Romsey, Southampton, Eastleigh, Winchester and Fareham (the three rivers being the Test, Itchen and Hamble) Their steering Group includes representatives from Eastleigh BC, Hampshire CC, Southampton CC, Test Valley BC, Winchester CC and Wiltshire CC plus the three train operators serving the area.

3.7.4 They are promoting a project like Option 3 to create 'Solent Metro Lite' which would involve a new shuttle rail service on the existing heavy rail network. This would provide a 30 min service in each direction on a loop between Eastleigh, Southampton and onto Fareham on the southern route via Hamble and back to Eastleigh on the northern route via Hedge End (and of course potentially via Allington). It is seen as a much more deliverable option than the costly Solent LEP's proposal for the Solent Metrolink.

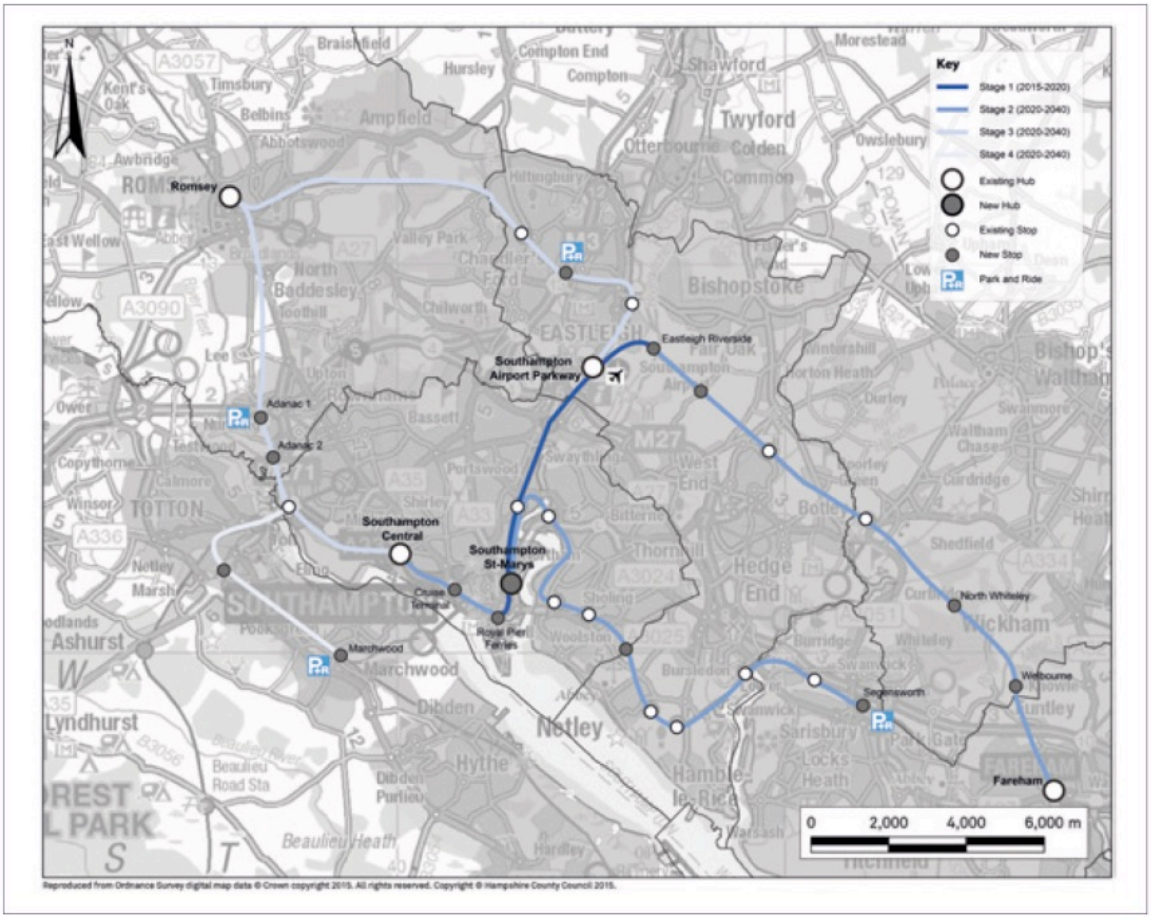
3.7.5 The idea is being actively explored by the train operators and will forms part of the CMSP review currently under way. What this also demonstrates is that there are interesting and imaginative ideas which are being pursued for delivering an improved rail service in the area and for Option D/E.

3.8 Option 4
3.8.1 *Solent LEP Metrolink between Eastleigh and Fareham sharing and occasionally running alongside the existing line between Eastleigh and Fareham*.

3.8.2 Again, the SGOCAP demonstrates a lack of future vision by dismissing out of hand the proposals for a Solent Metro [26] as un-costed and uncertain. While no capital funding is currently available to develop this exciting new transport link, given the likely emphasis on sustainable transport and the need to combat climate change it could be argued that within the life of the local plan this could be a viable proposal.

3.8.3 The Solent Local Enterprise Partnership's (SLEP) Transport Investment Plan 2016 [27] shows Allington Lane as a proposed station on the Metrolink between Eastleigh and Fareham.

FIGURE 4.6 PROPOSED SOLENT LIGHT RAIL NETWORK



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3.8.4 The SLEP commissioned Ramboll in mid-2017 to undertake a study to generate options after the SLEP's Transport Investment Plan [28] estimated that time lost due to road congestion would increase 50% in Hampshire by 2026. The plan also highlighted the need for an integrated transport network to promote growth in the region.

3.8.5 Phase one of the Solent Metro network could see 'Tram-trains' run from Eastleigh south to a new station in Southampton's St Mary's district, on to a waterfront interchange at Royal Pier, then back up to the Westquay shopping area and Southampton Central railway station. Following Phase One, the new metro system network allows for connecting the towns of Fareham and Botley to Southampton, and then onto Romsey and Eastleigh, providing new connections to Southampton Airport.

4. SUMMARY

4.1 In the summary related to rail, the SGOCAP [29] dismisses the potential of D/E to be served by heavy or light rail as low. It is in their interest to do so as they do not want Option D/E to perform better than B/C. They have not undertaken a fair or unbiased comparison.

4.2 It is clear the EBC have chosen to ignore that there are significant opportunities for enhancing the rail service for Options D/ E in accordance with NPPF guidelines. Further study would prove that in terms of sustainable transport options Option D and E are significantly better than Options B and C.

4.3 Further detailed research should be undertaken into possible rail options, especially in the context of longer-term Solent Metro aspirations. This would investigate the phasing of these options over the next 3 decades as we see a move into more sustainable transport modes coupled with increasing population and development in the Solent region. Initial work related to this is to be underway in the form of the CMSP referred to in para 1.9 above.

4.4 With the UK Parliament declaring a Climate Emergency and the growing protest groups such as Extinction Rebellion, the issue of the environment has become centre stage. At last people are realising that something must be done. The UK Government is the first to write into law the requirement to be carbon neutral by 2050. The push for sustainable solutions will increase year on year as the effect of climate change becomes all the more apparent. The record breaking warm weather in February 2019 in the UK and the tragic storm in Mozambique amongst many other recent weather events are consistent with this. In the coming years these type of events will accentuate. In these circumstances it is totally unsustainable to be proposing development on B/C, the most remote part of the borough far from all rail stations when there is an alternative option next to a railway line with potential to provide a new station which is central to a sustainable transport solution.

4.5 In terms of a sustainable solution Options D and E far outweigh B and C in potential to achieve significant gains and integration into wider sustainable transport developments.

July 2019

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Glossary

ADD – Action Against Destructive Development
EBC – Eastleigh Borough Council
GRIP – Network Rail's Governance for Railway Investment Projects
NPPF – National Planning Policy Framework
SGO - Strategic Growth Option
SGOPTA - Strategic Growth Option – Public Transport Accessibility background paper
SGOCAP - Strategic Growth Option – Comparative Assessment Paper
SLEP - Solent Local Enterprise Partnership
WebTAG - The Department for Transport's suite of guidance on how to assess the expected impacts of transport policy proposals and projects.

Appendix 8 - Habitats Regulations Assessment – Relevant Case Law and Legal Principles by Caroline Daly of Francis Taylor Building

A. The Certainty Required in an Appropriate Assessment in order to properly conclude that a Plan will not Adversely Affect the Integrity of the Site

1. It is *"only when it is sufficiently certain that a measure will make an effective contribution to avoiding harm to the integrity of the site concerned, by guaranteeing beyond all reasonable doubt that the plan or project at issue will not adversely affect the integrity of that site, that such a measure may be taken into consideration in the 'appropriate assessment' within the meaning of Article 6(3) of the Habitats Directive" (*Coöperatie Mobilisation for the Environment and Vereniging Leefmilieu C-293/17, paragraph 126; see also Grace and another v An Bord Pleanála C-164/17 at paragraph 51)

2. It not acceptable, as a matter of law, to draw a conclusion that there will be no adverse effects on the integrity of a site where there is uncertainty and/or any reasonable doubt as to the effectiveness of mitigation measures proposed to avoid harm to the integrity of the site concerned.

B. The Proper Approach at the Plan-making Stage

3. With regard to the approach to appropriate assessment at the plan-making stage where it is known that there will be project level assessments at a subsequent point, the competent authority must consider whether there is "*sufficient information at that stage"* i.e. the plan-making stage *so as to be "duly satisfied that the proposed mitigation could be achieved in practice."* The competent authority needs to be *"satisfied as to the achievability of the mitigation in order to be satisfied that the proposed development would have no such adverse effect."*(No Adastral New Town Limited v Suffolk Coastal District Council [2015] EWCA Civ 88, paragraph 72)

4. A decision-maker is not able lawfully to defer consideration of the effectiveness of mitigation to the project level stage. The competent authority must be satisfied, at the plan-making stage, that it is sufficiently certain and beyond reasonable doubt that the proposed mitigation will be successful and can be achieved in practice.

C. <u>The Appropriate Assessment cannot contain Lacunae</u>

5. The assessment carried out *"may not have lacunae and must contain complete, precise and definitive findings and conclusions capable of dispelling all reasonable scientific doubt as to the effects of the proposed works on the protected area concerned"* (Grace and another v An Bord Pleanála C-164/17 at paragraph 39).

6. In Holohan v An Bord Pleanála (C-461/17), the ECJ said that an appropriate assessment must:

   (i) catalogue the entirety of habitat types and species for which a site is protected;

   (ii) identify and examine the implications of the proposed project for the species present on that site, and for which that site has not been listed, provided that those implications are liable to affect the conservation objectives of the site; and

   (iii) identify and examine the implications for habitat types and species to be found outside the boundaries of that site provided that those implications are liable to affect the conservation objectives of the site (paragraph 40 of the judgment).

D. <u>Approach to Scientific Expert Opinion</u>

7. A third party alleging that there is a risk that cannot be excluded on the basis of objective information must produce credible evidence that there is a real as

opposed to hypothetical risk that must be considered (Boggis v Natural England [2009] EWCA Civ 1061 at paragraph 37).

8. With regard to circumstances in which a competent authority rejects the findings in a scientific expert opinion recommending that additional information be obtained, the ECJ found that the appropriate assessment *"must include an explicit and detailed statement of reasons, capable of dispelling all reasonable scientific doubt concerning the effects of the work envisaged on the site concerned"* (Holohan v An Bord Pleanála (C-461/17) at paragraph 52).

E. Compensatory Measures such as Habitat Creation

9. There is a clear distinction between protective measures intended to avoid or reduce any adverse effects that a plan or project may have on the site, which may be considered in the appropriate assessment, and measures that are aimed at compensating for the negative effects of the project on a European site, which cannot be considered in an appropriate assessment (Grace and another v An Bord Pleanála C-164/17 at paragraph 50).

10. Such compensatory measures includes habitat creation, about which the ECJ has said the following: *"As a general rule, any positive effects of the future creation of a new habitat, which is aimed at compensating for the loss of area and quality of that habitat type in a protected area, are highly difficult to forecast with any degree of certainty or will be visible only in the future"* (Grace and another v An Bord Pleanála C-164/17 at paragraph 52).

F. Approach to the Views of Statutory Consultees

11. The views of a statutory consultee should ordinarily be given considerable weight but that advice is not binding and it does not have to be given such weight if cogent reasons can be given for departing from it (R (Akester) v

DEFRA [2010] EWHC 232 (Admin) at paragraph 112; Wealden DC v SSCLG [2016] EWHC 247 (Admin) at paragraphs 91 and 95).