

Note in Response to Applicant ES Addendum (February 2022) – Matters relating to the Water Environment

Appeal APP/U2235/C/08/2087987 by Mr Guy Harrison, Monk Lakes,
Staplehurst Road, Marden, TN12 9BS against Enforcement Notice
issued 12 September 2008

Site address	Hertsfield Barn, Marden, Kent, TN12 9BW
Report prepared for	David Padden The Rear Barn, The Manor Farm 124 Manor Road North, Thames Ditton Surrey, KT7 0BH
Report reference	70276R4
Report status	DRAFT
Date issued	13 April 2022
Report author	Dr Paul Ellis BSc, PhD, C. Geol

1. Introduction

- 1.1. Geosmart have been commissioned to provide advice regarding flooding at Hertsfield Barn, Marden, Kent, TN12 9BW. The advice relates to the potential for groundwater flooding and impacts on the water environment resulting from the unauthorised development at the neighbouring property known as Monk Lakes. I have reviewed information provided in relation to the appeal made for Monk Lakes retrospective planning application for the retention and completion of the Lakes.
- 1.2. My name is Dr Paul Ellis. I am Managing Director of Geosmart Information Limited, a specialist land, water and sustainable development consultancy, based at Old Bank Buildings, Bellstone, Shrewsbury SY1 1HU. I lead a team of environmental consultants comprising hydrogeologists, hydrologists and environmental modellers.
- 1.3. I have over 20 years' experience as a geologist and hydrogeologist, with a BSc in Applied Geology and a PhD in Hydrogeology. I am also a Fellow of the Geological Society of London and a Chartered Geologist.
- 1.4. I have particular expertise in the mapping and assessment of groundwater flood risk and have undertaken numerous studies involving the analysis of drainage, flooding, and groundwater levels and flows and the interactions between surface water and groundwater systems. This includes research at Birmingham University and a lead role in the development of the Geosmart National Groundwater Flood Risk Map. I have been involved on behalf of Mr Padden in reviewing the impacts of the Monk Lakes development since 2014.

2. Scope

- 2.1. We have reviewed the environmental statement addendum prepared on behalf of Taytime Ltd by Pegasus Group Ltd (Dated February 2022, Ref P20-0831) in support of the planning appeal. The Environmental Statement Addendum responds to the Regulation 25 request for Further Information made on 1 April 2021. We have focussed our review on Chapter 6.0 which relates to the methodology and assessment of the likely significant effects of the development in relation to potential effects on the Water Environment.
- 2.2. The appellant has been asked for 'a clear explanation of the methodologies adopted to define the likely significant effects of the development.' We have reviewed the appellants methodologies and the outcome of the impact screening undertaken. We have identified several receptors relating to flood risk that are missing from the assessment and the significance of the impacts has been understated. We have put forward evidence for this and our estimates of the impact of the development using the same framework set out by the appellant.

- 2.3. We note that the development within the flood plain and its contribution to other forms of flood risk does not support the purpose of the planning system to achieve sustainable development. We disagree with the ES Addendum assessment which identified that the effect of the entire development once complete on the water environment is not significant. We consider that the retrospective development has had a Major and fundamental effect on the water environment which has yet to be mitigated. Using the methodology for assessment set out in the recent ES addendum we consider that subject to mitigation measures and the proposed future development, the development will have a Major to Moderate effect on the Water Environment. We have set out the reasons for challenging the conclusions of the appellants impact assessment in the following review of the ES Addendum (February 2022).

3. Sensitivity of Receptors

- 3.1. The appellant is required to provide information on the sensitivity of individual receptors. The further information request states 'although impacts are described the sensitivity of individual receptors is not'.
- 3.2. The February 2022 addendum acknowledges the presence of two Listed Buildings including Hertsfield Barn (Grade II) within close proximity to the western boundary. However, Section 7 on cultural heritage makes no reference to the potential impact from increased flood risk on Hertsfield Barn, neither is this covered in section 6.0 on the Water Environment. Section 7.73 (Page 145) states 'It should also be reiterated that the significance of the Grade II Listed Barn is mostly embodied within its remaining physical fabric and historic interest as a rare, 15th century former agricultural building'. Mr Padden has made frequent representations that his property is being adversely affected by flooding as a result of the development. We consider Hertsfield Barn should be included as a receptor within the assessment of the likely significant effects of the development on the water environment.
- 3.3. The addendum highlights the risk to Monk Lakes due to fluvial flooding, however, it fails to adequately relate the impact of the development to the surrounding receptors outside the site boundary. The addendum should highlight, in addition to fluvial (river flooding) the other recorded flood risks to the site and the surrounding area from surface water, groundwater flooding and a breach in the fishing lake embankments. The proposed development has a material impact on all these forms of flooding which will also impact upon Hertsfield Barn.
- 3.4. The addendum, Table 2.3 indicates that Climate Change is assessed as part of the 'Water Environment' which is of direct relevance to the proposals being in close proximity to the River Beult. We also note that climate change will impact on the other sources of flooding that may affect Hertsfield Barn as a result of the development which are highly likely to be increased as a result of climate change. The effect of climate change on the water environment interacting with the development and increasing risk to offsite receptors should be considered within the EIA.

- 3.5. In reference to Table 6.1: Criteria for Assessing Sensitivity of Receptors, we note that in line with government guidance the assessment should incorporate all sources of flooding and include potential increases in risk off site. The appellant has focused on assessing the impact on fluvial flood risk as being the main receptor and should also include a specific assessment of the other sources flooding in the surrounding area.
- 3.6. Government guidance states for the purposes of applying the National Planning Policy Framework, “flood risk” is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources. In addition, the objectives of a site-specific flood risk assessment are to establish: whether a proposed development is likely to be affected by current or future flooding from any source; whether it will increase flood risk elsewhere; whether the measures proposed to deal with these effects and risks are appropriate; the evidence for the local planning authority to apply (if necessary) the Sequential Test, and; whether the development will be safe and pass the Exception Test, if applicable. [Reference <https://www.gov.uk/guidance/flood-risk-and-coastal-change>, Paragraphs: 002 and 030 Reference ID: 7-002-20140306, Revision date: 06 03 2014]
- 3.7. According to the Environment Agency Website (<https://www.gov.uk/check-long-term-flood-risk>), Hertsfield Barn is at High Risk of Surface water flooding , Moderate Risk of Fluvial Flooding and within the extent of reservoir flooding when there is also flooding from rivers. The Environment Agency don't publish groundwater flood risk maps, but information from the British Geological Survey indicates that Monk Lakes and Hertsfield Barn are at risk of groundwater flooding at the surface.
- 3.8. Section 6.55, Table 6.4 refers only to flood risks to the site and ignores flood risk to adjacent receptors. The table also indicates that there is only potential for fluvial flood risk and screens out the potential for surface water flooding, groundwater flooding and flooding from infrastructure failure. However, as indicated in the Figures we present below, the site and surrounding area are at risk from these other sources of flooding, which should be included within the impact assessment in accordance with the appellants own EIA methodology. Table 6.1 identifies a High sensitivity receptor as an area that is at high risk from flooding (greater than 3.3% annual exceedance probability (AEP). A Medium sensitivity receptor is identified as an area that is at moderate risk from flooding (3.3% AEP to 1% AEP). There are clearly areas of flood risk both within the application area and in adjacent areas which should be included within the impact assessment.

3.9. Fluvial (River Flooding)

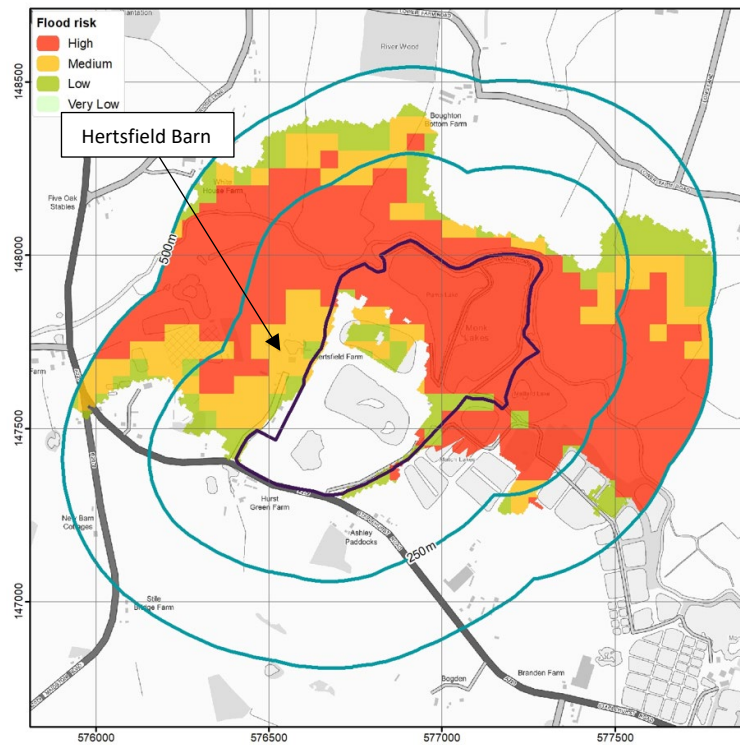


Figure 1 Environment Agency Risk of flooding from Rivers and Sea (ROFRAS)

Fluvial flooding is acknowledged as a risk, and will require the implementation of a flood storage compensation scheme to mitigate the impact on other receptors. We note that parts of the site currently designated at Low risk in Flood Zone 1, are likely to have been at a lower elevation (and therefore at higher risk) under baseline (pre-development) conditions. It is evident from the data in Figure 1, the Environment Agency model used to define the flood zones is using the recent topography after land raising has occurred.

3.10. Groundwater Flooding

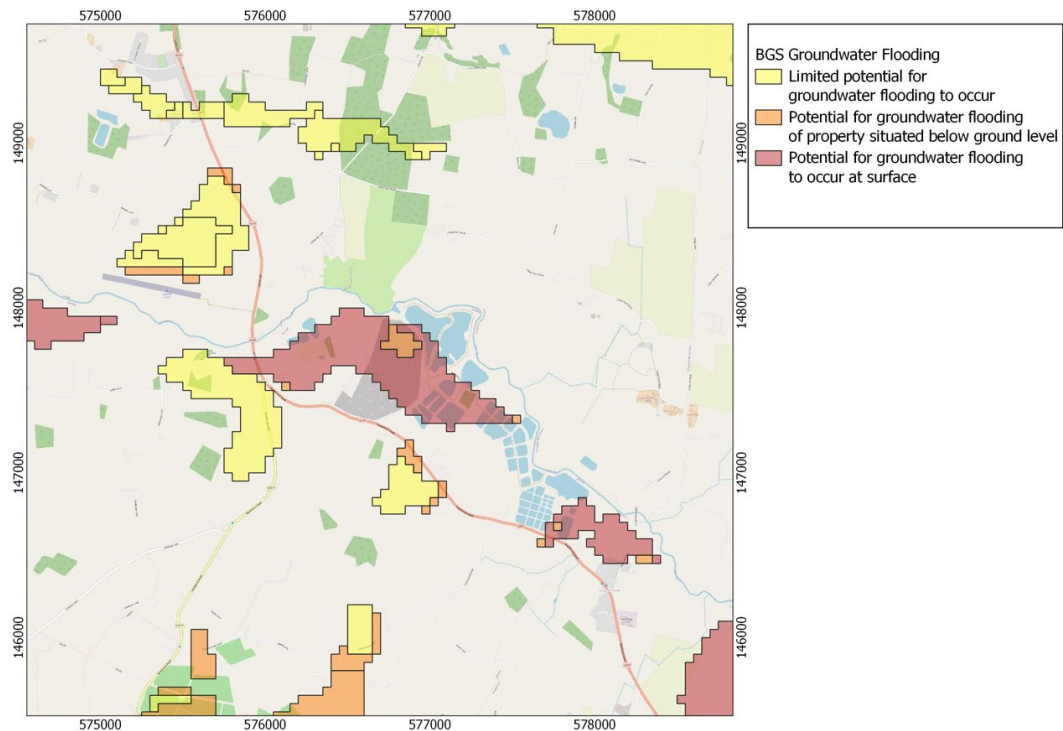


Figure 2 Susceptibility to groundwater flooding map, version 6.1, British Geological Survey.

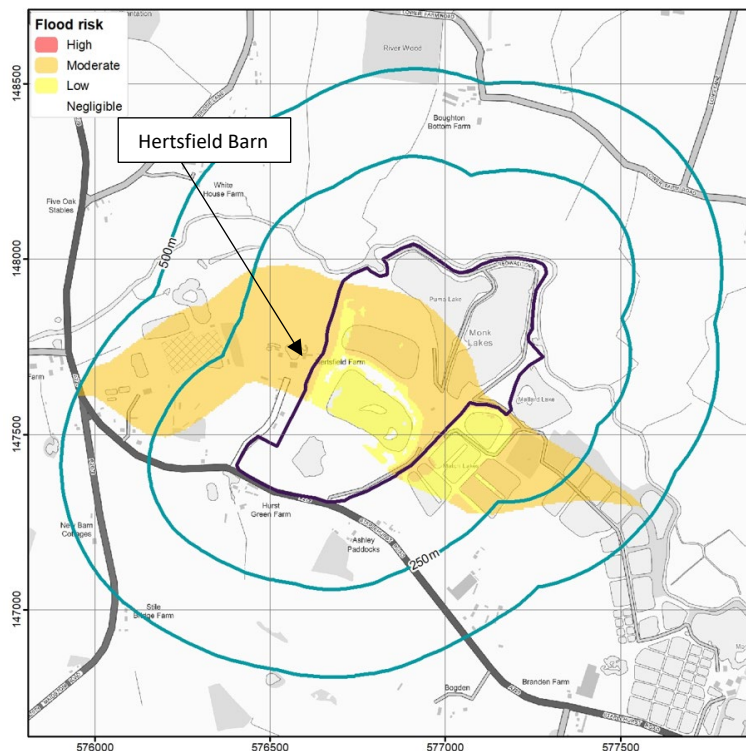


Figure 3 Groundwater Flood Risk Map GW5, Geosmart Information, National Map.

Two commercially available, national data sets identify both Monk Lakes and Hertsfield Barn to be at risk of groundwater flooding. This is likely as a result of the shallow groundwater table within the permeable superficial deposits. As indicated in

our previous statements there is evidence to suggest that the development has increased the risk of groundwater flooding.

3.11. Surface Water

Information on the pluvial (surface water) flood depth is presented showing the extreme (1 in 1000, 0.1% AEP) and medium risk (1 in 100, 1% AEP) scenarios. The extreme case has a low probability of occurring, but highlights the risk areas around Hertsfeld Barn and the A229 to the south. The risk of surface water flooding is likely to be increased along the western margin of the development due to the presence of a steep slope and the low permeability of the material used to create the raised lake. The cumulative impact of the development on the existing off-site, surface water flood risk should therefore be considered within the impact assessment.

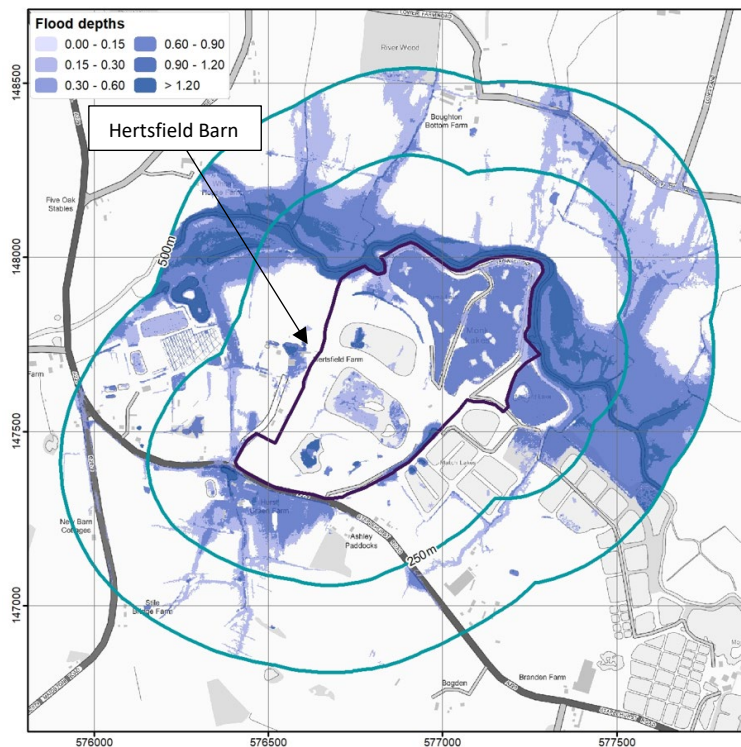


Figure 4 Environment Agency Surface Water flood depths for the 1 in 1000 year event.

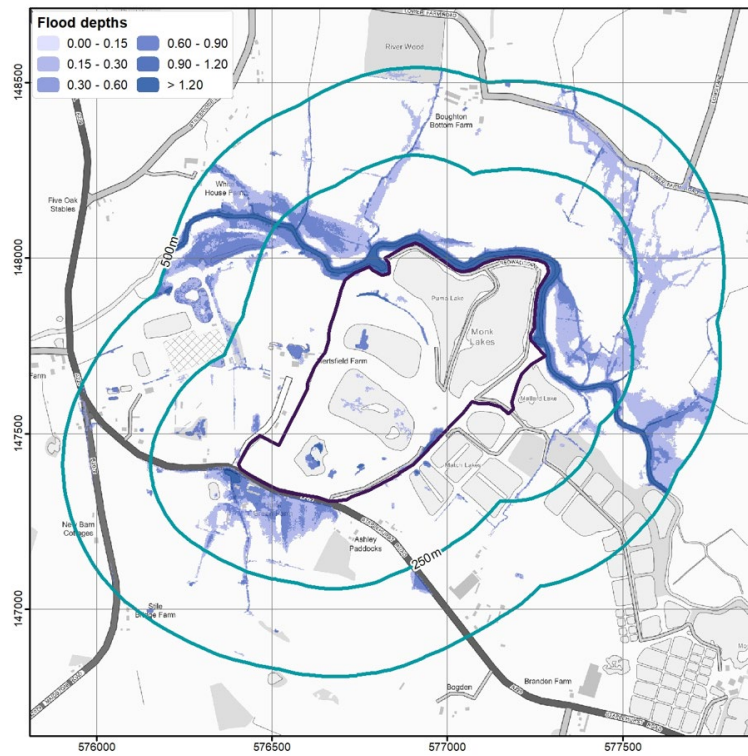


Figure 5 Environment Agency Surface Water flood depths for the 1 in 100 year event.

3.12. Reservoir Flooding

As indicated in Figure 6 Hertsfield Barn lies within the extent of reservoir flooding when there is also flooding from rivers. There will be additional cumulative risk from the adjacent raised reservoir which should be included within the impact assessment. There will remain a residual risk for as long as the raised fishing lakes are in operation, and the degree of risk will depend on the ongoing inspection and maintenance of the lake banks. To provide context, Figure 7 is a photograph taken from a drone showing the close proximity of Hertsfield Barn to the raised lakes.

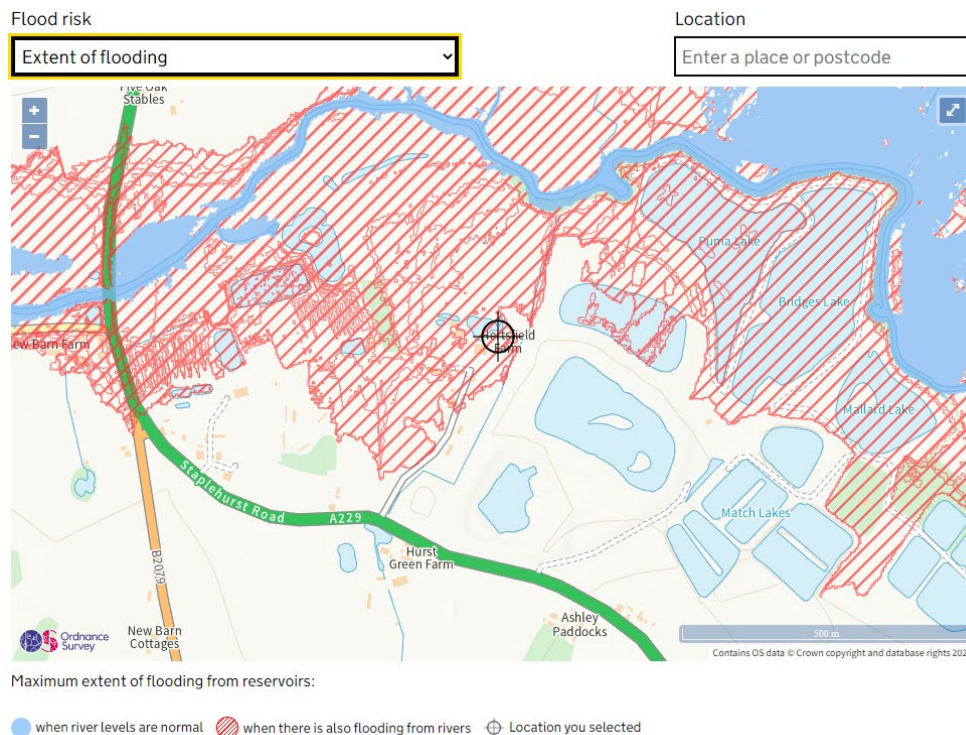


Figure 6 Environment Agency Maximum extent of flooding from reservoirs.

3.13. In relation to Table 2.3: Environmental Themes Scoped In/ Out of the EIA (page 6), we note under Accidents and Disasters it states 'It is also acknowledged that as a number of the lakes are 'raised' there is a residual risk of failure of the embankments if not constructed properly'. However, it then goes on to scope this out of the EIA on the grounds that it is covered under the reservoir act. We disagree that this should be scoped out of the EIA, given that the design of the development has led to the creation of this long-term residual risk, which could be mitigated by altering the design to reduce the height of the fishing lake above ground level. The raised design of the fishing lakes ('reservoir') is a key part of the planning application and therefore the construction and safety of the proposal should be considered within the impact assessment, particularly as the residual risk will remain without ongoing mitigation through regular inspection

3.14. The findings of the breach analyses undertaken by N. Reilly in his calculations dated 5/10/2011 (page 540 of the pdf of the Environmental Statement, Next Phase, February 2019) states 'A breach of either of lakes 1 or 2 on the west side would seriously affect properties in Old Hertsfield. Velocities of flow at the foot of the embankment would approach 10 m/s although they would slow rapidly to much less while at the same time becoming deeper. Around 50 m from the toe a depth of about 0.5 m could be expected with a velocity of around 1 m/s'. In the event of a failure the impact on Hertsfield Barn could clearly be significant.

3.15. As indicated in Section 4 of our report 70276R3vn2 (Geosmart, March 2021) there remains uncertainty regarding the proper supervision, construction and filling of the reservoirs, with evidence from the Environment Agency, dated September 2015, that it may have been undertaken without the supervision of a reservoir panel engineer. The flood risk related to the reservoir should therefore be considered relevant to the retrospective planning and lie within the scope of the EIA.



Figure 7. View from a drone, looking south of Hertsfield Barn and Monk Lakes 1 and 2 (October 2019).

3.16. As indicated in Section 4 of our report 70276R3vn2 (Geosmart, March 2021) there remains uncertainty regarding the proper supervision, construction and filling of the reservoirs, with evidence from the Environment Agency, dated September 2015, that these activities may have been undertaken without the supervision of a reservoir panel engineer. The flood risk related to the reservoir should therefore be considered relevant to the retrospective planning and lie within the scope of the EIA.

4. Significance of Impacts

- 4.1. According to Table 6.2, A major change can be defined as 'Fundamental (long term or permanent) changes to the baseline hydrology, hydrogeology and water quality'. We consider the importation of thousands of tonnes of waste material to create a series of raised lakes has fundamentally changed the baseline water environment, including changes to the recharge of the underlying aquifer and the loss of field drains, field boundary ditches and ponds which would have positively drained the Site (as indicated in Section 6.38). A fundamental change to the River flood plain has occurred resulting in a loss of flood plain storage which will require extensive mitigation.
- 4.2. Section 6.38 states that for the pre-development scenario small volumes of groundwater are likely within the river terrace deposits' and 'groundwater would be anticipated to flow generally northwards'. We therefore assume that any changes in these conditions would be identified as an impact using the applicants EIA methodology. As mentioned in our previous work, groundwater level contours presented by Mr Padden (Geosmart, 2019a) indicate groundwater flow in a northwesterly direction from Monk Lakes towards Hertsfield Barn, evidence that a change in flow direction from baseline conditions has occurred.
- 4.3. Section 6.38 notes the loss of several field drains, field boundary ditches and ponds which would have positively drained the Site and conveyed water to the River Beult. The development has therefore created a fundamental change from the baseline water environment.
- 4.4. The development has created a significant change from the baseline water environment. Mitigation measures are proposed but have not yet been implemented. Therefore, the current magnitude of change resulting from the existing development is considered to be Major within the site boundary, and Major to Moderate along the western boundary and at Hertsfield Barn. The long-term performance of the mitigation measures is unknown and reliant on regular maintenance, which may be difficult for the buried drainage system proposed for the mitigation of high groundwater levels. It is therefore not possible to assume that the proposed measures will mitigate the long-term flood risk caused by the development.
- 4.5. As mentioned previously the proposed attenuation basins for the surface water run-off are not shown on the proposed development plans, and so it is not clear that there is sufficient space to accommodate them within the proposed landscaping.
- 4.6. Surface water flooding should be highlighted as a potential risk to the site and adjacent receptors. The information we have presented above highlights locations at high, medium and low risk both within the site and on the land immediately adjacent to the site. This complies with the appellants own definition of high, medium and low sensitivity receptors in Table 6.1.

- 4.7. The appellant has acknowledged the increase in surface water flood risk which has necessitated a flood attenuation scheme along the western margin of the development (see section 6.101). Mr Padden has previously presented evidence of flooding from the western boundary ditch on to his property (Geosmart, 2021).
- 4.8. It is considered likely that Hertsfield Barn would be classified as a moderate to highly sensitive receptor based on the current probability of flooding and Grade II listed status (Table 6.1). The Monks Lakes development has potentially created additional risk which may have a cumulative impact on the existing surface water flood risk, consequently resulting in a Major to Moderate significance of effect (Table 6.3). We consider this to be the current impact status of the 'Retrospective Development' as mitigation measures have not been implemented. Surface water flooding should therefore be assessed more rigorously within the EIA.
- 4.9. Groundwater flooding is not considered a significant risk by the appellant, despite the published data to the contrary presented in Figures 2 and 3, and the long history at the site surrounding the investigation of groundwater flooding, including a previous judicial review. The applicant's boreholes have proved the existence of a shallow groundwater table and BGS mapping supported by site investigation data from Mr Padden indicates the aquifer extends beneath Hertsfield Barn. As discussed in our previous report (Geosmart, 2019a) groundwater contours indicate potential groundwater flow from Monk Lakes, towards Hertsfield Barn.
- 4.10. The appellant states within Table 6.4 'Any shallow groundwater located within the overlying river terrace and alluvium deposits is likely to be in hydraulic conductivity with the River Beult and therefore risk from this source of flooding to the Site is considered low'. We do not agree that continuity with the river reduces the flood risk. In fact, it is likely to increase the risk of groundwater flooding, as a rise in river level can cause a rise in shallow groundwater levels in response. This mechanism of groundwater flooding from Permeable Superficial deposits (PSD) is well established and used within both the Geosmart and BGS national groundwater flood risk maps. For example, the British Geological Survey define this type of groundwater flooding in a shallow unconsolidated sedimentary aquifer setting as follows.
- 4.11. 'Groundwater flooding is often associated with shallow unconsolidated sedimentary aquifers which overly non-aquifers. These aquifers are susceptible to flooding as the storage capacity is often limited, direct rainfall recharge can be relatively high and the sediments may be very permeable, creating a good hydraulic connection with adjacent river networks. Groundwater levels are often close to the ground surface during much of the year. Intense rainfall can cause a rapid response in groundwater levels; rising river levels, as the upstream catchment responds to the rainfall, can create increased heads that drive water into the aquifer (<https://www2.bgs.ac.uk/groundwater/flooding/unconsolidated.html>).
- 4.12. The applicant has elsewhere acknowledged the potential increase in groundwater flood risk which has necessitated the proposal for a groundwater

drainage system in an attempt to mitigate the flood risk along the western margin of the development. Mr Padden has presented evidence of groundwater flooding to his property on several previous occasions (ESI, 2015 & Geosmart, 2019).

- 4.13. It is considered likely that Hertsfield Barn would be classified as a moderate to highly sensitive receptor based on the current probability of flooding and Grade II listed status (Table 6.1). The Monks Lakes development has potentially created additional risk which may have a cumulative impact on the existing groundwater flood risk, consequently resulting in a Major to Moderate significance of effect (Table 6.3), which is potentially the current impact status of the 'Retrospective Development' as mitigation measures have not been implemented. Groundwater flooding should therefore be assessed more rigorously within the EIA.
- 4.14. Flooding from infrastructure failure: the applicant has indicated that, 'the Site is not reliant of any offsite infrastructure and is therefore not considered to be at risk'. However, as indicated in Figure 6 the site is identified as at risk from off-site reservoirs. The applicant also states that 'a detailed assessment of potential breach scenario of the lakes has been undertaken and shown that risk of inundation due to a breach is considered very low as the impoundment features will be managed under the Reservoirs Act 1975'. The potential magnitude of the impact on Hertsfield Barn resulting from a breach in the lakes could be very significant, despite the probability of the breach occurring being low. The reference to a breach analyses undertaken by N.Reilly in 2012, predates the final construction and filling of Lake 2 and relies upon appropriate construction methods being employed.
- 4.15. As indicated in our previous report (Geosmart, 2021) The construction of Lakes 1, 2, and 3 should have been subject to continuous supervision as required by legislation. Based on the aerial imagery presented in Figure 7 of the PBA (2015) drainage report, Lake 2 was unfinished in July 2011, and completed and filled by 15th February 2014. Google Earth Imagery further refines the timeline and indicates Lake 2 was unfilled on the 9th July 2013. However, a letter from the Environment Agency dated 8th September 2015 (page 471 of the ES pdf) states that 'No new reports have been submitted to our Reservoirs team and no certificate has been submitted to show that the lakes can properly be filled with water'.
- 4.16. A freedom of information request was submitted to the Environment Agency by R.Lord (Geosmart, 2021) and supplied on 10/12/2020 detailing various correspondence in relation to the Monks Lake development. An email dated 6/08/2014 from Nick Reilly (reservoir construction engineer) to Richard Knight (EA) states 'I have heard nothing for well over a year from the Harrisons re Monk Lakes and was beginning to suspect that their plans had been abandoned. As you know I assisted them to formulate their planning application with the aim (on their part) that I would act as Construction Engineer under the Act. I have never been formally

appointed to this role and my intention was that I would not accept it unless they regularised their approach to be more professional in design, testing and supervision etc' .

- 4.17. There remains uncertainty regarding the proper supervision, construction and filling of the reservoir which may have been undertaken without the supervision of a reservoir panel engineer. We consider this is relevant to the impact of leakage on groundwater flooding and has other implications for flood risk and safety. It should therefore be considered relevant to the determination of the planning appeal rather than just a matter for the Environment Agency under the Reservoirs Act 1975. Regular inspection by a panel engineer may be considered as a mitigation measure, but it does not remove the residual risk created by the formation of the raised fishing lakes adjacent to Hertsfield Barn.
- 4.18. Section 6.57 indicates further development is not proposed in flood zones 2 and 3. However, the flood zones defined by the Environment Agency on the basis of the current topography may well have been more extensive before the land raising took place.
- 4.19. On the basis of the multiple sources of flooding and the surrounding receptors identified above, we disagree with Section 6.58 which states 'Flooding risk to the Site is therefore considered low, however there is a limited potential for an increased risk of surface water flooding downstream of the Site as a result of the Proposed Development yet to be completed.'
- 4.20. We have identified fluvial, surface water, groundwater and reservoir flooding as flood risks associated with the retrospective planning permission for the site as it currently stands rather than only for the proposed development yet to be completed. Mitigation measures have not been implemented in the majority of cases and therefore the impact of the current development is significant.
- 4.21. Section 6.74 acknowledges that surface water regime has been modified by the Retrospective Development but then states this is only a localised effect. We strongly disagree that this is only a local short to medium term effect. According to Table 6.2 the magnitude of the change would be considered Major, with a long term change to both the hydrology and hydrogeology, with the loss of drainage ditches beneath the fill material and the permanent creation of steep slopes and increased run-off along the margins, potentially creating permanent impacts outside of the application area. Mitigation measures have not been installed and therefore the magnitude of the impact of the Retrospective Development is permanent and remains Major. If mitigation measures are installed there is a long term requirement to maintain these features and we consider insufficient information has been provided to confirm that they will work in the long term. On this basis we consider

the impact of the retrospective development on the water environment to be as follows.

Receptor	Sensitivity	Magnitude of Change	Significance of effect
Surface water flooding along the western margin	Medium to High: Run-off from the retrospectively developed steep slopes flows towards Hertsfield Barn which lies within 50m of the western boundary. Hertsfield Barn contains areas at High and Moderate risk of surface water flooding (>3.3% and 3.3% to 1% AEP). Previous flooding has been reported from the western perimeter ditch and mitigation measures, although proposed have not been installed. The development is contributing to an increase in flood risk.	Major (potentially reducing to Moderate if mitigation installed). The hydrology of the area along the western boundary has been fundamentally changed with deposition of inert waste material, installation of steep slopes resulting in increased run-off and changes to the hydrodynamics of the western boundary ditch, plus loss of much of the pre-existing drainage system beneath the lakes. Mitigation has not been installed for the Retrospective development.	Major (With mitigation the significance would be Moderate based on the sensitivity of the receptor and the permanent nature of the change)
Groundwater regime and flooding along the western margin	Medium to High: The predeveloped site and adjacent area is identified as being at risk of a shallow water table and groundwater flooding at surface, within at least the moderate risk category (3.3% to 1% AEP). Potential sources for increases in groundwater level (and flooding) as a result of the retrospective development have been identified including focussed recharge along the western margin, removal of the pre-existing	Major (potentially reducing to Moderate if mitigation installed). The hydrogeology of the area along the western boundary has been fundamentally changed with deposition of inert waste material causing permanent changes in the aquifer recharge pattern, loss of previous land drainage and potential alteration to groundwater storage	Major (With mitigation the significance would be Moderate based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change)

	<p>land drainage, possible leakage from the lakes, and compaction/obstruction of the aquifer beneath the lakes.</p> <p>We have presented evidence that groundwater flows towards Hertsfield Barn which lies within 50m of the western boundary. Mr Padden has reported frequent problems with groundwater flooding.</p> <p>Mitigation measures, although proposed have not been installed. The development is contributing to an increase in flood risk.</p>	<p>and flow directions. Baseline monitoring was not undertaken prior to the development and therefore it is difficult to prove exactly what changes have occurred. However, there is strong evidence presented by Mr Padden that an impact is currently occurring which has not been addressed by the applicant, as offsite monitoring data has not been included in the assessment.</p> <p>Mitigation has not been installed for the Retrospective Development. As stated previously we do not consider that sufficient assessment has been undertaken to confirm the proposals will be successful or effective in the long term.</p>	
<p>Fluvial Flooding – construction within the flood plain along the northern and western margins</p>	<p>Medium to High: The predeveloped site and adjacent area is identified as being at High and Medium risk of fluvial (>3.3% and 3.3% to 1% AEP). A significant volume of inert waste has been deposited within the flood plain resulting in the loss of 42,550 m² of flood plain storage.</p>	<p>Major (potentially reducing to Moderate if mitigation installed). The hydrology of the flood plain along the River Beult has been fundamentally changed with deposition of inert waste material causing permanent changes in</p>	<p>Major</p> <p>(With mitigation the significance would be Moderate based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change)</p>

	Mitigation measures, although proposed have not been undertaken. The development is contributing to an increase in flood risk.	the flow across the flood plain.	
Flood Risk from Reservoir Flooding	<p>Medium to High: The predeveloped site and adjacent area is identified as being at Risk of flooding from reservoirs when there is also flooding from the River. In addition, according to the appellants supporting information, if a breach were to occur in the western margin of Lake 2, Hertsfield Barn would be seriously affected, with a potential flood depth of 0.5 m and a velocity of around 1 m/s.</p> <p>The development is contributing to an increase in flood risk.</p>	<p>Major (potentially reducing to Moderate if mitigation measures are undertaken). The risk from reservoir flooding to the area along the western boundary has been fundamentally changed with the creation of the embankments and lakes raised 6m above ground level. A significant new flood risk has been created and there is uncertainty over the supervision and construction of the lakes. Construction records have not been provided.</p> <p>Mitigation is reliant upon regular inspection by a panel engineer in the long term.</p>	<p>Major</p> <p>(With mitigation the significance would be Moderate based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change)</p>
Pollution of groundwater and surface water	<p>Medium.</p> <p>A significant quantity of waste material (assumed to be inert) from a variety of sources was imported to create the lakes through an exemption from the requirement for an environmental permit.</p>	<p>Moderate reducing to Minor on the basis that supporting records are provided demonstrating the inert nature of the imported waste material and the short term nature of any potential impact.</p>	<p>Moderate</p> <p>(With mitigation and regular water quality sampling the significance would be Minor assuming contamination was not detected)</p>

	Spillage from mobile plant may have occurred. Sediment accumulation may be generated by run off from temporary surfaces.	Future work would require an environmental permit and discharge consent supported by regular monitoring. Mitigation supported through the use of Environmental Permits is not yet in place for the site.	
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Table 1 – Significance of the effect of the retrospective development along the western margin

4.22. Table 1 has been produced on the basis of our review of the available data and the definitions provided in tables 6.1,6.2 and 6.3 of the 2022 addendum. Significant long-term impacts have already occurred as a result of the retrospective development and mitigation measures will be required to reduce the significance of these effects. The proposed construction activity related to the importation of more inert waste to create Lake 1 will result in an additional major and fundamental change to the groundwater regime and the drainage system along the western margin. The infilling of the existing pit and creation of the new raised landform with steep slopes will increase run-off and focus additional flow through the western drainage ditch. There will be an increase in surface water flood risk, plus the risk from a breach in the new reservoir and potentially groundwater flooding related to additional recharge along the western margin.

4.23. We disagree with the statement in Section 6.116 that the effect of the whole development (Retrospective and Proposed) on receptors is assessed as Negligible and not significant in EIA terms. We have identified a number of receptors in the vicinity of the site, that have not been appropriately assessed. This includes areas adjacent to the site with pre-existing surface water and groundwater flood risk which according to Table 6.1 would be classed as moderate to highly sensitive receptors. The sources of flood risk are in addition to the fluvial flood risk which has been identified by the appellant. Hertsfield Barn is a grade II listed building which lies within both a groundwater and surface water risk zone with a reported increase in flood risk since the retrospective development has taken place. It should therefore be considered as a sensitive receptor covered within the EIA.

- 4.24. Our assessment of the current retrospective development is that it has had a Major effect on the water environment and associated receptors based on Table 6.3. Mitigation measures have not yet been installed to mitigate the impact of the retrospective development. With mitigation the significance of the effect could be reduced to Moderate to Major, based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change that has already occurred. The proposed future development involves the importation of further waste material and will create additional surface water, groundwater and reservoir flood risk which will require mitigation. We recommend that the impact of the retrospective development is mitigated as a priority to ensure the proposed measures operate as predicted before additional material is imported. We also recommend that alternative designs for the proposed development are considered that remove the increase in flood risk. To reduce the risk from a lake/reservoir breach we recommend avoiding the creation of additional above-ground lakes and reducing the bund height of Lakes 2 and 3, potentially by infilling of the adjacent void on the site of Lake 1.
- 4.25. We consider the proposed development will have a Major effect on the water environment and associated receptors. With mitigation the significance of the effect could be reduced to Moderate to Major, based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change that has already occurred.
- 4.26. We disagree with the statement in Section 6.119 that all in-combination effects have been considered. We have identified areas of pre-development groundwater and surface water flood risk that may have been negatively impacted by the development.

5. Contamination

- 5.1. Table 2.3 indicates Ground conditions and contamination have been scoped out of the ES and includes the statement 'the risk of unknown ground contamination is low'. However, the applicant has not provided any records of the imported material deposited on site beyond limited retrospective sampling. The site was not operated under an Environmental Permit and still does not have an Environmental Permit to cover the ongoing discharges from the site. A construction report, which should form part of the reservoir construction process, has also not been provided. We therefore do not agree that contamination should be scoped out of the EIA on the basis that the risk of unknown ground contamination is low.
- 5.2. Section 6.103, mentions the need to obtain a discharge permit. We note that the site has been in operation for a number of years and the appellant is aware of the need for discharge consents from the Environment Agency for the current operation. These permits have not yet been obtained and provide an indication of the appellants attitude to regulatory requirements. Mitigation measures for the proposed development rely on obtaining a number of permits and good practice measures set out in Table 6.6 . We note that it is unclear if any of the assessment and water quality monitoring required for the permits in relation to the proposed development will incorporate the retrospective development. Continued water quality and groundwater level monitoring of the existing site will help identify and mitigate any potential impact from the retrospective development.

6. Proposed Site Layout

- 6.1. Section 4.6 describes the changes from the originally proposed development. However, the proposed plans (Volume 2, Appendix 4, The 'Proposed Site layout' page 13) have not been altered to accommodate the proposed surface water attenuation scheme comprising attenuation basins and a weir system to mitigate flood risk along the western boundary (see Figure 2675/MBCR2/A7, Vol2 part F of the ES, section 4.1 of Hafren 2019 and Geosmart, April 2019). This suggests the Appellant has not considered how the basins will be incorporated within the landscaping of the development, given the limited space along the western margin and the need to avoid locating flood attenuation basins within the flood plain. Without a correct understanding of the proposed site topography and its relationship to the adjacent receptors we do not consider it feasible for appropriate conclusions to be reached from the Environmental Impact Assessment.

7. Review of the Water Environment

- 7.1. Section 6.2 lists a number of reports produced on behalf of the applicant but fails to list any of the additional relevant material produced by other stake holders which will be relevant to the EIA. In particular expert reviews produced for Maidstone Borough Council (Mott Macdonald, 2019. Hydrogeological advice to Maidstone Borough Council in relation to planning application ref. 11/1948, dated July 2019). In addition, reports submitted by Mr Padden containing evidence of the hydrogeology around Hertsfield Barn are also extremely relevant to supplement the applicants assessment of risk (including ESI, 2015. Report on "The potential for groundwater flooding resulting from the unauthorised development at the neighbouring property known as Monk Lakes" - reference RL1-63346R2 & Geosmart 2021, Statement on Hydrogeology and Flooding).
- 7.2. Section 6.4 lists the work undertaken to prepare the ES Addendum, but as discussed above the methodology of the February 2019 ES (and subsequent Addendum), should include a review of all the relevant data.
- 7.3. Section 6.6, as discussed in our previous reports (Geosmart, 2020) we do not agree that all hydrology, hydrogeological, flooding, and drainage issues can be satisfactorily addressed and mitigated by the development, subject to planning conditions and/or legal agreement. The principle of planning conditions is to allow the development to proceed subject to undertaking certain work. In this case the majority of development has already proceeded so the use of consent with conditions is not appropriate for the assessment of impact.
- 7.4. The issue of whether there has been an impact on the neighbouring properties should be assessed and a conclusion reached before a decision on the development can be made. The only exception to this logically would be if a scheme was installed that would be guaranteed to remove the risks, which in this case would entail more work before feasibility can be confirmed. This should include agreement of criteria to judge if the mitigation measures are successful. It is not possible to agree with the applicants assessment that there is an insignificant risk to the water environment and Hertsfield Barn.
- 7.5. In relation to Section 6.65 we have previously raised concerns regarding the monitoring frequency and resolution required to pick up information on leakage from the lakes and infiltration from the western ditch to the underlying groundwater system. In addition, the groundwater assessment is deficient in its lack of offsite monitoring, particularly in regard to the potential for groundwater flooding at Hertsfield Barn (Geosmart, 2021). Information on groundwater levels and geology collected through site investigation work by Mr Padden at Hertsfield Barn has been provided and should have been included within the Environmental Impact Assessment as requested previously. For example, the amended cross section presented by the Appellant does not extend the geology beyond the site boundary which would clearly show the potential risk of an influence on groundwater levels beneath Mr Padden's property. See Drawing 2675/MBCR2/03 (Hafren Water 2019) in

the Environmental Statement, (Next Phase, 2019, page 244 of the Environmental Statement pdf).

- 7.6. Given the lack of the key information within the EIA we disagree with the statement 6.68 that the study 'provides a clear understanding of the baseline conditions both for the Retrospective Development and the Proposed Development'.
- 7.7. We have demonstrated that shallow groundwater levels at Monk Lakes are higher than adjacent levels at Hertsfield Barn which indicates groundwater flow, towards the Barn. The impact assessment doesn't acknowledge this evidence or account for the potential increased flood risk to the Barn. Appropriate trigger levels have not been agreed which would define when an impact has occurred and if the proposed mitigation is successful. It is difficult to have confidence that the Appellant will develop a suitable mitigation scheme without acknowledging that an impact on groundwater levels has occurred.
- 7.8. We disagree with section 6.74 which states 'previous assessments have confirmed that the importation of inert materials on groundwater was considered to be minor and no significant change in groundwater levels or flows, including offsite groundwater flooding, had been noted as a result of the Retrospective Development'. We have presented evidence on several previous occasions that suggests that groundwater flooding has been increased by the development and this is supported by comments from other expert reviews.
- 7.9. For example, the Hydrogeological advice to Maidstone Borough Council in relation to planning application ref. 11/1948, dated July 2019, prepared by Mott Macdonald (MM, July 2019), which comments on the revised Environmental Statement (ES) (Next Phase, February 2019) as follows. MM state the ES 'does not present a comprehensive description (conceptual site model) of the assumed baseline hydrogeology, that includes all the available data for the site' (section 1.3.3) and also 'The Revised ES and technical report does not address all of issues raised by stakeholders' (section 1.3.4).
- 7.10. In addition, the MM July 2019 report (section 3.1.4) states 'The Hafren Water (2019) report does acknowledge the potential for an off-site impact on groundwater level but the overall tone of the document attempts to diminish the significance of the unmitigated effect. In doing so, the conclusions drawn are sometimes tenuous'. Furthermore, the Appellant's Drainage Strategy Report (Peter Brett Associates (PBA), July 2015, Section 6.3.2) states 'It is possible that both ground and surface water flooding is occurring'.
- 7.11. Section 6.101 provides information on the proposed groundwater mitigation measures and states pipes will be installed to a level of 14.7m AOD and the groundwater drainage conveyed to the River Beult. We note that it is highly likely that the drainage will be below the water table and potentially require dewatering which will have a short-term impact on the water environment, followed by the long term impact of the drain on groundwater levels. We note that the design of the

groundwater drainage system is based on very limited data, as off site monitoring has not been undertaken by the appellant. A review by Mott Macdonald on behalf of Maidstone Borough Council (2019), section 2.3.12 states 'The design is reliant on a single water level measurement taken by ESI in 2015. It is recommended that this water level measurement is confirmed as accurate and that any other relevant off-site receptor elevations are sought prior to detailed design'.

- 7.12. In addition, an analyses of the operation of the system when the river levels are high (potentially above the proposed invert level) is also required. Trigger levels should also be set to establish when the system is operating correctly. Without a detailed analyses of the operation and effectiveness of the proposed groundwater drainage system it is difficult to agree with the assumption that the risk from groundwater flooding will be mitigated.
- 7.13. A series of weirs and associated basins are proposed to attenuate surface water run-off, however, these basins have not been included in the proposed development plans. Given the space constraints along the western margin, it is not possible to be certain that the basins can be installed successfully within the currently proposed landform.
- 7.14. We have presented national maps, including data from the British Geological Survey showing the site is at risk from groundwater flooding. We also note that the appellant is proposing to install groundwater mitigation measures, which acknowledges the potential risk from groundwater flooding.

8. Summary and Conclusion

- 8.1. As discussed in the previous sections, Table 6.5: Sensitivity of Receptors, should include receptors both on and offsite, including Hertsfield Barn which lies adjacent to the western boundary. In addition, the section on flooding is too limited and should include all the sources of flooding which we have identified including: fluvial, groundwater, surface water and reservoir, which comply with the applicants criteria for identifying sensitive receptors (Table 6.1).
- 8.2. For the proposed development yet to be implemented we consider that subject to implementation of mitigation measures the significance of the effects on the water environment, would be Major to Moderate based on the sensitivity of the receptor, the uncertainty of the proposed mitigation and the permanent nature of the change.
- 8.3. We consider that the retrospective development has caused a fundamental change to the water environment resulting in a Major effect which has not been mitigated effectively and will require significant remedial action. We have identified receptors in the vicinity of the site, including groundwater and surface water flood risk and Herstfield Barn, that have not been appropriately assessed. Importation of further waste material to create an additional raised lake with an associated increase in flood risk is proposed.
- 8.4. We do not agree with the conclusion of Chapter 6 that 'Subject to adaptation of good practice methods and obtaining the relevant permits and permissions, no adverse significant effects on the Water Environment are predicted during the construction and operation of the entire development'. With mitigation measures installed the effect of the entire development is considered Moderate to Major, unless significant alterations are implemented to the proposed design.

9. References

- 9.1. ESI, October 2017. Technical note - Hertsfield Barn - Review of new technical data. Reference 62852L04Rev01.
- 9.2. ESI, 2015. Report on "The potential for groundwater flooding resulting from the unauthorised development at the neighbouring property known as Monk Lakes" - reference RL1-63346R2.
- 9.3. ESI, 2014. Hertsfield Barn - Groundwater Flood Risk Assessment. 62852R1, August 2014
- 9.4. Geosmart, 2019a. Letter dated April 2019, Hertsfield Barn: response to EIA statement for Monk Lakes, reference 70276R1.
- 9.5. Geosmart, 2019b. Letter dated December 2019b, Hertsfield Barn: Addendum to response to EIA statement for Monk Lakes, reference 70276R2.
- 9.6. Geosmart, 2021. Statement of Paul Ellis dated 22nd March 2021, The potential for groundwater flooding resulting from the unauthorised development at the neighbouring property known as Monk Lakes.