Technical Briefing Note

Project: Downlands Farm, Uckfield

Technical Briefing Note 08: Potential for hydrological connectivity to Sphagnum bed at Lake Wood

Date: 11 October 2022

1. Executive Summary

- Objectors have raised in issue the potential for deterioration to the Irreplaceable Habitat of Lake Wood, which is included within the Ancient Woodland Inventory compiled and maintained by Natural England.
- The deterioration is said to arise from changes to the hydrology of Lake Wood, and specifically to inflows from the Downlands Farm site that currently support a small Sphagnum moss bed, which in turn is said to feed the lake.
- Outflow from the lake, which is alleged will be adversely affected, drains into the Shortbridge Stream, which is known to have specialised ecology; this, too, is said to be subject to adverse effects should the development proceed.
- Sylvan has undertaken a review of relevant technical information, including the *Geo-environmental Site Investigation* (GSI) prepared by BRD Environmental, the *Flood Risk Assessment* (FRA) prepared by Waterman Consulting, the topographic survey, and LiDAR data.
- Sylvan has also undertaken field work to test the validity of the conclusions of the FRA and GSI.
- Based on our combined desk and field study, we conclude that no hydrological connection exists at or above the level of materiality between Downlands Farm and the Sphagnum bed and/ or the lake in Lake Wood.
- Accordingly, the proposed development would neither cause deterioration to Irreplaceable Habitat, nor result in an adverse effect of the ecology of the Shortbridge Stream.

The Sylvan brand is a specialist collaboration between Aspect Ecology Ltd (registered number 5648214 – England and Wales) and Forbes Laird Arboricultural Consultancy Ltd (registered number 05253618 – England and Wales)

2. Introduction and Background

2.1. Sylvan (Aspect Ecology and Forbes-Laird Arboricultural Consultancy (FLAC)) is advising in respect of ancient woodland matters relating to the site Downlands Farm, Uckfield. The site is being considered for residential development, with an application pending decision before Wealden District Council (its ref. WD/2022/1637/MEA).

2.2. Consultation responses have been received on the application from, amongst others, Sussex Wildlife Trust (SWT); the Woodland Trust (owners of Lake Wood); and a local resident, Dr Martyn Stenning.

2.3. Whilst the Woodland Trust does not directly take a position on hydrological change affecting Lake Wood, it does cite with approval the opinion of Dr Stenning. Dr Stenning states:

> *The Sphagnum peat fed lake at Lake Wood, which… supports a huge biodiversity of aquatic plants, invertebrates and vertebrates, including great crested newts, is… fed with water from Downlands Farm and would be jeopardised by the drainage engineering proposed by the developers.*

2.4. However, this assertion is not supported by reference to evidence. Notably Dr Stenning does not refer to the FRA or GIS and their findings.

2.5. In similar vein, SWT state, also without providing evidence, that Downlands Farm is:

> *Hydrologically connected to the Woodland Trust's Lake Wood Reserve which contains a sphagnum peat fed lake.*

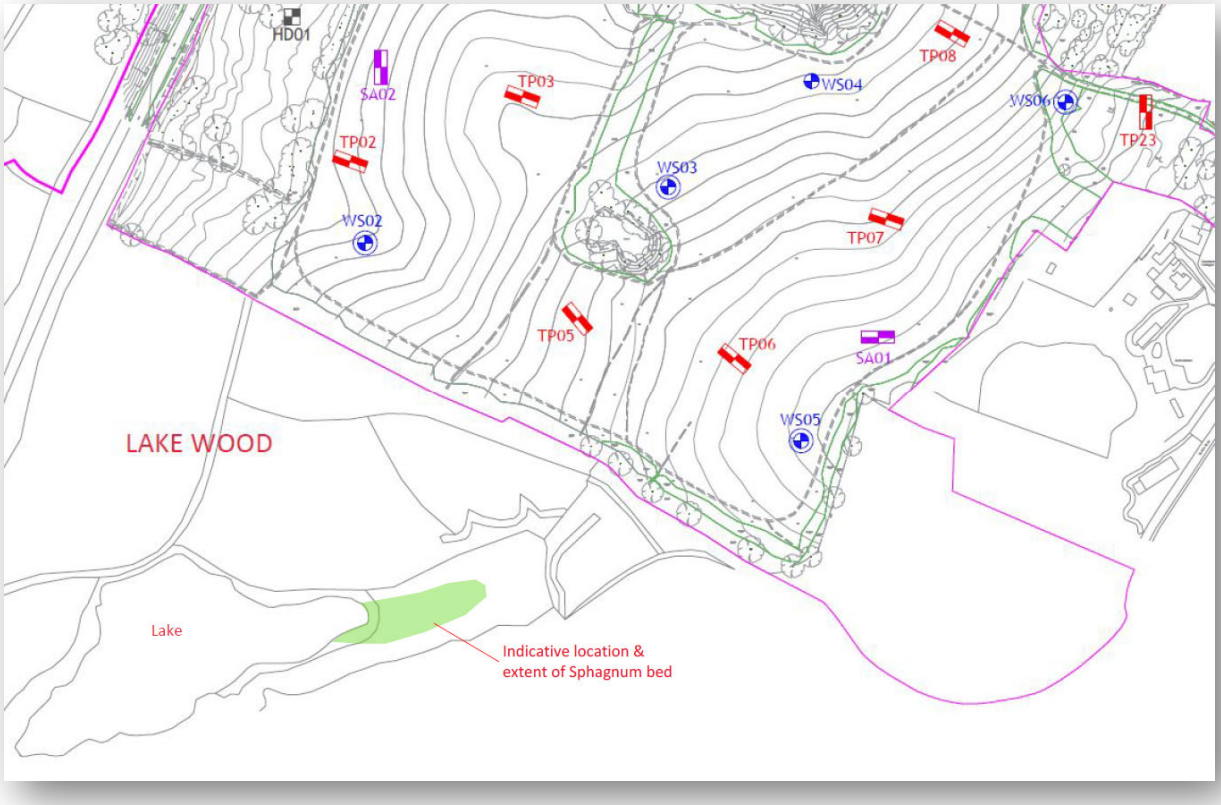
2.6. This Technical Note directly addresses these assertions.

3. Desk study

Geo-environmental Site Investigation

3.1. Appendix 10.2 of the Environmental Statement comprises the GIS referred to already. The GIS includes reports of trial hole and bore-hole surveys that provide empirical evidence of soil conditions. Figure 1 is an extract from the *Exploratory Hole Location Plan* found within Appendix 1 of the GIS.

Figure 1 – Extract from BRD Environmental Exploratory Hole Location Plan, *11.01.2022, marked up by Sylvan to show indicative location and extent of the Sphagnum bed in Lake Wood*



3.2. The GIS summarizes the ground conditions as follows:

The ground conditions encountered at the site were generally as anticipated from the published geology.

3.3. The published geology, derived from the British Geological Survey (BGS) online viewer, shows "Grinstead Clay Member" being present on-site for the length of the common boundary with Lake Wood. An extract from the BGS website depicting the relevant area is included at Figure 2.

Figure 2 – Extract from BGS Geology Viewer showing Grinstead Clay member as green fill



3.4. Referring to the exploratory hole location plan extract at Figure 1, it is apparent that holes WS02, WS05, TP02, TP05 and TP06 are all located in that area of the site which abuts the Lake Wood boundary. The exploratory hole results are included in the GIS at its Appendix 2. Consulting this data confirms that the stratum underlying the topsoil in all five cases is Grinstead Clay Member.

3.5. BGS technical report WD/00/04, titled *The physical properties of minor aquifers in England and Wales*, describes the Grinstead Clay Member as an "aquiclude" (5.3.3.4). An aquiclude is a stratum that takes up water until field capacity is reached, and then retains it, confining soil water in adjoining strata. In other words, the Grinstead Clay Member adjacent to Lake Wood acts as a barrier, preventing lateral flow from soil water on site into Lake Wood. This technical work demonstrates that the assertions of Dr Stenning and SWT are not supported by the GIS which shows the contrary, namely the absence of a material sub-surface hydrological link.

Flood Risk Assessment

3.6. Appendix 8.1 of the Environmental Statement comprises the FRA referred to already. The FRA includes the proposed drainage strategy, which was worked up based on detailed collaboration between Sylvan and Waterman Consulting.

3.7. A key element of the drainage strategy is the extent to which infiltration could be used to drain the proposed development area. To inform their view on this point, Waterman Consulting undertook a review of the infiltration test data contained within the GIS, concluding that:

Soakage testing was undertaken across the Site, which demonstrated soil permeability that was too low to calculate the infiltration rate in most locations. In one location a rate of 1.12 x 10-6 m/s was calculated, which is considered too low to successfully support infiltration. The Geo- Environmental Site Investigation report concludes that the disposal of surface water to soakaways will not be feasible at this Site due to the predominantly cohesive nature and proved low permeability of the underlying soils.

3.8. This finding further demonstrates that a material hydrological link between Downlands Farm and Lake Wood is absent (contrary to the assertion of objectors), instead strongly indicating that on-site water remains on-site, currently draining with the lie of the land.

Topographic survey

3.9. The site topographic survey provides directly relevant information on the extent to which the lie of the land favours drainage from Downlands Farm to Lake Wood. Levels data from the topo confirms a fall along the Lake Wood boundary of ca. 10m from southeast (at Chicory Cottage) to northwest (the A22).

3.10. The levels data also confirms a more complex topography from within the site and towards Lake Wood. Whilst in the southeast Downlands Farm slopes towards Lake Wood, more centrally along the boundary the slope lies the other way, before the land lies broadly even in the northwest. Thus it is the case that only in the southeast, for ca. 120m, would the lie of the land permit potential overland flows into Lake Wood from Downlands Farm in any event.

LiDAR data

3.11. Figure 3 is an extract from the Environment Agency's LiDAR data visualization for the locality. This information allows us to plug the gap between the on-site topo survey covering Downlands Farm, and the off-site terrain within Lake Wood, which has not been topographically surveyed.

Figure 3 – Extract from EA LiDAR survey, 1m resolution DTM



3.12. The location of the lake is readily apparent in Figure 3, as is a valley feature extending from the westerly projection of the lake to head, somewhat north of west, towards the common site boundary. Cross-referencing Figure 3 to Figures 1 and 4, helps in understanding the location of the Sphagnum bed: it occupies the lower reaches of the valley where this terminates at the lake.

Figure 4 – Extract from aerial image dated 2004 selected to show thicketting trees within Sphagnum bed, indicative extent of which is highlighted



3.13. Referring back to Figure 3, the dark shadow along the southern aspect of the valley is a line of sandstone bluffs, which together form a more or less continuous outcrop at this point, frequently rising to a height of 4m or so. The nature of the sandstone outcropping effectively provides the enquirer with a section through the local geology that is plain to see (Figure 5).

3.14. Extending NNE and NE from the northernmost point of the lake are two linear depressions: these are tracks. Extending NNW from the north shore of the lake is a much wider depression: this is the outflow route to the culvert under the A22, through which the lake drains into the Shortbridge Stream.

3.15. With the terrain at lake Wood now revealed by the LiDAR data, it becomes apparent that any hydrological connection between Downlands Farm and the Sphagnum bed involves the valley in which the latter sits. Thus an on-site search for indications that such a connection could be present, despite the strong geophysical evidence to the contrary set out above, must consider the northern valley side, especially the bluffs, and the head of the valley.

Figure 5 – Photograph taken 07.10.22 showing part of sandstone bluff along north side of valley



4. Field work

Methodology

4.1. Sylvan undertook field work in Lake Wood on 06 & 07 October 2022. As well as seeking obvious signs of hydrological connections into the Sphagnum valley, our primary search targets were botanical indicators of elevated soil moisture (phyto-hydrological markers), that would suggest (or confirm) the presence of overland flows, wet flushes, seasonal watercourses, and so on.

4.2. In this regard, it should be understood that plants are symptomatic of soil conditions, with locally higher levels of soil moisture giving rise to specific marker species, which colonise damp locations opportunistically. For example, in Longwood Gill and Shermanreed Wood, the key marker species for hydrological inflows is Hart's-tongue Fern (*Asplenium scolopendrium*).

Findings

4.3. In brief, we found no indications of any material hydrological connection between Downlands Farm and the valley hosting the Sphagnum bed which is said by Dr Stenning and SWT to feed the lake. Both the northern side of the valley and its head appeared to be floristically homogenous with elsewhere in the wood, with no phyto-hydrological marker species being found except the Sphagnum bed itself, which occupies a well-defined area.

4.4. Examination of the sandstone bluffs found no signs of water flowing over, through or under these features. This is significant because at about 34-39AOD the bluffs occupy a key part of the level transition from the site (at ca. 40-42AOD) to the valley floor (at ca. 34AOD): if there were deeper seepage inflows in play, for example if soil water was moving below the Grinstead Clay Member, these should be apparent on examination of the sandstone and related plant colonies. No such indications were found.

5. Discussion

5.1. The Woodland Trust owns and manages Lake Wood, in furtherance of which latter it has prepared a Management Plan covering the period 2016-2021 (no more recent edition appears to be available). Within this document is section 5.1 *Historic Landscape*, which contains the following description:

> *The landscaping of Lake Wood occurred in the late eighteenth and early nineteenth century after the site became part of the Rocks Estate, owned by the Streatfield family, in 1789. An existing spring-fed pond was enlarged by the building of the dam.*

5.2. Notwithstanding that the Woodland Trust cited Dr Stenning's opinion with approval, the text set out above directly contradicts both his and the SWT's assertion that the lake is fed from Downlands Farm via the Sphagnum bed. Having examined all the evidence in print and on site, we conclude that the Woodland Trust's description of the lake as being spring fed is correct.

5.3. In this regard, we do not consider it material whether the spring feeds the Sphagnum bed, which in turn supplies the lake, or the spring feeds the lake, which supplies the Sphagnum bed. Either is equally consistent with the Woodland Trust's understanding of the site, and neither speaks to hydrological supply from Downlands Farm.

6. Conclusion

6.1. Consultees on the planning application have put forward a claim that deterioration of Irreplaceable Habitat at Lake Wood, as well as adverse impact on lake and stream ecology, would occur due to changes to hydrology arising from the proposals. Notably, the objectors put forward no evidence to support their assertions.

6.2. To test these assertions, Sylvan has undertaken a review of the data supplied to the Council as part of the planning process, and has ground-truthed the presence/ absence of possible hydrological connection pathways between the Downlands site and Lake Wood. In this regard, the evidence centres on the Geo-environmental Site Investigation and the Flood Risk Assessment, supported by topographic and lidar survey data.

6.3. This work provides confirmatory geophysical evidence that sub-surface or surface flow pathways are absent between the Downlands site and the Sphagnum bed or lake in Lake Wood. Sylvan has further checked this conclusion through field survey work, which confirms an absence of any indications of a hydrological connection between the two sites.

6.4. It is the case, therefore, that all of the evidence supports the Woodland Trust's position that the lake is spring fed, rather than fed via hydrological supply from the Downlands Farm site.

6.5. Based on the suite of information available, we conclude that there is no material hydrological link between the Downlands site and the lake in Lake Wood. Accordingly, the claim by objectors that hydrological change could occur through such a link is not supported by the evidence.