PPEAL REFERENCE: APP/Z2315/W/23/3325783
DATE OF HEARING/INQUIRY: 24th – 27th October 2023
APPEALANT: Prospect Homes

4th October 2023

HOLLINS CROSS FARM, BURNLEY
PROOF OF EVIDENCE – FLOOD RISK & DRAINAGE

Appeal by Prospect Homes Ltd against the failure of Burnley Borough Council to determine a Full planning application for the erection of 200 dwellings and associated works.

My name is Richard Nicholas, I am a Civil Engineer specialising in Flood Risk and Drainage. I have been a Director of Betts Hydro Limited since 2015 and I have over 20 years of experience across a range of sectors and projects including residential development.

This proof of evidence exceeds 1500 words, therefore, in accordance with PINS guidance a summary is provided at the end on this document (section 8.0, pg.15).

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1.0 Matters of Dispute

1.1 The Statement of Case prepared by Burnley Borough Council states: -

6.1 {defer until} the full report of an over winter survey on flooding has been received and considered by the relevant experts on flooding.

6.1.1 The drainage reports commissioned by the Council and the resident's group both state that over winter testing of groundwater would be beneficial to inform the detailed drainage design.

6.1.2 Given the contents of the reports the Council consider it necessary to request the additional information regarding groundwater before determining the application. Without this information it cannot be determined to be in accordance with Local Plan policies CC4 and CC5 and therefore a putative reason for refusal.

6.1.4 It is however a matter that can be dealt with by the submission of information and capable of being agreed. If satisfactory reports are submitted to clarify that the development will not increase the risk of flooding from groundwater and this information is used to inform the detailed drainage design; together with the recommended conditions this would ensure compliance with policies CC4 and CC5 of the Local Plan."

1.2 The Rule 6 Party concerns relate to the SuDS Retention Basin / Pond Safety and I have summarised below the points that relate to flood risk or drainage based on the Statement of Case.

- No evidence that the basin will only contain water for short periods of time at peak flow times
- Groundwater flooding and Over winter groundwater survey
- Child safety around water features and fencing off the SuDS feature
- Separate children's play equipment from water features
- Freezing over of the retention basin and children playing on ice

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2.0 Situation & Summary

2.1 There is an area in the north of the development site where a large proportion of the site drains to, where the ground is saturated and frequently has standing water.

2.2 In my opinion from review of the ground investigation information and the wider surface water runoff catchment data the reason that there is ponding, and wet ground here is primarily due to surface water runoff (pluvial), based on ground conditions and topography.

2.3 There is sufficient assessment of the flood risk posed by groundwater within the many documents supporting this application to ascertain that the over-winter groundwater monitoring is not necessary. Whilst it may be considered to provide some benefit to the developer, it is not necessary, as suitable mitigation measures can be provided within the constraints of the layout irrespective of the additional groundwater monitoring results.

2.4 Based on the information I have reviewed, including the Flood Risk Assessment and Drainage Management Strategy (core doc. 1.05, Hydrock, 2019), the Flood Risk Assessment (core doc. 2.22, RSK, 2021), the Drainage and Levels Strategy (core doc. 2.16, REFA, 2022), the Geo-Environmental Report (core doc. 2.25a/b, REFA, 2022), I believe that the saturation of ground and ponding is primarily from surface water runoff. It is possible that some groundwater could be present in this location, however, whether the ponding is from surface water runoff alone or from surface water runoff exacerbated by the presence of groundwater there are standard mitigation measures available to manage flood risk. It is important to note that the introduction, through the proposed development of suitable measures to manage surface water runoff and groundwater would greatly reduce the current flood risk to the adjacent dwellings as at present a large proportion of surface water runoff from, and beyond, the development site drains, in a relatively uncontrolled fashion to this northern location where ponding occurs. Whereas the flood mitigation measures to be delivered by the development will capture, control and manage these currently uncontrolled flows, attenuating in pipes and basin and controlling release into the wider drainage system at a far reduced and manageable flow rate. Combined, this will reduce flood risk both on the development, for the properties directly adjacent to the development and for the wider area.

2.5 Mitigation of surface water from elevated ground to the south of site is captured within the condition relating to surface water management proposed by the Lead Local Flood Authority which requires 'Details of proposals to collect and mitigate surface water runoff from the development boundary'.

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2.6 Over-winter groundwater monitoring is not considered necessary. This is because from review of all of the ground investigation information (boreholes, window samples and trial pits), it is already clear that ponding occurs throughout the year, not just in the winter months, in the northern portion of the of site. Any over-winter groundwater monitoring will likely only show water at or near to surface, therefore would not provide any useful information for improved decision making.

2.7 The key is to manage the existing uncontrolled surface water runoff entering site using appropriate interception techniques. Appropriate techniques can also reduce the peak rate of runoff by slowing the flow. Controlling the surface water runoff from the south near the southern boundary of the site would greatly reduce the ponding that occurs at present. The management of the surface water from the development site itself would also reduce flood risk to the adjacent dwellings by attenuating the flows and providing a suitably sized basin for stormwater storage up to and including the 100-year return period storm event with a suitable allowance for climate change.

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3.0 Drainage Strategy

3.1 The site is at present 'greenfield' and is being treated as such in terms of surface water run-off. The run-off currently follows the topography with a proportion of the site runoff being captured by land drainage ditches before discharging to a 600mm diameter culverted drainage system on the northeastern boundary and a 375mm diameter culverted drainage system beneath Woodplumpton Lane.

3.2 The infiltration characteristics of the site mean that the drainage proposals are to mimic the existing surface water drainage situation by continuing to discharge surface water to the culverted drainage systems that serve the site, albeit at a reduced and restricted rate of discharge, QBar (mean annual flood). This presents betterment in terms of reducing the peak rate of surface water runoff leaving the site in storm events greater than the 2.33yr return period.

3.3 The drainage strategy has been developed by REFA Consulting Engineers and aligns with current drainage design approaches both nationally and locally. The strategy has been developed with design solutions intended to allow the surface water system to be adopted by United Utilities or a NAV.

3.4 The Lead Local Flood Authority have not objected to the proposed strategy and the proposals align with the objectives of national guidance with surface water being managed in surface features (I.e. basin) where possible to obtain wider SuDS benefits such as water quality improvement, biodiversity and amenity value that are not achieved with more traditional below ground drainage solutions.

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4.0 Stormwater Storage

4.1 The site is proposed to be restricted to a maximum peak surface water discharge rate of 48.6 l/s. This creates a stormwater storage requirement which must be contained onsite in the key design storm event, the 100-year return period event with a 40% allowance for climate change, along with consideration of other variables such as a 10% allowance for urban creep.

4.2 The attenuated stormwater is proposed to be contained within a large retention basin to the north as well as some online over-sized below ground pipes and some offline cellular/crate storage.

4.3 In line with guidance, stormwater should, where possible, be stored within sustainable drainage systems (SuDS), the retention basin is a good form of sustainable drainage as it not only caters for extreme stormwater storage by dealing with the volume aspect, it also provides water quality improvement due to the permanent ponding area and also enhances biodiversity and amenity aspects which are also key SuDS objectives. A retention basin is favoured over a detention basin insofar as it provides a small area (by proportion to the overall storage capacity) that is permanently wet by lowering levels below the outfall invert.

4.4 Detailed levels design of the basin area and base levels will allow the permanent wet area to utilised for storage in 'normal' daily rainfall events and small storm events, ideally up to and including the annual storm event; that is, events with a 100% probability of occurrence in any one given year. This means that in ordinary rainfall scenarios and lesser storm events the wider basin area might experience some limited ponding from localised runoff based on direct rainfall, however it would not be fully utilised. The wider basin area is only intended to be utilised in more extreme storm scenarios and provides the necessary stormwater storage to cater for the 1% annual probability event, more often referred to as the 100-year return period event, with an allowance for climate change. Design and capacity of the basin is not considered to be of concern as there is significant additional capacity within the basin freeboard.

4.5 The topography of the site is such that it lends itself to the basin storage system proposed, with the basin providing the storage needs of the majority of the site. The additional over-sized storage pipes are as a result of a proportion of the site that needs to be drained being at a lower level, this is a small proportion and an acceptable practice.

4.6 The basin is designed in such a way that it will drain-down during and following the storm event at greenfield runoff (48.6 l/s) as the levels are such that there should be no downstream surcharging, however, a precautionary approach will be applied

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with the design subject to adoptions requirements by UU (I.e. surcharging of the outlet will be simulated). Flows are proposed to be controlled by a vortex flow control device (Hydrobrake) which throttle the rate of discharge to the pre-development greenfield rate. This greatly reduces downstream impact in later storm events beyond the 2 year return period.

4.7 The top water level in the 100-year return period event results in a maximum depth of water within the wider basin area of 1.2m. It is acknowledged that sequential storm and rainfall events can and do occur, however the basin is designed to half drain-down within 24 hours, Causeway Flow (industry standard modelling software) identifies a drain-down time of approximately 210mins. Lesser events will drain-down more quickly.

4.8 To protect the proposed basin from the potential for groundwater ingress it is proposed that the basin be formed with an impermeable barrier, this prevents ingress from beneath. In addition a cut-off drain would be installed around the perimeter of the basin before connecting out to the surface water outfall location. This would be a 'french drain' type feature, with a perforated land drainage pipe wrapped in a geotextile in a granular filled trench installed to a depth approximately 300mm below the invert level of the basin. This cut-off drain would intercept any groundwater flow towards the basin from any direction, conveying flow along the natural route to watercourse, it would also capture any groundwater that could come up from beneath the basin area. This cut-off drain would have the added benefit of reducing the risk of groundwater flooding to the existing septic tanks and also the proposed foul water pumping station.

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5.0 Ground Conditions

5.1 A preliminary appraisal (Desk Study) was prepared by Sirius (ref. C8498, 2019) which provided an environmental appraisal of the site including a review of the environmental setting, review of propriety environmental database, review of historical plans and the geological report.

5.2 Findings from the desk study include "*the underlying natural strata is considered to comprise of glacial clays with bedrock indicated to be present at depths <5m bgl. The desk study has identified the potential for shallow coal mine workings therefore intrusive investigations are required to determine the presence of shallow coal mine workings.*" (Sirius, 2019).

5.3 REFA consulting engineers have undertaken an intrusive ground investigation based on the findings of the Sirius desk study. The REFA ground investigation report (GIR, 2022) states, "*These investigations have confirmed relatively uniform superficial ground conditions present across majority of the site area, although localised areas of made ground have been identified. Reference should be made to individual trial pit and borehole journals for details of the ground conditions identified.*" (REFA, 2022).

Made ground

5.4 In addition, "*Topsoil deposits have been identified over the majority of the site proven to a maximum depth of 0.4m bgl but generally the topsoil is present at a thickness of 0.2m.*" REFA, 2022). The investigations also identified no made ground other than within the location of WS04 (window sample), comprising topsoil with minor brick fragments. No other deposits of made ground have been identified.

Glacial Till

5.5 The GIR identifies the underlying natural strata comprises of glacial till which is firm to stiff sandy gravelly clays, proven to a maximum depth of 3.7m bgl (below ground level).

5.6 The GIR identifies that within TP02 (trial pit) a soft brown, black clayey peat has been identified at depths between 0.2 – 1.2m bgl. It is considered that the peat material will be unsuitable as a bearing strata due to its highly compressible nature and therefore cannot provide a suitable safe bearing capacity for foundations.

Bedrock

5.7 The GIR confirm; "Bedrock has been encountered across the majority of the site at depths ranging between 0.2 – 1.9m bgl (below ground level). The underlying bedrock comprises of alternating sandstone and mudstone and appears to have an extremely weathered interface initially and is competent with depth." (REFA, 2022).

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Groundwater

5.8 The GIR identifies that groundwater ingress was recorded within TP02 and WS04 at depths of 0.8 – 1.2m bgl (below ground level). It also stated, "*The walkover has also identified extremely soft boggy ground conditions within the site indicating the presence of large amounts of surface water. The site also contains large drainage brooks which also contain significant amounts of ground water therefore a program of groundwater management should be considered for the development phase.*" It goes on to state, "*Evidence of large amounts of groundwater have been identified within the site and it is anticipated that large amounts of groundwater will be present within the site during inclement periods of the year. It is anticipated that excavations within the site will be inundated with perched water.*" (REFA, 2022).

5.9 The above statements are misleading based on my walk-over of the site and my observations, insofar as the drainage ditches, in my opinion, appear to be to cater for surface water runoff and did not appear to be for conveyance of groundwater. I however, have the benefit of all of the investigation information including additional window sample data.

5.10 The location of water within TP02 (trial pit) is not unexpected as this is where a band of peat was encountered, and the water was within this layer. It is likely that this band is holding surface water runoff as this the lower northern end the site and appears to be where surface water runoff is routing when flowing overland from the south.

5.11 Additional investigations (4no. window samples) were undertaken to better understand ground conditions in the location of the proposed basin (WS101-104). WS101, WS102 and WS103 (window samples) identified the presence of peat, WS104 did not. Groundwater was encountered within WS102, WS103 and WS104 at depths ranging between 0.3m and 0.8m bgl. This is again likely to be as a result of surface water runoff flowing to this location overland and in the surface strata with the ground above the impermeable subsurface becoming saturated and water becoming perched.

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6.0 The Retention Basin and child safety

6.1 It has been my experience having designed SuDS basins for many years in a range of scenarios and locations that these are not typically fenced off as they loose some of their benefit in terms of aesthetic appeal and fencing can actually reduce safety by obscuring and/or preventing access to people who may get into difficulty in the basin.

6.2 Clearly any depth of water presents a risk of drowning, especially to young children and the vulnerable. *"Drowning can occur in permanent bodies of water or in normally dry areas when they contain water temporarily during and after rainfall events. Drowning more frequently occurs from accidentally falling in rather than by deliberately accessing a body of water and then getting into difficulty. This may be increased during the hours of darkness and when there is unsupervised access to open water, particularly by younger children or those under the influence of alcohol or drugs."* (CIRIA RP992/17, 2013) (an update to the SuDS Manual).

6.3 The Royal Society for the Prevention of Accidents (RoSPA) states "We must try to make life as safe as necessary, not as safe as possible".

6.4 The Health and safety principles for SuDS (CIRIA RP992/17, 2013) (an update to the SuDS Manual) makes a series of statements that I feel are pertinent: -

> *"When dealing with the design of public amenity space, it is important to weigh up the risk of harm against the benefits of provision, i.e. with the objective of balancing positive attributes against the inevitable risk of injury which any public activity generates (Ball and Ball-King, 2011). Publically accessible green and blue infrastructure (including SuDS) support important societal benefits including health and welfare benefits relating to improved quality of life and recreational and educational benefits for children and adults.*
>
> *As a society, we are prepared to broadly tolerate the risks posed by our road network, because of the benefits and support it provides to our daily lifestyle. SuDS components that are surface features (e.g. ponds, basins, swales), if managed correctly and if the public are made aware of the risks, should come to be accepted as important, necessary and beneficial ways of managing our societal impacts.*
>
> *The benefits of providing a well-designed SuDS scheme are local and regional. The risks that need to be considered should look at the local situation and expectations."*

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6.5 The Health and safety principles for SuDS (CIRIA RP992/17, 2013) goes on to state: *"The early response to water features in the landscape was to deny access through metal fencing, hedging and planting barriers. However, although physical barriers might be suitable where the risks are high, the provision of pedestrian fencing is frequently challenged by designers, health and safety experts and often by the local community itself. Where the water is accessible, the edge gradient above and below the water line, and the depth profile of the water are of critical importance. If the risk is high, either due to the required nature of the edge, the hinterland activity, the presence of hard features such as culverts, steps etc or a combination of these then fencing may be deemed necessary. The height and nature of the fence along with location in relation to the water feature are important considerations."*

6.6 The side slopes of the basin are shown at 1:3 and 1:4 which are acceptable gradients based on the design principles in the SuDS Manual (CIRIA C753, 2015).

6.7 Provision of a fence can reduce the observation of the basin reducing the natural security of the basin and any water being overlooked. The basin is very much located in an area that lends itself to good natural surveillance, not only reducing the likelihood of persons entering the water unnoticed but also minimising abuse.

6.8 However, where it is likely that unsupervised young children (toddlers) could gain access to the water then a toddler proof fence could be installed around the retention portion of the basin area (permanent wet area). These are typically 600 – 750 mm high to prevent toddlers getting to the water but also low enough to allow adults to access the water in case of emergency. Specific fence types must be used if this approach is applied.

6.9 It is unlikely that during a significant storm event, when the wider basin area is being utilised, that any toddlers would be out playing, therefore it would be reasonable not to fence the entire basin area that would only be utilised on an occasional basis.

6.10 There is no proposal for any play equipment to be located within the basin area, nor would I advocate this.

6.11 Detail design will also likely identify the need for a low (knee-high) rail birds-mouth type fence adjacent to the public footpath above the basin, not to prevent persons from accessing the wider landscaped area but to reduce the risk of a wayward pram, buggy or toddler on a scooter or bike.

6.12 Access to the water can be discouraged by reeds and shrubs that do not obstruct visibility but provide a safe deterrent.

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6.13 Provision of Life Saving Equipment should be considered during detailed design and discussed with the Lead Local Flood Authority. Life rings and other Public Rescue Equipment (PRE) have frequently been provided when not necessary in the past and are often abused with their provision sometimes creating a false sense of security to those considering entering the water.

6.14 Signage is very important, both to educate the public regarding the health and safety risks of the SuDS basin and also to educate about how the system works, the water cycle and how rainwater can be managed sustainably and integrated within a residential setting. Detailed design of the basin and surrounding levels and landscaping will identify the necessary signage details including locations. The signage should also highlight the hazards not only of entering the water but also of playing on ice.

6.15 Safety grilles might be required on the inlet pipe structures (any pipes over 300mm), however detailed drainage design might enable the outlet pipe diameters to be further reduced.

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7.0 Conclusion

7.1 In my view there is nothing which identifies that an entirely satisfactory SuDS drainage system cannot be designed in detail for this site and there should be no increase in flood risk, in fact I would anticipate a reduction in flood risk to the existing dwellings as a result of the scheme.

7.2 The requirement for over-winter groundwater monitoring is not necessary, as it is likely to offer no new information than that already available. It is easy to request this assessment as it has the perception of adding value, however it will not provide any additional information to improve any further decision making. This should have been apparent to the LPA when they deferred the appeal application.

7.3 If the situation is as I describe then I would anticipate water at or near surface due to surface water runoff and saturation of the soils at the topographically low areas of site. This water would be expected to be encountered within the window samples in the northern area, which is where any over-winter sampling would be undertaken, but this is surface water runoff rather than groundwater. If any groundwater is encountered during the construction phase, which is likely with deep trench excavations for drainage, foundations and earthwork exercises then appropriate groundwater mitigation measures will be undertaken, this is standard practice in the construction industry. If there is permanent shallow groundwater in the vicinity of the basin this can be supressed by suitably located cut-off drains on the southern side of the basin and drained via gravity to the surface water outfall.

7.4 There is significant benefit of the reduced peak rate of surface water discharge in large storm events post-development compared to the existing situation and these far outweigh any insignificant increase in the volume of surface water run-off that results from the introduction of impermeable area.

7.5 The proposal to use a retention basin follows good practice and industry guidance and has appropriate design features such as side slopes no steeper than 1:3. The detailed drainage design would normally be conditioned and will need to be approved by the Lead Local Flood Authority, the basin would be managed by a Management Company and the headwalls and outfalls managed by United Utilities. The health and safety concerns of the Rule 6 party are acknowledged and can be covered by a suitable worded condition relating to detailed design with a suitable risk assessment and mitigation measures.

7.6 Clearly in these circumstances, I reserve the right to make further comment in response to any specific flood risk or drainage criticisms that the LPA may raise in their evidence. However, from the analysis that I have undertaken, I have not been able to

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identify any drainage or flood risk related impact of the proposed development that might be described as of significant detriment such that it would justify the refusal of planning permission.

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8.0 Summary

8.1 There is an area in the north of the development site where a large proportion of the site drains to, where the ground is saturated and frequently has standing water and it is my opinion from review of the ground investigation information and surface water runoff catchment data the reason that ponding occurs, and the ground is saturated here is primarily due to surface water runoff from the development site and the land to the south, not from groundwater. Surface water and groundwater flooding are often confused as both are mainly an issue when flooding occurs at the surface.

8.2 A surface water management condition was proposed by the Lead Local Flood Authority to address the potential need for mitigation measures. Suitable surface water interception measures can and will be detailed as required in the proposed planning condition.

8.3 There is sufficient assessment of the flood risk posed by groundwater within the many documents supporting this application to ascertain that the over-winter groundwater monitoring is not necessary, as the groundwater flood risk can be mitigated for by providing the necessary protection to the basin area and the lower area of site adjacent to the proposed foul water pumping station, cellular storage and existing septic tanks.

8.4 The proposed measures to mitigate the potential for shallow groundwater to the north of site, the interception the surface water runoff entering site from the southern boundary and the management of the surface water runoff generated by the site itself will reduce the existing flood risk to the north of the site, including reducing the risk to the adjacent dwellings.

8.5 The proposal to use a retention basin follows good practice and industry guidance and has appropriate design features. The health and safety concerns of the Rule 6 party are acknowledged, again, a suitable surface water management condition was proposed by the Lead Local Flood Authority.

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Documents appended to this report include: -

Appendix A - Flood Risk Assessment and Drainage Management Strategy (Hydrock, 2019)
Appendix B - Flood Risk Assessment (RSK, 2021)
Appendix C - Drainage and Levels Strategy (REFA, 2022)
Appendix D - Preliminary appraisal (Desk Study) (Sirius, 2019)
Appendix E - Geo-Environmental Report (REFA, 2022)

I confirm this is a clear and accurate statement based on my involvement in this project.

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Director
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