Oxford Technology Park, Langford Lane, Kidlington, Oxfordshire.

Flood Risk Assessment And Drainage Strategy

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1 Introduction

This Flood Risk Assessment has been prepared on behalf of Hill Street Holdings, in support the planning application for a new office and industrial development off Langford Lane, Kidlington, Oxfordshire.

The approximate National Grid reference to the site is 447546, 214823, with access gained to it off the Langford Lane to the north of the site.

The site is currently undeveloped greenbelt land with an approximate area of 6.5 hectares. A site location plan is included within appendix A.

Adjoining premises to the site can be indentified as follows:

- To the North of the site is the Langford Lane.
- To the East the site is bounded by Oxford Motor Park.
- To the South is open farmland.
- To the West of the site is the Campfield Detention Centre and Evenlode Crescent.

This assessment has been prepared following the guidance set out in Planning Policy Statement Note no. 25 (PPS25) / National Planning Policy Framework (NPPF).

Further guidance has been obtained from:

- EA/DEFRA R&D document W5-74/A/TR/1 “Preliminary rainfall runoff for new developments” Revision D, including figures 2.1 & 2.2.
- “Interim National Procedures” point 3, 10.2 & 10.3
- The Suds Manual (ciria c697)
- “interim Code of Practice for Sustainable Drainage Systems 2004” (ICOP SUDS)

2 Existing Site

2.1 Site Location and Receiving Watercourse / River

The existing site is currently greenbelt land and predominantly soft landscaped / grassed. There is a small area of hardstanding where the former Rugby Club pavilion has been removed, the site has not been used for 10 years. There is no known positive drainage within the site demise.

The nearest natural watercourse is the Rowel Brook with is located approximately 650 metres south of the site.

2.1.1 Topography

The topography of the existing site is shown on Ordinance Survey maps to have a nominal slope west to east of approximately 1 in 80. The existing levels over the site appear to vary between 66.0m to 70.0m AOD with the level at Langford Road the proposed new site junction position at approximately 71.300 AOD.

2.1.2 Description of Catchment

Initial investigation of the Environment Agency floodplain maps appears to indicate that the existing/proposed site area is not within a recognised floodplain area and as such is categorised as Flood Zone 1. A copy of the Environment Agency Flood map is included within Appendix A.

The Environment Agency website has also indicated that the site does not lie within a designated groundwater source protection zone.

Record searches have confirmed that the site is situated over a Secondary Aquifer of high to intermediate vulnerability, and although is not a large abstraction source it is likely to be a contributor to local supplies and base flow to local rivers. A copy of the record maps indicating the above can be found within appendix C.

2.2 Geology

An Engineering Appraisal was carried out in November 2013 by Haydn Evans Consulting) in which some limited geotechnical investigation was carried out to inform future development proposals.

This work included exploratory trial pit taken down to 2.3m below existing ground level and some preliminary soakaway testing to determine infiltration rates. A copy of all the test results are included within appendix D of this report and are summarised below.

Geology (Band Thickness)

0 – 250mm	Topsoil
100 – 300mm	Stiff mid brown to dark brown CLAY
250 – 1300mm	Fractured ROCK with interstitial stiff mid brown CLAY, with some sand in places.
-	ROCK strata then encountered to depth

Soakaway Testing and Infiltration Rates

Soakaway testing was carried out across the site with 6 tests carried out in total. Testing was carried out at varying depths that ranged from 530mm to 1990mm into both the clay and rock strata.

In summary the test results varied from between 1.24×10^{-4} m/s to 5.5×10^{-6} m/s and are representative at the strata they were performed in. Whilst the infiltration values are low, the rates should still allow for a soakaway drainage scheme to be considered to be appropriate for this development.

Further soakaway testing will need to be carried out at the appropriate detailed design stage that is fully compliant with BRE Digest 365 to more site / development specific location that can be used to design future proposed soakaway more accurately.

3 Proposed Site

3.1 Description of development

The development proposals are to release of 6.5 hectares (16 acres) of greenbelt land at Longford Lane, Kidlington, to create approximately 23,200 sq.m (250,000 sq.f) of B1(b) research and development space at Oxford Technology Park.

The development proposals comprise of two new office unit fronting Langford Lane with associated car paring to their rear. Six new warehouse units are also proposed along the eastern and western boundaries all with service yards and separate car parking facilities. A new central road running north / south down the centre of the development will provide access to the various plots.

Allowances will also been made for a new soft landscaping scheme throughout the development.

As the site is currently undeveloped and greenfield rainwater is allowed to infiltrate directly into the ground. This provides some indication that infiltration should be considered as a possible means of dealing with runoff from the new impermeable areas of the development.

The proposed site levels will be set such that they try to (where possible) follow the contours of the existing site so as to minimise the requirement for any retaining walls and also adhere to highway design standards.

Proposed development levels will also be set such that they try to minimise any surface water flooding from the new development drainage network and ensure that should any flooding occur it is controlled and kept within the new development demise and not effect neighbouring properties or highway land.

Proposed development levels will also need to respect any future earthworks operations in relation to the development to try and balance cut and fill quantities thus re-using as much of the on site material as possible minimising cart off.

Development levels and the proposed foundation solution will need to be mindful of the relatively shallow rock strata that is identified within the site investigation work.

4 Drainage Strategy

4.1 Existing Drainage

The site is currently not positively drained and as such rainfall permeates naturally into the ground over the course of any rainfall event. During recent times there have been no reported incidences of any surface water flooding at the site of the proposed development.

4.2 Foul Water Strategy

It is proposed that the foul water flow from the development is discharged to the expected existing public sewers 150m east of the development site along Langford Lane. Given the existing topography of the site it will be necessary to pump foul flows via a new rising main located along the verge of Langford Lane to the existing public sewer. Refer to drawing 12076 / 104 within appendix A.

4.3 Proposed Surface Water Drainage Strategy and SUDS Measures

4.3.1 Surface Water Strategy

From review of the Geotechnical investigation information in section 2.2 it is evident that the use of infiltration drainage techniques to deal with surface water discharge will be appropriate for this site.

It is therefore proposed that soakaway in the form of cellular infiltration tanks are incorporated into the drainage design to provide both attenuation storage whilst at the same time being allowed to freely infiltrate flows back into the ground. The rate of surface discharge will be controlled by the natural infiltration rate of the strata below and not an artificial control such as a hydrobrake for example.

The drainage strategy for the development is described below:

<u>Office Building Unit 1 and Unit 2</u>

It is proposed that the external car parking area is constructed using a permeable paving system that incorporates an appropriate block paving system with suitable free draining subbase material that will enable surface water run-off to be attenuated.

This design will help attenuate peak design flows both from the car park surface and the roof water drainage from the building by utilising the volume available the permeable stone (type 1 material with no fires) within the structural layers of the construction.

It is proposed that the base of this construction is not tanked and flows are allowed to discharge back into the ground.

Drainage from the building roof will be distributed into the permeable stone media by the incorporation of a perforated pipe distribution system and a “fin-drain”.

The above method of surface water interception / collection will also avoid the need to provide formal by-pass oil interceptor units to the car parking areas as the stone media beneath the permeable block paving will naturally capture any hydro carbon contaminants.

Warehouse Units 3, 4, 5, 6, 7 and 8

The proposed new units are arranged such that their car parking areas are located to the fronting the new central access road.

It is proposed that these new car parking area are formed impermeable block paving construction similar to Unit 1 and function in the same way. The permeable stone media beneath the parking area will also accept flow from the road gullies that serve the new central access road and part of the new building roofs. Flows will again distribute into the permeable stone via the use of perforated collector pipe system.

To the rear of the building it is likely that the service yards will be formed in a more appropriate concrete slab construction. Drainage in this instance from the yard area and building roof is proposed to discharge into cellular infiltration tank located such that it targets the most efficient permeable strata to maximise infiltration back into the ground.

It is noted that the geotechnical investigation confirmed a relatively shallow strata of rock underlying the site.

The drainage strategy for all of the proposed development will therefore endeavour to design a drainage system that where possible avoid have excessive lengths of deep drains that will require significant excavation into the rock strata. The incorporation linear drainage channel and kerb drainage systems into the design will aid this.

Drawing 12076 / 101 – Proposed drainage strategy contained within appendix A illustrates the above proposals.

4.3.2 Allowable Surface Flooding

Additional storage of peak storm water can be facilitated by allowing car-parking areas to flood at the extreme 1 in 100 year + 30 % year event up to 100mm, provided this will not put the buildings, or neighbouring properties at risk of flooding. The proposed site levels will be set such that any minimal flooding that does occur should be routed to central car parking areas and away from buildings and third party land.

4.3.3 Filtration / Cleaning

There will be a natural filtering/cleaning out of any hydrocarbon pollution from the effect of surface water passing through the stone media underneath and permeable car parking surfacing. The use of a petrol interceptor is not proposed in this instance.

4.3.4 Maintenance

The complete drainage system will have a detailed maintenance regime in place prior to occupation. This regime will involve an inspection after 3 and 6 months, and any maintenance required will be carried out. A further inspection will be carried out after 12 months, after which the maintenance schedule will be reviewed and adjusted to suit the circumstances and maintenance requirements of the development. In any case following severe storm events, the system will be inspected to ensure that all elements are performing satisfactory.

4.3.5 Other SUDS Measures Considered

We have precluded the use of surface water attenuation ponds with the drainage strategy as the development density and space constraints would not make this feasible.

4.4 Windes Network Modelling

Windes / Microdrainage modelling software has been used to analyse the proposed development drainage proposals.

Design files are included within appendix B.

The storm return periods that have been simulated are:
1 in 30 year
1 in 100 year + 30% for climate change

The design assumes that the roof water systems for the buildings are of conventional gravity downpipes at this stage.

4.4.1 Drainage Design Summary

Taking onboard some of the techniques discussed in the previous sections we therefore propose to incorporate the following features within our Windes drainage design model:

- Introduce an infiltration soakaways that incorporates free draining material and cellular block to achieve attenuation volumes.
- Permeable Paving blocks are proposed new vehicular parking area, along the frontage, allowing total infiltration into the ground.
- Allowing the external car parking and service yard areas to flood in the more extreme 1 in 100 year plus climate change storm events. (Underground storage is to be designed such that no flooding occurs at the 1 in 30 year event).
- (Incorporate an oil interceptor to the rear service yard areas)

4.4.2 Discharge Rates

Discharge or re-charge rates back into the existing ground will largely be governed by infiltration rates of the natural underlying strata.

The drainage calculations contained within appendix B of this report show that for the 30 year and 100 year plus climate change storm return period the infiltration rate into the ground do not exceed the existing greenfield run-off values.

The volume provided by porous block paving construction and infiltration tank has been accurately modelled into the simulations so that we have accounted for the attenuation of peak flows from these areas and taken account of available storage volumes.

Design files are included within appendix B with the proposed drainage network and drainage area illustrated on drawing 12076 / 102 within appendix A.

4.4.3 Design Analysis

We have carried out a full suite of storm simulations for different return periods and durations and these are all appended to this report, and also show the volumes of run-off for each period and duration.

Duration tested ranged between:

15 minutes through to 10080 minutes for both the winter and summer profiles.

The simulation results show that the design is compliant with the criteria set out in the drainage design summary in section 4.4. i.e.

- No flooding is observed at the site for the 1 in 30 year return period.

The level of flooding indicated for the 1 in 100 plus climate change event by our preliminary calculations is illustrated on our flood routing plan 12070 / 103 in appendix A.

Porous Car Parking Area

The porous car parking layout has been laid out such that the access road / aisle / Bays to the car park area is formed in porous block.

Stone / Cellular Infiltration Soakaway to Service Yard and Building Roof

The infiltration trench construction detail can been seen within appendix A on drawing 12076 / 101.

It essentially comprises of a series of pipes entering the cellular storage tank with the tank being bed on a blanket of free drainage material 100mm deep. The whole unit is then wrapped within a permeable geotextile membrane that allows collected surface water to infiltrate into the surrounding ground.

The depth of the unit is such that its sides and base will be located within the permeable strata, the depths of which have been established within the recent site investigation work.

From the simulation results within appendix B it can be seen that for the 1 in 30 year storm return period there is no flooding observed over the infiltration units or the porous car parking areas.

Drawing 12076 / 103 the Flood Routing Plan shows that this volume of water can be easily accommodate such that flow will be directed towards the car park and service yard areas and contained below the height of the kerbs.

5 Flood Risk Assessment

5.1 Existing Information on Flood Risk

5.1.1 Tidal/Coastal

Tidal or coastal flooding is not considered a risk as the nearest coast is approximately 100 kilometres away from the site.

5.1.2 Groundwater

Groundwater flooding is not known to be an issue on this site.

5.1.3 Surface Water

There is no formal surface water drainage to the existing site and as such rainfall permeates into the ground via natural means and rates.

Infiltration drainage has proved to be feasible as a means for dealing with proposed surface water flows. It is proposed that surface water from this new development be restricted to the natural infiltration values of the underlying strata.

A limited site investigation has been carried out over the extent of the site that has confirmed the permeability of the ground, and suggest soakaway drainage will be suitable for use at the development site.

5.1.4 Rivers / Watercourses

The Environment Agency publishes floodplain maps on the internet (http://www.environment-agency.gov.uk). These maps show the possible extent of fluvial flooding for the 1 in 100-year flood (that which would have a 1% probability of being exceeded each year) or the possible extent of tidal flooding to a 1 in 200 year event. A plan showing the extent of the flooding along the nearest marked Environment Agency marked watercourse is presented in Appendix C.

This plan shows that the development under consideration is outside the area of any recognised floodplain.

6 Summary

Baynham Meikle Partnership has prepared this Flood Risk Assessment in accordance with the guidelines set out in the National Planning Policy Framework (NPPF) / Planning Policy Statement Note no.25 (PPS25), to support the Planning Application.

The Flood Risk Assessment may be summarised as follows:

- The Flood Maps have shown that the site is not identified to be at risk from fluvial flooding and does not form part of the functional floodplain.
- The proposed redevelopment will be designed such that it will not generate any extra flow and / or exacerbate any flooding that may already occur within the vicinity of the site.
- The surface water run-off from the development site will be dealt with via infiltration drainage. This will be achieved through flow attenuation and the use of SUDS techniques in the new design. The techniques to be utilised are sub-surface storage in the way of permeable paving and infiltration soakaways.
- External areas of car parking are to be allowed to temporarily flood by no more than 100mm in extreme storm events. Finished ground levels have been carefully considered and flood routing will be applied to ensure protection proposed buildings and of adjacent landowners, in the event of extreme conditions.
- The water quality will also be improved via of the use of SUDS drainage techniques such as permeable paving and surface water swales.

It can therefore be said that the proposed redevelopment drainage scheme will not increase the potential of any flood occurring within the vicinity of the site. This is mainly due to the peak runoff flows from the site being kept the same as the current existing flows from the site and adoption of recommended SUDS design techniques in line with the EA guidance.