

Civil and Structural Engineering Group

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Flood Risk Assessment
Woodcock Estate, Farington

BDP.

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1.0 Introduction

1.1 Appointment & Brief

BDP was appointed to prepare a Masterplan for the proposed establishment of a Lancashire County Cricket Club Academy and ancillary development at the Woodcock Estate site in Farington.

The high-level brief for the development comprises:

Proposed Cricket Facility comprising 2No. cricket ovals and associated pavilion building and spectator seating, covered cricket nets, access, parking, landscaping and associated works (including temporary event overlay facilities on ticketed match days).

The site lies to the west of the 'Lancashire Central' strategic site, which will be developed as a regionally significant employment hub.

1.2 Objective of the Strategy

As part of the scope of work to inform the development of the masterplan for the site, a Sustainable Drainage Strategy has been produced to advise on a potential solution for foul and surface water drainage. This is covered in a separate report which should be referred to in conjunction with this document (P3000932-LCCC-BDP-XX-XX-RP-C-1001).

The objective of this report is to undertake a Flood Risk Assessment in accordance with the National Planning Policy Framework (NPPF) in support of a Planning Application for the development.

The detail and complexity of a Flood Risk Assessment should reflect the level of risk to the Site. The NPPF is the official document that regulates the assessment of flood risks and their appropriate mitigations to the planning process.

This report assesses flood risk to the site and any impact on flood risk to other land because of the development proposals.

The report is intended to provide information and present proposals relating to the following:

- The existing topography, geology and hydrogeology across the development;
- Any existing surface and foul drainage systems within and in the vicinity of the site;
- Identify existing overland flow paths;
- Assess the risk of flooding due to fluvial, tidal, groundwater, surface water, flows from surcharged sewers and risks for other possible sources;
- Develop mitigation measures for flood risk if required;
- Proposed foul and surface water discharge points;
- Proposed foul and surface water flow rates and storage volumes;
- Potential constraints imposed by the regulatory bodies including the Environment Agency, Internal Drainage Board, Local Water Authority and Lead Local Flood Authority.

1.3 Limitations

This report has been prepared to inform the development of the masterplan for the site and in support of a planning application. It is based on information available at the time of writing and further site survey work, investigations and consultations will be required to verify the information contained herein.

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BDP has endeavoured to assess all information provided to them during this appraisal. The report summarises from several external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

The Flood Risk Assessment addresses the flood risk posed to and from the proposed development, the extent of which is shown on the Masterplan contained within Appendix B. This report has been undertaken with the assumption that the site will be developed in accordance with these proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

2.0 Existing Conditions

2.1 Site Characterisation/ Land Use

The Woodcock Estate currently comprises a network of agricultural grassland and fields, divided by hedgerows and avenues of trees, with around 10 clusters of farmhouses and associated buildings.

A number of existing public rights of way cross the site, many of which run parallel to the existing hedgerows. In addition, the site contains a number of existing land drainage ditches/ ordinary watercourses which generally flow in a northerly direction towards the River Lostock where they are culverted below the A582 Farington Road which forms the northern boundary of the site.

An area of land within the site and adjacent to the A582 is designated as Flood Zone 2 on the Environment Agency Flood Map.

The A582 Farington Road is subject to a package of improvement works which is being undertaken by the Local Authority. As part of these proposals, a surface water attenuation pond is to be constructed just outside the northern boundary and within the area of Flood Zone 2 noted above.

The A5083 Stanfield Lane forms the western boundary of the site which junctions onto the A582 via a roundabout at the north western corner.

The general location of the site is shown in Appendix A and it has an approximate post code of PR5 5XS.

2.2 Topography

Topographical information in the form of detailed survey was obtained for the site, a copy of which is provided in Appendix C. This suggests that the site falls generally from the southeast to the northwest towards the A582 Farington Road and the River Lostock. Levels in the south are in the region of 37.0m AOD with levels along the A582 at around 32.0m AOD.

2.3 Geology

The 1:50,000 scale bedrock geology is described as: Singleton Mudstone Member – Mudstone. Sedimentary bedrock formed approximately 242 to 252 million years ago in the Triassic period.

The 1:50,000 scale superficial deposits description is Till, Devensian – Diamicton Superficial Deposits formed up to 2 million years ago in the Quaternary Period.

2.4 Groundwater Protection Zones

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which the Environment Agency occasionally applies, to a groundwater source.

There are no active groundwater abstractions within 1km of the site and the site is not within a groundwater source protection zone.

2.5 Existing Drainage

Sewer Records were obtained from United Utilities for the site and surrounding area.

There are no public sewers identified within the development site or in the immediate vicinity. The only public sewers within a reasonable distance are located to the north beyond the A582 and River Lostock. This generally comprises a network of combined sewers of varying size ranging from 150mm to 450mm diameter. Some of this network is shown to be pumped from Sherdley Road up to Watkin Lane where it flows in a northerly direction, presumably to the Walton-le-Dale WWTW.

The records also indicate a number of Sewer Overflows in the area which discharge into the River Lostock. This would suggest potential capacity issues with the public sewer network in the area.

In addition to the public sewers surrounding the site, an existing 600mm diameter Highways England surface water drain crosses the development in a north westerly direction and discharges to the River Lostock on the northern side of Farington Road. A drainage survey of this feature was undertaken to establish the precise alignment and level, a copy of which can be found in Appendix D. It is intended that this feature will be retained along its current alignment with existing manholes adjusted as necessary to suit new levels and new manholes provided at suitable locations to facilitate potential future access.

Initial discussions have been held with Highways England who confirmed they were comfortable with this solution providing that at least 1m of cover is provided to the pipe and that a further survey is undertaken following completion of construction works to confirm no damage has been sustained.

2.6 Existing Watercourses

As noted above, the River Lostock is located to the north of the development site on the northern side of the A582 Farington Road. This is served by a network of ditches and ordinary watercourses, some of which are located within the development site. Information obtained in relation to the A582 highway improvement works indicates that these watercourses are culverted below Farington Road ranging from 225mm diameter to 700mm diameter. Some of these culverts will be upgraded as part of the proposed highway improvements to provide additional capacity.

A Flood Screening report was obtained from Envirocheck which details the river and watercourse network in the area; an extract from this information is provided below with the full report provided in Appendix E. This was used in conjunction with the topographic survey to conduct a site walkover and survey to try and establish the connectivity of these features through the site.

Where necessary, some of the ditches within the site boundary will be abandoned as they will become redundant as a result of the development proposals. Where any connectivity exists through the site, these ditches will be culverted as necessary subject to agreement with the LLFA and formal land drainage consent.

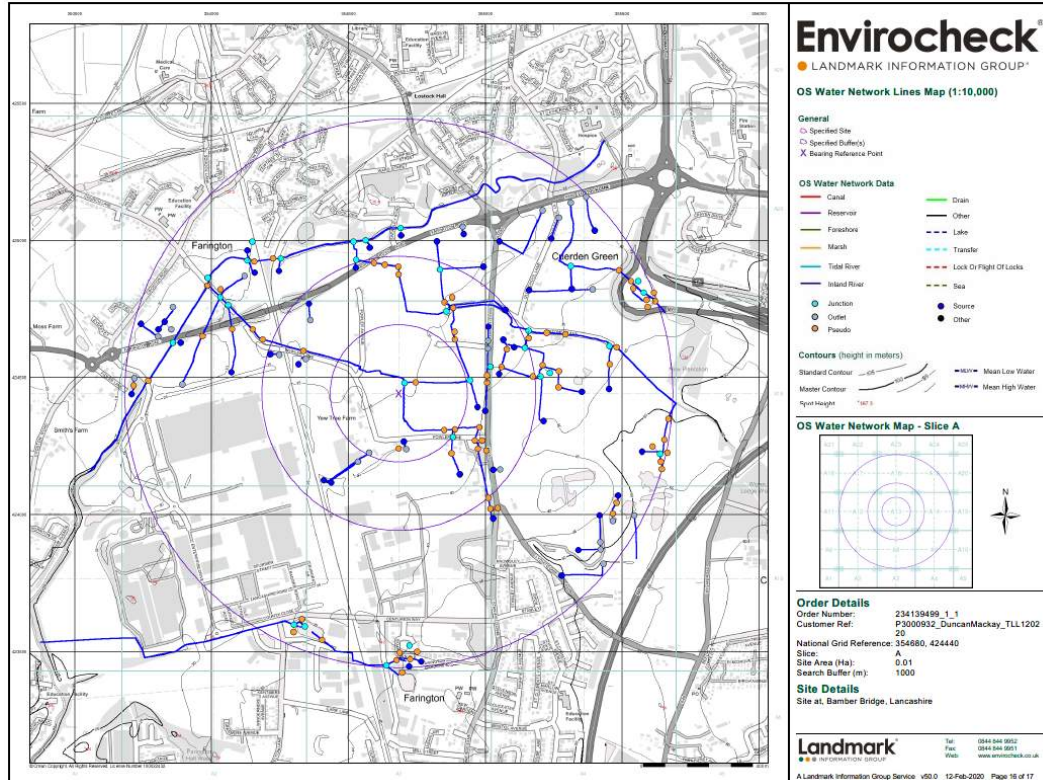


Figure 2.1 OS Water Network Map

2.7 Historical Flood Records

As LLFA, Lancashire County Council is required, under the Flood and Water Management Act, to maintain and update a historic flood incidents database as and when any flooding incidents occur. The LLFA has a statutory responsibility to investigate and report upon any 'significant' flood events.

The Central Lancashire SFRA contains details of historic flood incidents. A review of this information did not highlight any records of flooding to the proposed development site.

An internet-based search also did not highlight any previous flooding issues at the site.

2.8 Flood Mapping

EA/ NRW FLOOD MAP DATA

The Environment Agency Flood Zone Map indicates that the development is primarily located in Flood Zone 1 (low risk).

This is land designated as having a less than 0.1% annual probability of flooding from rivers or the sea in any year (less than a 1 in 1000 annual probability of flooding).

An area of Flood Zone 2 is shown to the north mainly outside of the site boundary along Farington Road. A small area encroaches on the north west corner of the development in the vicinity of the attenuation pond. The flood zone designation is associated with the River Lostock and based on the topography of the site is not considered to pose a risk.

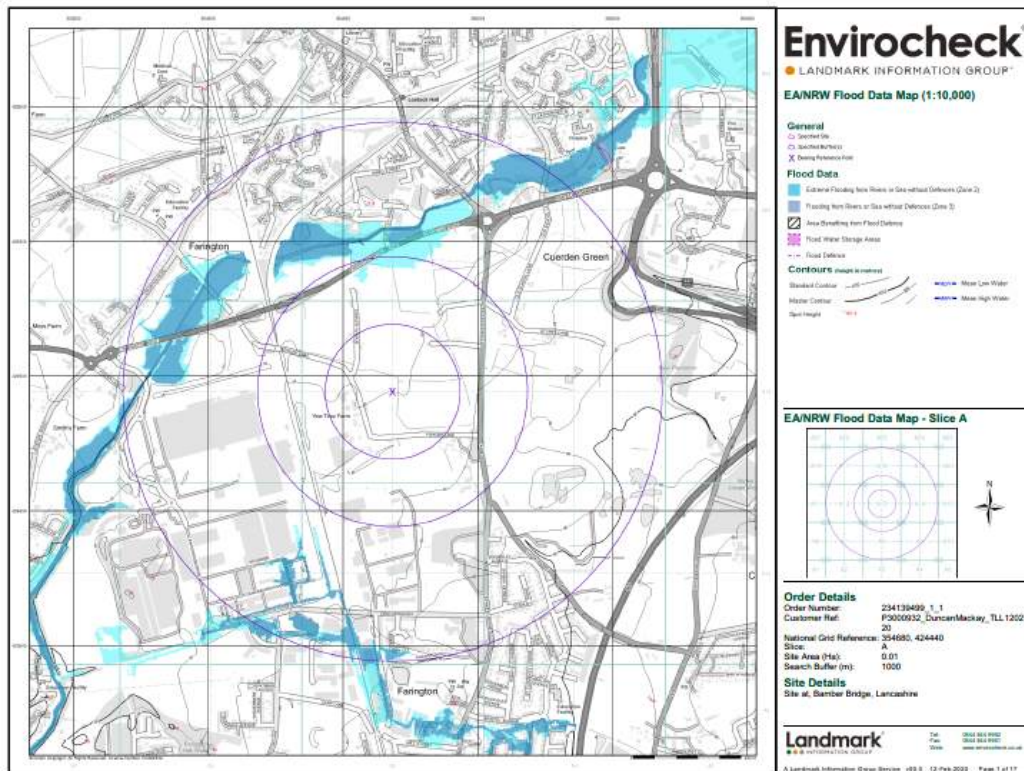


Figure 2.2 Flood Data Map

BRITISH GEOLOGICAL SURVEY

The British Geological Survey Flood Data indicates that the site has no inland geological indicators of flooding but there is potential for ground water flooding to occur at the surface. This would suggest that shallow groundwater may be present across the site.

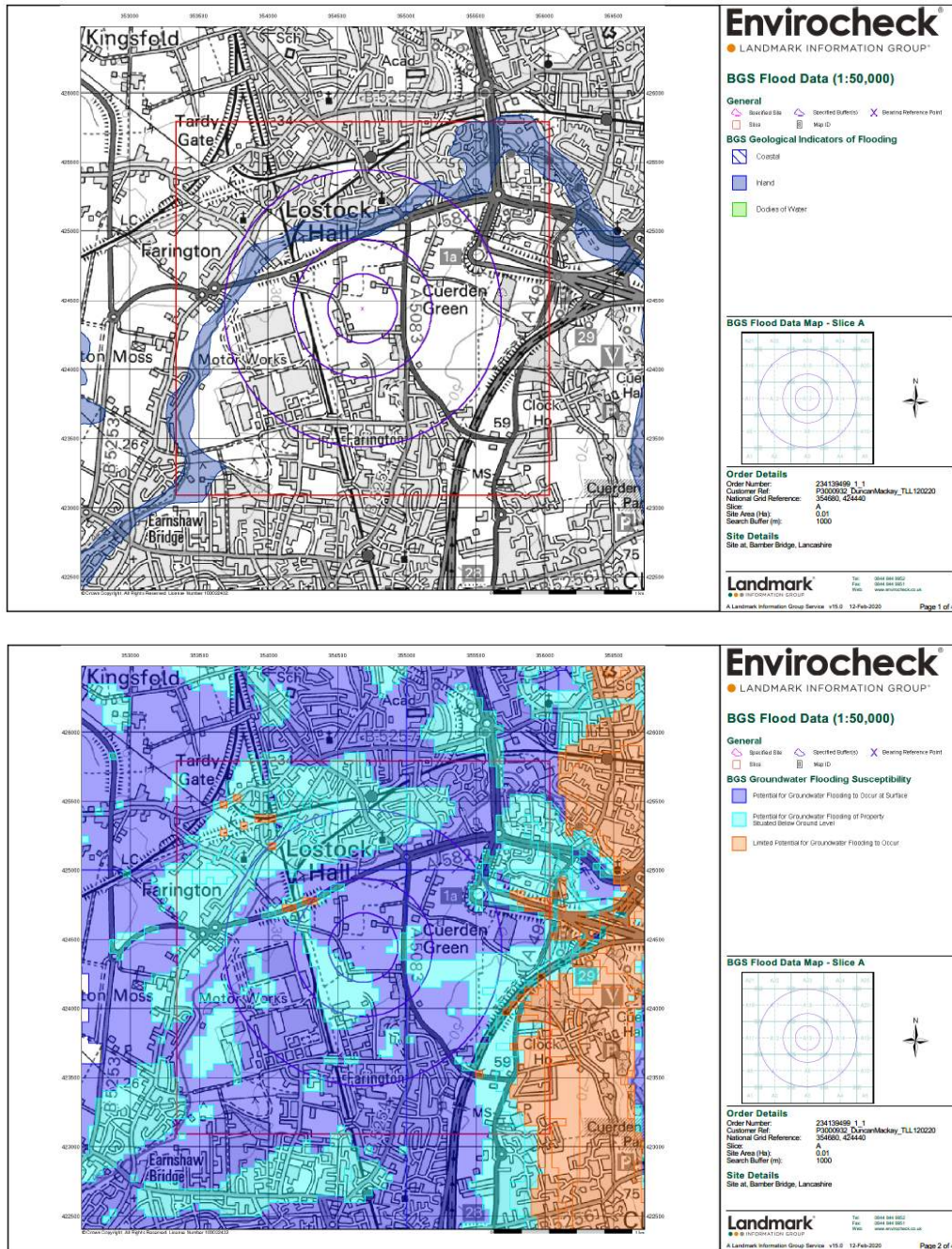


Figure 2.3 BGS Flood Data Maps

EA/NRW SURFACE WATER FLOOD MAPPING

The surface water flood mapping data does not indicate any significant areas that are potentially susceptible to pluvial flooding in the 30, 75, 100, 200 and 1000-year return periods. Some isolated flooding is shown in the north west corner however this represents a low point in the existing topography which will be the site of the proposed attenuation basin.

The Environment Agency's surface water flood maps also indicate that the majority of the site is at LOW risk from surface water flooding with isolated areas of medium and high risk along the line of the existing ditch network and at low points within the topography as expect.

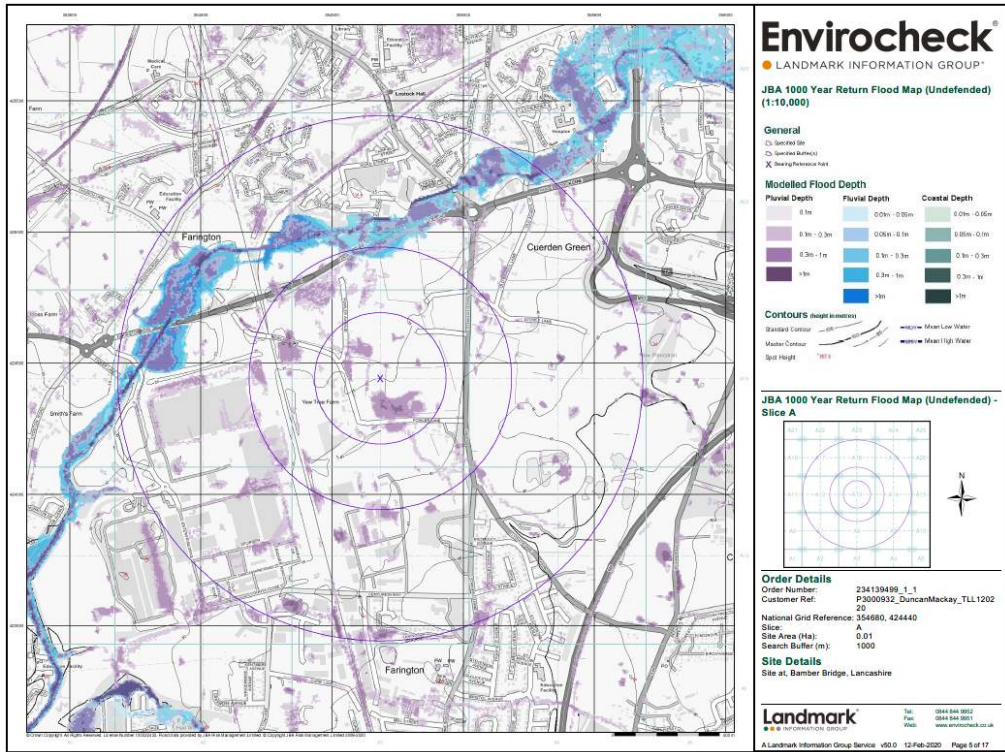


Figure 2.4 EA/NRW Surface Water 1000 Year Return Period

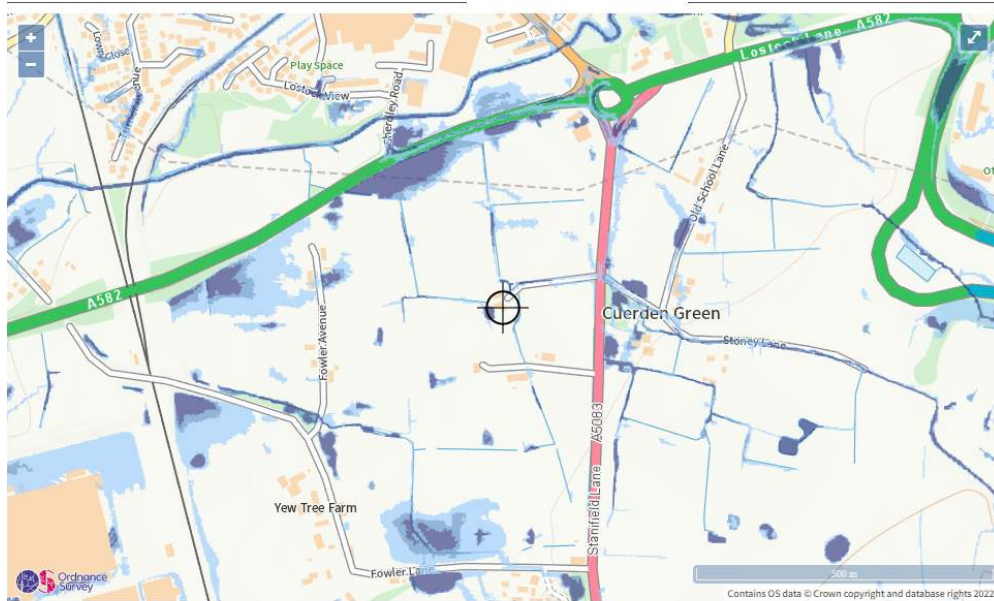


Figure 2.5 EA.GOV Surface Water Flood Map

3.0 Development Proposals

3.1 Nature of the Development

The proposed development will bring together elite and community cricket on a site at Farington in central Lancashire.

The proposals include two full-sized cricket pitches with natural sloping terraces and training facilities, including nets, a new pavilion including a gym, changing rooms, hospitality space, as well as cycle and car parking.

The designs for the site have been sensitively and carefully designed to respect the open and green setting and protect the amenity of neighbouring residents. New tree planting, landscaping and green spaces would provide an attractive setting and provide screening for local properties.

The approximate gross development area is around 13.7 ha.

Appendix B contains the proposed development masterplan.

3.2 Proposed Development Levels

A full levels strategy has been undertaken for the site to inform the proposed masterplan as creating the proposed sports pitches and spectator mounds will require some fairly significant earthworks to be undertaken.

The general fall of the site in a north westerly direction will be maintained and a cut-fill balance is expected to be achievable so there will therefore be no significant volumes of material requiring export from the site. However, there will be some fairly substantial alterations to site levels in order to achieve this and ensure that the sports pitches, mounds, pedestrian and vehicular areas can be constructed with compliant gradients.

Notwithstanding the above, whilst existing overland flow paths will be affected by these level changes, ultimately the proposed new levels will still direct any exceedance flows in a north westerly direction towards the River Lostock.

The only building currently proposed on the site is the Pavilion which will have two floors, Ground and Lower Ground. The finished floor levels for both will be set 150mm above the proposed external ground level with levels of hardstanding externally falling away.

A copy of the proposed finished levels can be found in Appendix I.

3.3 Proposed Foul & Surface Water Management

A separate drainage strategy report has been produced by BDP (Ref: P3000932-LCCC-BDP-XX-XX-RP-C-1001) to accompany this Flood Risk Assessment. Reference should be made to this report for existing and proposed rates of runoff, discharge volumes, attenuation provision, points of connection etc along with the overall strategy for the disposal of foul and surface water from the development.

4.0 Sources of Flood Risk

4.1 Fluvial Flood Risk

Information relating to flood risk at the site has been obtained via an Envirocheck Flood Screening Report details of which can be found in Appendix E.

Examination of the Flood Map shows that the site is located within an area classified as Flood Zone 1 and the risk of flooding from Rivers or the Sea is considered to be 'low'.

As discussed in Section 2.6, the River Lostock is located to the north of the development site on the northern side of the A582 Farington Road. This is served by a network of ditches and ordinary watercourses, some of which are located within the development site.

The site generally drains in a north westerly direction using these ditches towards a culverted watercourse which connects into the River Lostock.

These ditches are under Riparian Ownership and there is no known flood risk to the site from these features.

Taking this into consideration, the sites location in Flood Zone 1 and the topography which all drains in a northerly direction away from the development, it is considered that the risk of fluvial flooding to the proposed development is LOW.

4.2 Pluvial Flood Risk

Pluvial flooding is defined as flooding resulting from rainfall-generated overland flow before runoff enters any watercourse or sewer.

It is usually associated with high intensity rainfall events but can also occur with low intensity rainfall or melting snow where ground is saturated, frozen, developed or otherwise has low permeability resulting in overland flow and ponding in depressions in the topography. Large catchment areas are particularly prone to this type of flooding.

EA/NRW flood mapping data indicates the site is not an area that is potentially susceptible to pluvial flooding. Some isolated areas of risk are identified but this is all along the line of the existing ditch network and/or at low spots within the topography which is to be expected.

Surface water flood maps can be found in Appendix E with existing overland flow paths in Appendix G.

The proposed development will be subject to some significant changes in level in order to create the proposed Cricket pitches and associated spectator mounds. However, the general topography of the site will still drain in a north westerly direction towards The River Lostock and existing overland flow paths will be maintained including any from off site.

The proposed new development will also be served by a new surface water drainage network and attenuation which has been designed to accommodate surface water flows within the site for up to and including the 100 year plus climate change storm event. Any exceedance flows will generally be directed towards to attenuation pond in the northwest corner of the site where it would be able to be stored before eventually draining down via the site's outfall.

The proposed attenuation facility is located within a depression within the proposed topography and therefore has significant spare capacity above the design water level. Should there be a situation where this is somehow exceeded, flows would overtop and enter the adjacent ditch/ culvert and be passed forward to the River Lostock.

A copy of the proposed exceedance flow paths can be found in Appendix H.

Taking the above into consideration, the risk of flooding to the site from surface water is considered to be LOW.

4.3 Sewer Flood Risk

There is very little in the way of public sewerage infrastructure in the vicinity of the site and therefore the risk of flooding to the site from this infrastructure is considered to be very low.

An existing highway agency drain crosses the site in a north westerly direction which connects into the River Lostock. It is intended that this will be retained along its current alignment and any existing chambers adjusted as necessary to suit the development proposals. There are no known capacity issues associated with this feature and a drainage CCTV survey undertaken confirms that it is in very good condition. The risk of flooding to the site from this feature is therefore considered to be low.

The proposed site surface water drainage system has been designed to maintain the surface water flows below ground or within surface attenuation features for up to and including the 1 in 100 year return period as a minimum. Some minor flooding occurs within the drainage system during the extreme 100 year + 40% return period however this is safely stored on the surface until it can re-enter the drainage system once the storm has subsided.

The foul water drainage system will be designed in accordance with the relevant British Standards and Building Regulations and will provide sufficient capacity for the development.

Taking all of the above into consideration, it is considered that the risk of flooding to the site from either existing or proposed sewerage infrastructure is LOW.

4.4 Groundwater Flood Risk

In general terms groundwater flooding can occur from three main sources, raised water tables, seepage and percolation, and groundwater recovery or rebound.

If groundwater levels are naturally close to the surface, then this can present a flood risk during intense rainfall. Having reviewed groundwater flood maps from the British Geological Survey they indicate that the site has no inland geological indicators of flooding and that there is potential for ground water flooding to occur at the surface. This would suggest that shallow groundwater may be present across the site

An intrusive investigation has been undertaken at the site and this indicated that groundwater was present between 1.2m and 2.9m below ground level with it generally being encountered at 2m plus.

As noted earlier in this report, the site will undergo some quite significant level changes to facilitate the proposed development. However, generally depths of cut will be less than 2m with levels being raised where possible to accommodate compliant longfalls/ crossfalls and to facilitate drainage. Levels will be engineered to direct any water away from proposed buildings where it can either enter the proposed drainage system or follow natural flow paths.

The most significant area of cut is around the new sports pitches which will be provided with an extensive network of drainage which will help to deal with any potential shallow groundwater issues.

Taking the above into consideration it is considered that the risk to the site from groundwater flooding is LOW.

4.5 Flooding from Other Sources

Non-natural or artificial sources of flooding can include reservoirs, lakes and canals etc.

No other potential sources of flood risk have been identified in the vicinity of the site.

The SFRA has confirmed that there are no records of any flooding incidents in close proximity which would have impacted on the site.

Taking the above into consideration it is considered the risk of flooding to the site from other sources is LOW.

4.6 Flood Risk Vulnerability Classification

The proposed development is commercial and can be considered as 'Less vulnerable' within the: Flood Risk Vulnerability Classification table in the NPPF. This type of development would be wholly appropriate for Flood Zone 1.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

5.0 Residual Risks & Impacts

5.1 Flood Risk Management Measures

The surface water drainage strategy for the new development site (Ref: 3000932-LCCC-BDP-XX-XX-RP-C-1001) indicates an overall reduction in peak discharge flow rates and volumes from the site.

As a result of this reduction in flow rate and increase in impermeable area attenuation has been proposed in the form of site control measures. The new private drainage system will be designed in accordance with current design guidance and standards and attenuation will be provided both below ground and in surface features for up to the 100 year return period storm event with a 40% allowance for climate change.

The use of SuDS site control measures, with controlled release of surface water to the existing watercourse network will help to minimise the flood risk impact downstream.

Finished site levels have been engineered very carefully to provide positive drainage where required and prevent ponding. The accumulation of standing water will therefore not occur and thus not pose a risk.

Gradients of the hardstanding areas have been designed to fall away from buildings such that any overland flow resulting from extreme events would be channelled away from entrances.

As the site and surrounding areas are located within Flood Zone 1, it is considered that access and egress should not be affected during flooding.

5.2 Offsite Impacts

To ensure that the proposed development will not increase flood risk elsewhere, surface water drainage discharge rates will be restricted to greenfield runoff (Q_{bar}). This restricted discharge in conjunction with surface water attenuation on site will mitigate against any food risk to other land.

By reducing the pre-development peak runoff prior to its discharge to the river network, this will reduce the potential for surface water flooding downstream.

5.3 Residual Risks

The development and its drainage system will be designed to cope with the intense storm events up to and included the 100 year return period rainfall event with an allowance for climate change. If an extreme rainfall event exceeds the design criteria for the drainage network, it is likely that there will be some overland flows which are unable to enter the system. It is therefore important that these potential overland flows are catered for within the proposed planning layout in the event that the capacity of the drainage system is exceeded.

Any overland flows generated by the proposed development must be directed away from the adjacent existing properties surrounding the site and towards the highway network where it can follow natural flow paths. Whilst there are significant changes to site levels to facilitate the development, overland flow paths have been maintained and the site topography still drains in a north westerly direction towards the River Lostock.

As with any drainage system, blockages within the surface water system have potential to cause flooding or disruption. It is intended that an appropriate maintenance regime will be scheduled in due course and an appropriate management company appointed to carry out the works.

6.0 Summary

The proposed development comprises new cricket facilities to serve Lancashire County Cricket Club and the local community. Two new pitches are proposed, one to a standard appropriate to hold First Class County Cricket matches, the second for wider academy and community use, supported by a pavilion, indoor and outdoor training facilities and ancillary accommodation.

The site is located across the Woodcock Estate, Farington on greenfield land which comprises a network of agricultural grassland and fields, with a small number of farmhouses and associated buildings.

The site is primarily in an area identified as having a low probability of flooding on the Environment Agency Flood Map and is located in Flood Zone 1. A very small area of Flood Zone 2 is located to the north west of the site in the vicinity of the attenuation pond. Whilst levels are being adjusted in this area, they are not thought to impact on the flood zone extent.

A separate Drainage Strategy has been prepared by BDP which should be read in conjunction with this report (Ref: P3000932-LCCC-BDP-XX-XX-RP-1001).

NPPF requires that planning applications for development proposals of 1 hectare or greater in Flood Zone 1 should be accompanied by a Flood Risk Assessment.

The Flood Risk Assessment (FRA) has reviewed all sources of flood risk to both the proposed development and to the existing adjacent properties as a result of the development proposals, including fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources.

The development is accessible for emergency access and egress during times of extreme flooding as the flood plain does not extend into the area proposed for development.

As with any drainage system, blockages within the surface water sewer systems constructed to serve the development has the potential to cause flooding or disruption. An appropriate management regime will be put in place with a management company to ensure that this risk is mitigated.

Site levels will be re-engineered to facilitate the development. However, overland flow paths will be maintained and catered for within the development.

Discharge from the site will be restricted to the existing pre-development greenfield run-off rate (Q_{bar}). This has currently been calculated at **81.9 l/s** based on the proposed drained area of the site. By restricting the site discharge in this way and providing surface water attenuation on site, flood risk to the downstream watercourse network will be reduced.

The Flood Risk Assessment is considered to be commensurate with the development proposals and in summary, the development can be considered appropriate for Flood Zone 1 in accordance with the NPPF.