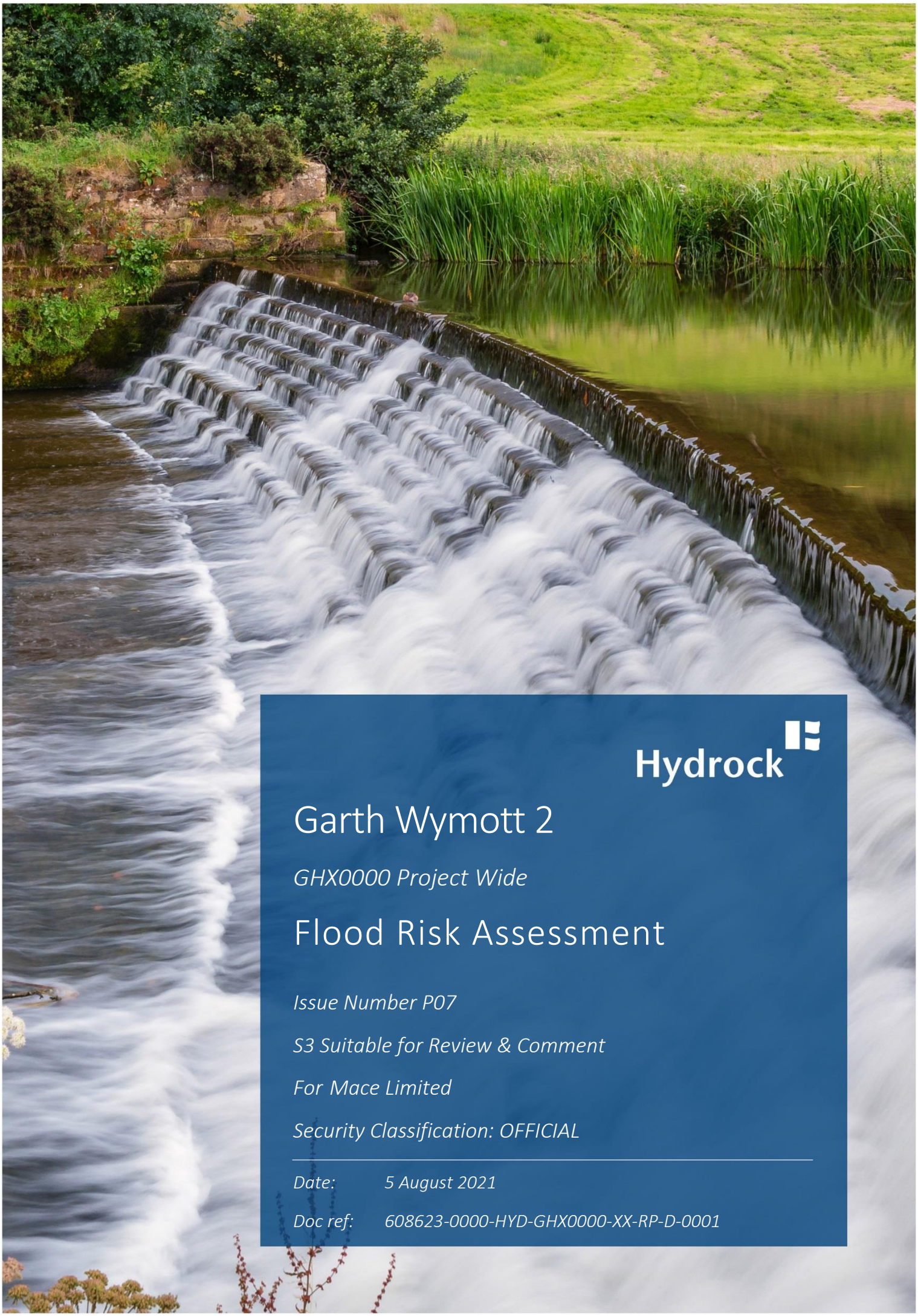

Hydrock

Garth Wymott 2

GHX0000 Project Wide

Flood Risk Assessment

Issue Number P07

S3 Suitable for Review & Comment

For Mace Limited

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Figures

1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited on behalf of Mace Limited in support of a Planning Application to be submitted to Chorley Council for a proposed new prison at land adjacent to Her Majesty's Prison (HMP) Wymott and HMP Garth, on the south-western outskirts of Leyland in Lancashire.

This Flood Risk Assessment report has been prepared to address the requirements of the National Planning Policy Framework (NPPF), through:

- Assessing whether the site is likely to be affected by flooding.
- Assessing whether the proposed development is appropriate in the suggested location.
- Presenting any flood risk mitigation measures necessary to ensure that the proposed development and occupants will be safe, whilst ensuring flood risk is not increased elsewhere.

The report considers the requirements for undertaking a Flood Risk Assessment as detailed in the NPPF.

2. SITE INFORMATION

2.1 Location and Setting

The site lies to the south-west of Leyland, approximately equidistant between Preston to the north-east and Southport to the south-west, with postcode PR26 8NE and grid reference SD 50547 20873 (at the approximate centre of the site).

The site area extends to approximately 43.53ha, and currently comprises: agricultural land, an agricultural building, and a pond within the north-eastern portion of the site; ancillary buildings, access tracks, hard standing areas, and pasture land within the north-western portion of the site, associated with the adjacent HMP Garth and HMP Wymott (separated from the north-eastern portion of the site by Pump House Lane); and, an external grassed sports area and associated ancillary building within the south-eastern portion of the site, located within the existing secure boundary of HMP Wymott.

The site is bounded by an access track to the north, with agricultural land beyond; agricultural land to the north-east; a residential area to the east; Moss Lane to the south-east, with agricultural and pasture land beyond; HMP Wymott to the south; and, HMP Garth to the west.

The approximate location of the site is shown in Figure 1.

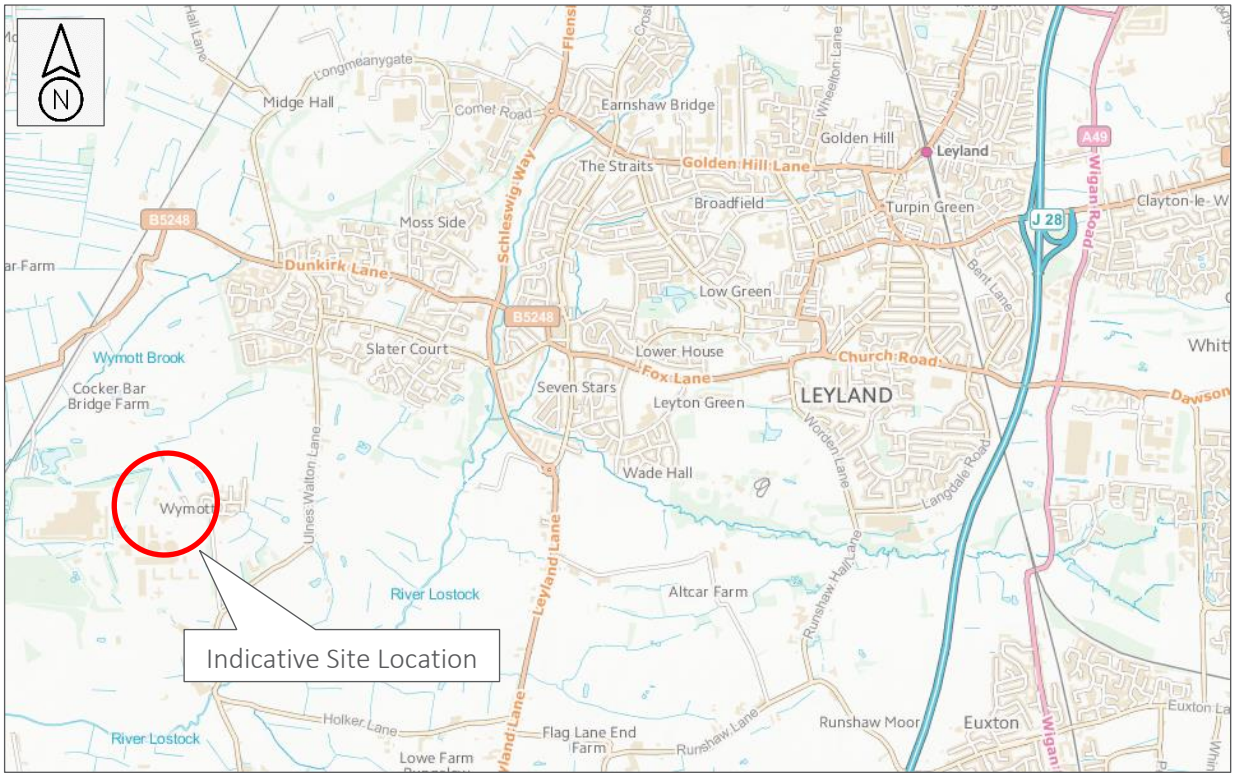

Figure 1: Site Location Plan

2.2 Topography

On a broad scale, Ordnance Survey mapping shows the area surrounding the site to be relatively level, lying between around 10-15m AOD, with a general gentle gradient to the south-west.

A Topographical Survey of the site, included with the Hybrid Planning Application submission, shows ground levels on land to the north of HMP Wymott generally fall in a south-westerly direction across

the site, from around 15.5m AOD in the north-eastern portion of the site, to approximately 10.4m AOD near the north west corner of HMP Wymott walls.

In the land to the south of HMP Wymott, ground levels are shown to increase in a south-westerly direction from a low of around 11m AOD near the south west corner of HMP Wymott, to approximately 14m AOD near the south west boundary of site.

Several artificial localised areas of high ground are present within the site (specifically towards the north-eastern site boundary, the south-eastern corner of the site, and the south-western corner of the site), rising around 3.9m, 0.7m and 3.5m above general surrounding ground levels, respectively.

2.3 Proposed Development

Hybrid planning application seeking: Outline planning permission (with all matters reserved except for access, parking and landscaping) for a new prison (up to 74,531.71sqm GEA) (Class C2A) within a secure perimeter fence following demolition of existing buildings and structures and together with associated engineering works; Outline planning permission for a replacement boiler house (with all matters reserved except for access); and Full planning permission for a replacement bowling green and club house (Class F2(c)).

Proposed scheme drawings are included with the Hybrid Planning Application submission.

3. ASSESSMENT OF FLOOD RISK

3.1 Fluvial & Tidal Flooding

The Environment Agency's (EA's) current Flood Map for Planning (Figure 2) shows the majority of the site to be within Flood Zone 1 (land having a less than 1 in 1,000 annual probability of fluvial and tidal flooding). However, the extreme western portion of the site is shown to be within Flood Zone 3 (land having a 1 in 100 or greater annual probability of fluvial flooding / a 1 in 200 or greater annual probability of tidal flooding).

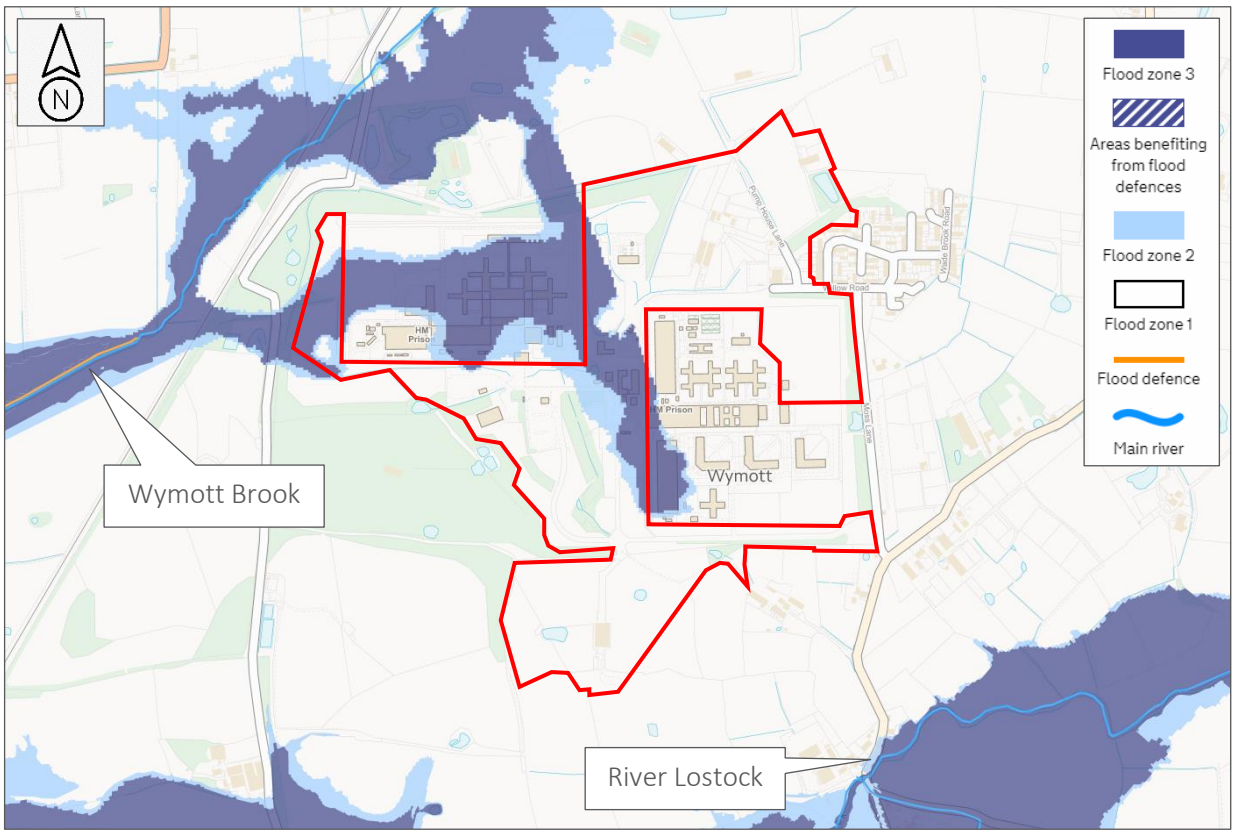

Figure 2: EA Flood Map for Planning - Current

Wymott Brook flows south-westwards approximately 460m to the north-west of the site, and the River Lostock flows south-westwards around 630m to the south-east of the site. These watercourses converge around 1.8km to the south-west of the site, before discharging (in turn) into the River Yarrow, River Asland/Douglas, River Ribble, and eventually the Irish Sea around 13.7km to the north-west of the site.

The Wymott Brook and River Lostock are shown to be tidally influenced to within around 1.5km and 1.2km of the site respectively (based on the 'normal tidal limit' indicated for both watercourses by Ordnance Survey mapping), and therefore the watercourses are considered to pose a potential combined fluvial and tidal flood risk. However, given the distance of the site upstream of the tidal influences on either watercourse, the flood risk posed by the watercourses adjacent to the site is considered to be fluvially dominated, and consequently the risk of tidal flooding in isolation at the site has not been assessed further (i.e. this assessment considers the key flood event as the 1 in 100 year fluvial flood event, in accordance with the requirements of the Flood Risk and Coastal Change National Planning Practice Guidance (NPPG), as opposed to the 1 in 200 year tidal flood event).

The EA has provided modelled flood extents and levels for the site, based on the '2014 Tidal ABD [Areas Benefitting from Defences] Study'. When providing relevant data from the '2014 Tidal ABD Study' the EA commented that *"When putting this data together, we have noticed that there is an area in the published flood zones which does not align to the Fluvial outputs from the Tidal 2014 Study. Therefore, the Flood Zones will be updated on gov.uk"*. Consequently, for the purposes of this assessment, the current Flood Map for Planning (Figure 2) is considered inaccurate and an overrepresentation of potential flood risk at the site, with the updated mapping provided by the EA and included at Figure 3 considered a more accurate illustration of the potential fluvial flood risk posed to the site.

The updated mapping (Figure 3) shows the site to be outside the present-day 1 in 100 year floodplain (i.e. Flood Zone 3), with only the north-western margin of the site shown to be at risk of flooding in the 1 in 1,000 year flood event (i.e. Flood Zone 2), with the flood risk modelling indicating a 1 in 1,000 year flood level of 10.47m AOD within that area.

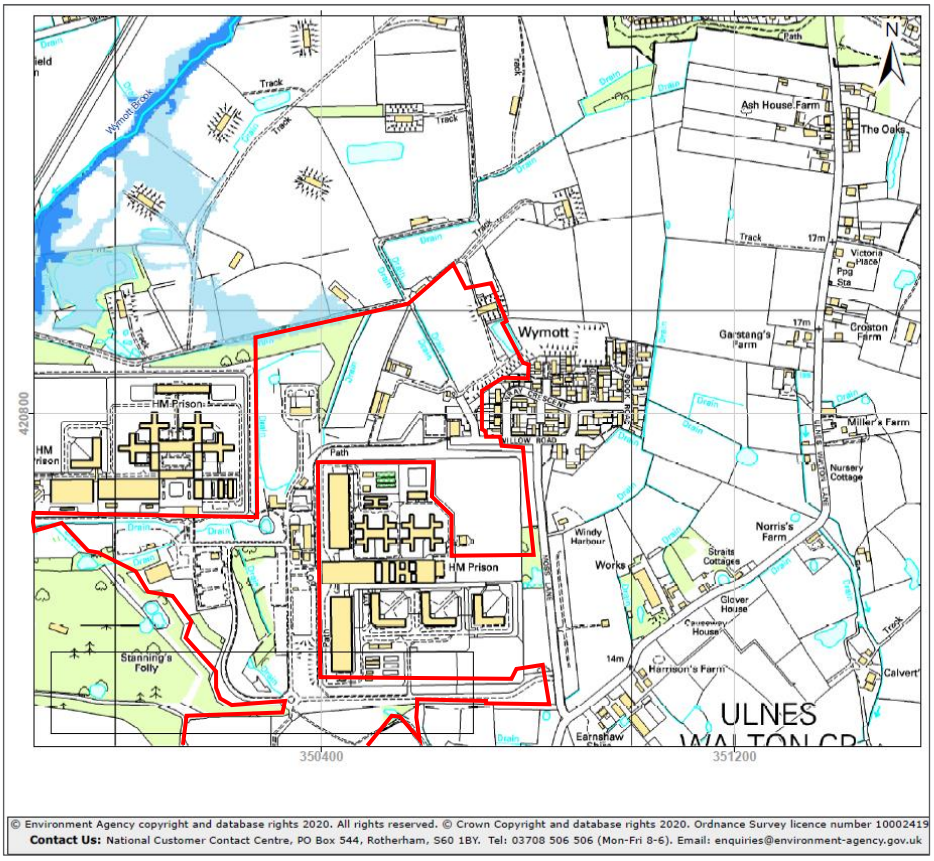

Figure 3: EA Flood Map for Planning - Updated

The Topographical Survey of the site records a lowest ground level within the north-western portion of the site of 10.11m AOD (located on the north-western site boundary), thereby indicating a maximum potential flood depth within that area of the site in the 1 in 1,000 year flood event of 0.36m. It is however noted that ground levels are shown to rise to levels above 10.47m AOD a short distance into the site from the north-western site boundary, and therefore the area of the site indicated to be at risk of flooding in the 1 in 1,000 year flood event is isolated to a small area immediately adjacent to the north-western site boundary, as illustrated in Figure 3.

The '2014 Tidal ABD Study' does not include a simulation of the potential impact of climate change on the 1 in 100 year flood event (under current EA guidance, a 35% climate change allowance would apply in this instance in relation to the 1 in 100 year flood event). However, it is noted that:

a. Given the relatively constrained nature of the 1 in 100 year floodplain shown in Figure 3 (i.e. restricted to land immediately adjacent to Wymott Brook), a 35% increase in flow is considered unlikely to be of a magnitude so as to result in on-site fluvial flooding.

b. A 35% increase in flow in the 1 in 100 year flood event is considered unlikely to exceed the modelled 1 in 1,000 year flood event flow, and therefore the currently modelled 1 in 1,000 year floodplain / flood level can be considered as a 'conservative' representation of the 1 in 100 year + 35% floodplain / flood level.

Based upon the points identified above, the site is concluded to be at low risk of tidal flooding, and the majority of the site also at low risk of fluvial flooding. A small area immediately adjacent to the north-western site boundary is, however, concluded to be at risk of fluvial flooding in the 1 in 1,000 year flood event (which is also considered representative of the likely 1 in 100 year + 35% floodplain).

3.2 Surface Water Flooding

An extensive existing ditch network is currently present immediately adjacent to and within the site, as shown in Figure 4. The ditches are believed to intercept and manage rainfall run-off from within the site and surrounding area, and eventually discharge flows to the Wymott Brook to the west of the site.

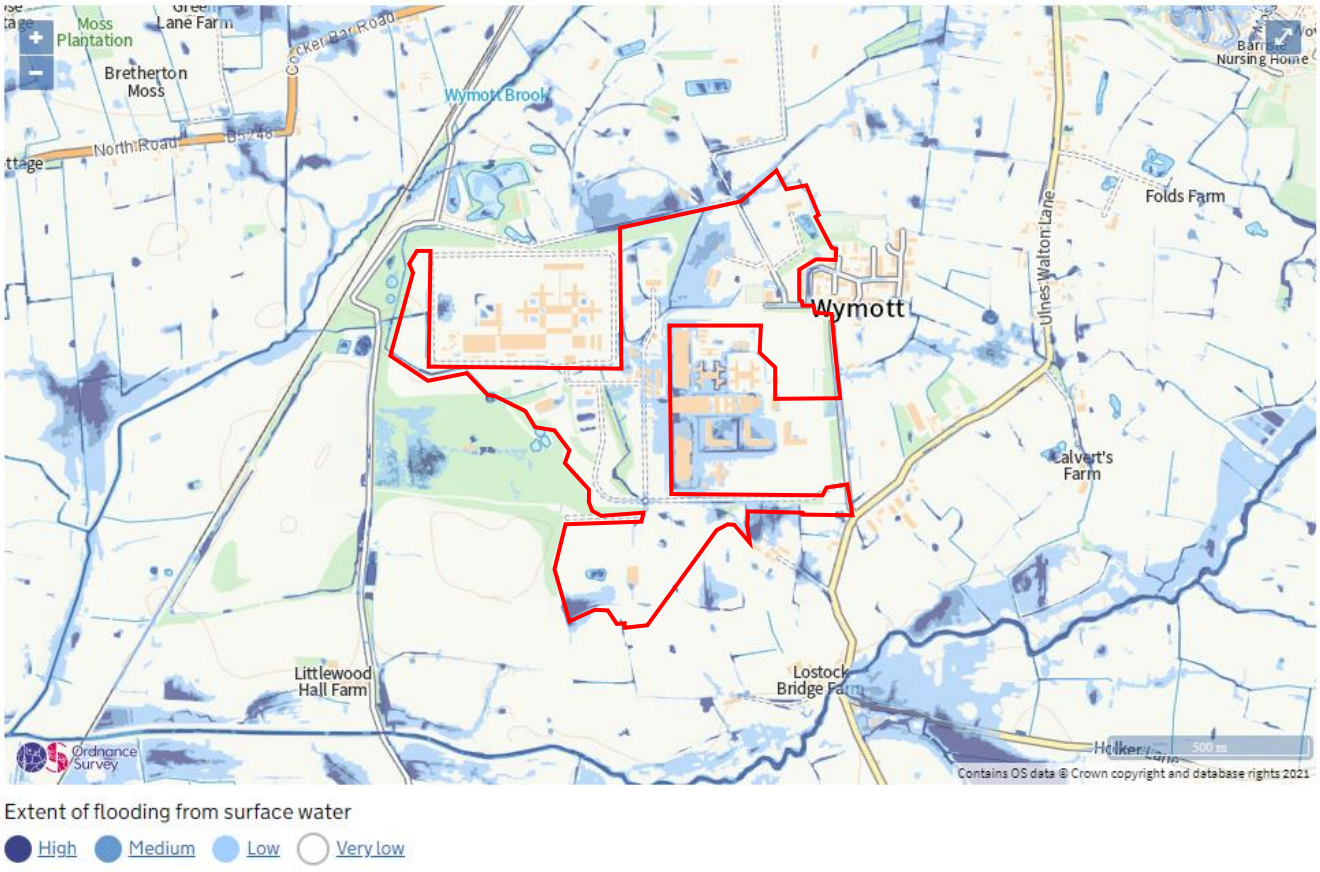

Figure 4. EA Flood Risk from Surface Water Mapping

The EA's Flood Risk from Surface Water mapping (Figure 4) shows the majority of any surface water flooding within the site to be concentrated along the route of the existing ditches running through the site, and lower-lying land immediately adjacent to the channels. However, the EA's mapping also shows an area within the approximate centre of the site to be at potential risk of surface water flooding, with flood depths of up to between 0.3m - 0.9m indicated in the 'worst-case' scenario assessed. This area of potential flooding corresponds with a low-lying depression, with a lowest recorded existing ground level of 10.37m AOD, as indicted by the Topographical Survey.

Any surface water flooding within this area is likely to 'pond' until 'weiring-over' the lowest surrounding ground level in order to then flow overland into the existing surrounding ditch network. The lowest existing ground level identified along the crest of high ground between the depression and surrounding ditches is 10.82m AOD, thereby equating to a maximum surface water flood depth within the centre of the site of 0.45m (in line with the potential maximum flood depth range indicated by the EA's mapping).

Whilst the potential effects of climate change could increase the frequency, depth and extent of on-site surface water flooding, given the sloping topography of the site, any increase in flood risk is considered unlikely to be of a magnitude which would result in a significant increase in the risk of on-site surface water flooding, as any surface water run-off will likely continue to be intercepted and managed by the existing ditch network.

On the basis of the above, the majority of the site is concluded to be at low risk of surface water flooding. However, land immediately adjacent to the existing ditches running through the site is concluded to be at risk of surface water flooding, as is the low-lying depression within the approximate centre of the site, where a maximum flood water depth of 0.45m has been identified.

3.3 Groundwater Flooding

British Geological Survey mapping shows the majority of the site and surrounding area to be underlain by superficial deposits of Till, which overlies the Singleton Mudstone Member. Superficial Head deposits comprising Clay, Silt, Sand and Gravel are indicated in the western portion of the site.

The generally low permeability of such geology is unlikely to be conducive to groundwater emergence.

This analysis is supported by the Central Lancashire Strategic Flood Risk Assessment (SFRA) which states that *"Little or no records of groundwater flooding were found during the course of the study"*.

Given that the determination of groundwater flood risk in this instance is principally driven by geological factors, which will be unaffected by the potential effects of climate change, the risk of groundwater flooding posed to the site is considered unlikely to increase as a result of climate change.

Accordingly, the site is concluded to be at low risk of groundwater flooding.

3.4 Infrastructure Failure Flooding

The generally undeveloped nature of land immediately uphill of the site to the north-east indicates that an extensive sewer system is unlikely to be present immediately uphill of the site, and therefore the risk of any surcharged sewer flows being generated and directed into the site is considered low.

Whilst existing surface and foul water drainage networks are shown to run within the site, the Topographical Survey shows the systems to only serve the site itself, and therefore the networks are considered to be at low risk of surcharging. Furthermore, in the unlikely scenario that the systems were to fail, the potential volume of surcharged sewer waters is unlikely to be significant (on the basis of the

existing site uses) and therefore any surcharged sewer flooding is unlikely to result in significant flooding (in terms of extent and/or depth) within the site.

Two ponds are located within the site, one pond within the north-eastern portion of the site, and another in the north-western corner of the site. A number of other ponds are other shown to be located within the vicinity of the site. However, all ponds are believed to be incised (as opposed to bunded and retained above ground level) and therefore are considered to be at negligible risk of catastrophically failing and posing a flood risk to surrounding areas, including the site.

No other potential sources of infrastructure failure flooding, such as reservoirs or canals, were identified within the immediate vicinity, or uphill, of the site.

Given that the determination of infrastructure failure flood risk in this instance is principally driven by factors which will be unaffected by the potential effects of climate change, the risk of infrastructure failure flooding posed to the site is considered unlikely to increase as a result of climate change.

On this basis, the site is concluded to be at low risk of infrastructure failure flooding.

4. NPPF REQUIREMENTS

4.1 Sequential & Exception Tests

This assessment has demonstrated that a portion of the application boundary is on land designated as Flood Zone 2 by the EA's updated Flood Zone Mapping. However all development is located within Flood Zone 1.

On the basis of the Sequential Approach, this assessment has demonstrated that the site is on land designated as Flood Zone 1 by the EA's Flood Zone Mapping, and is at low risk of flooding from all other potential sources.

Paragraph 033 of the Flood Risk and Coastal Change National Planning Practice Guidance (NPPG) states that "*Nor should it normally be necessary to apply the Sequential Test to development proposals in Flood Zone 1".*

Accordingly, the application of the Sequential and Exception Tests are concluded to not be required in this instance.

The NPPG Flood Risk Vulnerability and Flood Zone Compatibility matrix (Table 3 of the NPPG) also indicates that all forms of development are "appropriate" in Flood Zone 1 and 2 without application of the Exception Test.

Accordingly, the application of the Exception Test is concluded to not be required in this instance.

4.2 Mitigation Measures

Whilst an Exception Test is not explicitly required under the NPPG in this case, the following section details measures recommended to mitigate the flood risks identified, to ensure that the proposed development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, akin to the requirements of section 'b' of the Exception Test, as outlined in the NPPF.

4.2.1 Resistance and Resilience Measures

In addition to the recommended 'sequential approach' to site use allocation, it is recommended that the finished floor level of all new buildings be set at (as a minimum) the higher of either:

- 11.12m AOD (based on providing a 0.15m 'freeboard' above the potential surface water flood level of 10.82m AOD identified within the approximate centre of the site; and, in excess of the 'standard' required 0.30m 'freeboard' above the 1 in 1,000 year fluvial flood level of 10.47m AOD (which is also considered representative of the likely 1 in 100 year + 35% fluvial flood level)).
- 0.3m above adjacent proposed general ground levels.
- 0.3m above adjacent 'top-of-bank' levels of existing/re-aligned ditches.

The adoption of such measures is considered to appropriately address the potential fluvial and surface water flood risks identified.

4.2.2 Safe Access and Egress

Access to the site will be via the existing surrounding highway network, which is indicated to be at low risk of flooding within the immediate vicinity of the site, based on the EA's Flood Map for Planning and

Flood Risk from Surface Water mapping (the potential surface water flooding indicated along sections of the existing surrounding access road and highway network is generally shown to be <0.3m deep, and therefore considered unlikely to impede safe vehicular access).

To ensure that safe access is achievable through the site, all critical external access routes are recommended to be set at (as a minimum) the higher of either:

- 11.12m AOD (based on providing a 0.15m 'freeboard' above the potential surface water flood level of 10.82m AOD identified within the approximate centre of the site; and, in excess of the 'standard' required 0.30m 'freeboard' above the 1 in 1,000 year fluvial flood level of 10.47m AOD (which is also considered representative of the likely 1 in 100 year + 35% fluvial flood level)).
- 0.3m above adjacent 'top-of-bank' levels of existing/re-aligned ditches.

On the basis of the above, and assuming such measures are integrated into the design and construction of the proposed development, safe access and egress is concluded to be possible to and from the site.

4.2.3 Floodplain Storage

On the basis that the site has been demonstrated to be at low risk of fluvial and tidal flooding, and therefore outside a functioning floodplain, the proposed development is not considered to increase flood risk within the catchment through a loss of floodplain storage, and accordingly no further mitigation measures are required in this respect.

4.2.4 Surface Water Drainage

4.2.4.1 Existing

The Topographical Survey of the site indicates the presence of an extensive existing ditch network immediately adjacent to and within the site, along with existing surface and foul water drainage networks. The existing surface water drainage network serving the currently developed areas in the eastern portion of the site is indicated to discharge to a sewer system located to the east of the site, whilst the drainage network serving the currently developed areas in the western portion of the site is indicated to discharge to the existing ditch network running through the site.

Rainfall within those portions of the site not currently served by a positive surface water drainage system is currently assumed to preferentially infiltrate to ground, with any rainfall unable to infiltrate (i.e. in the scenario that the infiltration capacity of the site is exceeded as a result of prolonged and/or intense rainfall), likely to be directed overland as shallow 'sheet-flow' following the prevailing topography, and into the existing ditches.

4.2.4.2 Proposed

Given the potential for the proposed development of the site to generate surface water run-off which could be directed off-site onto third-party land, a proposed Drainage Strategy has been prepared for the site. The Strategy has been prepared separately and included with the Planning Application submission, and accordingly should be consulted regarding the proposed means of surface water drainage. However, the following principles are to be adopted within the design and specification of the proposed system:

- In accordance with Building Regulations Part H and Paragraph 080 of the NPPG, rainfall run-off should (in preferential order) be: re-used, infiltrated to ground, discharged to a local watercourse,

discharged to a surface water sewer, or discharged to a combined water sewer. In respect of each potential means of surface water disposal:

- The re-use of clean surface water run-off (i.e. from proposed building roof areas) will be considered and adopted where feasible.
- Infiltration drainage is not anticipated to be practicable based on the indicative low-permeability of the on-site geology. However, this will be subject to confirmatory infiltration testing, and whilst not anticipated, on-site infiltration drainage will be used if demonstrated to be viable.
- Existing watercourses are indicated to be present adjacent to and within the site (in the form of a ditch network) and therefore may offer a potential means of surface water disposal. This would be subject to confirmation of capacity and downstream connectivity, though based on the understanding that surface water run-off from the site currently discharges, in part, to the ditch network, is likely to offer a viable means of surface water disposal.
- Whilst there is a current existing sewer system to the east of the site indicated within the Topographical Survey, it is noted that this existing pump house is to be demolished and a new one located in the north east of the site. It is thought that this would act in a similar manor to the existing system and offer potential means of surface water disposal. This would be subject to confirmation of capacity, though based on the understanding that surface water run-off from the site currently discharges, in part, to the sewer network, is likely to offer a viable means of surface water disposal.

- The acceptability of discharging surface water run-off from the site to watercourses and/or sewer will be subject to agreement with Lancashire County Council (in their role as Lead Local Flood Authority (LLFA)) and United Utilities, respectively. However, it is anticipated that any discharge will need to be restricted to the pre-development run-off rate from the site (and potentially reduced compared to existing rates), for all storm events up to and including the 1 in 100 year + 40% (climate change allowance) storm event.
- On-site attenuation storage will likely be required to ensure no on-site flooding in up to and including the 1 in 100 year + 40% storm event. Such attenuation should ideally adopt Sustainable Drainage System (SUDS) principles.
- It is likely that appropriate and proportionate pollution control methods will also need to be incorporated into the proposed system to ensure an acceptable surface water discharge quality from the site.

The function of the existing drainage network (i.e. the ditch network; and, potentially the existing surface and foul water drainage networks) will need to be retained (or diverted/relocated) as part of the proposed development, in order to ensure any existing in-flows to the ditches and drainage networks can still be managed, to reduce the risk of surface water flooding at the site, and to offer a viable potential surface water disposal option for the discharge of surface water run-off from the proposed development.

The proposed route and dimensions of any necessary ditch re-alignments will be confirmed at the detailed design stage, and it will need to be ensured that the ditches offer suitable conveyance capacity for the anticipated upstream in-flows. The proposed ditch diversion works will also be subject to Consent via the LLFA.

In addition, a minimum 5.0m easement will need to be provided from the edge of any re-aligned ditches, and existing retained ditches, to any new above ground structures, including buildings and fences/walls.

5. CONCLUSIONS

The EA's current Flood Map for Planning shows the majority of the site to be within Flood Zone 1, and the extreme western portion of the site to be within Flood Zone 3. However, a detailed assessment of fluvial flood risk based on updated flood risk modelling provided by the EA has identified that only the north-western margin of the site is at risk of flooding and within Flood Zone 2.

The site is concluded to be at risk of surface water flooding, though such flooding is likely to be concentrated in land immediately adjacent to the existing ditches running through the site, and an existing low-lying depression within the approximate centre of the site, where a maximum flood water depth of 0.45m has been identified.

The flood risk posed to the site from other potential sources of flooding has been assessed as 'low'.

Irrespective of the flood risks identified, the proposed development has been concluded to meet the requirements of the Sequential and Exception Tests, in accordance with the NPPF and NPPG, on the basis of adopting a recommended site-based 'sequential approach' to development land-use.

A number of flood risk mitigation measures have been recommended in order to address the flood risks identified, specifically:

- The adoption of a ‘sequential approach’ to site use allocation, entailing the locating of all operational elements of the proposed development within those portions of the site identified to be at lower risk of flooding (i.e. within Flood Zone 1), with those uses considered to have a lower 'vulnerability' to flooding (i.e. proposed landscaped areas) located within those portions of the site identified to be at greater risk of flooding (i.e. within Flood Zone 2 within the area immediately adjacent to the north-western site boundary).
- The finished floor level of all new buildings to be set at (as a minimum) the higher of either:
  - 11.12m AOD (based on providing a 0.15m ‘freeboard’ above the potential surface water flood level identified within the approximate centre of the site; and, in excess of the ‘standard’ required 0.30m ‘freeboard’ above the 1 in 1,000 year fluvial flood level (which is also considered representative of the likely 1 in 100 year + 35% fluvial flood level)).
  - 0.3m above adjacent proposed general ground levels.
  - 0.3m above adjacent ‘top-of-bank’ levels of existing/re-aligned ditches.
- All critical external access routes through the site to be set at (as a minimum) the higher of either:
  - 11.12m AOD (based on providing a 0.15m ‘freeboard’ above the potential surface water flood level of 10.82m AOD identified within the approximate centre of the site; and, in excess of the ‘standard’ required 0.30m ‘freeboard’ above the 1 in 1,000 year fluvial flood level of 10.47m AOD (which is also considered representative of the likely 1 in 100 year + 35% fluvial flood level)).
  - 0.3m above adjacent ‘top-of-bank’ levels of existing/re-aligned ditches.

It has also been demonstrated that a means of safe access and egress is possible to and from the site; and, that the proposed development is not considered to increase flood risk within the catchment through a loss of floodplain storage.

A proposed Drainage Strategy has been prepared separately for the site and is included with the Planning Application submission, and this should be consulted regarding the proposed means of surface

water drainage. However, it is anticipated that the proposed system will likely include a restricted discharge to either existing ditches within/adjacent to the site and/or sewer, based on the pre-development run-off rate from the site, with on-site attenuation provided for up to and including the 1 in 100 year + 40% storm event.

The function of the existing drainage network within/adjacent to the site will need to be retained (or diverted/relocated) as part of the proposed development. The proposed route and dimensions of any necessary ditch re-alignments will be confirmed at the detailed design stage, and it will need to be ensured that the ditches offer suitable conveyance capacity for the anticipated upstream in-flows. The proposed ditch diversion works will also be subject to Consent via the LLFA.

In addition, a minimum 5.0m easement will need to be provided from the edge of any re-aligned ditches, and existing retained ditches, to any new above ground structures, including buildings and fences/walls.

This report therefore demonstrates that, in respect of flood risk, the proposed development of the site with a new prison:

- Is suitable in the location proposed.
- Will be adequately flood resistant and resilient.
- Will not place additional persons at risk of flooding, and will offer a safe means of access and egress.
- Will not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage or impedance of flood flows.
- Will put in place measures to ensure surface water is appropriately managed.

As such, the Application is concluded to meet the flood risk requirements of the NPPF.

Hydrock Consultants Limited