Pendle Level 2 Strategic Flood Risk Assessment - Site P013

Draft

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Contract

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This report describes work commissioned by Pendle Borough Council by an instruction dated 27 June 2024. The Client's representative for the contract was John Halton of Pendle Borough Council. Kaylyn Carroll of JBA Consulting carried out this work.

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Acknowledgements

We would like to thank the Environment Agency for their assistance with this work

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Pendle Borough Council Site P013. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Pendle Level 1 SFRA' (2021) and read the 'Pendle Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site P013

- Location: Land north of West Craven Business Park
- Existing site use: Greenfield
- Existing site use vulnerability: Water compatible
- Proposed site use: Employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 10.9 ha
- Proposed development impermeable area: 9.3 ha (assumed as 85% of site area)
- EA model: Earby Beck 2018 / Earby Beck Phase 2 2021
- Watercourse: Earby Beck
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Assess modelled fluvial depths and hazards
    - Assess surface water depths and hazards
    - Climate change proxy assessment
    - Assess reservoir risk

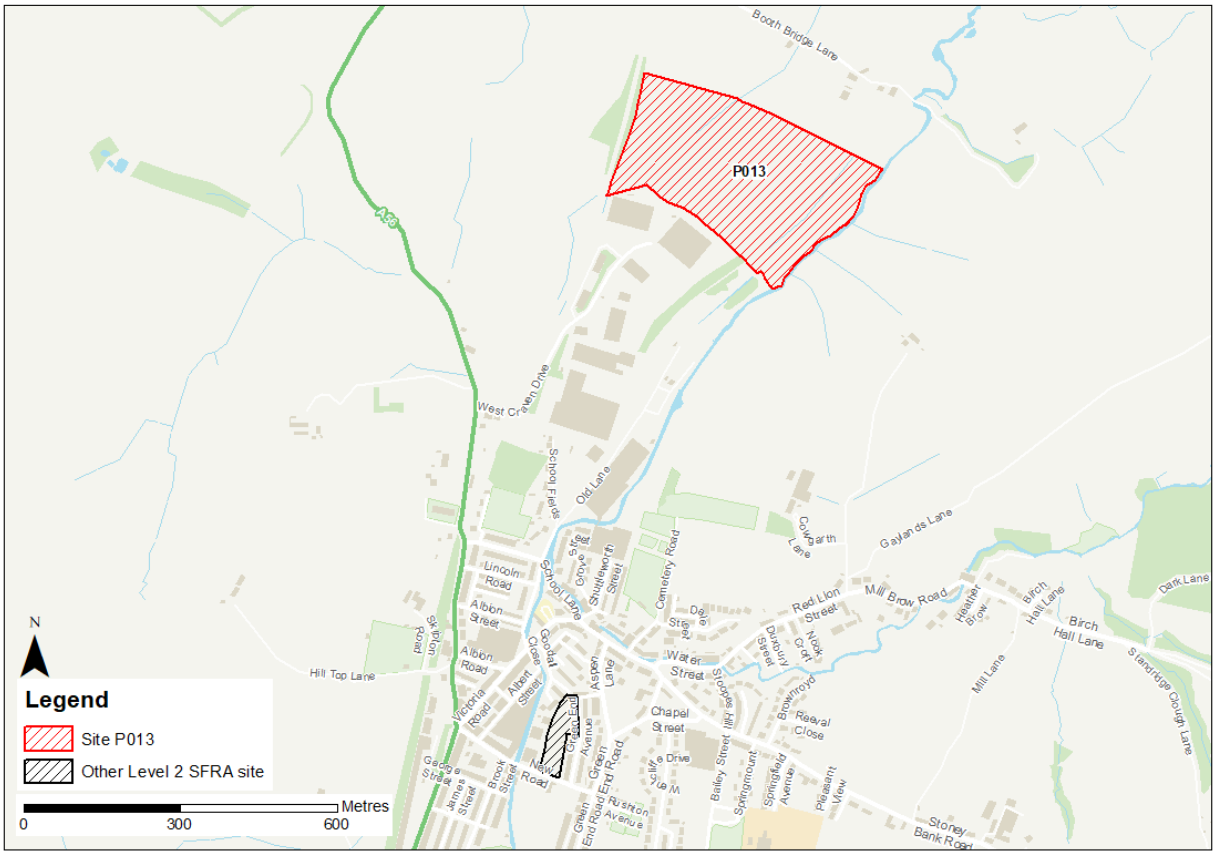

Figure 1-1: existing site location boundary

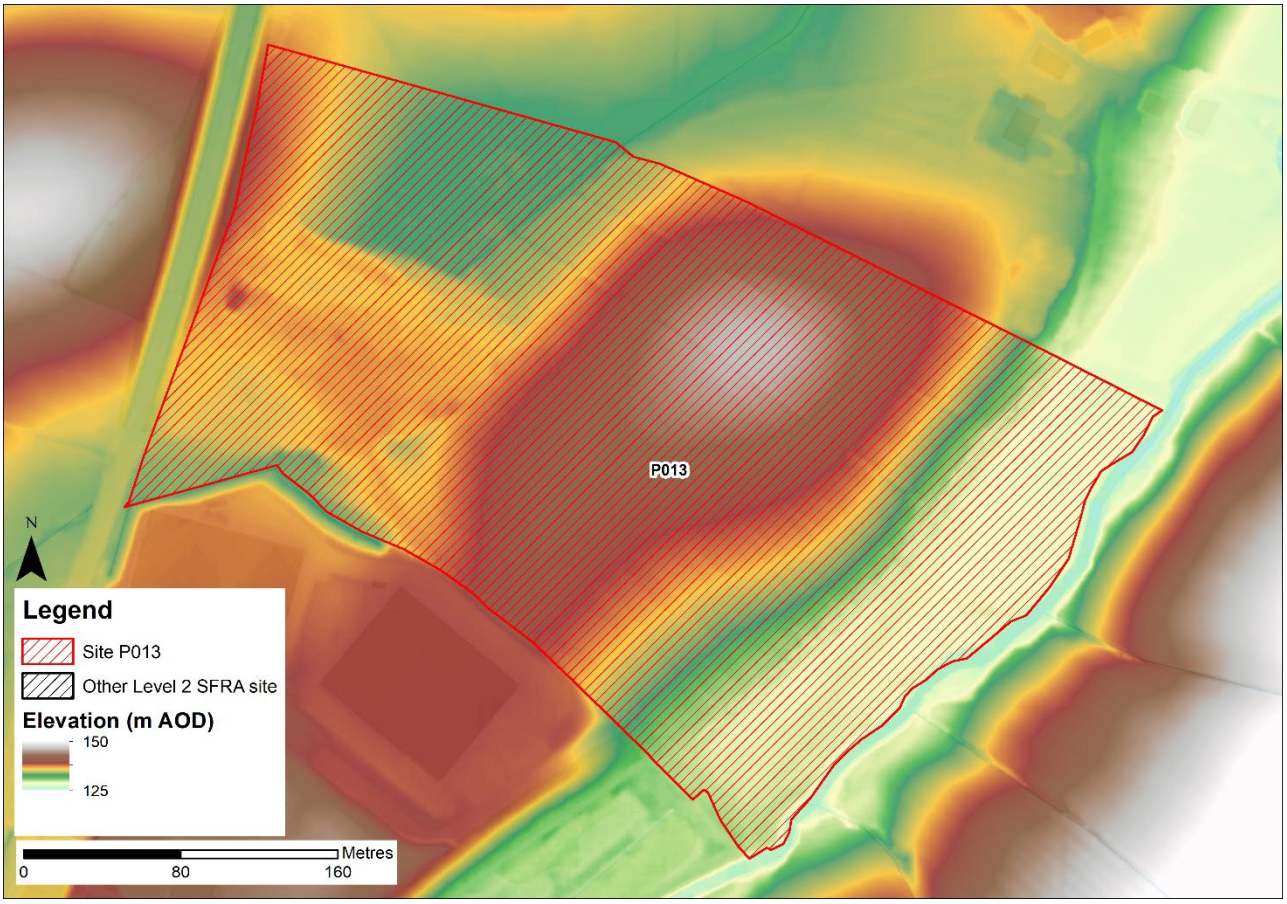

Figure 1-2: topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the Pendle Level 2 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The area along the eastern boundary of the site is located within Flood Zone 3b. The area of functional floodplain onsite should be left free of development. The functional floodplain in this location is based on the 3.3% AEP defended event from the Earby Beck 2018 and Earby Beck Phase 2 2021 models. The majority of the site is within Flood Zone 1.

Table 2-1: existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
86	0	1	13

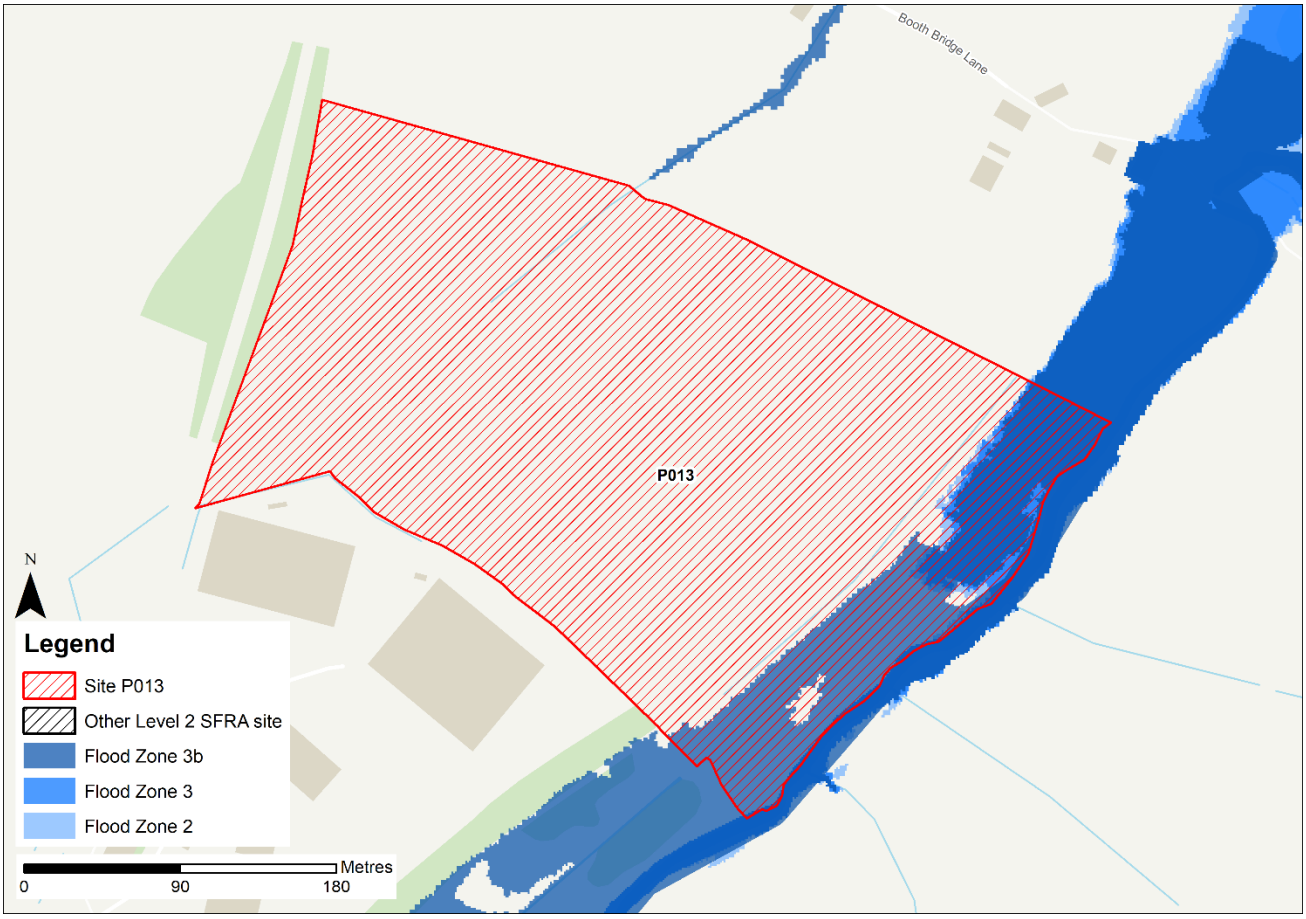

Figure 2-1: existing risk from rivers to the site

2.1.2 Earby Beck Phase 2 2021 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area along the eastern site boundary modelled to be at risk. Maximum flood depths within the site for this event are modelled to be between 0.3 and 0.6 m. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard is largely categorised as 'Very low', with a small isolated area categorised as 'Danger for some'. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event, reflecting Flood Zone 3.

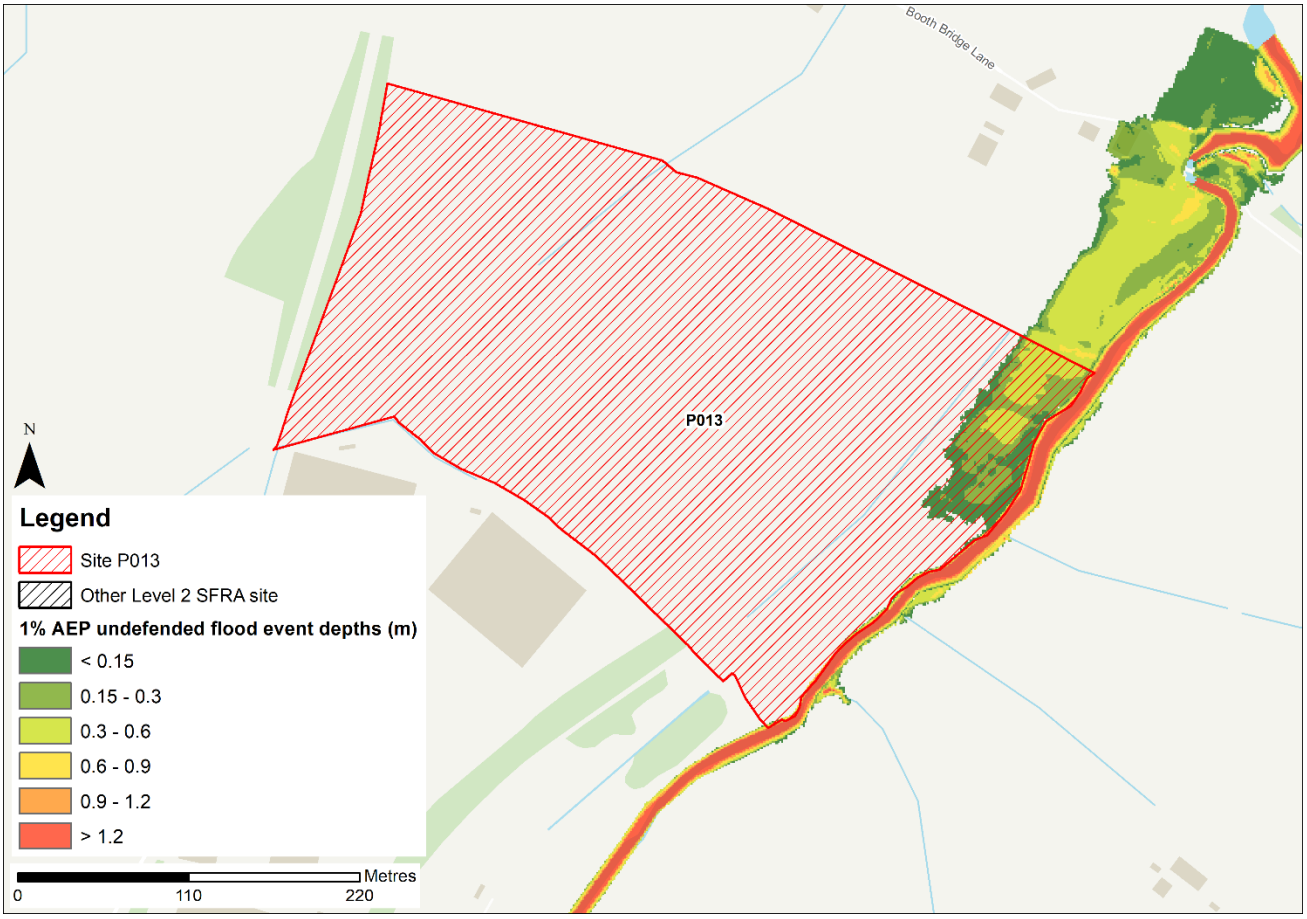

Figure 2-2: flood depths for 1% AEP undefended flood event

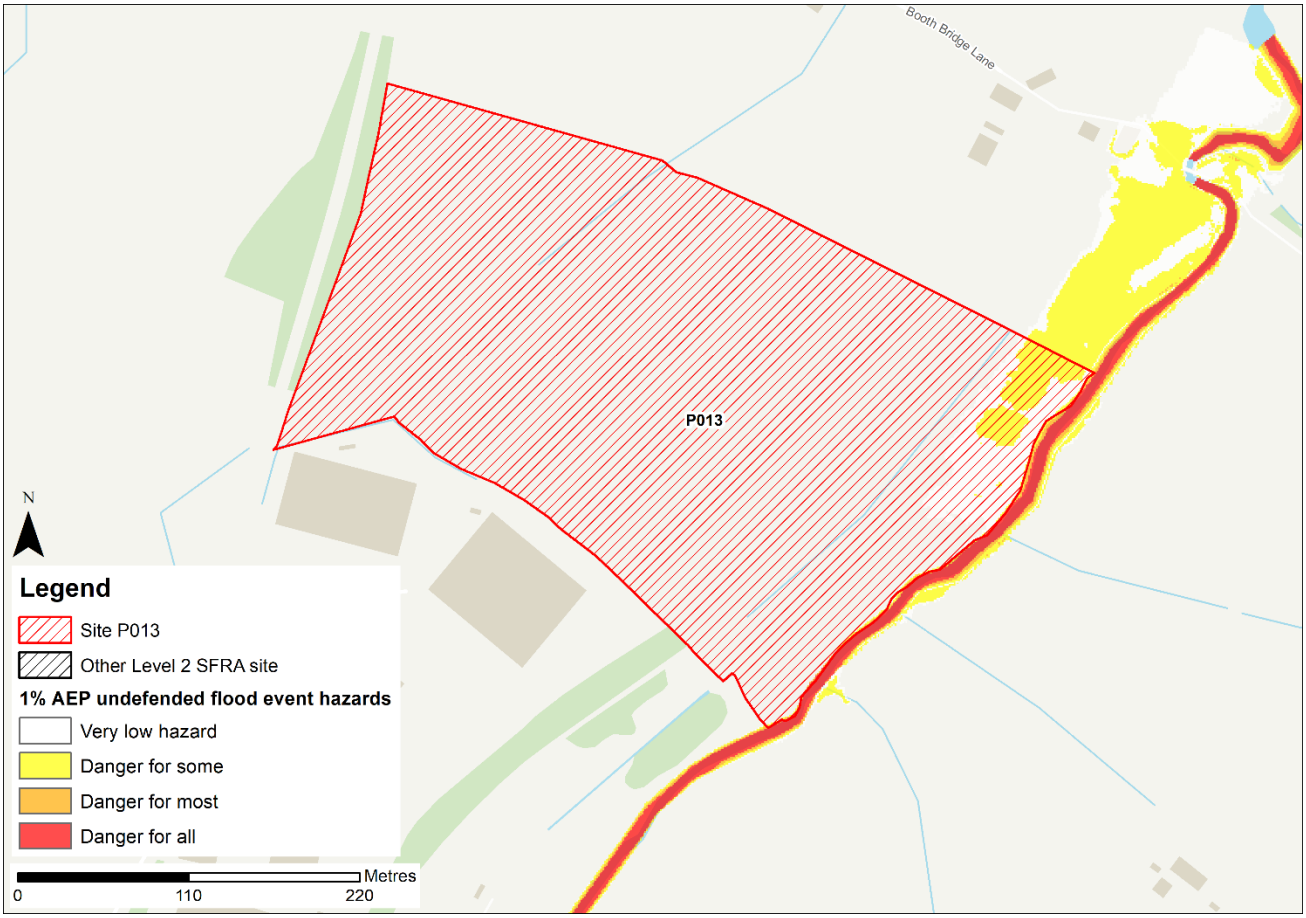

Figure 2-3: flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from Earby Beck have not been modelled for this SFRA, as the timescales for the Local Plan would not allow for it. Therefore, in the absence of modelled climate change information, the modelled present day 0.1% AEP undefended event has been used as a conservative proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to be slightly greater in extent to the present day Flood Zone 3, with some slightly greater depths (Figure 2-4) and hazards (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform on whether the site can remain safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or FRA should include for the most up to date climate change allowances based on a fully up to date flood model.

1 Fluvial hazard ratings based on Table 4 of the SUPPLEMENTARY NOTE ON FLOOD HAZARD RATINGS AND THRESHOLDS FOR DEVELOPMENT PLANNING AND CONTROL PURPOSE – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008.

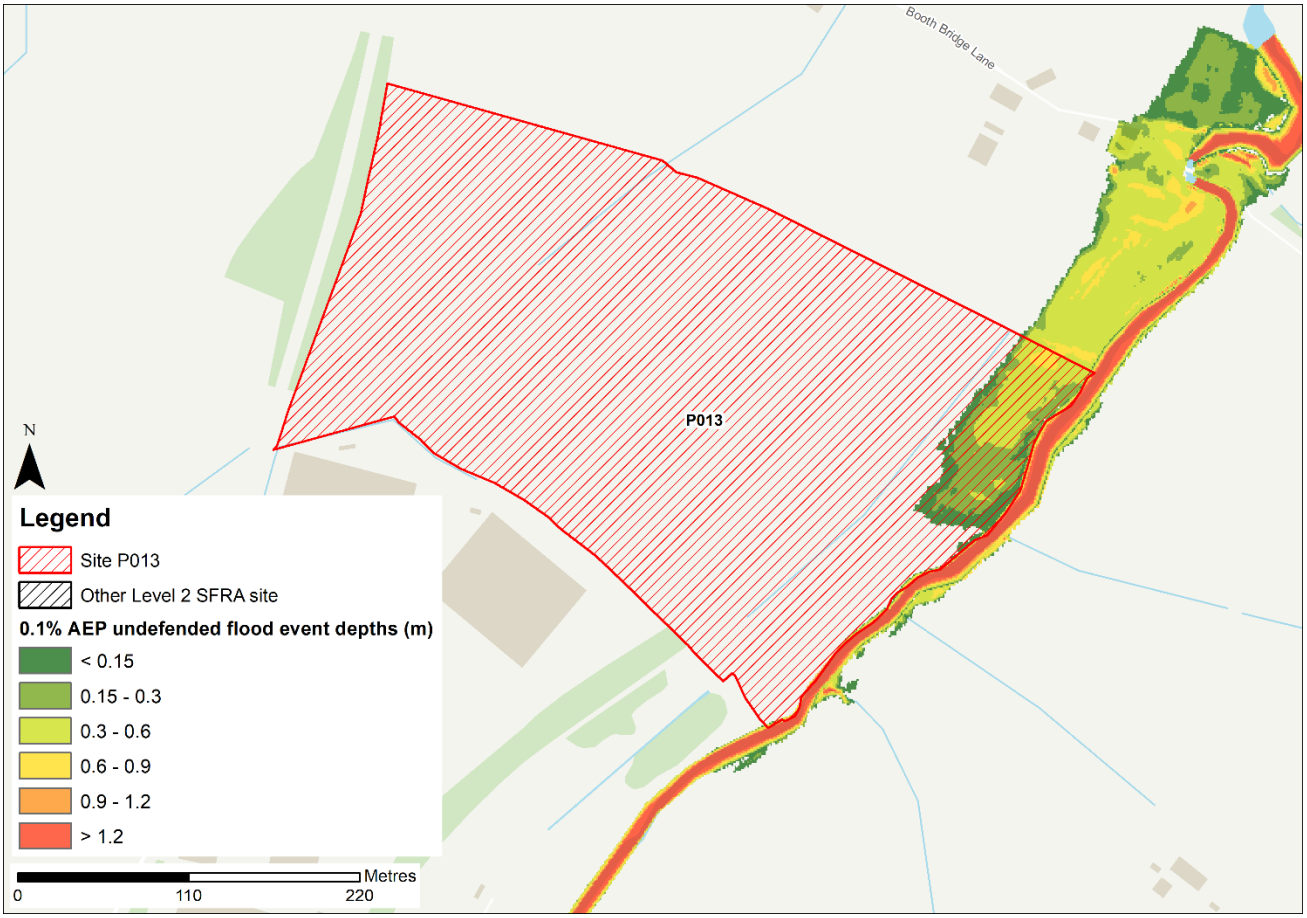

Figure 2-4: flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

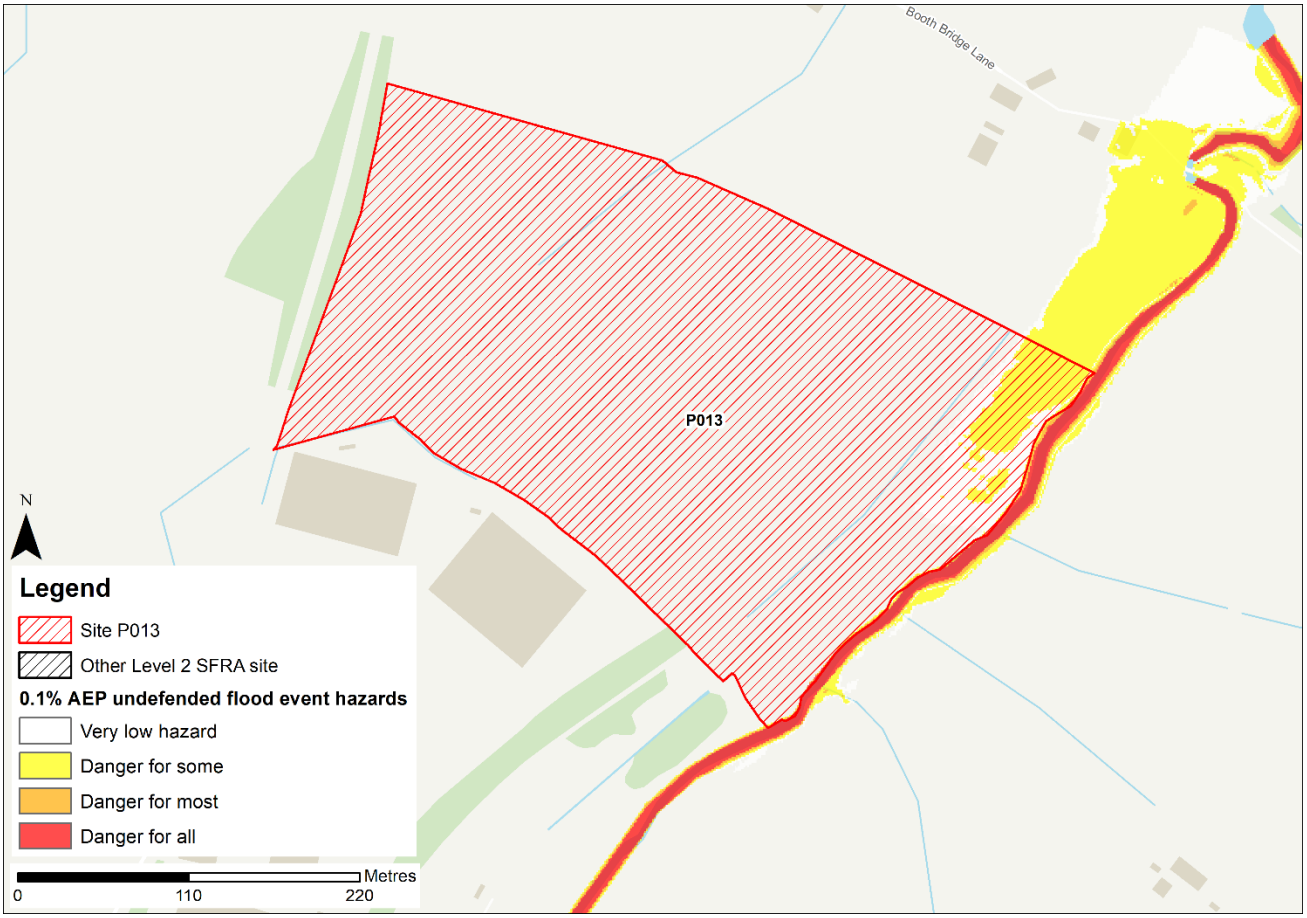

Figure 2-5: flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

A short section of flood defence is in place on the left bank of Earby Beck in the south of the site, as shown on Figure 2-6. Information provided in the EA's 'Spatial Flood Defences' dataset states that this defence is a raised wall with design standards of protection (SoP) and actual SoP unknown. Current condition is also unknown. The dataset states that a private individual or company owns and maintains the defence in this area. Based on the flood zones and modelling flood risk, this section of defence does not appear to provide any protection to the site, therefore residual risk associated with this defence can likely be discounted.

Figure 2-6: EA Spatial Flood Defences dataset

2.3.1 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting to reduce runoff downstream and potentially provide some level of flood mitigation to the town of Earby. There is also potential for runoff attenuation features within the site, to store floodwater and reduce the speed at which flooding occurs downstream. These areas are shown in Figure 2-7.

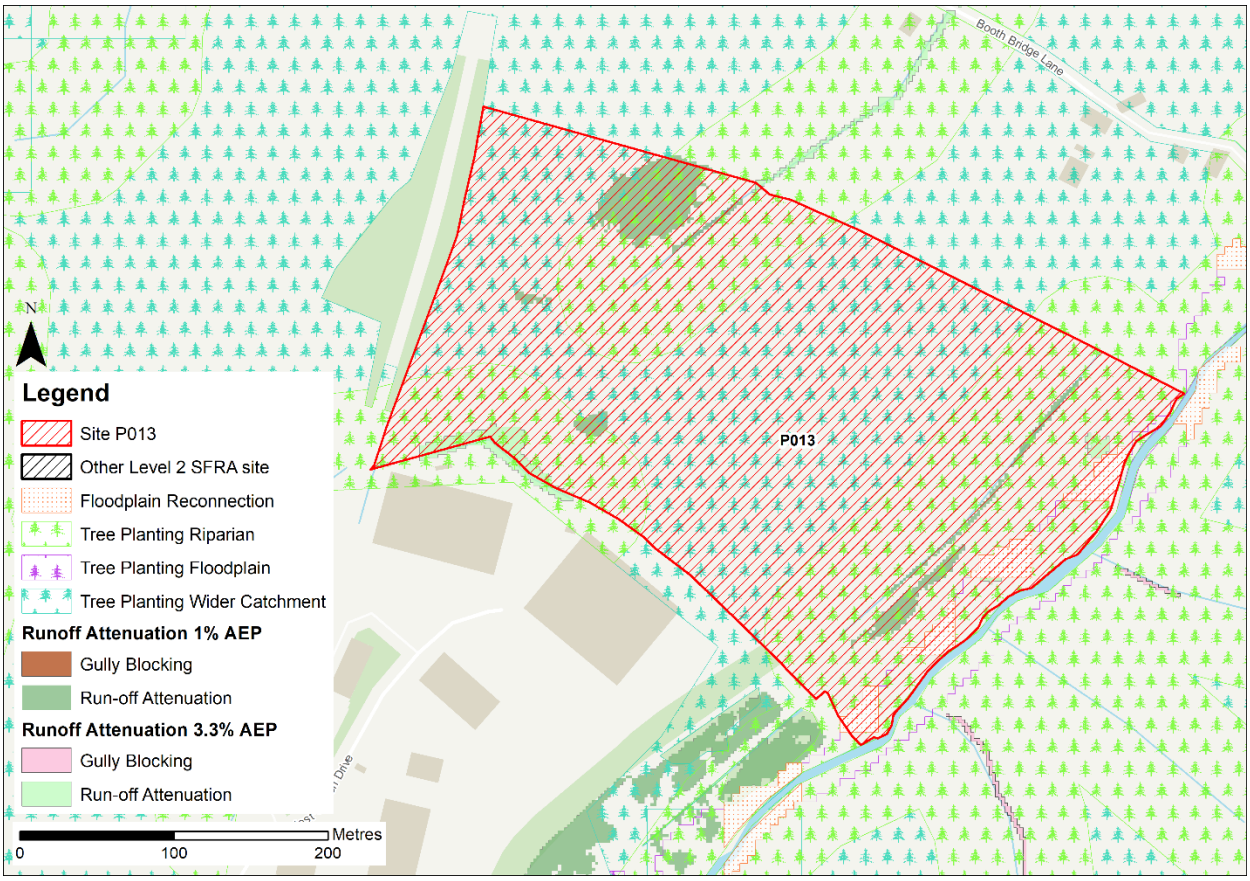

Figure 2-7: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 2-8 shows the RFM in a "dry day" and a "wet day" scenario. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is potentially at risk from three reservoirs, all of which are located within the Pendle authority area. The Canal & River Trust is the undertaker for all three reservoirs.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required. Refer to the main Level 2 SFRA report for further information.

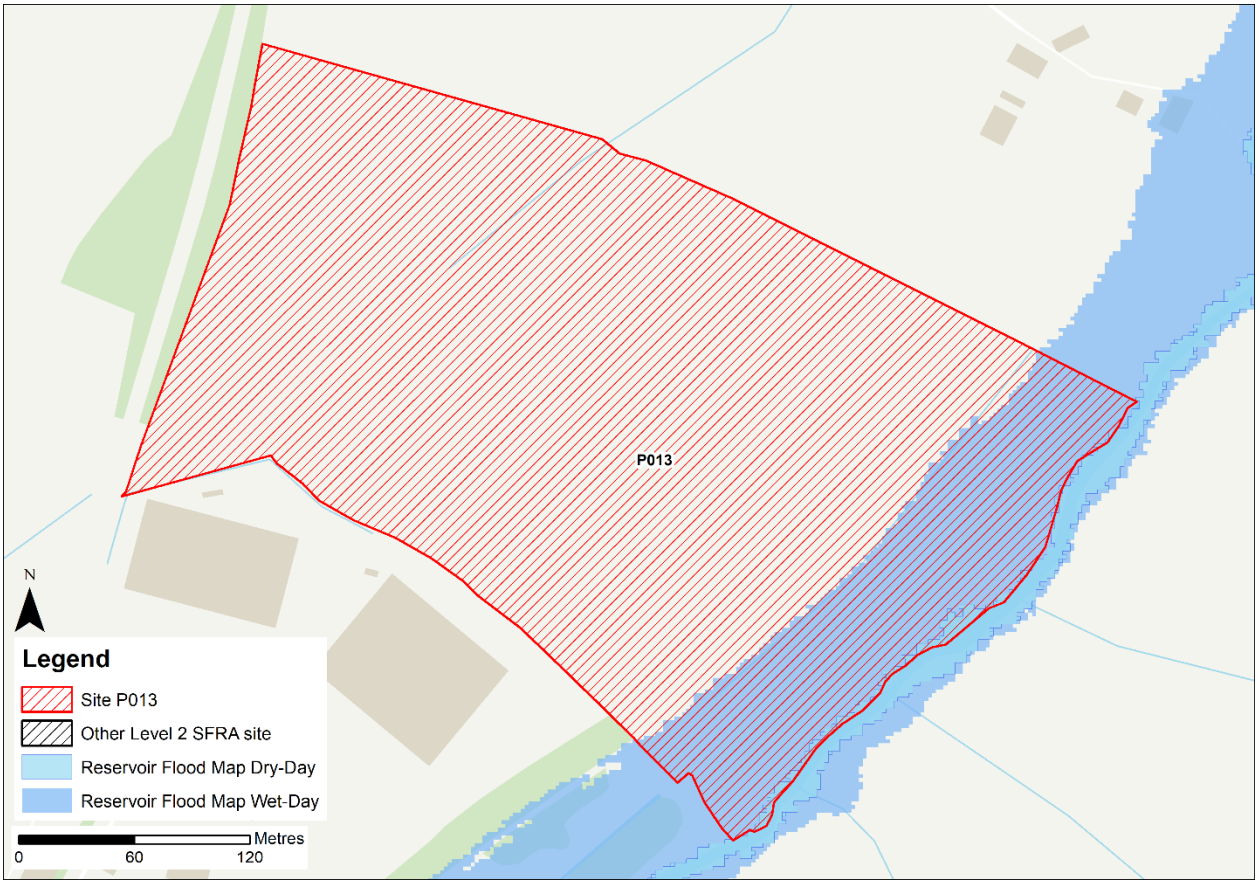

Figure 2-8: Flood risk from reservoirs

2.5 Historic flood incidents

There are no recorded historic flood events within the vicinity of the site.

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. This site is not located within a FWA.

Flood alerts may be issued ahead of a flood warning for properties located within a Flood Alert Area (FAA), to provide advance notice of the possibility of flooding occurring. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is not located within a FAA.

Safe access and escape routes should be achievable via West Craven Drive to the south of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The proposed development of the site would see a change in the risk classification from a water compatible greenfield site to a less vulnerable employment site, according to the NPPF classification.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- A flood risk activity permit may be required from the EA if development is planned within 8 metres of the bank of Earby Beck, which is a main river. EA advice would normally recommend for no development within 8m of a main river, to enable access for maintenance activities.
- However, the site is modelled to be within the functional floodplain and Flood Zone 3a along the eastern boundary of the site, adjacent to Earby Beck. Development is not permitted within the functional floodplain and development should avoid Flood Zone 3a. If feasible, this area would be used as a green / blue corridor which can provide multifunctional benefits providing ecological, social and amenity value, which should include the 8m buffer area.
- There also appears to be a flow path or drain in the north of the site. Further investigation will be required to ascertain any flood risk associated with the drain and any subsequent mitigations that may be required.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a conservative estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with some slightly greater depths and hazards. However, climate change must be fully modelled at the FRA stage to inform on whether the site can be made safe for its lifetime.
- Safe access and escape routes should be achievable via West Craven Drive to the south of the site. This should be confirmed at the FRA stage along with any requirements for emergency plans or flood plans for the site.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 5% of the site is within the high risk surface water flood zone, as shown in Table 3-1. A further 7% of the site is at medium risk and a further 12% of the site is at low risk.

The area at risk in the high risk event is mainly confined to a distinct flow path along the eastern boundary of the site, coincident with Earby Beck. There are some small areas of topographic ponding across the rest of the site with a small flow path developing along the southern border. This is consistent with the medium risk event, with a greater extent of flooding in the areas of ponding. In the low risk event, the area of ponding within the north of the site develops into a flow path extending to the north.

Greatest flood depths in the high risk event, outside of the Earby Beck channel, range between 0.9 and 1.2 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via West Craven Drive to the south of the site in all events.

Table 3-1: existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
76	12	7	5

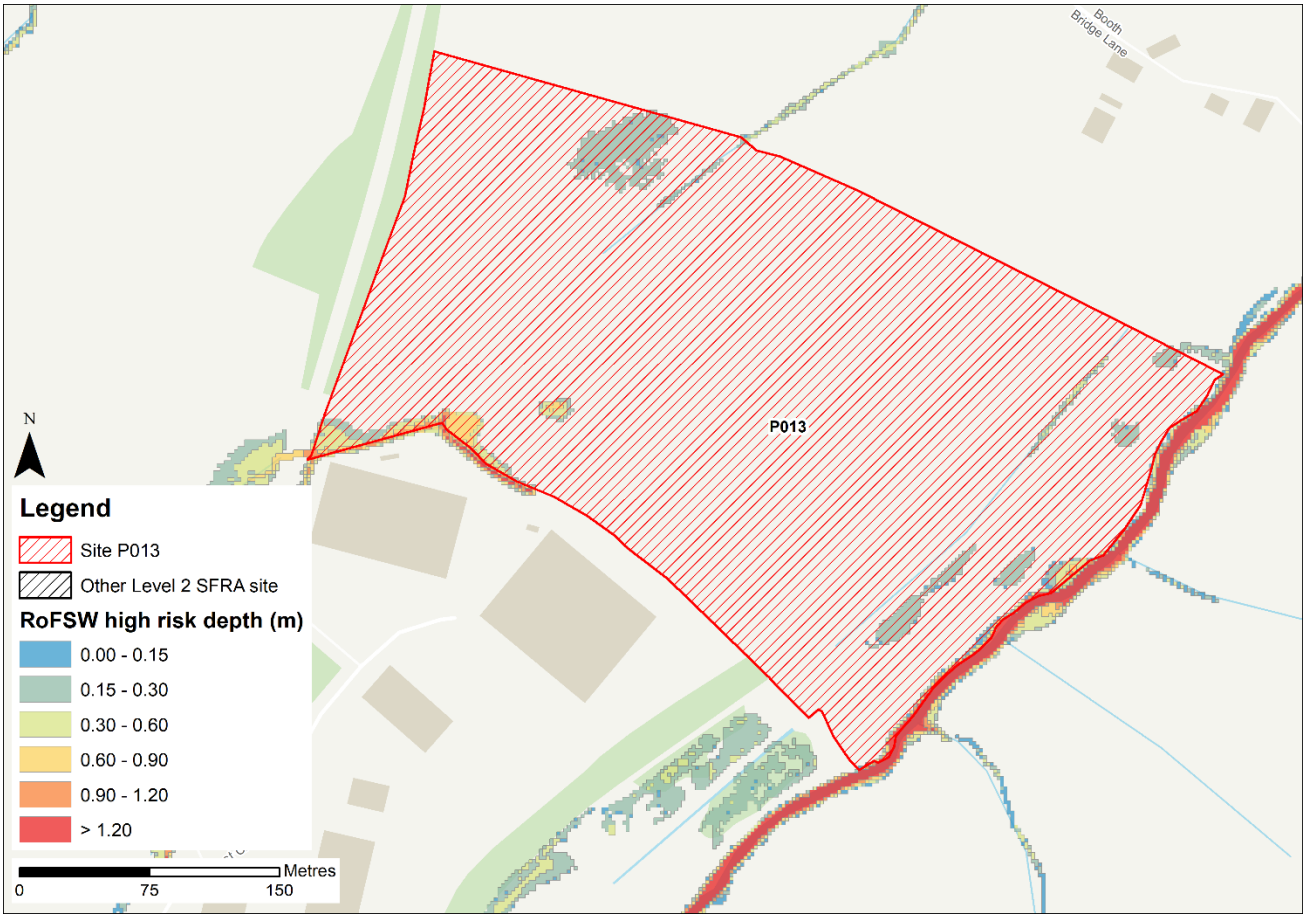

Figure 3-1: high risk event surface water flood depths (Risk of Flooding from Surface Water map)

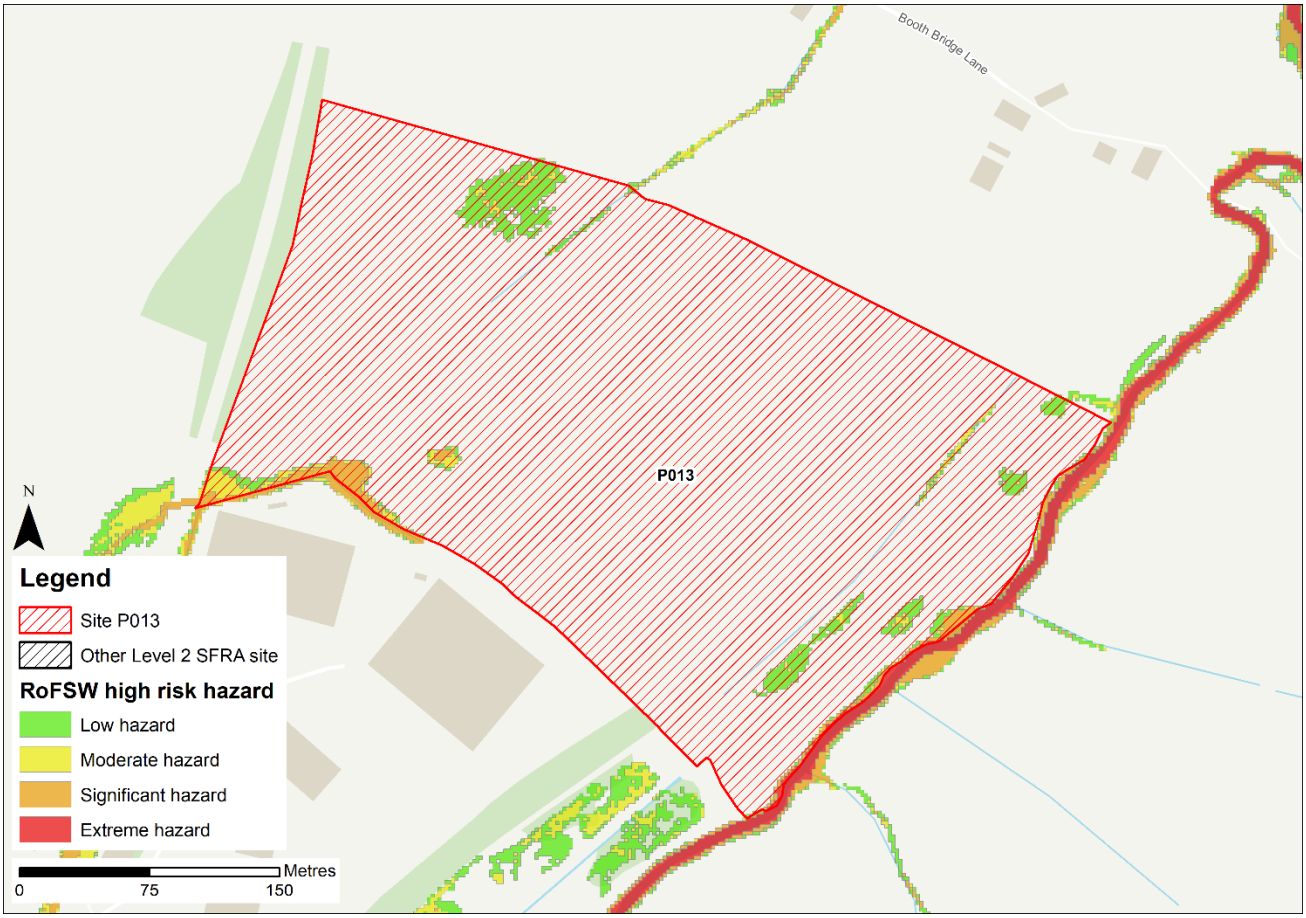

Figure 3-2: high risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impacts of climate change on surface water flood risk have been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: modelled climate change allowances for rainfall for the Ribble Management catchment

Return period	Central allowance 2070s	Upper end allowance 2070s
3.3% (high risk)	30%	40%
1% (medium risk)	35%	50%

Figure 3-3 shows the modelled surface water flood depths for the medium risk event +50% climate change. Risk is modelled to be significantly greater than for present day conditions, with the medium risk plus climate change event being similar in extent to the low risk present day event. Greatest flood depths are modelled to be > 1.2 m with some areas of

2 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

extreme hazard (Figure 3-4). Safe access and escape routes should remain possible via West Craven Drive to the south of the site.

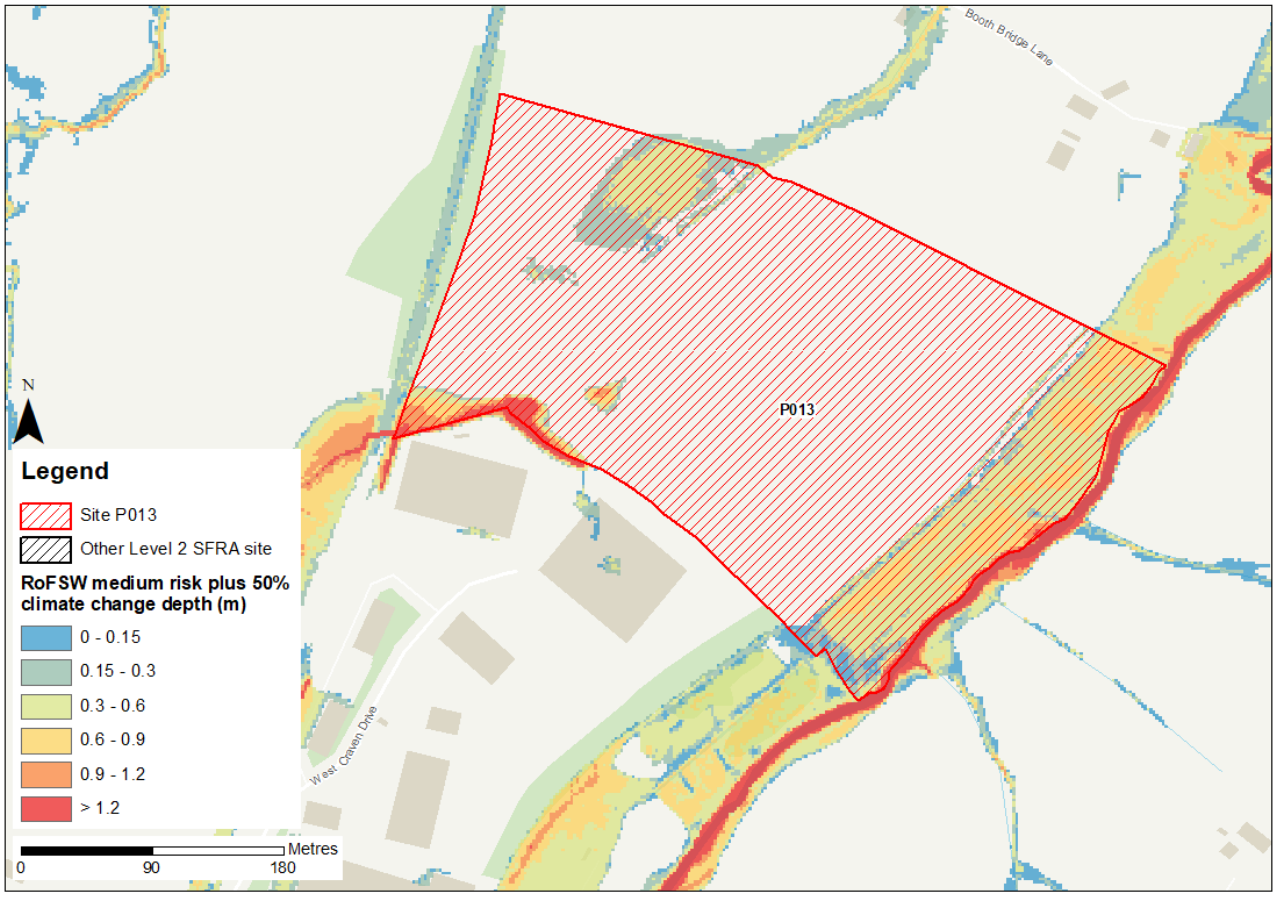

Figure 3-3: medium risk event surface water flood depths plus 50% climate change (based on Risk of Flooding from Surface Water map)

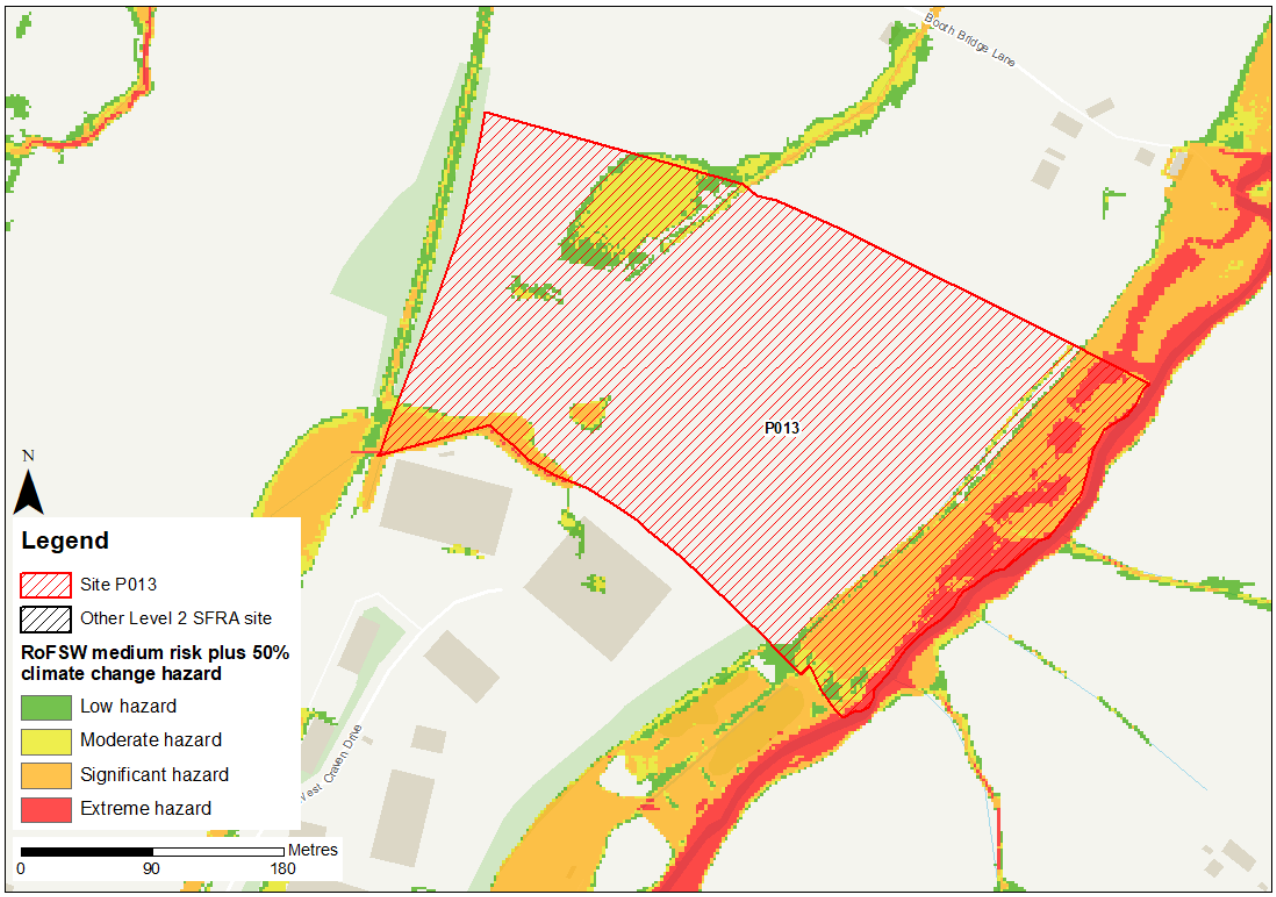

Figure 3-4: medium risk event surface water flood hazards plus 50% climate change (based on Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- The site is predominantly at very low surface water flood risk in the present day, with a flow path along the eastern and southern boundaries of the site in all events. Safe access and escape routes should be achievable via West Craven Drive to the south of the site.
- The modelled climate change outputs indicate increased surface water flood risk to the site. The flow path along Earby Beck is coincident with the functional floodplain and should remain free of development. The area of risk in the north of the site is coincident with the onsite drain. This drain should be left free of obstruction and allowed to flow if required.
- Safe access and escape routes should remain achievable to the south of the site.
- The use of appropriate SuDS should be investigated. The groundwater table is likely to be low across the majority of the site judging from the Groundwater Flood Map in Figure 4-1 therefore infiltration SuDS may be an option. This will require appropriate ground and infiltration survey, and surface water modelling based on layout plans and detailed design and consultation with the LLFA.
- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will

require surface water modelling based on layout plans and detailed design and full consultation with the LLFA on required runoff rates.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site P013 and the surrounding areas and Table 4-1 explains the risk classifications.

The majority of the site is in an area of no risk of groundwater emergence. There is a small area within the Earby Beck floodplain where there is a risk of groundwater flooding to both surface and subsurface assets. However, this area should not be developed. Groundwater conditions should therefore be suited to infiltration SuDS across the majority of the site.

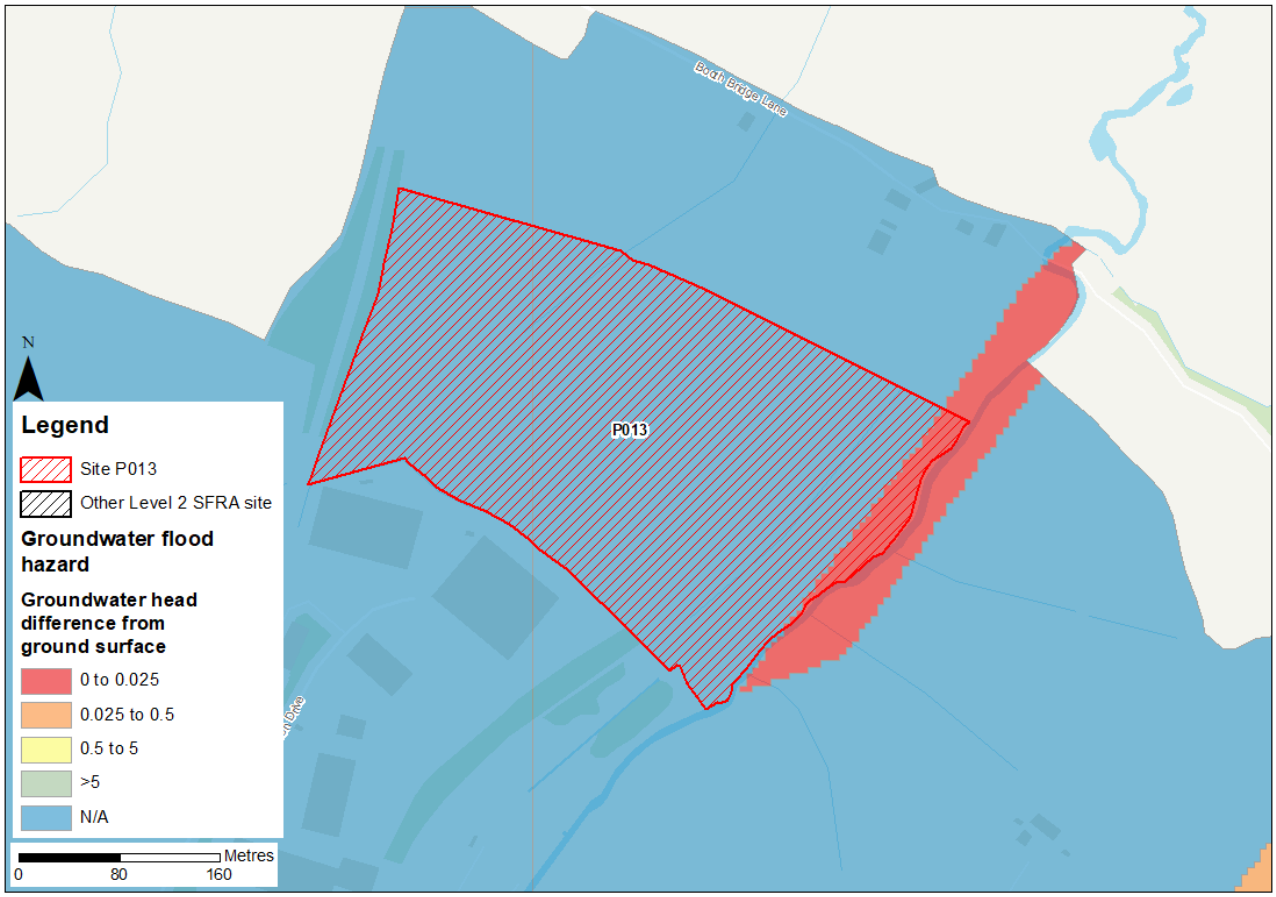

Figure 4-1: JBA 5m Groundwater Flood Map

3 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

- The site is not required to pass the exception test as it is proposed for less vulnerable uses. However, it must be proven at the FRA stage that the site can remain safe for its lifetime.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2021) and this Level 2 SFRA:

- There should be no development within the functional floodplain including for the 8m buffer of Earby Beck. This area should be maintained as a blue / green corridor to provide ecological, amenity and social value.
- Updated climate change modelling along Earby Beck should be used to update this Level 2 SFRA or to inform the site-specific FRA to provide a robust assessment of fluvial flood risk to this site and the surrounding areas.
- The drain in the north of the site should be assessed for potential flood risk.
- Based on current information, this site could be allocated if development avoids the area at modelled fluvial risk in the modelled 1% AEP undefended event and the areas of the site at significant surface water risk.
- A drainage strategy will be required for any new development, given the extent of surface water flooding when considering climate change. The use of infiltration SuDS should be investigated.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from Earby Beck and the drain is fully ascertained.

5.3 FRA requirements and further work

- Any FRA must further consider the impacts of climate change on fluvial flood risk to the site, including for the drain in the north.
- Any FRA must further consider surface water flood risk including a drainage strategy which should include ground investigation for infiltration SuDS suitability.
- Any FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; Pendle Local Plan and LLFA policies; and national and local SuDS policy and guidelines.

4 Para 164 National Planning Policy Framework 2023

- Throughout the FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; UU; the highways authorities; and the emergency services.

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