

AMBIENTAL

ENVIRONMENTAL ASSESSMENT

Flood Risk Assessment 5953

Land East of Howdendyke Road,
Howden,
East Riding of Yorkshire,
DN14 7RA

Document Issue Record

Project: Phase 1 Flood Risk Assessment

Prepared for: David Orton

Reference: 5953

Site Location: Land East of Howdendyke Road, Howden, East Riding of Yorkshire, DN14 7RA

Proposed Development: It is understood that the development is for the construction of three horse stables (retrospective).

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1. Summary

- 1.1 Ambiental Environmental Assessment has been appointed by David Orton to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at Land East of Howdendyke Road, Howden, East Riding of Yorkshire, DN14 7RA.
- 1.2 It is understood that the retrospective development comprised of the construction of three horse stables.
- 1.3 The retrospective development is an extension to the existing site use, so could be considered as a 'Minor Development' under the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF). Therefore, the EA's Standing Advice for Minor Developments could be applied, whereby the Finished Floor Levels of the development should be no lower than the existing ground levels.
- 1.4 With reference to the Environment Agency (EA) Flood Map for Planning, the retrospective development is located within Flood Zone 3 and benefits from flood defences.
- 1.5 The development is considered "Less Vulnerable" under the Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF).
- 1.6 At the time of writing this report, detailed flood modelling had not been provided by the Environment Agency.
- 1.7 The site is location within an EA Flood Warning Service Area.
- 1.8 A summary of the flood risk to the site and any recommended mitigation measures is provided in the table below:

| Source | Summary of flood risk | Mitigation measures |
|----------------------------------|--|---|
| Tidal | <p>Flood Zone 3 – high risk of tidal flooding from River Ouse (EA Main River).</p> <p>Site is defended under normal circumstances.</p> <p>No detailed flood modelling available at time of writing.</p> | Site should continue to benefit from flood defences, so no further mitigation measures required. |
| Fluvial | <p>Several watercourses located around the site could pose flood risk.</p> <p>No detailed flood modelling available at time of writing. Furthermore, EA Flood Map for Planning indicates the site benefits from flood defences.</p> | |
| Surface | <p>The EA risk of surface water flooding online maps demonstrates that there is a very low risk of flooding at the location of the stables and the surrounding area.</p> | Mitigation measures not required. |
| Groundwater | <p>BGS Susceptibility to Groundwater Flooding map indicates that the retrospective development is in an area with the '<i>Potential for groundwater flooding to occur at the surface</i>' and partially in an area that is not identified as having an increased susceptibility to groundwater flood risk.</p> | Stables have already been constructed, so no further excavations or ground works required. No mitigation measures required. |
| Sewer | <p>East Riding of Yorkshire Council SFRA demonstrates that parts of the council area have been affected by sewer flooding in the past but provides no indication of the location of previous flood incidences.</p> | Due to nature of the development, retrospective stables should not be affected by sewer flooding. Mitigation measures not required. |
| Residual risk of flooding | <p>Site currently benefits from defences, so there's a risk of flooding in the unlikely event of breach or failure of nearby defences.</p> <p>No breach modelling or detailed flood modelling available at time of writing.</p> | Measures for mitigation are not required. |
| Climate change (tidal) | <p>Risk of flooding at the site could increase in the future. Should continue to benefit from tidal flood defences.</p> <p>No detailed flood modelling available at time of writing.</p> | |

Following the guidelines contained within the NPPF, the retrospective development is considered to be suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

| Development Description | Existing | Retrospective |
|---|---|--|
| Development Type: | Agricultural land | Development comprises of the retrospective construction of three stables. |
| EA Vulnerability Classification: | Less Vulnerable | Less Vulnerable |
| Ground Floor Level: | | |
| Impermeable Surface Area: | Existing site is agricultural land, so considered as wholly permeable. | Total footprint of the stable building is 100m ² |
| Surface Water Drainage: | Given that existing site is agricultural, it is considered that no formal drainage infrastructure is present. | Retrospective stable increase impermeable surface area on site. Given that site is mostly permeable, infiltration may be viable. |
| Site Size: | Approximate Land Ownership Area is 9,940m ² | Same as existing |
| Risk to Development | Summary | Comment |
| EA Flood Zone: | Flood Zone 3 | Area Benefitting from Flood Defences |
| Flood Source: | Fluvial | River Ouse (EA Main River) |
| 1:100 Year Flood Level | N/A | |
| 1:100 Year Flood Level & Climate Change | N/A | No EA flood data available for nearby EA Main River or for site. |
| 1:1000 Year Flood Level | N/A | |
| Recorded Flood Events in Area: | Yes | EA historic flood extents and June 2007 flood extent, according to East Riding of Yorkshire SFRA historic mapping online. |
| Recorded Flood Events at Site: | No | Site is not within a historic flood extent, according to East Riding of Yorkshire SFRA historic mapping online. |
| SFRA Available: | Yes | East Riding of Yorkshire Council Level 1 SFRA (2019). |
| Management Measures | Summary | Comment |
| Ground floor level above extreme flood levels: | N/A | No site-specific flood data available. Stables are in Flood Zone 3 (high risk) and benefit from flood defences. |
| Safe Access/Egress Route: | Yes | See Section 7 |
| Flood Resilient Design: | Yes | See Section 7 |
| Site Drainage Plan: | N/A | |
| Flood Warning & Evacuation Plan: | Yes | Site is in EA Flood Alert and Warning Service Area. |
| Offsite Impacts | Summary | Comment |
| Displacement of floodwater: | No | Stables are considered as floodable, so should not displace or increase floodwaters. |
| Increase in surface run-off generation: | Negligible | Stables are outside 1:1000-year pluvial event. |
| Impact on hydraulic performance of channels: | None | No works within 8m of EA Main River. |

Table 1 Summary of flood risks, impacts and proposed flood mitigation measures.
 N/A¹ not required for this assessment; N/A² data not available.

2. Development Description and Site Area

Development and Location

- 2.1 The development is located at Land East of Howdendyke Road, Howden, East Riding of Yorkshire, DN14 7RA (Figure 1).
- 2.2 This Flood Risk Assessment is for a retrospective planning application and the three stables already exist on site. It is understood that the development is for the construction of three horse stables.
- 2.3 The retrospective development is an extension to the existing site use, so could be considered as a 'Minor Development' under the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF).
- 2.4 Topographic levels within the footprint of the retrospective stables are between approximately 2.86m AOD and 3.21m AOD. The topography around the stables slopes downwards in a southern direction, as demonstrated in Figure 2.

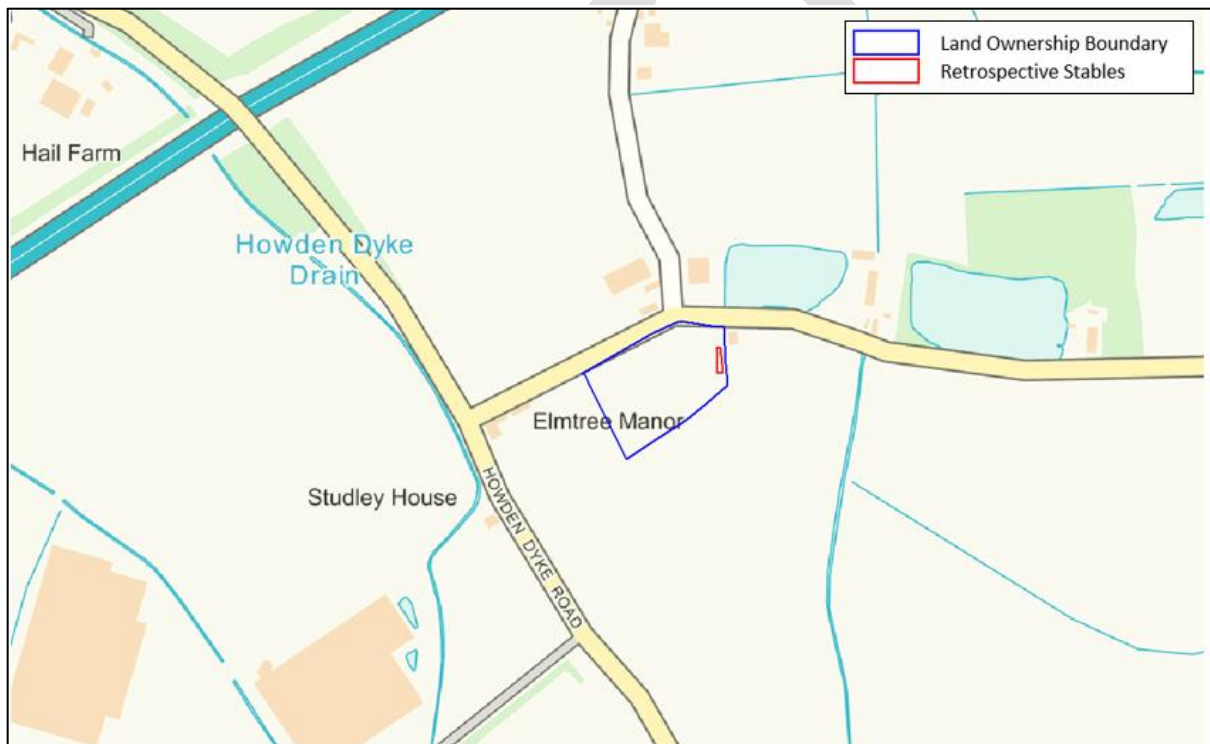


Figure 1 Location Map, identifying the location of the development (Source: OS)

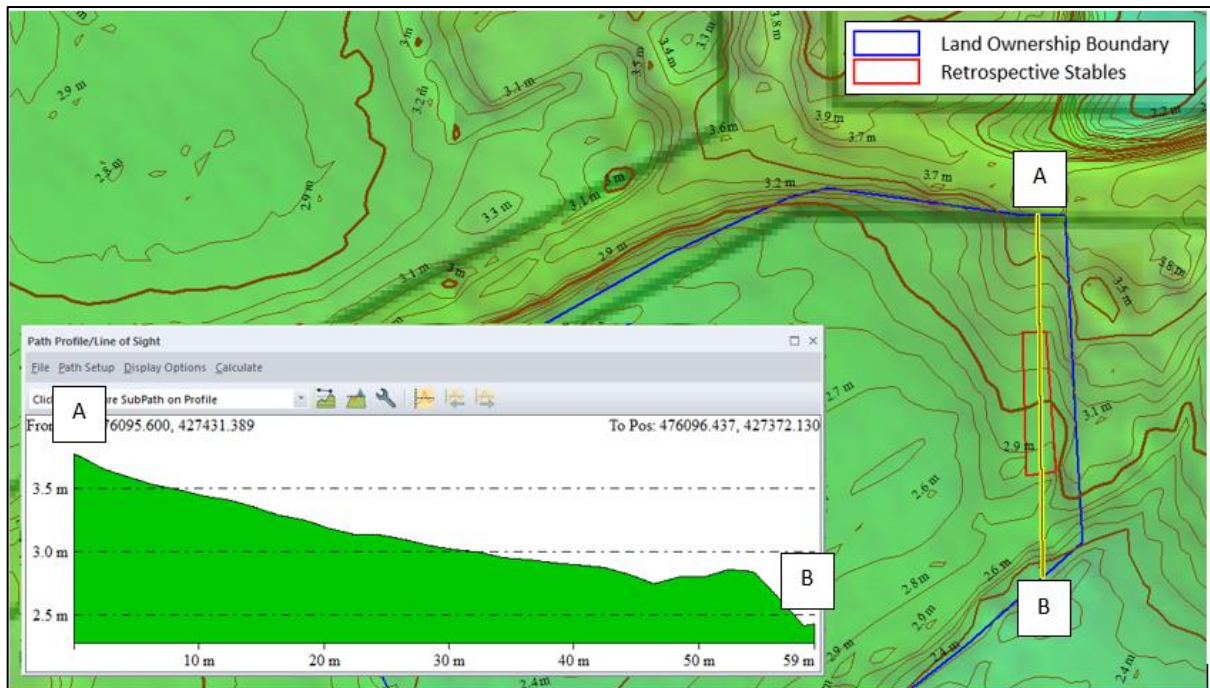


Figure 2 Cross-section of topography of stables, using EA 2m DTM LiDAR. Cross-section shown by yellow line and drawn from north to south. (Source: EA)

Vulnerability Classification

- 2.5 The EA Flood Map for Planning (Figure 3) demonstrates that the development lies within Flood Zone 3 and is in an area benefitting from flood defences. The Environment Agency defines Flood Zone 3 as an area with a high probability of greater than 1 in 100 (1%) of river flooding in any year.
- 2.6 The retrospective development is considered “Less Vulnerable” (land and buildings used for agriculture and forestry) under the Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF). There was no change in vulnerability to flood risk as a result of this development, as the existing site could also be considered as “Less Vulnerable”.
- 2.7 The retrospective development is an extension to the existing site use, so could be considered as a ‘Minor Development’ under the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF).

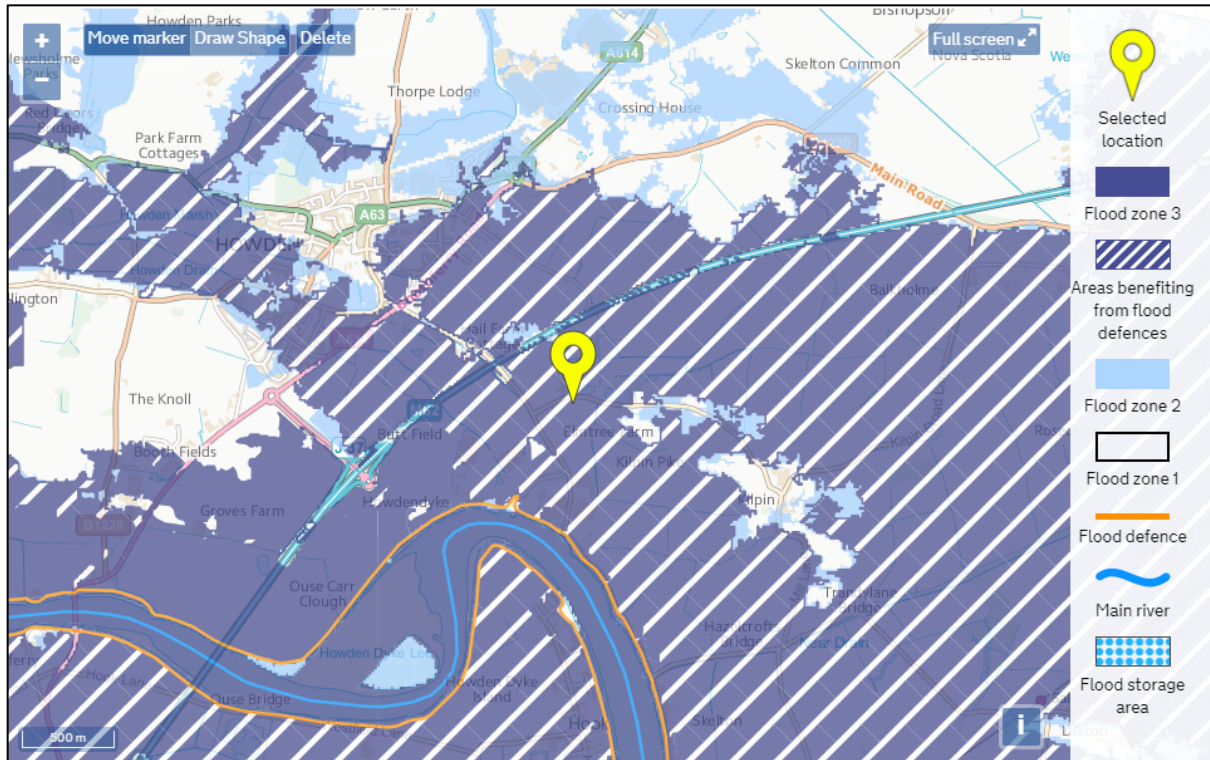


Figure 3 EA Flood Map for Planning, indicating location of stables (Source: EA)

Geology

- 2.8 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is Mercia Mudstone Group, comprising of mudstone (Source: BGS). This formation is considered to be a Secondary 'B' aquifer (Source: EA; Magic Map online resource. See Figure 4). A Secondary 'B' aquifer has low permeability but with limited groundwater available in fissures or thin geological horizons.

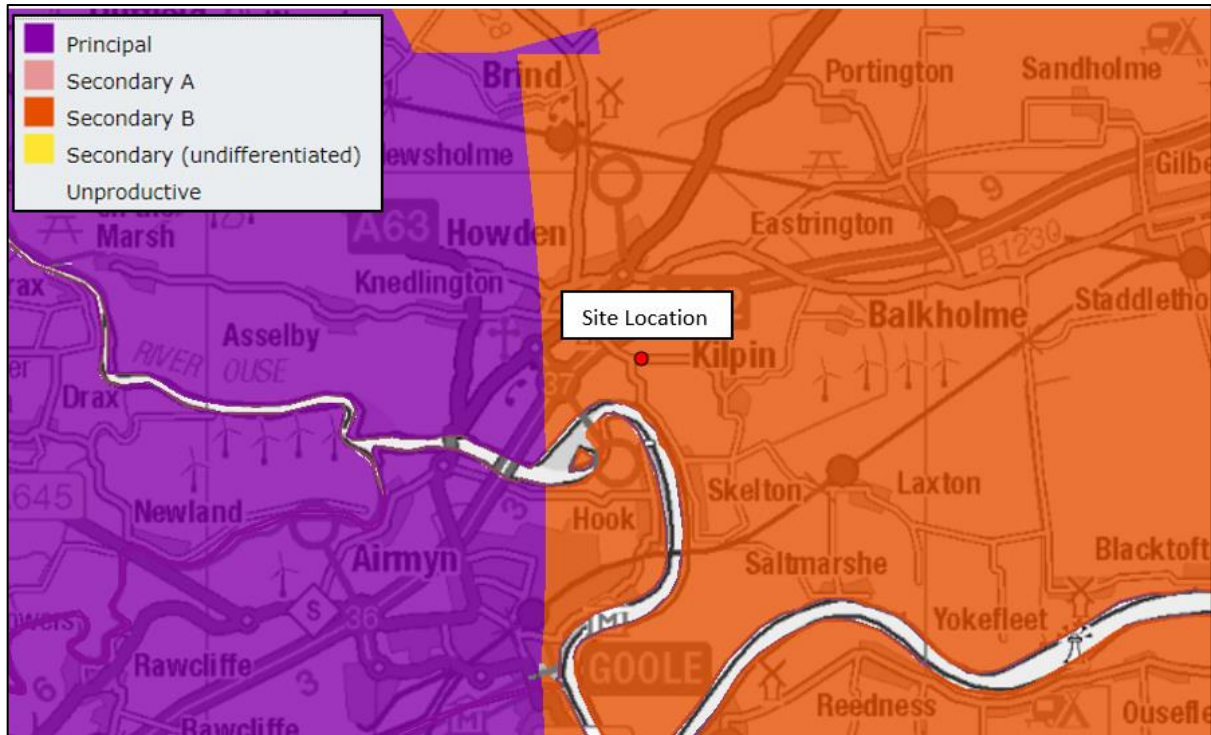


Figure 4 Aquifer Designation of Bedrock Geology, indicating location of site (Source: MagicMap online)

2.9 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the superficial deposits underlying the site are Alluvium, comprising of clay, silt, sand and gravel (Source: BGS). This formation is a Secondary 'A' aquifer (Source: EA; Magic Map online resource). A Secondary 'A' aquifer is permeable, supporting water supplies at a local scale and may contribute to base flow of rivers.

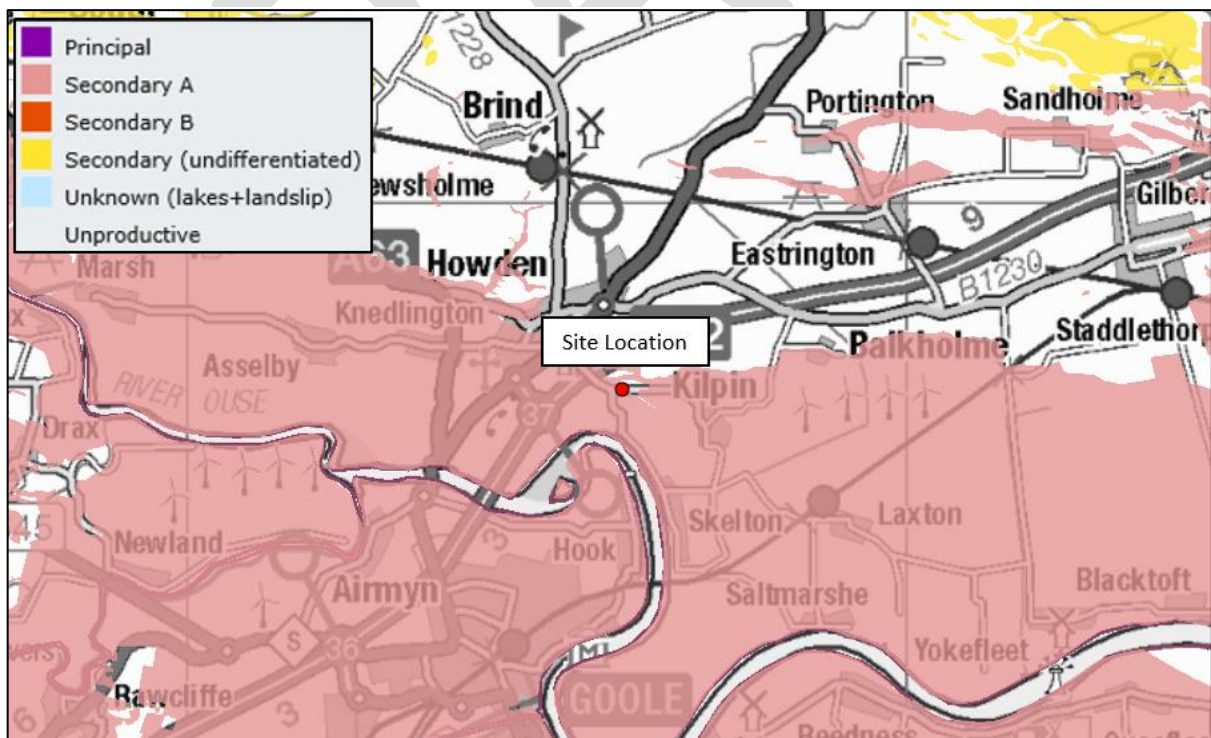


Figure 5 Aquifer Designation of Superficial Deposits Geology, indicating location of site (Source: MagicMap online)

2.10 The site is not within an EA groundwater Source Protection Zone, according to DEFRA’s MagicMap online. This is indicated in Figure 6.

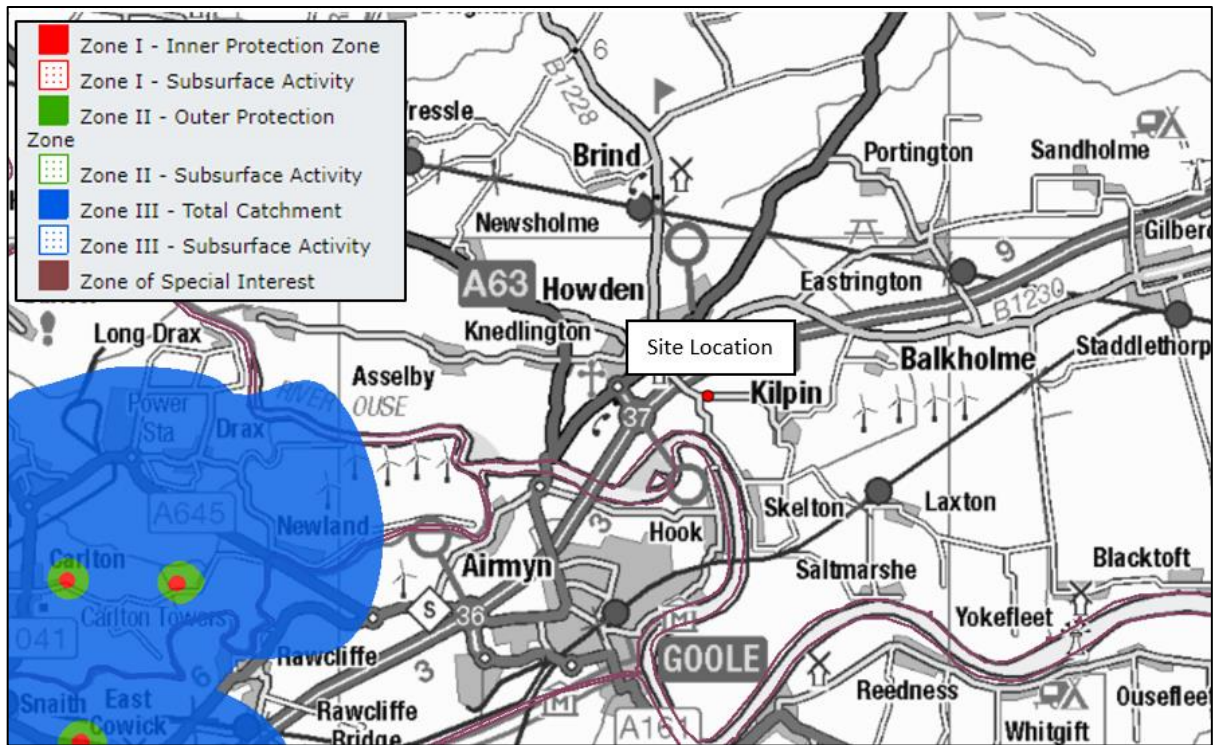


Figure 6 EA Groundwater Source Protection Zones, indicating location of site (Source: EA)

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3. Sequential Test/Exception Test

- 3.1 Under the NPPF, all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.
- 3.2 The Flood Risk and Coastal Change Planning Practice Guidance (PPG) *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below;

| Flood Risk Vulnerability Classification | | Essential Infrastructure | Water Compatible | Highly Vulnerable | More Vulnerable | Less Vulnerable |
|---|---|--------------------------|------------------|-------------------------|-------------------------|-----------------|
| Flood Zone | Zone 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Zone 2 | ✓ | ✓ | Exception Test Required | ✓ | ✓ |
| | Zone 3a | Exception Test Required | ✓ | ✗ | Exception Test Required | ✓ |
| | Zone 3b <i>Functional Floodplain</i> | Exception Test Required | ✓ | ✗ | ✗ | ✗ |

Table 2 The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF.
 Please note: ✓ means development is appropriate; ✗ means the development should not be permitted.

- 3.3 The retrospective development could be considered "Less Vulnerable" (land and buildings used for agriculture and forestry) under the Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF). The stables are in Flood Zone 3 (high risk).
- 3.4 Using the principles of the Sequential Test outlined above, "Less Vulnerable" developments are appropriate in Flood Zones 1, 2 and 3. As such, the retrospective development will not require the application of an Exception Test or Sequential Test.
- 3.5 It is understood that the development is for the construction of three horse stables. The stables are affected by Flood Zone 3, so it is required that a Flood Risk Assessment is undertaken for the development.
- 3.6 Given that the retrospective stables are in Flood Zone 3, the planning application submitted by the client is required to be accompanied by an FRA which shows the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and the surrounding area.

4. Site Flood Hazards

Sources of Flooding

4.1 The stables are located within Flood Zone 3 (high risk of flooding) and are considered to be 'Less Vulnerable' according to NPPF guidelines. Table 3 summarises the potential sources of flooding to the site:

| Source | Description |
|--------------------------|---|
| Tidal | Flood Zone 3 – River Ouse (EA Main River; tidal at this location). Site is protected by flood defences. |
| Fluvial | Several watercourses located around the site could pose flood risk. |
| Surface | Very low risk |
| Groundwater | 'Potential for groundwater flooding to occur at the surface' and partially in an area that is not identified as having an increased susceptibility to groundwater flood risk. |
| Sewer | Retrospective stables should not be affected by sewer flooding. |
| Historic flooding | Local area has been affected by flooding in the past. |

Table 3 Summary of flood sources.

Mechanisms and History of Flooding

4.2 The EA Flood Map for Planning demonstrates the site to be located within Flood Zone 3 (high risk of flooding). It is important to note that the EA Flood Map for Planning shows only the potential floodplain; the mitigating effects of any flood defences currently in place are not considered.

Tidal

4.3 The EA Flood Map for Planning (Figure 3) demonstrates that the development lies within Flood Zone 3 and is in an area benefitting from flood defences. The Environment Agency defines Flood Zone 3 as an area with a high probability of greater than 1 in 100 (1%) of river or tidal flooding in any year.

4.4 The East Riding of Yorkshire Council SFRA (2019) document indicates that the River Ouse is tidal in this area. It also states that this area (near Howden village) is protected from the River Ouse by a series of flood walls and embankments which run along its left bank.

4.5 The tidal River Ouse (EA Main River) flows approximately 700m south of the retrospective stables.

4.6 At the time of writing this Flood Risk Assessment, no Environment Agency modelled flood data had been provided. Thus, the flood level of the nearby River Ouse is not known.

4.7 Given that the EA Flood Map for Planning shows the site to be in an area which benefits from flood defences, and the East Riding of Yorkshire Council SFRA has stated that this area is protected from tidal flooding from the River Ouse, it is considered that the stables should benefit from flood defences up to the 1 in 200-year standard of protection.

- 4.8 As such, the retrospective stables should be defended against flooding during an extreme flood event. It should also be noted that stables generally have an open structure, so they can be considered as floodable, even if an extreme flood event were to occur.
- 4.9 Therefore, the risk of flooding from tidal sources to the retrospective development could be considered low, due to the protection provided by the flood defences.

Fluvial

- 4.10 The nearest watercourse (unnamed) to the retrospective stables is approximately 130m to the east. Howden Dyke Drain is approximately 240m south-west of the stables. Both of these ordinary watercourses drain into the River Ouse (EA Main River), which is circa 700m south of the stables.
- 4.11 These ordinary watercourses, as well as other watercourses surrounding the site, could pose a risk of flooding to the stables.
- 4.12 The site is in an area which benefits from flood defences, as shown by the EA Flood Map for Planning. Consequently, this site would not normally flood in up to a 1 in 100-year event, so flood compensation will not be required.

Surface Water (Pluvial)

- 4.13 The Environment Agency Flood Risk from Surface Water map (Figure 7) shows the proposed development to be within an area of 'Very Low' risk of flooding from surface water.
- 4.14 The following definitions of the annual surface water flood risk classifications are given by the EA:
- 'High Risk'; >3.3% AEP (more often than 1 in 30);
 - 'Medium Risk'; 3.3% to 1.1% AEP (between 1 in 30 and 1 in 100);
 - 'Low Risk'; 1% to 0.1% AEP (between 1 in 100 and 1 in 1000);
 - 'Very Low Risk'; <0.1% AEP (less often than 1 in 1000).
- 4.15 As such, the risk of surface water flooding to the retrospective stables could be considered very low.

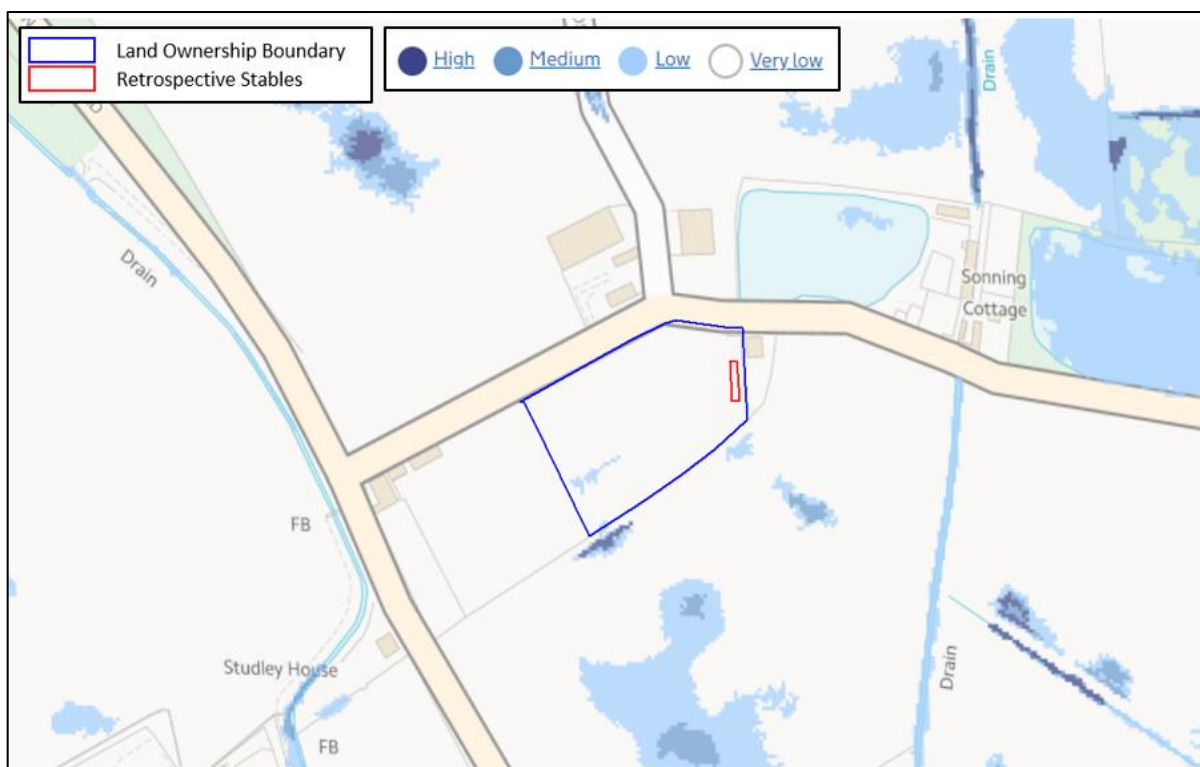


Figure 7 EA Surface Water Flood Risk Map, indicating site layout plan. (Source: EA)

Groundwater

- 4.16 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.
- 4.17 BGS Susceptibility to Groundwater Flooding mapping demonstrates that the stables lie within an area with 'Potential for groundwater flooding to occur at the surface' and partially in an area that is not identified as having an increased susceptibility to groundwater flood risk. This is demonstrated in Figure 8.
- 4.18 Given that the stables have already been built, there will be no further ground excavations are proposed as part of this development. Thus, the development should not increase the risk of groundwater flooding elsewhere. No further mitigation measures are proposed.

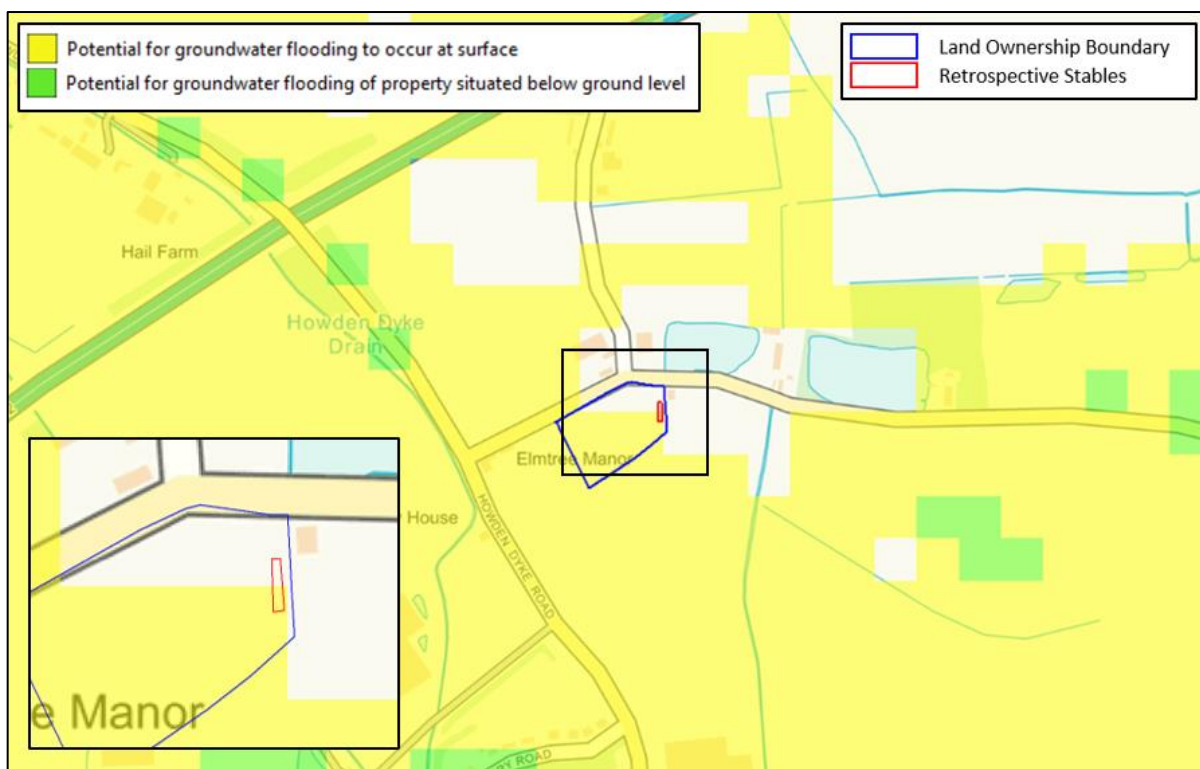


Figure 8: BGS Groundwater Susceptibility Map, indicating site layout (Source: BGS)

Sewer

- 4.19 The East Riding of Yorkshire Council Level 1 SFRA (2019) provides information on historic flood events which have occurred in the council area. It indicates that there have been several flood incidences within the council area which have involved sewer network or drainage system capacity issues. There is no map made available within the SFRA to indicate the location of these flood events. As such, it is not known whether the site has been affected by flooding in the past.
- 4.20 Given that the development is for three horse stables, it is considered that the development should not be affected by sewer flooding and should not require any mitigation against sewer flooding.

Surface Water Drainage Strategy

- 4.21 In order to mitigate flood risk posed by the development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at its source and the flood risk on/off site is not increased over the lifetime of the development.
- 4.22 Under the NPPF, following development, surface water runoff rates should be equivalent to (or below) the existing site run-off rate for all events up to the 1 in 100-year storm event, with an allowance for climate change.
- 4.23 It is understood that the development is for the construction of three horse stables. Using plans provided by the client, the built footprint is shown to be approximately 100m². The retrospective stables could be considered as an extension to the existing use on site and have a footprint less than 250m². Therefore, it is considered a 'Minor Development' under the Flood Risk and Coastal Change PPG and NPPF. As such, the retrospective development should not increase flood risks further than the existing site.
- 4.24 Generally, horse stables are open structures, so it is considered that the development is floodable if an extreme flood event were to occur.

4.25 The client has not yet provided any information detailing how surface water runoff is dealt with on the existing horse stables.

Records of Historical Flooding

4.26 Historic mapping provided on the East Riding of Yorkshire SFRA online mapping portal indicates that the local area has been affected by flooding in the past, during the June 2007 flood event and as identified by the EA historic flood extents. An extract of the historic flood mapping is shown in Figure 9, indicating the approximate location of the retrospective stables, which is shown to be located outside of the historic flood extents.

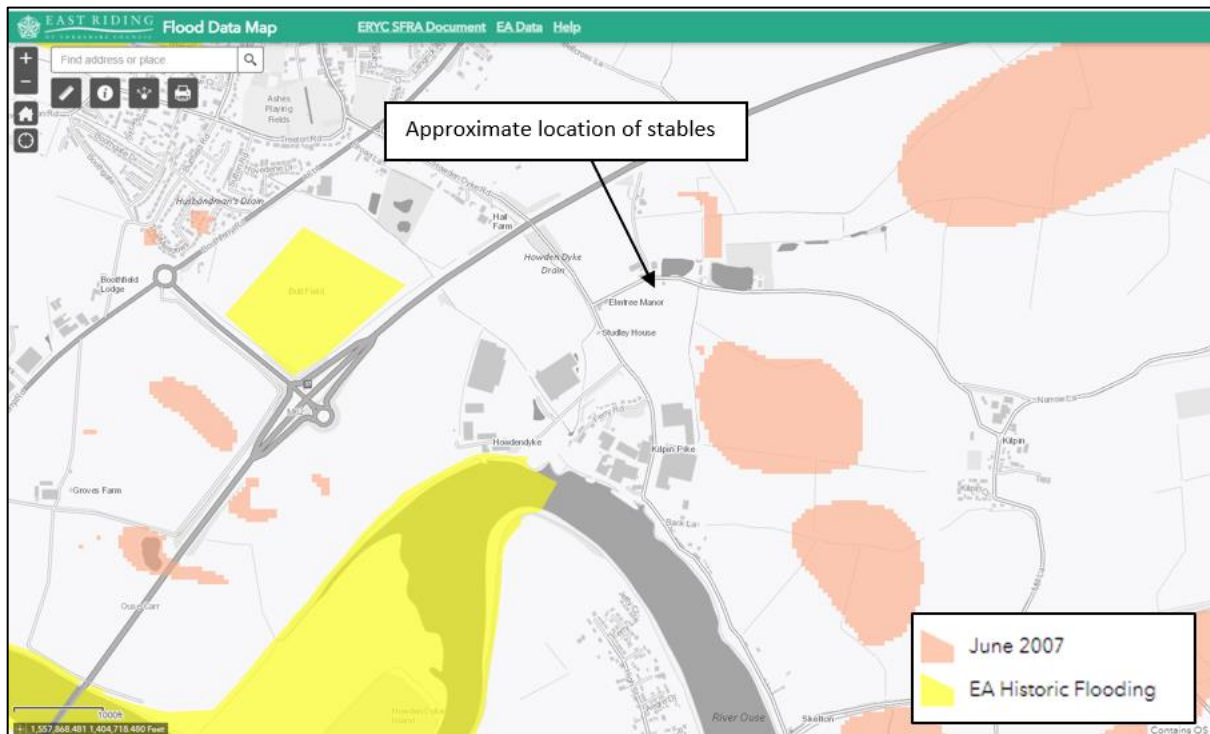


Figure 9: Historic flood extents, from East Riding of Yorkshire SFRA online mapping, indicating approximate location of stables

5. Probability of Flooding

Flood Zones

- 5.1 According to the EA Flood Map for Planning, the site is located within Flood Zone 3 (high risk of flooding).
- 5.2 The EA Flood Map for Planning has been produced in part using a relatively coarse, national scale flood modelling strategy, and in part by detailed modelling. It is important to note that only the potential floodplain is modelled; **the mitigating effects of any flood defences currently in place are not considered.** For reference, the definition of the NPPF flood risk zones is included below.

| Zone | Description |
|------|--|
| 1 | Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). |
| 2 | Medium Probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year. |
| 3a | High Probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. |
| 3b | The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes). |

Table 4 Definition of the NPPF Flood Zones. (Source: EA)

Climate Change on Site

- 5.3 Climate change is likely to increase the flow in rivers, raise sea levels and increase storm intensity. The range of allowances in *Table 5* is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.
- 5.4 The:
- central allowance is based on the 50th percentile
 - higher central is based on the 70th percentile
 - upper end is based on the 90th percentile
- 5.5 So, if the central allowance is 30%, scientific evidence suggests that it is just as likely that the increase in peak river flow will be more than 30% as less than 30%.
- 5.6 At the higher central allowance, 70% of the possible scenarios fall below this value. So, if the higher allowance is 40%, then current scientific evidence suggests that there is a 70% chance that peak flows will increase by less than this value, but there remains a 30% chance that peak flows will increase by more (Source: EA).

5.7 The risk of flooding to the site would, therefore, be expected to increase following the effects of climate change. The likely increases in peak rainfall intensity would also lead to an increased risk of surface water flooding.

| Flood Zone | Essential Infrastructure | Highly Vulnerable | More Vulnerable | Less Vulnerable | Water Compatible |
|------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|------------------|
| 1 | Central | Central | Central | Central | None |
| 2 | Upper End | Higher Central and Upper End | Higher Central and Upper End | Central and Higher Central | Central |
| 3a | Upper End | Development should not be permitted | Higher Central and Upper End | Central and Higher Central | Central |
| 3b | Upper End | Development should not be permitted | Development should not be permitted | Development should not be permitted | Central |

Table 5: Allowance and Flood Zone Table (Source EA)

- 5.8 The development is 'Less Vulnerable' and is located within Flood Zone 3 and an area that benefits from flood defences.
- 5.9 With reference to Table 5, 'Less Vulnerable' developments in Flood Zones 2 and 3a should consider the 'Central' and 'Higher Central' allowances.
- 5.10 At the time of writing this Flood Risk Assessment, the Environment Agency had not provided any detailed modelled flood data.
- 5.11 The retrospective stables may be at an increased risk of tidal flooding in the future, due to its proximity to the tidally dominated River Ouse (EA Main River). Currently, the stables benefit from flood defences on the nearby River Ouse.

6. Residual Risks

Identification of Residual Risks

- 6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:
- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
 - failure of a reservoir, or;
 - a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

Defence Breach

- 6.2 The site benefits from tidal flood defences, so there is a residual risk of flooding to the site, from breach or failure of defences.
- 6.3 At the time of writing this report, no EA detailed flood information has been provided for the site, including any breach modelling data. Ambiental have also reviewed the mapping provided on the East Riding of Yorkshire Council online mapping portal and have not found any breach modelling for this area.
- 6.4 Due to the lack of breach modelling data available, Ambiental have conducted a conservative analysis of breach flooding, using guidance provided in the Flood Risks to People Document (FD2321).
- 6.5 Using the EA's 2m LiDAR, a cross-section of the topography around the nearest flood defences to the site indicate that the crest levels are approximately 6.0mAOD. This is shown in Figure 10.
- 6.6 Ambiental have not received modelled flood data for the River Ouse at the time of writing this report. As such, Ambiental have taken a conservative approach to estimate the potential flooding that could occur as a result of a breach in flood defences by using the flood defence height to represent the flood level. Normally, a 600mm freeboard is expected between the tidal water level and the top of flood defences. Thus, using the top of the defence levels to represent the flood level could be considered to be an overestimate of the water level of the River Ouse.
- 6.7 Topographic levels within the footprint of the retrospective stables are between approximately 2.86mAOD and 3.21mAOD. As such, when this is compared with the approximate defence crest level of 6.0mAOD, it is demonstrated that the existing defence crest level is approximately 2.79m to 3.14m higher than the existing topographic levels. This level of 6.0mAOD represents the water level in this analysis. With reference to the Flood Risks to People Guidance shown in Table 6, the site could be considered to be in an area of 'Danger for Most' in the unlikely event of a defence breach (Head above floodplain is 3m and Distance between site and breach is 1000m in calculation).
- 6.8 Thus, this crude calculation demonstrates that the site of the retrospective stables could be at risk of flooding in the unlikely event of flooding due to breach in the nearby River Ouse tidal flood defences.

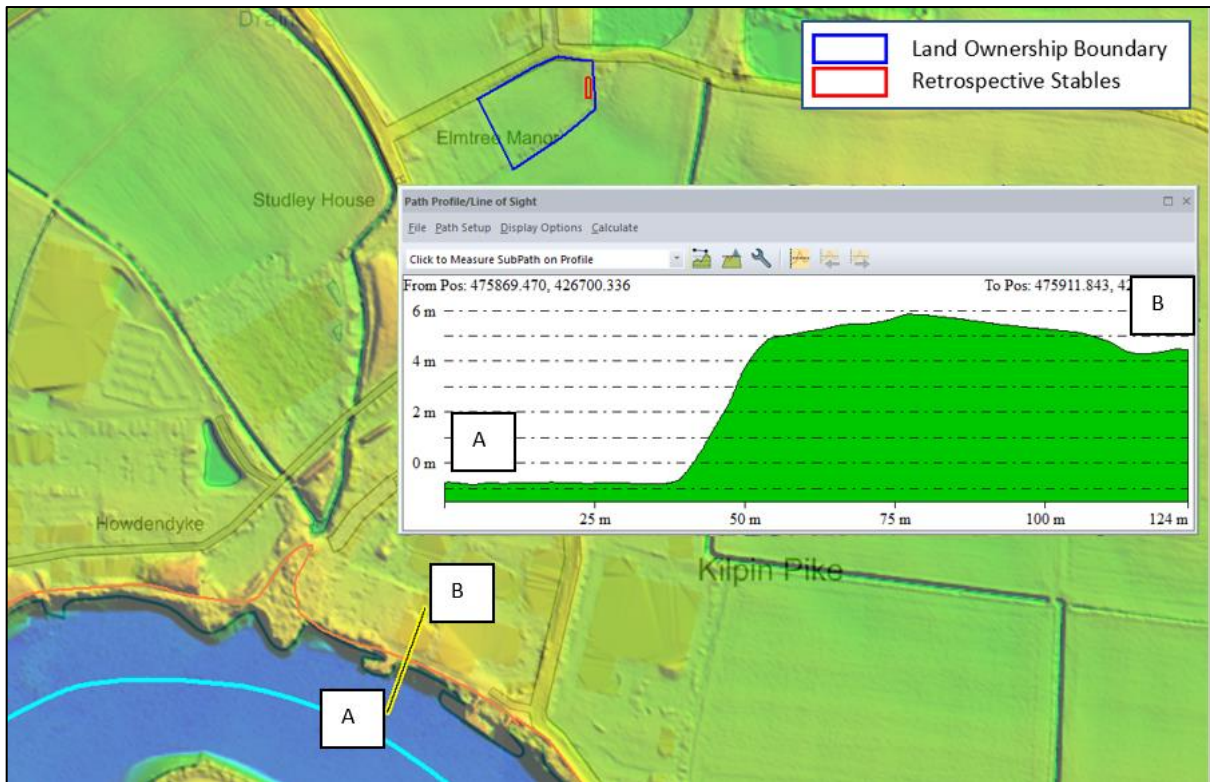


Figure 10: Cross-section of topography of nearby defences, to show approximate crest level of defences (Source: EA)

| Distance from breach (m) | Head above floodplain (m) | | | | | | |
|--------------------------|---------------------------|---|---|---|---|---|---|
| | 0.5 | 1 | 2 | 3 | 4 | 5 | 6 |
| 100 | | | | | | | |
| 250 | | | | | | | |
| 500 | | | | | | | |
| 1000 | | | | | | | |
| 1500 | | | | | | | |
| 2000 | | | | | | | |
| 2500 | | | | | | | |
| 3000 | | | | | | | |
| 3500 | | | | | | | |
| 4000 | | | | | | | |
| 4500 | | | | | | | |
| 5000 | | | | | | | |

Key:

- Danger for some
- Danger for most
- Danger for all

Table 6: DEFRA Flood Risk to People guidance - Danger to People from Breaching Relative to Distance from Defence

Reservoir Failure

6.9 The EA Risk from Reservoir Flooding Map demonstrates that the site is outside flood extents in the event of reservoir flooding. This is shown in Figure 11.

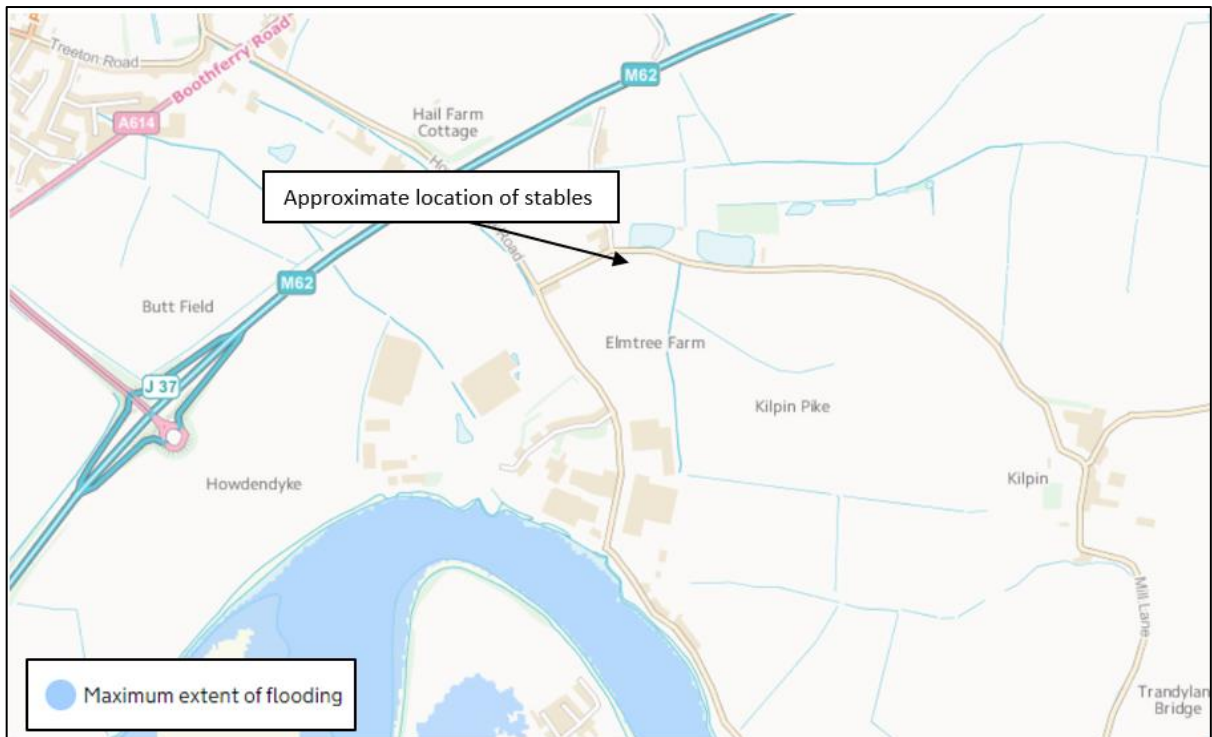


Figure 11: Extract from EA Risk from Reservoir Flooding map, indicating approximate location of stables (Source: EA)

Drainage Exceedance

6.10 In the event of drainage failure/exceedance, overland flows would be dictated by external topography. The topography surrounding the retrospective stables slopes downwards in a southerly direction, so it is considered that any overland flows will be directed in this direction.

7. Flood Risk Management Measures

Flood Risks

7.1 It is understood that the retrospective development is for the construction of three horse stables.

7.2 The following mitigation measures are recommended:

- Site users should sign up to the EA Flood Warning Service, if they have not done so already and they should consider whether to conduct a Flood Evacuation Plan for the site.

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8. Off Site Impacts

Impact to Flood Risk Elsewhere

- 8.1 The retrospective horse stables are in Flood Zone 3. Under normal circumstances, the site should be defended against tidal flooding from the River Ouse. Thus, the retrospective development should not displace floodwaters.
- 8.2 Furthermore, horse stables have an open structure, so it is considered that the development is a floodable asset. As such, if an extreme flood event occurs, floodwater could pass into building, so it is considered that any increase in flood risk elsewhere is negligible.

Generation of Runoff

- 8.3 In order to mitigate flood risk posed by the development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at its source and the flood risk on/off site is not increased over the lifetime of the development.
- 8.4 Under the NPPF, following development, surface water runoff rates should be equivalent to (or below) the existing site run-off rate for all events up to the 1 in 100-year storm event, with an allowance for climate change.
- 8.5 It is understood that the development is for the construction of three horse stables. Using plans provided by the client, the built footprint is shown to be approximately 100m². The retrospective stables could be considered as an extension to the existing use on site and have a footprint less than 250m². Therefore, it is considered a 'Minor Development' under the Flood Risk and Coastal Change PPG and NPPF. As such, the retrospective development should not increase flood risks further than the existing site.
- 8.6 Generally, horse stables are open structures, so it is considered that the development is floodable if an extreme flood event were to occur.
- 8.7 The client has not yet provided any information detailing how surface water runoff is dealt with on the existing horse stables.

9. Conclusion

- 9.1 Ambiental Environmental Assessment has been appointed by David Orton to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at Land East of Howdendyke Road, Howden, East Riding of Yorkshire, DN14 7RA.
- 9.2 It is understood that the retrospective development comprised of the construction of three horse stables.
- 9.3 The retrospective development is an extension to the existing site use, so could be considered as a 'Minor Development' under the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF). Therefore, the EA's Standing Advice for Minor Developments could be applied, whereby the Finished Floor Levels of the development should be no lower than the existing ground levels.
- 9.4 With reference to the Environment Agency (EA) Flood Map for Planning, the retrospective development is located within Flood Zone 3 and benefits from flood defences.
- 9.5 The development is considered "Less Vulnerable" under the Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the principles of the National Planning Policy Framework (NPPF).
- 9.6 At the time of writing this report, detailed flood modelling had not been provided by the Environment Agency.
- 9.7 The site is location within an EA Flood Warning Service Area.
- 9.8 A summary of the flood risk to the site and any recommended mitigation measures is provided in the table below:

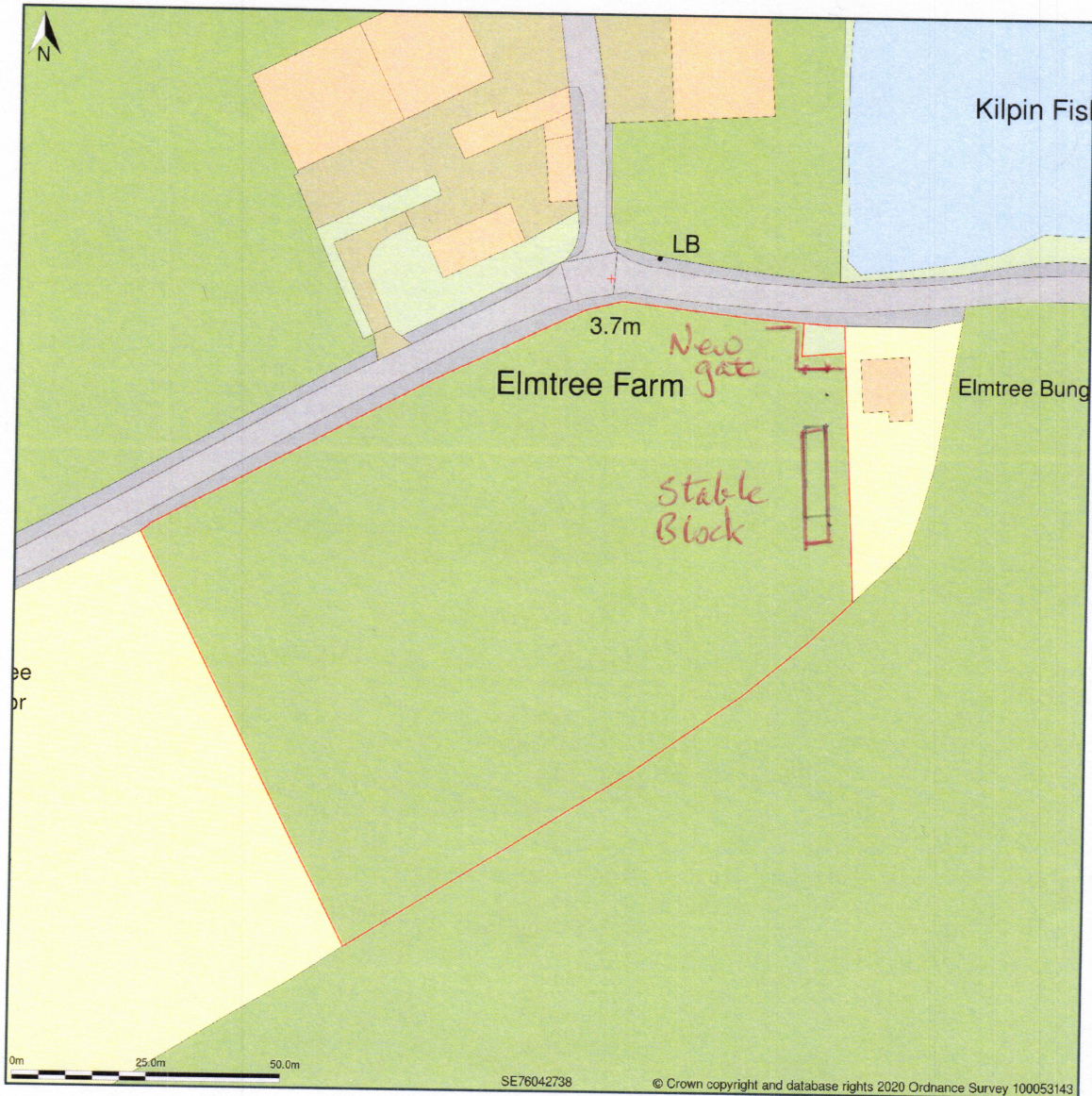
| Source | Summary of flood risk | Mitigation measures |
|----------------------------------|---|---|
| Tidal | <p>Flood Zone 3 – high risk of tidal flooding from River Ouse (EA Main River).</p> <p>Site is defended under normal circumstances.</p> <p>No detailed flood modelling available at time of writing.</p> | Site should continue to benefit from flood defences, so no further mitigation measures required. |
| Fluvial | <p>Several watercourses located around the site could pose flood risk.</p> <p>No detailed flood modelling available at time of writing. Furthermore, EA Flood Map for Planning indicates the site benefits from flood defences.</p> | |
| Surface | The EA risk of surface water flooding online maps demonstrates that there is a very low risk of flooding at the location of the stables and the surrounding area. | Mitigation measures not required. |
| Groundwater | BGS Susceptibility to Groundwater Flooding map indicates that the retrospective development is in an area with the ' <i>Potential for groundwater flooding to occur at the surface</i> ' and partially in an area that is not identified as having an increased susceptibility to groundwater flood risk. | Stables have already been constructed, so no further excavations or ground works required. No mitigation measures required. |
| Sewer | East Riding of Yorkshire Council SFRA demonstrates that parts of the council area have been affected by sewer flooding in the past but provides no indication of the location of previous flood incidences. | Due to nature of the development, retrospective stables should not be affected by sewer flooding. Mitigation measures not required. |
| Residual risk of flooding | <p>Site currently benefits from defences, so there's a risk of flooding in the unlikely event of breach or failure of nearby defences.</p> <p>No breach modelling or detailed flood modelling available at time of writing.</p> | Measures for mitigation are not required. |
| Climate change (tidal) | <p>Risk of flooding at the site could increase in the future. Should continue to benefit from tidal flood defences.</p> <p>No detailed flood modelling available at time of writing.</p> | |

Following the guidelines contained within the NPPF, the retrospective development is considered to be suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

Site Plans

Appendix I -

Land to the east of Howdendyke road, Howdendyke Road, Howden, East Riding Of Yorkshire, DN14 7RA

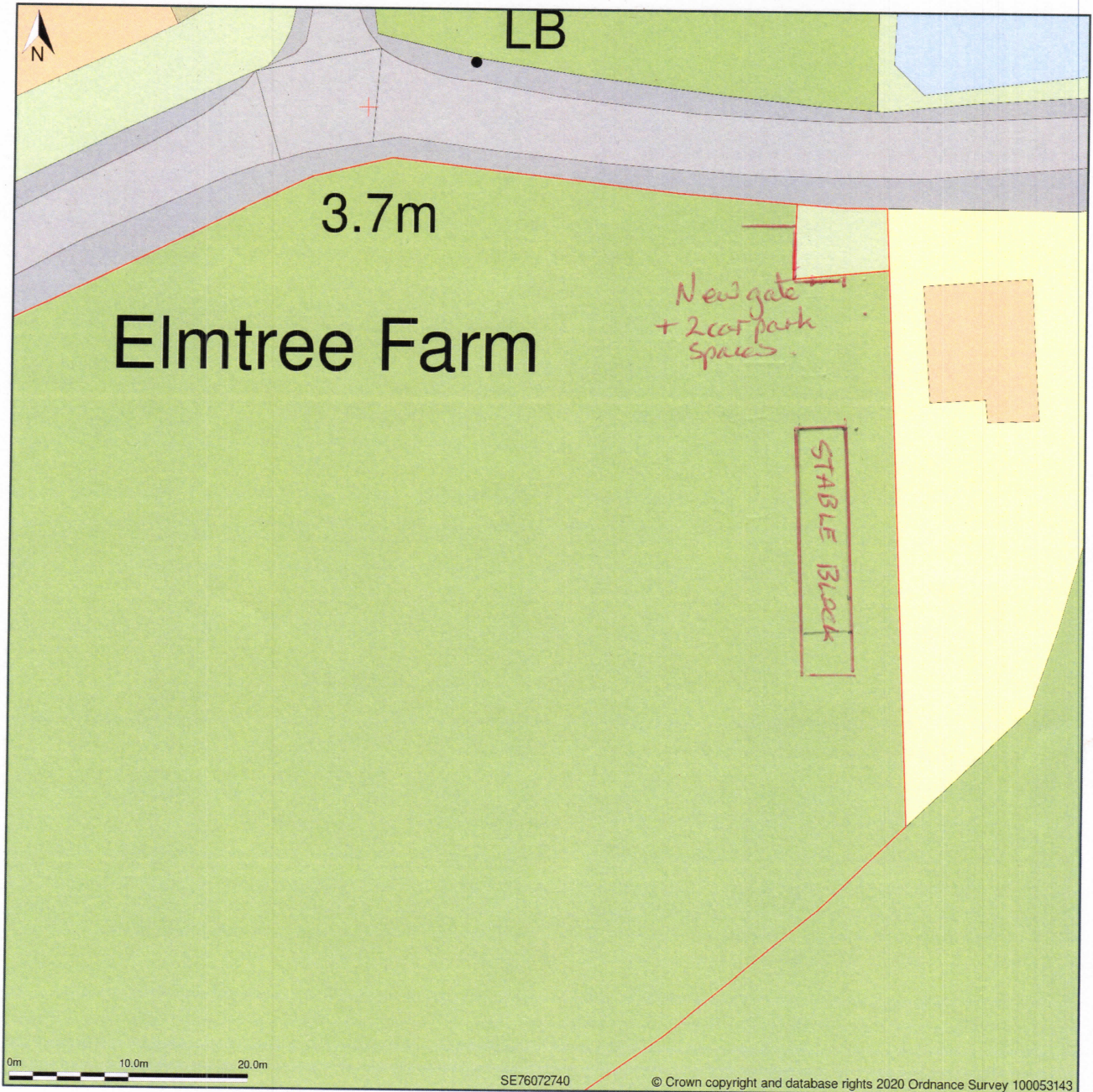


Site Plan shows area bounded by: 475946.49, 427289.06 476146.49, 427489.06 (at a scale of 1:1250), OSGridRef: SE76042738. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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Land to the east of Howdendyke road, Howdendyke Road, Howden, East Riding Of Yorkshire, DN14 7RA



Block Plan shows area bounded by: 476027.4, 427358.5 476117.4, 427448.5 (at a scale of 1:500), OSGridRef: SE76072740. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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