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Flood Risk Assessment AEG4203_DN14_Goole_01

Site Address: Kemira Chemicals UK Ltd
New Potter Grange Road 5
Goole
DN14 6BZ

UK Experts in Flood Modelling, Flood Risk
Assessments, and Surface Water Drainage Strategies

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Document Issue Record

Project: Flood Risk Assessment

Prepared for: Kemira Chemicals UK Ltd

Reference: AEG4203_DN14_Goole_01

Site Location: Kemira Chemicals UK Ltd, New Potter Grange Road 5, Goole, DN14 6BZ

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Table of Contents

Summary	1
1. Introduction.....	3
Site Overview.....	3
Planning Policy and Guidance	5
2. Planning Policy.....	6
National Planning Policy Framework (NPPF)	6
Local Planning Policy	8
Sequential and Exception Tests.....	9
Summary.....	10
3. Consultation and Review	11
Consultation	11
Documents and Online Mapping.....	11
4. Sources of Flood Risk.....	14
Fluvial/Tidal	14
Canals	24
Pluvial	25
Reservoirs	31
Groundwater	32
Sewers	34
5. Flood Risk Mitigation	35
Fluvial/Tidal	35
Pluvial	36
Sewer.....	36
Canals, Reservoirs, and Groundwater	36
Increase to Flood Risk Elsewhere	36
Flood Warnings.....	36

6. Conclusions.....	38
Appendix A - Development Proposals.....	40
Appendix B - Consultation.....	41

Summary

Development Description	Existing	Proposed
Development Type	Commercial premises	Construction of a small extension of the existing process building, a change of use for the builders merchants to become a raw materials storage facility and a conveyor system between the two.
EA Vulnerability Classification	Less Vulnerable	Less Vulnerable
Ground Floor Level	Based on EA 1m LiDAR, the ground levels across the site boundary range from approximately -0.14m AOD to 3.08m AOD.	FFLs to remain unchanged. FFLs of proposed extension to be set no lower than those of the existing building.
Impermeable Surface Area	Approximately 11,150m ² - site is entirely hardstanding	No change – extension to be constructed atop existing hardstanding.
Surface Water Drainage	N/A ¹	Given there is no increase in hardstanding, the discharge of runoff is to remain as per existing.
Site Size	Approximately 11,150m ² based on site plans	
Development Size	Total area of extension approximately 135m ² (115m ² + 20m ²) based on site plans.	
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zone 3	
Flood Source	Tidal/Fluvial	River Ouse
SFRA Available	East Riding of Yorkshire Council Strategic Flood Risk Assessment: Level 1 (East Riding of Yorkshire Council, 2019) and the Goole Level 2 Strategic Flood Risk Assessment (East Riding of Yorkshire Council, 2020)	
Management Measures	Summary	Comment
Ground floor level above extreme flood levels	FFLs to remain unchanged.	FFLs to be set no lower than existing in line with EA standing advice for minor developments. In addition, given the nature of the operations on site, FFLs cannot be set higher than existing.
Safe Access/Egress Route	N/A	Considering that the development is a minor development (extension to existing commercial premises), existing access/egress arrangements would

Flood Resilient Design		remain unchanged post-development compared to the existing situation.
	Recommended	Details of flood resilience and resistance techniques should be included in accordance with ' <i>Improving the flood performance of new buildings</i> ' (DCLG, 2007)
	N/A	Given there is no increase in hardstanding, the discharge runoff is to remain as per existing.
Site Drainage Plan	N/A	Given there is no increase in hardstanding, the discharge runoff is to remain as per existing.
Flood Warning and Evacuation Plan	Yes	Recommended to sign up to the River Ouse at Goole, and River Aire at Rawcliffe and Rawcliffe Bridge Environment Agency (EA) flood warning service.
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	The proposed development is considered as a Minor Development. Site also unaffected in modelled 1.0% AEP +CC fluvial event and as such should have a negligible impact on flood risk elsewhere.
Increase in surface run-off generation	N/A ¹	Given there is no increase in hardstanding, there is no increase in surface run-off and therefore discharge is to remain as per existing.
Impact on hydraulic performance of channels	Negligible	No Change. Proposed development footprint located approximately 200m from the nearest mapped watercourse.

¹ not required for this assessment

² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Kemira Chemicals UK Ltd to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

- 1.3. The site of the proposed development is Kemira Chemicals UK Ltd, New Potter Grange Road 5, Goole, DN14 6BZ (Figure 1).

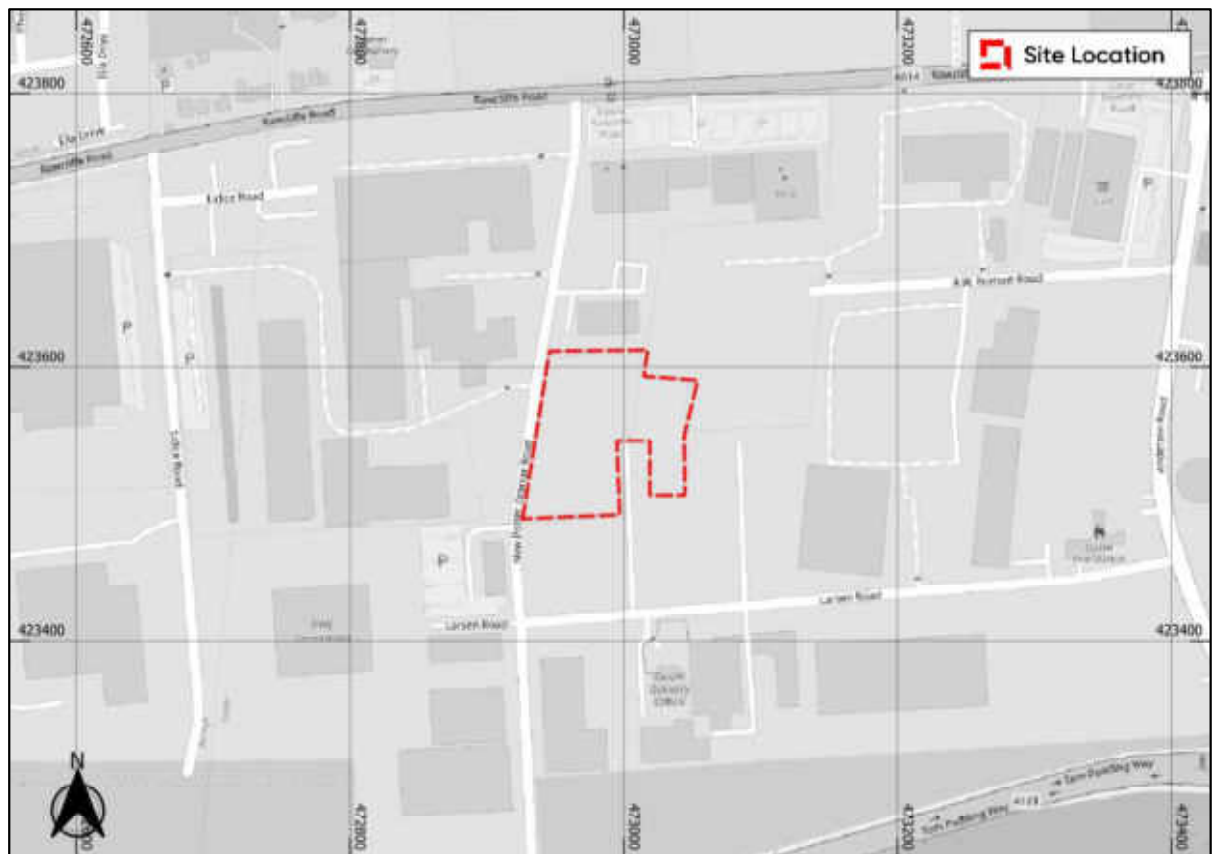


Figure 1: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.4. The proposed development is for the construction of a small extension to the existing process building, a change of use for the builders merchants to become a raw materials storage facility and a conveyor system between the two – ultimately to extend the existing Kemira Chemicals operations. For development proposal plans refer to Appendix A.

- 1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site (Figure 2).
- 1.6. Based on the 1m DTM LiDAR, the ground levels across the site boundary range from approximately -0.14m Above Ordnance Datum (AOD) to 3.08m AOD.

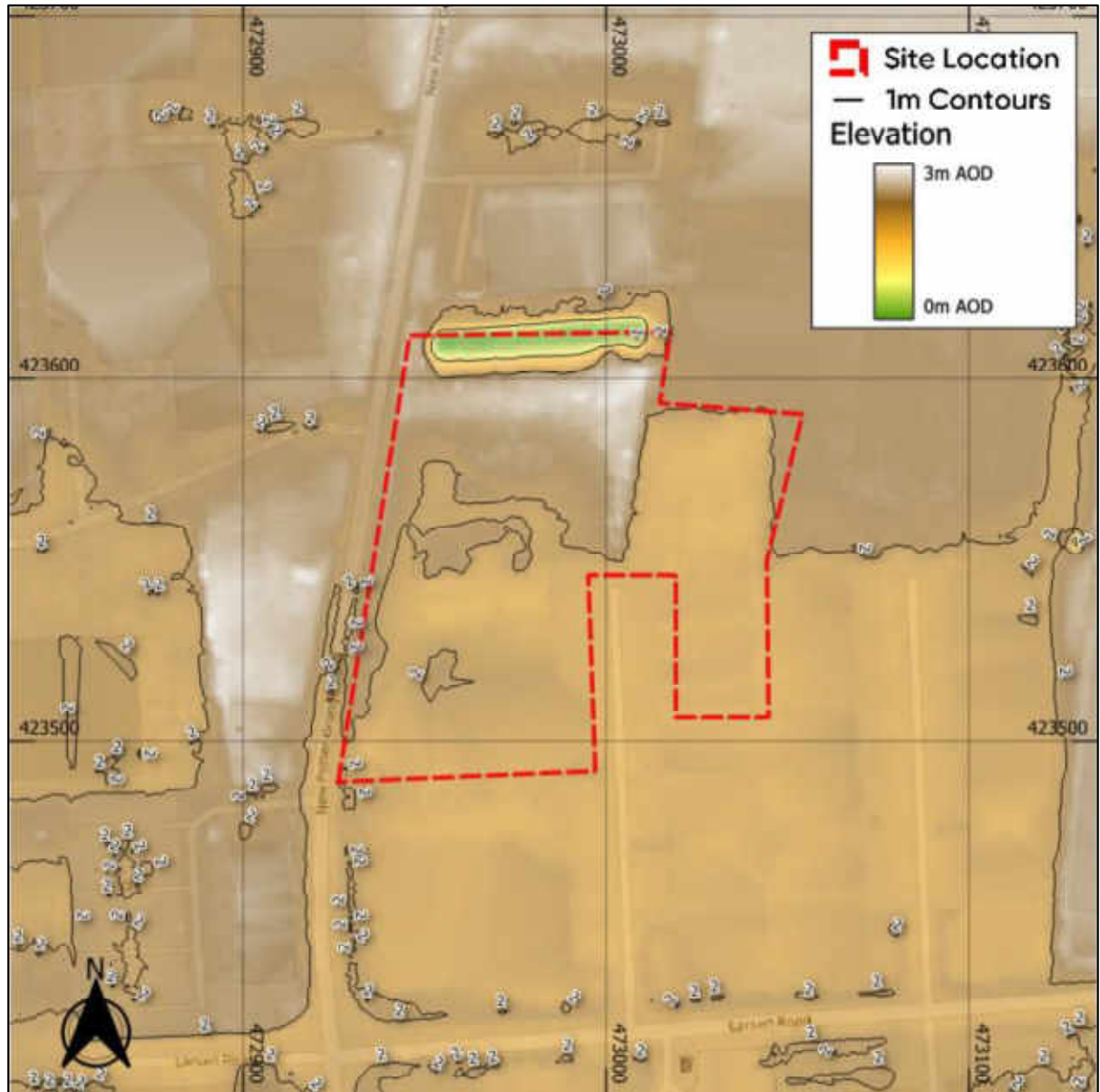


Figure 2: Site Topography (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 1.7. East Riding of Yorkshire Council is the Local Planning Authority (LPA) for the site and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Yorkshire region.

Planning Policy and Guidance

1.8. UK government planning guidance states¹ that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

1.9. The site is located within Flood Zone 3 and therefore an FRA is required in accordance with the NPPF.

1.10. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial/Tidal flood risk
- Surface water flood risk
- Risk of flooding from other sources

¹<https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

2. Planning Policy

- 2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

National Planning Policy Framework (NPPF)

- 2.2. The National Planning Policy Framework² (NPPF) (DLUHC, 2023) which includes UK Government policy on development and flood risk states:

165. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

173. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

174. Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.

- 2.3. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

²<https://www.gov.uk/guidance/national-planning-policy-framework>, last updated Dec 2023

Minor development means:

- **minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 250 square metres.**
- *alterations: development that does not increase the size of buildings, e.g. alterations to external appearance.*
- *householder development: for example, sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling (eg subdivision of houses into flats) or any other development with a purpose not incidental to the enjoyment of the dwelling.*

2.4. The proposed extension to the building itself is less than 250m² and as such, the proposal would be considered a Minor Development under the PPG. The remainder of the application is for the change of use of the builder's merchants land to expand the Kemira Chemicals operations.

2.5. Footnote 59 of the NPPF states:

A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or

land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

- 2.7. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.8. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Local Planning Policy

- 2.9. The East Riding Local Plan 2012-2029³ prepared by the Local Planning Authority, East Riding of Yorkshire Council, sets out the policies for development in the local area.
- 2.10. Policy ENV6.1: Managing environmental hazards: Flood risk outlines the requirements for new development within the area. It states:

- B. The risk of flooding to development will be managed by applying a Sequential Test to ensure that development is steered towards areas of lowest risk, as far as possible. The Sequential Test will, in the first instance, be undertaken on the basis of the East Riding of Yorkshire Strategic Flood Risk Assessment (SFRA) and the Environment Agency's Flood Map, within appropriate search areas. Where development cannot be steered away from Flood Zone 3, the sub-delineation of Zone 3a, detailed within the relevant SFRA, will be used to apply the Sequential Test, with preference given to reasonably available sites that are in the lower risk/hazard zones. Where necessary, development must also satisfy the Exception Test.

- C. If, following application of the Sequential Test, it has not been possible to successfully steer development to Flood Zone 1 or a sequentially preferable site, a Sequential Approach will be taken to site layout and design, aiming to steer the most vulnerable uses towards the lowest risk parts of the site and upper floors.

- D. Flood risk will be proactively managed by:

- 1. Ensuring that new developments:*

³<https://downloads.eastriding.org.uk/corporate/pages/east-riding-local-plan/Strategy%20Document%20-%20Adopted%20April%202016%20lo.pdf>

- i. limit surface water run-off to existing run-off rates on greenfield sites, and on previously developed land reduce existing run-off rates by a minimum of 30%, or to greenfield run-off rate;
 - ii. do not increase flood risk within or beyond the site;
 - iii. incorporate Sustainable Drainage Systems (SuDS) into major development proposals and proposals at risk of flooding, unless demonstrated to be inappropriate;
 - iv. do not culvert or otherwise build over watercourses, unless supported by the Risk Management Authority;
 - v. have a safe access/egress route from/to Flood Zone 1 or establish that it will be safe to seek refuge at a place of safety within a development;
 - vi. incorporate high levels of flood resistant and resilient design if located in a flood risk area;
 - vii. are adequately set-back from all watercourses including culverted stretches; and
 - viii. adhere to other relevant SFRA recommendations.
- 2. Supporting proposals for sustainable flood risk management, including the creation of new and/or improved flood defences, water storage areas and other schemes, provided they would not cause unacceptable adverse environmental, social, or economic impacts.
- 3. Supporting the removal of existing culverting and returning these sections to open watercourse.
- 4. Designating areas of Flood Zone 3b (Functional Floodplain) and safeguarding land for current and future flood risk management, on the Policies Map.

2.11. The East Riding Local Plan 2012-2029 does not provide any specific guidance on minor developments, from a flood risk point of view.

Sequential and Exception Tests

2.12. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

2.13. The proposed development is viewed as minor development in accordance with the EA standing advice. In accordance with NPPF paragraph 174, minor developments should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.

2.14. In addition, the change of use of the builders merchants land is to expand the existing Kemira Chemicals operations and thus it would not be practical to locate this additional raw materials storage facility elsewhere.

Summary

2.15. This flood risk assessment has been prepared with due consideration to the above local and national policy.

3. Consultation and Review

Consultation

- 3.1. The EA have provided a Product 4 and Product 6 dataset upon request which have been utilised in this report, a copy of the Product 4 will be provided in Appendix B.
- 3.2. This report and its inherent conclusions will be informed by the modelling outputs provided as part of Product 6, unless specifically stated otherwise.

Documents and Online Mapping

- 3.3. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.
- 3.4. The following sources of information have been reviewed for this assessment:
 - Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
 - Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
 - National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023)
 - Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
 - Geindex Onshore (British Geological Survey, 2023)
 - East Riding Local Plan 2012-2029 (East Riding of Yorkshire Council, 2016)⁴
 - East Riding of Yorkshire Council Strategic Flood Risk Assessment: Level 1 (East Riding of Yorkshire Council, 2019)⁵

⁴<https://downloads.eastriding.org.uk/corporate/pages/east-riding-local-plan/Strategy%20Document%20-%20Adopted%20April%202016%20lo.pdf>

⁵[https://downloads.eastriding.org.uk/corporate/pages/strategic-flood-risk-assessment/Strategic%20Flood%20Risk%20Assessment%20\(Level%201\)%20-%20Main%20Report.pdf](https://downloads.eastriding.org.uk/corporate/pages/strategic-flood-risk-assessment/Strategic%20Flood%20Risk%20Assessment%20(Level%201)%20-%20Main%20Report.pdf)

- East Riding of Yorkshire Council Strategic Flood Risk Assessment: Level 2 Goole (East Riding of Yorkshire Council, 2020)⁶
- East Riding of Yorkshire Council Preliminary Flood Risk Assessment (East Riding of Yorkshire Council, 2011)⁷
- East Riding of Yorkshire Council Local Flood Risk Management Strategy 2015 – 2027 (East Riding of Yorkshire Council, 2015)⁸

Preliminary Flood Risk Assessment (PFRA)

- 3.5. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority East Riding of Yorkshire Council. The flood risk from all sources, including fluvial, surface water, groundwater, and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.
- 3.6. The PFRA summarises historical flood incidents in East Riding of Yorkshire Council. The site is not recorded as having been affected by any flood event.

Strategic Flood Risk Assessment (SFRA)

- 3.7. The Level 1 SFRA, published in 2019, and the Goole Level 2 SFRA, published in 2020, provide the evidence base for the Local Planning Authority East Riding of Yorkshire Council Local Plan and guidance for consideration when determining planning applications. The SFRA's seek to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.8. The SFRA mapping provided by East Riding of Yorkshire Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.
- 3.9. Both the Level 1 and Level 2 SFRA's make reference to the Section 19 Flood Investigation Reports. The Goole Floods August 2011 & July 2012 Flood Investigation Report does not provide any records of flooding at the site.
- 3.10. The Level 2 SFRA shows the site to be located within the “overtopping region” of Goole. According to the SFRA, FFL's should be set to 600mm above the design flood level (including climate change, breach and overtopping scenarios). **The only exception is for operational need for certain parts of the development.**

⁶ <https://www.eastriding.gov.uk/download/easysite-asset-780300/>

⁷ <https://downloads.eastriding.org.uk/corporate/pages/local-flood-risk-management-strategy/Preliminary%20Flood%20Risk%20Assessment%202011.pdf>

⁸ <https://downloads.eastriding.org.uk/corporate/pages/local-flood-risk-management-strategy/Local%20Flood%20Risk%20Management%20Strategy.pdf>

Local Flood Risk Management Strategy (LFRMS)

- 3.11. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives, and actions of the Lead Local Flood Authority.
- 3.12. The East Riding of Yorkshire Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

4. Sources of Flood Risk

Fluvial/Tidal

- 4.1. Flooding from watercourses (fluvial flooding) arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.
- 4.2. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the river bank or river defences when tide levels are high.
- 4.3. The site is located within Fluvial/Tidal Flood Zone 3 as shown in Figure 3.
- 4.4. Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%) and a risk of flooding from tidal sources greater than 1 in 200 (0.5%). As such, the site can be considered to be at a high risk of fluvial/tidal flooding.



Figure 3: EA Flood Map for Planning (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Main Rivers and Ordinary Watercourses

- 4.5. The closest EA main river to the site is the River Don (Dutch River), located approximately 1.1km south. The site is also located approximately 1.9km west of the River Ouse, another EA Main River. Both of these are classified as tidal rivers.
- 4.6. The Aire and Calder Navigation (Knottingley and Goole Canal) is located approximately 960m south of the site and is classified as a Main River.
- 4.7. There are a number of ordinary watercourses surrounding the site, as presented in Figure 4.

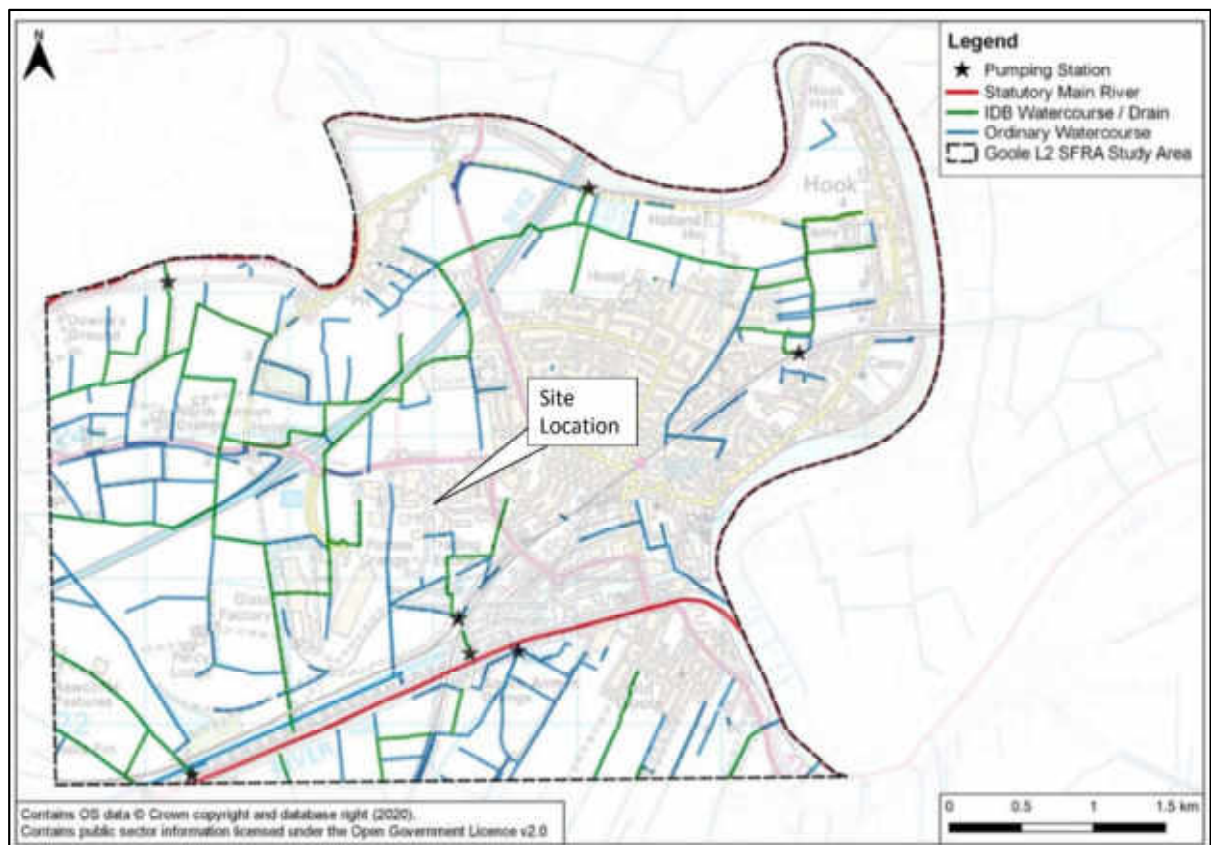


Figure 4 Goole Watercourses (Goole Level 2 SFRA, 2020)

- 4.8. The Goole Level 2 SFRA provides further information on the watercourses within the site's vicinity:

Hook Drain is a major riparian watercourse serving Goole. It consists of an open channel section discharging north to Hook Clough pumping station and a culverted section along Long Lane and Thorntree Lane which drains to the open channel section via a flapped outfall. It also discharges south into the North Street trunk sewer and from there to Lock Hill pumping station. Several public sewers, lateral drains and minor watercourses discharge into Hook Drain within the culverted section. Flow from the open channel back into the culverted section is prevented by the flap valve. Hook Drain discharges into the North Street trunk sewer.

EA Data

4.9. The EA have provided Product 4 data in the form of PDF maps centred around the site location. In addition, Product 6 data has been provided from the 2016 Upper Humber Flood Risk Mapping Study, including QGIS Outputs for various Defended, Undefended and Breach Scenarios, for both present day and climate change events.

Present Day, Combined (Fluvial and Tidal), Defended Scenario

4.10. Figure 5 presents the modelled flood outlines for the 1%, 0.5% and 0.1% present day, combined, defended events.

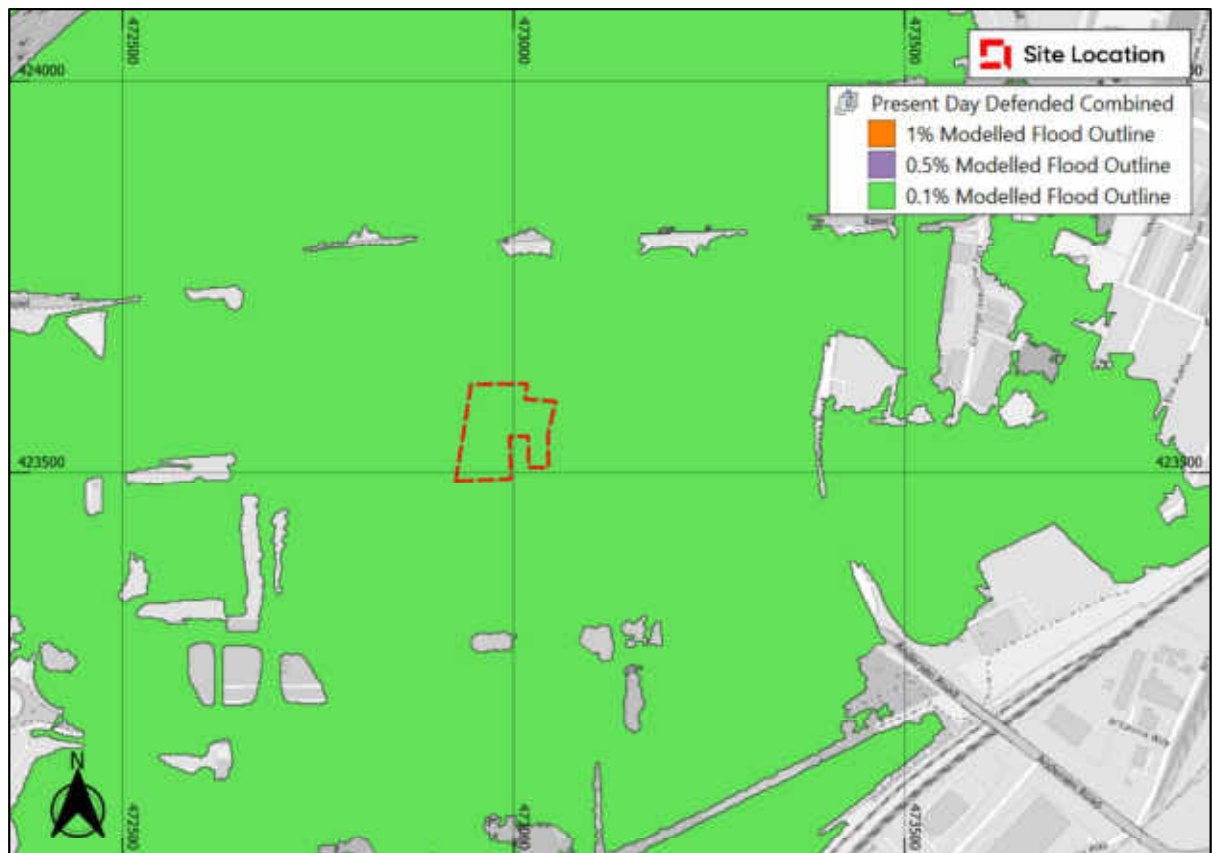


Figure 5 EA Product 6 Present Day, Combined, Defended Modelled Flood Outlines (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.11. As is evident from Figure 5, the site is outside the modelled extents of the 1% AEP and 0.5% AEP events, however it is expected to be affected in the 0.1% AEP present day, combined, defended event.

4.12. Figure 6 presents the expected flood depths for the 0.1% AEP present day, combined, defended event.

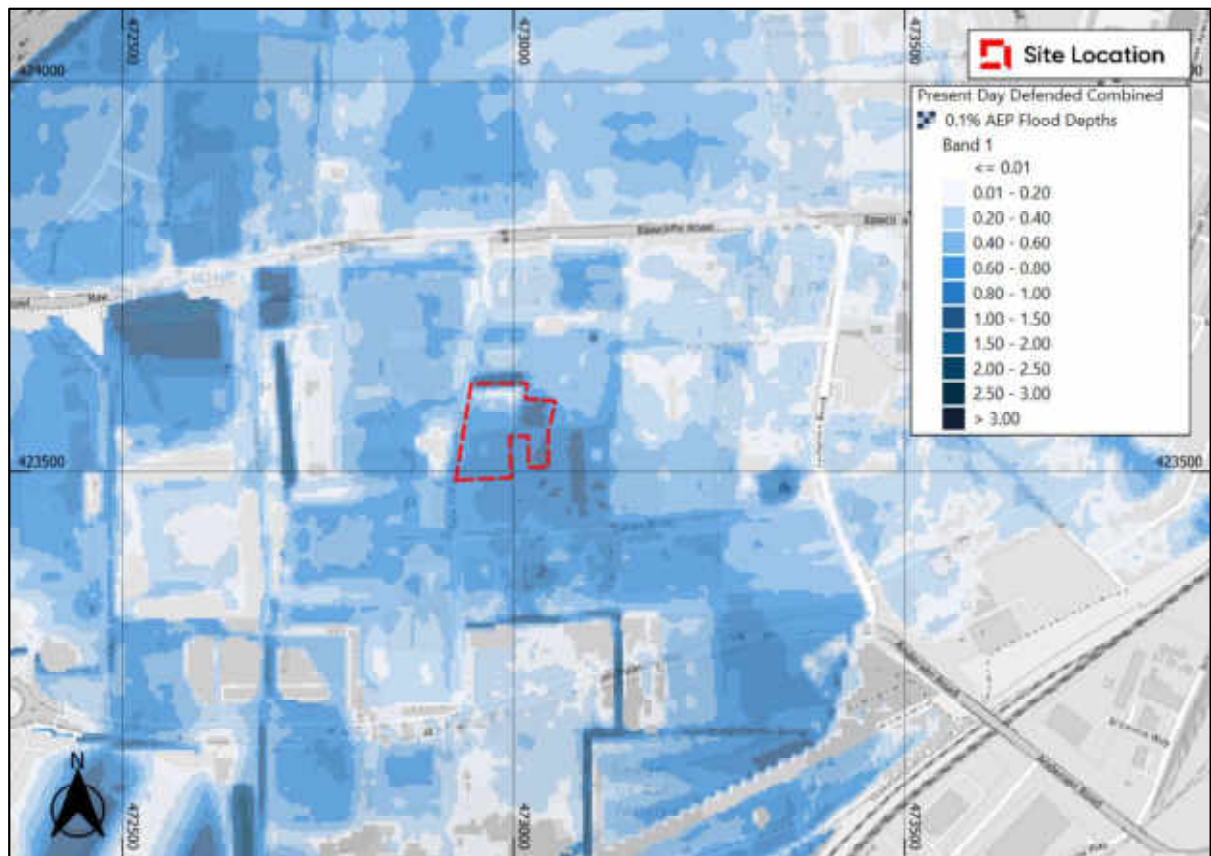


Figure 6 EA Product 6 0.1% AEP Combined Defended Flood Depths (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.13. After interrogation of the modelled flood depth layer in QGIS Software, the site could reach flood depths up to 1.48m within the north edge of the site boundary. The majority of the site is expected to experience flood depths of 0.6m – 1m, with some sections within the eastern and northern edges expected to experience flood depths of 1m – 1.5m.

4.14. The area of the proposed extension itself is in an area of expected depths of 0.6m – 1m.

Climate Change, Combined, Defended Scenario

4.15. Figure 7 presents the modelled flood outlies for the 0.5% AEP + 20%CC and 1% AEP + 20%CC Defended Scenarios.

4.16. The site lies within the Don and Rother Management Catchment, which has updated central peak flow river allowances of 11% for the 2020s, 15% for the 2050s and 28% for the 2080s. As the development is for the extension of a commercial premises, the peak river flow allowance of 15% would be required for fluvial flood flows.

4.17. As is evident from Figure 7, the site is expected to remain unaffected in both the 0.5% AEP + 20%CC and 1% AEP + 20%CC Defended, Combined events. No modelled flood outline of the 0.1% AEP + 20%CC event was provided.



Figure 7 EA Product 6 Climate Change Scenarios (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Undefended and Breach Scenarios

- 4.18. As the site is not expected to experience flooding up to and including the defended 0.5%AEP + 20% CC flood level, the flood risk from undefended scenarios can therefore be considered residual risk and not necessary for this analysis.
- 4.19. The flood risk from a breach event should in theory be considered a design scenario in accordance to the *gov.uk* guidance. The breach flood level for the 0.5%AEP was assessed as 3.12m AOD, which shows the whole site and its vicinity to be submerged, as shown in Figure 8.
- 4.20. The flood depths shown in Figure 8 put the site under over 2m of water depth.
- 4.21. However, when comparing the LiDAR elevation dataset against the flood level, the flood depths appear to be generally in the range of 500mm to 1m. Nevertheless, it is important for the mitigation measures to be derived from the modelled flood level of 3.12m AOD rather than flood depth given the potential discrepancies between current LiDAR and the LiDAR used in the EA model.

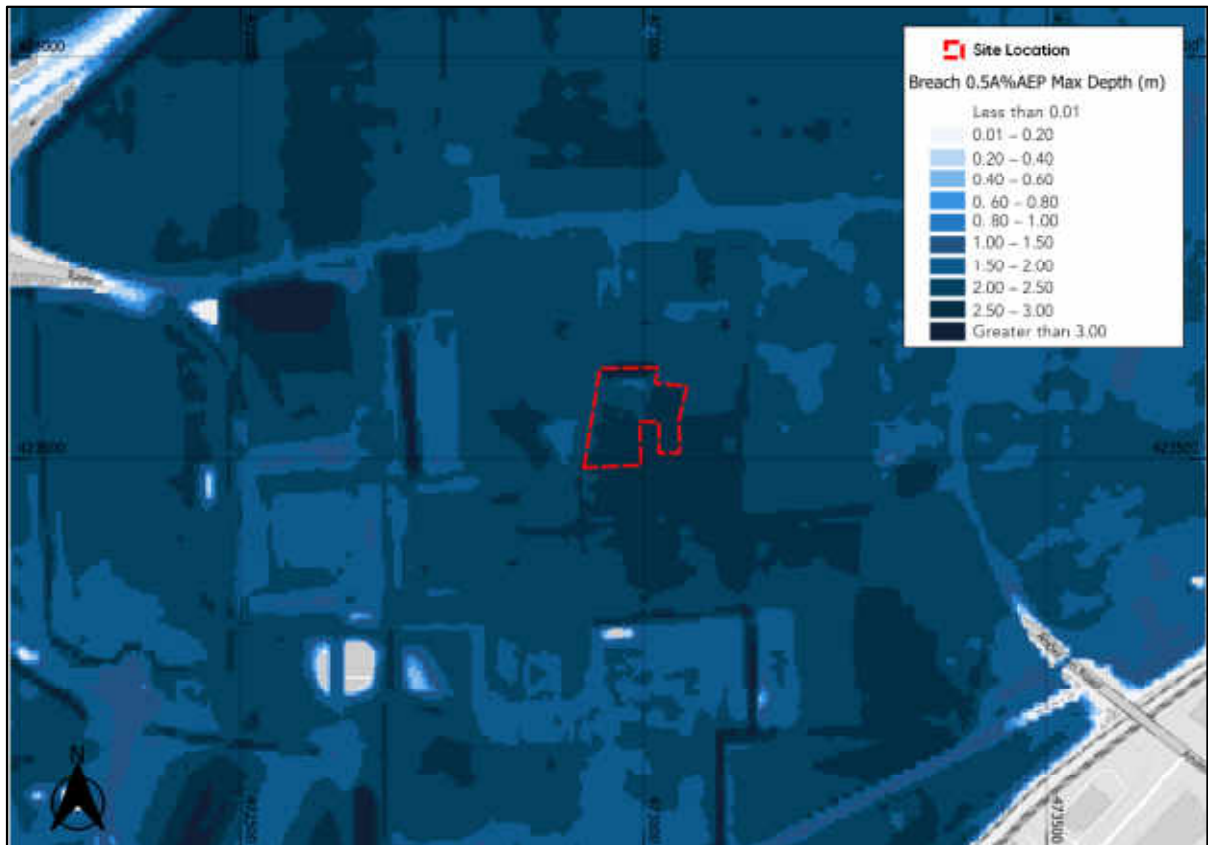


Figure 8 EA Product 6 Breach 0.5%AEP flood depths (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Flood Defence

4.22. The EA have also provided a Flood Defence Asset Map for the site location, presented in Figure 9.

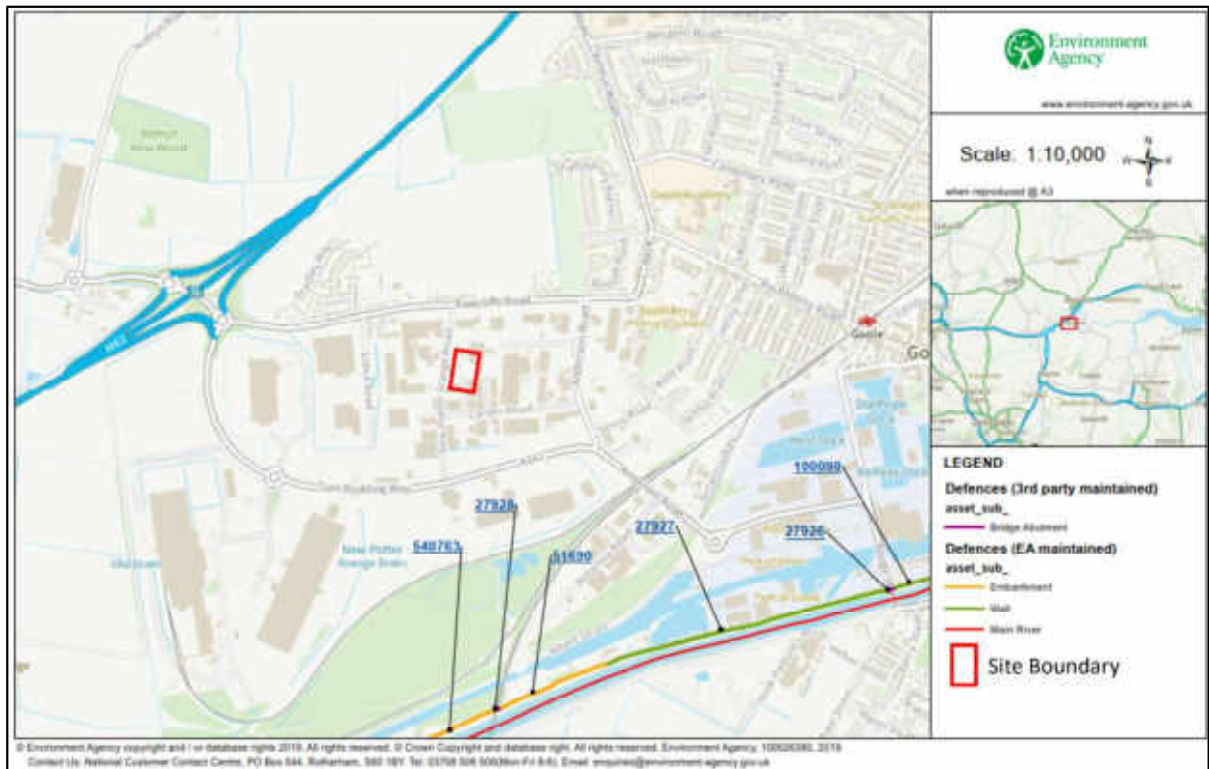


Figure 8 Fluvial/Tidal Flood Defences (EA Product 4)

4.23. The EA have included Defence tables providing further information for the assets presented in Figure 8.

4.24. Table 3 presents the EA Maintained Defence Assets.

Table 2 EA Maintained Defences

Defences (EA Maintained)						
Asset ID	Description	Asset Type	Protection	Target Condition	Overall Condition	Design Standard of Protection (SOP)
100090	Vermuyden Terrace Flood Wall	Wall	Fluvial/Tidal	2	2	200
27927	Dutch River Side Flood Wall	Wall	Fluvial/Tidal	2	3	200
51690	Upper Goole Docks Embankment	Embankment	Fluvial/Tidal	2	3	200
540783	No Info	Embankment	Fluvial/Tidal	3	3	No Info

4.25. Table 4 presents the 3rd Party Maintained Defence Assets.

Table 3 3rd Party Maintained Defence Assets

Defences (3rd Party Maintained)							
Asset ID	Description	Asset Maintainer	Asset Type	Protection	Target Condition	Overall Condition	Design Standard of Protection (SOP)
27926	Old Goole Bridge north abutment	Private individual, Company or Charity	Bridge Abutment	Fluvial/Tidal	No Info	No Info	200
27928	Dutch River Rail Bridge north abutment	Private individual, Company or Charity	Bridge Abutment	Fluvial/Tidal	No Info	No Info	200

4.26. The Goole SFRA (2020) provides further information on the use of flood defences within vicinity:

*Flood defences are any asset that provides defence to flooding or coastal protection functions and can be formed of structures, buildings or parts of buildings. Usually a number of assets will be used in combination to manage flood risk to an area. Goole and the surrounding area generally has a ground level of 2 to 4 metres above ordnance datum (AOD). This is significantly below the Mean High Water Spring level and the estimated 1% annual exceedance probability (AEP) level for the River Ouse. As such, Goole and the surrounding area is **heavily reliant on flood defences** to prevent regular inundation.*

*The right bank of the **River Ouse** as it flows past Goole is lined by a series of flood walls and embankments. These defences have a design standard of protection of **0.5% AEP against fluvial and tidal flooding**. The **Dutch River** is also lined by a series of flood walls and embankments along both banks, providing protection to the docks and Old Goole from tidal and fluvial flooding. These defences have a design standard of **0.5% AEP**.*

In addition to the fluvial and tidal defences, there are pumping stations which discharge surface water directly into the River Ouse to prevent surcharging of the urban drainage system

Historical Fluvial/Tidal Flooding

4.27. The EA have provided a historic flood map within the Product 4 dataset, presented in Figure 9.

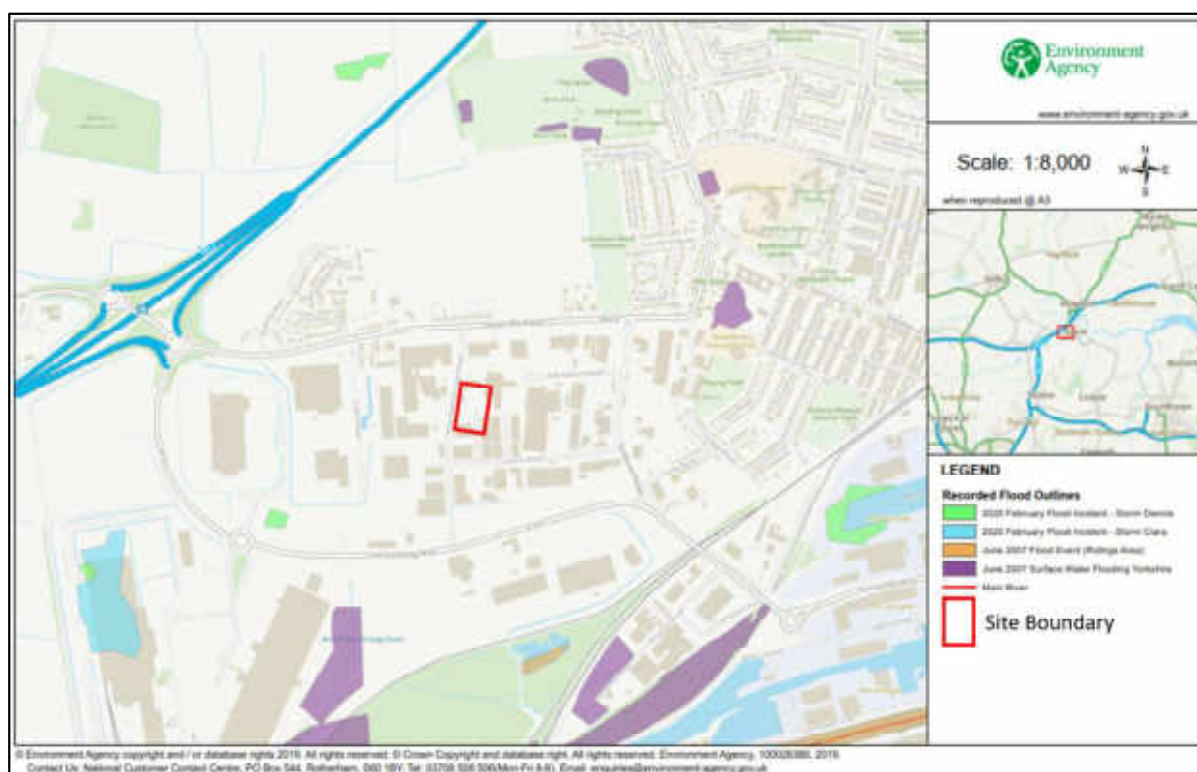


Figure 9 EA Historic Flood Map (EA Product 4)

- 4.28. As is evident from the Figure, there is no record of tidal/fluvial flooding within the site boundary itself based on EA datasets.
- 4.29. The flood incidents presented in Figure 9 are all considered local drainage/surface water incidents and are therefore further discussed in the Pluvial section of this report.
- 4.30. According to the EA Historic Flood Outlines data layer utilised with QGIS Software, the closest recorded fluvial/tidal event to the site occurred in December 2013, approximately 1.8km east, due to a tidal surge event. Further information is provided in the Goole Level 2 SFRA (2020):

During early December 2013 significant flooding was forecast by the Environment Agency as it was anticipated that a storm surge, travelling south down the North Sea coast, could coincide with a spring tide. Flood alerts were issued on 5 December and were subsequently upgraded to flood warnings and severe flood warnings, and emergency plans were implemented. Estimating the timing and height of the surge was difficult due to changing conditions out to sea which led to little time to revise forecasts and update flood warnings. ERYC's emergency plan was implemented.

Where flooding occurred in East Riding, water overtopped the defences just before the peak water level occurred. In East Riding, a total of some 300 properties (69 commercial and 231 residential) were directly affected by flooding, as well as large areas of agricultural land (approximately 6,000 acres). Estimated damages in East Riding were in the region of £13.4 million. Many roads were closed during the event and some remained closed for several days as flood water trapped behind defences slowly subsided and stranded debris blocking roads

*was removed. Areas in the Level 2 SFRA area affected by flooding included Old Goole, although **Goole itself was not flooded.***

The Council, Environment Agency and IDBs deployed pumps to areas where flood water had become trapped behind defences and was not able to drain away naturally.

The Section 19 investigation highlighted that the estimated damages associated with the tidal surge were significantly less (less than 1%) than those that could occur in the absence of any flood defences.

Fluvial/Tidal Summary

- 4.31. According to the Environment Agency's Product 6 detailed hydraulic modelling data, the site is expected to remain outside the flood extents of the 1% AEP + 20%CC and 0.5% AEP + 20%CC (the design flood level) combined, defended events.
- 4.32. The breach scenario shows the site to be flooded up to a level of 3.12m AOD for the 0.5%AEP flood event. The flood risk from undefended and breach scenarios can therefore be considered residual. Albeit the flood level for the breach scenario should be used as a design flood level, it would not be practicable to set FFL's higher than this flood level.
- 4.33. The site is currently protected by flood defences at a 0.5% AEP standard of protection. These defences are operated and maintained by the EA.
- 4.34. Overall, the actual risk to the site posed from fluvial/tidal flooding can be considered to be low, however mitigation measures are still recommended given the site's location in Flood Zone 3 and the residual risk of flooding following a defence breach. These are further discussed in Section 5 of this report.

Canals

- 4.35. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.
- 4.36. The site is approximately 960m north the Aire and Calder Navigation (Knottingley and Goole Canal).
- 4.37. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. Control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.
- 4.38. Flooding can occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 4.39. The Goole SFRA (2020) provides the following information on the canal in the study area:

The Aire and Calder Navigation runs in the south of Goole through the docks to the River Ouse. The canal could potentially transfer water from the River Don (Dutch River) if the Don defences were to breach.

- 4.40. Given the risk posed from canal flooding would come as a result of a defence breach, the risk can be considered residual.
- 4.41. The site is therefore considered to be at low risk of canal flooding.

Pluvial

- 4.42. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.43. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
 - 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
 - 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
 - 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).
- 4.44. Examination of the EA's Flood Risk from Surface Water mapping (Figure 10) for High Risk, Medium Risk, and Low Risk AEP flood events shows the site and its immediate vicinity is at risk of flooding in 'High' surface water flood events.

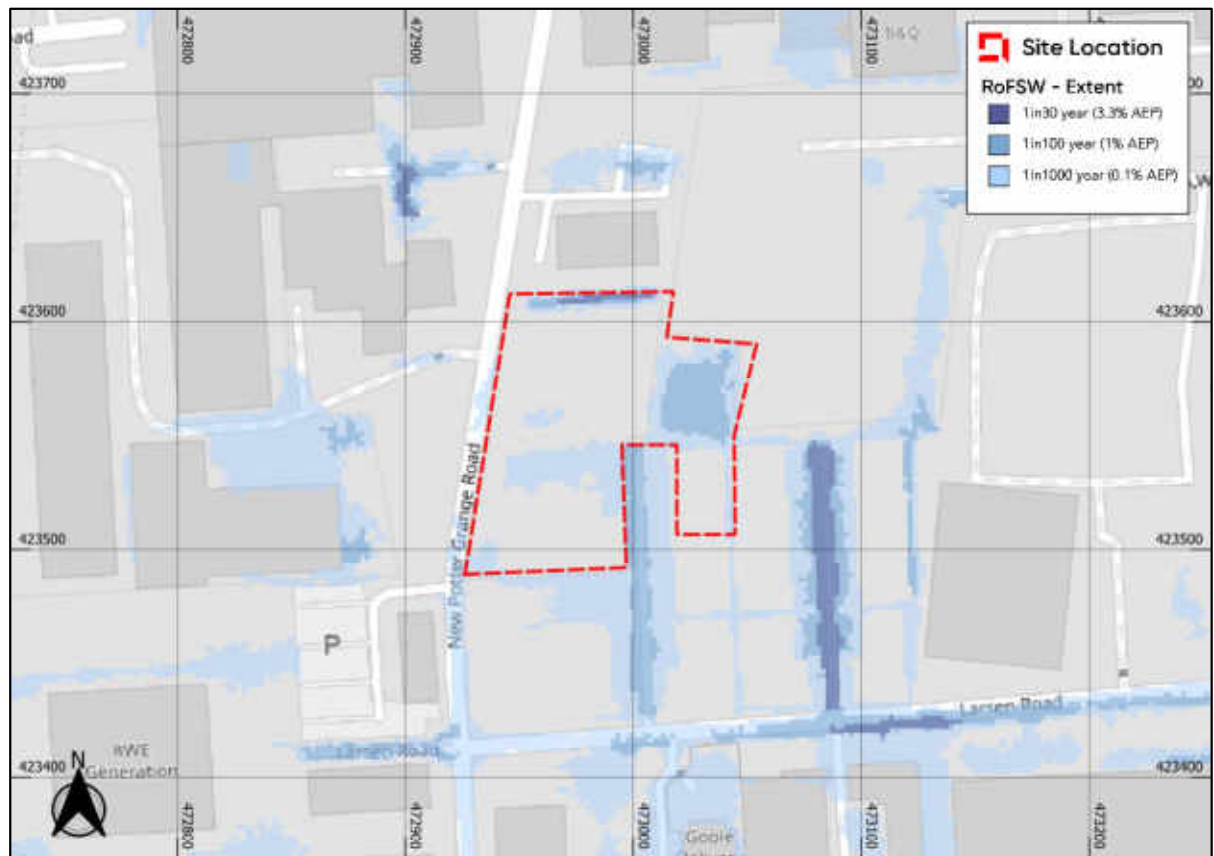


Figure 10: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.45. The Risk of Flooding from Surface Water (RoFSW) datasets provided by DEFRA have also been used to determine the pluvial flood risk to the site.
- 4.46. Figure 11 presents the pluvial depths of a 1:30 year flood within the site's vicinity.

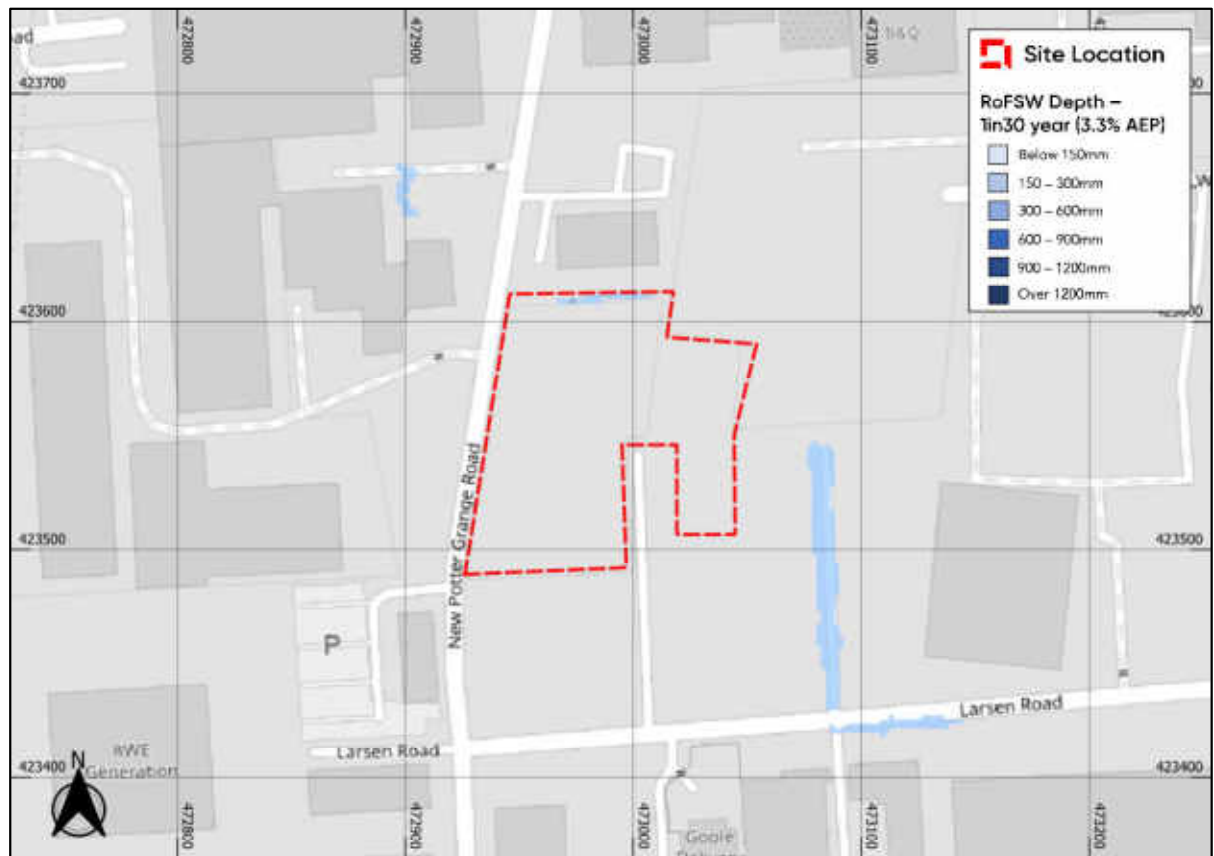


Figure 11 EA Surface Water Flood Risk Mapping 3.33% AEP Depth (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors, © EA copyright and/or database right 2015)

- 4.47. As is evident from the Figure, the majority of the site remains unaffected in the 3.33% pluvial event, however a small section within the northern boundary could experience depths up to 0.3m.
- 4.48. The area of the proposed extension itself is expected to remain unaffected in the 3.33% pluvial event.
- 4.49. Figure 12 presents the pluvial depths of a 1:100 year flood within the site's vicinity.

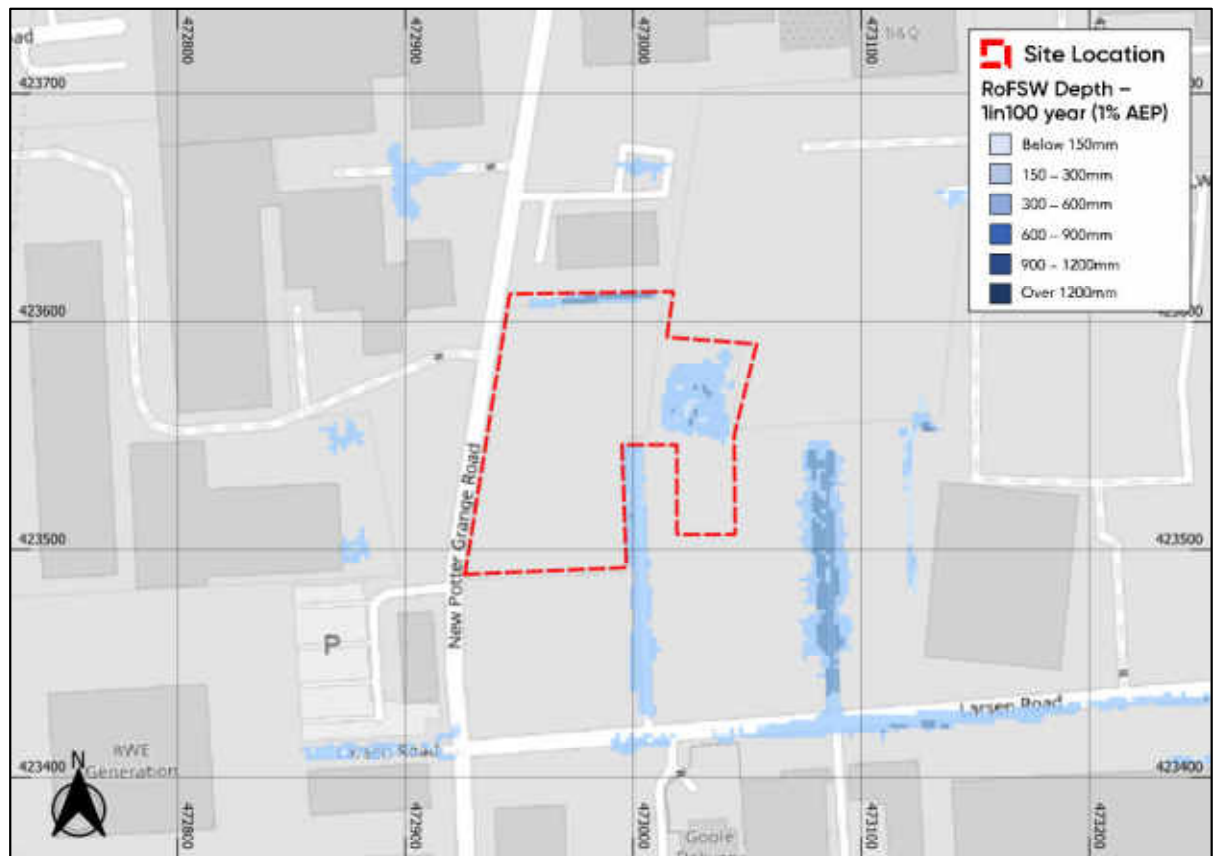


Figure 12 EA Surface Water Flood Risk Mapping 1% AEP Depth (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors, © EA copyright and/or database right 2015)

- 4.50. As is evident from the Figure, the majority of the site remains unaffected in the 1% pluvial event. However, a small section within the northern boundary and a section within the eastern boundary could experience depths up to 0.6m.
- 4.51. The area of the proposed extension itself is expected to remain unaffected in the 1% pluvial event.
- 4.52. Figure 13 presents the pluvial depths of a 1:1000 year flood within the site's vicinity.

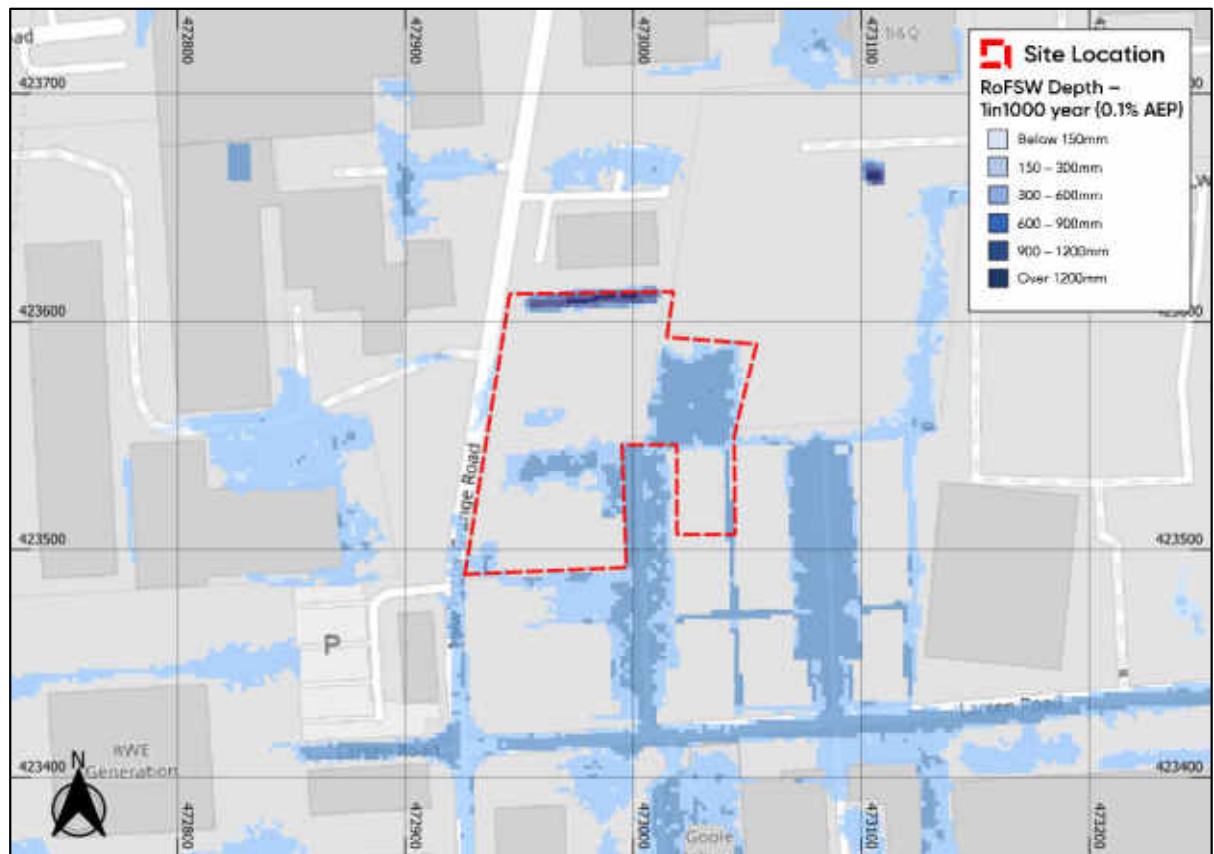


Figure 13 EA Surface Water Flood Risk Mapping 0.1% AEP Depth (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors, © EA copyright and/or database right 2015)

- 4.53. As is evident from the Figure, the site remains largely unaffected in the 0.1% pluvial event. However, a small section within the northern boundary could experience depths up to 1.2m. In addition, various sections within the site boundary could experience depths up to 0.6m.
- 4.54. The area of the proposed extension itself is expected to experience flood depths up to 0.6m.

Historical Pluvial Flooding

- 4.55. The closest recorded flood event according to the EA Recorded Flood Outlines Data (Figure 14) to the site occurred in February 2020 due to Storm Dennis, causing a surface water surcharge incident approximately 490m south west of the site and 950m south west of the site.
- 4.56. Surface water flooding also occurred approximately 530m south and 660m north east of the site in June 2007. In addition, a significant surface water flood even occurred in August 2011 affecting the vicinity of the site.



Figure 14: EA Historic Flood Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.57. The East Riding of Yorkshire Council SFRA (2019) provides further detail on the June 2007 Flood Event:

*Prolonged intense rainfall in June 2007 fell over much of the UK. In East Riding the rainfall resulted in flash flooding that inundated a substantial number of homes and businesses. Over 6,000 households were affected by water entry into the ground floor with more suffering from floods in outbuildings, driveways and gardens. 12,334 hectares of land were flooded leading to loss of crops as well as damage to soil. 92 businesses and commercial properties were affected as well as some 700 km of highways, including culverts and drains. Many local roads were impassable. The estimated loss or damage to private property and businesses was in excess of £200 million. **The flood was estimated to be a 0.67% annual exceedance probability event.***

4.58. The Goole SFRA (2020) provides further detail on the August 2011 event:

On 3 August 2011 a relatively short, but very intense, summer storm led to media reports of internal flooding of approximately 30 properties in Goole. The Section 19 investigation concluded the return period of the storm was 2.2% probability in any given year (1 in 45 years) and was likely to have been much greater than this at 0.11% probability in any given year (1 in 950 years).

The high intensity of the storm meant the rate of inflow into the sewer system exceeded the rate of discharge, causing the sewers to start to fill and surcharge, eventually resulting in the flow of water out of manholes and gullies, as witnessed by residents in Goole. The storm was of an exceptional intensity and exceeded current or historic design standards for all sections of the drainage infrastructure and it is likely that substantial and widespread flooding would have occurred irrespective of the condition or state of operation of the drainage network.

In addition to the surcharge of the sewer system, the full pumping capacity of the Carr Lane pumping station was not available. However, the effect of the reduced pump capacity on flooding could not be verified in the Section 19 investigation.

At the time of the storm, the tide would have been ebbing to its lower level in the River Ouse and did not affect the rate of discharge at the pumps. The nature of the flooding was surface water rather than fluvial and therefore Environment Agency defences along the Rivers Ouse, Aire and Don had no impact on the extent or cause of the flooding.

Pluvial Summary

- 4.59. Overall, the flood risk to the site from pluvial flooding can be considered high given the site is expected to experience flood depths in all modelled scenarios (3.33%AEP, 1%AEP and 0.1%AEP).
- 4.60. However, the risk of pluvial flooding to the actual development itself can be considered low, given the proposed extension is expected to remain unaffected in the 3.33% and 1% pluvial events. The development is expected to experience flood depths of up to 0.6m in the 0.1% pluvial event.

Reservoirs

- 4.61. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 4.62. According to the EA's Flood Risk from Reservoirs mapping (Figure 15) the site is at risk of flooding in the event of a breach at multiple reservoirs. The worst reservoir failure model is a 'wet day' scenario meaning that it would have to happen at the same time as other flooding for there to be enough water to reach the site.

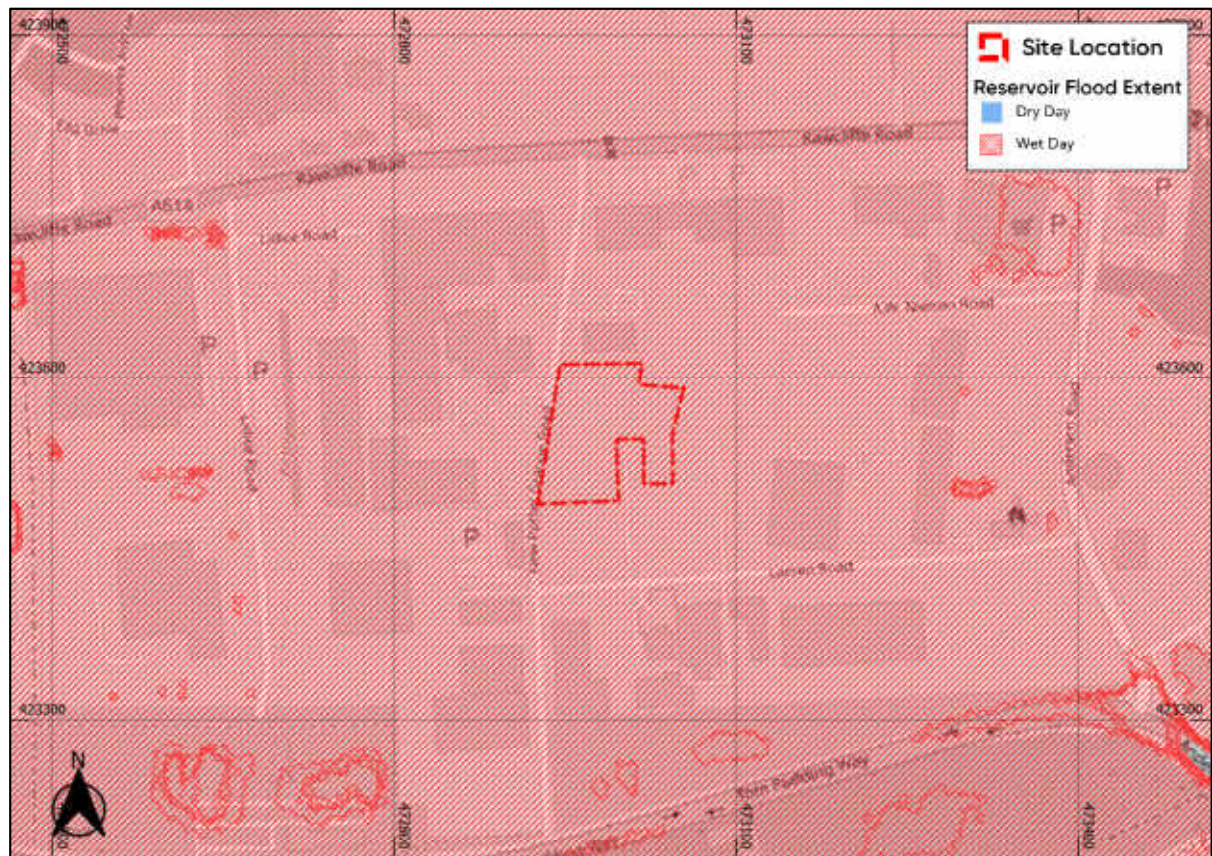


Figure 15: EA Reservoir Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). ©<https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.63. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the Reservoirs Act 1975 in England and Wales. The EA are responsible to ensure that reservoirs are inspected regularly, and essential safety work carried out. As reservoirs are highly managed the maximum flood extent provided in the EA Risk of Flooding from Reservoirs mapping is considered a worst-case scenario.
- 4.64. As reservoir flooding is unlikely and the modelled flood depths are based on the worst-case scenario, flooding from this source may be considered as a relatively low risk.

Groundwater

- 4.65. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.66. The British Geological Survey's (BGS) mapping shows superficial deposits of Warp comprising clay and silt underlying the site. The bedrock underlying the site is Sherwood Sandstone Group comprising Sandstone.
- 4.67. A historic BGS borehole (ref: SE72SW28) located 50m west of the site struck water at a depth of approximately 21m.

4.68. The East Riding of Yorkshire SFRA (2019) presents the EA's Areas Susceptible to Groundwater Flooding mapping (Figure 16), which assesses the future risk of groundwater flooding. This mapping consists of 1km grid squares and shows the proportion of each which is at risk of groundwater flooding.

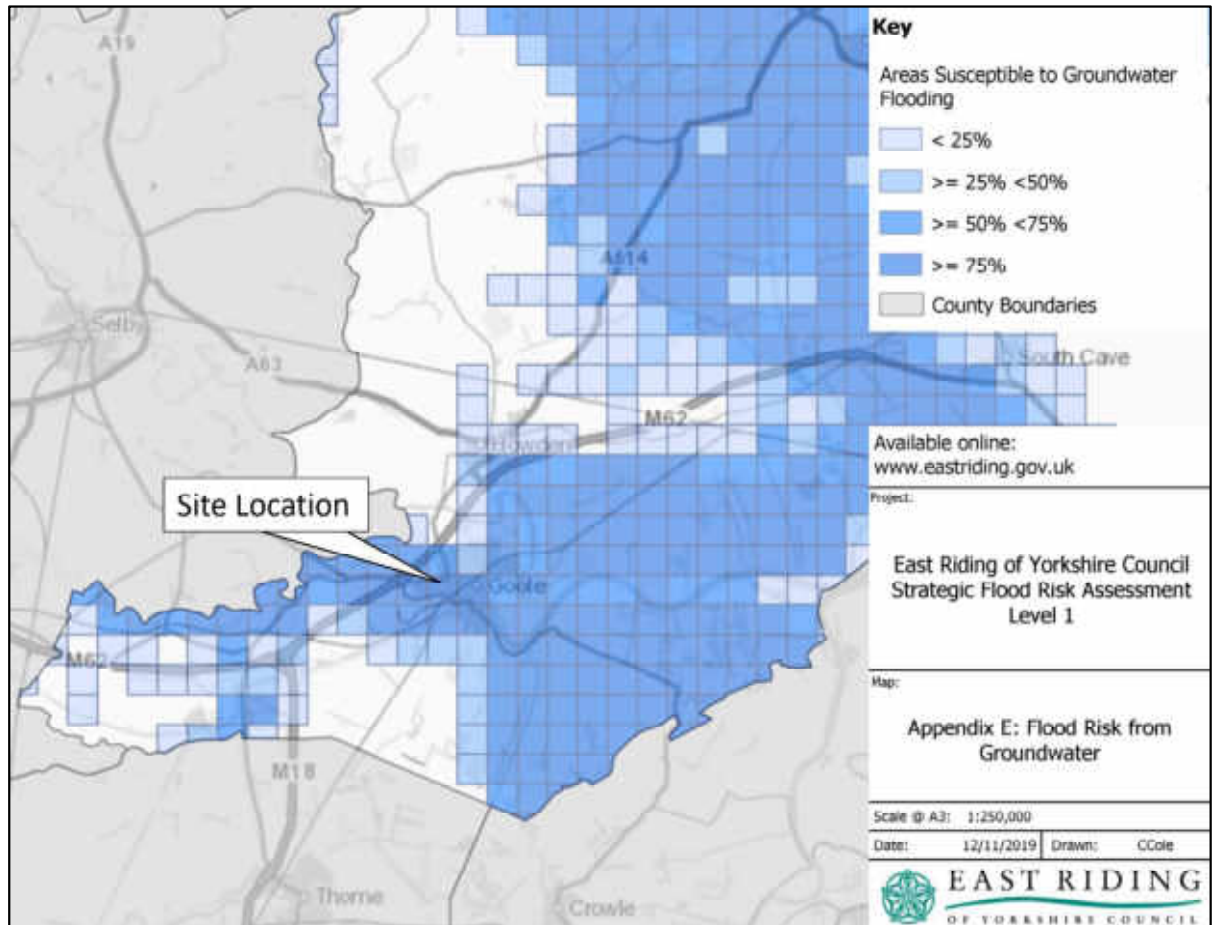


Figure 16 SFRA Susceptibility to Groundwater Flooding (East Riding of Yorkshire SFRA, 2019)

4.69. As is evident from the Figure, the site is within a 1km cell which is $\geq 75\%$ at risk of groundwater flooding in the future.

4.70. The Goole SFRA (2020) provides further information on this groundwater mapping:

It is likely that only isolated locations within the overall susceptible area actually suffer the consequences of groundwater flooding. The dataset does not show the likelihood of groundwater flooding occurring, and it does not take into account the chance of flooding from groundwater rebound. The ASGWf is not suitable for site level analysis and should only be used as a starting point for further investigation into groundwater risk.

4.71. As the development proposals do not include any proposed basements, the risk from groundwater to the development is considered to be low.

Sewers

- 4.72. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.73. The Goole SFRA (2020) provides further information on the sewerage system in place within the study area:

Yorkshire Water is the statutory sewerage undertaker for Goole and is responsible for the operation and maintenance of the public sewerage system, including public sewers, pumping stations, rising mains, attenuation systems, and sewage treatment plants.

There are 12 pumping stations in Goole operated by Yorkshire Water, of which Carr Lane and Lock Hill are the largest. Typically, these pumping stations consist of multiple pumpsets that, when operated in parallel, will provide the design pumping capacity. They also have an additional pump on standby in the event of failure of one of the other pumps.

Carr Lane pumping station is the Goole's main terminal pumping station and receives flows directly from the town drainage system and indirectly from other Yorkshire Water pumping stations within the Goole catchment. During storm events the flow from the town drainage system increases as rainfall enters the system. Inlet screens on the pumping station protect the pumpsets by removing solid material from the wastewater flows; these screens have automated cleaning equipment to remove debris. Once through the screens, flow enters wastewater pumpset wet wells. When the flow into the wet well is higher than the capacity provided by the pumps, the level in the wet well rises and when it reaches a specific level, overflows into storm pumpset wet wells. The storm pumpsets discharge into the River Ouse.

If the capacity of both the wastewater and storm pumpsets is exceeded, wastewater levels will rise in the wet wells until they reach the soffit of the structure causing flows to back up in the sewer system and, once capacity of the sewage network is reached, flood out onto low lying areas of Goole. Wastewater may then also enter road gullies that drain into surface water drains, for example Hook Drain, that are not part of the Yorkshire Water system.

Lock Hill pumping station is located on East Parade next to the River Ouse. The pumpsets discharge into a gravity combined sewer system which in turn discharges into the Carr Lane pumping station. Incoming flows to Lock Hill enter through a combined sewer overflow. In storm conditions the excess inflow will surcharge and weir into the storm pump wet wells, which then discharge directly into the River Ouse.

The Sandhill Detention tank was built by Yorkshire Water at Millennium Way / Maple Drive in 2009 with a 3.3% AEP Standard of Protection. The system stores excess combined wastewater prior to pumping it back into the main sewer system at a controlled rate.

- 4.74. The site has not been assessed for Critical Drainage Areas as not all councils have released this data, you should check the Surface Water Management Plan held here or consult directly with your local authority.
- 4.75. Based on the information above, the sewer flood risk is considered to be acceptable provided the appropriate mitigation measures discussed in Section 5 of this report are included.

5. Flood Risk Mitigation

Fluvial/Tidal

- 5.1. The site is located within Fluvial and Tidal Flood Zones 3, denoting a high risk of flooding from these sources. The site is expected to remain unaffected in both the 1% AEP and 0.5% AEP combined, present day, defended flood events.
- 5.2. The site is also expected to remain outside the flood extents of the 1% AEP + 20%CC and 0.5% AEP + 20%CC combined, defended events.
- 5.3. The site is currently protected by flood defences at a 0.5% AEP standard of protection. These defences are operated and maintained by the EA. The flood level for the 0.5%AEP breach scenario shows the site to be affected by flooding – based on a modelled flood level of 3.12m AOD.
- 5.4. Overall, the actual risk to the site posed from fluvial/tidal flooding can be considered to be low, given the protection offered to the site. Furthermore, the development should not bring about an increase in the current flood risk to the site, given the EA vulnerability classification remains the same (Less Vulnerable).
- 5.5. However, mitigation measures are still recommended given the site's location in Flood Zone 3.
- 5.6. Although no hazardous materials are expected to be stored within the new extension, it is recommended that the stored materials and conveyor belts are set above the 0.5%AEP breach level (3.12m AOD), where reasonably practicable. However, due to the nature of the site and requirements in terms of operations, Finished Floor Levels cannot be set higher than existing levels.
- 5.7. As the proposal itself is considered a Minor Development, as the extension is <250m², access/egress routes are to remain as existing and can adhere to the EA Standing Advice for Minor Developments.
- 5.8. Furthermore, the extension should be constructed in a flood resilient manner where these do not disrupt normal operations, in accordance with the DCLG Report 'Improving the Flood Performance of New Buildings - Flood Resilient Construction' (2007). Flood resistance measures should be incorporated into the scheme which could include, but are not limited to, the following:

- *Solid floors with waterproof screed.*
- *Raised wiring and power outlets at ground level.*
- *Waterproofing materials used at ground floor.*
- *Air brick covers to be installed, if applicable.*
- *Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.*
- *External doors may be susceptible to ingress of flood water. Any window/door sills should be adequately sealed. Double glazing should be used to provide resistance against external flood water pressure. Flood door/barrier is recommended.*

Pluvial

- 5.9. The flood risk to the site from pluvial flooding can be considered high given the site is expected to experience flood depths in all modelled scenarios (3.33%AEP, 1%AEP and 0.1%AEP).
- 5.10. However, the risk of pluvial flooding to the actual development itself can be considered low, given the proposed extension is expected to remain unaffected in the 3.33% and 1% pluvial events. The development is expected to experience flood depths of up to 0.6m in the 0.1% pluvial event.
- 5.11. No further mitigation measures beyond those recommended for fluvial/tidal flooding are required.

Sewer

- 5.12. Based on this assessment, the sewer flood risk is considered to be acceptable provided that appropriate mitigation measures mentioned in this report are implemented.
- 5.13. Non-return valves are recommended on all new sewer connections to limit the potential for backflow.

Canals, Reservoirs, and Groundwater

- 5.14. Flood risk from other sources is considered to be low and therefore no specific mitigation measures are required.

Increase to Flood Risk Elsewhere

- 5.15. The proposed development is for the construction of a minor extension to an existing process building (<250m²). As such, the proposal constitutes a Minor Development under the NPPF.
- 5.16. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

Minor developments are unlikely to raise significant flood issues unless:

- *they would have an adverse effect on a watercourse, floodplain or its flood defences;*
- *they would impede access to flood defence and management facilities, or;*
- *where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows.*

- 5.17. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.

Flood Warnings

- 5.18. The site is in the Environment Agency (EA) 'River Ouse at Goole, and River Aire at Rawcliffe and Rawcliffe Bridge' flood warning service area. This service allows site owners to register an address along with contact details so that, in the event of a flood being forecast, they are sent an alert. As a further precaution and risk reduction, the owner of the site should sign up.

5.19. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

6. Conclusions

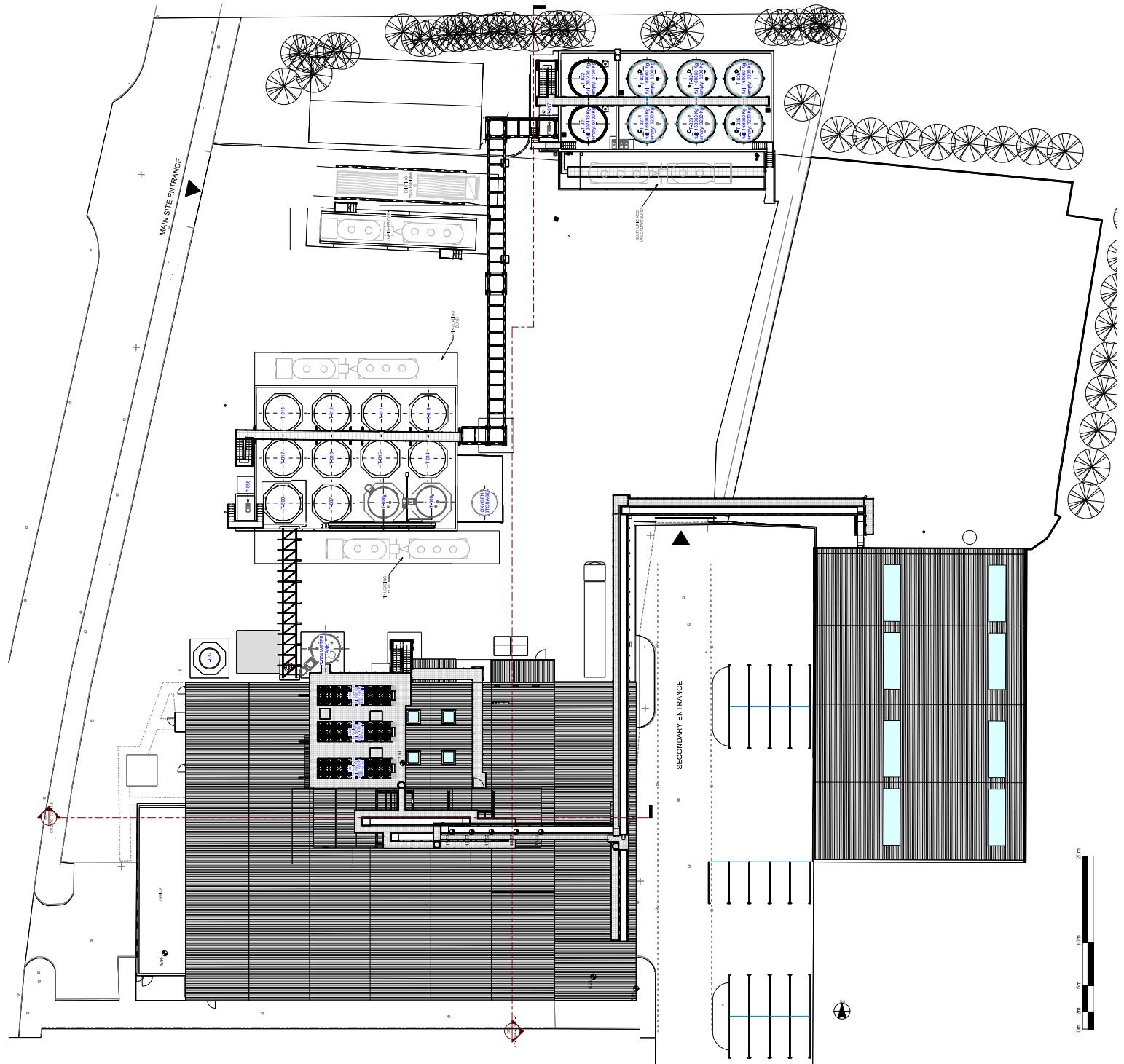
- 6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at Kemira Chemicals UK Ltd, New Potter Grange Road 5, Goole, DN14 6BZ. It has been written to support a planning application and prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Fluvial/Tidal	<p>Based on this assessment, the proposed development is considered to be at low risk of fluvial/tidal flooding. The site is expected to remain unaffected in both the 1% AEP and 0.5% AEP combined, present day, defended flood events.</p> <p>The site is also expected to remain outside the flood extents of the 1% AEP + 20%CC and 0.5% AEP + 20%CC (the design flood level) combined, defended events.</p> <p>The site is currently protected by flood defences at a 0.5% AEP standard of protection and the flood risk from undefended and breach scenarios can therefore be considered residual risk.</p> <p>Furthermore, the development should not bring about an increase in the current flood risk to the site, given the EA vulnerability classification remains the same (Less Vulnerable). Mitigation measures are still recommended given the site's location in Flood Zone 3.</p> <p>Although no hazardous materials are expected to be stored within the new extension, it is recommended that the stored materials and conveyor belts are set above the 0.5%AEP breach level (3.12m AOD), where reasonably practicable. However, it is understood that due to the nature of operations on site, Finished Floor Levels cannot be set higher than the existing.</p> <p>As the proposal itself is considered a Minor Development, as the extension is <250m2, access/egress routes are to remain as existing and can adhere to the EA Standing Advice for Minor Developments.</p> <p>The extension should be constructed in a flood resilient manner where practical, in accordance with the DCLG Report 'Improving the Flood Performance of New Buildings - Flood Resilient Construction' (2007), provided such measures do not disrupt the normal operations.</p>
Pluvial	<p>The flood risk to the site from pluvial flooding can be considered high given the site is expected to experience flood depths in all modelled scenarios (3.33%AEP, 1%AEP and 0.1%AEP).</p> <p>However, the risk of pluvial flooding to the actual development itself can be considered low, given the proposed extension is expected to remain unaffected in the 3.33% and 1% pluvial events. The development is expected to experience flood depths of up to 0.6m in the 0.1%</p>

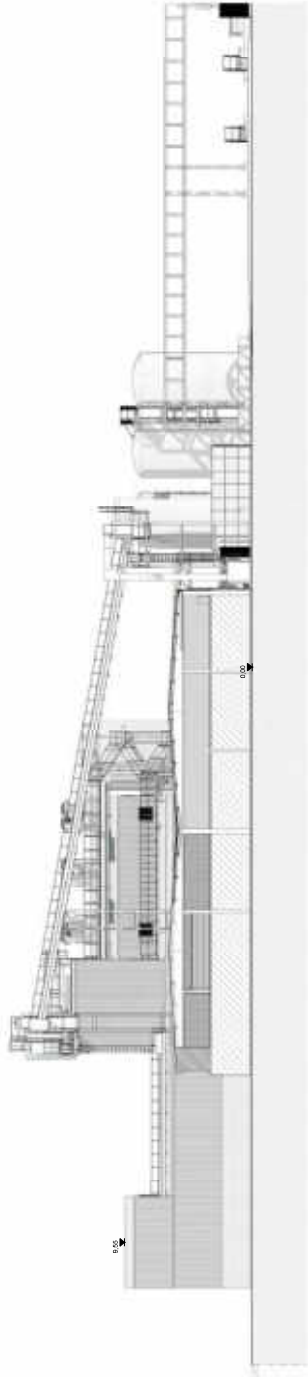
	pluvial event. No further mitigation measures beyond those recommended for fluvial/tidal flooding are required.
Sewer	Based on this assessment, the sewer flood risk is considered to be acceptable provided that appropriate mitigation measures in this report are implemented. Non-return valves are recommended on all new sewer connections to limit the potential for backflow.
Canals Reservoirs Groundwater	The site is considered to be at low risk from these sources.

- 6.3. The FRA supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.
- 6.4. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

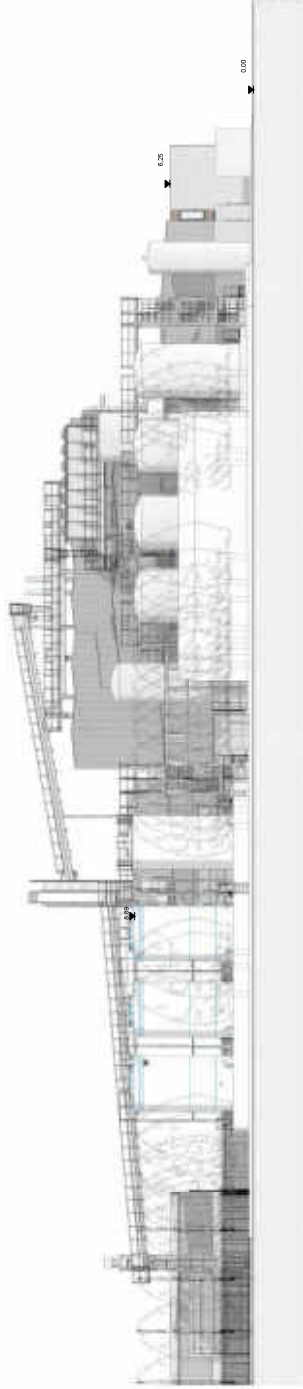
Appendix A - Development Proposals



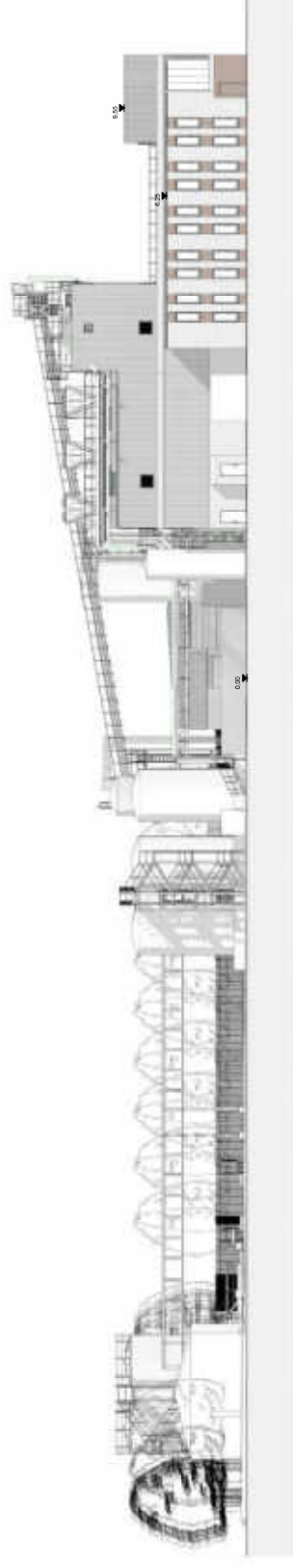
NO.	REVISION	DATE	BY	CHECKED	APPROVED
1	ISSUE FOR PERMITTING	10/01/2023	A. S. H. A.	A. S. H. A.	A. S. H. A.
2	ISSUE FOR CONSTRUCTION	10/01/2023	A. S. H. A.	A. S. H. A.	A. S. H. A.
3	ISSUE FOR OPERATION	10/01/2023	A. S. H. A.	A. S. H. A.	A. S. H. A.
4	ISSUE FOR MAINTENANCE	10/01/2023	A. S. H. A.	A. S. H. A.	A. S. H. A.
5	ISSUE FOR DECOMMISSIONING	10/01/2023	A. S. H. A.	A. S. H. A.	A. S. H. A.
CONTRACTOR: VTV (Vietnam Tin Van)					
CLIENT: Kemira					
PROJECT: EGGULE EXPANSION PROJECT II					
SHEET: General Plot Plan					
SCALE: 1:1000					
DATE: 10/01/2023					
DRAWN BY: A. S. H. A.					
CHECKED BY: A. S. H. A.					
APPROVED BY: A. S. H. A.					



AFTER - East Building Elevation
Scale: 1:200



AFTER - North Building Elevation
Scale: 1:200



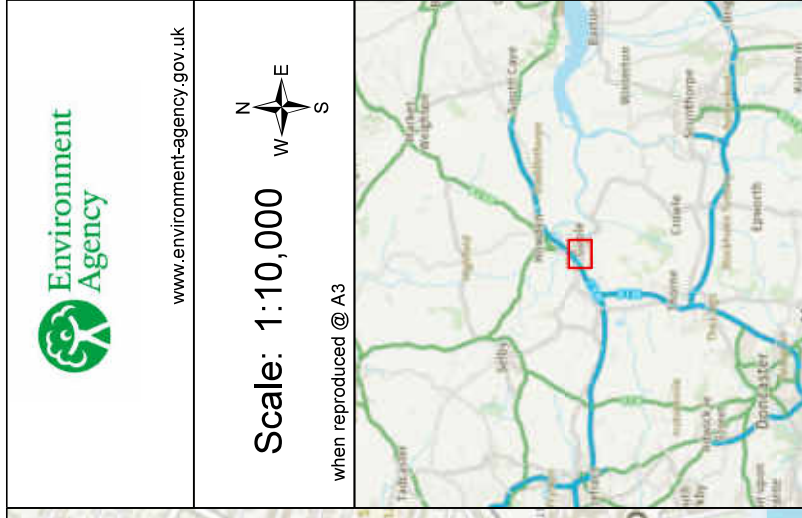
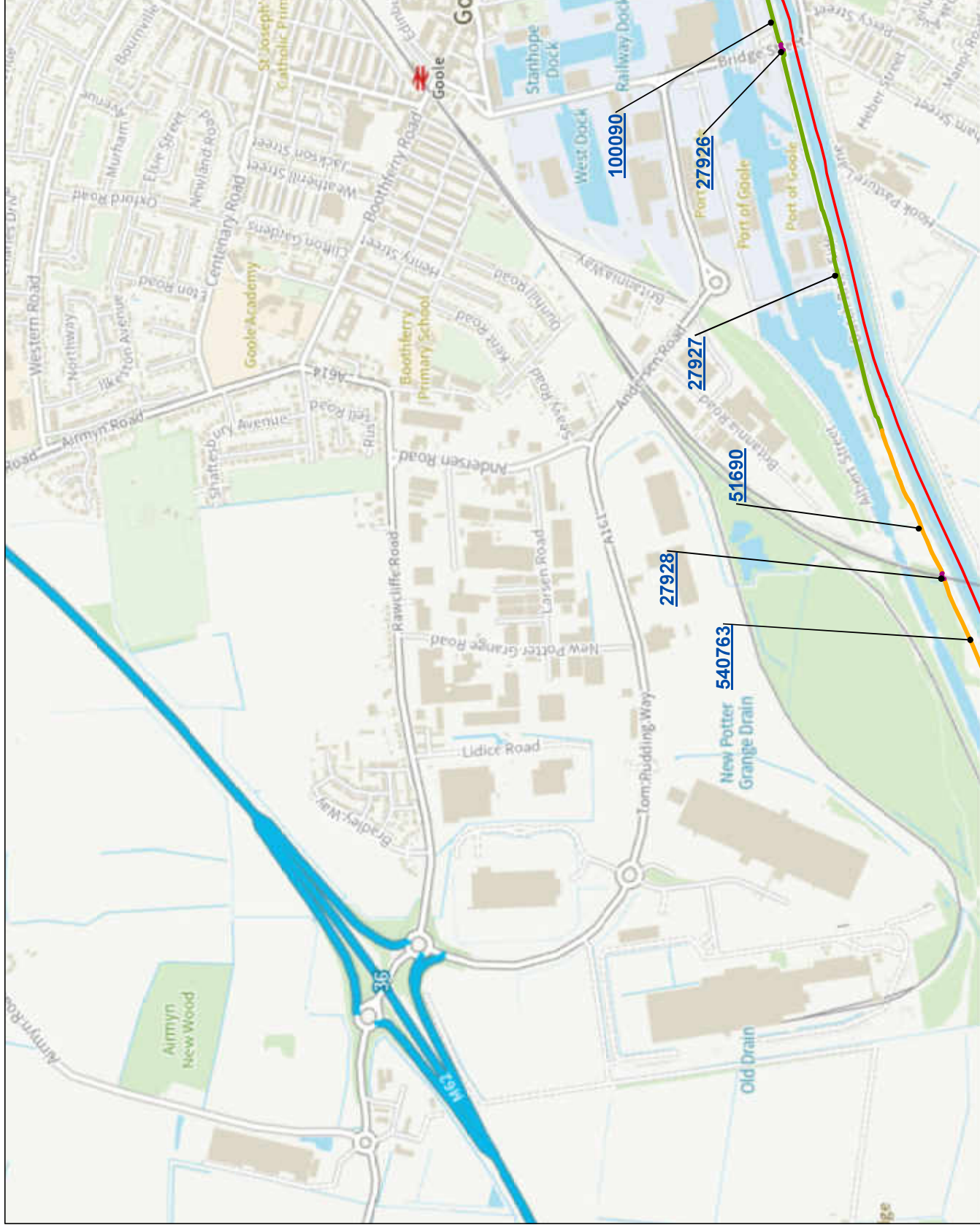
AFTER - West Building Elevation
Scale: 1:200



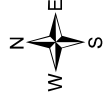
AFTER - South Building Elevation
Scale: 1:200

NO.	DATE	BY	CHKD.	DESCRIPTION
01	18/07/2023	W. BENAZIR	M. BENAZIR	W. BENAZIR
02	25/07/2023	W. BENAZIR	M. BENAZIR	M. BENAZIR
03	26/07/2023	W. BENAZIR	M. BENAZIR	M. BENAZIR
REV.	DATE	BY	CHKD.	DESCRIPTION
				CLIENT CHECK
CONTRACTOR: VTU Engineering Italia S.p.A. Via S. Maria Maddalena 16 I-48038 Balzano				
PROJECT NO: KEM-16-27				
DRAWING NO: KEM-16-27-01-01				
CONTRACT NO:				
PROJECT NO:				
CONTRACT NO:				
DRAWING NO:				
FILE NO:				
GENERAL STAMP:				
 Kemira Kemira Chemicals UK Ltd The Valley South East Yorkshire • DN14 6BZ, UK Phone +44 1274 517460				
OWNER: GOOLE EXPANSION PROJECT II Building Elevations				
DRAWING NO: KEM-16-27-01-01-01-01				
SHEET NO: 01 of 01				
SCALE: 1:200				

Appendix B - Consultation



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Scale: 1:10,000

when reproduced @ A3

LEGEND

Defences (3rd party maintained)

asset_sub_
 Bridge Abutment

Defences (EA maintained)

asset_sub_
 Embankment
 Wall
 Main River

Defences (EA Maintained) - RFI/2024/344927

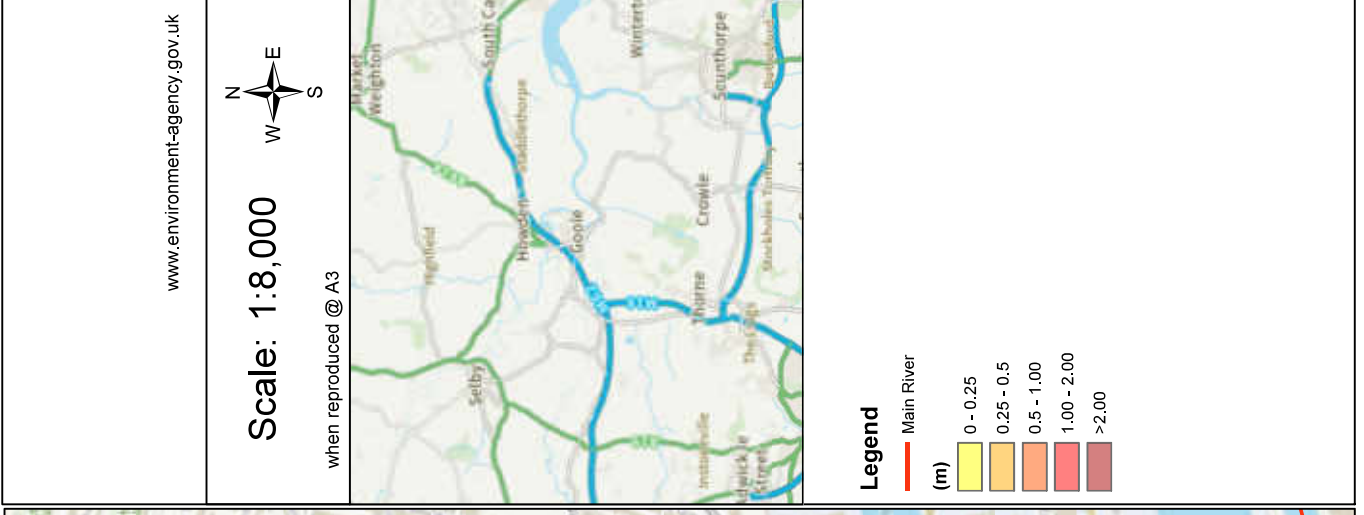
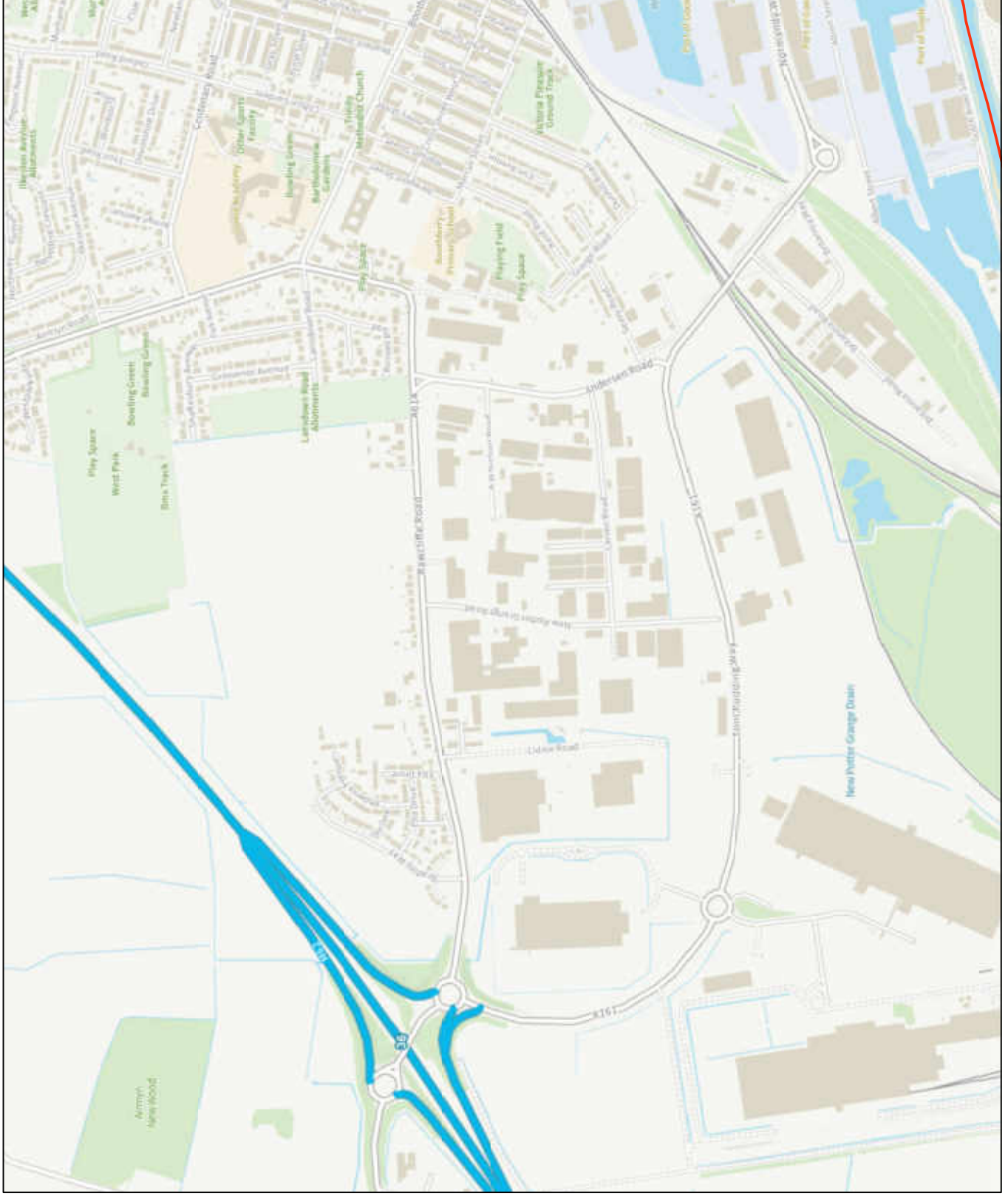
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSETS TYPE	LENGTH (m)	ACTUAL Downstream Crest Level (mAOD)	ACTUAL Upstream Crest Level (mAOD)	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
100090	Vermuyden Terrace Flood Wall	Environment Agency	Wall	290.98	6.62	6.39	Fluvial/Tidal	2	2	200
27927	Dutch River Side Flood Wall	Environment Agency	Wall	1011.52	6.66	7.19	Fluvial/Tidal	2	3	200
51690	Upper Goole Docks embankment	Environment Agency	Embankment	398.86	7.19	6.50	Fluvial/Tidal	2	3	200
540763		Environment Agency	Embankment	1938.03			Fluvial/Tidal	3	3	

Defences (3rd Party Maintained) - RFI/2024/344927

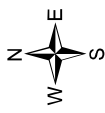
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSETS TYPE	LENGTH (m)	ACTUAL Downstream Crest Level (mAOD)	ACTUAL Upstream Crest Level (mAOD)	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
27926	Old Goole Bridge north abutment	Private individual, Company or Charity	Bridge Abutment	18.79	6.41	6.66	Fluvial/Tidal			200
27928	Dutch River Rail Bridge north abutment	Private individual, Company or Charity	Bridge Abutment	19.07	6.50	6.03	Fluvial/Tidal			200

RFI/2024/344927 Fluvial Scenario: Depth Grid Map for the 1% AEP + 20% CC centred on 472987E 423640N

Date created: 21/02/2024



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Scale: 1:8,000

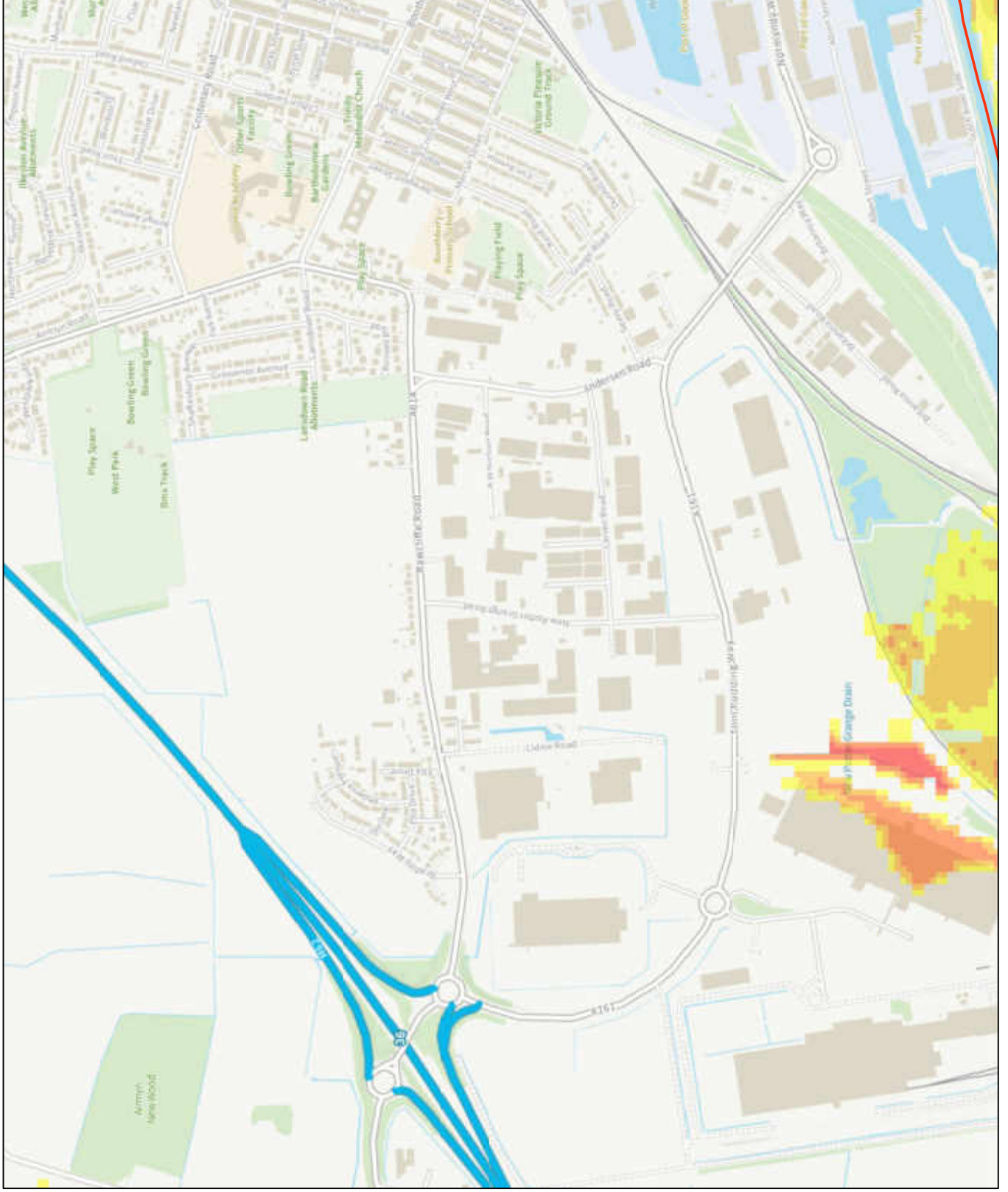
when reproduced @ A3

Legend

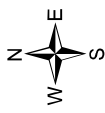
- Main River
- (m)
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.00
- 1.00 - 2.00
- >2.00

RFI/2024/344927 Tidal Scenario: Depth Grid Map for the 0.5% AEP + 20% CC centred on 472987E 423640N

Date created: 21/02/2024

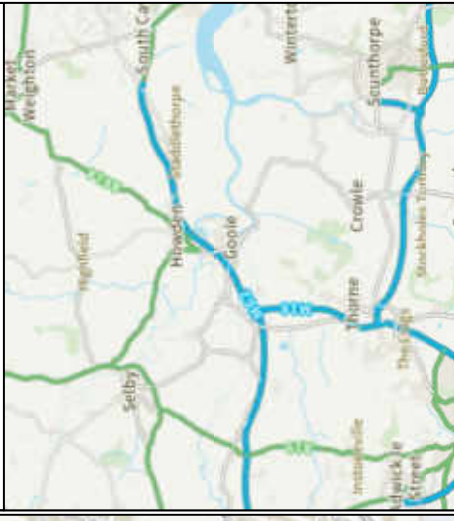


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Scale: 1:8,000

when reproduced @ A3

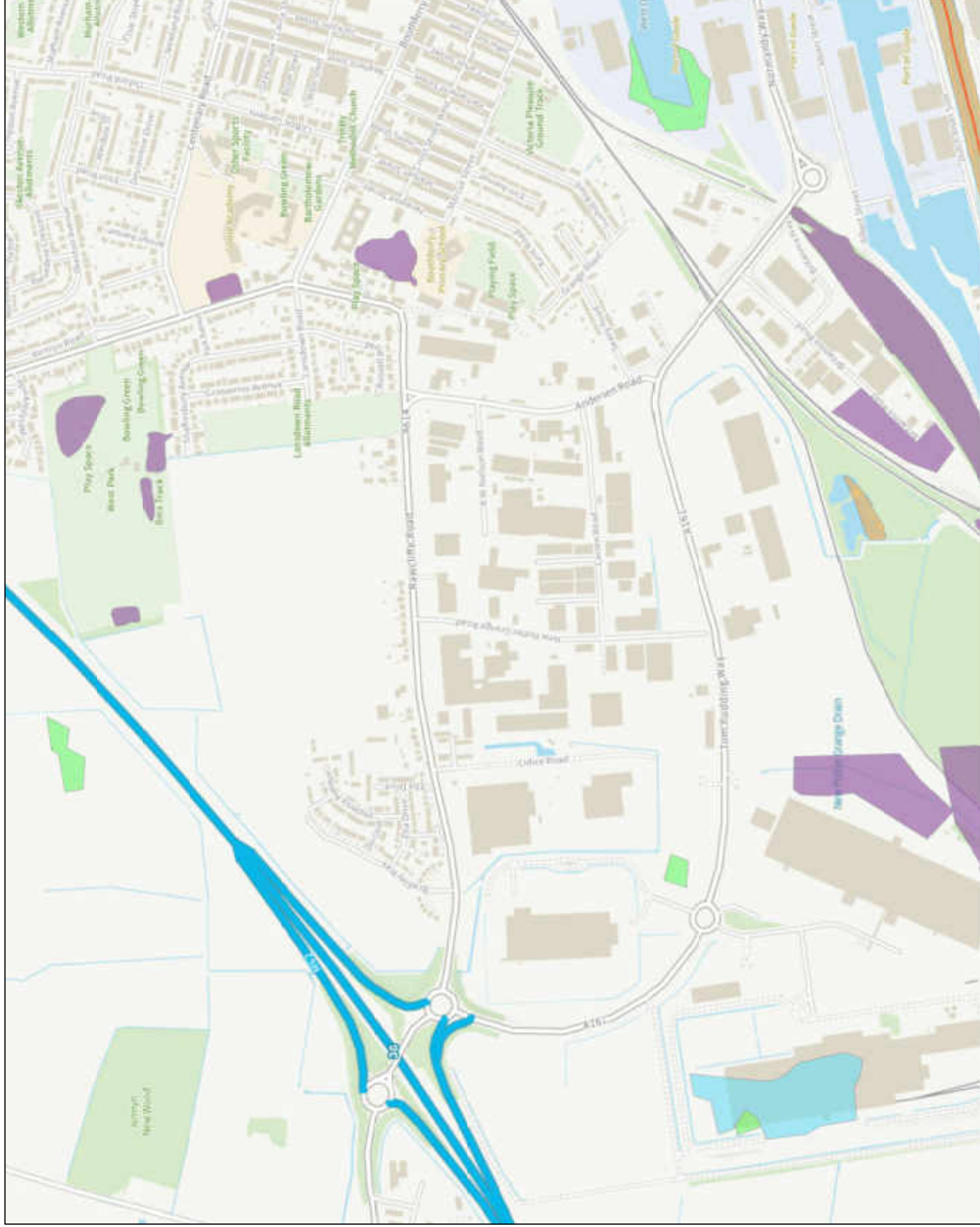


Legend

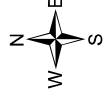
- Main River
- (m) 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.00
- 1.00 - 2.00
- >2.00

RFI/2024/344927 Historic Flood Map centred on 472987E 423640N

Date created: 20/02/2024

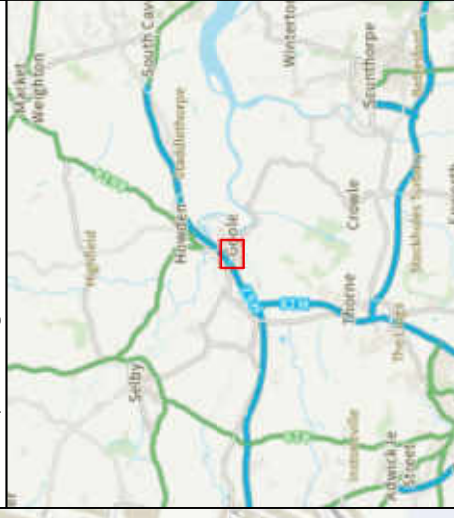


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Scale: 1:8,000

when reproduced @ A3



LEGEND

Recorded Flood Outlines

- 2020 February Flood Incident - Storm Dennis
- 2020 February Flood Incident - Storm Ciara
- June 2007 Flood Event (Ridings Area)
- June 2007 Surface Water Flooding Yorkshire
- Main River