ENVIRONMENTAL STATEMENT

VOLUME 3 – APPENDIX 12.1

Part 1 of 2

Flood Risk Assessment (Tracked)

Drax Bioenergy with Carbon Capture and Storage

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

Document Reference Number: 6.3.12.1

Applicant: Drax Power Limited

PINS Reference: EN010120

REVISION: 01~~1~~2

DATE: December~~May~~ 2022

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PUBLIC

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EXECUTIVE SUMMARY

WSP has been appointed by Drax Power Ltd to prepare a site-specific Flood Risk Assessment (FRA) to support a Development Consent Order (DCO) application for the proposed Bioenergy with Carbon Capture Storage (BECCS) at the Drax Power Station, North Yorkshire.

The FRA is conducted in accordance with the National Planning Policy Framework (NPPF) and Overarching National Policy Statement for Energy (EN-1) and the Draft Overarching National Planning Policy Statement for Energy providing a quantitative analysis of flood risk to support the DCO application.

Item	**Overview**
Site Location	The Drax Power Station Site is located approximately 7 km to the south-east from the centre of Selby, North Yorkshire, approximate NGR 466440, 427460. The works are proposed to be undertaken within the central and northern parts of the Drax Power Station Site.
Development Proposals	~ The Proposed Scheme comprises an extension to the existing biomass generating units and includes the following: ~ Carbon capture infrastructure at Drax Power Station on up to two biomass generating units; ~ Infrastructure for the treatment and compression of carbon dioxide at Drax Power Station to allow connection to a National Grid carbon dioxide transport and storage system; ~ Potential road modifications to facilitate the transport of abnormal indivisible loads; ~ Temporary construction laydown areas; ~ Areas for habitat provision; and ~ Supporting infrastructure required for the Carbon Capture Plant.
Environment Agency Flood Zone(s)	The Environment Agency Flood Map for Planning shows that the area of the Proposed Scheme is located partially in Flood Zone 2 and partially within Defended Flood Zone 3.
Vulnerability Classification(s)	Essential Infrastructure.

Item	Overview
Fluvial and Tidal Flood Risk	The River Ouse at the location of the Proposed Scheme is tidally influenced. The fluvial and tidal flood risk has been assessed by combining and enhancing two of the Environment Agency's hydraulic models namely the Upper Humber and the Humber Extreme Water Levels (EWL) models. The site-specific hydraulic modelling demonstrates that the Proposed Scheme is at risk during the design flood event. This is mitigated by raising the sensitive infrastructure located within the floodplain by a minimum of 800 mm above the design flood level, which provides mitigation for the sensitivity analysis and the breach event.
Surface Water Flood Risk	The Proposed Scheme is considered to be at low susceptibility of flooding from surface water. There remains a risk of flooding to the Proposed Scheme as a result of the Carr Dyke culvert blockage / exceedance and failure of the Lendall pumps. Given the size of the Carr Dyke catchment, the relatively flat land adjacent to the Lendall pumps and the drainage infrastructure and preferential flow routes through the Drax Power Station Site it is considered that the depth of any flooding as a result of these mechanisms would be less than that associated with the Fluvial and Tidal flood risk and thus the risk is managed and mitigated by the associated measures.
Groundwater Flood Risk	The site is at low risk of flooding from groundwater, this risk is to be managed through the Fluvial and Tidal mitigation and the surface water drainage infrastructure across the Drax Power Station Site.
Sewer Flood Risk	The risk of sewer flooding to the Proposed Scheme is considered to be low, this risk is to be managed through the Fluvial and Tidal mitigation and the foul and surface water drainage infrastructure across the Drax Power Station Site.
Artificial Flood Risk	The Proposed Scheme is at a residual risk of reservoir flooding, primarily from the onsite cooling water reservoirs, which are appropriately managed by Drax Power Station and thus the risk is considered Low. Furthermore, the Fluvial and Tidal mitigation will help mitigate the risk associated with failure / breach of the reservoirs.

Item	Overview
Sequential and Exception Test	The site passes both the Sequential and Exception Tests
Surface Water Drainage Strategy	Surface water runoff from across the Proposed Scheme and potentially the Drax Power Station Site is to be utilised in the cooling process thus reducing the runoff and associated downstream flood risk.

1. INTRODUCTION

1.1. PROJECT BACKGROUND

1.1.1. Drax Power Limited (the Applicant) intends to install post combustion carbon capture technology on up to two of the existing 660-megawatt electrical ('MWe') biomass power generating units at the Drax Power Station in Selby, North Yorkshire. This will remove approximately 95% of the carbon dioxide from the flue gas, resulting in overall negative emissions of greenhouse gases.

1.1.2. The Proposed Scheme comprises an extension to the existing biomass generating units and includes the following:

- **a.** Carbon capture infrastructure at Drax Power Station on up to two biomass generating units;
- **b.** Infrastructure for the treatment and compression of carbon dioxide at Drax Power Station to allow connection to a National Grid carbon dioxide transport and storage system;
- **c.** Potential road modifications to facilitate the transport of abnormal indivisible loads;
- **d.** Temporary construction laydown areas;
- **e.** Areas for habitat provision; and
- **f.** Supporting infrastructure required for the Carbon Capture Plant.

1.1.3. WSP has been commissioned by the Applicant to prepare an Environmental Statement (ES). This technical report provides the Flood Risk Assessment (FRA) and has been carried out to support the ES for the Proposed Scheme.

1.1.4. The FRA is conducted in accordance with the National Planning Policy Framework (NPPF), the Overarching National Policy Statement for Energy (EN-1) and the Draft Overarching National Planning Policy Statement for Energy providing a quantitative analysis of flood risk to support the DCO application. The assessment includes the following:

- **a.** Review of the relevant policy, legislation and guidance;
- **b.** Review of the availability and adequacy of the existing information related to risk of flooding;
- **c.** Confirmation of the sources of flooding that may affect the Proposed Scheme;
- **d.** A quantitative assessment of the risk of flooding to the proposal and to the adjacent sites as a result of the Proposed Scheme; and
- **e.** Provision of appropriate flood mitigation measures, including an outline surface water drainage strategy.

1.2. DEVELOPMENT PROPOSAL

1.2.1. The proposed scheme would involve the installation of post-combustion carbon capture technology to capture carbon dioxide from up to two existing 660-megawatt electrical ('MWe') biomass power generating units at the Drax Power Station (Unit 1 and Unit 2).

1.2.2. The installation of this technology constitutes an extension to the biomass Units 1 and 2. The carbon dioxide captured will undergo processing and compression before being transported via a proposed new pipeline for storage under the southern North Sea. Transport and storage infrastructure will be consented through separate applications.

1.2.3. It is intended that core items of the existing infrastructure at the Drax Power Station are re-used by installing and integrating the Carbon Capture Plant with existing infrastructure including existing power generating units (Units 1 and 2) for extraction of steam, re-using the cooling water systems, Main Stack and electrical connections.

1.2.4. The Proposed Scheme is made up of the following. For further information on the Proposed Scheme refer to **Chapter 2** of the ES (Site and Project Description) (document reference 6.1.2):

- **a.** Up to two Carbon Capture Plants (one associated with Unit 1 and one associated with Unit 2);
- **b.** Additional Common Plant infrastructure and modification work to the Drax Power Station that are required to support and integrate with one or both Carbon Capture Plants;
- **c.** Infrastructure to transport compressed carbon dioxide from the Carbon Dioxide Processing and Compression Plant to storage and transport infrastructure operated by National Grid Carbon Limited;
- **d.** Minor vegetation and street furniture management and other works to facilitate access during construction;
- **e.** Additional supporting infrastructure and other works for the Proposed Scheme;
- **f.** Temporary construction laydown areas (Drax Power Station Site Construction Laydown Areas and the East Construction Laydown Area); and
- **g.** Habitat Provision Areas.

1.2.5. The construction works will be carried out mainly in the northern part of the existing Drax Power Station Site. The indicative layout of the Proposed Scheme is shown in **Appendix A**, while the indicative site layout plan is shown in **Appendix B**. The proposed laydown areas are also shown in **Appendix B**.

1.2.6. The design life of the proposal is 25 years.

1.3. CONSULTATION

1.3.1. The summary of consultation undertaken to the date and that relates to flood risk and drainage is provided in Table 1.1. The important correspondence with the consultees is shown in **Appendices C – G** (as detailed in Table 1.1).

Table 1.1 - Consultation Summary

Body/Organisation and Appendix Reference	Meeting dates and other forms of consultation	Summary of Response
Environment Agency – Appendix C	Scoping Opinion letter received on 16 February 2021, letter reference RA/2021/142654/01-L01	~ The Environment Agency supports the proposed production of a FRA for the Proposed Scheme; ~ The FRA should be appropriate to the nature and scale of the proposed development; ~ In line with previous FRAs for this site, the FRA should assess the impacts of breach and overtopping events on the Proposed Scheme; and ~ The FRA should demonstrate that the Proposed Scheme will be safe during flood events. The FRA should also demonstrate that the Proposed Scheme does not increase or exacerbate flood risk to others; surface water drainage arrangements should be discussed and agreed with both North Yorkshire County Council and the IDB, although if the arrangements include a discharge to main river, then the Environment Agency will provide comments and agree the discharge rate.
	Conference call to discuss initial modelling approach with the Environment Agency, September 2021	~ The Environment Agency agreed to providing the Humber Extreme Water Level model; and ~ The Environment Agency confirmed the use the same breach location that was used in the 2018 Repower DCO.
	Conference call to discuss updated modelling approach proposed by WSP and baseline results – February 2022	~ Modelling approach agreed between the Environment Agency and WSP; and ~ The Environment Agency considered that the baseline model outputs did not show any unexpected risk and were broadly in agreement with the results but require a formal review of the model.
Yorkshire Water – Appendix D	Scoping Opinion response received on 4 February 2021, letter reference EN010120-000019-210119	~ Information on the existing water supply, sewerage and water infrastructure located within the Order Limits to be clearly shown on the layout of the Proposed Scheme. Diversion and / or protection measures will be required to ensure that the public water supply and sewerage networks are not adversely impacted by the Proposed Scheme; and ~ FRA should include a robust surface water management plan that follows sustainable drainage principles.
	Consultation response received on 21 June 2021	~ Locations of Yorkshire Waters clean water mains network in the vicinity of the Drax Power Station Site were provided. Yorkshire Water stated that the majority of the pipe work within the Drax Power Station Site is maintained and operated by Drax Power Ltd. and not Yorkshire Water owned and operated.
North Yorkshire County Council (Lead Local Flood Authority) – Appendix E	Consultation email sent on 17 February 2022	~ The following information on the existing and proposed surface water drainage systems was submitted to the LLFA: ▪ Proposed Scheme layout; ▪ Drawing showing the existing surface water drainage system and indicative location of the proposed connection to the cooling system; ▪ Estimated peak runoff generated in the new impermeable areas; ▪ Current abstraction rates; ▪ Cost-development discharge; and ▪ Exceedance flows drawing. ~ Note: Full details are provided in the Proposed Surface Water Drainage Strategy report.
	Consultation response received on 8 March 2022	~ The LLFA confirmed that the submitted documents (Existing and Proposed Surface Water Drainage Approach Technical Note, dated 17 February 2022) demonstrate a reasonable approach to the

Body/Organisation and Appendix Reference	Meeting dates and other forms of consultation	Summary of Response
		management of surface water and are in line with what has been discussed and as such the LLFA confirmed its agreement in principle to the proposed surface water drainage strategy; and ~ In addition, the LLFA advised on further information which would be needed to allow the LLFA to accept the proposed surface water drainage strategy during DCO examination.
Selby Area Internal Drainage Board (IDB) – Appendix F	Consultation response received on 19 August 2021	~ The IDB confirmed the following: ▪ The permitted discharge from the site is 1.4 l/s/ha or no greater than existing runoff; ▪ Outfall construction should ensure that pipes are not protruding into the receiving watercourse; and ▪ IDB Consent is required for any works above ground within 7 metres of the edge of the piped ordinary watercourse Carr Dyke, and/or 7 metres form the edge of the bank top of the open channel watercourse Carr Dyke. This would apply to all piped or open channel ordinary watercourses within the Drainage District (whether maintained by the IDB or by riparian owners).
Selby District Council (SDC) – Appendix G	Consultation email May 2021	~ SDC confirmed the following: ▪ The FRA should follow the guidance within the NPPF; ▪ A FRA will be required for the Proposed Scheme; ▪ A Sequential Test for flood risk (and Exception Test where necessary) would be required for any development within Flood Zones 2 or 3. However, the search area for the Sequential Test may be narrowed down to the area of Drax Power Station Site if functional (or other) reasons can be put forward to justify this; and ▪ Priority should be given to the use of sustainable urban drainage systems.

2. SITE DESCRIPTION

2.1. SITE LOCATION

2.1.1. The Drax Power Station Site is located approximately 7 km to the south-east from the centre of Selby, North Yorkshire, with an approximate NGR 466440, 427460. The works are proposed to be undertaken within the central and northern parts of the Drax Power Station Site. The location of Drax Power Station and approximate areas of the proposed works are shown in **Plate 2.1** and **Plate 2.2** below.

Plate 2.1 - Drax Power Station Location

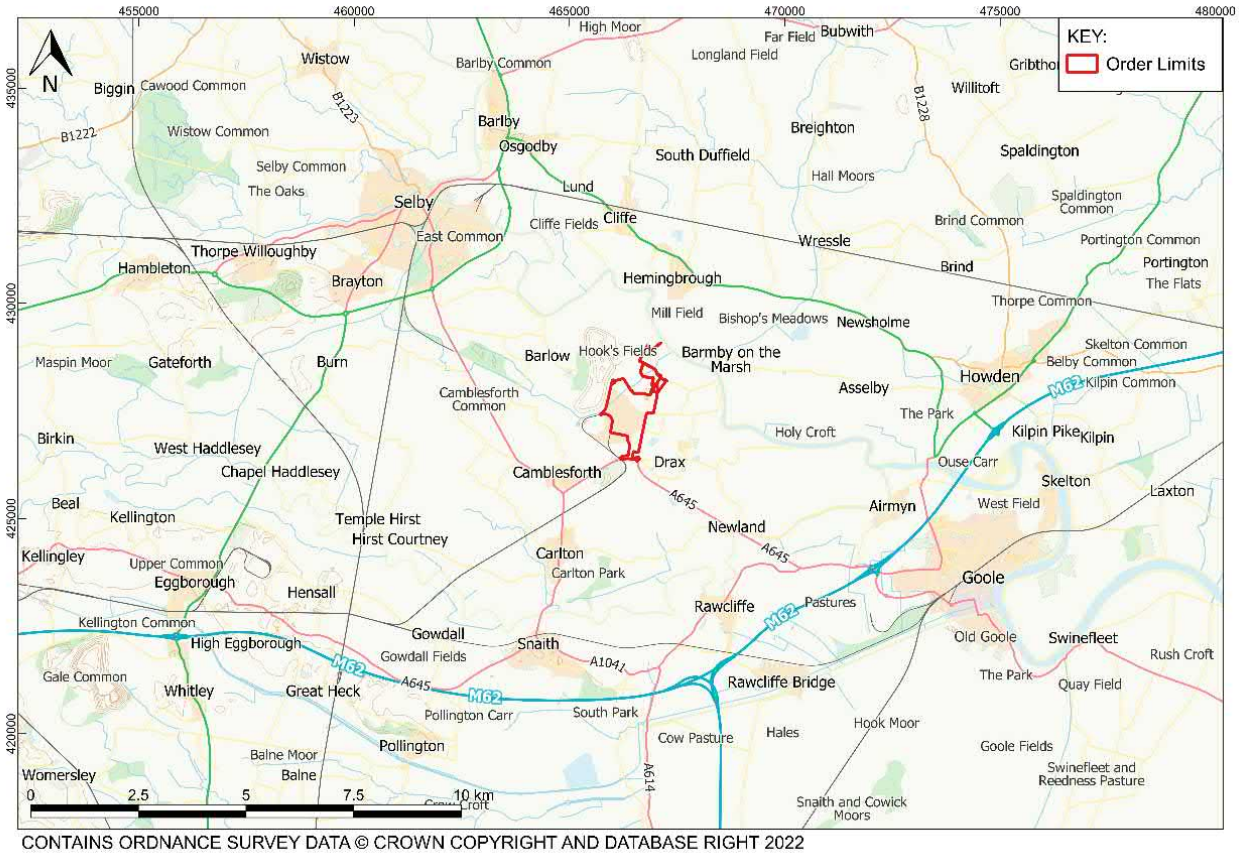

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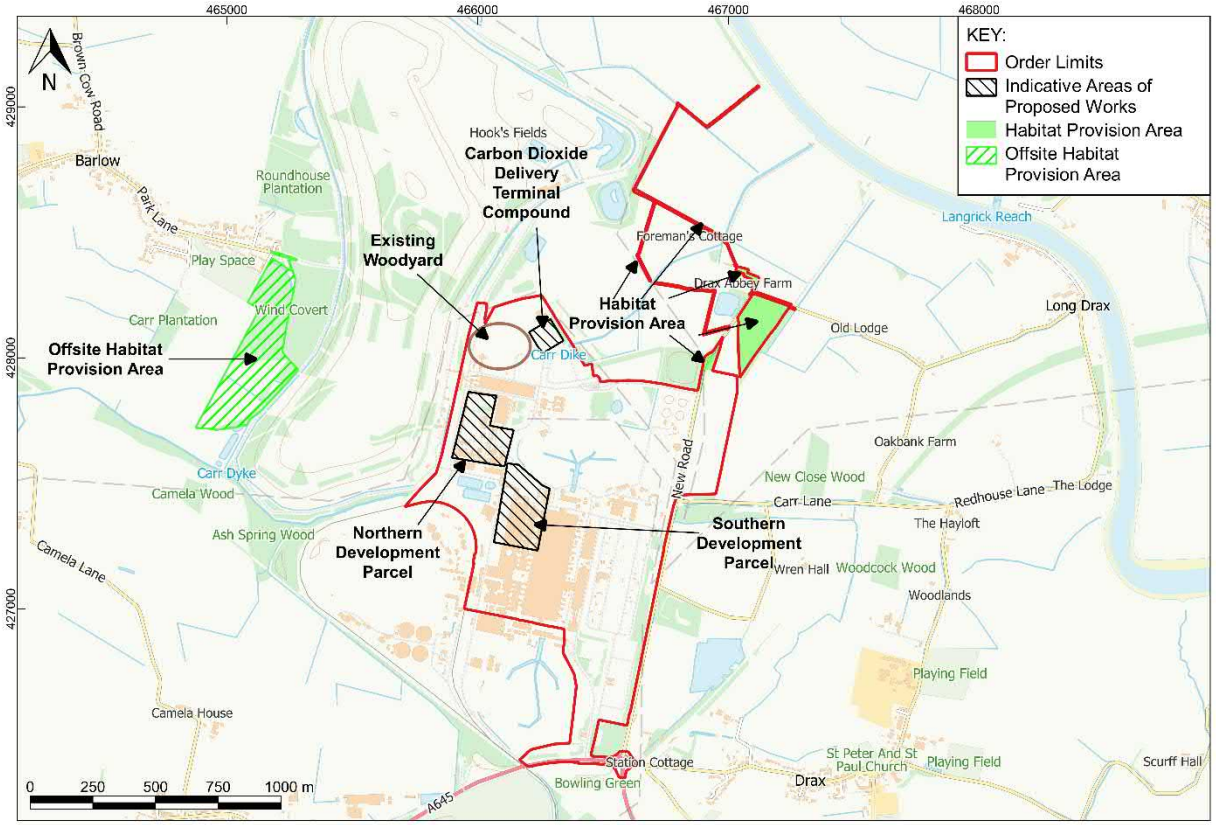
Plate 2.2 - Drax Power Station Location of Proposed Works



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2.2. SITE DESCRIPTION

2.2.1. The power station is bounded by rural areas to the north, west and south-west and by the A465 carriageway and New Road to the south-east and east respectively. The majority of works proposed within the boundary of the Drax Power Station will be undertaken in the areas that have already been developed. The indicative areas of the proposed works are shown in **Plate 2.2** above.

2.2.2. The area of the Drax Power Station and the surrounding areas comprise general low lying and flat land. The ground levels within the site vary between around 4.2 m AOD in the existing woodyard area and around 6 m AOD in the southern part of the site respectively.

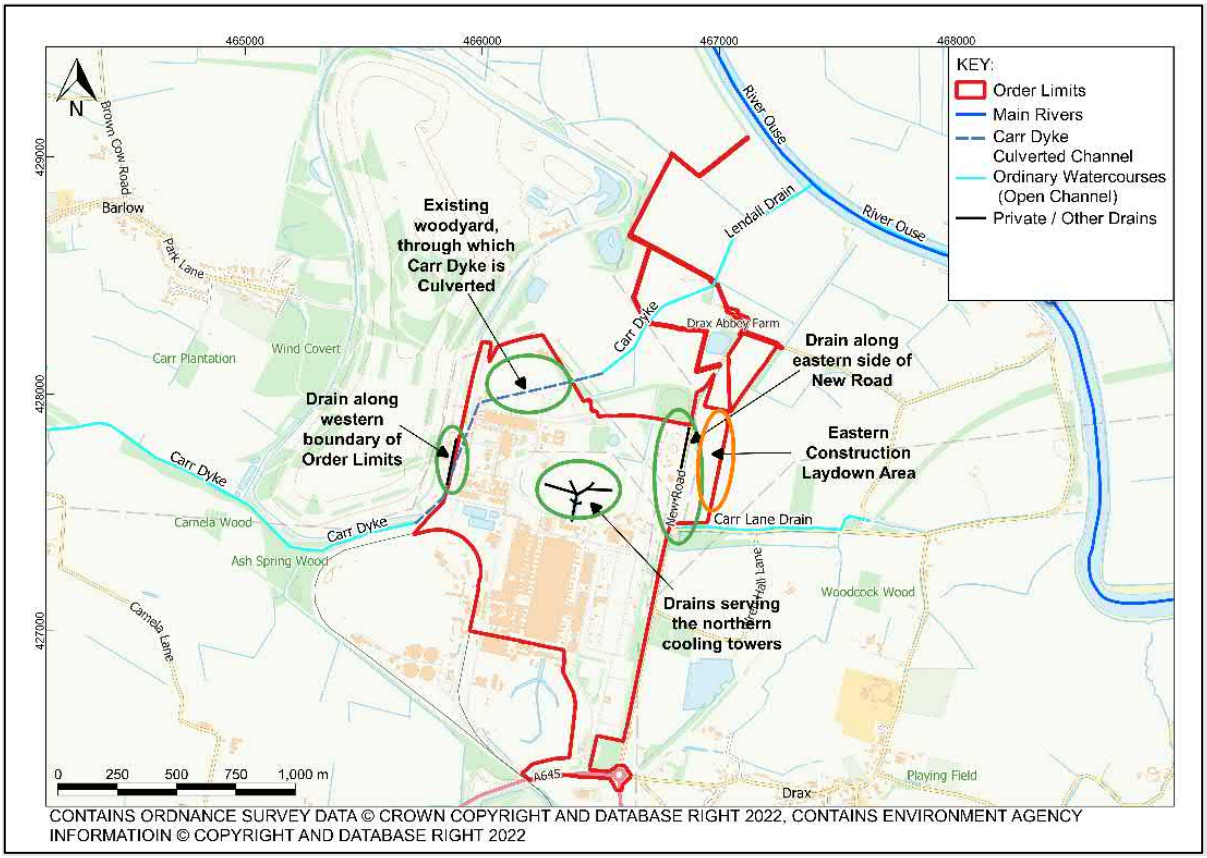
HYDROLOGY AND SURFACE WATER FEATURES

2.2.3. The area surrounding Drax Power Station Site is served by a system of drains that discharge to the River Ouse at locations to the north and east of Drax Power Station. The drains are classified as ordinary watercourses and the vast majority are under the jurisdiction of the Selby Area IDB. The River Ouse flows approximately 1.2 km and 1.7 km to the north and east of the Drax Power Station boundary and flows in an

easterly direction to the Humber Estuary. The river is designated as a main river under the jurisdiction of the Environment Agency.

2.2.4. The locations of the key water features are indicated in **Plate 2.3**.

Plate 2.3 - Watercourses in the vicinity of the Drax Power Station Site



2.2.5. The proposed construction works within the Drax Power Station Site are in close proximity with the following drains and watercourses:

a. Carr Dyke – the dyke is culverted under the north-western part of the Drax Power Station Site and flows in a north-easterly direction towards the River Ouse. The dyke is under the jurisdiction of the Selby Area IDB, except for the length culverted under the Drax Power Station Site, which is under riparian ownership and is the responsibility of Drax Power Ltd. Carr Dyke becomes Lendall Drain just before it discharges into the River Ouse. Water levels in Lendall Drain and the discharge rate into the River Ouse are controlled by Lendall Pumping Station. The dyke and pumping station is under the jurisdiction of the Selby IDB;

b. Drains in the area of the Northern Cooling Towers in Drax Power Station - these channels are located in the area of the north cooling towers and form part of the cooling water infrastructure. They are managed by Drax Power Ltd; and

c. Drain along the western boundary of Order Limits - this drain is part of the existing drainage system serving and managed by Drax Power Ltd. It flows along

the western boundary of Drax Power Station approximately 60 m to west of the proposed construction works.

2.2.6. The following watercourses / drains are located in close proximity to East Construction Laydown Area:

a. Carr Lane Drain – This is designated as an ordinary watercourse under the jurisdiction of the Selby Area IDB. It flows approximately 15 m to the south of East Construction Laydown Area, along northern side of Carr Lane; and

b. Unnamed drain along the eastern side of New Road - The drain is not identified on the Selby Area IDB plan; hence it is considered to be part of the existing highway drainage system. The drain flows along the western boundary of East Construction Laydown Area.

GEOLOGY AND HYDROGEOLOGY

2.2.7. A review of British Geology Survey (BGS) mapping (British Geological Survey, 2022) shows that:

a. The majority of the Drax Power Station Site, including areas of the proposed works, is underlain by bedrock identified as Sherwood Sandstone Group – Sandstone, identified as Principal Aquifer. The BGS mapping also shows that this area is also underlain mainly by superficial deposits in the form of Hemingbrough Glaciolacustrine Formation - Clay, Silty identified as Unproductive Strata;

b. The area of the proposed gas heat exchanger, quench and absorber columns and associated infrastructure is indicated to be underlain by superficial deposits in form of Breighton Sand Formation - Sand identified as Secondary A Aquifer; and

c. The area along the north-western boundary of the Drax Power Station, and part of the area of the existing woodyard, including the area of the proposed Carbon Dioxide Delivery Terminal Compound is underlain by bedrock identified as Sherwood Sandstone Group – Sandstone overlaid by superficial deposits in form of Alluvium – Clay, Silt and Gravel, identified as Secondary A Aquifer.

2.2.8. A Principal Aquifer is described as layers of rock or drift deposits that have high intergranular and / or fracture permeability – meaning they usually provide a high level of water storage. Principal Aquifers may support water supply and/or river base flow on a strategic scale. Unproductive Strata is described as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. A Secondary A Aquifer is described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

2.2.9. A review of the BGS borehole logs (British Geological Survey, 2022) recorded within the boundary or in the vicinity of the Drax Power Station shows the Sandstone bedrock to be located at a depth of approximately 19 m below ground level (bgl). The borehole logs also indicate that groundwater was recorded at depths of between

approximately 4.9 m bgl (borehole reference SE62NE29) and 2.20 m bgl (borehole reference SE62NE126) in the north-eastern and southern part of the area of the Power Station Site respectively.

2.2.10. The Environment Agency's Groundwater Source Protection Zone (SPZ) mapping (Department for Environment, Food and Rural Affairs DEFRA, 2022) shows that the Drax Power Station Site and the proposed laydown areas are located in Zone 3 of the groundwater SPZ. The area of the existing woodyard, including the area of the proposed Carbon Dioxide Delivery Terminal Compound, the Habitat Provision Area and Offsite Habitat Provision Area are not located in the groundwater SPZ.

SOIL INFILTRATION

2.2.11. A number of in-situ soil infiltration tests were undertaken as part of the site investigation undertaken to inform the White Rose Carbon Capture and Storage Surface Water and Flood Risk Environmental Statement Chapter (ERM, 2014), this was another project associated with Drax Power Station. The results show a very low permeability ranging between 1.1×10^{-5} m/s and 6.97×10^{-8} m/s.

2.2.12. A review of The Cranfield Soil and Agrifood Institute mapping (Soilscape) (Cranfield Soil and Agrifood Institute Soilscapes, 2022) also shows that Drax Power Station Site and the southern part of the proposed Habitat Provision Area are underlaid with slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage. The area of the proposed Habitat Provision Area located closer to the River Ouse is indicated to be underlain by loamy and clayey soils of coastal flats with naturally high groundwater,

2.2.13. Considering this information and the recorded geology and hydrogeology of the site, the soil infiltration rates in this area are considered to be low and not suitable for infiltration techniques.

EXISTING DRAINAGE

2.2.14. Information on the existing drainage system serving the Drax Power Station was received from Drax Power Ltd. Surface water runoff generated within the boundary of Drax Power Station is managed by a complex drainage system that combines gravity and pumped systems with open ditches, culverts, land drainage and lagoons.

2.2.15. Surface water runoff from the area of the existing Woodyard, the car park and offices located to the north of the northern cooling towers and partially from the area surrounding the northern cooling towers is discharged to the culverted section of Carr Dyke crossing the existing Woodyard, which eventually discharges into the River Ouse via the Lendall Pumping Station. Surface water runoff generated in the Proposed Scheme and partially from the area surrounding northern cooling towers is conveyed to the 'purge' pump from where it is pumped into the River Ouse, along with all other waters being discharged from the Drax Power Station Site (i.e., treated effluent, cooling and process water and silt from sedimentation tanks).

2.2.16. Effluent water from all water streams (cooling, surface water runoff, foul water) across the Drax Power Station Site are eventually combined in the 'purge' pumping system prior to discharge to the River Ouse. Further context on the individual systems is provided below.

2.2.17. The total water discharged from the Site, which is understood to mainly comprise the cooling water, but also includes process water, silt from the sedimentation tanks and treated effluent, is currently around 5,150 m^3/hour, this is significantly below the permitted discharge rate. This produces a large dilution capacity for any contaminants within the individual discharge streams prior to discharge to the River Ouse. The silt collected in the sedimentation tanks is returned to the River Ouse via the purge pump together with the other water discharged from Drax Power Station Site.

2.2.18. Surface water runoff generated in areas likely to pick up oily contaminants, such as oil tank storage areas and car parks, is passed through oil separators prior to discharge to Carr Dyke or the purge discharge to the River Ouse.

2.2.19. All foul effluent from toilets and welfare facilities is drained via a separate drainage system to an on-site sewage treatment plant. From here, the treated foul effluent is pumped to the primary surface water pumping station, from where it is pumped to the purge pump house and then to the River Ouse via the consented purge water discharge.

2.2.20. A drawing showing the existing drainage system serving the northern part of Drax Power Station Site, where the Proposed Scheme is proposed to be located is shown in **Appendix H**.

2.2.21. Habitat Provision Area and Offsite Habitat Provision Area are served by an existing drainage network (drainage ditches and culverts) managed by the IDB or riparian owners; the works will not impact the functionality or operation / management of the drainage network.

3. PLANNING POLICY

3.1. OVERVIEW

3.1.1. This FRA report summarises baseline flood risk information and identifies flood risk to the Proposed Scheme and potential flood risk to other areas caused by the Proposed Scheme.

3.1.2. Flood risk is assessed in accordance with the NPPF, National Policy Statement (NPS) and local planning policy relevant to the proposed location of the Proposed Scheme. A summary of these policies is provided in this section.

3.2. OVERARCHING NATIONAL POLICY STATEMENT FOR ENERGY (EN-1)

3.2.1. The Overarching National Policy Statement for Energy (NPS EN-1) (Department of Energy & Climate Change, 2011) recognises that infrastructure can have adverse effects on the water environment. It states that the effects could lead to adverse impacts on health or on protected species and habitats and could result in surface waters, groundwaters or protected areas failing to meet environmental objectives established under the WFD.

3.2.2. It states that where projects are likely to have effects on the water environment, applicants should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES.

3.2.3. Section 5.7 (Flood risk) of NPS EN-1 details that project of 1 hectare or greater in Flood Zone 1 in England and all proposals for energy projects located in Flood Zones 2 and 3 in England should be accompanied by a Flood Risk Assessment (FRA). As set out in paragraph 5.7.5 of NPS-EN-1, the minimum requirements for FRAs are that they should:

a. Be proportionate to the risk and appropriate to the scale, nature and location of the project;

b. Consider the risk of flooding arising from the project in addition to the risk of flooding to the project;

c. Take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;

d. Be undertaken by competent people, as early as possible in the process of preparing the proposal;

e. Consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure;

f. Consider the vulnerability of those using the Site, including arrangements for safe access;

g. Consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;

h. Consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;

i. Include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;

j. Consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems;

k. Detail measures that will be included to ensure development will be safe and remain operational during a worst case flood event over the development's lifetime; and

l. Be supported by appropriate data and information, including historical information on previous events.

3.2.4. In determining an application for development consent, the Secretary of State should be satisfied that where relevant (paragraph 5.7.9 of NPS EN-1):

a. The application is supported by an appropriate FRA;

b. The Sequential Test has been applied as part of site selection;

c. A sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;

d. The proposal is in line with any relevant national and local flood risk management strategy;

e. Priority has been given to the use of sustainable drainage systems (SUDS); and

f. In flood risk areas the project is designed and constructed to remain safe and operational during its lifetime, without increasing flood risk elsewhere, including safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development.

DRAFT OVERARCHING NATIONAL PLANNING POLICY STATEMENT FOR ENERGY

3.2.5. The draft (Department for Business, Energy & Industrial Strategy, 2021) sets out the national policy for energy infrastructure. It states that a site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England (i.e., this site) and it confirms the same approach regarding requirements for flood risk assessments.

3.3. NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

3.3.1. The NPPF (Ministry of Housing, Communities & Local Government, 2021(a)) and Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' (Ministry of Housing, Communities & Local Government, 2021(b)) documents provide guidance on how new developments must take into account flood risk, including allowance for the impacts of climate change.

3.3.2. In relation to flood risk, the NPPF encourages decision makers to:

a. Steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding;

b. Prevent any increase in flood risk elsewhere and reduce flood risk through the layout and form of the development and the appropriate application of sustainable drainage systems;

c. Reduce flood risk by making space for water by creating flood flow paths and by identifying, allocating and safeguarding space for flood storage; and

d. Use regeneration to help relocate development to lower risk locations when climate change is expected to mean that some existing development may not be sustainable in the long-term.

3.3.3. As discussed below, the NPPF defines flood risk as the product of the likelihood or chance of a flood occurring (flood frequency) and the consequence or impact of the flooding (flood consequence).

3.3.4. Flood frequency is identified in terms of the return period and annual probability. For example, a 1 in 100 year flood event has a 1% annual probability of occurrence. Table 3.1 provides a conversion between return periods and annual flood probabilities. In this report the return period convention has been adopted. A return period, also known as a recurrence interval or repeat interval, is an average time or an estimated average time between flood events to occur.

Table 3.1 - Flood Probability Conversion Table

Return Period (years)	2	5	10	20	50	100	200	1000
Annual Flood Probability (%)	50	20	10	5	2	1	0.5	0.1

3.3.5. The NPPF identifies Flood Zones in relation to flood frequency. The zones refer to the probability of river (fluvial) and sea (tidal) flooding, whilst ignoring the presence of defences. **Table 3.2** summarises the relationship between the Flood Zone categories and the identified flood risk.

Table 3.2 - Flood Zone Definitions

Flood Risk Area	Identification	Annual Probability of Fluvial Flooding	Annual Probability of Tidal Flooding
Flood Zone 1	Low Probability	< 1 in 1000	< 1 in 1000
Flood Zone 2	Medium Probability	1 in 100 to 1 in 1000	1 in 200 to 1 in 1000
Flood Zone 3a	High Probability	> 1 in 100	> 1 in 200
Flood Zone 3b	Functional Floodplain	> 1 in 20	> 1 in 20

FLOOD CONSEQUENCE

3.3.6. The consequence of a flood event describes the potential damage, danger and disruption caused by flooding. This is dependent on the mechanism and characteristics of the flood event and the vulnerability of the affected land and land use.

3.3.7. The Environment Agency have identified five classifications of flood risk vulnerability and provide recommendations on the compatibility of each vulnerability classification with the Flood Zones. This is outlined in Table 3.3.

3.3.8. Full details of the Environment Agency's Flood Zones and flood risk vulnerability classifications can be found in the Planning Practice Guidance 'Flood Risk and Coastal Change' (Ministry of Housing, Communities & Local Government, 2021(b)).

Table 3.3 - Flood Risk Vulnerability and Flood Zone Compatibility

EA Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b	Exception test required	✓	×	×	×

✓ Development considered acceptable

× Development considered unacceptable

3.3.9. In accordance with this guidance, the Proposed Scheme is considered as ‘essential infrastructure’ and should remain operational during flood events. The Sequential and Exception Tests are addressed in **Section 9** below.

3.4. THE FLOOD WATER MANAGEMENT ACT 2010

3.4.1. The Flood and Water Management Act 2010 (FWMA) introduced responsibilities for local authorities to manage flood risk and sets out new requirements for the management of sustainable drainage.

LEAD LOCAL FLOOD AUTHORITIES

3.4.2. Under the FWMA North Yorkshire County Council as County Council is designated the 'Lead Local Flood Authority' (LLFA) with responsibility for managing flood risk from surface water, groundwater and ordinary watercourses within their area. The LLFA is also ordinarily the consenting authority for works near or within ordinary watercourses.

3.4.3. In areas where there are special drainage requirements such as the areas surrounding Drax Power Station Site, Selby Area Internal Drainage Board (IDB) has permissive powers to manage water levels within their drainage district. IDBs undertake works to reduce flood risk to people, property and infrastructure, and to also manage water levels for agricultural and environmental needs. They are also the consenting authority for works near or within ordinary watercourses (unless the requirement for such consents is disapplied in the DCO as is the case for the Proposed Scheme (but with the IDB given an appropriate role in other parts of the DCO).

3.5. SUSTAINABLE DRAINAGE

3.5.1. The Non-Statutory Technical Standards for Sustainable Drainage Systems (DEFRA, 2015) provides general guidance for the design, maintenance and operation of sustainable drainage systems (SuDs). Detailed design and guidance is provided in The SuDS Manual (C753) (Construction Industry Research and Information Association (CIRIA), 2015).

3.5.2. In addition, the NPPF (Ministry of Housing, Communities & Local Government, 2021(a)) promotes SUDS and states that major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a. take account of advice from the lead local flood authority;

b. have appropriate proposed minimum operational standards;

c. have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

d. where possible, provide multifunctional benefits.

3.6. REVIEW OF RELEVANT LOCAL PLANNING POLICY

SELBY DISTRICT CORE STRATEGY PLAN (SELBY DISTRICT COUNCIL, 2013)

3.6.1. The following policies relate to drainage and flood risk:

a. Policy SP15 (Sustainable Development and Climate Change) sets out to promote sustainable development and determine scheme layouts which are resilient to climate change:

i. Section A Part D) Ensure that development in areas of flood risk is avoided wherever possible through the application of the sequential test and exception test; and ensure that where development must be located within areas of flood risk that it can be made safe without increasing flood risk elsewhere.

ii. Section A Part E) Support sustainable flood management measures such as water storage areas and schemes promoted through local surface water management plans to provide protection from flooding; and biodiversity and amenity improvements.

iii. Section B part C) Incorporate water-efficient design and sustainable drainage systems which promote groundwater recharge.

b. Policy SP18 (Protecting and Enhancing the Environment) sets out to protect the District's environment, in particular by:

i. Section 7. Ensuring that new development protects soil, air and water quality from all types of pollution.

ii. Section 8. Ensuring developments minimise energy and water consumption, the use of non-renewable resources, and the amount of waste material.

iii. Section 9. Steering development to areas of least environmental and agricultural quality.

3.6.2. The Local Plan identifies a number of primary issues which should be considered. Two of these issues are relevant to the Proposed Scheme in relation to the water environment:

a. Protection of groundwater (paragraph 7.24): The District is underlain by the Sherwood Sandstone and the Magnesian Limestone aquifers, both of which provide a significant groundwater supply. Where there are no superficial deposits over the aquifers, groundwater contamination is a serious concern so consideration must be given to the prevention of pollution and the protection of water quality within the groundwater. Water conservation measures such as Sustainable Drainage Systems to encourage ground water discharge are promoted across the District to adapt to the future pressures of climate change.

b. Flood Risk management (paragraph 7.27): Significant flood risks exist across large areas of Selby District is shown by the Council's Level 1 Strategic Flood Risk Assessment, most developments therefore require the application of the Sequential Test.

3.7. OTHER LOCAL GUIDANCE

NORTH YORKSHIRE COUNTY COUNCIL (NYCC) SUDS DESIGN GUIDANCE (NORTH YORKSHIRE COUNTY COUNCIL (B), 2018 (UPDATE))

3.7.1. North Yorkshire County Council (NYCC) SUDS Design Guidance provides principles for the design of SUDS measures, which have been followed during the design of the proposed surface water drainage system.

SELBY AREA INTERNAL DRAINAGE BOARD BYE-LAWS (SELBY AREA INTERNAL DRAINAGE BOARD , 1999)

3.7.2. Selby Area Internal Drainage Board bye-laws provide a summary of the requirements related to any works planned to be undertaken within or in close proximity to the ordinary watercourses located in the area under the jurisdiction of the Internal Drainage Board (IDB). The bye-laws also provide information on the requirements related to drainage discharge rates to the watercourses under the jurisdiction of the IDB. A summary of the general requirements of the bye-laws is given in **Appendix F**.

4. METHODOLOGY AND DATA

4.1. METHODOLOGY

4.1.1. The methodology adopted in the preparation of this FRA comprises:

a. Review of available flood risk data to identify existing flood risk from fluvial, tidal, groundwater, surface water and artificial sources;

b. Review of existing ground conditions on-site to determine groundwater levels, soil permeability and contamination risks through examination of previous land uses and information available from the Environment Agency, the British Geological Survey (BGS) and the Cranfield Soil and Agrifood Institute mapping;

c. Review of the Proposed Scheme with respect to the flood risk vulnerability and flood zone compatibility of the Scheme, in accordance with the methodology outlined in the NPPF;

d. Assessment of how the Proposed Scheme might affect flood risk to the site and elsewhere supported by a hydraulic modelling of the proposed works; and

e. Preparation and assessment of proposals for the appropriate management of flood risk to enable construction and operation of the development without increasing flood risk elsewhere.

4.2. DATA

4.2.1. Data regarding flood risk relevant to the Proposed Scheme and the surrounding area has been obtained from the following sources:

a. Drax Repower Flood Risk Assessment (WSP, 2018);

b. Extreme Water Levels Model (Jacobs Consulting, 2020);

c. Flood Map for Planning (Environment Agency, 2022(a));

d. GeoIndex Onshore Geology of Britain Viewer (British Geological Survey, 2022);

e. Long Term Flood Risk Maps (Environment Agency, 2022(b));

f. MAGIC Online Environmental Mapping (Department for Environment, Food and Rural Affairs DEFRA, 2022);

g. North Yorkshire County Council (NYCC) Local Flood Risk Strategy (North Yorkshire County Council, 2018(a));

h. Ouse Catchment Flood Management Plan Summary Report (Environment Agency, 2010);

i. Selby District Council Level 1 Strategic Flood Risk Assessment (Selby District Council, 2020);

j. Selby District Council Level 2 Strategic Flood Risk Assessment (Selby District Council, 2021);

k. Soilscapes for England and Wales (UK Soil Observatory, 2022);

l. Information on existing flood defences ((Environment Agency (c), 2021) and

m. Upper Humber Model (JBA Consulting, 2016).

5. EXISTING FLOOD RISK

5.1. POTENTIAL SOURCES OF FLOODING

5.1.1. In accordance with the NPPF and the NPS, which states all sources of flood risk should be taken into account. The following sources of flooding have been considered in this assessment (as detailed in the following sections):

a. Fluvial water from watercourses;

b. Tidal;

c. Overland surface water runoff from adjacent sites;

d. Site generated surface water runoff;

e. Surcharging of sewers;

f. Reservoirs; and

g. Groundwater.

5.2. HISTORICAL FLOODING

5.2.1. A review of the Selby District Council Level 1 SFRA (Selby District Council, 2020) indicates there are no records of historical flooding in the area of Drax Power Station or within the carbon capture location boundary.

5.2.2. The flood records received from the Environment Agency (May 2021) confirm that there is no known flood history within the Order Limits. The Environment Agency Recorded Flood Outlines mapping is shown in **Appendix I**.

5.3. FLOOD DEFENCES

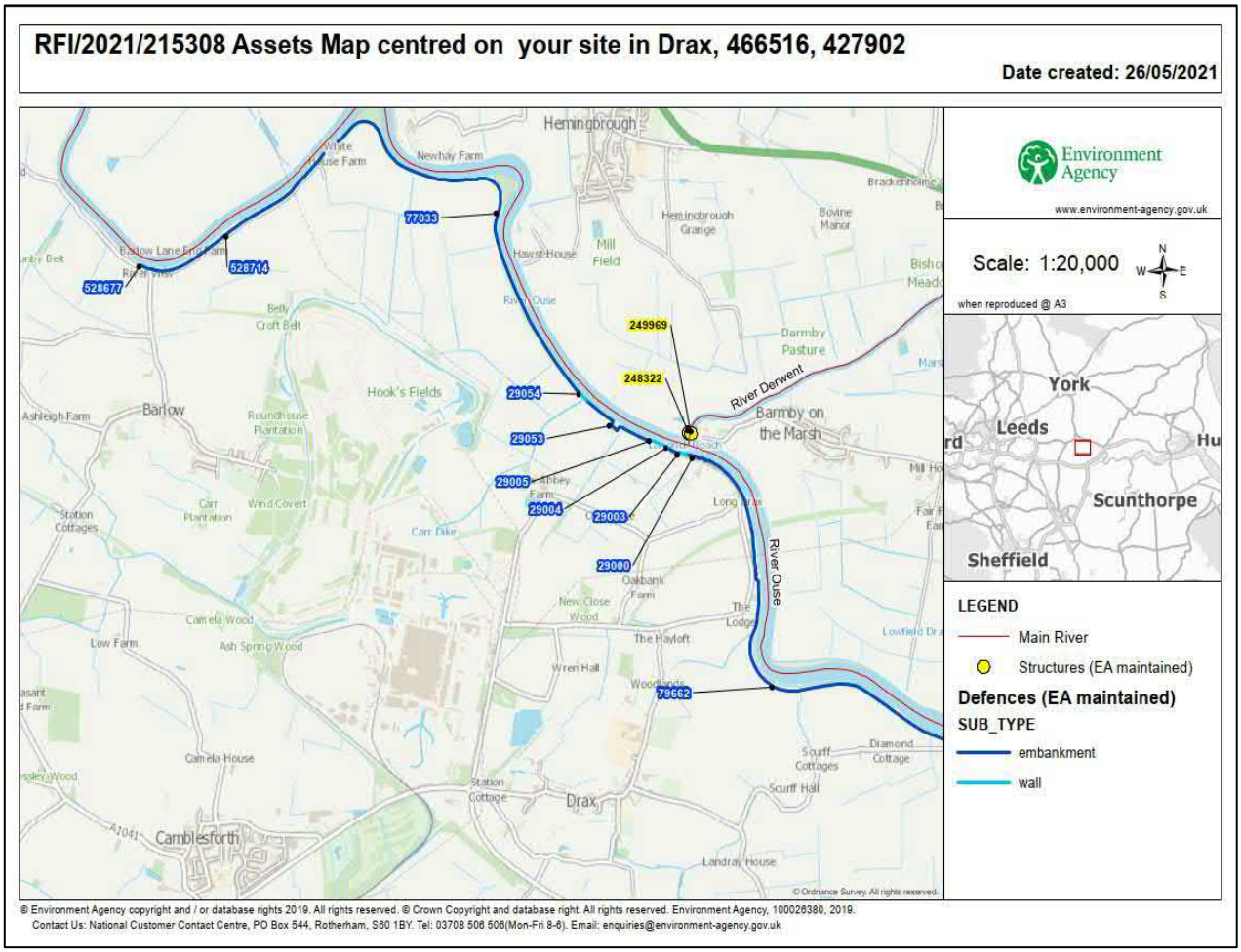
5.3.1. Information on the existing flood defences was received from the Environment Agency. This identifies that flood defences in the form of walls and raised embankments are present along the western bank of the River Ouse which provide fluvial and tidal protection and are maintained by the Environment Agency. Details of the flood defences are provided in **Table 5.1** and their locations are shown in **Plate 5-1**.

Table 5.1 - Existing Flood Defence Details (EA, May 2021)

Asset ID	Type	Downstream Crest Level (mAOD)	Upstream Crest Level (mAOD)	Overall Condition
29000	Embankment	6.16	5.86	3 (fair)
29003	Wall	6.21	6.03	3 (fair)
29004	Embankment	5.94	6.05	1 (poor)
29005	Wall	6.05	5.62	3 (fair)
29053	Embankment	5.62	5.95	2 (good)
29054	Wall	5.95	6.02	3 (fair)
528677	Embankment	-	-	3 (fair)
528714	Embankment	-	-	3 (fair)

Asset ID	Type	Downstream Crest Level (mAOD)	Upstream Crest Level (mAOD)	Overall Condition
77033	Embankment	6.06	6.31	3 (fair)
79662	Embankment	5.71	6.13	3 (fair)

Plate 5.1 - Location of Existing Flood Defences (Environment Agency (c), 2021)



5.3.2. Whilst these defences are present there is still a residual risk of flooding in case of breach of the flood defences or their overtopping by a flood greater than that for which they were designed.

5.3.3. The Environment Agency stated that asset inspections are undertaken on average every six months, although some critical assets are assessed on a more regular basis. The Environment Agency aim to maintain all flood defence assets to at least 'fair' standard to ensure that the assets provide appropriate protection.

5.4. RISK OF FLUVIAL AND TIDAL FLOODING

5.4.1. The River Ouse is tidally influenced at the location of the Proposed Scheme. The risk of flooding in this area from the River Ouse is therefore a combination of fluvial and tidal flooding.

PRESENT DAY / CONSTRUCTION PHASE

Flood Map for Planning and SFRA Mapping

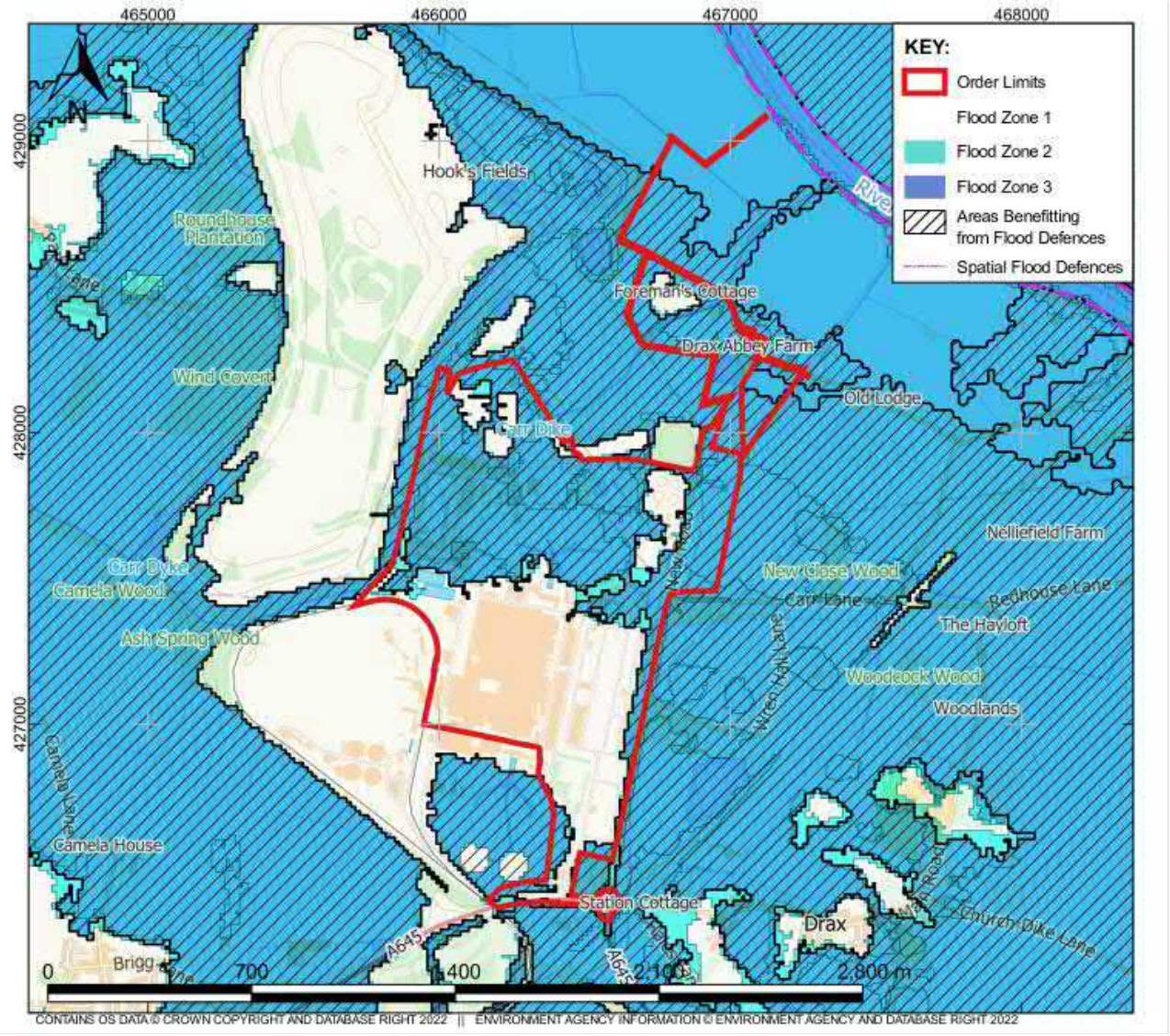
5.4.2. The Environment Agency's Flood Map for Planning (Environment Agency, 2022(a)) and the Level 1 SFRA (Selby District Council, 2020) have been produced at a strategic scale to support the development and implementation of planning policy.

5.4.3. The flood map for planning shows the extent of the floodplain during the 'undefended scenario', which means that the presence of the existing flood defences is not taken into account. The mapping does, however, indicate those areas of the floodplain that will benefit from flood defences during the 1 in 100 year fluvial event or the 1 in 200 year tidal event.

5.4.4. The Flood Map for Planning and mapping from the Level 1 SFRA (Selby District Council, 2020) show that the central part of the Drax Power Station Site and isolated areas to the north of Drax Power Station are located within Flood Zone 1. Flood Zone 1 corresponds to land having a less than 1 in 1000 return period of river or tidal flooding.

5.4.5. The northern and southern parts of Drax Power Station Site (the proposed East Construction Laydown Area and Habitat Provision Area) are shown to be located within Flood Zone 3 but benefiting from the existing flood defences. Flood Zone 3 is defined as a land with a 1 in 100 or greater chance of flooding each year from rivers; or with a 1 in 200 or greater chance of flooding each year from the sea.

Plate 5.2 - Extract of the Environment Agency's Flood Map for Planning



5.4.6. The Level 1 SFRA mapping shows that of the Order Limits which are within Flood Zone 3 the majority are in Flood Zone 3a, including the Habitat Provision Area. There remains an isolated part of the Order Limits (located to the north of Drax Abbey Farm which is north of the Drax Power Station Site) within Flood Zone 3b which extends to the banks of the River Ouse.

5.4.7. Flood Zone 3b is considered to be a functional floodplain and is defined by the NPPF (Ministry of Housing, Communities & Local Government, 2021(a)) as land where water has to flow or be stored in times of flood.

5.4.8. The Level 1 SFRA mapping indicates that the Offsite Habitat Provision Area is located in Flood Zone 3a.

2016 Upper Humber Hydraulic Model

5.4.9. The Environment Agency develop hydraulic models to further assess the risk of flooding in key areas.

5.4.10. The Environment Agency provided detailed flood mapping from their 2016 Upper Humber hydraulic model (**Appendix J**) which shows the present-day risk of flooding in the area of the Proposed Scheme. This shows that the entire Drax Power Station Site is outside of the present day defended scenario for the 1 in 200 year event. However, large parts of the site are shown to be at risk of flooding in the 1 in 1000 year event.

5.4.11. Based on the mapping from the 2016 Upper Humber model the southern half of the Offsite Habitat Provision Area is shown to be at risk of flooding during the present day 1 in 200 year defended event, with the entirety of the Offsite Habitat Provision Area shown to be at risk of flooding during the present day 1 in 1000 year defended event.

5.4.12. The associated combined breach mapping from the 2016 Upper Humber modelling shows that in the present day, the entire Drax Power Station Site and Offsite Habitat provision Area are located outside of floodplain associated with a breach scenario for up to and including the 1 in 200 year return period event. Although the northern and southern end of East Construction Laydown Area and Habitat Provision Area may potentially be flooded during a breach event.

OPERATIONAL PHASE

Methodology

5.4.13. Hydraulic modelling of the River Ouse was undertaken to assess the risk of flooding to the Proposed Scheme during its design life. It was agreed with the Environment Agency that this would be undertaken by combining their two existing hydraulic models: the Upper Humber model (JBA Consulting, 2016) and the Humber Extreme Water Levels (EWL) model (Jacobs Consulting, 2020).

5.4.14. Full details of the hydraulic modelling, including the relevant correspondence and agreements with the Environment Agency, are provided in **Appendix K**. A summary of the key aspects are summarised in paragraphs below.

5.4.15. The design life of the Proposed Scheme is anticipated to be 25 years. At the end of the 25-year period, the facility may have some residual life remaining and an investment decision would be made as to whether the operational life of the Proposed Scheme would be extended. If it is not appropriate to continue operation, the Proposed Scheme would be decommissioned. Considering this information, the following climate change allowances based on the 25-year design life of the Proposed Scheme, have been used in the hydraulic modelling as agreed with the Environment Agency:

a. Upper end allowance (Epoch 2050s) for peak river flows:

i. 29% for the River Ouse catchment.

ii. 31% for the River Aire catchment.

iii. 36% for the River Don catchment, and

iv. 38% for the River Trent catchment.

b. Sea level rise uplift of 252.6 mm.

5.4.16. As the Proposed Scheme is on the fluvial / tidal boundary of the River Ouse it was agreed with the Environment Agency that a range of joint probability scenarios would be assessed in the hydraulic model. Table 5.2 - Fluvial / Tidal Joint Probability Matrix of The Environment Agency's EWL model report details the critical combination of scenarios for this reach. The adopted scenarios and their purpose are:

a. "FT2" scenario is used as a design flood event;

b. Scenarios "FT1", "FT5", "T" and "FD" are used for sensitivity analysis; and

c. Scenarios "FT1" and "FT2" are used for breach analysis to assess the residual flood risk to the Proposed Scheme.

Table 5.2 - Fluvial / Tidal Joint Probability Matrix

ID	Design / Sensitivity	RP	Aire	Don	Ouse	Trent	Tidal	Event Type
FT2	Design	200	50	20	100	50	10	Mixed tidal / fluvial
FT1	Sensitivity	200	100	50	200	100	5	Mixed tidal / fluvial
FT5		200	5	2	10	5	100	Mixed tidal / fluvial
T		200	2	2	5	2	200	Tidal
FD		200	200	200	200	200	5	Fluvial

5.4.17. The terrain data in the hydraulic model was updated to include the Environment Agency's latest available LiDAR DTM to ensure that the ground levels in and around the Proposed Scheme are best represented.

5.4.18. Flood levels for all the events (design scenario, sensitivity analysis and breach analysis) were extracted from the model at the locations shown in Plate 5.7, are summarised in Table 5.3 and discussed below. Noting that the building references correspond to those from the Indicative Plant Equipment Layout Plan, drawing "FRA – Plate 1", which is included in **Appendix A**.

Design Flood Event

5.4.1. The modelled peak flood extent and depths during the design flood event (FT2) are shown in Plate 5-3.

5.4.2. During the design flood event (FT2), flooding is predicted to occur in the following areas of the Proposed Scheme:

a. **Southern Development Parcel** - dry except for the Electrical Switch Room Building which is predicted to experience depths of up to 0.03 m and the eastern unit of Solvent Regeneration System which is predicted to experience flood depths of up to 0.10 m;

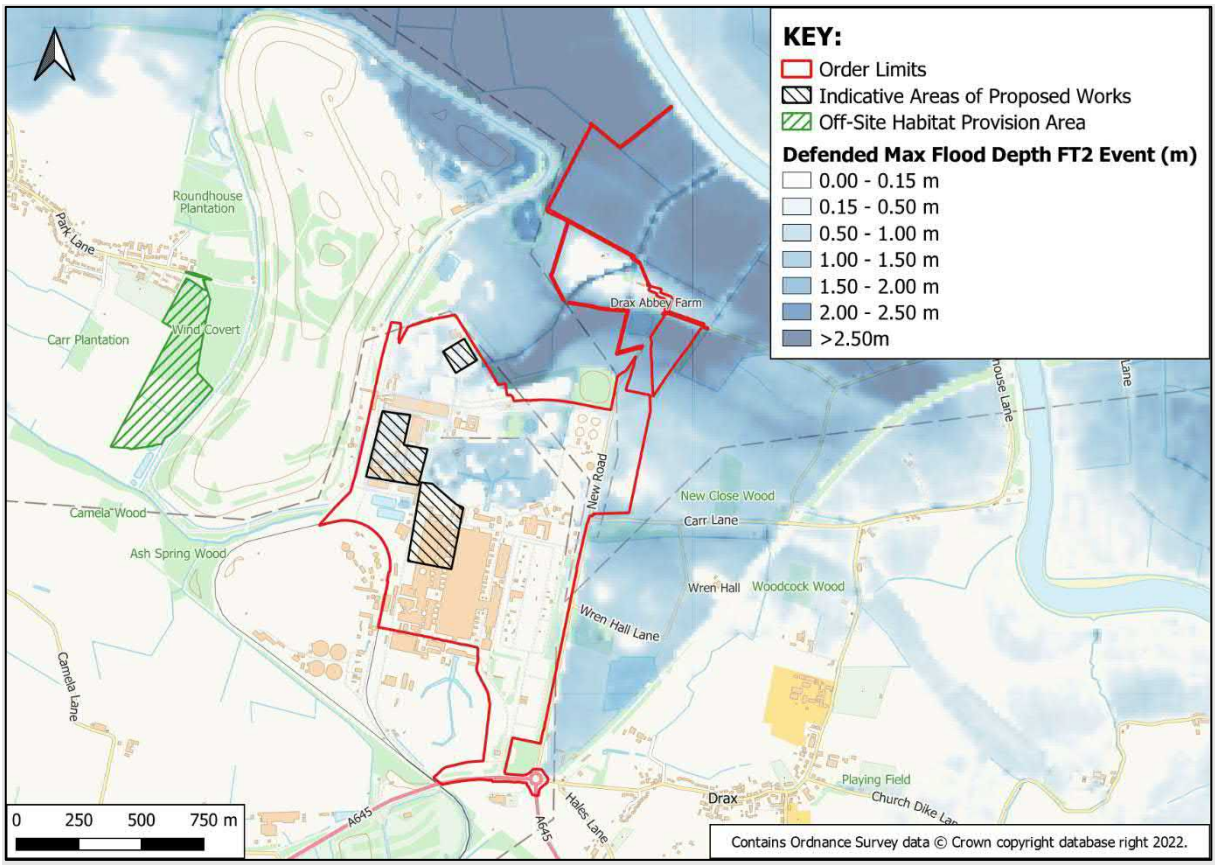
b. **Northern Development Parcel** - depths of up to 0.17 m by the Carbon Dioxide Processing and Compression Plant; depths of up to 0.18 m by the Carbon Capture Wastewater Treatment Plant; and depths of up to 0.05 m by the Solvent Storage and Make-up System;

c. **Carbon Dioxide Delivery Terminal Compound** - depths of up to 0.66 m by the **Carbon Dioxide Delivery Terminal Compound**;

d. **Habitat Provision Area –** depths of up to 3.19m may occur in this area; and

e. **Offsite Habitat Provision Area** – this area is outside of the defended flood extents for design event FT2.

Plate 5.3 - Flood Depths for the Design Scenario (FT2)

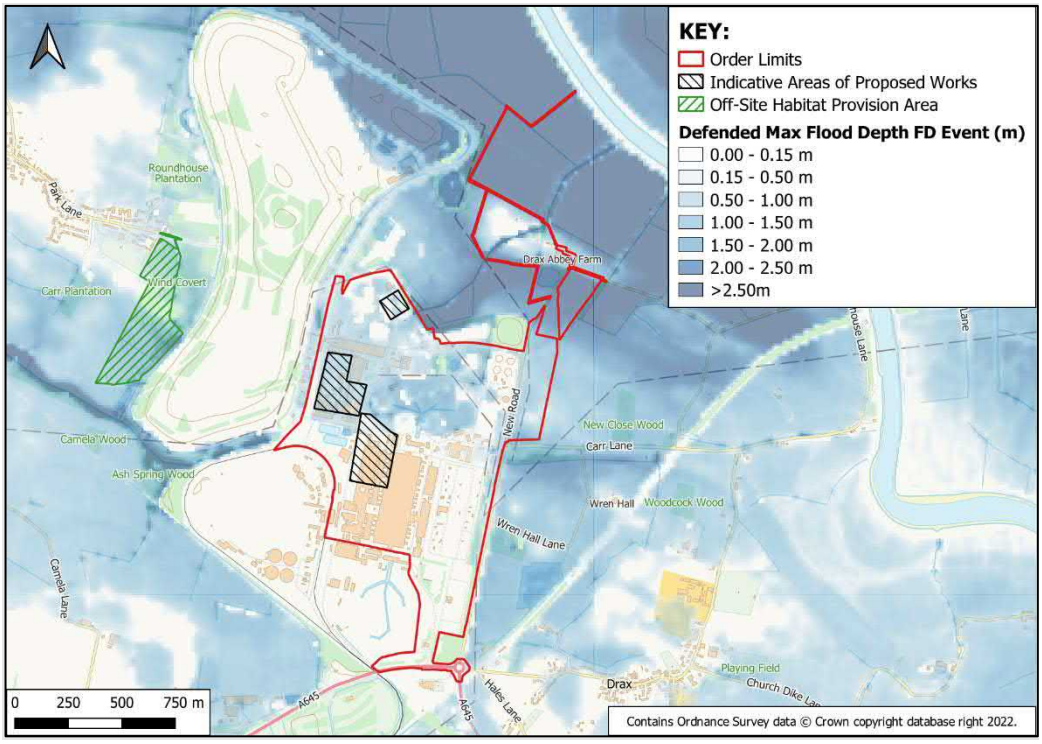


Sensitivity Analysis

5.4.3. The model results for flood events T and FT5 show that the Proposed Scheme is not at risk during these events, and neither is the Offsite Habitat Provision Area. Flood depth maps for these events are presented in **Appendix L**.

5.4.4. The model results for flood events FD and FT1 show that the Northern Development Parcel and the Carbon Dioxide Delivery Terminal Compound components of the Proposed Scheme would be impacted by flooding. The Offsite Habitat Provision Area is also shown to be at risk of flooding during events FT1 and FD, as is the Habitat Provision Area. Flood depth maps for these events are provided in Plate 5-4 and Plate 5-5 respectively.

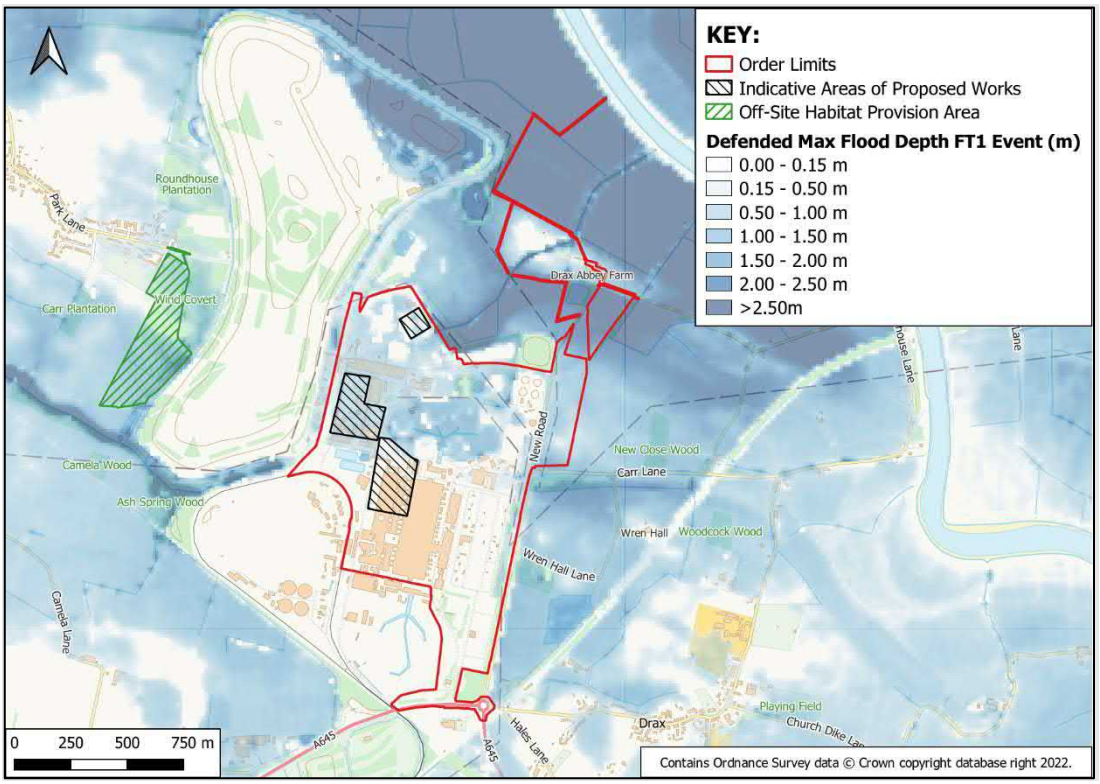
Plate 5.4 - Flood Depths for Sensitivity Scenario (FD)



5.4.5. During sensitivity scenario event “FD” the modelling shows that the following areas of the Proposed Scheme are predicted to experience flooding:

a. **Southern Development Parcel** – flood depths of up to 0.52 m in the north of the parcel (adjacent to the existing cooling towers), however the majority of the southern development parcel is expected to remain dry;
b. **Northern Development Parcel** – the entire parcel is predicted to be wet, with maximum depths of up to 0.60 m in the northern part of the parcel;
c. **Carbon Dioxide Delivery Terminal Compound** – depths of up to 1.08 m are predicted around the Carbon Dioxide Delivery Terminal Compound area;
d. **Habitat Provision Area** – depths of up to 3.6 m; and
e. **Offsite Habitat Provision Area** – depths of up to 2.35 m may occur in this area.

Plate 5.5 - Flood Depths Defended for Sensitivity Scenario (FT1)



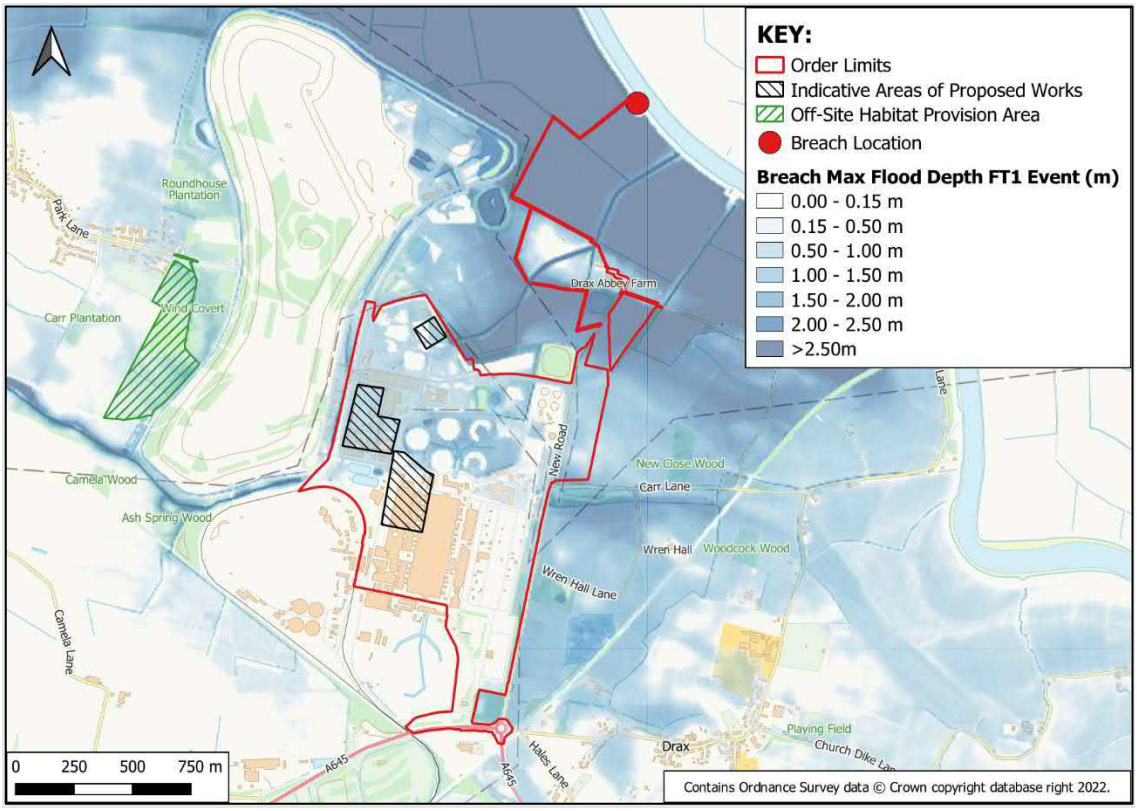
5.4.6. The modelling shows that during the sensitivity scenario "FT1" event, the following areas of the Proposed Scheme are predicted to experience flooding:

a. **Southern Development Parcel** – flood depths of up to 0.51 m in the north of the parcel (adjacent to the existing cooling towers), however the majority of the southern development parcel is expected to remain dry;
b. **Northern Development Parcel** – the entire parcel is predicted to be wet, with maximum depths of up to 0.59 m in the northern part of the parcel;
c. **Carbon Dioxide Delivery Terminal Compound** – depths of up to 1.07 m are predicted around the Carbon Dioxide Delivery Terminal Compound area;
d. **Habitat Provision Area** – depths of up to 4.0 m may occur in this area; and
e. **Offsite Habitat Provision Area** - flooding up to depths of 2.33 m.

Residual Risk - Breach Scenarios

5.4.7. The modelled breach flood depths for flood events "FT1" and "FT2" are shown in Plate 5-6 and Plate 5-7 respectively.

Plate 5.6 - Flood Depths for FT1 Breach Scenario



5.4.8. The modelling shows that during the breach scenario for the “FT1” event, the following areas of the Proposed Scheme are predicted to experience flooding:

a. **Southern Development Parcel** – flood depths of up to 0.65 m in the north of the parcel (adjacent to the existing cooling towers), however the majority of the southern development parcel is expected to remain dry;

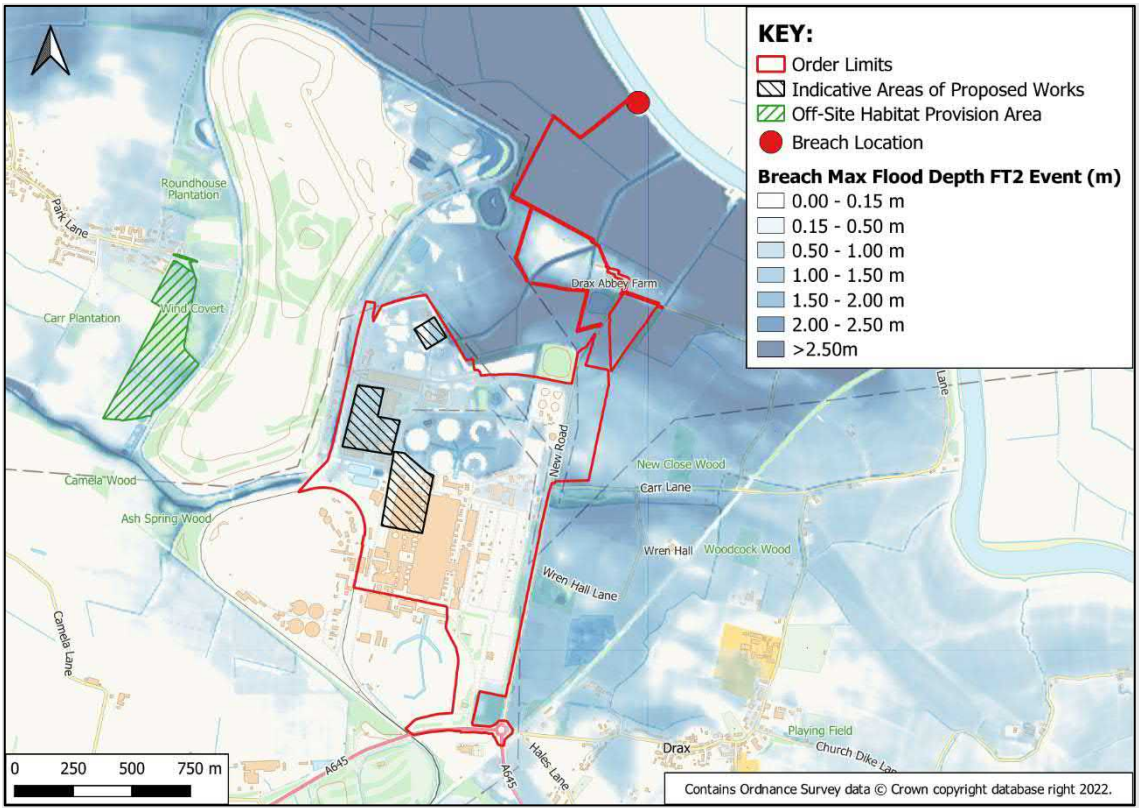
b. **Northern Development Parcel** – the entire parcel is predicted to be wet, with maximum depths of up to 0.73 m in the northern part of the parcel;

c. **Carbon Dioxide Delivery Terminal Compound** – depths of up to 1.20 m are predicted around the Carbon Dioxide Delivery Terminal Compound area;

d. **Habitat Provision Area** – depths up to 3.85 m may occur in this area; and

e. **Offsite Habitat Provision Area** - is predicted to experience flooding up to depths of 1.76m.

Plate 5.7 - Flood Depths for FT2 Breach Scenario



5.4.9. The modelling shows that during the breach scenario for the "FT2" event, the following areas of the Proposed Scheme would be at risk of flooding:

a. **Southern Development Parcel** - depths of up to 0.64 m in the north of the parcel (adjacent to the existing cooling towers), however the majority of the southern development parcel is expected to remain dry;

b. **Northern Development Parcel** – the entire parcel is predicted to be flooded, with maximum depths of up to 0.72 m in the north of the parcel;

c. **Carbon Dioxide Delivery Terminal Compound** – depths of up to 1.20 m are predicted around the Carbon Dioxide Delivery Terminal Compound area;

d. **Habitat Provision Area** – flood depths of up to 3.85 m may occur in this area; and

e. **Offsite Habitat Provision Area** - flood depths of up to 1.77 m are envisaged in this area.

Flood Hazard

5.4.10. Flood Hazard describes when flood creates a danger to life and is a combination of flood depth, velocity and debris factor. Flood Hazard mapping for design event, sensitivity analysis events and breach scenarios can be found in **Appendix L**.

5.4.11. The Flood Hazard mapping for the design event “FT2” shows that for the areas which will be inundated, which are the vast majority of Northern Development Parcel, isolated areas within Carbon Dioxide Delivery Terminal Compound and an isolated area in the northern end of the Southern Development Parcel these are predicted to have Low Hazard Rating (very low hazard to people). The Habitat Provision Areas are shown to have hazard rating between Significant Hazard (danger for most) and Extreme Hazard (danger for all). The Off-Site Habitat Provision Area is located outside of the floodplain; hence no hazard rating is associated with this area.

5.4.12. The Flood Hazard mapping for the sensitivity scenario “FT1” shows that the entire area of the Northern Development Parcel and Habitat Provision Areas are predicted to experience Significant Hazard (dangerous for most), and the Off-Site Habitat Provision Area is predicted to experience Significant Hazard (dangerous for most) to Extreme Hazard (dangerous for all). The other areas which will be inundated including isolated areas within Carbon Dioxide Delivery Terminal Compound and in the northern end of the Southern Development Parcel are predicted to experience Low Hazard (very low hazard to people) to Significant Hazard (dangerous for most).

5.4.13. The Flood Hazard mapping for sensitivity event “FD” shows that the vast majority of the Northern Development Parcel and Off-site Habitat Provision Area are predicted to experience Significant Hazard (dangerous for most). The Flood Hazard Rating for Habitat Provision Areas vary between Significant Hazard (dangerous for most) and Extreme Hazard (dangerous for all). Isolated areas within Carbon Dioxide Delivery Terminal Compound are predicted to experience Low Hazard (very low hazard to people) to Significant Hazard (dangerous for most). The vast majority of the Southern Development Parcel is outside of floodplain, with exception of the isolated areas in its northern end, which are indicated to experience Low Hazard from flooding (very low hazard to people).

5.4.14. There is no flooding predicated to occur within the Drax Power Station Site and Off-Site Habitat Provision Area during sensitive scenarios “FT5” and “T” hence there is no hazard rating associated with these areas. The Habitat Provision Areas are shown to be located in the area of flood risk, and the Flood Hazard mapping shows that these areas are predicted to experience Significant Hazard (dangerous for most) with small, isolated areas predicted to experience Extreme Hazard (dangerous for all).

5.4.15. During breach events “FT1” and “FT2”, the Northern Development Parcel and the Carbon Dioxide Delivery Terminal Compound are predicted to experience Significant Hazard (dangerous for most). Most of the Offsite Habitat Provision Area is expected to experience Significant Hazard during breach events “FT1” and “FT2”, with a small section of the Habitat Provision Area expected to experience Extreme Hazard (dangerous for all) during these events. Most of the Habitat Provision Areas is

expected to experience Extreme Hazard (dangerous for all) during breach events “FT1” and “FT2”.

Flood Duration

5.4.16. The results of the hydraulic model show that for the design and sensitivity events, it will take approximately 52 hours from the start of the storm event for flood water to reach the Drax Power Station Site. Once it reaches the Drax Power Station Site, the site will stay inundated for more than 150 hours.

5.4.17. The result of the modelling also shows that if breach of the flood defences occurs, it will take approximately 15 minutes from the start of the breach for flood water to reach the Drax Power Station Site. Once it reaches the Drax Power Station Site, the site will stay inundated for more than 100 hours.

Flood Depths

5.4.18. Flood levels for all the events (design scenario, sensitivity analysis and breach analysis) were extracted from the model at the locations shown in **Plate 5.8** (i.e., for the proposed built footprint, using the building numbers as shown on the Indicative Site Layout – **Appendix A**) and are summarised in **Table 5.3** with appropriate mitigation solutions for each outlined in **Section 7**.

Plate 5.8 - Flood Level Assessment Locations (showing “FT2” flood extents)

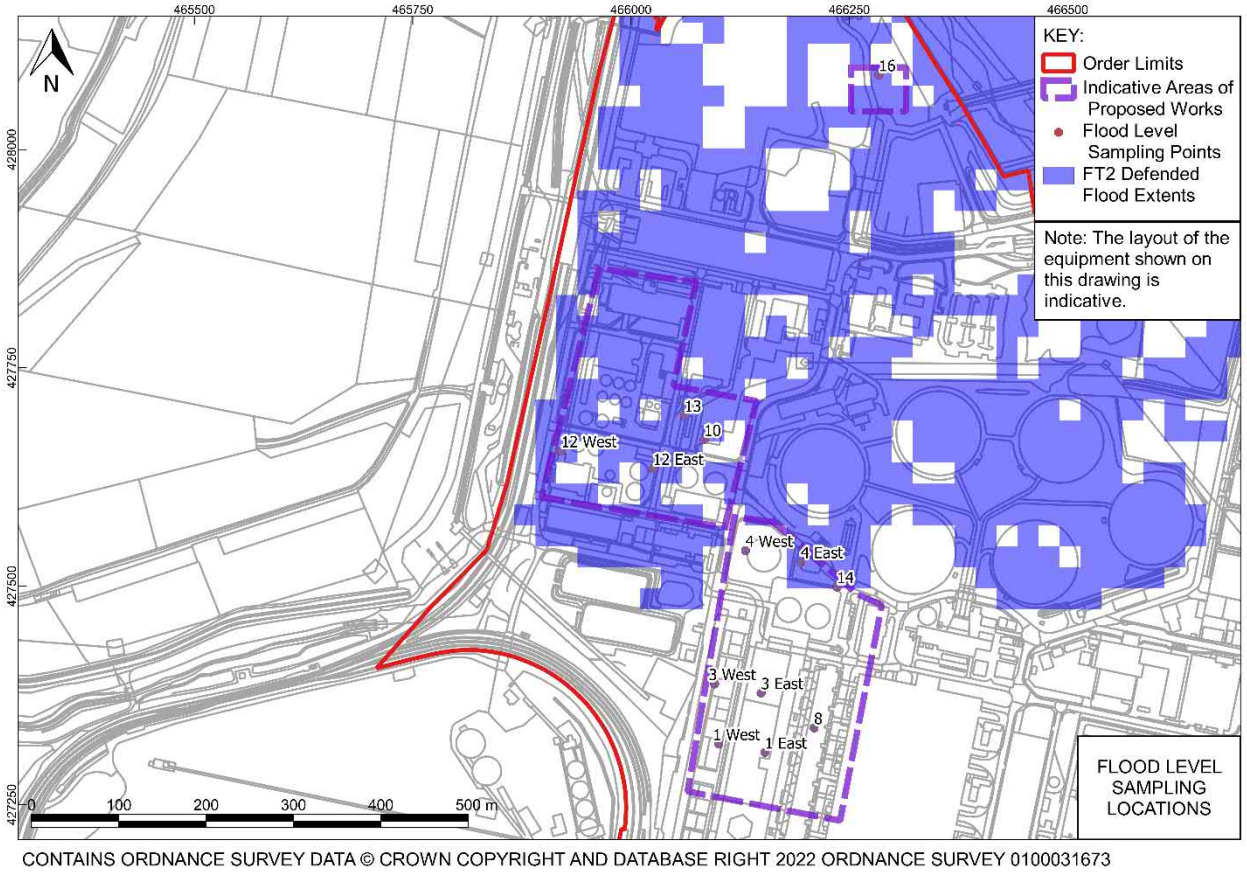


Table 5.3 - Flood Levels

Proposed Building	Current Ground Level (mAOD)	Flood Levels (mAOD) in 2046						
		FT2 (Design Event)	FT1	FD	FT5	T	FT1 Breach	FT2 Breach
1 (East) Gas Heat Exchanger	6.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 (West) Gas Heat Exchanger	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3 (West) Absorber Column	5.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3 (East) Absorber Column	5.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 (East) Solvent Regeneration System	4.50	4.60	5.02	5.02	0.00	0.00	5.15	5.14
4 (West) Solvent Regeneration System	5.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8 Combined Power Turbined Building	5.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10 Solvent Storage and Make-up System	4.55	4.60	5.02	5.02	0.00	0.00	5.15	5.14
12 (East) CO^2 Processing and Compression Plant	4.43	4.60	5.02	5.02	0.00	0.00	5.15	5.14
12 (West) CO^2 Processing and Compression Plant	4.55	4.60	5.02	5.02	0.00	0.00	5.15	5.14
13 Carbon Capture Wastewater Treatment Plant	4.42	4.60	5.02	5.02	0.00	0.00	5.15	5.14
14 Electrical Switch Room Building	4.57	4.60	5.02	5.02	0.00	0.00	5.15	5.14
16 Carbon Dioxide Delivery Terminal Compound	3.94	4.60	5.02	5.02	0.00	0.00	5.15	5.14

Long Term Risk

5.4.19. An additional sensitivity assessment has been undertaken to assess the impacts of increases in climate change beyond that required under standard Environment Agency guidance or an extension to the design life of the Proposed Scheme. This is to ensure the risks to the Proposed Scheme are understood and embedded in the design, as far as practical.

5.4.20. The design life is 25 years after which the continued operation of the infrastructure will be reviewed. At this stage it is assumed that it will no longer be appropriate to continue operation, so the plant will be decommissioned. The flood risks during the decommissioning phase would be similar to that for the construction phase, although hydraulic modelling may have to be undertaken prior to the commencement of this phase to confirm the risks to any temporary works areas and to ensure appropriate mitigation is in place.

5.4.21. As there remains the potential for the Scheme / buildings to remain operational beyond the design life, the model was run for a 60 year design life to assess any additional flood risk which may require future consideration.

5.4.22. The period of the design life and the extended design life are not in accordance with those detailed in the Flood Risk and Coastal Change Planning Practice Guidance, as these are based upon standardised design life for residential and commercial properties. Whereas, the Proposed Scheme has a design life associated with an existing operational power station and the likely period of operation which is being agreed with the Government.

5.4.23. The modelling for this sensitivity assessment was undertaken for the following scenarios: FD, FT1, FT5 and T and included appropriate climate change allowances (sea level rise and peak river flows) for the 60 year design life – see details below.

5.4.24. Fluvial flows were increased by the following in line with the Central estimate of climate change in the Humber Estuary for the 2080s:

a. 23% for the River Ouse catchment;

b. 23% for the River Aire catchment;

c. 28% for the Don catchment; and

d. 29% for the Trent catchment.

5.4.25. The model was also run with the upper end climate change allowance of 695.4 mm for sea level rise.

5.4.26. The flood depth maps and levels (**Appendix N**) show that the Carbon Dioxide Delivery Terminal Compound and the northern development parcel are at risk of flooding during these modelled scenarios. The key findings are:

a. During flood event FT5 event there is predicted to be approximately 500 mm of freeboard in the 60 year design scenario;

b. During flood event T there is predicted to be approximately 550 mm of freeboard during the 60 year design scenario;

c. During event FT1, flood depths of approximately 180 mm are predicted to impact Proposed Scheme buildings 4, 10, 12, 13, 14 & 16 (building references are shown on Plate 5.8 of the FRA) in the 60 year design life scenario; and

d. During flood event FD flood depths of approximately 280 mm are predicted to impact Proposed Scheme buildings 4, 10, 12, 13, 14 & 16 (building references are shown on **Plate 5.8** of the FRA) in the 60 year design life scenario.

Mitigation

5.4.27. Should the design life be extended beyond the 25 year period, it has been agreed with the Environment Agency that Drax Power Ltd would manage the risk by ensuring the Operational Management Plan / Emergency Operational Management Plan for the site is implemented in a timely manner to ensure a safe shut down and evacuation of the areas of the Proposed Scheme that would be at risk of flooding.

5.4.28. In any event, a shut down of the Proposed Scheme would be required, in this scenario, given that it is an extension to the Existing Power Station, parts of which would be at risk of flooding during these events, thus preventing the operation of the Proposed Scheme.

5.4.29. If, after 20 years of the Scheme's operating life it is considered likely that the Proposed Scheme would continue to operate, then discussions should commence with the Environment Agency to provide appropriate time for assessment, design and interventions to occur, to facilitate the on-going operation of the Proposed Scheme along with the Existing Power Station.

5.5. RISK OF FLOODING FROM SURFACE WATER

5.5.1. The Environment Agency's Risk of Flooding from Surface Water mapping shows that the vast majority of the Proposed Scheme is not susceptible to flooding from surface water. The Environment Agency's Risk of Flooding from Surface Water mapping does, however, indicate that there are some isolated areas at low to high susceptibility of flooding from surface water, as shown in Plate 5.9.

5.5.2. Low risk of flooding from surface water indicates those areas that could be at risk between the 100 year and 1,000 year rainfall event. Medium risk of flooding from surface water indicates those areas that could be at risk between the 30 year and 100 year rainfall event, and high risk – those areas that could be at risk greater than 30 year rainfall event.

5.5.3. The areas at medium to high risk of surface water flooding largely correspond to the existing network of ponds and ditches present in Drax Power Station Site.

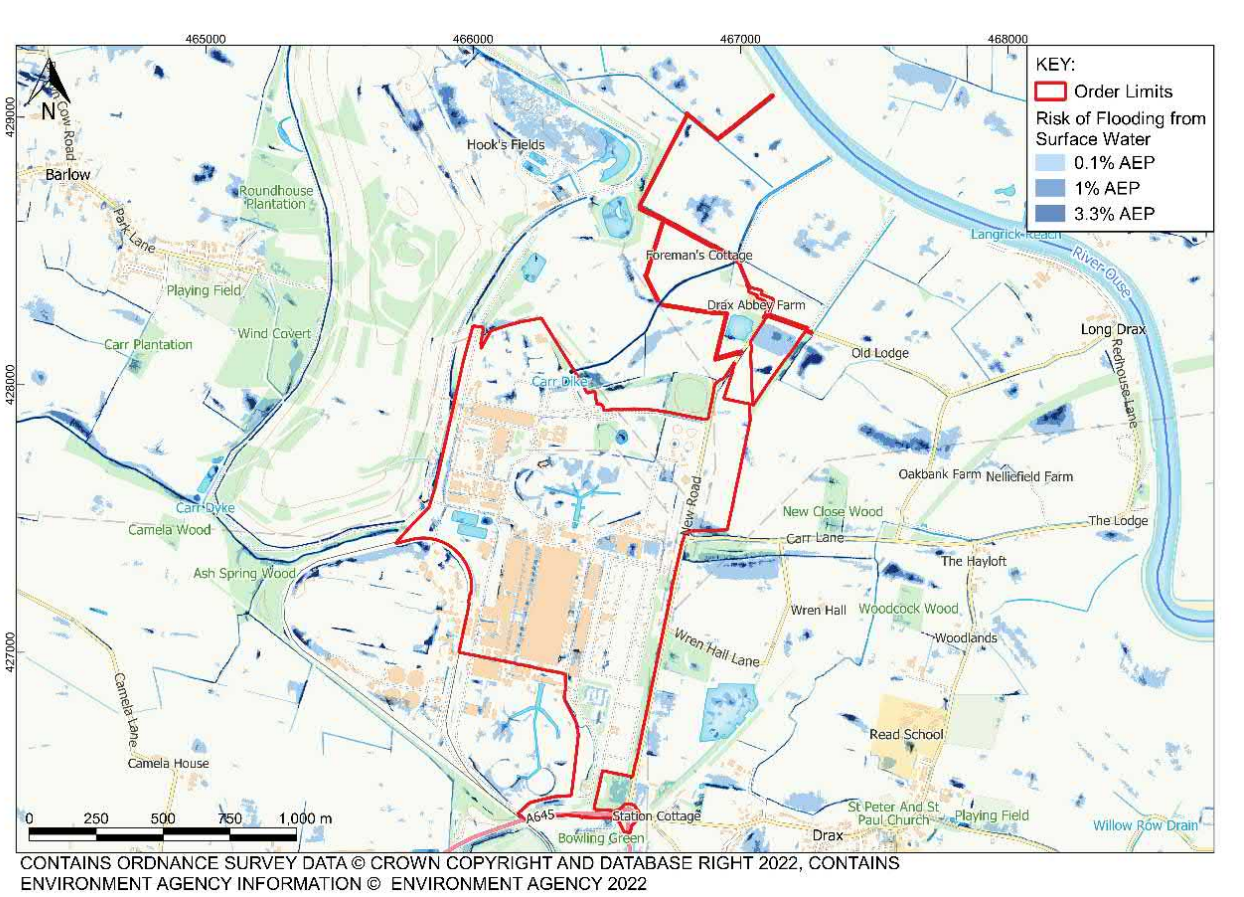
5.5.4. The map also shows that here is a low to medium risk of flooding in the locations of the proposed Carbon Dioxide Delivery Terminal Compound and the construction laydown area associated with the Northern Development Parcel.

5.5.5. A review of the Environment Agency's map also shows that the vast majority of the Habitat Provision Area is at low risk of flooding from surface water. The Habitat Provision Area located immediately to the north of East Construction Laydown Area is indicated to be at low to medium risk of flooding from surface water. The same map also indicates that the Offsite Habitat Provision Area is at low risk of surface water flooding.

5.5.6. It is likely that the indicated risk of flooding is associated with localised areas of low ground where water would pond during or after severe or prolonged rainfall events before being drained by the existing / proposed surface water drainage infrastructure once capacity becomes available.

5.5.7. Considering this information along with the mapping not taking full account of the surface water drainage infrastructure the Proposed Scheme is considered to be at low susceptibility of flooding from surface water.

Plate 5.9 - Environment Agency's Risk of Flooding from Surface Water Map



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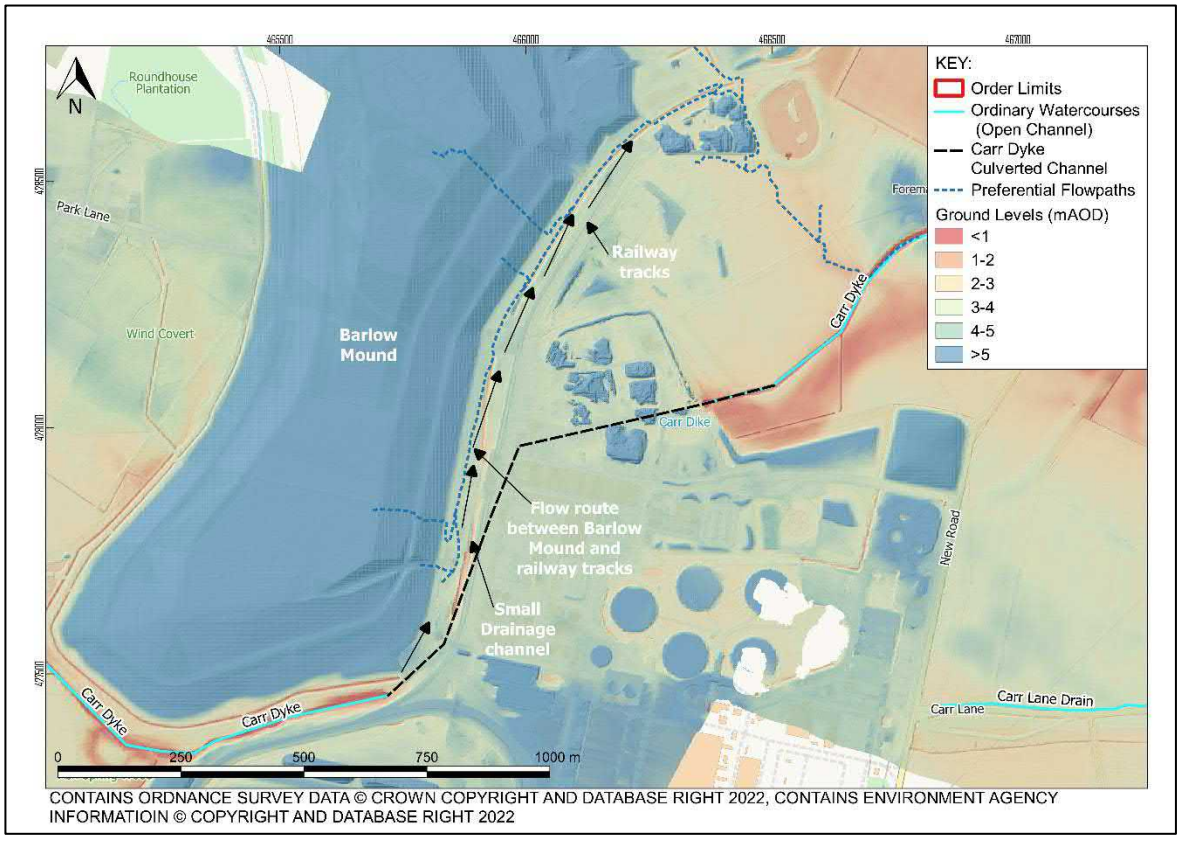
5.5.8. No modelling or mapping of the flood risk associated with the Carr Dyke / Lendall Drain is available. However, given that this watercourse is maintained by the IDB, the risk of flooding from this source under normal conditions is considered to be low. There remains a risk of flooding to the Proposed Scheme as a result of culvert

blockage / exceedance and failure of the Lendall pumps, noting that Drax Power Ltd regularly inspect the culvert inlet to ensure that it is clear and not blocked. Given the size of the Carr Dyke catchment, the relatively flat land adjacent to the Lendall pumps, the drainage infrastructure and preferential flow routes through the Drax Power Station Site (see **Plate 5-10**) it is considered that the depth of any flooding as a result of these mechanisms would be less than that associated with the Fluvial and Tidal flood risk and thus the risk is managed and mitigated by the associated measures.

Plate 5.10 - Surface Water Preferential Flow Routes



5.6. RISK OF FLOODING FROM GROUNDWATER

5.6.1. Groundwater flooding occurs when water stored below the ground reaches the surface. It is commonly associated with porous underlying geology, such as chalk, limestone and gravels.

5.6.2. During consultation undertaken in 2018 as part of Drax Repower (WSP, 2018), the Selby Area IDB advised that high groundwater levels are likely to occur in the area around Drax Power Station. However, the Proposed Scheme is underlain by a few metres of clayey superficial deposits which are likely to limit groundwater emergence above ground level.

5.6.3. The Environment Agency's Areas Susceptible to Groundwater Flooding (AStGWF) map is a strategic scale map illustrating areas susceptible to groundwater flooding on a 1 km^2 grid. It illustrates the proportion of each 1 km^2 grid square where geological and hydrogeological conditions indicate that groundwater emergence might occur. The Selby District Level 1 SFRA (Selby District Council, 2020) reproduces the relevant portion of AStGWF map. The map indicates that the area of the Drax Power Station Site is located in a 1 km^2 grid square where less than 25% of the land is considered to be susceptible to groundwater flooding. The map also shows that the Proposed Scheme is not located in the area susceptible to groundwater flooding.

5.6.4. A Groundsure report (Groundsure, 2021) indicates that the majority of the southern part of the Drax Power Station Site has a Moderate risk of groundwater flooding, whereas the northern portion of the Drax Power Station Site and the majority of the Habitat Provision Area have a high risk from groundwater flooding.

5.6.5. Considering the above information, the potential risk of flooding from groundwater is assessed to be low. Furthermore, the risk of groundwater flooding is managed through the Fluvial and Tidal mitigation and the surface water drainage infrastructure across the Drax Power Station Site.

5.7. RISK OF FLOODING FROM RESERVOIRS

5.7.1. The Environment Agency's Risk of Reservoir Flooding map (Environment Agency, 2022(b)) does not separate out the risk of flooding from individual reservoirs. As such under normal river conditions it is considered that the Drax Power Station Site is at risk of flooding from the failure of the two onsite reservoirs (the northern and southern cooling water reservoirs – **Plate 5-11**), these are the concrete structures beneath the cooling water towers. The risk of failure of these structures is considered to be low, given their construction, which must be designed, and its construction supervised by a qualified engineer from the Panel Engineers, frequency of inspection and maintenance combined with the only inflows being artificial and heavily controlled.

Plate 5.11 - Example of the Cooling Water Reservoirs

5.7.2. During times of flood the Drax Power Station Site is at risk of flooding from the failure of off-site reservoirs, which may occur as a result of the capacity of the facility being exceeded and / or as a result of dam or embankment failure.

5.7.3. The Selby Level 1 SFRA (Selby District Council, 2020) identifies that the nearest reservoir is the Barmby Raw Water Reservoir located approximately 4 km upstream of the Proposed Scheme, although the flood risk shown may be a result of failure of additional reservoirs further upstream.

5.7.4. The Environment Agency is responsible for ensuring that reservoirs are inspected regularly, and essential safety works are carried out. Large reservoirs are regulated by law, which requires the appointment of a Supervising Panel Engineer (SupE). It is the role of the SupE to promote the safe operation of the reservoir by working with the owner to maintain accurate records, monitor the safety of the dam and to help the owner manage potential risks which can change over time. Furthermore, there has been no loss of life from reservoir-related flooding for nearly 100 years (British Dam Society, 2022) Considering this information, the risk of flooding from reservoirs is considered to be low.

5.8. RISK OF FLOODING FROM SEWERS

5.8.1. Sewer flooding occurs as a result of a number of influencing factors. It is most likely to occur during storms, when large volumes of rainwater enter the sewers. However, it can also occur when pipes become blocked or damaged. In this instance the risk of

sewer flooding also includes the highway drainage and the private drainage infrastructure across the Drax Power Station Site.

PUBLIC SEWER FLOODING

5.8.2. The Selby Level 1 SFRA (Selby District Council, 2020) includes information on the historical records of flooding from sewers in the area of the Proposed Scheme. The Level 1 SFRA has an extract from the Yorkshire Water DG5 register, which records historic internal and external sewer flooding events over the previous 10 years. Due to data protection requirements the data has not been provided at individual property level; rather the register comprises the number of properties within 4-digit postcode areas that have experienced flooding either internally or externally within the last 10 years. The map included in the Selby Level 1 SFRA shows that the Proposed Scheme is located in the area where up to two incidents of flooding from sewers were recorded in the last 10 years. It is however understood that the public sewer infrastructure does not extend into the Drax Power Station Site. As such the Proposed Scheme is not considered to be at risk of flooding from this source.

HIGHWAY DRAINAGE FLOODING

5.8.3. The Drax Power Station Site is surrounded by rural areas to the north, west and south-west, therefore there is no risk of flooding from sewers from these directions. Drax Power Station Site is bounded by the A645 and New Road to the south-east and east. It is likely that these roads are provided with an appropriate highway drainage system that is regularly inspected and maintained, therefore the risk of flooding from the highway drainage system is considered to be low.

PRIVATE SEWER FLOODING

5.8.4. Drax Power Station Ltd have a comprehensive surface water drainage network across the site, which results in the surface water runoff being discharged to the River Ouse through the purge pump. It is understood that this infrastructure is maintained to a high standard and frequently inspected, as such the risk of flooding from this source is minimised.

SEWER FLOODING SUMMARY

5.8.5. The risk of sewer flooding to the Proposed Scheme is considered to be low. Furthermore, the risk of flooding from sewers is managed through the Fluvial and Tidal mitigation and the surface water drainage infrastructure across the Drax Power Station Site.

6. CONSTRUCTION PHASE MITIGATION

6.1.1. The Proposed Scheme and the surrounding area is protected by the existing flood defences up to and including the 1 in 200 year flood event. However, the northern and southern ends of East Construction Laydown Area may be flooded during a breach of existing flood defences In the 1 in 200 year event. The following measures would be implemented to mitigate potential risk of flooding to construction workers and construction materials and plant:

a. The appointed contractor would sign up to the Environment Agency's flood warning service to receive up to date flood information and warnings;

b. No works would be carried out within the northern and southern ends of East Construction Laydown Area when there is a risk of breach of the existing flood defences (a significant flood event);

c. No stockpiles, no hazardous materials and / or site cabins, plant and equipment would be placed in the northern and southern ends of East Construction Laydown Area when there is a risk of breach of the existing flood defences (a significant flood event); and

d. A Method Statement would be developed detailing the procedures for securing the Site and plant equipment for a flood event (breach of the defences), in particular with reference to safe working practises, harmful substances and fuels.

6.1.2. The vast majority of the area of the Proposed Scheme is not susceptible to flooding from surface water. The isolated areas which are susceptible to flooding from surface water are associated with localised low ground level areas where water would pond during or after prolonged and heavy rainfall events. Water ponding in the low ground areas could delay construction works if not appropriately managed. An appropriate construction phase surface water drainage strategy will be developed and implemented by the appointed contractor to manage this risk. This strategy would also be developed to manage the sediment load from the site.

7. OPERATIONAL PHASE MITIGATION

7.1.1. The previous sections demonstrate that the Carbon Dioxide Delivery Terminal Compound, the Northern Development Parcel, part of the Southern Development Parcel and Habitat Provision Area are at risk of flooding during the design event “FT2”. The proposed mitigation measures are detailed below for design and sensitivity events:

FREEBOARD

7.1.2. The flood modelling undertaken by the Environment Agency and then refined to be site specific for the Proposed Scheme provides a high level of local knowledge and understanding, thus the freeboard allowances can be set with the levels of confidence associated with the model.

7.1.3. For the purposes of this assessment sensitive infrastructure is that which is required to maintain the operation of the Proposed Scheme (“sensitive infrastructure”) and could be adversely impacted by flood waters.

7.1.4. The sensitive infrastructure within the floodplain will be set a minimum of 800 mm above the design event (FT2) flood levels. For sensitive infrastructure located outside of the design and sensitivity floodplains a minimum freeboard of 300 mm will be incorporated to mitigate the risk of flooding during exceedance events and from surface water.

7.1.5. Raising the sensitive infrastructure will provide a minimum of 380 mm freeboard for level of the sensitive infrastructure and the modelled flood levels for the sensitivity scenarios and a minimum of 250 mm freeboard allowance between the level of the sensitive infrastructure and the modelled breach flood levels.

7.1.6. The inclusion of these freeboard allowances for the sensitive infrastructure is within the maximum height parameters for the Proposed Scheme as detailed in Schedule 15 of the DCO.

7.1.7. Details of the proposed finished levels and associated freeboard are summarised in Table 7.1.

Table 7.1 - Modelled flood levels and proposed building levels

Building	Current Ground Level (mAOD)	Modelled Flood Levels (mAOD) in 2046							Minimum Design Level (mAOD) Based on Event "FT2"	Resultant Minimum Freeboard (m)					
		FT2 (Design Event)	FT1	FD	FT5	T	FT1 Breach	FT2 Breach		FD	FT1	FT5	T	FT1 Breach	FT2 Breach
1 (East)	6.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.58	0.3m above ground level					
1 (West)	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.20	0.3m above ground level					
3 (West)	5.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.23	0.3m above ground level					
3 (East)	5.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.15	0.3m above ground level					
4 (East)	4.50	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
4 (West)	5.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.91	0.3m above ground level					
8	5.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.26	0.3m above ground level					
10	4.55	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
12 (East)	4.43	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
12 (West)	4.55	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
13	4.42	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
14	4.57	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.25
16 Carbon Dioxide Delivery Terminal Compound	3.94	4.60	5.02	5.02	0.00	0.00	5.15	5.14	5.40	0.38	0.38	No onsite flooding		0.25	0.26
Elements outside of the Design floodplain	Varies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Varies	0.3m above ground level					

RISK TO HUMAN HEALTH

7.1.8. The results of the hydraulic modelling show that the Carbon Dioxide Delivery Terminal Compound, Northern Development Parcel and part of Southern Development Parcel) are located in the areas at risk of flooding during a breach event. During both of these events, the Northern Development Parcel and the Carbon Dioxide Delivery Terminal Compound are predicted to experience Significant Hazard (dangerous for most). Due to the nature of the Proposed Scheme and that Drax Power Station Site will update (prior to construction and operation, as appropriate) operational management plans, Environment Management System and Drax Management Instructions, as appropriate, to incorporate the additional risks and requirements of the Proposed Scheme, to ensure safe operation of the site and the ability to safely shut down and evacuate the site (in an extreme case the existing evacuation alarm system would be utilised), if required, this is considered an acceptable hazard rating.

FLOODPLAIN IMPACTS

7.1.9. The Proposed Scheme is located on the edge of the floodplain, thus any impact on flow routes and overall flood level without mitigation is likely to minimal, however, appropriate mitigation has been included within the Proposed Scheme.

7.1.10. The existing built footprint across the site does not form part of the floodplain in accordance with the Flood Risk and Coastal Change Planning Policy Guidance which states:

> "Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain."

7.1.11. There are existing buildings within the design event (FT2) floodplain which will be demolished prior to construction of the Proposed Scheme under planning consent (202/0994/FULM). These buildings are considered to be solid and relatively watertight as shown in **Plate 7.1** and **Plate 7.2**.

Plate 7.1 - Example of an Existing Tank

Plate 7.2 - Example of an Existing Building

Floodplain Assessment

~~7.1.12.~~ Notwithstanding this demolition, the comparison of the built footprint in the design event floodplain (including climate change allowances) ~~is detailed in Table 7.2~~has been undertaken in GIS to determine the magnitude of the floodplain compensation required included for the design event:

7.1.12.

a. Utilising the flood results from the design scenario, as detailed within the FRA (scenario FT2);

b. Identifying the buildings / bunds (that comply with point 3 above) which are to be demolished and are located within the floodplain. The nature of these buildings is provided in paragraphs **7.1.9 to 7.1.14** of this FRA. Planning permission for the demolition of these buildings has been granted by the LPA (ref 2020/0994/FULM), whilst other aspects of the demolition is covered by permitted development rights. The area of each of these buildings / bunds was extracted, based upon that in the Indicative Plans and Elevations (APP-012) and drawing Plan View Layout Plant and Buildings to be Demolished (ref 70069244-DWG-002) from the consented scheme (LPA ref 2020/0994/FULM), along with the information contained in the 3D model which forms the basis of the Model Flyover Video (APP-198);

c. The overhead features (i.e. conveyors / gantries) were discounted from the assessment, given the negligible footprint;

d. Identifying the elements of the Proposed Scheme and demolished buildings/bunds which are located within the floodplain, the area and flood depths of each of these elements were extracted, based upon the information used to develop that shown in the Indicative Plans and Elevations (APP-012);

e. Intersecting the flood results and the proposed and demolished footprints, this enabled the flood depths and extents to be accurately extracted for each building (see **Appendix A**);

f. Areas which are currently protected by bunds (based on the Indicative Plans and Elevations (APP-012)) which will remain bunded in the future have been discounted from the assessment;

g. The findings of the GIS assessment demonstrate that the proposed footprint is larger than the footprint of buildings which will be demolished to facilitate the Proposed Scheme (**Table 7.2**).

Table 7.2 - Pre and Post Scheme Footprint Comparison

	Design Scenario (FT2) Areas Flooded (m^2)
Demolished	5051.9
Proposed	8443.8
Change in built footprint	+3391.9

7.1.13. The footprints which are to be demolished are shown in **Plate 7.3** and the proposed footprint areas are shown in **Plate 7.4**; these are extracted from the 3D ground model (APP-198) also provided in more detail in **Appendix M**, where they are overlain with the flood extents.

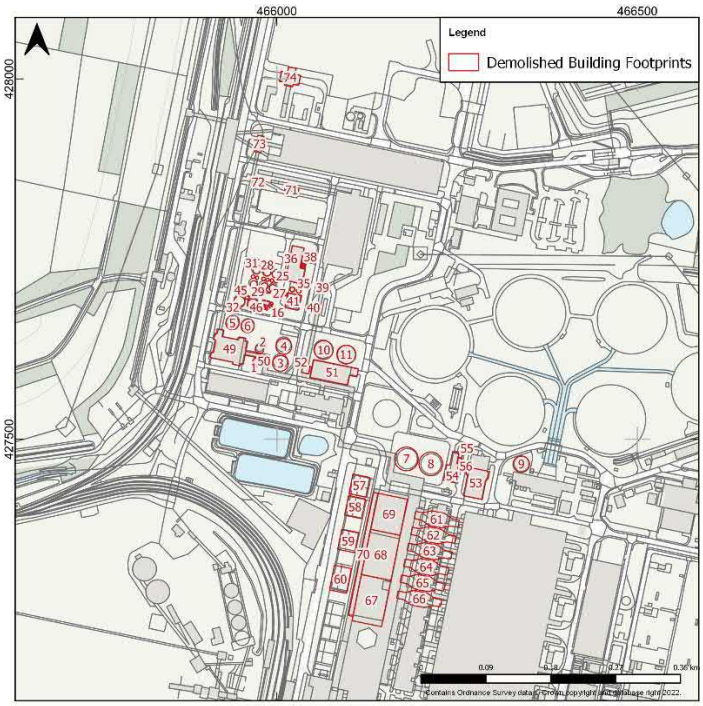


Plate 7.3 - Demolished Buildings Footprints

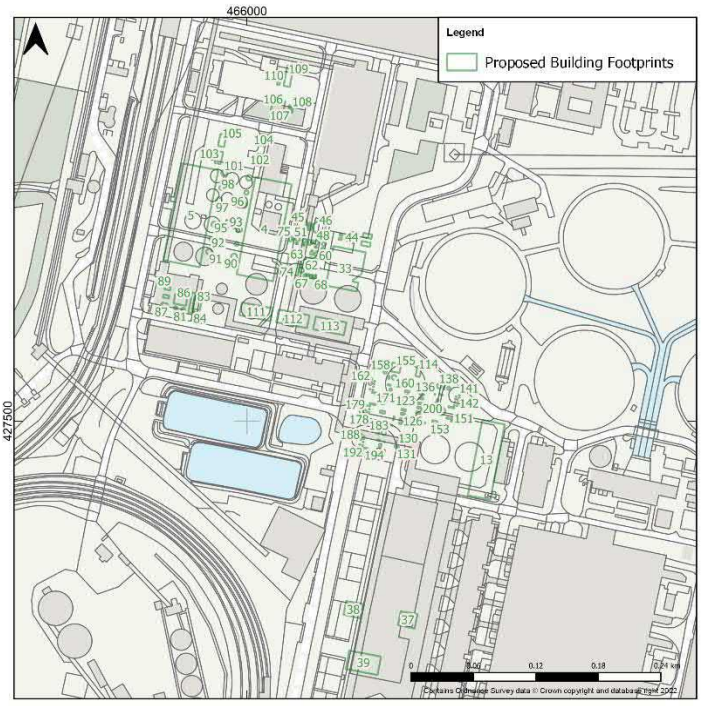


Plate 7.4 - Proposed Building Footprints

7.1.14. The assessment has been undertaken by interrogating the baseline (i.e. structures which will be demolished as part of the enabling works) and the proposed footprint areas above ground level, from which, in conjunction with the depth grids from the Hydraulic Model - FT2 scenario (design scenario), both the baseline and proposed floodwater volume has been calculated. It should be noted that not all of the proposed / demolished footprints are located within the floodplain. The overall results of the current volumetric assessment for the demolished and proposed structures are provided in **Table 7.3**.

Table 7.3 - Pre and Post Scheme Volume Comparison

	Design Scenario (FT2) Flood Volume (m^3)
Baseline	578.4
Proposed	1457.7
Change in volume	+879.3

7.1.15. This assessment determines that an overall floodplain storage volume of 880m^3 will be displaced by the Proposed Scheme in the future scenario during the design event. Floodplain compensation is to be provided to mitigate against this loss of floodplain storage. It has been agreed with the Environment Agency (during a meeting on 23

August 2022), that floodplain compensation would be provided on a volume-for-volume basis as the floodplain is relatively flat across the Site.

~~**Table 7.2 - Floodplain - built footprint comparisons**~~

~~**Stage**~~	~~**Built Footprint**~~
~~Baseline~~	~~9,070m^2~~
~~Post development~~	~~10,960m^2~~
~~Difference~~	~~+1,889m^2~~

7.1.16. ~~This demonstrates that the Proposed Scheme will result in a minor loss of floodplain, which if not mitigated could have an adverse impact on third parties~~In the current day scenario, the Proposed Scheme is located within the defended floodplain, thus there is no flood risk during the design flood event. Should the Environment Agency not enhance the offsite defences to keep pace with the impacts of climate change, then the Proposed Scheme will result in a loss of floodplain during the design event and thus requires the provision of floodplain compensation as detailed in **Table 7.2** to ensure that there are no adverse effects to third parties.

7.1.17. As part of the preparation of this FRA, the approach and requirements for the provision of floodplain compensation were discussed with the Environment Agency. The most detailed discussion was held on 10 February 2022, with the Minutes provided in **Appendix C**. The key agreements are:

a. No compensation will be required if it can be proved that the footprint of demolished solid buildings/bunded areas are equal or less than the footprint of the proposed solid buildings;

b. No change in floodplain displacement in Flood Zone 3 is expected by the Environment Agency;

c. It would need to be demonstrated that those existing buildings which are to be demolished do not flood. Paragraph 15 (Reference ID: 7-015-20140306) of the Flood Risk and Coastal Change Planning Practice Guidance states that the buildings have to be a solid building so that they do not flood;

d. Post-development modelling may not be required if the footprint balance can be justified. If the footprint balance is achieved, any changes will be negligible and therefore there is no need to continue to model something on the fringes of the floodplain;

e. Residual risk - breach scenario - volume for volume compensation is expected beyond any increase in built footprint; and

f. Sensitivity test - need to consider displacement of hazard, change in hazard band, change in speed in onset or change in a local planning allocation. However, as the Proposed Scheme is not located in a major flow route no change in flood hazard is expected. Furthermore, if the footprint balance is achieved then there is no requirement to be concerned about the change in hazard as the buildings are changing very marginally on the edge of the floodplain.

Policy

7.1.18. The Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' (Department for Levelling Up, Housing and Communities, 2022), covers the requirements for flood compensation in Paragraph 049. This paragraph provides a hierarchy for the provision of floodplain compensation, this is as follows:

a. On-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development;

b. Off-site compensatory storage on site, noting that it has to be hydraulically and hydrologically linked;

c. On-site volume for volume compensatory storage [inferred]; and

d. If the impacts of development on flood risk elsewhere, now and in the future cannot be fully mitigated, the site-specific flood risk assessment will need to fully detail the extent and nature of the increase in risk and to assess its significance.

7.1.19. The design of the flood compensation strategy has been based upon this hierarchy. It is not possible to provide compensation within the Proposed Scheme footprint given the nature of the operational Power Station Site and land required for the construction / enabling works, furthermore this land is not at the right elevation to provide suitable floodplain compensation.

7.1.20. As such, an area of adjacent land which is hydraulically and hydrologically linked has been identified. The compensation is being provided on the basis that an equal volume of floodplain will be provided to that lost using the lowest and highest flood levels across the development site.

Requirements

7.1.21. The loss of existing floodplain storage associated with the proposed structure footprints will be offset by providing floodplain compensation on a volume-for-volume basis, through the removal of material (cut) from an area of existing high ground located immediately north of Drax Power Station Site. This area is currently agricultural grazed land referred to as "Flood Compensation Field" and is owned by Drax Power Station Ltd. The location of the proposed Flood Compensation Area (FCA) is shown in **Plate 7.5** below. This area is shown to be outside of the existing floodplain during the design scenario FT2, and therefore it can be used for provision of floodplain compensation storage.

7.1.22. The preliminary calculations, as detailed in **section 7.1.15** above, indicate that a total floodplain compensation volume of 880 m^3 is required (these will be confirmed during

detailed design). To mitigate the risk of flooding, the required volume can only be provided between levels outlined below in **Table 7.4**, which are the minimum and maximum flood levels across the Proposed Scheme, as identified from the flood modelling for the design scenario. The topographical survey (Appendix M) of the proposed FCA, shows that the existing ground levels vary between approximately 3.3 mAOD and approximately 6.6 mAOD. The topographical survey has been compared to the LiDAR and they show a good level of match. The survey shows that the required compensation storage volume can be achieved in the proposed area.

Table 7.4 - Levels Extracted from Proposed Footprints

	Design Scenario (FT2) mAOD
Max flood height at the proposed built footprints	+5.35
Min DTM at the proposed built footprints	+4.36

7.1.23. The location of the proposed FCA is shown in **Plate 7.5** and detailed in **Appendix M** along with photos of the proposed FCA.

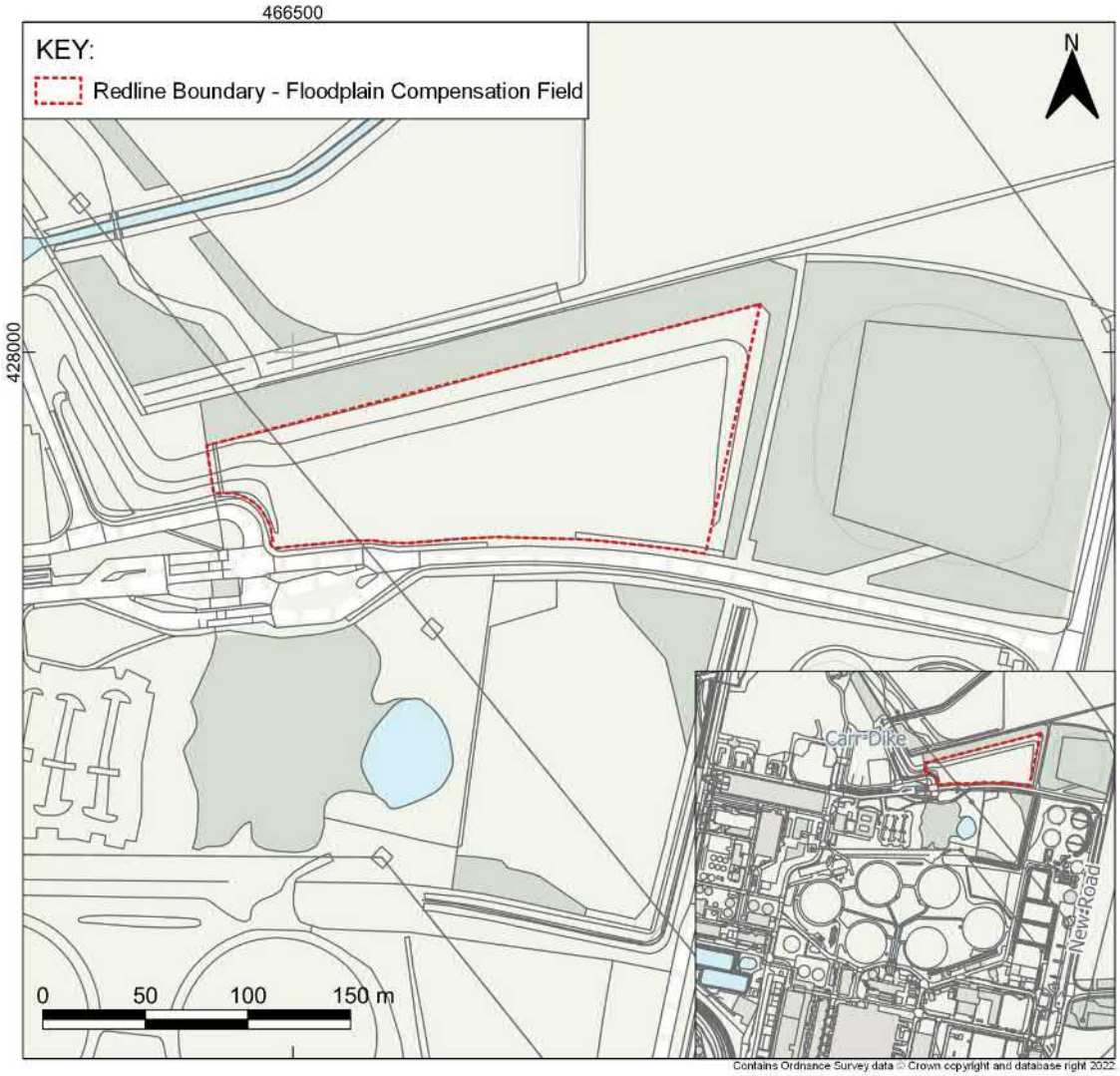


Plate 7.5 - Indicative Location of the Flood Compensation Area

7.1.24. Two potential extents for floodplain compensation storage are indicated in **Plate 7.6**. The blue (smaller) extent indicates the minimum cut area extent required to achieve volume of 880 m^3. The black (larger) extent offers a more flexible approach to allow for any other landscaping which may take place on site (i.e. it facilitates changes to how the slopes are tied into the existing and provides additional volume, should it be required at detailed design).

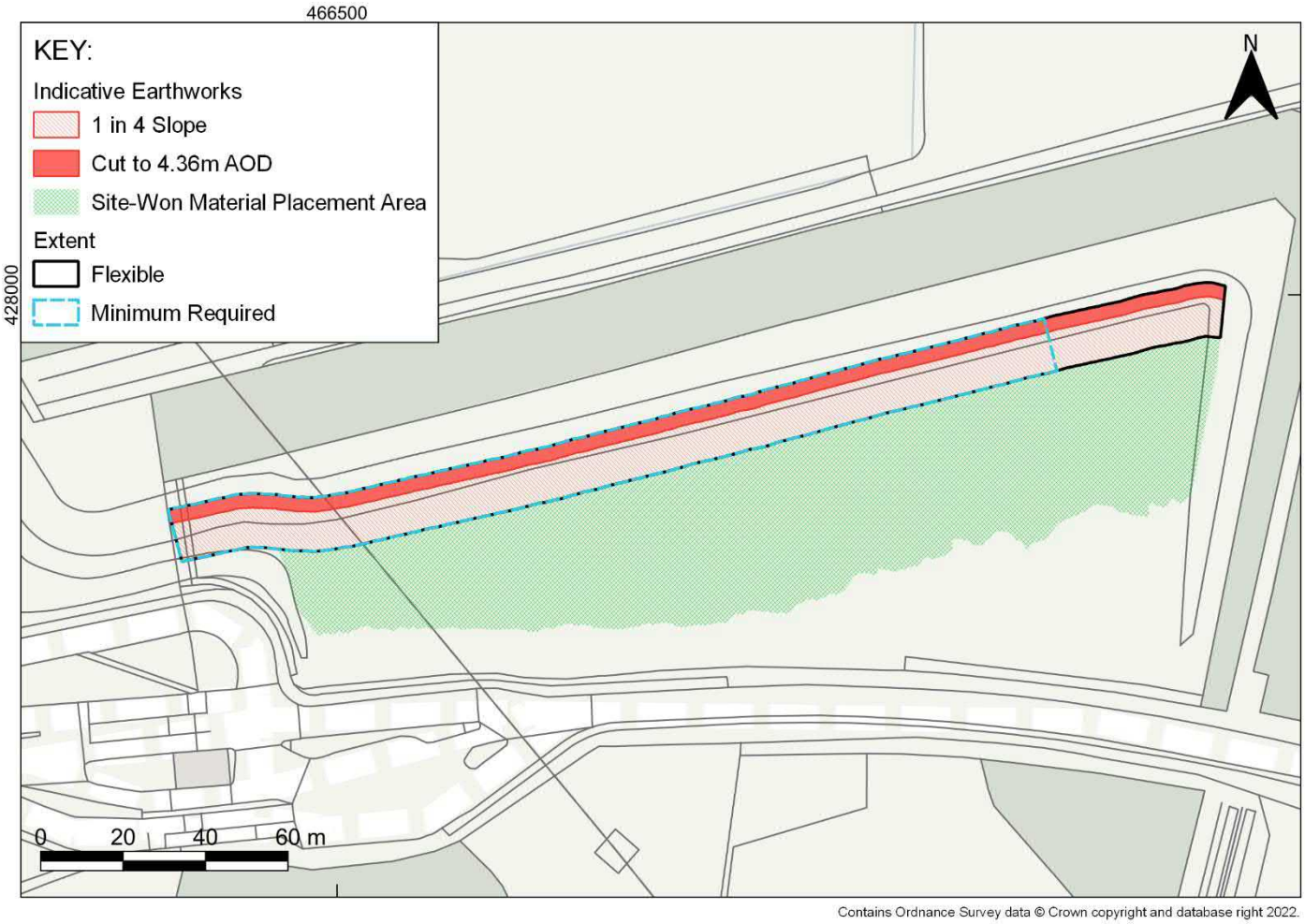


Plate 7.6 - Flood Compensation Area General Arrangement

7.1.25. An indicative section through the proposed flood compensation area is shown in **Plate 7.7**, and details are shown in **Appendix D**. The 'cut volume providing flood compensation' was calculated based on material removed between ground levels of +4.36 mAOD up to +5.35 mAOD. The 'total volume of cut' consists of both the 'cut volume providing flood compensation' and the volume of material cut to provide the required 1 in 4 slopes to tie into the existing land levels. Volumes of material removed by cut within the proposed flood compensation storage area are summarised in **Table 7.5** below. These volumes were calculated using a ground elevation grid of both the existing situation (based on LiDAR[1]) and the proposed situation (manipulated proposed floodplain compensation area grid).

7.1.26. The indicative cross section in **Plate 7.7** shows that the required floodplain compensation volume is available for the full range of vertical levels from +5.35 mAOD down to +4.36 mAOD, where it connects to the existing ground levels. This

[1] Environment Agency - Survey Data; LiDAR, DTM, 1m Res - 2020 Accessed: https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

approach will ensure that water can flow freely in and out of the proposed FCA during a flood event. The flood waters will naturally reach the FCA by flowing from the existing floodplain, through the adjacent tree line, at a depth of approximately 2m for the design scenario.

Plate 7.7 - Flood Compensation Cut Indicative Section

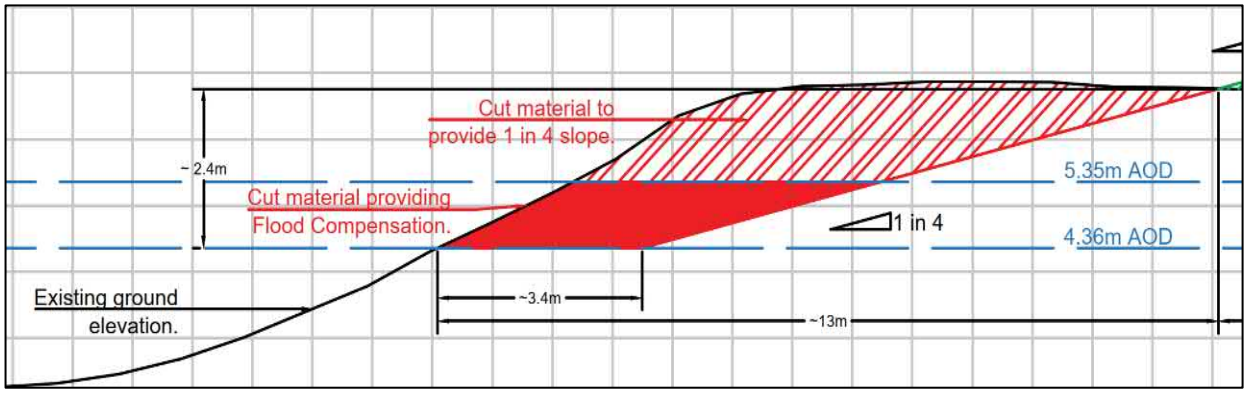


Table 7.5 - Volume Provided by the Flood Compensation Area

Volume (m^3)	Compensation Storage Minimum Required Extent (blue extent in Plate 7.6)	Compensation Storage Flexible Extent (black extent in Plate 7.6)
Cut volume providing flood compensation (m^3)	880	1,079
Total volume of cut (m^3)	2,038	2,505

7.1.27. The 'cut volume providing flood compensation' provided in **Table 7.5** shows that compensation storage volume can be achieved, whilst providing flexibility for the any changes to the earthworks design.

7.1.28. Considering this information, the proposed flood compensation storage will provide a beneficial impact, as more floodplain storage will be available as a result of the Proposed Scheme, as this does not take account of the fluctuation in ground surface across the area where the Proposed Scheme will occur. This is because the FCA has been designed to cut the entire proposed area to the lowest design flood level.

7.1.29. The excavated material (total volume of cut) will be kept within the FCA and placed in the area indicated in green in **Plate 7.6**. This area is bounded by existing higher ground (at levels above +5.35 mAOD), therefore, it is located outside of the existing floodplain and adding the extra material on top will have no impact on the risk of flooding during the design event in the area or elsewhere.

7.1.30. The extent of the proposed FCA was established to avoid the existing trees and their root protection areas.

7.1.31. No change to the risk of groundwater flooding is predicted as a result of the floodplain compensation works. However, given that the works involve land lowering on the edge of the floodplain, there may be instances where the groundwater level rises above ground surface and groundwater flooding occurs. However this would contribute to some of the combined flood volume in a similar manner as would occur under the baseline scenario.

7.1.32. The FCA will be maintained by Drax Power Ltd throughout the lifetime of the Proposed Scheme to ensure the FCA remains suitable for the proposed use. This requirement is included in Ref ID WE17 of the **Register of Environmental Actions and Commitments (REAC) (**document reference: 6.5, revision 03**).**

Environment Agency Requirements

7.1.33. Demonstration as to how this meets the Environment Agency's requirements are outlined below in **Table 7.6**.

Table 7.6 - EA Requirements and how they have been addressed

EA Requirement	How requirement has been addressed
i. No compensation will be required if it can be proved that the footprint of demolished solid buildings/bunded areas are equal or less than the footprint of the proposed solid buildings;	The proposed footprint is greater, thus floodplain compensation is required.
ii. No change in floodplain displacement in Flood Zone 3 is expected by the Environment Agency;	No action required, furthermore, the mitigation area will result in additional Flood Zone 3 being created.
iii. It would need to be demonstrated that those existing buildings which are to be demolished do not flood. Paragraph 15 (Reference ID: 7-015-20140306) of the Flood Risk and Coastal Change Planning Practice Guidance states that the buildings have to be a solid building so that they do not flood;	The nature of the existing buildings is provided in paragraphs 7.1.9 to 7.1.14 of this FRA.

EA Requirement	How requirement has been addressed
iv. The Post-development modelling may not be required if the footprint balance can be justified. If the footprint balance achieved any changes will be negligible and therefore there is no need to continue to model something on the fringes of the floodplain;	The volume that will be provided in the compensation area equates to / is greater than the volume lost as a result of the Proposed Scheme, as this is provided in close proximity therefore there is no requirement to undertake further hydraulic modelling.
v. Residual risk – breach scenario - volume for volume compensation is expected beyond any increase in built footprint;	It is demonstrated that an equal to or greater volume of storage would be provided as part of the floodplain compensation.
vi. Sensitivity test – need to consider displacement of hazard, change in hazard band, change in speed in onset or change in a local planning allocation. However, as the Proposed Scheme is not located in a major flow route no change in flood hazard is expected. Furthermore, if the footprint balance is achieved then there is no requirement to be concerned about the change in hazard as the buildings are changing very marginally on the edge of the floodplain.	It is considered that the Proposed Scheme will not result in any changes in flood hazard given the location of the buildings and the floodplain compensation area.
vii. The land is suitable for use as floodplain compensation.	The land is owned by Drax Power Ltd and soil testing has been undertaken to that the land is not contaminated (refer to Appendix 1 (FCA Trial Pitting Interpretative Technical Note) (AS-050)).
~~i.~~viii. Maintenance will be undertaken for the lifetime of the Proposed Scheme to ensure the floodplain	These measures are included in the **REAC** (document reference: 6.5, revision 03).

EA Requirement	How requirement has been addressed
volume remains an active part of the floodplain.	

Delivery Programme / Approach

7.1.34. The Proposed Scheme is protected from flooding by the Environment Agency's flood defences along the River Ouse, under the current day design flood scenario but becomes impacted during the operational phase of the Proposed Scheme, as demonstrated by the flood modelling for the design year.

7.1.35. This means that the FCA construction does not have to be undertaken as a pre-commencement requirement but could be completed at any point during the construction phase.

~~7.1.13.~~ The indicative design will be reviewed during detailed design and further consultation will be held with the Environment Agency (refer to ref ID WE16 of the **Register of Environmental Actions and Commitments** (document reference 6.5, revision 03). The review will be carried out during detailed design when further details on the construction and operational methods are available to ensure the Flood Compensation Area identified is still appropriate. ~~This increase will be mitigated by creating additional floodplain (a minimum floodplain area of 1,889m^2 will be created) through the lowering of ground outside the floodplain on land controlled by the Applicant.~~

~~7.1.14.~~7.1.36. This will ensure that the Proposed Scheme will not result in a loss of floodplain and that there will be no displacement of flood waters elsewhere. As such no increase in flood risk offsite is expected.

8. SURFACE WATER DRAINAGE STRATEGY

8.1.1. The surface water drainage strategy is provided in the accompanying report "*Proposed Surface Water Drainage Strategy*" (**Appendix 12.3** of the ES (document reference 6.3.12.3)). The drainage strategy is summarised in paragraphs below.

8.1.2. Currently the surface water runoff from the Drax Power Station Site is discharged to the River Ouse, however under the proposed scheme the surface water generated within the Drax Power Station Site will be reused in the cooling water system.

8.1.3. Under the existing surface water drainage system runoff is collected across the Drax Power Station Site by a network of surface water drains which direct these waters to the "purge", at which point they are joined by all other waters (i.e., treated effluent, cooling and process water and silt from sedimentation tanks to be discharged to the water environment and pumped into the River Ouse.

8.1.4. Under the proposed system surface water runoff will continue to be collected across the Proposed Scheme and potentially the wider Drax Power Station Site by a network of surface water drains but these will then be directed to a new sump and pump arrangement which under normal operating conditions will then direct these waters to the "northern cooling water reservoir". After the waters are used in the cooling water they are then directed to the "purge" and pumped into the River Ouse – as per the current arrangement and within the requirements of the existing Environmental Permit.

8.1.5. The proposed approach of redirecting surface water runoff from the site to the existing cooling system will reduce the amount of water which needs to be abstracted from the River Ouse for the cooling process.

8.1.6. Based on the Proposed Scheme design, the new impermeable areas are envisaged to cover a maximum area of 18,600 m^2 and from these new impermeable areas a peak flow of 695 m^3/hr has been estimated for the 1 in 100 year 6 hours storm event with 40% climate change allowance in accordance with the May 2022 climate change allowances (Environment Agency (d), 2022).

8.1.7. Information on water abstraction and use was provided by Drax Power Ltd which shows that currently more than 3,000 m^3/hr of water is abstracted used and stored in the existing cooling system. Therefore, the peak runoff of 695 m^3/hr from the new impermeable areas makes up only approximately 20% of the total volume of water per hour needed for the cooling process. As such 2,000 m^3/hr will still need to be abstracted from the River Ouse.

8.1.8. The remainder of water required for the cooling process will be supplied by runoff generated in other areas of the site and/or make up water from the River Ouse. This would result in the reduction of surface water discharge during storm events.

8.1.9. The proposed surface water drainage strategy has been accepted in principle by the LLFA and more details can be found in Appendix 12.3 Surface Water Drainage Strategy of the ES (document reference 6.3.12.3).

9. SEQUENTIAL TEST AND EXCEPTION TEST

9.1.1. The Proposed Scheme is classified as Essential Infrastructure under Annex 3 of the NPPF (Ministry of Housing, Communities & Local Government, 2021(a)). The location of Essential Infrastructure within Flood Zone 3 requires the Sequential Test and Exception Test to be passed. This section demonstrates how the Proposed Scheme satisfies the requirements.

9.2. SEQUENTIAL TEST

9.2.1. The Sequential Test area has to be limited to the Drax Power Station given that the Proposed Scheme has to be directly connected to the existing infrastructure. This approach has been agreed in principle with the LPA, Selby District Council in May 2021.

9.2.2. There are no other reasonably available sites in areas with a lower probability of flooding that would be appropriate for the Proposed Scheme as:

a. The location of the Proposed Scheme is driven by the need to enhance the existing Drax Power Station; thus, it is not feasible to locate it into lower flood zones and therefore it will remain within the floodplain of the River Ouse.

b. The location of the Proposed Scheme was chosen considering the space available within Drax Power Station Site and the functional requirement of need and ability to connect it to the existing infrastructure. Given the available space within the Drax Power Station Site, any other possible locations for the Proposed Scheme (within the Drax Power Station Site) would also be in the floodplain.

9.2.3. The Sequential Test is therefore deemed to be passed.

9.3. EXCEPTION TEST

9.3.1. In accordance with Table 3 of the Planning Practice Guidance ‘Flood Risk and Coastal Change’ (Ministry of Housing, Communities & Local Government, 2021(b)), Essential Infrastructure can be located in Flood Zone 3, but the Exceptional Test has to be passed, which requires both parts to be fulfilled, this is demonstrated below.

9.3.2. Demonstration that the development provides wider sustainability benefits to the community that outweigh flood risk;

a. The Proposed Scheme consists of carbon capture and storage and provides a sustainable approach to the production of energy, which is environmentally more sustainable and would align with the UK Governments Net Zero Strategy: Build Back Greener strategy.

b. Additionally, the wider benefits of the Proposed Scheme are detailed in the ES and the **Need and Benefits Statement** (document reference 5.3). It is considered that these Scheme benefits outweigh the minimal flood risk to and from the proposed development.

9.3.3. A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

9.3.4. This FRA demonstrates that the development will be:

a. **Safe for its lifetime** through the sensitive infrastructure being set 800 mm above the design flood levels. In the unlikely event of a breach of the flood defences, the Proposed Scheme will remain operational as the sensitive infrastructure will be 250 mm above the flood levels.

b. **Accounting for the vulnerability of its users** the Proposed Scheme will be constructed as part of the existing power plant, therefore appropriate emergency procedures are already in place and will be updated as part of the Proposed Scheme.

c. **Will not increase flood risk elsewhere** the Proposed Scheme, following the mitigation proposed, will not reduce the floodplain and will include a suitable surface water drainage strategy.

d. **Will where possible reduce flood risk overall** subject to detailed design the Proposed Scheme may increase the overall floodplain, thus reducing the flood risk, furthermore, surface water runoff from the Scheme will be removed, reducing the peak storm flows discharged from the Drax Power Station Site.

EXCEPTION TEST SUMMARY

9.3.5. Considering the information provided in the paragraphs above, the Proposed Scheme fulfils the requirements of the Exception Test.

10. CONCLUSIONS

10.1.1. The Environment Agency's Flood Map for Planning shows that the area of the Proposed Scheme is located partially in Flood Zone 2 and partially in Flood Zone 3, whilst the Habitat Provision Area is located in Flood Zone 3. The Environment Agency have confirmed that the Proposed Scheme and its surroundings are protected up to the present day 1 in 200 year event by the flood defences located along the banks of the River Ouse. There is however residual risk associated with a breach of the flood defences. A breach of the existing flood defences is considered unlikely to happen as they are regularly inspected and maintained by the Environment Agency, however, appropriate construction phase mitigation for a breach event has been incorporated into the Proposed Scheme.

10.1.2. The Offsite Habitat Provision Area is located in Flood Zone 3 and mapping from the 2016 Upper Humber Model shows that the southern half of this area is at risk of flooding during the 1 in 200 year defended scenario.

10.1.3. The Environment Agency's 2016 Upper Humber combined breach mapping indicates that in the present day, the entire Drax Power Station Site, including the construction laydown areas located in its boundary, is outside of the floodplain during the 1 in 200 year breach scenario. Although, the northern and southern ends of East Construction Laydown Area are within the floodplain for this breach scenario. The East Construction Laydown Area is outside of the Drax Power Station Site.

10.1.4. The Environment Agency's Flood Risk from Surface Water mapping shows localised areas along within the boundary of the Drax Power Station Site to be susceptible to flooding from surface water, including areas within the Habitat Provision Area. The indicated areas at risk of flooding are likely to be associated with the localised lower ground levels where water would pond during or after prolonged and heavy rainfall events. The Offsite Habitat Provision Area is considered to be at Low Risk of surface water flooding.

10.1.5. The Proposed Scheme is considered to be at low risk of flooding from groundwater, sewers and reservoirs.

10.2. CONSTRUCTION PHASE

10.2.1. The most notable potential risk of flooding during construction is associated with a breach of the existing flood defences, which could potentially impact the northern and southern ends of East Construction Laydown Area. Mitigation includes that stockpiles, hazardous materials and / or site cabins, plant and equipment are not located in the northern and southern ends of East Construction Laydown Area and that works are not undertaken in these areas when there is a risk of breach of the existing flood defences (i.e., a significant flood event).

10.3. OPERATIONAL PHASE

RISK OF FLOODING TO THE PROPOSED SCHEME

10.3.1. The Proposed Scheme is Essential Infrastructure and therefore should remain operational during flood events.

10.3.2. The sensitive infrastructure will be set 800 mm above the design flood levels (FT2), this provides sufficient mitigation for the sensitivity scenario and the breach event.

RISK TO HUMAN HEALTH

10.3.3. As a result of the nature of the Proposed Scheme and that Drax Power Station Site will have suitable operational management plans in place, to ensure safe operation of the site and the ability to safely shut down and evacuate the site, if required, this is considered an acceptable hazard rating.

FLOODPLAIN IMPACTS

10.3.4. The Scheme will not have an adverse impact on the floodplain, through its location on the edge of the floodplain and the maintaining built footprint and floodplain creation. Habitat Provision Area and Offsite Habitat Provision Area will also not have an adverse impact on the floodplain, as works proposed in these areas are limited to biodiversity improvements to planting and no increase in the existing ground levels are proposed. During consultation, the Environment Agency confirmed that the proposed planting in these areas will not impact flood risk and will not require compensation.

SURFACE WATER RUNOFF MANAGEMENT

10.3.5. The additional surface water runoff that will be generated as a result in the change in impermeable areas as part of the Proposed Scheme will be collected, stored and used within the cooling water process, with no increase in discharge off site.

10.3.6. Furthermore, the Proposed Scheme may result in a decrease in surface water runoff from the wider Drax Power Station Site, especially for the more frequent events. This is because it is expected that surface water from the other parts of the site, where feasible, will also be connected into the Northern Cooling Water Reservoir. This is a more sustainable option than abstracting water from the River Ouse.

10.4. THE SEQUENTIAL TEST AND THE EXCEPTION TEST

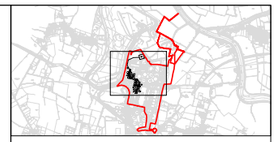
10.4.1. This FRA demonstrates that both the Sequential Test and Exception Test are passed as the Proposed Scheme is classified as Essential Infrastructure under the NPPF. In terms of the Sequential Test this is because the Proposed Scheme is an extension of Drax Power Station, which is partially located in Flood Zones 2 and 3 and cannot be relocated into lower flood zones.

10.4.2. The Proposed Scheme passes the Exception Test because it provides sustainability benefits through carbon capture and storage which provides a sustainable approach to the production of energy, which is less harmful to the environment. Additionally,

this FRA demonstrates that the Scheme will remain safe throughout its design life and that flood risk will not be increased elsewhere. Furthermore, the Proposed Scheme consists of carbon capture and storage and provides a sustainable approach to the production of energy, which is environmentally more sustainable and will help align with the UK Governments Net Zero Strategy: Build Back Greener strategy.

APPENDICES

APPENDIX A – INDICATIVE PLANT EQUIPMENT LAYOUT



Key:

- Order Limits
- Pipe Bridges and Ducting
- Aboveground Carbon Dioxide Pipeline
- Underground Carbon Dioxide Pipeline

Notes:

1. This drawing includes only the main plant equipment / buildings as referenced in Schedule 14 of the draft DCO.
2. Although the layout configuration, dimensions and number of plant equipment / buildings presented should be considered indicative, it represents the current concept design which has been developed from thorough and detailed engineering work with consideration given to the deliverability and integration with the existing Drax Power Station. For reference of the maximum parameters used for the environmental assessment, please refer to Schedule 14 of the draft DCO.
3. 7 metre easement from the culvert walls of Carr Dyke required. Route and width of culvert indicatively shown on plan but to be confirmed during surveys at Detailed Design.
4. Any works associated with replacements, upgrades or modifications of existing plant equipment / buildings have not been shown in this drawing. However, specific details for each of these works have been outlined below for reference, and details of all works have been included in Chapter 2 - Project Description of the Environmental Statement and Schedule 1 of the draft DCO:
   - 4.1. An alternate secondary electrical supply for the BECCS equipment would be provided from the existing 132 kV air insulated switchgear through upgrade works on the existing 400 kV National Grid substation, the existing 132 kV air insulated switchgear, replacement of existing 132 kV underground cabling and restringing of existing 132 kV overhead powerlines, and installation of new distribution voltage infrastructure.
   - 4.2. Cooling requirements would be provided using the existing northern cooling towers. Modification works would be required to the existing cooling water pumps and reconfiguration of the cooling water discharge manifold.
   - 4.3. Modification, upgrade and extension works would be required to the existing Unit 1 and Unit 2 to enable steam extraction and supply to the BECCS equipment.
   - 4.4. Modification and refurbishment works would be required to the existing Unit 1 and Unit 2 electrostatic precipitators.
   - 4.5. Replacement and upgrade works would be required to the existing main generator transformers for Unit 1 and Unit 2.
   - 4.6. Retrofitting works would be required to the existing Sedimentation Tanks to ensure suitable quality of circulating water through the BECCS plant.

Item	Description
1	Gas / Gas Heat Exchanger
2	Quench Column
3	Absorber Column
4	Solvent Regeneration System (Regenerators and Solvent Processing)
5	Rich Solvent / Lean Solvent Heat Exchangers
6	Main Process and Services Rack
7	Steam Pipe Bridge
8	Combined Power Turbines Building
9	Pressure Reducing De-Superheating Station Buildings
10	Solvent Storage and Make-up System
11	Carbon Dioxide Pipe Bridge
12	Carbon Dioxide Processing and Compression Plant
13	Carbon Dioxide Main Vent Stacks
14	Carbon Capture Wastewater Treatment Plant
15	Electrical Switchroom Buildings
16	Carbon Dioxide Delivery Terminal Compound (National Grid Carbon Limited)
17	Fire Water Tanks

0 62.5 125 187.5 250 m

SCALE 1:1,250

drax

wsp

PROJECT TITLE
DRAX BECCS DCO

DRAWING TITLE
INDICATIVE PLANT EQUIPMENT LAYOUT

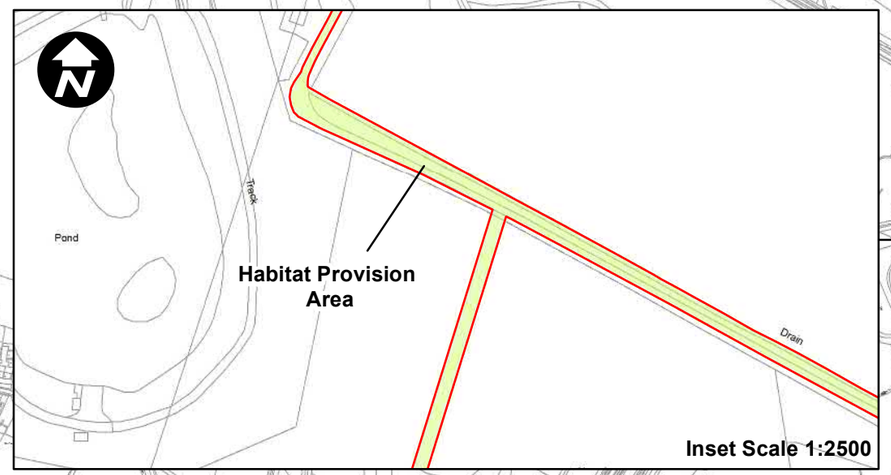
DRAWING STATUS
FOR ISSUE

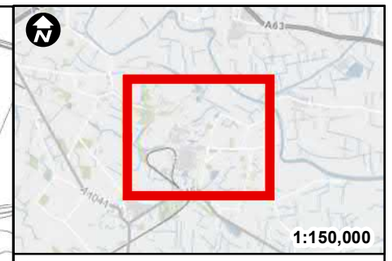
DRAWN	CHECKED	APPROVED	AUTHORISED
CH	RM	MM	NA

SCALE @ A0 SIZE	DATE	REVISION
1:1,250	06/05/2022	P01

DRAWING NUMBER
FRA - Figure 1

APPENDIX B – INDICATIVE SITE LAYOUT PLAN AND LAYDOWN AREAS





Key:

- Order Limits
- Drax Power Station Site
- Habitat Provision Area
- East Construction Laydown Area
- Minor Vegetation and Street Furniture Management
- Drax Power Station Site Construction Laydown Areas

Habitat Provision Area

East Construction Laydown Area

Drax Power Station

Existing Biomass Generating Unit 2

Existing Biomass Generating Unit 1

Minor vegetation and street furniture management

0 250 500 750 1,000 Metres

SCALE 1:10,000

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(o)

drax

wsp

PROJECT TITLE

DRAX BECCS DCO

DRAWING TITLE

INDICATIVE SITE LAYOUT PLAN

DRAWING STATUS

FOR ISSUE

DRAWN	CHECKED	APPROVED	AUTHORISED
LH	BS	ES	LM

SCALE @ A3 SIZE	DATE	REVISION
1:10,000	12/05/2022	P01

DRAWING NUMBER

FRA - FIGURE 2

APPENDIX C – ENVIRONMENT AGENCY CONSULTATION

AGENDA & MEETING NOTES

PROJECT NUMBER	EN010120	**MEETING DATE**	10 February 2022
PROJECT NAME	Drax BECCS DCO	**VENUE**	Virtual - Teams
CLIENT	Drax Power Limited	**RECORDED BY**	LM
MEETING SUBJECT	Baseline modelling results		

PRESENT	Andrew Pattinson (EA) Rachel Jones (EA) David Piercy (EA) Jenny Blyth (Drax) Christopher Summers (Drax) Jim Doyle (Drax) Andy Smith (WSP) Soledad Berbel Roman (WSP) Nicola Ashworth (WSP) Elzbieta Szostak (WSP) Louise Markose (WSP)
APOLOGIES	None
DISTRIBUTION	As above plus: Maria Marsh
CONFIDENTIALITY	**Restricted**

ITEM	SUBJECT	ACTION	DUE
1	**Introductions**		
1.1	**Flood Modelling Technical Note 08-02-22** Soledad (SBR) led the discussion on the modelling approach proposed by WSP and described in the Flood Modelling Technical Note issued to the EA on 8th February 2022. Main areas to seek agreement on are: • Changing the design event to FT2. • Utilising current built footprints which are to be demolished for no loss of floodplain and no offsite change. R Highlighted that the proposed design life has changed from 60 years to 25 years and outlined the revised climate change approach:		

- Upper end allowance (Epoch 2050s) for peak river flows:

• 29% for the River Ouse catchment.

• 31% for the River Aire catchment.

• 36% for the River Don catchment, and

• 38% for the River Trent catchment.

- Sea level rise uplift of 252.6mm based on Environment Agency's climate change allowances for schemes and strategies.

AP asked about the rational for reduced lifetime of the development.

JD outlined that the 25-year design life will take Drax beyond the 2050 net zero target set out by the government. It doesn't seem rational to extend the design life beyond that.

AP highlighted that with the 25 years it is quite short time and will get asked on it at the examination.

JD said it was the same as the Keadby project.

AP asked if after 25 years the infrastructure will be removed?

JD stated that he doesn't think we can make that assumption. We did not expect Drax Power Station to be operating into the 2020s given when it was built. JD stated that the buildings are likely to be there, but BECCS Scheme is not expected to be operational after 25 years At this stage it is not anticipated that the buildings will be repurposed for other uses or technology. However, if it is the case, appropriate mitigation measures will be designed and implemented.

AP advised that if the buildings will remain, the mitigation needs to be reassessed for beyond 25 years.

AS replied that that it has already been considered as aspects of the modelling was also carried out for the 60 year design life.

AS WSP will take this point away and discuss with the Drax team to see what they are willing to commit to beyond the 25 years lifetime.

AP Make it clear in the FRA that we have considered the extended lifetime, considered the increased flood risk in the future and we haven't mitigated but we have considered how we may mitigate it. Also outline the uncertainty around climate change. We have an extra 20-25 years to see how the river flows may change.

AP advised that there are similar schemes which retrofit mitigation. AP stated that adaptive approach should be followed. Evidence needs to be provided that the mitigation is feasible to be implemented after 25 years if it is required. May have a condition or separate legal agreement that in 25 years need to re-look at the flood risk. Delay the decision and mitigation until more information is available.

	AP Easington Gas terminal has been in place since 1990s and recently been renewed (a couple of years ago). Humber Hull Frontages (EA led scheme) was in place a 5 years ago. AS Lincolnshire Lakes is an example. AP to ask colleagues about how the conditions were put in. *AP regarding managed adaptations need to demonstrate at the outset that adaption is reasonably possible at a later time. So it doesn't look like we are proposing something that is impossible.* *Action to look at the refresh Easington is on East Riding Planning Portal.* *EA happy that the lifetime can be 25 years if we can demonstrate how we will make the scheme safe after 25 years.* AP confirmed that WSP have used the Upper Climate Change allowances for peak river flow which are recommend being used as a sensitivity test. More normally the central and higher central allowances would be used. Therefore, the modelling has been carried out adopting a precautionary approach so in theory WSP have assessed a longer lifetime for a more likely climate change scenario. *Recommend outlining this approach in the FRA.*	AP to action WSP to action	
2	**Flood Design Events** SBR outlined the revised assessment scenarios. AS outlines that the FD is an extreme scenario. The area is fluvially dominated so some of the design events should be used for sensitivity and some for the design life. SBR WSP reviewed the Upper Humber Extreme Water Level Model and we consider FT2 scenario as the revised design flood event and the other events as a sensitivity test. AP the design flood PPG guidance says generally for a fluvial dominated area the 1% design event is used and generally 0.5% for a tidally dominated area. The EA use the word generally rather than specifically. The EA use the guidance to inform that where there is a tidal influence then the 0.5% should be used. So the design event for the scheme is 0.5% AEP event. AS overall in joint probability terms the scenario is still tidally dominated (100 year on the Ouse, 10 year tidal, 1 in 20 year on the Don, 1 in 50 year on the Aire). Thus, we are still assessing the 1 in 200 year event it's just how it is made up. AP the FT2 scenario is the most consequential? AS no it's the most pragmatic, the most consequential is FD scenario which has been proposed to be used as a sensitivity test.		

	Given the chance of all those events happening at the same time is quite rare. The Ouse being in a 200 year flood is not appropriate given its a fluvially dominated scheme. AP stated that the table showing the different scenarios in the Humber Extreme Water Level Model report was carried out by the framework consultant and has gone through QA, hence the FD scenario cannot be ruled out as it has been considered as potential scenario that may happened. AP advised that if the FD scenario is discounted as a design event, evidence needs to be provided that this scenario has been somehow considered in the design. LM we need a single design flood event. AP FT2 scenario is acceptable as a design flood event and seems a sensible approach. As fluvial flooding on the Ouse is the dominant event and the site is on the River Ouse. AP agreed that the following scenarios are used in the assessment: • FT2 Design Event; • FT1, FT5, T, FD will be used as a sensitivity test.		
2.1	**Mitigation** **<u>Floodplain compensation</u>** AS we are still working on the mitigation, but what appears likely is that the existing footprint of the buildings will be more than what is going to be developed as part of the scheme. SBR presented the flood maps with the indicative footprints of the Proposed Scheme. The Proposed Scheme consists of Above Ground Installation (AGI), the southern area and the main area in the west is where we are most interested, and the modelling is showing flood depths of 200mm for FT2 and up to 600mm for other scenarios. Cooling towers are outside of the scheme and have their own drainage channels which the flood waters would just top up. Within the main area of works (western part of the Scheme) there are several existing buildings that will be demolished and pipes that will be above ground level, as well as areas that are bunded. So if we were not to do anything those buildings would already be there and in the floodplain so if we replace with the same or less footprint we will not be displacing any of the floodplain storage. AP confirmed that no compensation will be required if it can be proved that the footprint of demolished solid buildings/bunded areas are equal or less than the footprint of the proposed solid buildings. No change in floodplain displacement in Flood Zone 3 is expected by the EA. AP advised that if there is a floodplain displacement, come back to the EA to talk about what is an acceptable change.		

	AS stated, that we will show total footprint currently and total footprint the future (pre and post-development). DP confirmed that it is a sensible approach. AP also advised that it would need to be demonstrated that those existing buildings which are to be demolished do not flood. The existing guidance states that it has to be a solid building that does not flood. AP advised that it is referenced in PPG – Solid Buildings and Infrastructure and it is linked with functional floodplain and how to define it. AS stated that we will have a think about how best to demonstrate this once we have done the calculations, noting that it is possible to flood proof these buildings now under permitted development rights and thus they would be classed as being flood free. AP advised that post-development modelling may not be required if the footprint balance can be justified. AP advised that the following potential flood compensation are to be considered: - Residual risk – breach scenario -volume for volume compensation is expected beyond any increase in built footprint; - Sensitivity test – need to consider displacement of hazard, change in hazard band, change in speed in onset or change in a local planning allocation. AS stated that Drax BECCS is not located in a major flow route so we should not have a change in flood hazard, onset, so hopefully we will not see a major change. AP agreed with that statement. Hopefully you can balance the footprint so any change will be negligible and therefore do not need to continue to model something on the fringes of the floodplain. AS stated that then we do need to be concerned about the change in hazard as the buildings changing very marginally on the edge of the floodplain. AP agreed with that statement. **Freeboard** AS advised that the mitigation will be provided by either replacement of the buildings or put the sensitive infrastructure on plinths raised above the envisaged flood levels. AS advised that the freeboard may not be exactly 600mm, we may use some of the other extreme modelling to set the freeboard. AP advised that there is a new guidance on freeboard allowances “Accounting for Residual Uncertainty”, which includes a fluvial freeboard update. AP confirmed that WSP local knowledge is more		

	appropriate for the Proposed Scheme, than the guidance. *Should reference this new guidance in the report, but also state that we are using local knowledge on understanding of risk and depths to set the freeboard. Rather than using the wider guide which may mean we need to look at 900mm.* Make sure we state why we have not followed that guidance. AS stated that the proposed freeboard will not be a standard 300mm or 600mm freeboard. AS we have insight into that from the other modelling done. AP agreed. The floodplain depths are not going to change significantly. AS advised that the slab levels for sensitive infrastructure are proposed to be set at flood levels envisaged for the FT2 design scenario plus freeboard, providing that the other sensitive test flood levels are under that. AP confirms that this is an acceptable use of freeboard. AP so all the scenarios that have been run are within the residual risk levels? AS this still needs to be determined, but this is the thought process at the moment. Also accounting for the practicalities of operation side of the site. AP have you got an insight on the breach modelling what are the modelled depths? SBR we are currently running the model for FT2 and FT1, but the results have not been reviewed prior to the meeting. It looks like the levels of FD is the worst case. This will be confirmed.		
	Breach assessment AS stated that it is proposed to do the breach on FT1 and FT2 scenarios. FT1 scenario is very similar to FD scenario. Results have not yet finished but that is where the direction will be. AS asked if the EA agree that breach scenario is more of a residual risk rather than the design flood event and that will not be used to set platforms and plinth levels. AP advised that evidence will have to be provided that the Scheme is operational during breach or it can be shut down safely and people can be evacuated to higher grounds. If the elements of critical infrastructure can be put on plinths then it can be dealt with in a practical way. JB explained that Above Ground Installation (AGI) consist of pipes coming up from the ground. CS confirmed that they are just pipework		

	which water would not affect. CS also stated that there will be a small kiosk which can be mitigated if needed. JB highlighted that there are 3D models to show to the EA which would help with understanding the scheme. AS stated that just before or just after the FRA is submitted, we can have a call with the EA to help explain the scheme and help interpret the FRA. CS explained the scheme compressor buildings likely to be raised up to protect the plant in the building. East of the compressor buildings there will be a bunded tank storage farm. There will also be a number of switch rooms that sit elevated from ground level. The high-level pipe rack is raised. Which links to the AGI. JB / CS the site is raised slightly around 6m AOD. The bulk of the infrastructure is not going to be affected. CS stated that once we the flood levels are known we can look at the infrastructure and buildings and consider the protection to ensure they do not flood. AP confirmed that the approach is acceptable. AP confirmed that there are no significant concerns at the moment on the scheme. AS stated that there is not much time left to prepare for the DCO submission, and Drax/WSP may have to come back with an addendum to the FRA once it is submitted. AP asked if a statement of common ground (SoCG) been put together. AS advised that we are in the process of developing it. JB advised that it the SoCG is planned to be submitted to PINS at the end of April. AS stated that a further discussion with EA may be needed to close out remaining issues. AP stated that would be useful to have a discussion on the SoCG. RJ confirmed that the EA have not seen it. Action for WSP to determine when it will be appropriate to share it with the EA. **Modelling Review** AP advised that the modelling results presented to date are not showing any significant unusual results. But as its DCO and FZ3 the model needs to go through a review. In the SoCG it should be stated that this review will happen but that the EA are comfortable with the results.		

	AP advised that the modelling does not seem unexpected, the breach results may show a little bit more. *Agree in the statement of common ground that the results don't look unexpected. That the EA is broadly in agreement with the results and that a formal model review needs to be carried out. This can be done in the 6 months after submission, pre hearings with a view to seeking agreement.* AS to send the Statement of Common Ground to RJ at the EA for agreement. *AS we will be in touch on the building footprint and the breach results perhaps as a one page technical note so there are no surprises when the applications lands.*		

AGENDA & MEETING NOTES

PROJECT NUMBER	EN010120	**MEETING DATE**	27 September 2021
PROJECT NAME	Drax BECCS DCO	**VENUE**	Virtual - Teams
CLIENT	Drax Power Limited	**RECORDED BY**	ES
MEETING SUBJECT	Flood Risk Modelling – meeting with Environment Agency (EA)		

PRESENT	Jim Doyle (Drax) Jenny Blyth (Drax) Oliver Baybut (Drax) Matthew Wilcock (EA) David Piercy (EA) Andrew Pattinson (EA) Claire Brown (EA) Maria Marsh (WSP) Louise Markose (WSP) Soledad Berbel Roman (WSP) Ela Szostak (WSP)
APOLOGIES	n/a
DISTRIBUTION	As above plus: Lara Peter (WSP) Nicola Ashworth (WSP)
CONFIDENTIALITY	**Confidential**

ITEM	SUBJECT	ACTION	DUE
1	**Overview**		
	All attendees introduced themselves. Oliver Baybut (OB) provided an overview of the Proposed Scheme to the EA. Andrew Pattinson (AP) asked what is intended lifetime of the proposed development and whether or not there is an initial operational phase and then a subsequent future alternative lifetime? OB advised that the intended project lifetime is 60 years. The plant could operate for up to 60 years using the existing maintenance engineering capabilities on the site, so that's the extent of the life that it is looking at as a start. Once Carbon Capture and Storage (CCS) plant is fitted and operational at the Drax Power Station, unless the		

	EA wants Drax to take it out and rebuild it in a completely different way, it will stay largely as it is because the CCS plant is designed to operate with particular solvents, and it is not the sort of plant that can change the solvent that is used for the capture.		
2	**Flood Risk Technical Queries – Baseline**		
	Louise Markose (LM) provided short introduction and referred to the technical queries sent by Ela Szostak (ES) to the EA on 25/09/2021 which WSP would like to discuss on this call. LM stated that Soledad Berbel Roman (SBR) is a hydraulic modeller for the scheme. SBR presented slides to aid the this discussion.		
2.1	*Climate Change Allowance*		
	It is understood that the 2018 Upper Humber hydraulic model needs to be updated with the up-to-date climate change allowances. SBR stated that WSP would like to confirm climate change allowances which are to be used to update the model for the baseline scenario. SBR stated that the following approach is proposed: ▪ Fluvial flows to be increased by 23% in line with the Central estimate of climate change in the Humber Estuary; ▪ Tidal levels to be increased by 630mm using the UKCP18 Marine Projections for a 2080s epoch in the London Estuary (data available for the nearest Estuary). AP confirmed that the peak river flow allowances should be determined based on catchments rather than river basin districts. AP suggested for the sea level rise allowances to use the tables shown on the same climate change guidance pages as for peak river flows rather than outputs directly from the UKCP18. AP also stated that he noticed that RCP4.5 for London from the UKCP18 projections was proposed to be used. AP stated that it is incorrect as it should be RCP8.5 and it should be based on a specific grid cell that would be the nearest to the site, which would be in the Humber Estuary. AP advised that WSP needs to go to the user interface on the UKCP18 website and find that. Claire Brown (CB) advised that if WSP would like to use the outputs from the UKCP18, the closest location to the site will be Immingham in the Humber Estuary. CB also asked whether WSP have access to the Humber Extreme Water Levels (EWL) hydraulic model and whether WSP plan to use these levels in assessment of the flood risk. CB advised that it is a 1D model and the EA modelled the in-channel levels from the UKCP18 outputs up the Estuary, what includes levels close to the Drax Power Station site. CB also advised that the model includes a range of climate change allowances and it will be useful if WSP have access to this information. LM advised that WSP requested the Humber	EA to provide the Humber Extreme Water Level hydraulic model	

	Extreme Water Level model in July 2021 but that we still haven't received it. Matthew Wilcock (MW) advised that he chased the WSP request internally within the EA but it is a bit of challenge. LM asked MW when the Humber EWL model will be provided to WSP. MW stated that he has been pushing for the model internally and will chase the request again. CB asked whether WSP need outputs from the Humber EWL model or the model itself. SBR replied that the outputs are needed to compare them with the outputs from the 2018 Upper Humber hydraulic model, which WSP has already received. CB advised that the EA is still working with the consultants on the Humber EWL model hence it may be difficult to have access to it. CB advised that the outputs from the model should be relatively easy to supply. CB advised that she may be able to help with delivery of the model outputs to WSP as it is a matter of licensing. MW and CB stated that they will have a chat after the call to solve that issue. LM advised that WSP purchased a hard drive so the data can be uploaded onto it and send back to WSP. The hard drive is ready to be sent to the EA. SBR wanted to clarify the allowances for sea level rise. SBR asked whether the input levels from the Humber EWL model should be used to determine which tidal water level we should use or shall we check the sea level rise allowances determined by river basin districts and shown in the current guidance (Table 2 of the guidance). CB replied that it will be useful to compare those two. CB also advised that from the planning perspective reference will be made to the guidance mentioned earlier by AP. CB also advised that on the UKCP18 website specific uplifts for Humber geography can be downloaded. LM stated that WSP will prepare a modelling scope which WSP would like to agree with the EA. AP stated that it is a good idea.		
2.2	*Credible Maximum Scenario*		
2.2.1	*Confirmation of H++*		
	SBR stated that it is proposed to use H++ of 1.9m for the sea level rise and the Upper End allowance of 48% for peak river flow given it is an existing power station. It is proposed to use these allowances for the defended scenario as a sensitivity test. AP advised that the proposed allowances need to consider the lifespan of the development. AP confirmed that these allowances can be used as a sensitivity test. LM stated that a lot of flooding is likely to occur during H++ scenario, LM asked who would determine the mitigation needed following the		

	sensitivity test. Is that decision for Drax or what the EA would like to see? AP responded that with it being labelled as a sensitivity test, it's really to give the mitigation approach credibility to consider the alternative future climate impacts, hence it should be dealt with in the same way as other mitigation. If it cannot be implemented in the same way, alternative ways of managing it should be considered. AP stated that what the EA is looking for is that somewhere within the range of mitigation options, there is a way of mitigating that risk. If there is not, then potentially to look at sort of alternative mitigation strategies, whether or not that's looking at defence improvements or change to the design. LM wanted to clarify that the EA wants to see some level of mitigation for the H++ scenario whether it is a mitigation on site or increase in flood defences. AP replied that the EA position is that that risk can be mitigated, but it is not specific on quite how it needs to be done. AP also stated that the guidance talks about if that risk only exists in the sensitivity test, whether or not it's acceptable to delay the mitigation to future date sort following an adaptive pathway approach. AP advised that if the risk can be mitigated, the EA would like to see that. OB stated that the proposed development is significant and that Drax do not want to commit to spending money at the outside of the projects, but rather have been adapted versus project throughout its lifetime. AP agreed that it is adaptive approach. AP stated that one way of dealing with the risk is to delay incorporating mitigations until there is a greater certainty in the future that these impacts will actually materialize within the lifetime of the development. AP also stated that there are some developments which are more appropriate to adaptations than others. If development includes big infrastructure it may not be possible to do certain forms of mitigation down the line, which is why it is worth to consider it now and maybe look at building out in the first place so you don't need to be concerned about it at a later date. AP also stated that it is a sensitivity test and looking at the various climate change allowances it might be found that the difference and impacts at the Drax Power Station site is very minimal, in which case inbuilt mitigation might be quite easily achieved. SBR shared a screen showing the flood extent for the 1 in 200 year event H++ scenario which represent the worst case scenario. AP requested information how the model has been changed to derive this output. SBR explained that WSP have used the Upper Humber model defended scenario with tide level being increased to 1.9m.		

	CB asked if the 1.9m uplift is for H++ scenario at 100 year span. SBR replied that it is for the 1 in 200 year span. CB stated that the H++ flood extent is very conservative and that the outputs from the Humber EWL will give more realistic information on the levels in this area rather than the Upper Humber model. SBR confirmed that once we have the Humber EWL model we will check the water levels in the river channel adjacent to the site and compare to the H++ outputs. CB stated that thinking about it strategically is the development proposed in this area is likely to be adaptable into the future. Whether it can be adapted in the future if the reality looks like the worst case scenario just shown. LM asked OB if he has any comments whether from the operational perspective how likely is to adapt the scheme. OB advised that once the plant is built there is not much that can be done to the plant itself, but there is potential for some works to the landscape around the site which may help to mitigate potential impacts. Once the absorbers and regenerating columns are built there is not much opportunity to raise them. The buildings can be designed to be more resilient to flooding. OB also stated that it would be good to agree with the EA where is the level of conservativeness or precaution which need to be considered. It would be good to agree that at the early stage as because if there is the threshold where all of a sudden there's a big impact by just a raise of a few millimetres then we need to know where we are on that scale.		
2.2.2	*Storm Surge*		
	SBR stated that it is WSPs understanding that the current Upper Humber model accounts for storm surge within the tidal boundary maximum levels and therefore additional 2mm for each year on top of sea level rise is not required. SBR requested whether this is correct. AP replied that he will need to check it. AP also stated that he would encourage WSP to look at the Humber EWL outputs, which are likely to overrides the Upper Humber model. AP also states that he is fairly sure that the Hull outputs already accounts for the storm surges. CB states that she is 98% sure that the Humber EWL model accounts for storm surges, but she will have to confirm that. CB stated that it is not a brand new model, it is just extension of the Upper Humber model and just updated figures run through it, but it doesn't include waves impacts, but waves are not relevant to the scheme location.	EA (CB) to confirm whether the Humber EWL model accounts for storm surge	
2.2.3	*Proposed Design Flood Event*		
	SBR stated that the design flood event is proposed to be 0.5% AEP with climate change allowance (630mm) tidal event combined with a 1% with climate change allowance (23%) fluvial event breach		

	scenario. SBR asked the EA whether they accept the proposed approach. AP stated as he understands the area where the scheme is located, is tidally dominated but it is a joint probability area of the River Ouse. AP advised to check the Humber EWL report which includes maps showing the area with tidal dominance only, fluvial dominance only and areas of joint probability. AP states that he thinks that the scheme is located in a joint probability area. AP advised that for the breach simulations to use the same design inflows. AP also stated that the hydrographs will be different depending if the tidal or joint probability scenarios are used AP also advised that if WSP would like to narrow down the simulations to do, what the EA have tended to find is the tidal dominated scenarios will generate the greatest hazard for developments very close to the defences- is just get slightly higher head of water behind defences, but they're not quite as much volume through it over the course of 72 hours or so. AP also advised that as WSP is looking for the maximum flood extents, they need be looking more towards the joint probability or fluvial scenarios. It depends on how much of the site WSP need to look at as to whether they need to run the maximum flood extent or a maximum flood hazard, potentially both.		
2.2.4	*Confirmation of Breach Approach*		
	SBR showed a map showing the Upper Humber model combined breach scenario for the 1 in 200 year tidally dominated flood extent without climate change. The map considers breach locations closest to the scheme. SBR stated that it is proposed to run the same scenario but with updated climate change allowances. AP confirmed that the climate change will have to be accounted for. AP also advised that there will have to be an assumption as to how WSP will treat the defence that is breaching because they will overtop before it is breached. So potentially the input water level will be much higher than the height the flood defence so whether you're going to artificially raise the defence to breach it or are you going to leave the maximum breach level at the height of the flood defences. AP stated that this needs to be agreed with the EA. LM asked whether we can have another meeting with the EA after we receive the Humber EWL model to talk through this because a lot of these answers seem to be dependent on receiving that model and understanding the application of it. AP agreed that another meeting can be arranged. SBR stated that the current Upper Humber model includes 18 breach locations and the maximum flood extent for each of the breach locations can be viewed. SBR asked whether each breach location	AP to provide breach model guidance	

	needs to be analysed individually or can we combine outputs from the breach locations closest to the site, as it will provide the worth case scenario for the scheme. SBR asked which method would be preferable by the EA. Discussion on the breach location was carried out. AP stated that the guidance says if you are running your own breach modelling, you are looking for the simulation that generates the greatest hazard to your site. AP stated that if you merged all the available breach simulations together and took a maximum, it will identify the maximum depth or the maximum hazard to the site from those existing breach locations. AP also stated that it needs to be considered whether there is a need for further breach location that could generate greater hazard to the development as proposed. AP asked David Piercy (DP) whether he would like to comment on that query. DP stated that the proposed approach is probably appropriate as it will provide the worst case scenario. DP stated that he recalls that for the previous scheme only one breach location was considered, and it provided the worst case scenario. LM confirmed that for the Drax Repower project only one breach location to the north of the site was considered, and the mitigation was proposed based on that. LM asked the EA to clarify whether they want WSP to do almost like a sensitivity test again to check these five breach locations from the Upper Humber model versus one single location at the site, which will probably be the same location as we did for the Repower project. DP confirmed that yes, such exercise is worthwhile doing. Jim Doyle (JD) asked whether we will need to run several models here to get a single answer. SBR confirmed that we will have to run several different scenarios and compare the outputs. JD raised his concerns about the time and resource taken to do that. LM advised that the model is quite large and it takes a week to run it. LM stated that ideally we would like to assess only one breach location which gives the worst case scenario to the scheme. AP agreed with that and stated that we need to identify the breach location that generates the greatest hazard to the site. AP advised that the Upper Humber model is a very large model with only few selected breach locations considered, and it is often that development sites fall between locations where further breaches are needed to be considered. AP suggested to look at the flood defences near the site and try to work out location of a breach which would provide the worst case flooding. LM asked whether we can use the same breach location as it was used for Drax Repower project. AP stated that he is not familiar with that name. JD explained that it is a previous Drax project and that the EA is familiar with the hydraulic modelling outputs which supported that project as the EA reviewed and commented in them. DP asked to remind him the location of the breach used for the Drax Repower		

	project. JD stated that as far as he remembers it is somewhere between breach point C and 5 used in the current Upper Humber model. Ela Szostak (ES) stated that for the Drax Repower project we used the previous Humber model, not the current one. JD added that the Repower project is not going ahead anymore. SBR shared a screen showing the breach location used for the Drax Repower project. The breach location used for the Repower project is located approximately in the same location as breach location C used in the latest Upper Humber model. DP stated that this location looks probably like location that will have the greatest impact on Drax Power Station, and that is probably going to be the most sensible one to use. DP confirmed that the EA is happy with WSP using the same breach location as the one used for the Repower project. LM wanted to confirm if the EA is happy for WSP to run the breach scenario with that single breach location and the design event as discussed earlier, depending on the confirmation of tidal/fluvial influence. AP confirmed that it is correct. AP advised that there is a breach model guidance that is available for this area. The modelling approach which is to be prepared by WSP will be compared with that guidance to make sure that the proposed approach is going to be acceptable by the EA modelling team. AP also advised that alternatively he can send the breach model guidance to WSP so we can compare it against out model scope. LM stated that it would be good to have that guidance so we make sure our modelling scope complies with the EA guidance.		
2.2.5	*How future fate of defences is accounted for, e.g. Humber 2100++, or upstream changes (i.e. the step through Selby)*		
	SBR asked for explanation of the above statement received on 17/08/2021 as part of the consultation. What WSP need to account for? AP stated that it links with the adaptive approach and WSP need to look at how the future flood defences throughout the Humber Estuary need to be managed over the next 100 years and there is not one single approach to how those defences will be managed because of a whole range of reasons. AP stated that it means that as we move forward the flood risk throughout the estuary will change, whether we raise defences or whether we potentially remove parts of defences or lower defences, or look at outer estuary interventions, all that will affect the flood risk throughout the entire tidal floodplain, including Drax and Selby. AP stated that a Flood Risk Assessment needs to evidence based so it needs to look at some these options to ensure that the risk is suitably managed throughout. The Humber EWL datasets and the Upper Humber datasets look only at one future – how sea level rise or peak river flow will change as we go forward, without any changes to the flood defences. AP stated that now it is		

	known that if we raise flood defences throughout parts of the estuary, flood risk elsewhere is going to increase. Discussion on the strategic impact of change to the flood defences in the Estuary were carried out. SBR wanted to confirm whether a qualitative assessment, like checking the flood defences condition and levels in the area of the proposed scheme and compare them with the in-channel water levels at the different cross sections, is expected. CB stated that she will have to figure out what uplifts in that part of the Estuary could be as a result of decision about future management of defences in other parts of the Estuary. That information can be used as an uplift in the same way that a sea level risk is considered as an uplift for that section of the Ouse. It is a sensitivity test to check whether you can mitigate against the potential impacts.		
2.2.6	*Hydrology*		
	SBR stated that it is proposed to use the same hydrology used in the Upper Humber model with updated climate change allowances. SBR stated that we will also check the outputs from the Humber EWL model and compare them to assess which once are appropriate to use. WSP will summarise it in a modelling scope which would like to agree with the EA.		WSP to issue a modelling and hydrology scope to the EA
2.2.7	*Residual Risk*		
	SBR stated that to assess a residual risk for the scheme it is proposed to use a breach scenario as assumed this will give the maximum water levels when compared to overtopping. DP confirmed that the proposed approach is acceptable.		
2.2.8	*Baseline Model*		
	SBR asked whether the EA would like to approve the baseline model before we introduce the scheme into it. DP confirmed that the EA needs to approve the baseline model. Matthew Wilcock (MW) stated that he will make the EA's Data Team aware that such scope will come through so they can prepare the resources for this task. DP advised that there is a 4 weeks turnaround for review of the model.		
2.2.9	*Scheme Model*		
	SBR asked whether the EA would like to sign off the scheme model prior to DCO submission.		

	DP confirmed that it would be sensible if the EA sign off the model prior to DCO submission to avoid changes to the model at the DCO stage.		
2.2.10	*Environmental Permits*		
	DP confirmed that environmental permit is not needed for works in the defended areas of Flood Zone 3, unless these works are located within 16m of flood defences. Environmental permit will be required for works located in undefended areas of FZ3. Ela Szostak (ES) asked if permit is required for tree planting in the proposed mitigation area indicated to be undefended area of Flood Zone 3. DP confirmed that permit will be required for tree planting only in the area within 16m of flood defences. DP added that permit will be required if tree planting is associated with ground raising		
2.2.11	*Floodplain Compensation*		
	SBR asked if floodplain compensation is required in defended areas. DP stated that floodplain compensation may be required for permanent structures if they displace flood flows in defended areas. If it is shown that these structures do not increase risk elsewhere, compensation may not be required. DP confirmed that for laydown areas in floodplain, compensation will not be required, as these are temporary. CB confirmed that volume for volume compensation is not required for tidal floodplain, but if there is obvious flood flow route which is impacted by the proposed scheme, that will have to be mitigated to ensure no increase in the risk of flooding elsewhere.		
3	**Programme**		
	LM provided a rough programme: - Have another meeting with the EA once we receive the Humber EWL model, which we hope to receive by 1st October 2021; - WSP to review the model and have another meeting with the EA in a week commencing 11th October to allow WSP prepare a model scope; - Deliver the baseline model to the EA around week commencing 15th November; - Receive comments from the EA by the end of 2021; - Scheme modelling starts in January 2022 (3rd design freeze is planned for 14th January).		

	SBR raised concerns that we still haven't received the Humber EWL model and we are not sure how it will impact the Upper Humber model we are currently using. LM stated that we need to finalise our reports – Flood Risk Assessment and Water Chapter of the Environmental Statement, around February – March, as DCO submission is in April 2022.		

NEXT MEETING

An invitation will be issued if an additional meeting is required.

creating a better place

Environment Agency

Jim Doyle
Drax Power Ltd

Our ref: RA/2021/143797/01-L01
Your ref: Email 01/11/2021

Date: 10 December 2021

Dear Jim

Drax Bioenergy with Carbon Capture and Storage (BECCS) Section 42 Consultation

Drax Power Station, Selby, North Yorkshire YO8 8PH

Thank you for notifying us of the consultation period on the above proposal. We have reviewed the information submitted, including the Preliminary Environmental Information Report (PEIR), and have provided our comments below. Please note that our comments are not presented in any particular order of importance.

Flood Risk
In terms of flood risk the Preliminary Environmental Impact Report (PEIR) considers the relevant areas and legislation expected. The applicant has also taken into account previous advice and guidance given at the scoping stage, and this is referenced in the report.

We support that a standalone Flood Risk Assessment (FRA) will be produced to inform the ES. We note that the FRA will include an assessment of flood risk for the construction, operation and decommissioning of the development, this will help to ensure that the development throughout its phases will be safe and will not increase risk elsewhere.

We also support that the FRA will take into account breach and overtopping scenarios, consider all sources of risk, and will also take into account the latest climate change allowances. The information included in section 12.4.16 details the appropriate information that the FRA should be considering and will be used to inform the need for any mitigation measures that will be required to ensure the development is safe and does not impact upon others.

We are in ongoing discussions with the applicant to facilitate this and ensure that the FRA is based on the best available information. We are also in discussion with the applicant with respect to the proposed modelling that will be undertaken to inform the

Environment Agency
Foss House, Kings Pool, Peasholme Green, York, YO1 7PX
Telephone: 03708 506 506
Email: enquiries@environment-agency.gov.uk
Website: www.gov.uk/environment-agency

FRA.

We note that the applicant will consult with us with respect the requirements for any works that may require a Flood Risk Activity Permit and agree this at the appropriate stage. As all works taking place are now behind the defences (i.e. within the area benefitting from defences – as the plans to upgrade the Jetty and associated infrastructure are no longer being considered) it is likely that a permit will only be required for any works within 16m of the toe of a defence.

Groundwater and Contaminated Land

Standing advice
'The Environment Agency's approach to groundwater protection' sets out our position for a wide range of activities and developments, including:

Sub water table storage, underground storage & associated pipework:
Underground storage of polluting substances poses particular risks to groundwater because of the problems of leak detection.

It is advisable that a scheme to install any underground tanks, tank surround, associated pipework and monitoring system is designed.

Sub water table storage is more problematic than above ground or underground storage, as a leak is more likely to contravene EPR. Where risk assessment demonstrates a high risk of groundwater pollution, the Environment Agency will normally object to storage below the water table.

A full detailed risk assessment should be conducted for any proposals that may include sub-water table storage, pipelines or fluid filled cables that transport pollutants.

Piling and Other foundation designs
Penetrative methods can result in risks to groundwater from, for example, pollution/turbidity, mobilising contamination, drilling through different aquifers or creating preferential pathways.

Deep, and other foundation designs could physically disturb aquifers, lower groundwater levels, impede or intercept groundwater flow.

Any proposed activities that present a hazard to groundwater resources, quality or abstractions must identify appropriate mitigation where a hydrogeological risk assessment identifies unacceptable risks.

De-watering and Abstraction licences
Dewatering is the removal/abstraction of water (predominantly, but not confined to, groundwater) in order to locally lower water levels near the excavation. This can allow operations to take place, such as mining, quarrying, building, engineering works or other operations, whether underground or on the surface.

Dewatering activities on-site could have an impact upon local wells, water supplies and/or nearby watercourses and environmental interests.

This activity was previously exempt from requiring an abstraction licence. Since 1 January 2018, most cases of new planned dewatering operations above 20 cubic metres a day will require a water abstraction licence from us prior to the commencement of dewatering activities at the site.

More information is available on gov.uk: https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence#apply-for-a-licence-for-a-previously-exempt-abstraction.

If you intend to abstract more than 20 cubic metres of water per day from a surface water source e.g. a stream or from underground strata (via borehole or well) for any particular purpose then you will need an abstraction licence from the Environment Agency. There is no guarantee that a licence will be granted as this is dependent on available water resources and existing protected rights.

National quality mark scheme (NQMS) for land contamination
Where land contamination is an issue, the Environment Agency will:
• take into account use of the NQMS when formulating its responses under the planning system and encourage developers to use it
• encourage local planning authorities to consider referencing the NQMS in any standing advice
• be able to recommend the discharge of planning conditions more quickly, reducing time and cost
• encourage work under Part 2A voluntarily, in line with the NQMS
• encourage operators to carry out any work under the NQMS in EPR pre-application discussions
• encourage operators to employ specialists working under the NQMS to gather, interpret and present monitoring data • encourage use of NQMS to assess and manage a pollution incident, accident or spill or returning a site to baseline conditions
• specify the need for works to be carried out under the NQMS when undertaking its enforcement activities
Where NQMS submissions conclude that pollution is being prevented or managed satisfactorily the Environment Agency will take the view that no further regulatory intervention or enforcement is necessary.

Waste on-site
The CL:AIRE Definition of Waste: Development Industry Code of Practice (version 2) provides operators with a framework for determining whether or not excavated material arising from site during remediation and/or land development works is waste or has ceased to be waste. Under the Code of Practice:

- excavated materials that are recovered via a treatment operation can be reused on-site providing they are treated to a standard such that they are fit for purpose and unlikely to cause pollution
- treated materials can be transferred between sites as part of a hub and cluster project

- some naturally occurring clean material can be transferred directly between sites

Developers should ensure that all contaminated materials are adequately characterised both chemically and physically, and that the permitting status of any proposed on-site operations are clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

We recommend that developers should refer to:

- the position statement on the Definition of Waste: Development Industry Code of Practice
- The waste management page on GOV.UK

Waste to be taken off-site

Contaminated soil that is (or must be) disposed of is waste. Therefore, its handling, transport, treatment and disposal are subject to waste management legislation, which includes:

- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Environmental Permitting (England and Wales) Regulations 2016
- The Waste (England and Wales) Regulations 2011

Developers should ensure that all contaminated materials are adequately characterised both chemically and physically in line with British Standard BS EN 14899:2005 'Characterization of Waste - Sampling of Waste Materials - Framework for the Preparation and Application of a Sampling Plan' and that the permitting status of any proposed treatment or disposal activity is clear. If in doubt, the Environment

Agency should be contacted for advice at an early stage to avoid any delays.
If the total quantity of hazardous waste material produced or taken off-site is 500kg or greater in any 12-month period, the developer will need to register with us as a hazardous waste producer. Refer to the hazardous waste pages on GOV.UK for more information.

Biodiversity

PEIR – Chapter 8 (Ecology) – Biodiversity Net Gain

We strongly support the completion of a Biodiversity Net Gain (BNG) assessment using the latest version of the DEFRA Biodiversity Metric and the delivery of, at least, 10% BNG.

As well as accounting for area based (terrestrial) habitats, the latest version of the Biodiversity Metric includes two distinct supplementary modules for linear habitats (A: Hedgerows and lines of trees & B: Rivers and streams). A number of surface waterbodies and their functional riparian zones fall within the red line boundary of the proposed development site – including Carr Dike and the River Ouse. The current Biodiversity Metric guidance states that "*it is an important rule of the metric that the biodiversity units calculated through the core habitat area-based metric and each of the linear units are unique and cannot be summed or converted. When reporting*

biodiversity gains or losses with the metric, the different biodiversity unit types must be reported separately and not summed to give an overall biodiversity unit value".

Based on the above, the BNG assessment should include an assessment of the rivers and stream habitat on site. In line with the guidance, we expect the development to deliver, at least, 10% net gain for each habitat type present on site (including rivers and streams). Ideally, this should be done on-site, through improvements to these water bodies. However, where this is not deemed feasible, in line with the DEFRA Biodiversity Metric 3.0 guidance, off-site enhancement of river habitat should be pursued.

Section 8.4.12 of Chapter 8 (Ecology) of the PEIR states "*baseline habitat data collected as part of the PEA will be used to inform the habitat calculations for the BNG assessment. The BNG assessment will be presented in the ES, as it will be necessary to base the assessment on the Proposed Scheme design which is still in development at the time of writing".* Please note that where river habitat is concerned, a river condition assessment survey (using the MoRPh field survey method) is required in order to assess the condition of the baseline habitat. It is not clear whether this information has been collected as part of the PEA. If a river condition assessment survey has not yet been undertaken an accredited surveyor should undertake a river condition assessment for the development site at the earliest opportunity. This is to ensure that the results of the BNG assessment are accurate.

PEIR – Chapter 12 (Water Environment) – Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 – Water Framework Directive Assessment

The findings of a WFD screening assessment were recently presented to the EA on a call between the EA and the applicant. Following this meeting, the EA expressed agreement with the conclusions of the WFD screening assessment that, based on current designs, the scheme presented low risk to WFD receptors and that further impact assessment is therefore not currently required. Should the designs change (including any design changes associated with the delivery of Biodiversity Net Gain which may affect WFD receptors), this assessment should be revisited and updated where necessary.

Environment Management

1. The PIER does not contain a thorough examination of the site's hydrology. The site falls within two river catchments. The majority of the site falls within the *Ouse from R Wharfe to Upper Humber* river catchment. However, according to our records, a small part of the site (southeast) falls within the *Aire from River Calder to River Ouse* catchment. Properly identified the hydrology of the site is paramount given that it affects the scope and baseline information of the EIA. The PIER Chapter 12 par.12.5.1 states that that

'The study area will encompass surface water features up to a minimum of 0.5

km from the Proposed Scheme for the assessment of direct effects (i.e. associated with overland migration of pollutants directly to a surface feature, changes in overland flows and works within or near to a river channel). Features that are further than 0.5 km from the Proposed Scheme ***but are in hydraulic connectivity with the study area will also be considered,*** *including surface water abstractions and downstream watercourses. Features located up to approximately 1 km from the Proposed Scheme will be considered for indirect impacts'.*

The PIER although it makes a reference to the *Ouse from River Wharfe to Upper Humber* when referring to the river Ouse and Carr Dyke, it nevertheless makes no mention of the *Aire from River Calder to River Ouse* catchment. This is something the applicant needs to explore further.

2. The applicant needs to revise table **Table 12.7 - Construction Phase – Preliminary Assessment of Likely Significant Impacts.** Firstly, Column 3 in Rows 1 and 3 contain the same information (magnitude of impact of increased sedimentation) although the first row examines the effect of increased sedimentation and the second that of fuels and harmful substances. Secondly, the applicant has used deterioration of the WFD status as an indicator. It needs to be noted that some minor watercourses are not monitored for WFD. Additionally, in case of an accident there is likelihood of a major pollution incident due to for instance, sediment run-off even though this may not reduce the WFD status of the watercourse. Please note, that especially in case of sediment pollution, sedimentation is not a WFD classification parameter. Therefore, increased pollution risk must be considered when assessing the magnitude of impact for the river Ouse and Carr Dyke. Carr Dyke in particular, running through the site, is at high risk of pollution. It is not very clear why pollution risk is included in column 2 for 'Watercourses, field drains and other surface water features identified within the study area' but not for the river Ouse and the Carr Dyke for which only WFD status deterioration is considered.

   The applicant needs to consider the comments above when undertaking the Assessment of Likely Significant impacts during the operational stage.

3. We are pleased that the applicant will produce a Register of Environmental Actions and Commitments (REAC) that will accompany the ES and will inform the Construction Environmental Management Plan (CEMP) which would be prepared before construction begins and secured by a DCO Requirement. We are also pleased that the applicant will be including within the CEMP method statements for the proposed works, details of materials to be used, and an emergency response plan.

   In this respect we would also like to advise that the CEMP would need to consider in particular the following:

   <u>Containing run-off water:</u> the applicant needs to provide a management plan

for water run-off –rainwater surface run-off and/or water resulting from dewatering activities- during the construction stage. The plan needs to set out specific measures that they will be implemented to effectively prevent water containing sediments from entering the watercourse. In particular the applicant needs to ensure that the storage of any soil piles will be located at a suitable distance from the watercourse and that there shall be no discharge of contaminated site drainage into surface water or groundwater.

Vehicle movement: To reduce the risk of silty material being transferred and deposited to public highways and potentially escaping to watercourses though surface water drains, no HVGs shall be leaving the site without first having passed through a wheel-wash system.

Oil Storage: Any proposed storage tanks for fuel oils need to comply with oil storage regulations to prevent pollution of the water environment by accidental leaks.

In addition to pollution prevention and emergency response planning, provision should also be made for appropriate an adequate environmental management, pollution prevention and pollution incident response training of the staff on site.
No works shall commence before the Environment Agency reviews the Construction Environmental Management Plan

4. Permitting Requirements

a. Construction Stage
i.Water Discharge Permit: The applicant needs to apply for an environmental permit for any discharge of either surface water run-off or excess water resulting from dewatering, or for any activity falling within the definition of water discharge activity or groundwater activity as these are defined in schedule 21 and schedule 22 respectively of the Environmental Permitting (England and Wales) Regulations 2016.

ii.Abstraction License: An abstraction license may be required. Please confirm with the Environment Agency

b. Operational Stage
We are pleased that the applicant has considered our prior comment on potential changes to water abstraction volumes. However our comment on potential changes on the nature of the discharge has not been addressed. The EIA needs to consider such changes. If such changes do occur the applicant may need to apply for a permit variation.

Please note that the granting of planning permission does not guarantee the granting of an environmental permit. When an environmental permit is required no works may commence before the issue of such permit, therefore the applicant needs to consider permitting timeframes.

Environmental Permitting

Advice to applicant
Where a development involves any significant construction or related activities, we would recommend using a management and reporting system to minimise and track the fate of construction wastes, such as that set out in PAS402: 2013, or an appropriate equivalent assurance methodology. This should ensure that any waste contractors employed are suitably responsible in ensuring waste only goes to legitimate destinations.

The advice we shared with the planning inspectorate on 16 February 2021 in our letter reference RA/2021/142654/01-L01 in relation to Environmental Permitting issues is still generally valid but is updated here to reflect changes in our understanding and guidance in relation to post-combustion Carbon Dioxide capture.

This development will require a variation to the existing Environmental Permit, EPR/VP3530LS for Drax Power Station, under the Environmental Permitting (England and Wales) Regulations 2016 (EPR) issued by the Environment Agency. The operator has received initial pre-application advice from the Environment Agency regarding this. The operator is strongly advised to twin track applications for both the DCO process and the EPR permit variation and seek further 'enhanced' pre-application advice from us to support their application. Early engagement with us and submission of the permit application will give us the best opportunity to align the permit decision (or draft decision) with the DCO examination process.

Based on the level of detail provided in the PEIR around the specifics of the precise design of the proposed facility it may be advisable for Drax to consider a flexible design approach in the DCO application that includes a number of scenarios that would allow for some degree of flexibility in the final design. This would include fully assessing all significant effects of the 'worst case' design scenario. This would allow for maximum flexibility when determining the EPR permit application and how this interacts with the DCO process as it is not clear from the PEIR as to the technology to be used and the eventual site design to be chosen. For the DCO process to be successful any design approved would need to mirror what is contained in any eventual EPR permit.

Post combustion carbon capture (PCC) plants utilising an amine process is recognised as an 'emerging technique' for CO2 capture processes in the Large Combustion Plant Best Available Techniques (BAT) reference document for Large Combustion Plants (2017). Under Article 14(6) of the Industrial Emissions Directive, the Environment Agency has issued BAT guidance, in consultation with industry, for both new plants and in retrofitting PCC to existing power generation plant - [redacted]

As a retrofit to an existing power generating activity the environmental permit

variation application will be assessed against this BAT guidance. The operator is reminded to include a full BAT justification detailing why, in their opinion, it is BAT to retrofit PCC plant to existing boilers and a detailed assessment of the change in overall energy efficiency (the energy penalty) regarding net electrical output from the units to which PCC is to be retrofitted.

For emissions to air, the operator will need to complete an air emissions risk assessment and compare the impact of any emissions to the environmental standards provided in the following guidance: Air emissions risk assessment for your environmental permit, air-emissions-risk-assessment-for-your-environmental-permit.

Scoping Comments
Finally, please note the advice provided in our EIA scoping response to PINS – PINS ref: EN010120-000019 and our ref: RA/2021/142654/01 (dated 16 February 2021). This advice still applies and should be accounted for during preparation of future assessments.

If you have any questions further to our response or wish to discuss the specifics of any potential DCO conditions, please don't hesitate to contact me.

Yours sincerely

Matthew Wilcock
Planning Specialist

Team e-mail [redacted]@environment-agency.gov.uk

APPENDIX D – YORKSHIRE WATER CONSULTATION

Wilks Daly, Aidan

From: [redacted]@yorkshirewater.co.uk on behalf of [redacted]@yorkshirewater.co.uk
Sent: 21 June 2021 16:15
To: Szostak, Elzbieta
Subject: RE: Drax BECCS - request for consultation
Attachments: Drax Water Mains.pdf; Protection of Apparatus.pdf; pic21881.jpg

Hello Ela,

Please see the below response to your enquiry along with the attached plans indicating the location of Yorkshire Waters Clean Water mains network in the vicinity of Drax Power Station and the proposed expansion. I think there may have been a little confusion in the initial response as the majority of pipe work within the Drax site is maintained and operated by Drax Power Ltd. and not Yorkshire Water owned and operated.

The main area of concern is the protection of our 1000mm strategic water main and associated fittings located to the north of the Drax site (Fig.
1), this is within the environmental mitigation area on your attached plans. This main is covered by a 15m easement and would need to be suitably protected during any works, I have a attached our basic guidelines for protection but due to the strategic nature of the main Yorkshire Water would need to approve any proposals before allowing work to take place in the vicinity. If construction of any fixed structures or apparatus, planting of trees and deep rooted shrubs, or alterations in finished ground levels were to occur within this easement then the main would require diversion. The cost of this is likely to be significant due to the nature of the main, which is part of our Grid network, and long lead times would be involved. The same would also apply for any adverse changes in existing access arrangements for repair and maintenance purposes but these could be mitigated if required.

The proposed compressor units to be constructed in the Lay down area / wood yard to the east of New Road is unlikely to affect our existing assets (Fig. 2) as they are located within the public highway along New Road and Carr Lane. If any highways alterations were to be undertaken these mains would require protection or diversion depending on the proposed alterations, however the cost wouldn't be excessive and this would be straightforward. There is also a 90mm PVCu distribution main that is located in the public highway on Pear Tree Avenue, terminating within private land at Drax Abbey farm. It appears this would be unaffected as the farm is not included within the site boundary.

The remainder of Yorkshire Waters mains around the site (Fig.3) are located within the public highway, A645 and New Road, to the southern and eastern ends of the Drax site, however at some locations these mains are within the Drax boundary, particularly were the point of supply for Drax is located.
As the attached proposals highlight all work to be done to the north of the site I don't see these mains being affected by the proposals.

With regards to any protection or alterations of mains apparatus within the Drax site downstream of the existing Yorkshire water meter, these would need to be undertaken with Drax Power Ltd. These mains are highlighted Green on the attached plans.
Hopefully this allows you to progress, If you require any further information please contact me.

(See attached file: Drax Water Mains.pdf)(See attached file: Protection of Apparatus.pdf)

Martin

(Embedded image moved to file: pic21881.jpg)

Overview of Water Network Assets

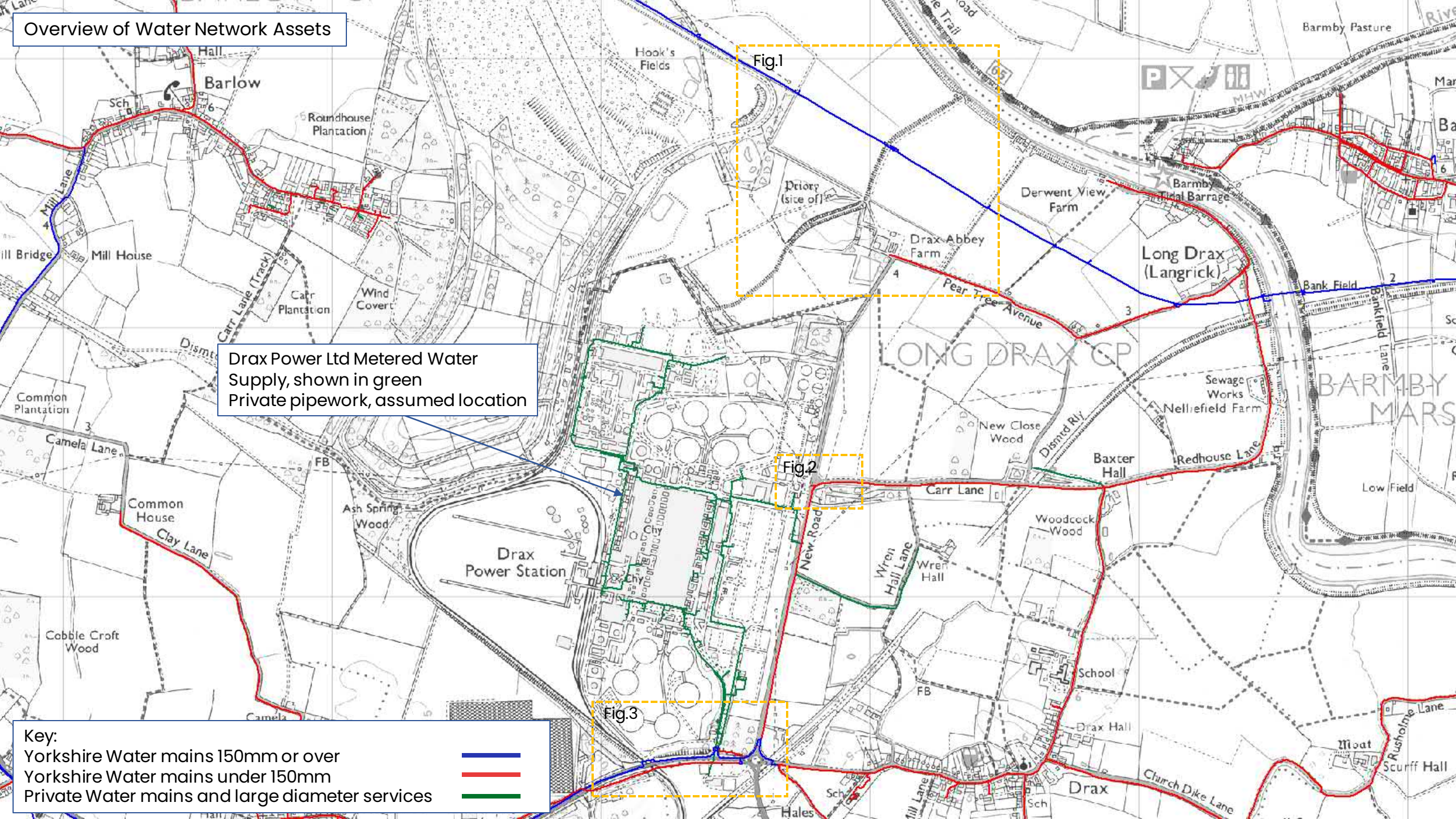


Fig. 1: North Drax Site to River Ouse

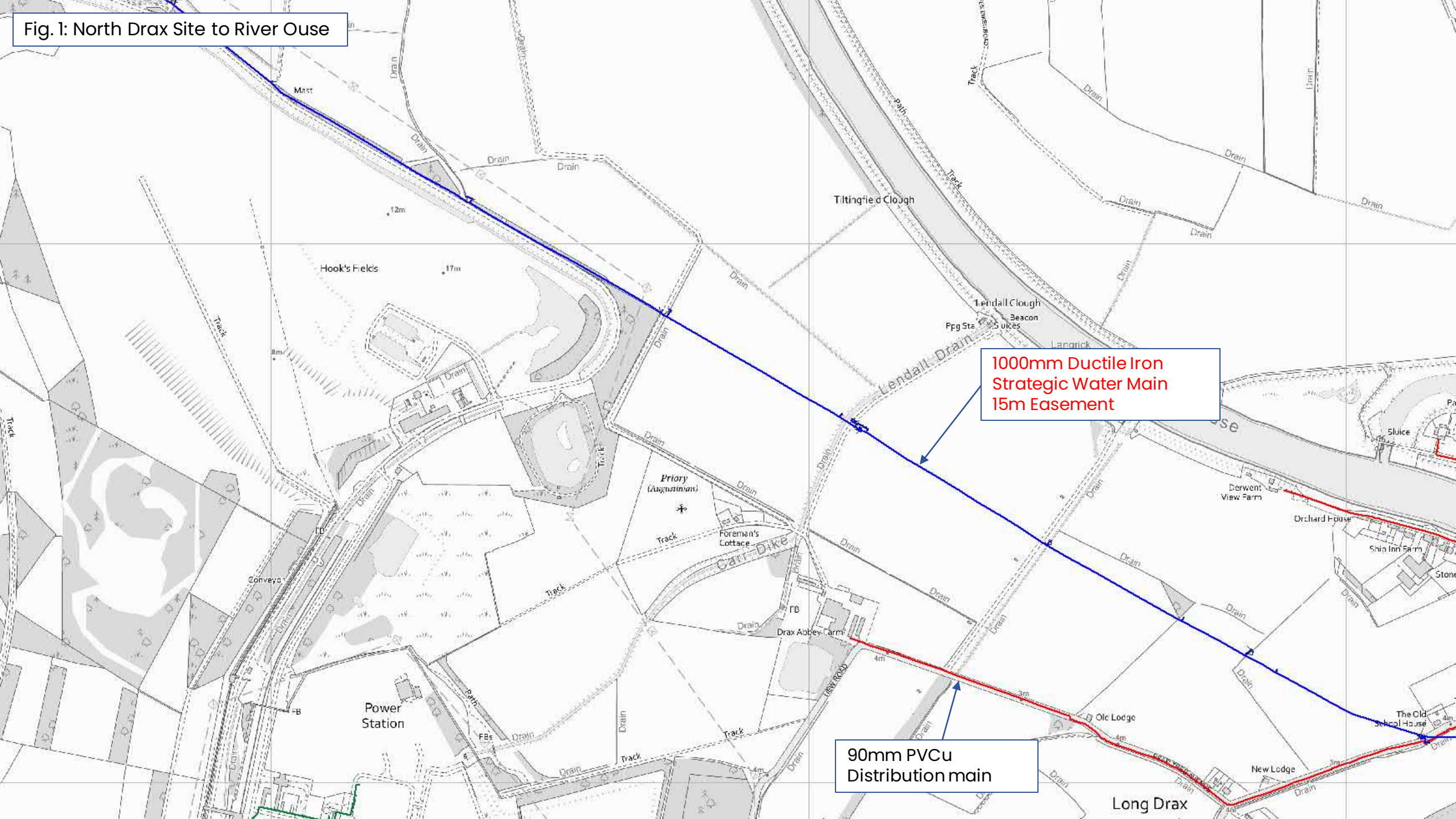


Fig. 2: New Road / Carr Lane

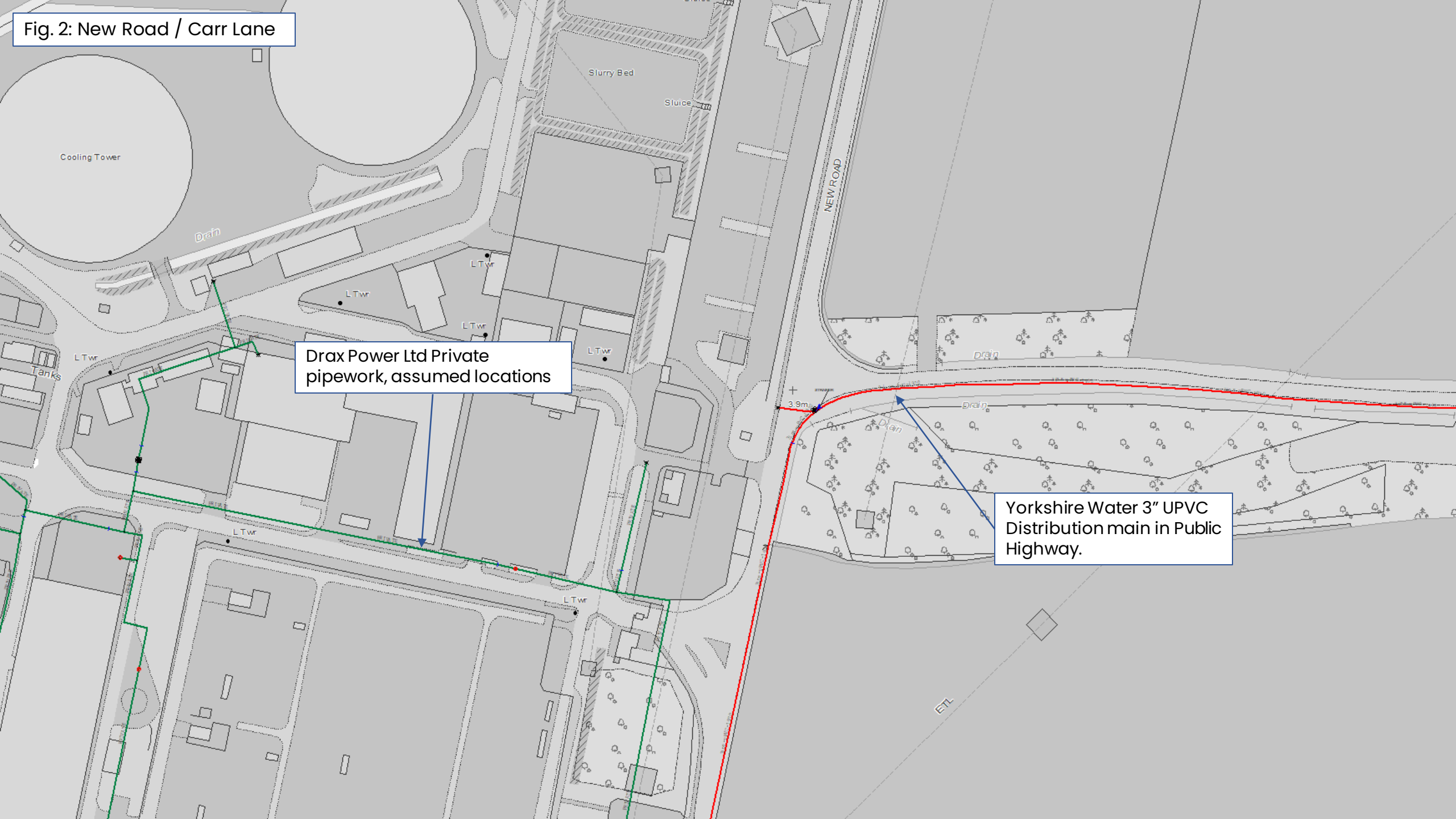
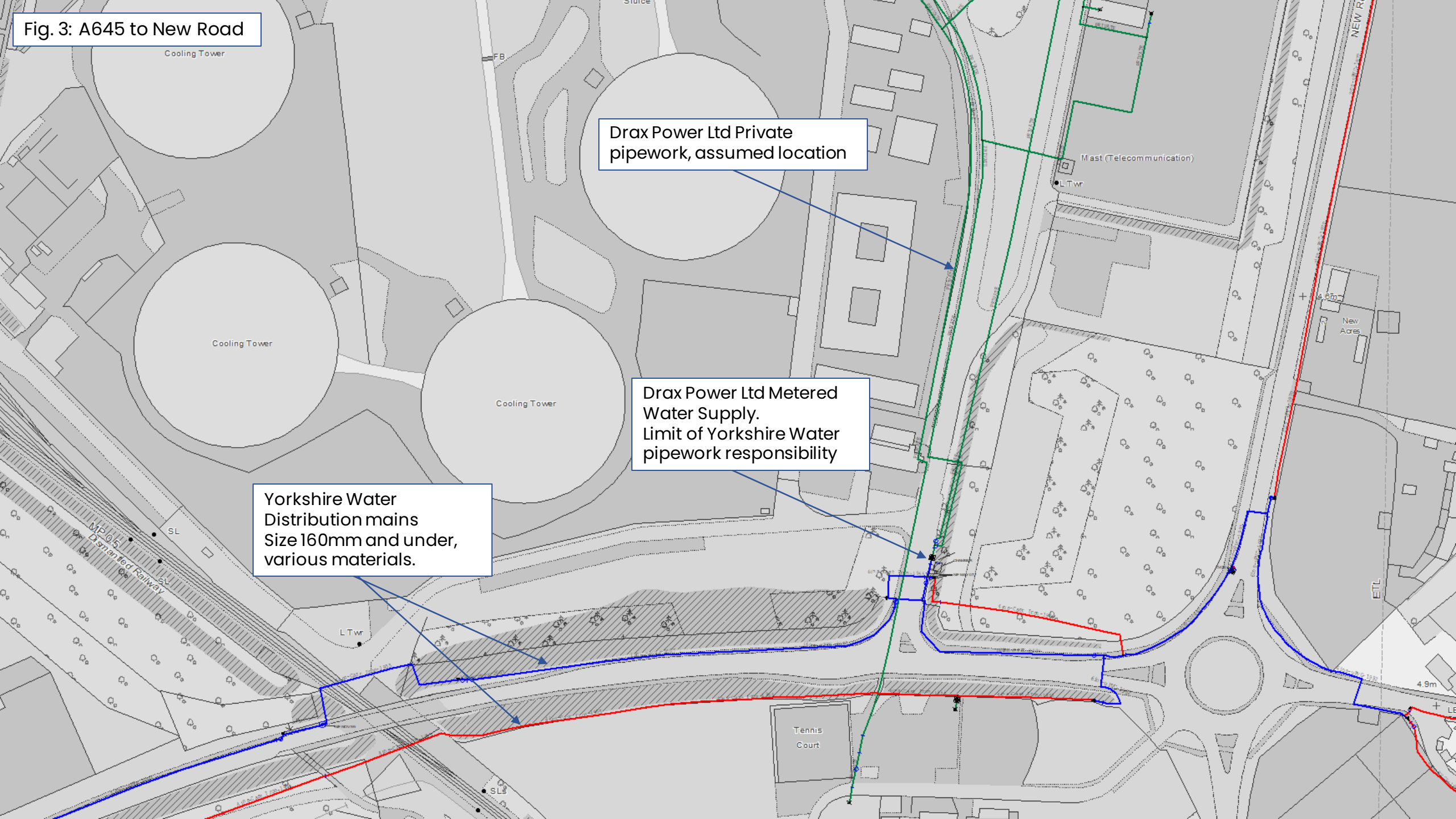


Fig. 3: A645 to New Road



Protection of Apparatus

1. Please note the positions of clean water apparatus shown on the enclosed plans are believed to be correct. However, Yorkshire Water (YW) will accept no responsibility in the event of any inaccuracy or omission. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline (0845 124 24 24) for water and (0845 124 24 29) for sewerage.

2. To enable future repair works to be carried out without hindrance any pipe, cable, duct etc. installed parallel with a water main or service pipe should not be installed directly over or within 300mm of the water main or service pipe. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45° and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter. Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis.

3. Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.

4. All excavation works near to YW apparatus should be by hand digging only.

5. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.

6. If surface levels are to be decreased or increased significantly the effects on YW's existing apparatus will be carefully considered and if any alterations are necessary the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.

7. Adequate support must be provided where any works pass under YW apparatus.

8. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.

9. Apparatus such as railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. Chamber lids must not be buried or covered.

10. Explosives shall not be used within 100 metres of any YW apparatus or installations.

11. Vibrating plant should not be used directly over any apparatus.

12. Under no circumstances should thrust boring or similar trenchless techniques commence until the actual position of YW's mains and services along the proposed route have been confirmed by trial holes.

13. Impact piling must not take place within 10m of YW apparatus. Core drilling must not take place within 5m of YW apparatus.

14. Any alterations to the highway should be notified in accordance with the procedures outlined in the New Roads and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversionary Works).

15. Any damage caused or observed to YWS apparatus must be immediately reported to YWS by telephoning 0845 124 24 24 for water and 0845 124 24 29 for sewerage.

16. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.

APPENDIX E – LLFA (NORTH YORKSHIRE COUNTY COUNCIL) CONSULTATION

Szostak, Elzbieta

From:	Meirion Jones [redacted]@northyorks.gov.uk>
Sent:	08 March 2022 18:11
To:	Szostak, Elzbieta
Cc:	Smith, Andy; Marsh, Maria; Markose, Louise; Ashworth, Nicola; Wilks Daly, Aidan; Jim Doyle; Jenny Blyth; Christopher Summers; Stocks, Matt; Emily Mellalieu
Subject:	RE: Drax BECCS - additional drainage information

Dear Elzbieta,

Thank you for the additional information that you sent through.

I agree that the document demonstrates a reasonable approach to the management of surface water and is in line with what we discussed and as such the LLFA would give its agreement in principle to the strategy.

I am concerned however that the document does not fully cover off the requirements of Paragraph 169 of the NPPF and it leaves a lot to be covered in the DCO examination period. Having discussed with others at the authority post meeting, I confirm the LLFA would still comment on any DCO examination based on the NPPF requirements and local SuDS design guide. I have added comments in red where further information would be needed in relation to the NPPF and where our local design guide fits in this process.

169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
(a) take account of advice from the lead local flood authority;
Submission must follow North Yorkshire County Council SuDS design guide 2018 – there would need to be a requirement to submit information as set out in point 8.2 i.e drainage layout and calculations.
(b) have appropriate proposed minimum operational standards;
More detailed drainage calculations specific to proposal would need to be submitted to demonstrate any proposed operational standard. There is a note in the minutes of the meeting the new drainage system will be appropriately sized to the current standards. The current standards are set out in the DEFRA Non-Statutory Technical Standards for sustainable drainage systems and also set out in our SuDS design guide, i.e. no flooding in 1 in 30 and any flooding from 1 in 100+CC contained on site. This needs to be evidenced as part of the DCO submission.
(c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
(d) where possible, provide multifunctional benefits

I trust the above is of assistance in that we can agree in principle that there is a reasonable approach to the management of surface water that does not increase flood risk elsewhere, but further information is still necessary before we would be comfortable recommending that the proposal meets NPPF requirements and local design guide for the purpose of the DCO examination.

Kind Regards
Meirion

Meirion Jones
Senior Flood Risk Management Engineer

Mr Meirion Jones FdSc BSc (Hons) | Senior Flood Risk Management Engineer | Development Management Team | Business and Environmental Services | North Yorkshire County Council | East Block | County Hall | Racecourse Lane | Northallerton | DL7 8AH | [redacted] | Email:Floodriskmanagement@northyorks.gov.uk

APPENDIX F – SELBY AREA IDB CONSULTATION AND BYE-LAWS SUMMARY

Szostak, Elzbieta

From:	Paul Jones [redacted]shiregroup-idbs.gov.uk>
Sent:	19 August 2021 09:05
To:	Szostak, Elzbieta; Shire Group Planning
Cc:	Markose, Louise; Jenny Blyth; Peter, Lara; Marsh, Maria; Jim Doyle; Oliver Baybut; Fava-Verde, Olivia; Sugden, Catherine
Subject:	RE: Drax BECCS - Selby IDB consultation request
Attachments:	Drax BECCS - Selby IDB consultation request; Selby AIDB Drax Power Station Plan.pdf

Hi Ela,

Thank you for the consultation and sincere apologies for the major delay.

I have reviewed the consultation documents and comment as follows along with the attached IDB Plan:

- The proposed runoff is not envisaged to change from existing.
- The permitted discharge from the site is 1.4 litres per second per hectare or no greater than existing runoff. This is due to the design of the IDB pump station ("Lendall Pumping Station") since 1944.
- Outfall construction should ensure that pipes are not protruding into the receiving watercourse.
- IDB Consent is required for any works above ground within 7 metres of the edge of the piped ordinary watercourse Carr Dyke, and/or 7 metres form the edge of the bank top of the open channel watercourse Carr Dyke. This would apply to all piped or open channel ordinary watercourses within the Drainage District (whether maintained by the IDB or by riparian owners).
- IDB Consent is required for works within a watercourse e.g. new outfall, or any access crossings etc.
- IDB Condition of Consent is to follow the Pollution Prevention Guidelines.
- No water quality monitoring requirements from the IDB.
- Surplus water discharge quality should be referred to the Environment Agency for quality compliance.

Consent, in addition to any planning or DCO, would be required from the IDB as described on the Boards website, https://www.shiregroup-idbs.gov.uk/planning-consents/

Kind regards,
For and on behalf of the Selby Area Internal Drainage Board,

Paul Jones BSc (Hons) MSc (Eng) GMICE
Engineer to the Board
Lead Water Level Management Engineer

From: Paul Jones
Sent: 09 June 2021 08:44
To: Szostak, Elzbieta <E[redacted]@wsp.com>; Shire Group Planning <[redacted]@shiregroup-idbs.gov.uk>; Information (ShireGroup) [redacted]@shiregroup-idbs.gov.uk>
Cc: Markose, Louise <[redacted]@wsp.com>; Jenny Blyth [redacted]@drax.com>; Peter, Lara [redacted]@wsp.com>; Marsh, Maria <[redacted]@wsp.com>; Jim Doyle <J[redacted]@drax.com>; Oliver Baybut [redacted]@drax.com>; Fava-Verde, Olivia <[redacted]@wsp.com>; Sugden, Catherine [redacted]@wsp.com>
Subject: RE: Drax BECCS - Selby IDB consultation request

Hi Ela,

APPENDIX G – SELBY DISTRICT COUNCIL CONSULTATION

Szostak, Elzbieta

From:	Jenny Tyreman [redacted]@selby.gov.uk>
Sent:	27 May 2021 10:30
To:	Szostak, Elzbieta
Cc:	Ruth Hardingham; Markose, Louise; Jenny Blyth; Jim Doyle; Oliver Baybut; Fava-Verde, Olivia; Peter, Lara; Marsh, Maria
Subject:	RE: Drax BECCS - consultation request
Attachments:	Selby District Council consultation _19052021.pdf; EN010120-PA-PEIR-0.1-Sheet1.pdf; EN010120-PA-PEIR-0.2-Sheet1.pdf

Dear Ela,

Thank you for your email below with attached consultation request. My comments are as follows:

- The guidance within National Policy Statements should be followed.
- A flood risk assessment would be required.
- A sequential test for flood risk (an exception test where necessary) would be required for any development within Flood Zones 2 or 3. However, the search area for the sequential test may be narrowed down to the area of Drax PS if functional (or other) reasons can be put forward to justify this.
- Priority should be given to the use of sustainable urban drainage systems.
- In addition to consideration of the advice contained within the Scoping Opinion issued by PINS, I would suggest you consult with consultees including the Local Lead Flood Authority, Environment Agency, local Internal Drainage Board and Yorkshire Water in respect of the Flood Risk Assessment and Water Chapter of Environmental Statement, if you have not already.

Kind regards,

Jenny Tyreman
Assistant Principal Planning Officer

t: [redacted]
e: [redacted]selby.gov.uk
w: www.selby.gov.uk

[redacted]

Selby District Council, Civic Centre, Doncaster Road, Selby, YO8 9FT.

From: Szostak, Elzbieta <[redacted]@wsp.com>
Sent: 19 May 2021 10:44
To: Jenny Tyreman [redacted]@selby.gov.uk>
Cc: Markose, Louise <[redacted]@wsp.com>; Jenny Blyth [redacted]@drax.com>; Jim Doyle [redacted]@drax.com>; Oliver Baybut [redacted]@drax.com>; Fava-Verde, Olivia [redacted]@wsp.com>; Peter, Lara <[redacted]@wsp.com>; Marsh, Maria [redacted]@wsp.com>
Subject: Drax BECCS - consultation request

Dear Jenny

I am a flood risk engineer and I will be working on a Flood Risk Assessment and Water Chapter of Environmental Statement for the works proposed at Drax Power Station.
Please find attached our consultation request regarding the proposed works.
If you would like to discuss it or require further information please do not hesitate to contact me.

I look forward to hearing from you.

Regards

Ela

Elzbieta Szostak
MSc, MCIWEM
Engineer
Water Risk Management and Engineering, WEI

[redacted]

Kings Orchard, 1 Queen Street,
Bristol, BS2 0HQ

[redacted]

-LAEmHhHzdJzBITWfa4Hgs7pbKI

APPENDIX H – EXISTING DRAINAGE SYSTEM FOR THE DRAX POWER STATION SITE

NOTES:

SITE DRAINAGE SCHEME NOTES & OUTFALL DETAILS FROM DRAWING 038411 REVISION Z9 DATED 05/08/2020

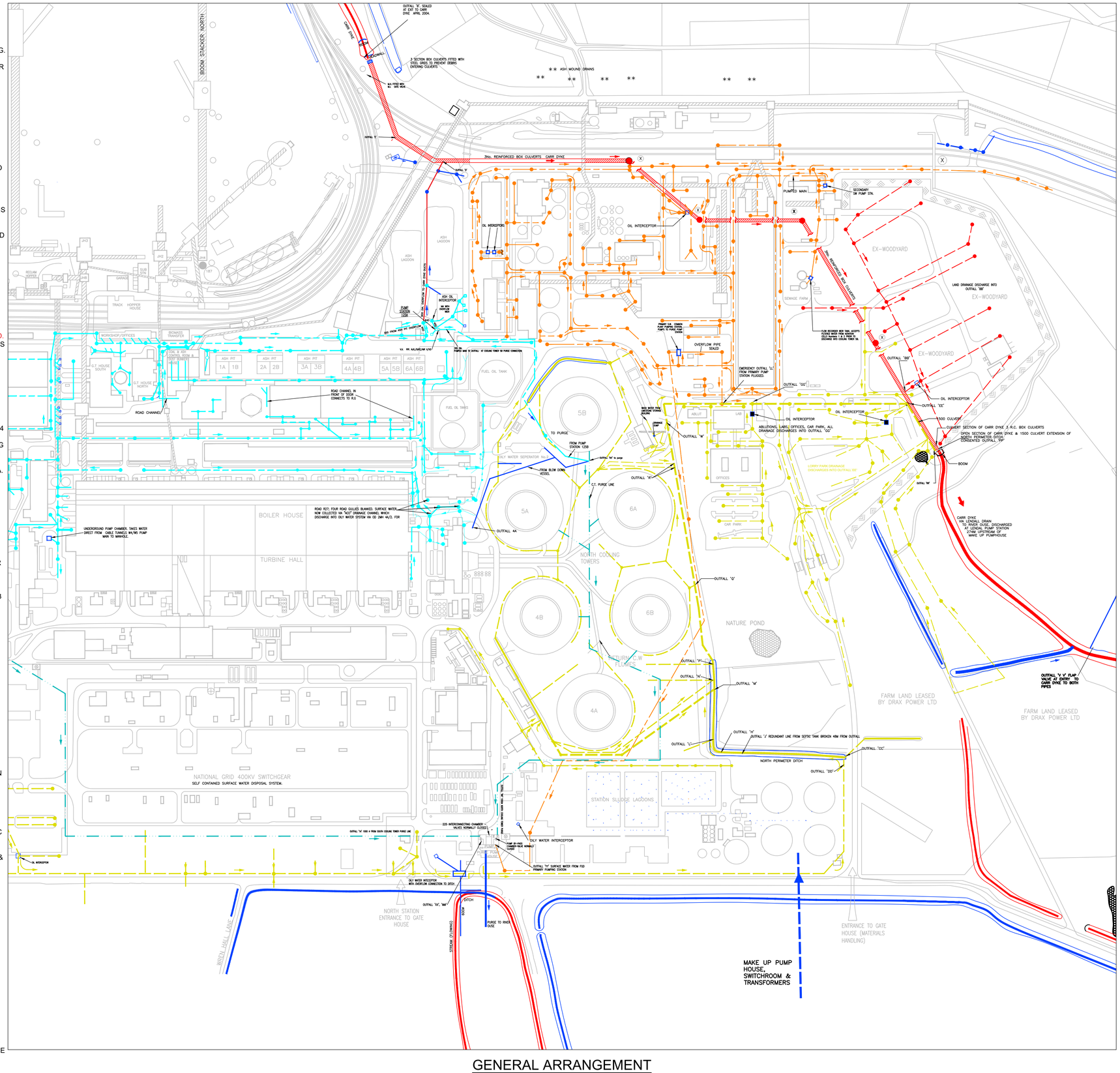
THE MAIN STATION AREA IS FLAT AND HAS BEEN RAISED FROM 4.25M TO 6.1M ABOVE ORDNANCE DATUM (OD) TO PROVIDE PROTECTION AGAINST FLOODING. A PERIMETER DITCH WHICH SURROUNDS THE STATION IS ARRANGED TO COLLECT THE ON & OFF SITE DRAINAGE AND CHANNEL THE WATER INTO CARR DYKE LOCATED TO THE NORTH WEST OF THE STATION. WHERE NECESSARY THE PERIMETER DITCH IS CULVERTED.
THE NORTH SIDE OF THE STATION DISCHARGES SURFACE WATER INTO CARR DYKE VIA CONSENTED OUTFALL 'PP'. THE WATER FROM CARR DYKE FEEDS INTO LENDALL DRAIN AND VIA LENDALL PUMPING STATION & IS DISCHARGED INTO THE RIVER OUSE. THE MAJORITY OF THE SITES' SURFACE WATER DISCHARGES VIA THE PURPE PUMPING STATION NEXT TO NORTH GATE INTO OUTFALL "K" INTO THE RIVER OUSE.
CONTAMINATED WATER FROM THE COAL AND ASH MOUNDS ETC. IS CHANNELED VIA DRAINS TO THE SLUDGE LAGOONS. THE RESULTING 'FILTERED WATER' IS THEN PUMPED TO THE PURGE SYSTEM TO DISCHARGE THROUGH OUTFALL "K", OR TO THE SEDIMENTATION TANKS AND THROUGH TO THE COOLING WATER MAKE-UP PIPELINE TO THE COOLING TOWERS. NOTE THE FILTERED WATER LINE DISCHARGE POINT IN THE PURGE PUMPING STATION BYPASSES THE MONITORING CHAMBER AND CAN ONLY CARRY SURFACE WATER.
THE LENDALL PUMPING STATION IS OWNED AND MAINTAINED BY THE N.R.A & IS LOCATED 274M UPSTREAM OF THE MAKE-UP PUMPHOUSE.
WHERE CONTAMINATION BY OIL IS POSSIBLE (E.G. IN TRANSFORMER OR OIL TANK STORAGE AREAS, CAR PARKS ETC) THE SURFACE WATER IS CHANNELED TO OIL INTERCEPTORS.

RED TEXT DENOTES OUTFALL IS NOT IN USE.

OUTFALL 'A'	COAL STORAGE EMERGENCY OVERFLOW TO CONCRETE CULVERT.
OUTFALL 'B'	COAL STORAGE OVERFLOW TO CONCRETE CULVERT 915MM DIA PIPE @ 457M /HR FLOW.
OUTFALL 'D'	WEST SIDE SURFACE DRAINAGE TO CONCRETE CULVERT. 915MM DIA PIPE @ 702M /HR FLOW. (NOT USED)
OUTFALL 'E'	OVERFLOW FROM COAL STORE TO CONCRETE CULVERT 305MM DIA PIPE INCLUDED IN 'B" WEIR & SCUMBOARD FITTED.
OUTFALL 'H'	ROAD DRAINAGE TO PERIMETER DITCH FROM EAST LAGOONS 457MM DIA. PIPE @ 50M3//HR.
OUTFALL 'J'	SEPTIC TANK OUTFALL & SEDIMENTATION TANK AREA TO PERIMETER DITCH 102MM DIA.
OUTFALL 'K'	RIVER OUSE PURGE OUTFALL 1525MM DIA. 14822 M3/ /HR

NOTE OUTFALLS L, M, N, P, Q, R & EE GO TO NORTH PERIMETER DITCH.

OUTFALL 'L'	LAND DRAINS FROM NORTH COOLING TOWERS 152MM DIA. 468 M3 /HR TO NORTH PERIMETER DITCH.
OUTFALL 'M'	OVERFLOW FROM NORTH COOLING TOWERS 300MM DIA. 2304 M3 /HR TO NORTH PERIMETER DITCH.
OUTFALL 'N'	PUMPED OVERFLOW LAND DRAINAGE FROM NORTH COOLING TOWERS 2X150MM DIA. 75 M3 /HR NOMINAL FLOW TO NORTH PERIMETER DITCH.
OUTFALL 'P'	LAND DRAINAGE FROM NORTH COOLING TOWERS 150MM DIA. 46 M3 /HR FLOW TO NORTH PERIMETER DITCH.
OUTFALL 'Q'	MANHOLE CONNECTION FROM NORTH COOLING TOWERS 200MM DIA. 72 M3 /HR FLOW TO NORTH PERIMETER DITCH.
OUTFALL 'R'	PUMPED OVERFLOW OF LAND DRAINS FROM NORTH COOLING TOWERS 300MM DIA. 187 M3/HR FLOW TO NORTH PERIMETER DITCH
OUTFALL 'W'	F.G.D PROCESS WATER PUMPHOUSE TO CULVERTED SECTION OF NORTH PERIMETER DITCH.
OUTFALL 'BB'	F.G.D CONTRACTORS AREA THROUGH OIL INTERCEPTOR TO CULVERTED SECTION OF CARR DYKE. 600MM DIA. 893 M3 /HR FLOW.
OUTFALL 'CC'	F.G.D ENTRANCE ROAD DRAINAGE TO OPEN DITCH. 300MM DIA. 133 M3 /HR FLOW
OUTFALL `DD'	SEDIMENTATION TANK AREA TO OPEN DITCH. 300MM DIA. 133 M3 /HR FLOW
OUTFALL `EE'	F.G.D CARPARK OIL INTERCEPTOR TO CULVERTED SECTION OF NORTH PERIMETER DITCH. 450MM DIA. 878 M3 /HR FLOW.
OUTFALL `GG'	F.G.D CARPARK LAB & OFFICESTO CULVERT SECTION OF NORTH PERIMETER DITCH. 600MM DIA. 853M /HR FLOW
OUTFALL'HH'	Ø900 OVERFLOW CULVERT COAL MOUND DRAINAGE TO OFFSITE DITCH. CAN WORK OPPOSITE WAY, DITCH TO COAL MOUND DRAINAGE.
OUTFALL'JJ'	Ø900 OVERFLOW CULVERT COAL MOUND DRAINAGE TO OFFSITE DITCH. CAN WORK OPPOSITE WAY, DITCH TO COAL MOUND DRAINAGE. CULVERT FOUND IN CATCH PIT. NOT FOUND IN DITCH.
OUTFALL'KK'	OILY WATER SEPARATOR NO.2 CLEAN WATER TO COOLING TOWER 5B PURGE CHAMBER, TO PURGE PUMPHOUSE.
OUTFALL'LL'	F.G.D. SURFACE WATER PRIMARY PUMP STATION TO CULVERT. DISCHARGE TO CARR DYKE OVERFLOW.
OUTFALL'MM'	PURGE PUMPHOUSE ADJACENT NORTH GATE HOUSE. OVERFLOW FROM WATER TREATMENT PLANT. PUMPED.
OUTFALL'NN'	PURGE PUMPHOUSE ADJACENT NORTH GATE HOUSE. COOLING WATER FROM NORTH COOLING TOWERS
OUTFALL'PP'	CULVERT SECTION CARR DYKE, HEADWALL AT EXIT TO OPEN DITCH SECTION CARR DYKE, F.G.D.
OUTFALL'RR'	F.G.D. LAND DRAINAGE & ROAD DRAINAGE IN VICINITY OF MATERIALS HANDLING GATEHOUSE, TO OPEN SECTION OF CARR DYKE AT CULVERT EXIT HEADWALL.
OUTFALL'SS'	CARR DYKE AT LENDALL PUMP STATION TO RIVER OUSE
OUTFALL'TT'	PURGE OUTFALL & JETTY AT RIVER OUSE. SURFACE WATER FROM ROADS & BUILDINGS & FILTERED WATER FROM SEPTIC TANK TO OFF SITE DITCH. DITCH DISCHARGES TO RIVER OUSE.
OUTFALL'UU'	C.W. INLET AT RIVER OUSE. SURFACE WATER FROM ROADS & BUILDINGS & FILTERED WATER FROM SEPTIC TANK TO OFF SITE DITCH. DITCH DISCHARGES TO RIVER OUSE.
OUTFALL `VV'	CULVERT FROM PUMP STATION ECOLOGICAL LAGOON TO OPEN SECTION OF CARR DYKE. NOW REDUNDANT.
OUTFALL `WW'	PURGE PUMPHOUSE ADJACENT NORTH GATEHOUSE. SLUDGE DRAIN FROM SEDIMENTATION SETTLING TANKS. RIVER WATER. PUMPED.
OUTFALL `XX'	PURGE PUMP HOUSE ADJACENT NORTH GATE HOUSE. SURFACE WATER. ORIGIN UNKNOWN.
OUTFALL `YY'	PURGE PUMP HOUSE ADJACENT NORTH GATE HOUSE. SURFACE WATER FROM F.G.D. PRIMARY PUMP STATION.
OUTFALL `ZZ'	PURGE PUMP HOUSE ADJACENT NORTH GATE HOUSE. SURFACE WATER EMERGENCY DUMP TO PURGE VIA PUMP STATION NO. 125B
OUTFALL `1A'	PURGE PUMP HOUSE ADJACENT NORTH GATE HOUSE. COOLING WATER FROM SOUTH COOLING TOWER.
OUTFALL `2A'	FROM NO.1 OILY WATER INTERCEPTOR TO SOUTH COOLING TOWER PURGE LINE TO PURGE PUMPHOUSE. FILTERED WATER.
OUTFALL `3A'	SOUTH BLOWDOWN TANK TO SOUTH COOLING TOWER PURGE LINE TO PURGE PUMPHOUSE. CONDENSATE.
OUTFALL `4A'	NORTH BLOWDOWN TANK. NORTH OILY SEPARATOR & PUMP STN 125A.TO NORTH COOLING TOWER PURGE LINE TO PURGE PUMPHOUSE. CONDENSATE. FILTERED WATER & SURFACE WATER.
OUTFALL `5A'	ECO STORE ATTENUATION LAGOON TO PURGE C.T. 2A.



GENERAL ARRANGEMENT

SCALE 1: 2,500 @ A1
SCALE 1: 5,000 @ A3

DO NOT SCALE

NOTES:

1. THE INFORMATION SHOWN ON THIS DRAWING WAS EXTRACTED FROM A DRAWING PROVIDED BY DRAX POWER LIMITED (DOCUMENT REFERENCE DF3-008)
2. TO BE READ IN CONJUNCTION WITH DRAWING 70072063 - INDICATIVE CHANGES TO EXISTING SW DRAINAGE SYSTEM

KEY:

- WOODYARD TO OUTFALL BB CAR DYKE CUL
- FILTERED WATER FROM FGD TO PRIMARY PUMP STATION TO PURGE
- WEST SIDE OF STATION TO PUMP STATION 125A TO CT
- SITE AREAS TO OUTFALL PP EAST
- PURGE SYSTEM
- IDB MAINTAINED DITCH
- CULVERTED SECTION OF DITCH (IDB MAINTAINED)

REV	DATE	DESCRIPTION OF REVISIONS	DRAWN	CHK	APP
P01	01/02/2022	EXISTING SURFACE WATER DRAINAGE SYSTEMS	BH	ES	AS

DRAWING STATUS: S2 - FOR INFORMATION

CONTRACTOR (S):
wsp
3rd Floor, Kings Orchard, 1 Queen St, Bristol, BS2 0HQ, UK
T+ 44 (0) 1179 306 200
wsp.com

PROJECT: DRAX BECCS

DRAWING TITLE: EXISTING SURFACE WATER DRAINAGE SYSTEMS

DESIGNED	-	SIGNED		DATE	AS PER ELECTRONIC SIGNATURE
DRAWN	BEN HOLLAND	SIGNED		DATE	AS PER ELECTRONIC SIGNATURE
CHECKED	ELZBIETA SZOSTAK	SIGNED		DATE	AS PER ELECTRONIC SIGNATURE
APPROVED	ANDY SMITH	SIGNED		DATE	AS PER ELECTRONIC SIGNATURE

SCALE @ A1: 1 : 2500
ELR & MILEAGE: N/A
PROJECT NO: 70072063
SHEET: SHEET 1 OF 1
DRAWING No: 70072063-EXISTING SURFACE WATER DRAINAGE SYSTEM
REV: P01

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70072XX\70072063 - DRAX BECCS D\CV03 ENVIRONMENT\09 SURFACE WATER\04 WIP\DRAINAGE STRATEGY\EXISTING AND PROPOSED SW DRAINAGE\70072063-EXISTING SURFACE WATER DRAINAGE SYSTEM.DWG, printed on 30 March 2022 17:04:16, by Holland, Ben

APPENDIX I – FLOOD MAP PACK

FLOOD RISK PACK

Client:
Drax Power Limited

Project Reference:
70072063 DRAX BECCS DCO

Site Reference:
70072063 - Drax BECCS

Site Location
466409, 427476

Site Area:
123.83 hectares

Map Scale:
1:20000

CONTENTS:

Created by: UKAMW009 - 2022-05-13 11:53:09
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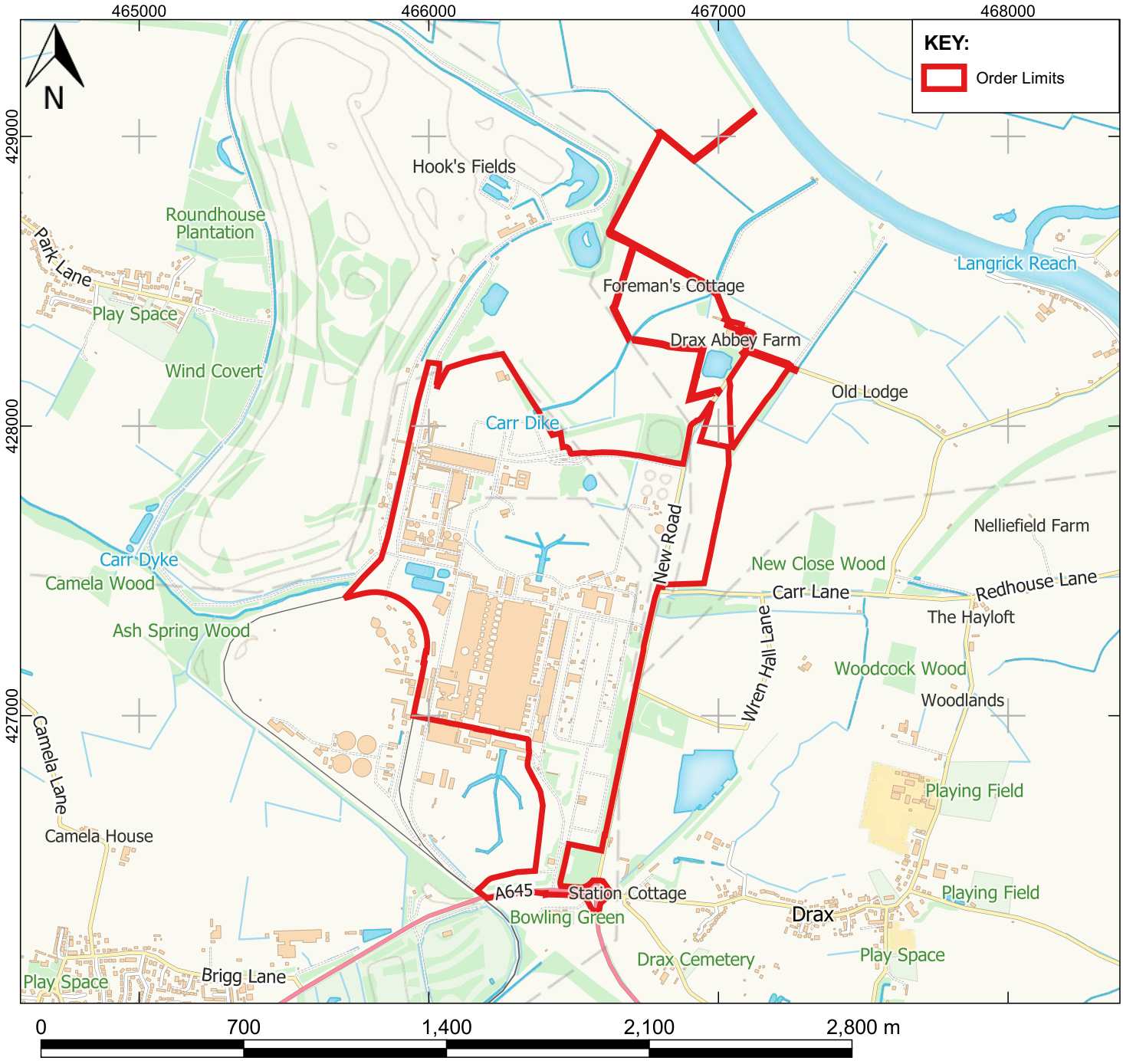
SITE LOCATION



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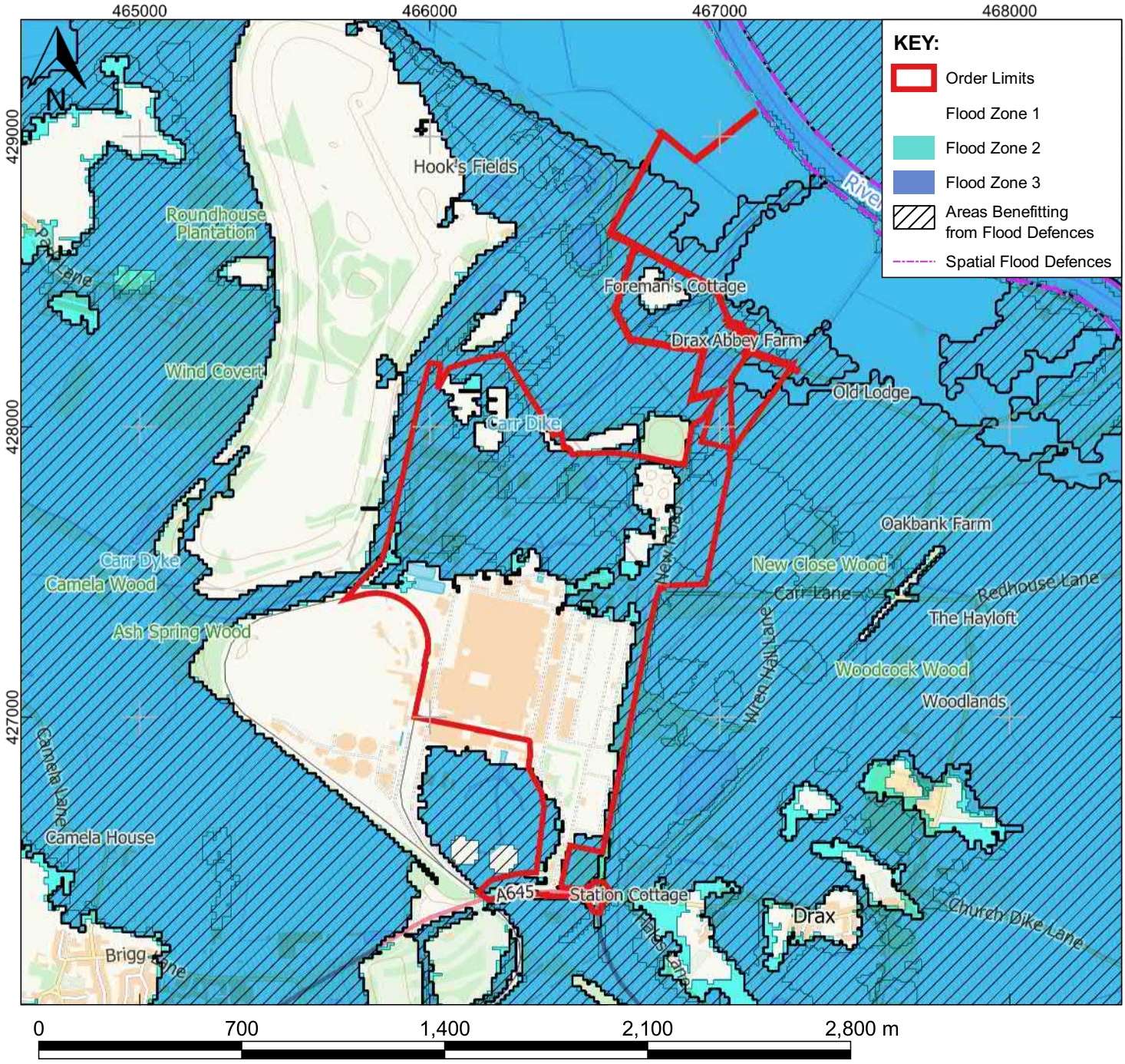
ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING



Flood zone maps are modelled using local and national river and sea data. This information provides an indication of the likelihood of flooding and is intended for planning use only.

Flood Zone 1 - Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3).

Flood Zone 2 - 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. (Land shown in light blue on the Flood Map)

Flood Zone 3 - 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. (Land shown in dark blue on the Flood Map)

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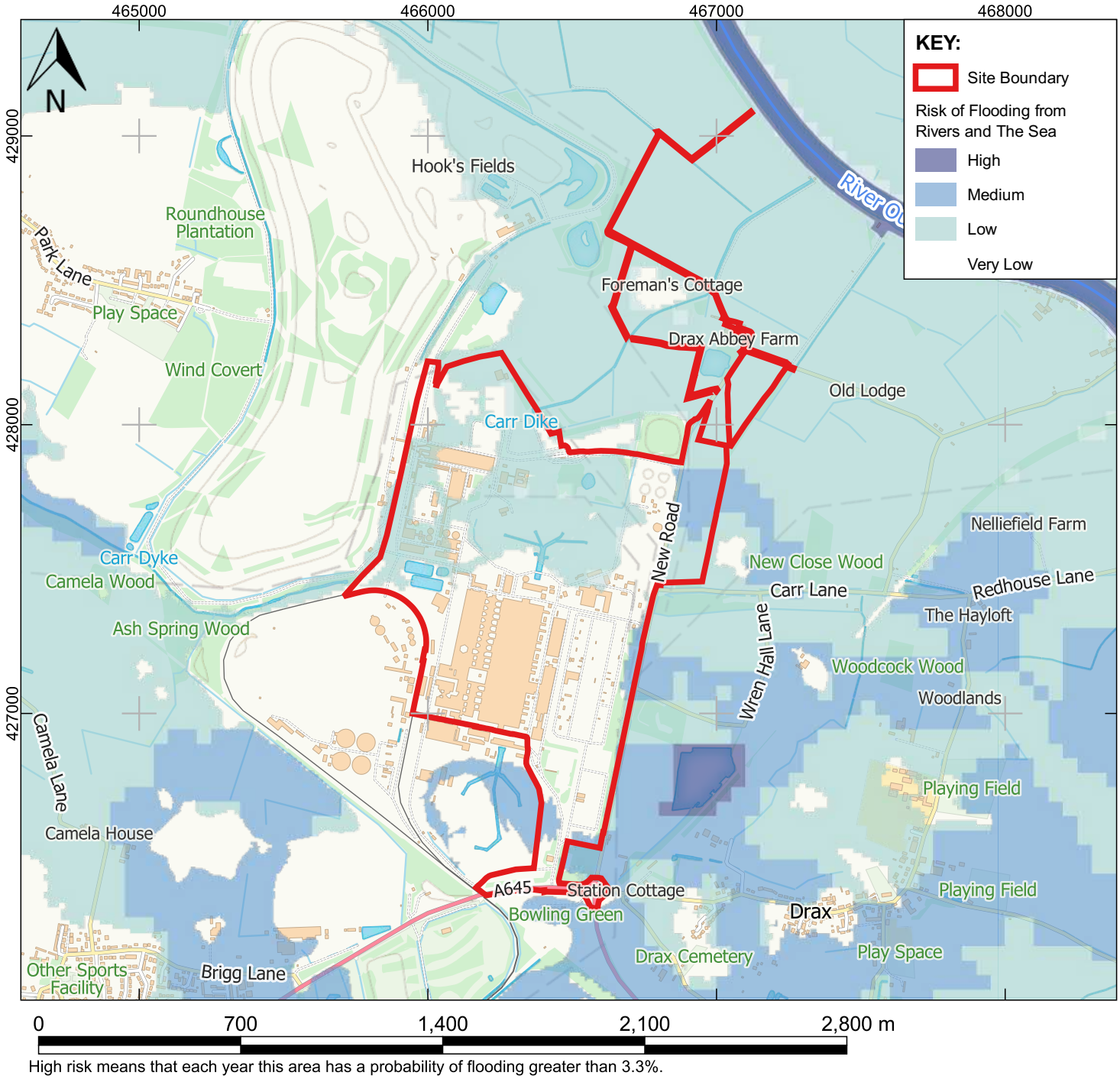
ENVIRONMENT AGENCY RISK OF FLOODING FROM RIVERS AND THE SEA



High risk means that each year this area has a probability of flooding greater than 3.3%.

Medium risk means that each year this area has a probability of flooding between 1% and 3.3%.

Low risk means that each year this area has a probability of flooding between 0.1% and 1%.

Very low risk means that each year this area has a probability of flooding below 0.1%.

This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

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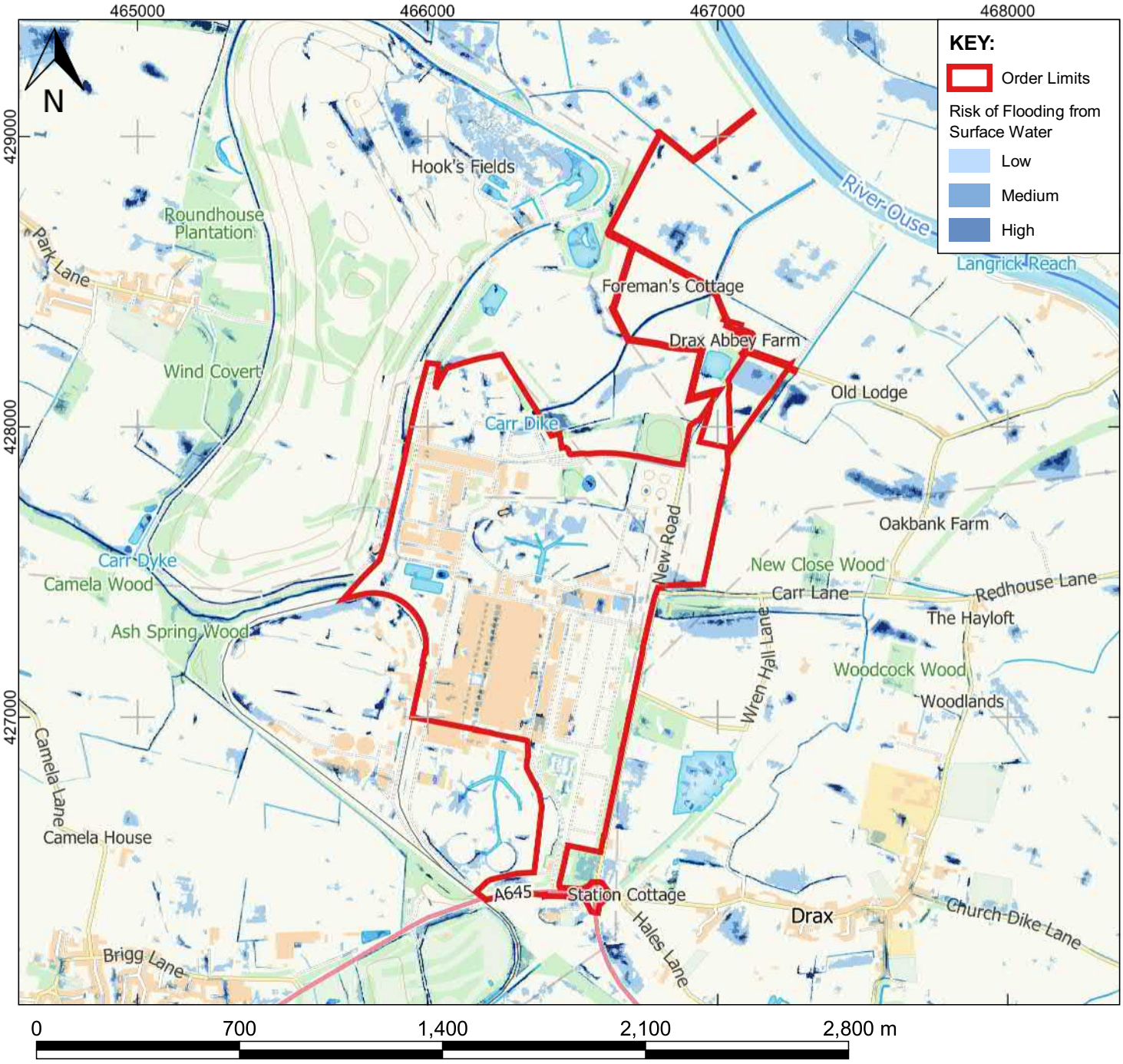
ENVIRONMENT AGENCY RISK OF FLOODING FROM SURFACE WATER



High risk means that each year this area has a probability of flooding greater than 3.3%.

Medium risk means that each year this area has a probability of flooding between 1% and 3.3%.

Low risk means that each year this area has a probability of flooding between 0.1% and 1%.

Very low risk means that each year this area has a probability of flooding below 0.1%.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

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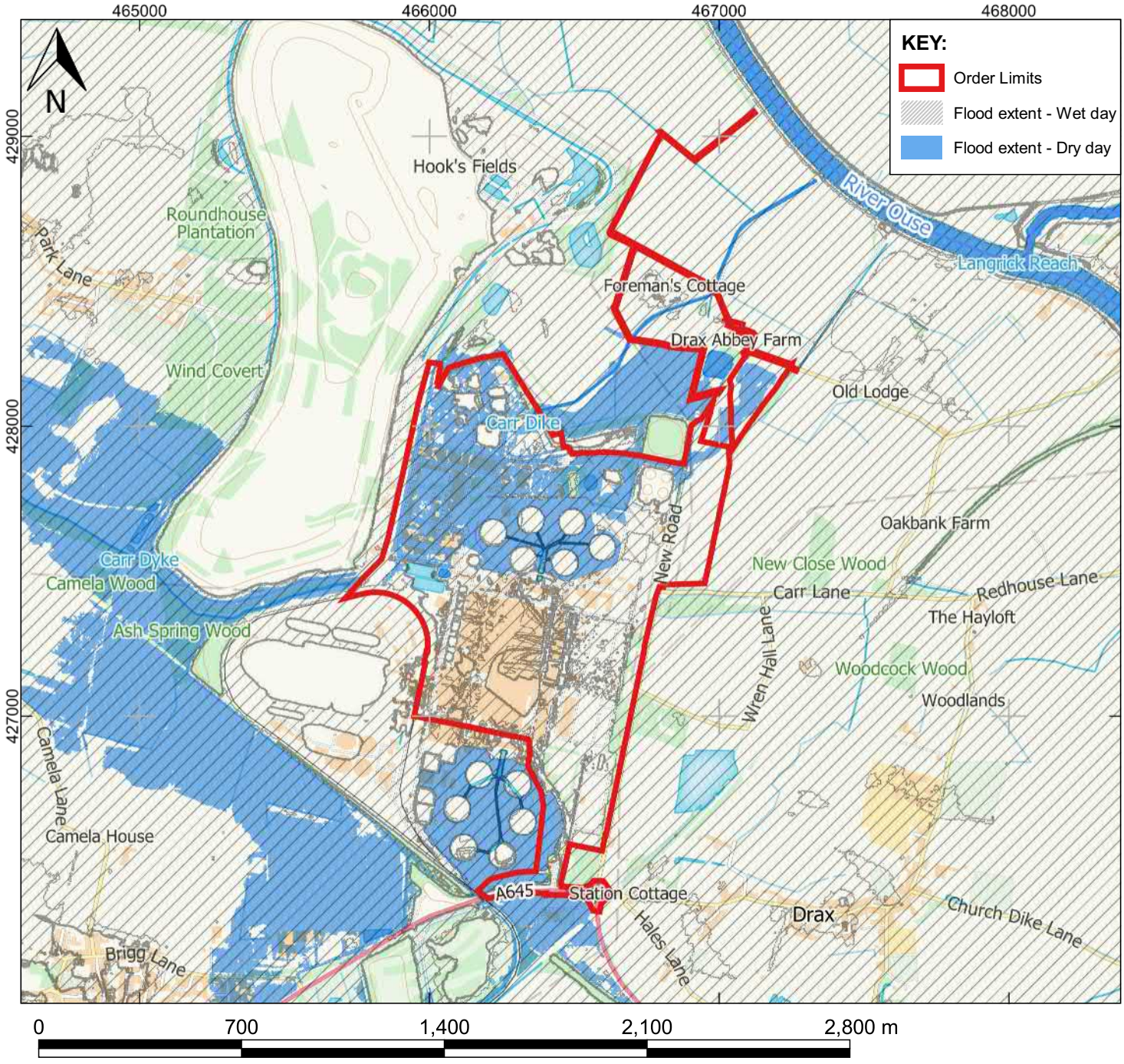
ENVIRONMENT AGENCY RISK OF FLOODING FROM RESERVOIRS



This data shows the individual flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a “wet day” when local rivers had already overflowed their banks.

It represents a prediction of a credible worst case scenario, however it’s unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding.

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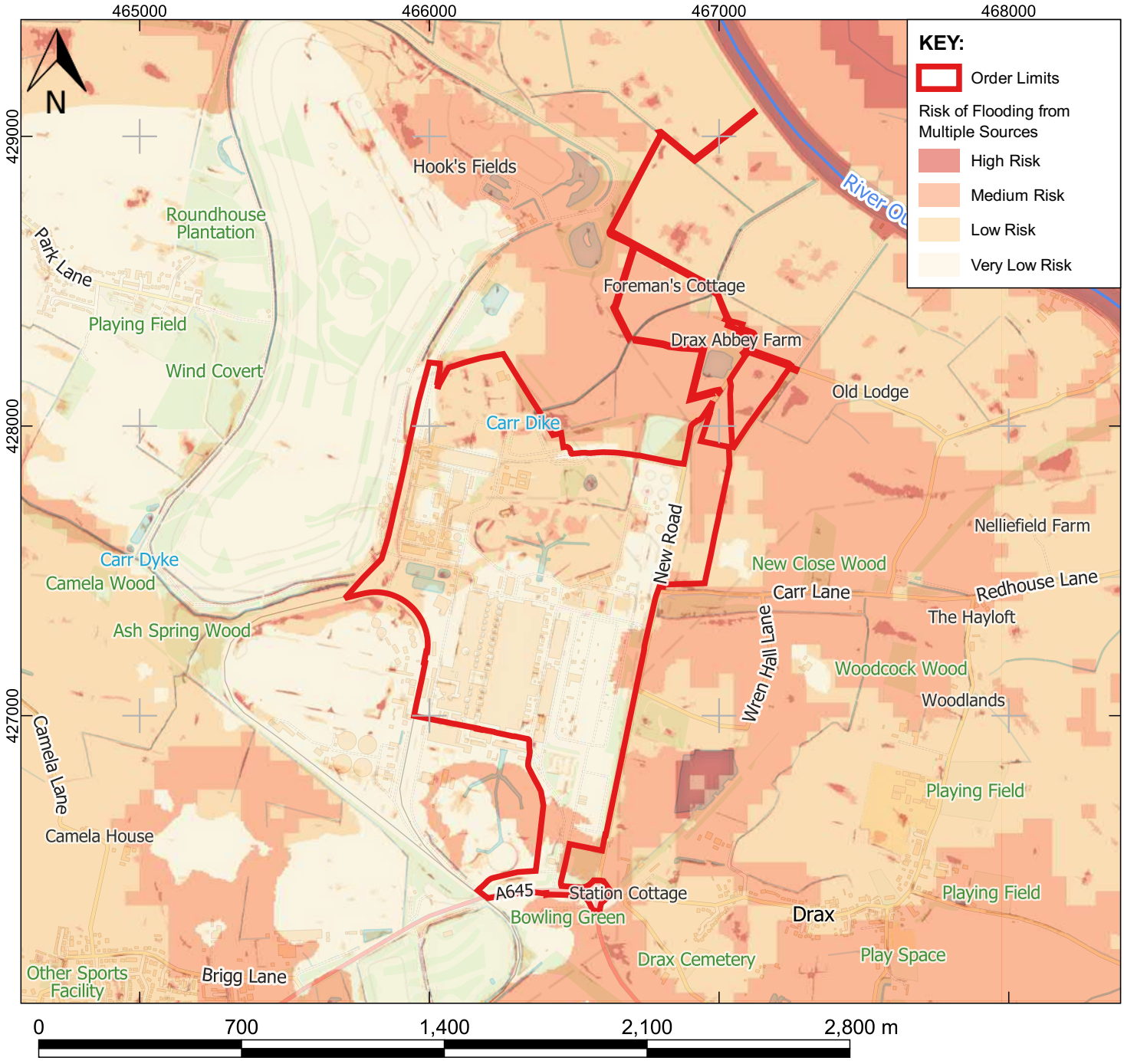
ENVIRONMENT AGENCY RISK OF FLOODING FROM MULTIPLE SOURCES



High risk means that each year this area has a probability of flooding greater than 3.3%.

Medium risk means that each year this area has a probability of flooding between 1% and 3.3%.

Low risk means that each year this area has a probability of flooding between 0.1% and 1%.

Very low risk means that each year this area has a probability of flooding below 0.1%.

This dataset is not suitable for identifying whether an individual property will flood. The Risk of Flooding from Multiple Sources (RoFMS) information is a national scale assessment. It gives an indication of what areas of land may be at risk of flooding from more than one source. This first version of the assessment considers flooding from rivers, the sea and surface water.

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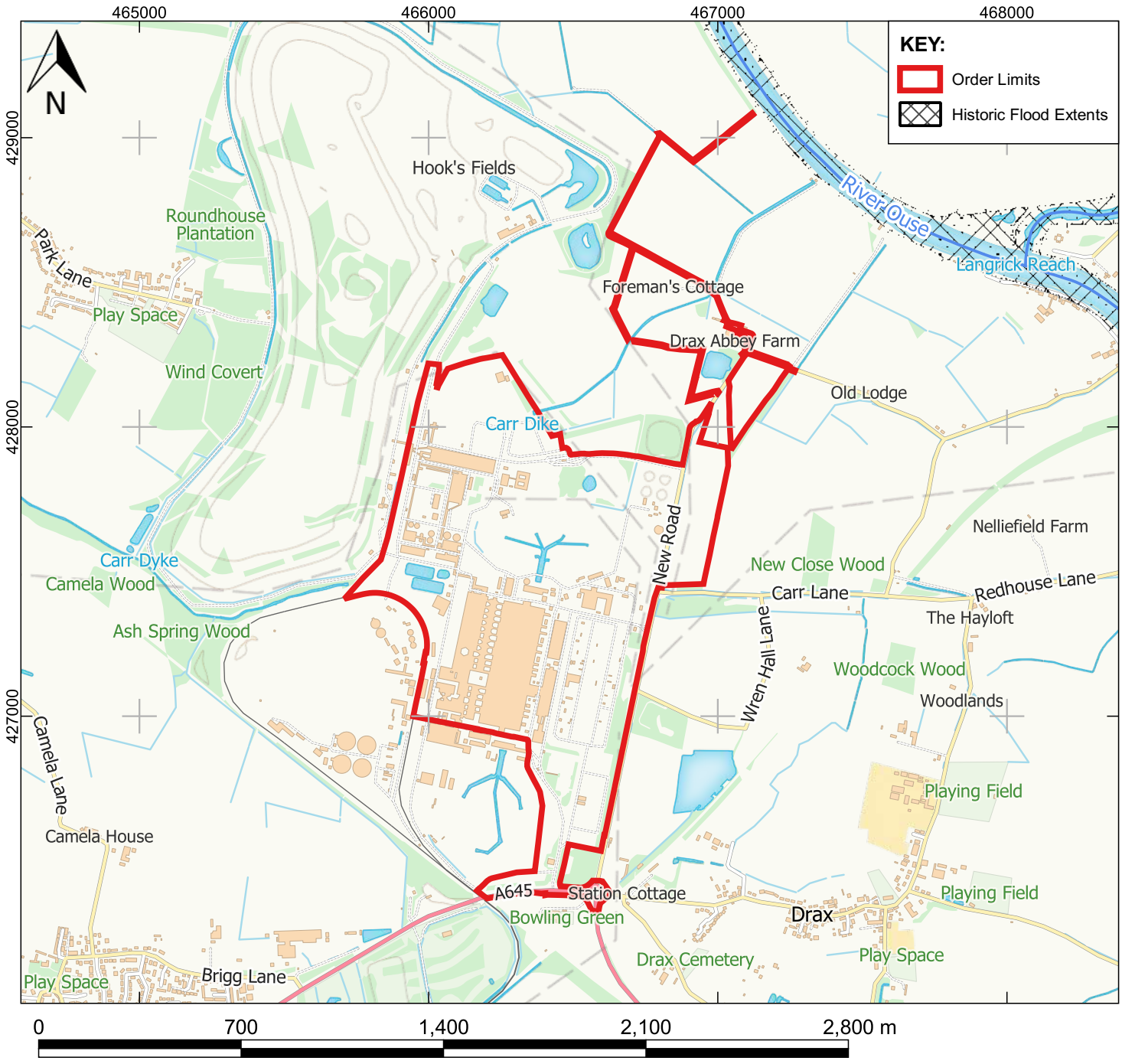
ENVIRONMENT AGENCY HISTORIC FLOOD MAP



The Historic Flood Map is a GIS layer showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater springs and shows areas of land that have previously been subject to flooding in England. Records began in 1946 when predecessor bodies to the Environment Agency started collecting detailed information about flooding incidents, although limited details may be held about flooding incidents prior to this date.

The absence of coverage by the Historic Flood Map for an area does not mean that the area has never flooded, only that we do not currently have records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood under different circumstances. The Historic Flood Map will take into account of the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It will include flood extents that may have been affected by overtopping, breaches or blockages. Flooding shown to the land and does not necessarily indicate that properties were flooded internally.

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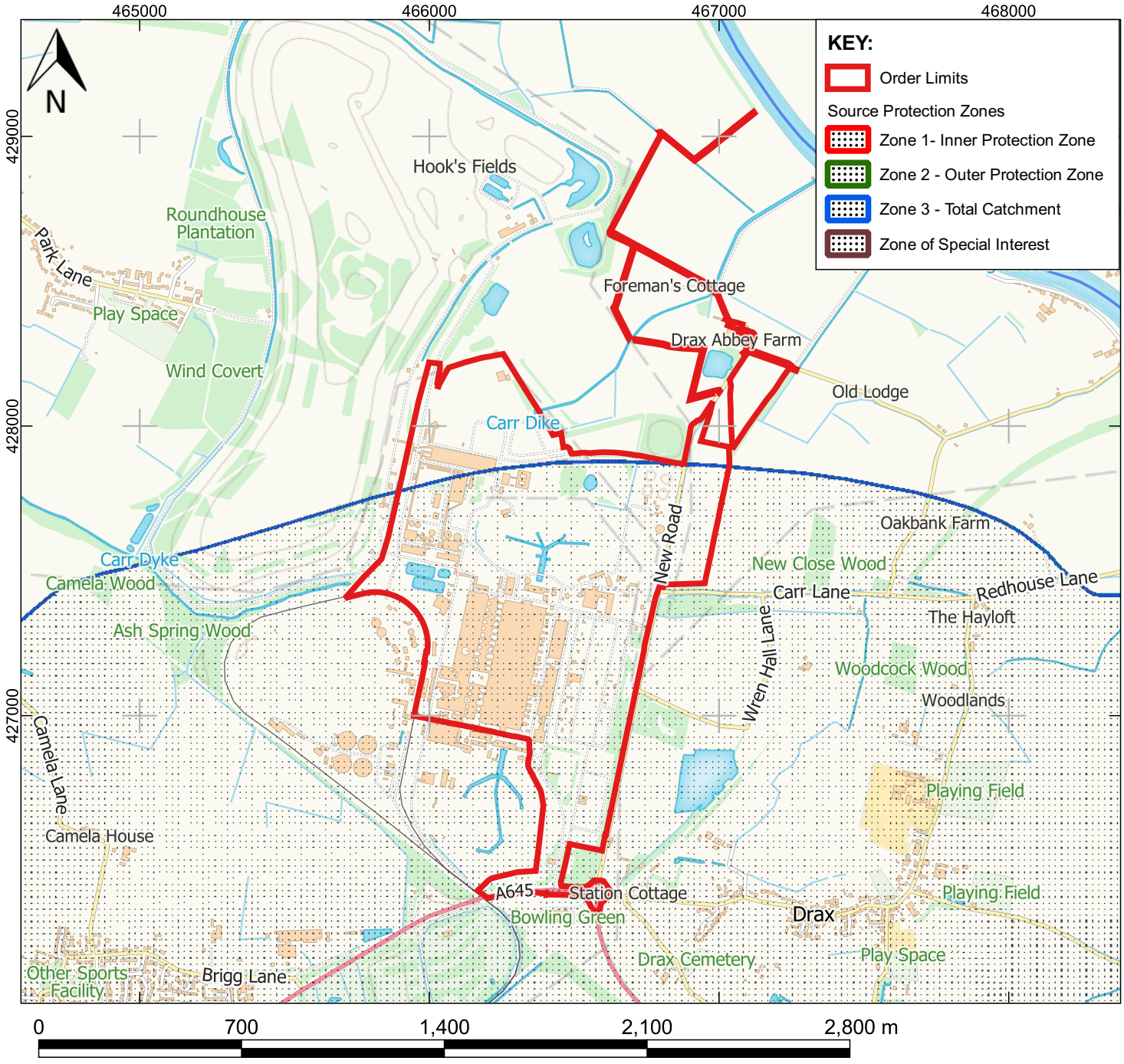
ENVIRONMENT AGENCY SOURCE PROTECTION ZONES



Inner zone (Zone 1) - Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;

Outer zone (Zone 2) - Defined by a 400 day travel time from a point below the water table. The previous methodology gave an option to define SPZ2 as the minimum recharge area required to support 25 per cent of the protected yield. This option is no longer available in defining new SPZs and instead this zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction;

Total catchment (Zone 3) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

Special interest (Zone 4) - A fourth zone SPZ4 or 'Zone of Special Interest' was previously defined for some sources. SPZ4 usually represented a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream).

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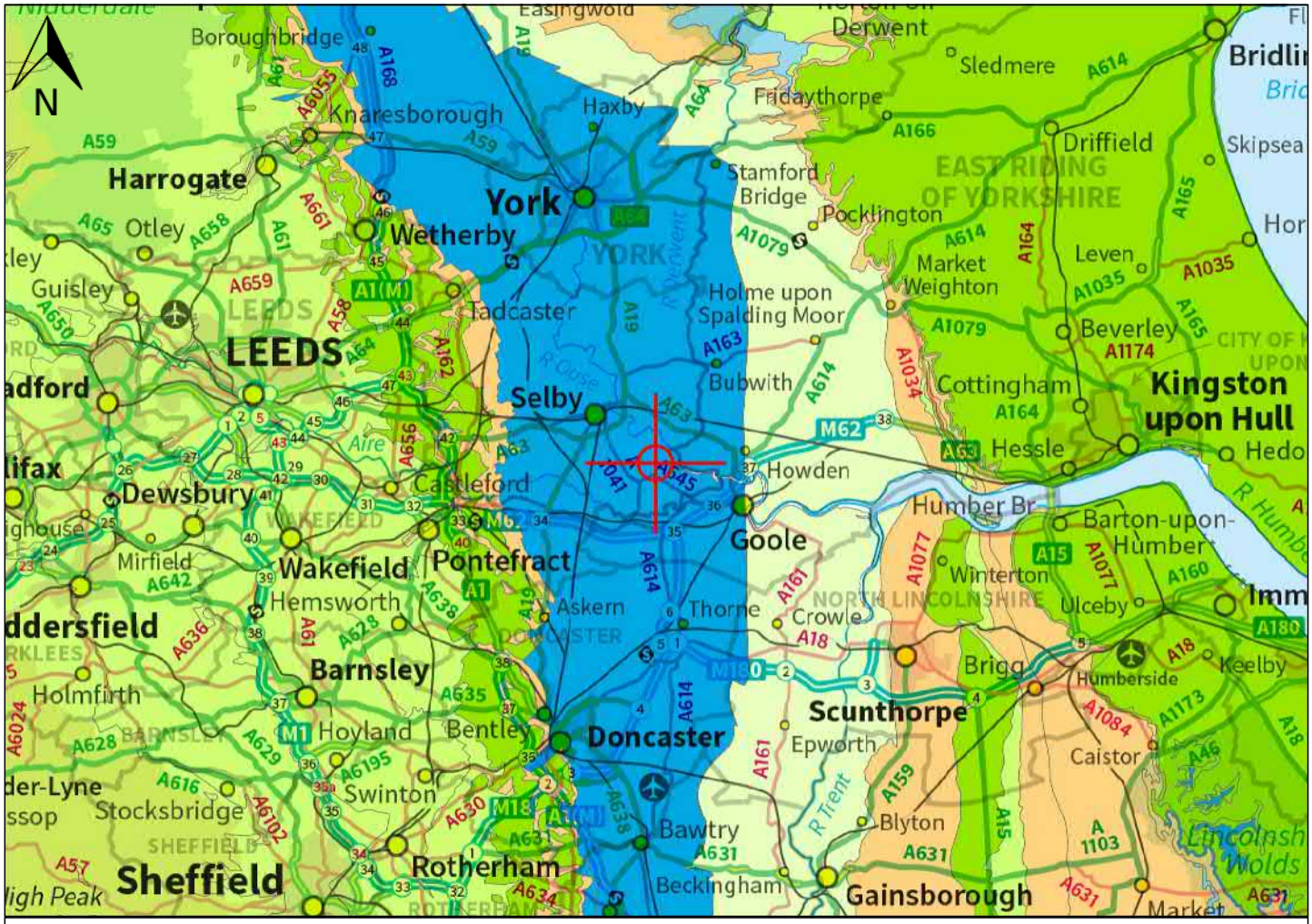
BRITISH GEOLOGICAL SURVEY 1:625,000 SCALE AQUIFER DESIGNATION



KEY:

Site Location

Aquifer with significant intergranular flow	Aquifer in which flow is virtually all through fractures and other discuninuities
Highly productive aquifer	Highly productive aquifer
Moderately productive aquifer	Moderately productive aquifer
Low productivity aquifer	Low productivity aquifer
	Rocks with essentialy no groundwater

0 20,000 40,000 60,000 80,000 m

The hydrogeological map indicates aquifer potential in generalised terms using a threefold division of geological formations:

1. those in which intergranular flow in the saturated zone is dominant
2. those in which flow is controlled by fissures or discontinuities
3. less permeable formations including aquifers concealed at depth beneath covering layers

Highly productive aquifers are distinguished from those that are only of local importance or have no significant groundwater. Within each of these classes the strata are grouped together according to age or lithology.

The 1:625 000 scale data may be used as a guide to the aquifers at a regional or national level, but should not be relied on for local information.

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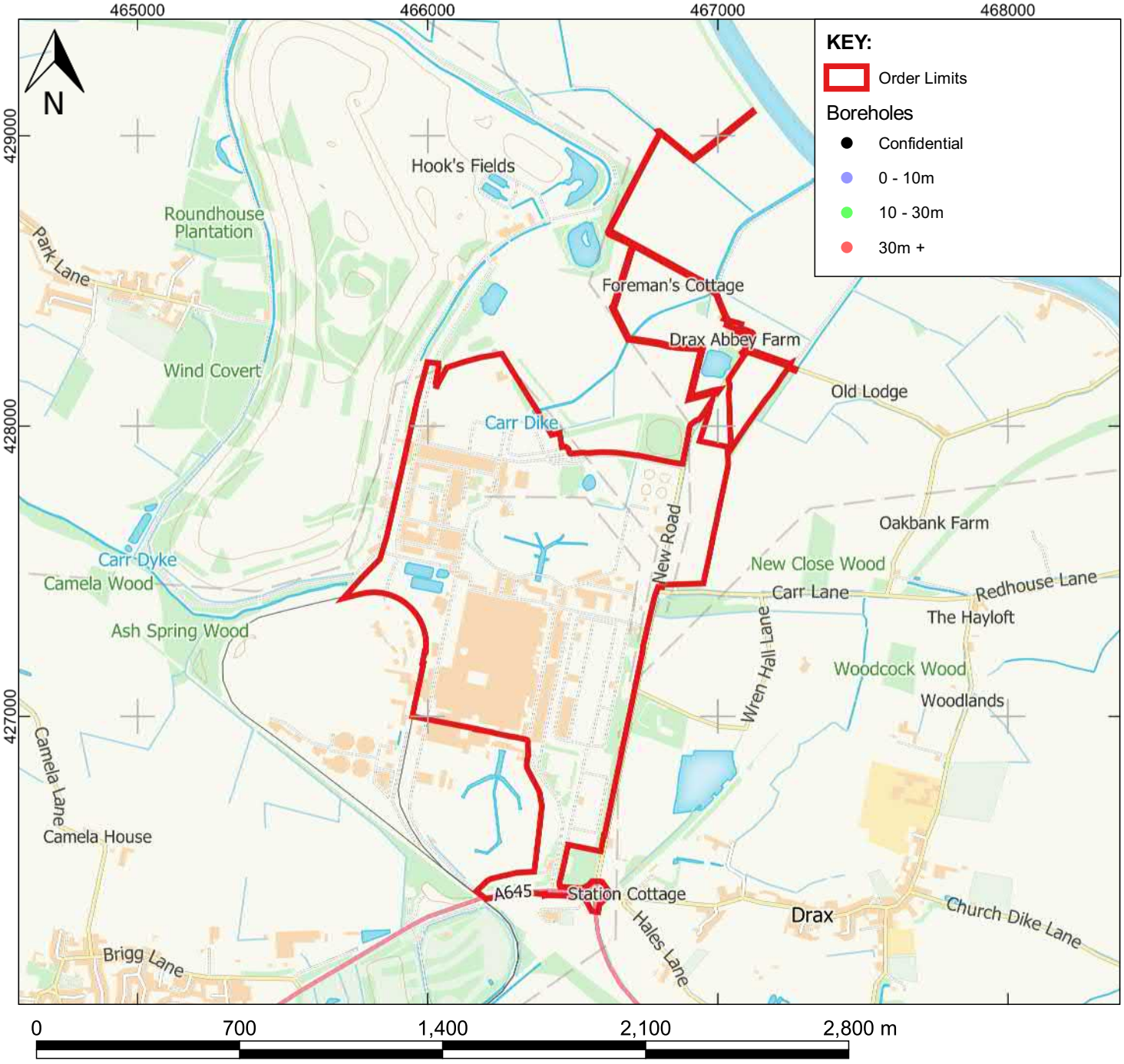
BRITISH GEOLOGICAL SURVEY BOREHOLES



The borehole map indicates the British Geology Survey record for the area and their reference number.

The scans for the boreholes can be found on the BGS website, using the query tool in the Geoindex to find the borehole of interest (http://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSBoreholes#)

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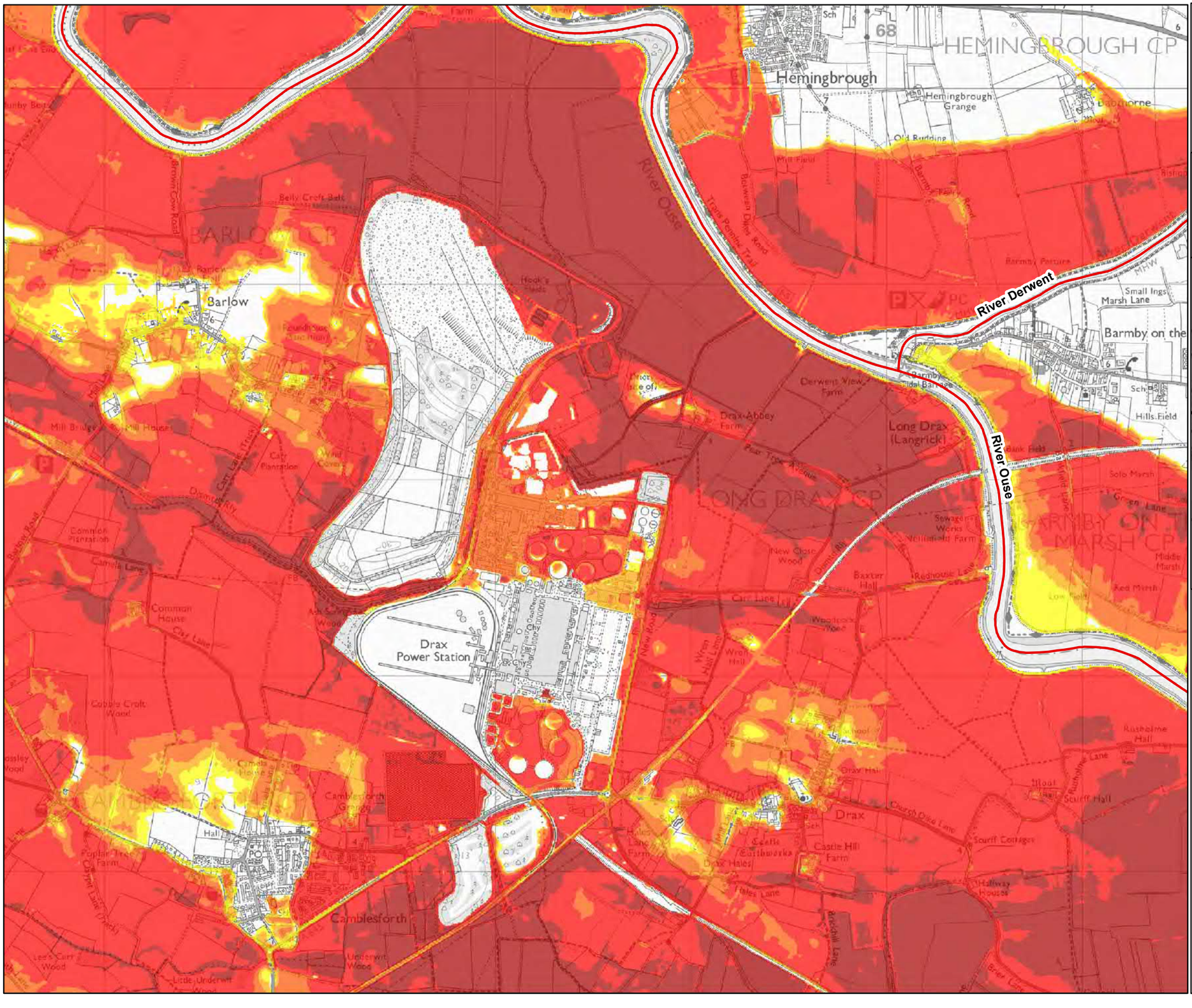
APPENDIX J – 2016 UPPER HUMBER MODEL FLOOD MAPS

2016 Upper Humber Defended Depth Grid Map for the 0.1% AEP (1 in 1000yr) Combined Scenario

Date created: 26/05/2021



www.environment-agency.gov.uk

Scale: 1:20,000

when reproduced @ A3

Legend

Main River

q1000_dmax.asc

(m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.00
- 1.00 - 2.00
- >2.00

2016 Upper Humber Defended Depth Grid Map for the 0.5% AEP (1 in 200yr) Combined Scenario

Date created: 26/05/2021

www.environment-agency.gov.uk

Scale: 1:20,000

when reproduced @ A3

Legend

- Main River

q200_dmax.asc

(m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.00
- 1.00 - 2.00
- >2.00

APPENDIX K – HYDRAULIC MODELLING REPORT

FRA APPENDIX K - HYDRAULIC MODELLING REPORT

Drax Bioenergy with Carbon Capture and Storage

Applicant: Drax Power Limited

PINS Reference: EN010120

REVISION: 01

DATE: April 2022

DOCUMENT OWNER: WSP UK Ltd

AUTHOR: S Berbel-Roman

APPROVER: A Smith

PUBLIC

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INTRODUCTION

1.1. BACKGROUND

1.1.1. Drax Power Limited (the Applicant) intends to install post combustion carbon capture technology on up to two of the existing 660-megawatt electrical ('MWe') biomass power generating units at the Drax Power Station in Selby, North Yorkshire. This will remove approximately 95% of the carbon dioxide from the flue gas, resulting in overall negative emissions of greenhouse gases.

1.1.2. The Proposed Scheme comprises an extension to the existing biomass generating units and includes the following:

a. Carbon capture infrastructure at Drax Power Station on up to two biomass generating units;

b. Infrastructure for the treatment and compression of carbon dioxide at Drax Power Station to allow connection to a National Grid carbon dioxide transport and storage system;

c. Potential road modifications to facilitate the transport of abnormal indivisible loads;

d. Temporary construction laydown areas;

e. Areas for habitat provision; and

f. Supporting infrastructure required for the Carbon Capture Plant.

1.1.3. WSP has been commissioned by the Applicant to prepare an Environmental Statement (ES). This hydraulic modelling report provides a detailed assessment of the hydraulic modelling that has been carried out to support the Flood Risk Assessment (FRA) and ES for the Proposed Scheme. To assess the potential fluvial and tidal flood risk to the Site, a combination of two existing models have been used: the 2016 Upper Humber model [1] and the Humber Extreme Water Levels (EWL) model[2] .

1.1.4. This technical report presents the background of the modelling undertaken for both defended and breach scenarios, the modelling methodology and subsequent output results.

1.2. SOURCES OF DATA

1.2.1. The data used to update the hydraulic model is summarised in **Table 1.1** below:

[1] Upper Humber Flood Risk Mapping Study, JBA Consulting, August 2016
[2] Extreme Water Levels, Jacobs Consultancy Ltd, November 2020

Table 0.1 - Model Input Data

Data	Description	Source
Hydraulic model of the Upper Humber (JBA Consulting, 2016)	In 2016 JBA on behalf of the Environment Agency undertook the hydraulic modelling of the Upper Humber (including the 2016 climate change allowances) covering the tidal estuary and the rivers flowing into it which have the potential to be a major source of flood risk to Drax Power Station Site.	Environment Agency
Hydraulic model of Humber EWL (Jacobs Consulting, 2020)	In 2020 Jacobs on behalf of the Environment Agency undertook the modelling of Extreme Water Levels (EWL) for the whole Humber catchment to support a better flood risk management of the Humber 2100+ project and the wider needs of the Environment Agency and partner organisations.	Environment Agency
Breach of defences guidance (Environment Agency, 2017)	The most up to date guidance on assessing breach to further use in flood risk assessments in England was used to model the breach scenario.	Environment Agency
Site visit photographs	Photographs undertaken on site (21st and 22nd February 2022) of the river flood defences next to Drax Power Station Site and key flow paths have been used to inform the hydraulic model.	WSP

1.3. CONSULTATION

1.3.1. Extensive consultation has been undertaken with the Environment Agency to agree scope of the modelling work and model parameters. A list of key consultation carried out with the Environment Agency is included within the FRA (document reference 6.3.12.1), and additional information is provided in the **Statement of Common Ground with the Environment Agency** (document reference 7.1.2). **Table 1.2** below summarise key consultation and outcomes.

Table 0.2 - Environment Agency Consultation Record

Date	Description	Outcome
09 April 2021	Initial consultation carried out by email. Introduction to the project and request for information.	Environment Agency provided initial advice on the consultation queries.
27 September 2021	Conference call to discuss initial modelling approach with the Environment Agency and agree on programme and next steps.	Environment Agency to provide Humber EWL model. Environment Agency confirmed the use of the same breach location that was used in the 2018 Drax Repower DCO.
21 October 2021	Conference call to follow up actions from the previous conference call undertaken on 27/09/2021.	A discussion on modelling approach and constraints, concluding with WSP to provide a Technical Note summarising modelling approach upon receival of Humber EWL model.
6 December 2021	Conference call to discuss modelling approach proposed by WSP.	Breach location agreed by the Environment Agency. Modelling approach agreed by the Environment Agency. Note: The modelling approach was refined to accommodate the change in the design life of the Proposed Scheme. The refined approach was discussed with the Environment Agency in February 2022. The Technical Note and meeting Minutes are included in Appendix A.

Date	Description	Outcome
10 February 2022	Conference call to discuss refined modelling approach to accommodate the change in the design life of the Proposed Scheme and baseline modelling results.	The final agreed modelling approach and the meeting Minutes are included in Appendix A.

SITE DESCRIPTION

1.4. LOCATION

1.4.1. Drax Power Station Site is located approximately 7 km to the south-east from the centre of Selby, North Yorkshire, approximate NGR 466440, 427460 (**Plate 2.1**). The area surrounding Drax Power Station Site is predominantly rural, with a number of villages such as Drax to the east, Camblesforth to the southwest and Barlow to the west and by the A465 carriageway and New Road to the south-east and east respectively. The area is heavily drained, with a complex network of field drains.

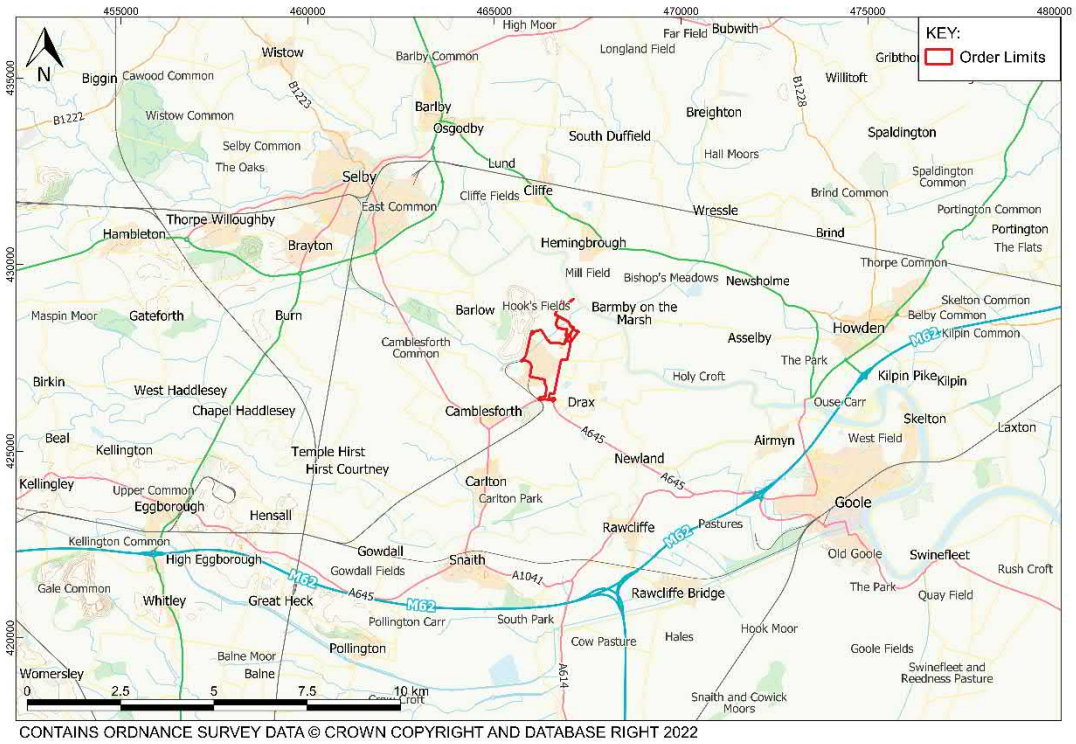


Plate 0.1 - Drax Power Station Location

1.5. PROPOSED SCHEME LAYOUT

1.5.1. The works are proposed to be undertaken within the central and northern parts of the Drax Power Station. The proposed works are within the boundary of the Drax Power Station Site, mainly, in areas that have already been developed. The new plant is located in the western part of the Drax Power Station Site.

1.5.2. The Drax Power Station Site and the surrounding areas comprise of generally low lying and flat land. The ground levels within Drax Power Station Site vary between around 4.6 m AOD and around 5 m AOD in the southern and northern part of the site respectively.

1.5.3. Approximate areas of the Proposed Scheme are shown in **Plate 2.2**, further details on the Proposed Scheme are provided within the accompanying **FRA**.

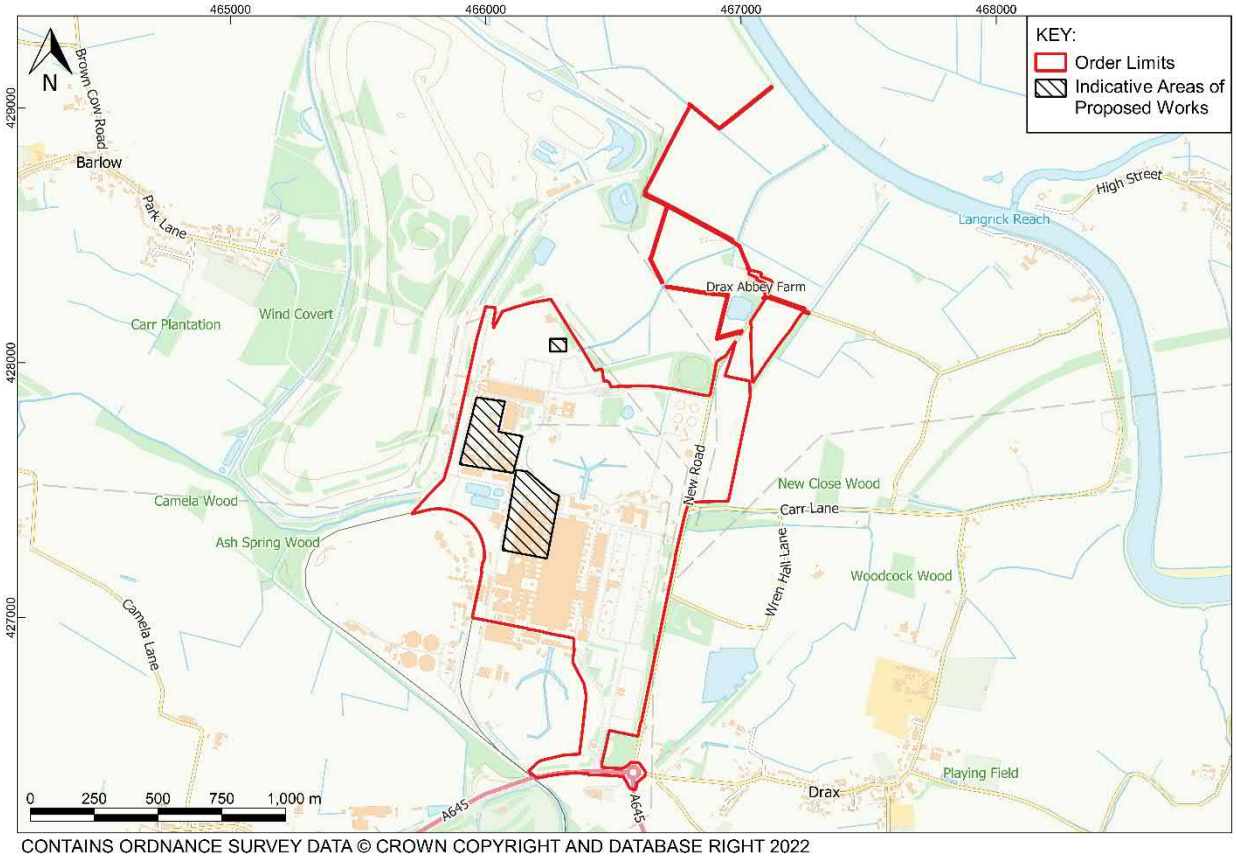


Plate 0.2 - Drax Power Station - Location of Proposed Works

HYDRAULIC MODELLING

1.6. INTRODUCTION

1.6.1. The hydraulic model was built using a linked one-dimensional / two-dimensional (1D/2D) schematisation. The hydraulic model has been built upon the existing Upper Humber model (JBA Consulting, 2016) which has been updated with the latest hydrology and joint probability events used in the latest Humber EWL model (Jacobs Consulting, 2020) along with the appropriate climate change allowances (sea level rise and peak river flows).

1.6.2. The River Ouse and main tributaries (River Aire, River Don and River Trent) are represented as a 1D component and is linked to the floodplain, which is represented by a 2D domain. The 1D component was constructed using Flood Modeller Pro 4.5.7110.17678 and the 2D component was constructed using TUFLOW (2018-03-AE-iDP-w64).

1.6.3. The extent of the model covers the catchments of the River Ouse, River Aire, River Don and River Trent. The River Ouse catchment extents from Cawood to the tidal boundary applied at the node HU_0_069 downstream of spurn point gauge. The River Aire catchment extents from Beale Weir to the intersection with the River Ouse south of Drax Power Station Site, the River Don catchment extents from Doncaster to the intersection with the River Ouse at Goole and the River Trent catchment extents from Gainsborough to the intersection with the River Ouse at Alkborough. The model extent is shown in **Plate 3.1**.

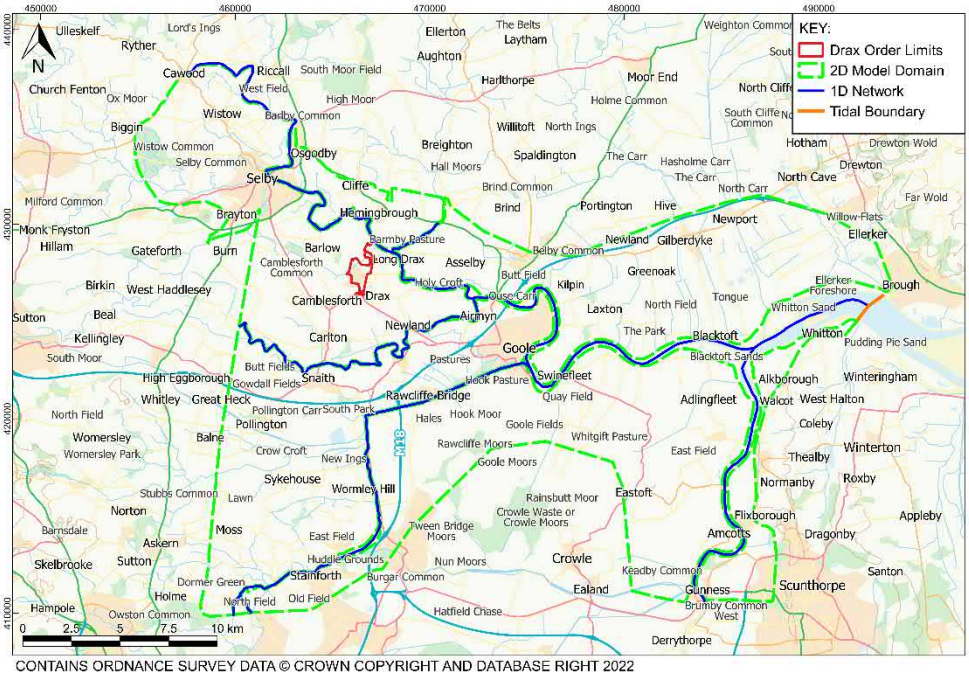


Plate 0.1 - Model extents

1.7. MODELLING METHODOLOGY

1.7.1. The baseline modelling methodology was agreed with the Environment Agency in February 2022. The baseline model has been built using the existing Upper Humber model (JBA Consulting, 2016) and the latest Humber EWL model (Jacobs Consulting, 2020).

1.7.2. The EWL model is a 1D model built in Flood Modeller developed specifically for the Humber 2100+ project. It was calibrated to seven historical flood events, including the December 2013 tidal surge. This model did not consider the latest 2021 climate change allowances (Environment Agency, 6 October 2021), therefore it has been re-run using the latest climate change allowances.

1.7.3. The design life of the Proposed Scheme is 25 years, as such the following climate change allowances for peak river flows and sea level rise have been used in the hydraulic modelling as agreed with the Environment Agency:

a. Upper end allowance (Epoch 2050s) for peak river flows:

i. 29% for the River Ouse catchment;

ii. 31% for the River Aire catchment;

iii. 36% for the River Don catchment, and

iv. 38% for the River Trent catchment.

b. Sea level rise uplift of 252.6 mm has been applied based on the latest sea level allowances by river basin district[3] (Table 2, Environment Agency, Flood Risk Assessments: Climate Change Allowances). The design tide curves obtained from the Coastal Flood Boundary surge shape for Immingham and applied in the Humber EWL model used year 2017 as a base year. Therefore, sea level rise uplift has been estimated from 2017. Calculations are summarised in **Table 3.1** below:

Table 0.1 - Relation between model and survey labels

River Basin District	Allowance	Years	Sea Level Rise (mm)
Humber	Upper End	2017 - 2035	120.6
		2035 - 2047	132
		Total	252.6

1.7.4. The below set of joint probabilities (fluvial, tidal and mixed fluvial/tidal flood) events which produce a combined return period of 0.5% annual exceedance probability

[3] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, Table 2, accessed March 2022

(AEP) were agreed with the Environment Agency in February 2022 to assess flood risk in Order Limits.

Table 0.2 – Return Periods Obtained from Table G.2 – JP Matrix 75-year to 200-year of Humber Extreme Water Levels Report[4]

ID	Event Type	RP	Aire	Don	Ouse	Trent	Tidal	Design Use
FT2	Mixed tidal/fluvial	200	50	20	100	50	10	Design Scenario
FT1	Mixed tidal/fluvial	200	100	50	200	100	5	Sensitivity Scenarios
FT5	Mixed tidal/fluvial	200	5	2	10	5	100	
T	Tidal	200	2	2	5	2	200	
FD	Fluvial	200	200	200	200	200	5	

1.7.5. The climate change uplifts described above were applied to the design sea level / hydrographs in the Humber EWL model for each of the flood events to account for the impacts of climate change. The derived hydrographs used as input in the Humber EWL model are shown below:

[4] Humber 2100+ Extreme Water Levels, Jacobs Consultancy Ltd, 2020

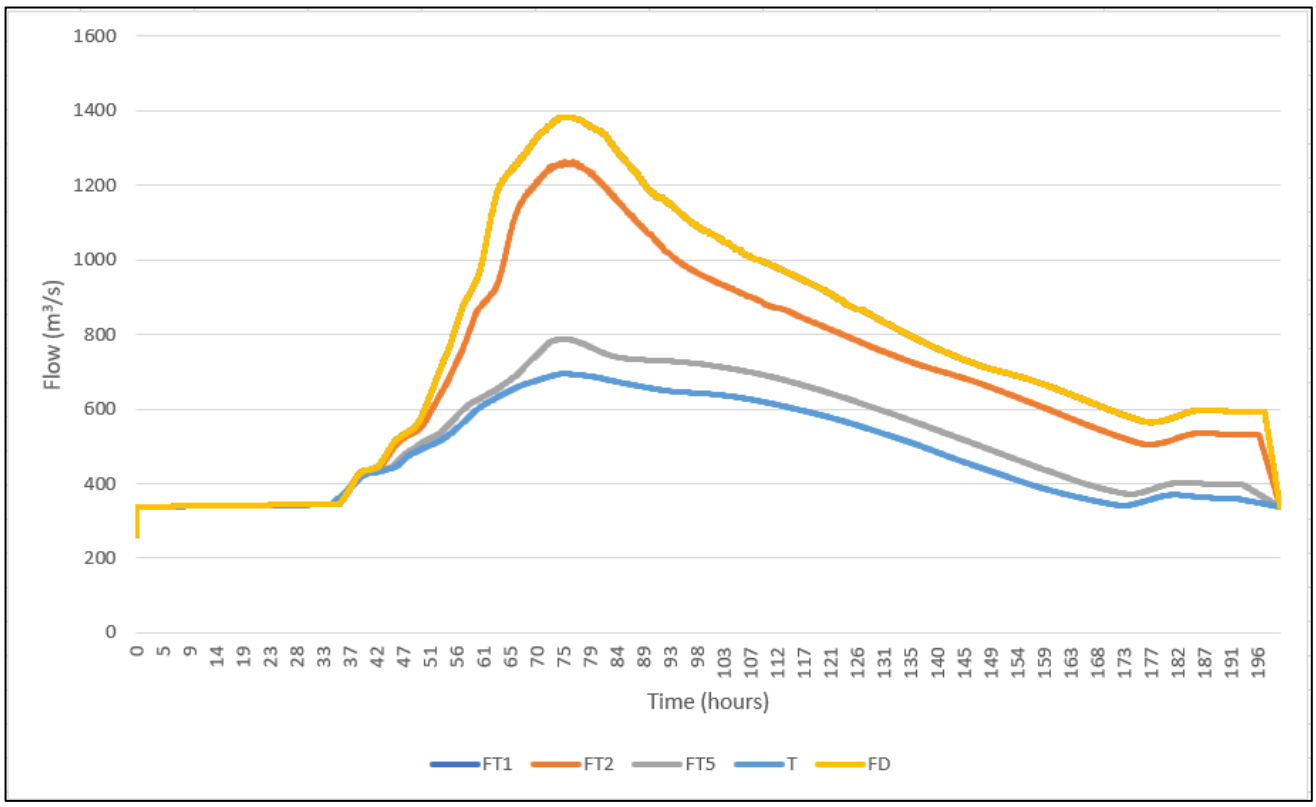


Plate 0.2 – Humber EWL model fluvial inflows on the River Ouse

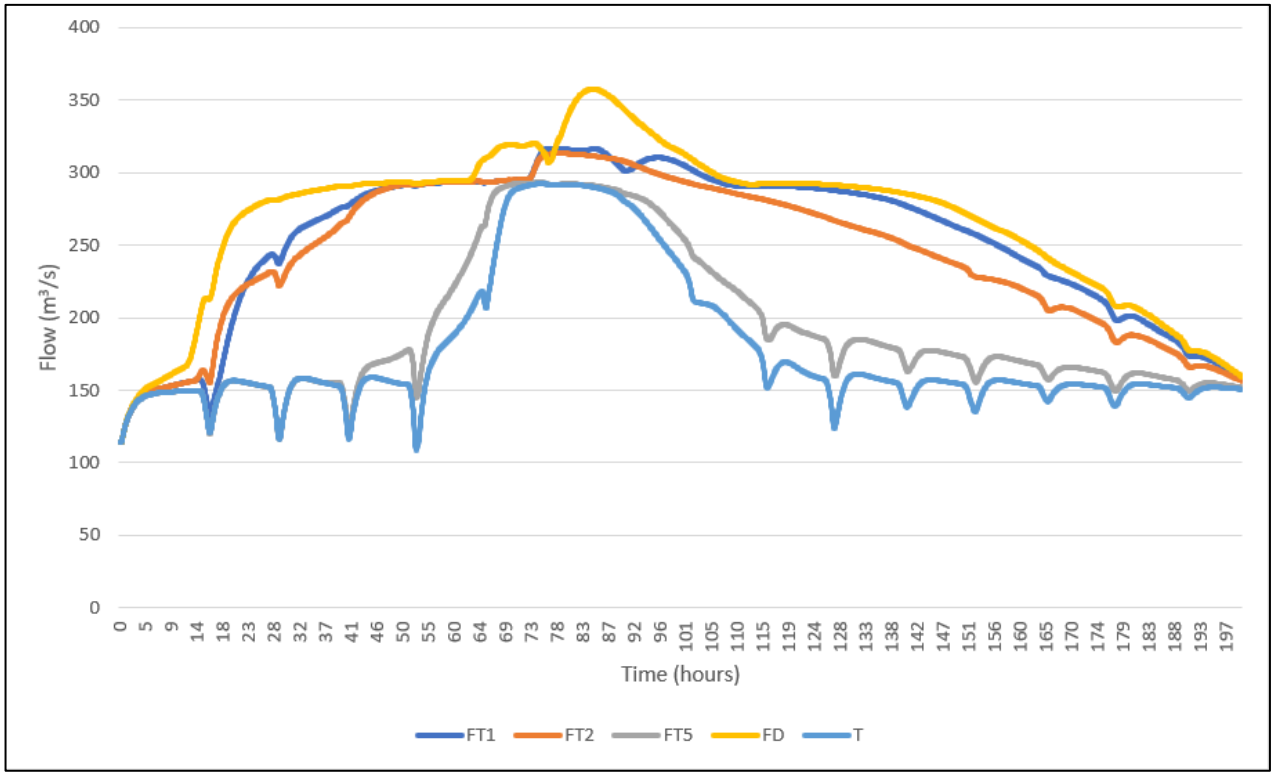


Plate 0.3 – Humber EWL model fluvial inflows on the River Aire

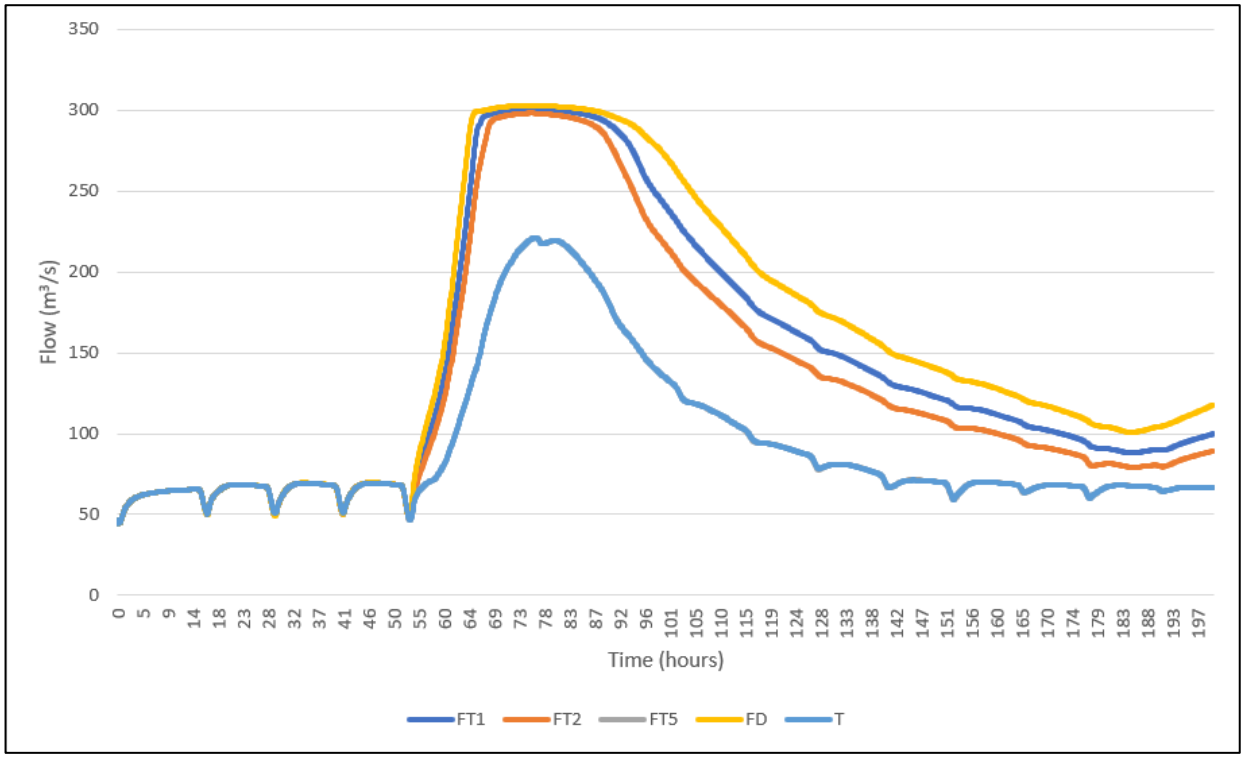


Plate 0.4 – Humber EWL model fluvial inflows on the River Don

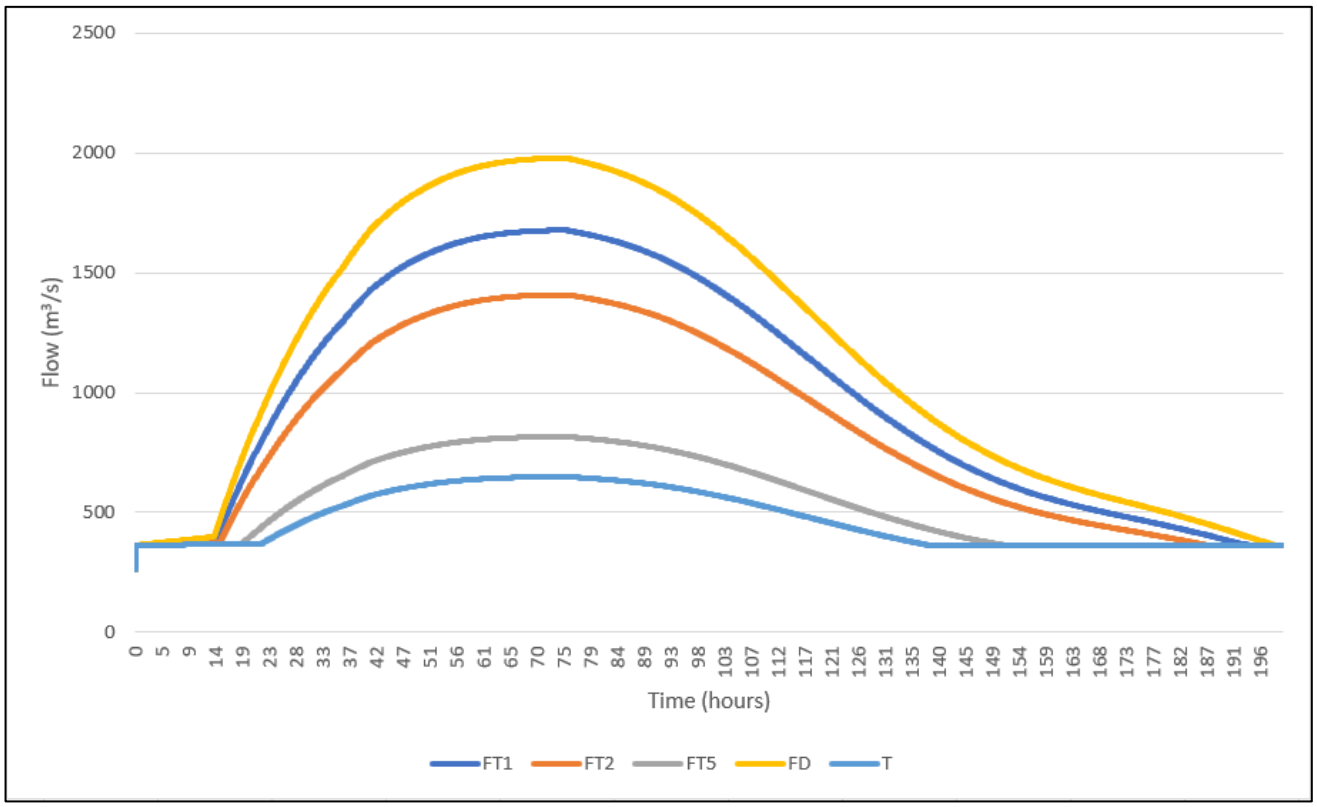


Plate 0.5 – Humber EWL model fluvial inflows on the River Trent

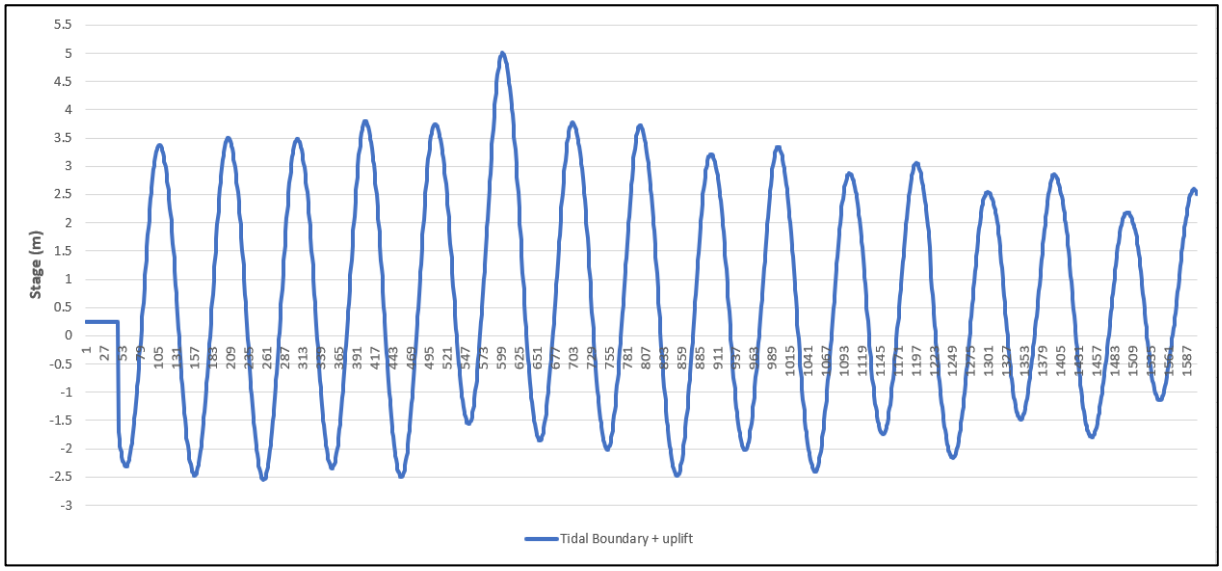


Plate 0.6 - Humber EWL model tidal boundary applied 3 km downstream of Spurn Point gauge

1.7.6. The Humber EWL model was rerun using the above fluvial inflows and tidal boundary. The derived fluvial inflows from the Humber EWL model for each of the flood events shown in **Appendix B** have been applied in the following nodes in the 1D/2D Upper Humber model (JBA Consulting, 2016).

Table 0.3 - The Upper Humber Model Node Which Were Updated with Inflows Derived from the Humber EWL Model

River Name / Tidal boundary	EWL model Node ID	Upper Humber model Node ID	Resulting inflows
River Ouse	Ouse	Ouse	FT1 – Figure 1 Appendix B FT5 - Figure 2 Appendix B T - Figure 3 Appendix B FD - Figure 4 Appendix B FT2 - Figure 5 Appendix B
River Aire	02670500058D	Aire	FT1 – Figure 6 Appendix B FT5 - Figure 7 Appendix B T - Figure 8 Appendix B FD - Figure 9 Appendix B FT2 - Figure 10 Appendix B
River Don	DON01_3175d	Don	FT1 – Figure 11 Appendix B

River Name / Tidal boundary	EWL model Node ID	Upper Humber model Node ID	Resulting inflows
			FT5 - Figure 12 Appendix B T - Figure 13 Appendix B FD - Figure 14 Appendix B FT2 - Figure 15 Appendix B
River Trent	NMUSKHAM	Trent	FT1 – Figure 16 Appendix B FT5 - Figure 17 Appendix B T - Figure 18 Appendix B FD - Figure 19 Appendix B FT2 - Figure 20 Appendix B
Tidal boundary	HU_0_011	OUSE_-08420	FT1 – Figure 21 Appendix B FT5 - Figure 22 Appendix B T - Figure 23 Appendix B FD - Figure 24 Appendix B FT2 - Figure 25 Appendix B

1.7.7. Location of fluvial and tidal inflows are shown in **Plate 3.7**.

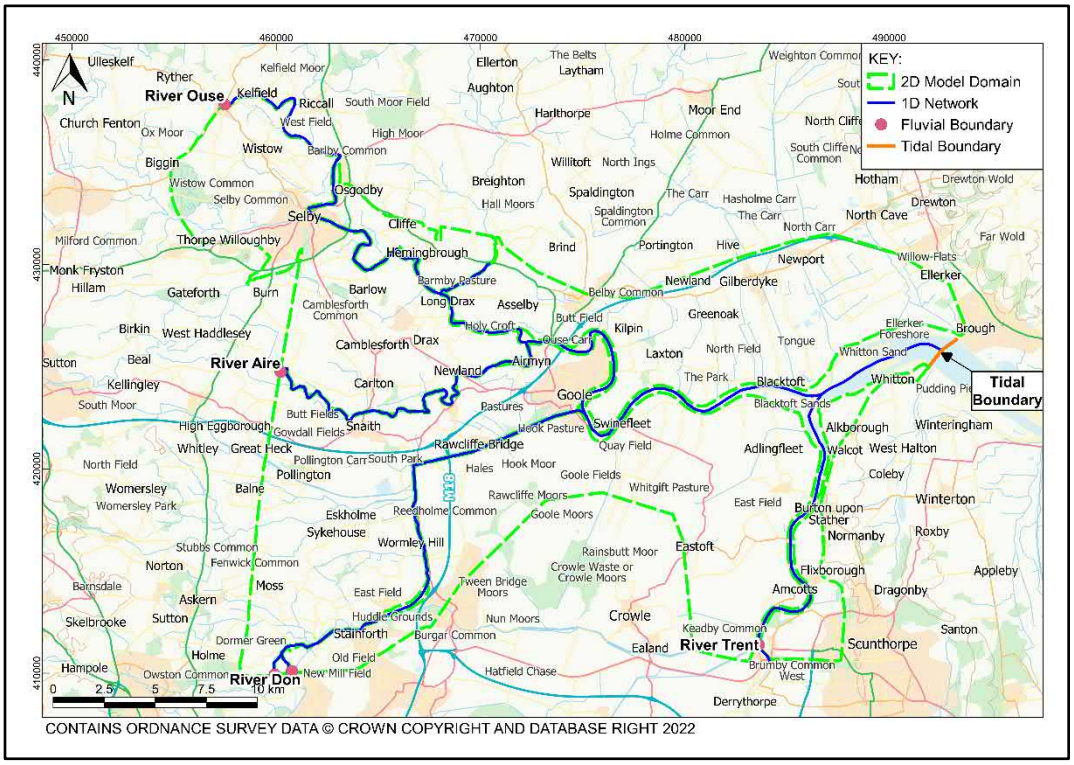


Plate 0.7 - Model boundary locations (fluvial and tidal) in the updated Upper Humber model

1.8. DEFENDED MODELLING

1.8.1. The defended scenario has been assessed using the Upper Humber model (JBA Consulting, 2016), with the revised inflows as detailed in the previous section. No requirement to modify the model parameters used in this model (channel data, defence network, bathymetry, roughness, etc) were identified as part of the consultation with the Environment Agency.

1.8.2. The defended model had been previously built based on a 24 m grid cell size. The grid resolution has been retained as deemed appropriate to capture the relevant flow conveyance paths in the floodplain whilst maintaining manageable simulation times and results file sizes. This has been refined through the incorporation of the most up-to-date Environment Agency filtered LiDAR data at 1 m resolution for the area covered by Drax Power Station Site which was used for the ground model input.

1.8.3. The defended model for the future day scenario (i.e. in year 2047) has been run for the flood events FT1, FT5, T, FD and FT2 to assess flood risk in this area. FT2 event has been selected as the design event and the remainder of the flood events have been used as a sensitivity assessment, with the Proposed Scheme protected from flooding during these events within the freeboard allowance.

1.8.4. FT2 event was selected as the design event as through consultation with the Environment Agency it was agreed that it is the most sensible scenario, given the location of Drax Power Station Site adjacent to the River Ouse which is dominant in this scenario.

1.9. BREACH MODELLING

1.9.1. A standalone ESTRY-TUFLOW model has been provided by the Environment Agency and modified to present a new breach location in the flood defence on a section of the right-bank of the River Ouse near Drax Power Station Site. The breach location was selected in agreement with the Environment Agency in December 2021. The inflows for the hydrograph are retrieved from the water level profile in the 1D/2D model simulation on the node CS46 which is immediately upstream of the breach location and used for both the FT1 and FT2 scenarios.

1.9.2. Flood events FT1 (results in the most significant flooding) and FT2 (the design event) have been modelled for the breach scenario as agreed with the Environment Agency in February 2022.

1.9.3. The breach has been modelled using the latest guidance provided by the Environment Agency5. The site visit confirmed that the flood defences at this location consist of earth embankments (**Plate 3.8**) and the modelling demonstrates that the River Ouse at this location is tidally influenced. Therefore, a breach width of 50 m has been represented in the model in accordance with the Environment Agency's breach guidance. The invert level of the breached defence has been set to the lowest ground level within a 50 m radius on the landward side of the structure (3.1 mAOD). The breach in the flood defence has started one hour prior to the in-channel flood peak which coincides with the time when the flood defence is breached in the model. The breach remained open for 30 hours, before being gradually closed over a one-hour period using a variable z-shape feature in TUFLOW. An 8 m grid resolution was adopted to represent key flow paths and the model was run for a total simulation time of 100 hours, after which time flooding is deemed to have considerably receded over the entire Order Limits.

[5] Breach of defences guidance (Environment Agency, 2017)

Plate 0.8 - Picture of the flood defences of the River Ouse taken during site visit undertaken on 22 February 2022

1.10. POST DEVELOPMENT MODELLING

1.10.1. It was agreed with the Environment Agency that post-development modelling was not required as the Proposed Scheme is located at the edge of large floodplain and the Proposed Scheme footprint is utilising the existing built footprint. Full details on the footprint balance are provided in the **FRA**.

1.11. MODEL RESULTS

BASELINE DEFENDED AND BREACH SCENARIO

1.11.1. The figures showing modelled flood extends, depths and hazards for baseline defenced and breach scenarios are shown in Appendix L of the **FRA**.

1.12. MODEL ASSUMPTIONS AND LIMITATIONS

1.12.1. The following bullet points summarise the main assumptions and limitations of this study:

a. The accuracy of the TUFLOW model is highly dependent on the accuracy of the topographical datasets which are used to build the Digital Terrain Model (DTM) for the model input. The best available information has been used, this is the Environment Agency's 1 m filtered LiDAR data. This has been utilised to form the basis of the DTM. It has been assumed that LiDAR data accuracy is adequate to suitably capture potential flow conveyance paths which may lead exceedance overland flows towards the site area;

b. The modelling methodology adopted for assessing breach scenario mirrors that used by the Environment Agency to assess a different breach location, which is approximately 2.6 km further downstream along the River Ouse;

c. A breach width of 50 m was assumed in the breach scenario model. This is in accordance with the Environment Agency's breach guidance that recommends the adoption of a 50 m breach width for the assessment of an earth embankment on a tidally influenced river; and

d. Model runs for defended scenarios were performed using two hydraulic models developed by the Environment Agency, namely the 1D/2D linked Upper Humber model (2016) and the 1D Humber EWL model (2020). No alterations were made to the two models, which were simply rerun using the revised climate change allowances that apply for the relevant set of design event scenarios and latest topographical data in the vicinity of the site.

1.13. MODEL RUN SUMMARY

DEFENDED SCENARIO

Model Run Parameters

Model Cell Size	24 m
Model run times	Start: 0 hrs End: 200 hrs
Timestep	1D ESTRY: 12s 2D TUFLOW: 12 Time series output interval: 900 s
2D run parameters	Default with the following changes: Double precision Map Output Format == XMDF Map Output Data Types == h V q d ZUK0 MB1 MB2 Maximums and Minimums == ON MAXIMUMS ONLY

Model Scenarios

Scenario	The defended baseline scenario has been run for the FT1, FT2, FD, T, FT5

TUFLOW Files	tcf: Humber_Defended_022_200H_CC_FT1_2046_ DTM_updated.tcf Humber_Defended_022_200H_CC_FT2_2046_DTM_updated.tcf Humber_Defended_022_200H_CC_FD_2046_DTM_updated.tcf Humber_Defended_022_200H_CC_T_2046_DTM_updated.tcf Humber_Defended_022_200H_CC_FT5_2046_DTM_updated.tcf Humber_Defended_022_200H_CC_FT1_ DTM_updated.tcf Humber_Defended_022_200H_CC_FD_DTM_updated.tcf Humber_Defended_022_200H_CC_T_DTM_updated.tcf Humber_Defended_022_200H_CC_FT5_DTM_updated.tcf tgc: Humber_Defended_018_CC_updated_dtm.tgc tbc: Humber_Defended_016.tbc ecf: Humber_Defended_022_200H_CC_FT1_2046_ DTM_updated.ecf Humber_Defended_022_200H_CC_FT2_2046_DTM_updated.ecf Humber_Defended_022_200H_CC_FD_2046_DTM_updated.ecf Humber_Defended_022_200H_CC_T_2046_DTM_updated.ecf Humber_Defended_022_200H_CC_FT5_2046_DTM_updated.ecf Humber_Defended_022_200H_CC_FT1_ DTM_updated.ecf Humber_Defended_022_200H_CC_FD_DTM_updated.ecf Humber_Defended_022_200H_CC_T_DTM_updated.ecf Humber_Defended_022_200H_CC_FT5_DTM_updated.ecf tmf: Humber_Defended_003.tmf

	results: Humber_Defended_022_200H_CC_FT1_2046_DTM_updated.xmdf Humber_Defended_022_200H_CC_FT2_2046_DTM_updated. xmdf Humber_Defended_022_200H_CC_FD_2046_ DTM_updated. xmdf Humber_Defended_022_200H_CC_T_2046_DTM_updated.xmdf Humber_Defended_022_200H_CC_FT5_2046_DTM_updated. Xmdf Humber_Defended_022_200H_CC_FT1_DTM_updated.xmdf Humber_Defended_022_200H_CC_FD_ DTM_updated.xmdf Humber_Defended_022_200H_CC_T_DTM_updated.xmdf Humber_Defended_022_200H_CC_FT5_DTM_updated.xmdf

Breach Scenario

Model Cell Size	8m
Model run times	Start: 0 hrs End: 100 hrs
Timestep	1D ESTRY: 20 s 2D TUFLOW: 4 s Time series output interval: 900 s
2D run parameters	Default with the following changes: Double precision Map Output Format == XMDF Map Output Data Types == d v h MB1 MB2 R ZUK0 Maximums and Minimums == ON MAXIMUMS ONLY

Model Scenarios

Scenario	The defended baseline scenario has been run for the FT1 and FT2

TUFLOW Files	tcf: Breach5_Cell4_Q200_Tidal_CC_FT1_inflow_V001.tcf Breach5_Cell4_Q200_Tidal_CC_FT2_inflow_V003.tcf tgc: Drax_Breach_Cell4_Q200_Tidal_CC_.tgc tbc: Breach5_Cell4_CC_FT1.tbc Breach5_Cell4_CC_V002.tbc tmf: Humber_Defended_004.tmf results: Breach5_Cell4_Q200_Tidal_CC_FT1_inflow_V001.xmdf Breach5_Cell4_Q200_Tidal_CC_FT2_inflow_V003.xmdf

APPENDICES

APPENDIX A - CONSULTATION WITH ENVIRONMENT AGENCY

AGENDA & MEETING NOTES

PROJECT NUMBER	EN010120	**MEETING DATE**	06 December 2021
PROJECT NAME	Drax BECCS DCO	**VENUE**	Virtual - Teams
CLIENT	Drax Power Limited	**RECORDED BY**	ES
MEETING SUBJECT	Modelling Approach		

PRESENT	Matthew Wilcock (EA) Andrew Pattinson (EA) David Piercy (EA) Jenny Blyth (Drax) Jim Doyle (Drax) Oliver Baybut (Drax) Andy Smith (WSP) Soledad Berbel Roman (WSP) Nicola Ashworth (WSP) Elzbieta Szostak (WSP)
APOLOGIES	Louise Markose (WSP)
DISTRIBUTION	As above
CONFIDENTIALITY	**Confidential**

ITEM	SUBJECT	ACTION	DUE
	Discussion on the modelling approach proposed by WSP and described in Flood Modelling Technical Note issued to the EA on 30th November 2021.		
	Andrew Pattinson (AP) advised that the proposed climate change tidal uplift calculated as described in the Technical Note is very conservative and in reality the tidal uplift for the Drax site can be less significant. Oliver Baybut (OB) asked AP if he can provide this revised tidal uplift so WSP can use it in the model. AP confirmed that he will provide the figures by the ned of the week.	AP to provide climate change tidal uplift figures which are to be used in the model	10/12/2021

	AP advised that the scenarios proposed to be run seem to be reasonable, but he will have to confirm that with the EA's Modelling Team.	AP to confirm the scenarios which are to be run with the EA's Modelling Team	ASAP
	EA confirmed that they agree with the proposed modelling approach described in the Technical Note.		

NEXT MEETING

An invitation will be issued if an additional meeting is required.

Drax BECCS Flood Modelling Technical Note

DATE:	08 February 2022	**CONFIDENTIALITY:**	Confidential
PROJECT NAME:	Drax BECCS DCO	**PROJECT NUMBER:**	EN010120
DOCUMENT NO. | REV. NO:	02	**DOCUMENT OWNER :**	WSP
AUTHOR:	Soledad Berbel Roman	**APPROVER :**	Louise Markose / Andy Smith
SUBJECT:	Humber Hydraulic Model Approach		

BACKGROUND

WSP has been appointed by Drax Power Limited to undertake a Flood Risk Assessment (FRA) and Environmental Statement (ES) to support the works for the proposed Bioenergy with Carbon Capture and Storage (BECCS) Scheme ('the Proposed Scheme') at Drax Power Station, North Yorkshire.

This Technical Note provides a description of the approach followed for the hydraulic modelling to support the FRA and ES for the Proposed Scheme. Considering the complexity of the scheme and based on the information provided by the Environment Agency (EA) during the recent consultation on December 6th 2021, WSP would like to seek an agreement with the EA on the modelling that has been carried out so far and next steps to ensure that it fits for purpose.

MODELLING APPROACH

CHANGE OF DESIGN LIFE

In our previous consultation with the EA on December 6th 2021 we agreed on the baseline modelling approach. It consisted in the combination of two existing hydraulic models; the Upper Humber (JBA Consulting, 2016) and the extreme water levels (EWL) (Jacobs Consulting, 2020). A design life of 60 years was established at that time, establishing the following climate change allowances:

- Upper end allowance (Epoch 2080s) for peak river flows based on the published current (October 2021) version of the Environment Agency's climate change allowances for schemes and strategies[3]:
  - 48% for the River Ouse catchment.
  - 51% for the River Aire catchment.
  - 60% for the River Don catchment, and
  - 62% for the River Trent catchment.
- Sea level rise uplift of 802.5 mm based on Environment Agency's climate change allowances for schemes and strategies[4].

The design life has moved now from 60 years to 25 years. Therefore, the following climate change allowances have been used under this scenario:

- Upper end allowance (Epoch 2050s) for peak river flows:
  - 29% for the River Ouse catchment.
  - 31% for the River Aire catchment.
  - 36% for the River Don catchment, and
  - 38% for the River Trent catchment.
- Sea level rise uplift of 252.6 mm based on Environment Agency's climate change allowances for schemes and strategies[4] (See Table 1).

Table 1 - Estimated See Level Rise considering 25 years design life

Years	Sea Level Rise (mm)
2017 - 2035	120.6
2035 - 2047	132
Total	**252.6**

REVISED ASSESSMENT SCENARIO

Based on the initial Proposed Scheme's design life span (60 years), the following flood events were agreed with the EA on December 6th 2021 to be run for the defended future day scenario (2121H):

Table 2 - Return periods obtained from Table G.2 – JP matrix 75-year to 200-year (Jacobs Consulting, 2020)

RP	Aire	Don	Ouse	Trent	Tidal	Event Type	ID
200	100	50	200	100	5	Mixed tidal/fluvial	FT1
200	5	2	10	5	100	Mixed tidal/fluvial	FT5
200	2	2	5	2	200	Tidal	T
200	200	200	200	200	5	Fluvial	FD

Model outcomes from the above flood events suggest that the Proposed Scheme is protected for the "tidally dominated" scenario (flood event named as "T") and for the mixed tidal/fluvial with a tidal boundary of 1 in 100 years return period (flood event named as "FT5"). Figure 1 and Figure 2 indicate the flood depths expected for these two flood events.

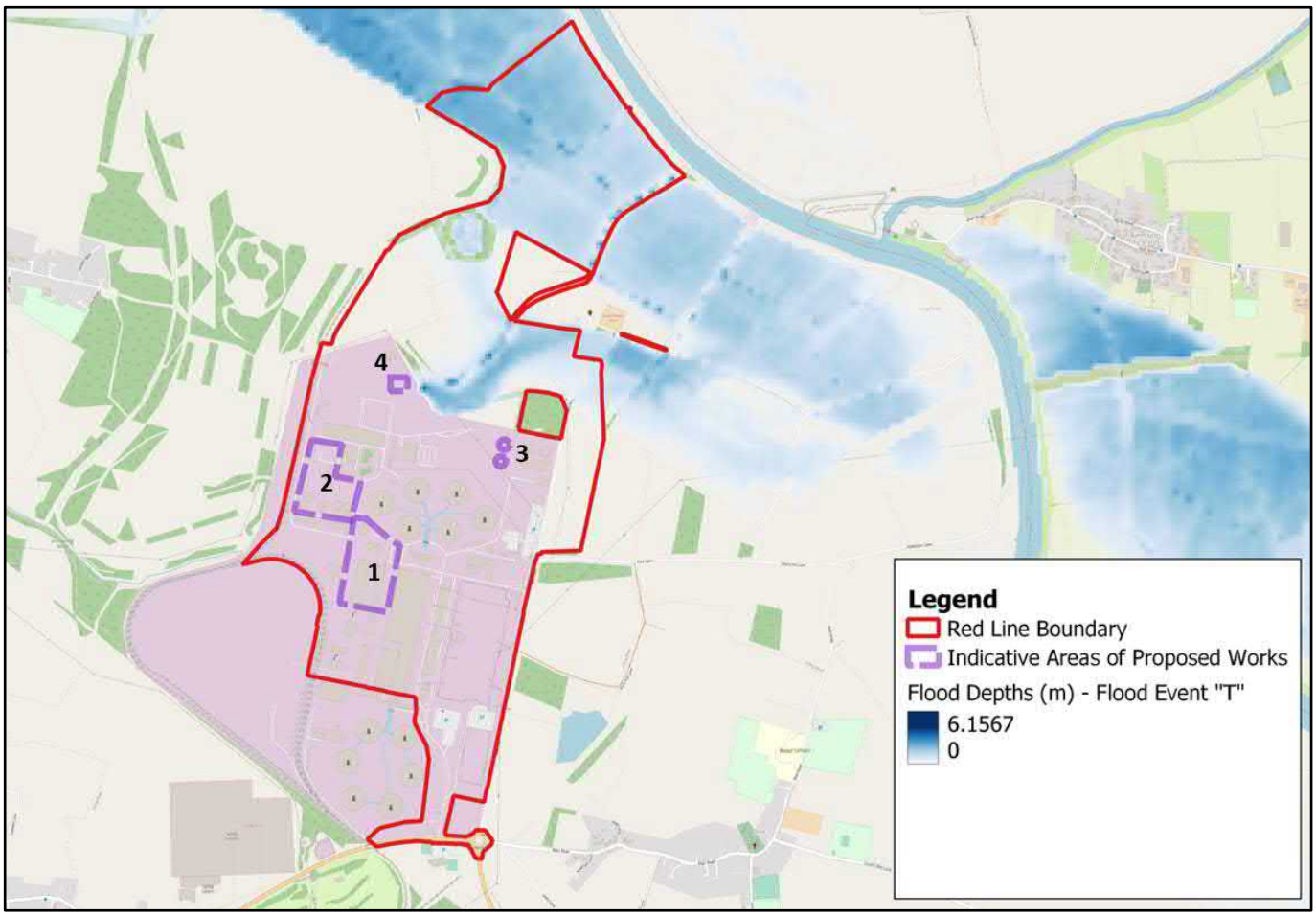


Figure 1 – Flood Depths defended future day scenario (2046H) – Flood Event "T"

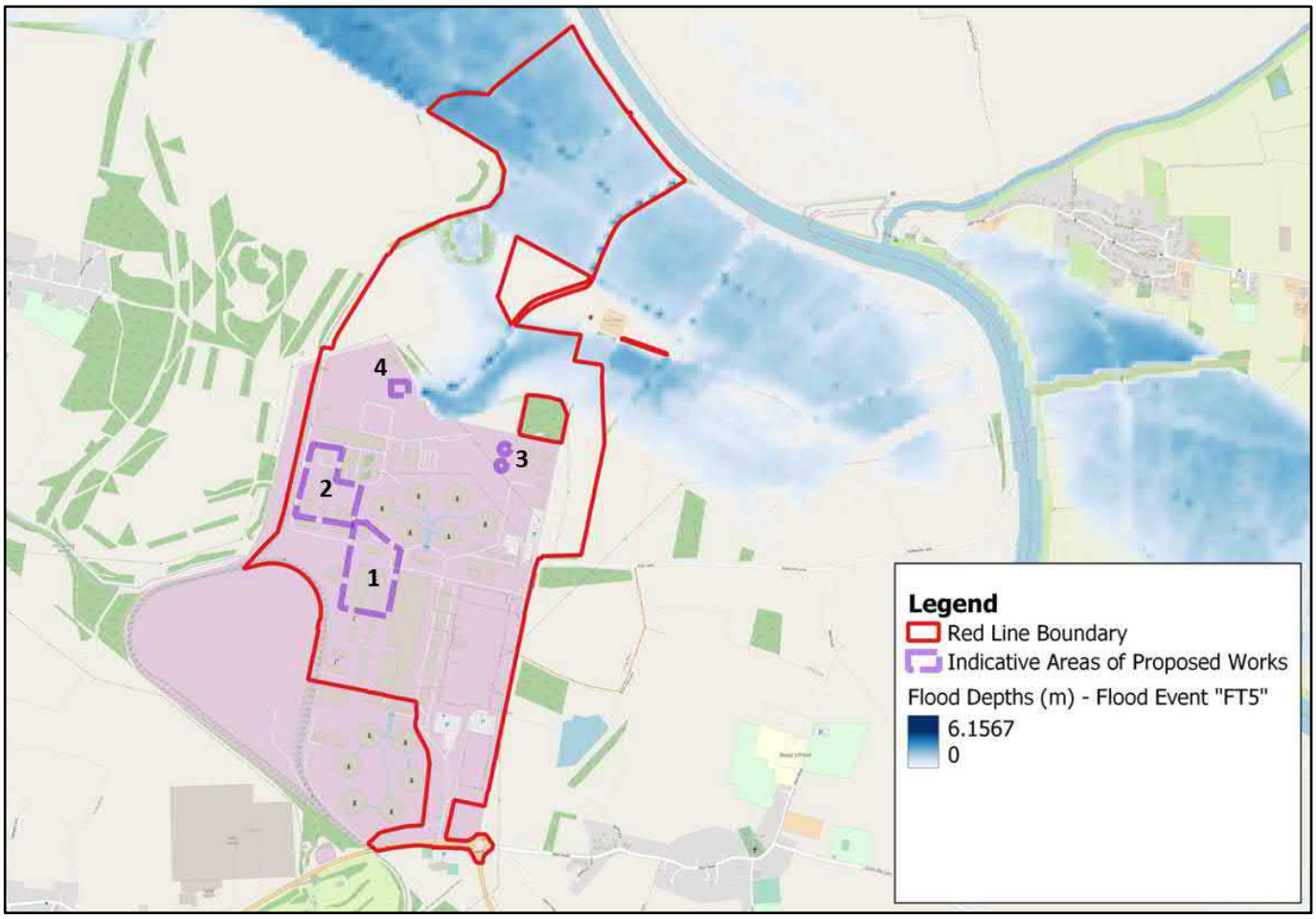


Figure 2 - Flood Depths defended future day scenario (2046H) – Flood Event "FT5"

It is deemed that the "fluvially dominated" scenario (flood event named as "FD") and the mixed tidal/fluvial with a return period of 1 in 200 years for the River Ouse (flood event named as "FT1") are not compatible with the definition of design flood in paragraph 55 of the Flood Risk and Coastal Change Planning Practice Guidance.

Therefore, in light of this, a new mixed tidal/fluvial design flood event with a return period of 1 in 100 years for the River Ouse (flood event named as "FT2") has been considered (See Table 3 and Figure 3). The previously agreed scenarios (flood events named "FD" and "FT1") will become a residual risk assessment, with the scheme protected from flooding during these events within the freeboard allowance.

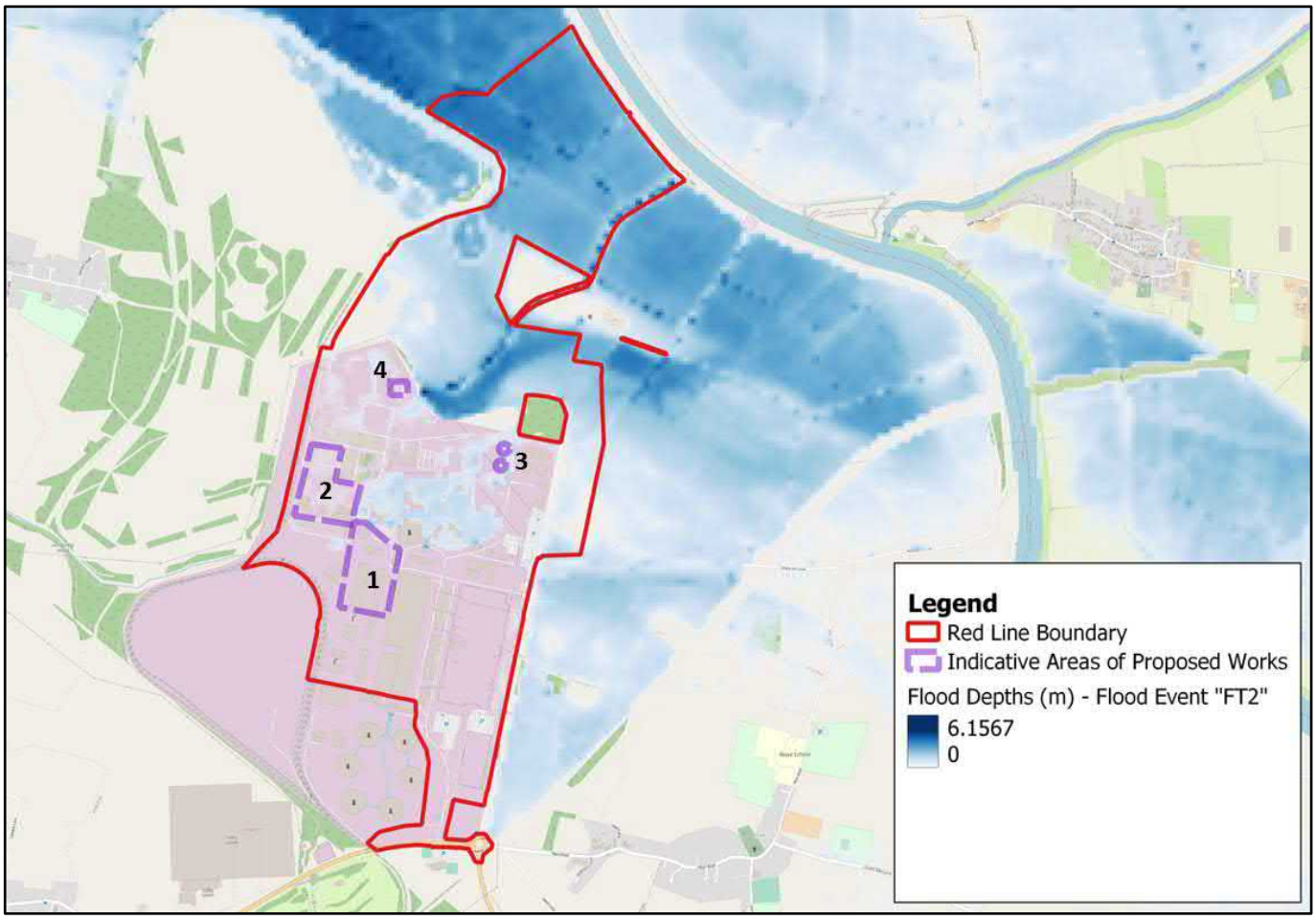


Figure 3 - Flood Depths defended future day scenario (2046H) – Flood Event "FT2"

The above figures show the following:

- No1 - Southern Development Parcel dry except a bunded tank
- No2 - Northern Development Parcel wet
- No3 - Sedimentation tanks – wet depending on flow routes
- No4 - AGI – wet but probably compatible depending on control panel / equipment design

Table 3- Additional Return period obtained from Table G.2 – JP matrix 75-year to 200-year (Jacobs Consulting, 2020)

RP	Aire	Don	Ouse	Trent	Tidal	Event Type	ID
200	50	20	100	50	10	Mixed tidal/fluvial	FT2

MITIGATION APPROACH

Based on the model outcomes from the design flood event (FT2) and residual risk flood events (FD and FT1) the following mitigation approach is proposed:

- It is expected that the total built footprint of the Proposed Scheme will remain equal to or less than the current area shown to be within flood Zone 3. Therefore, there will be no increase in flood risk offsite. Calculations demonstrating this are currently being undertaken and will be provided in the Flood Risk Assessment.
- Freeboard allowances will be confirmed with Drax. However, based on the modelling results it is expected that a freeboard between 300mm to 600mm will be sufficient to incorporate the level for the residual risk assessment.

RESIDUAL RISK

Impacts on site from residual flood risk will be managed by implementing the following:

- Above ground installation: Consultation on the design on going with National Grid will be carried out to identify the feasibility of plinth raising.
- BECCS Plant: buildings and plant platforms will be raised above FT2 flood event level. Flood risk is acceptable at the sedimentation tanks, however further assessment is required at the flow conveyance routes.
- Flood risk impacts are not expected on the rest of the Drax site.

No impacts offsite from residual flood risk are expected since there is no loss of floodplain.

NEXT STEPS

- Breach modelling for the FT2 and FT1 flood event scenarios is currently being undertaken.
- Residual risks from the breach scenario will be included within the Flood Risk Assessment.

AREAS OF DISCUSSION / AGREEMENT

- Changing the design event to FT2.
- Utilising current built footprints for no loss of floodplain and no offsite change.

Drax BECCS Flood Modelling Technical Note

DATE:	30 November 2021	**CONFIDENTIALITY:**	Confidential
PROJECT NAME:	Drax BECCS DCO	**PROJECT NUMBER:**	EN010120
DOCUMENT NO. | REV. NO:	01	**DOCUMENT OWNER :**	WSP
AUTHOR:	Soledad Berbel Roman	**APPROVER :**	Louise Markose / Andy Smith
SUBJECT:	Humber Hydraulic Model Approach		

BACKGROUND

WSP has been appointed by Drax Power Limited to undertake a Flood Risk Assessment (FRA) and Environmental Statement (ES) to support the works for the proposed Bioenergy with Carbon Capture and Storage (BECCS) Scheme ('the Proposed Scheme') at Drax Power Station, North Yorkshire.

This Technical Note provides a description of the approach proposed for the hydraulic modelling which will be carried out to support the FRA and ES for the Proposed Scheme. Considering the complexity of the information provided by the Environmental Agency (EA) during recent consultation, WSP would like to seek an agreement with the EA on the modelling approach to ensure that it fits for purpose.

In 2016 JBA undertook the hydraulic modelling of the Upper Humber[1] (including the 2016 climate change allowances) covering the tidal estuary and the rivers flowing into it which present have the potential to be a major source of flood risk to Drax Power Station.

In 2020 Jacobs undertook the modelling of extreme water levels (EWL)[2] for the whole Humber catchment to support a better flood risk management of the Humber 2100+ project and the wider needs of the Environment Agency and partner organisations.

A hydraulic modelling exercise including the latest 2021 climate change allowances is required to support the works at Drax Power Station associated with the Proposed Scheme. The proposed methodology to undertake this work is described in the following section.

MODELLING APPROACH

WSP has been provided with the following data:

- Hydraulic model of the Upper Humber (JBA Consulting, 2016);
- Hydraulic model of extreme water levels (EWL) (Jacobs Consulting, 2020);

[1] Ref. Upper Humber Flood Risk Mapping Study, JBA Consulting, August 2016
[2] Ref. Extreme Water Levels, Jacobs Consultancy Ltd, ENV0000300C-CH2-ZZ-3A0-RP-HY-0010.docx, November 2020

- Breach of defences guidance (Environment Agency, 2017).

The Upper Humber hydraulic model is a 1D-2D hydrodynamic model built using Flood Modeller Pro and TUFLOW. The model was built with the best available data at the time, however updated hydrology and climate change allowances have been released since the model was built. The EWL model is a 1D model built in Flood Modeller developed specifically for the Humber 2100+ project and calibrated to seven historical flood events, including the December 2013 tidal surge. It must be noted that the EWL model did not consider the latest 2021 climate change allowances.

It should be noted that WSP are presenting the modelling approach which includes the tasks required to complete the baseline modelling only. This is due to the Proposed Scheme design and potential mitigation required being unclear at the time of writing this note. Therefore, the proposed tasks to complete the baseline modelling to support the works at Drax Power Station are as follows:

- The 1D EWL model will be re-run and fluvial inflows derived from the 1D EWL model on the River Ouse, River Aire, River Don and River Trent at the top of the dark blue river branches and tidal boundary applied downstream of Spurn Point gauge will be applied to the 1D-2D Upper Humber model. Fluvial and tidal inflows will be applied at the locations shown in red in Figure 1 below:

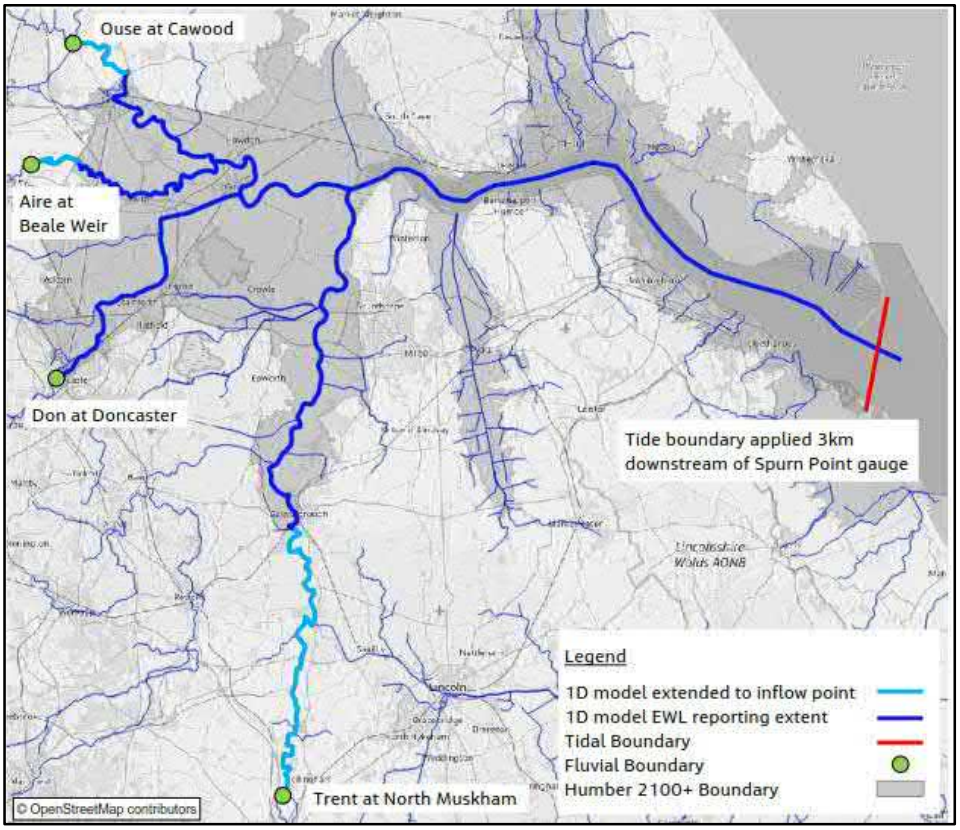


Figure 1: Model boundary locations (fluvial and tide) in the EWL model.

- Sea level rise allowances are derived based on the current UKCP18 climate change projections for the UKCP18 ”RCP 8.5” climate change scenario, in accordance with the recommendations in the current (July 2021) version of the Environment Agency’s climate

change allowances for schemes and strategies[3]. According to this, an uplift of 782 mm should be used for the Humber Estuary, Epoch 2080. Therefore, this uplift will be applied into the corresponding tidal boundary derived from the 1D EWL model.

- River flow allowances will be applied based on the published current (October 2021) version of the Environment Agency's climate change allowances for schemes and strategies[3] and flood risk assessments[4]. Fluvial flows will be increased by 23% for the Ouse and Aire catchments, 28% for the Don catchment and 29% for the Trent catchment in line with the Central estimate of climate change in the Humber Estuary for the 2080s.
- As the Proposed Scheme is classified as a nationally significant infrastructure project (NSIP) a sensitivity analysis will be carried out to assess the flood risk from a credible maximum climate change scenario. The H++ climate change allowance for sea level rise (1.9 m) and the upper end allowance for peak river flows will be used. Therefore, fluvial inflows will rise as follows:
  - 48% for the River Ouse catchment.
  - 51% for the River Aire catchment.
  - 60% for the River Don catchment, and
  - 62% for the River Trent catchment.
- The joint probability (JP) analysis undertaken in the EWL model has identified the JP type which produces the maximum levels. The blue dots represent the pure tidal event, red dots pure fluvial and the green dots show where the JP scenarios result in the maximum level. According to this, the section of the River Ouse in the proximity of Drax Power Station is tidally influenced for the present-day scenario (See Figure 2). However, this area is dominated by a JP event in the future day scenario (Figure 3).

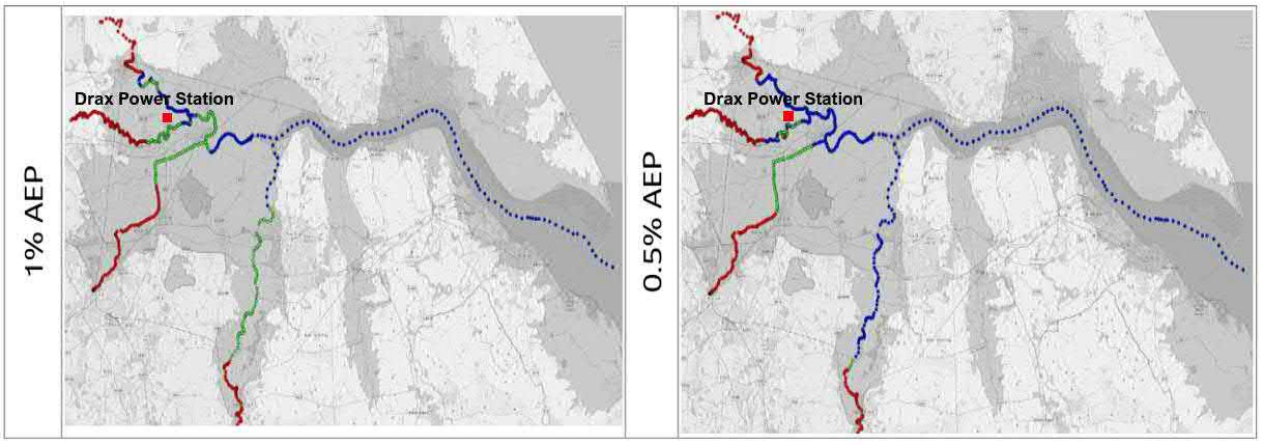


Figure 2: Event type which produces extreme water level – 2021H

[3] https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances#history

[4] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

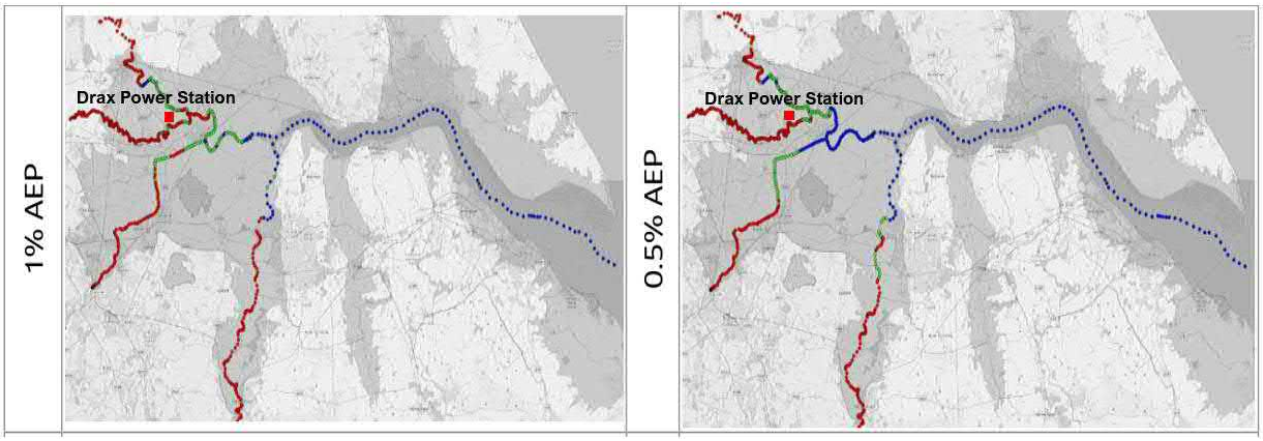


Figure 3: Event type which produces extreme water level – 2121H

Based on this analysis and the Proposed Scheme's design life span, the following events will be run for the defended future day scenario (2121H):

Table 1 - Return periods obtained from Table G.2 – JP matrix 75-year to 200-year (Jacobs Consulting, 2020)

RP	Aire	Don	Ouse	Trent	Tidal	Event Type	ID
200	100	50	200	100	5	Mixed tidal/fluvial	FT1
200	5	2	10	5	100	Mixed tidal/fluvial	FT5
200	2	2	5	2	200	Tidal	T

The above return periods will be run for the 2021 July climate change allowances described previously and for the H++ sensitivity analysis.

- Breach modelling of the flood defences is required to assess the greatest hazard to the Site. The breach location used previously for the Drax Repower project will be used since it was demonstrated at that time to provide the worst-case scenario in this area; the proposed location is shown in Figure 4.

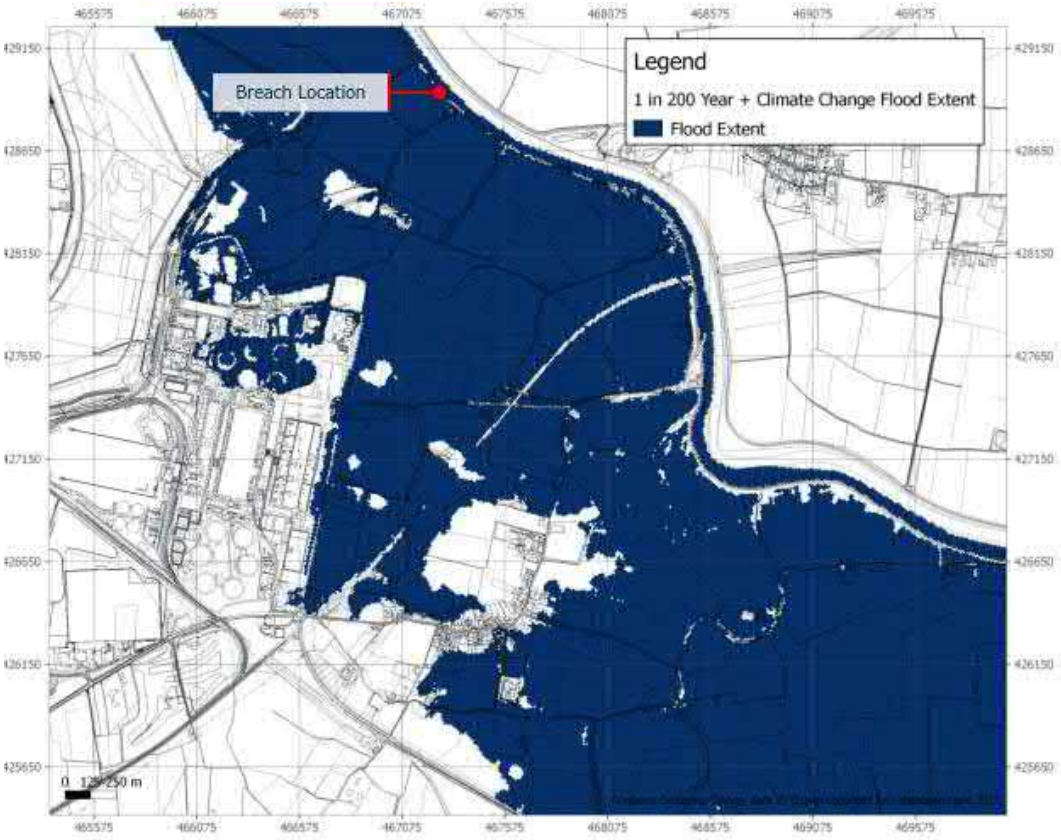


Figure 4: Breach of flood defences undertaken for Drax Repower Project.

- The breach model will be developed as a standalone TUFLOW model using the TUFLOW embankments from the Upper Humber defended model. The breach levels will be set up to the adjacent floodplain level for this location, with a width of 20 m in case of reinforced concrete banks and 50 m for earth banks according to Table 2 of the Environment Agency's breach of defences guidance[5]. A variable TUFLOW z-shape command will be used to close the breach after 72 hours.
- Water level results from the EWL model will be extracted at the nearest Flood Modeller node to the breach location. The event providing the highest water levels and flood extent for the defended future day scenario will be used to run the breach scenario. Water levels extracted from the EWL model node CS46 will be used as inflows for the breach scenario as shown in Figure 5.

Breach ID	Node ID EWL Model
Breach Repower	CS46

[5] Ref: Breach of Defences Guidance: Modelling and Forecasting Technical Guidance Note, Environment Agency, September 2017.

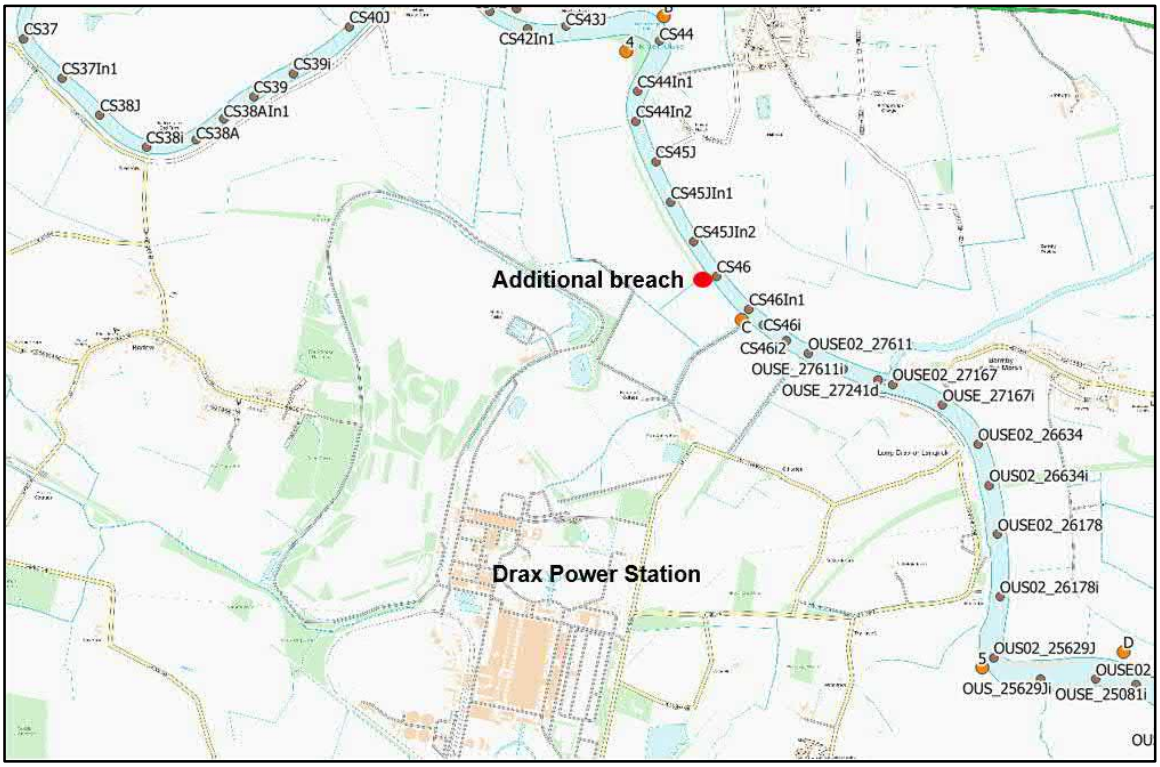


Figure 5: Location EWL model inflows and location of breach used for Repower project (additional breach).

- The breach will be set up to one hour before peak water levels at the Flood Modeller node adjacent to the breach location. To allow sufficient time for the floodwater to spread to its maximum extent, the breach model will be run for up to 200 hours.

AGENDA & MEETING NOTES

PROJECT NUMBER	EN010120	**MEETING DATE**	10 February 2022
PROJECT NAME	Drax BECCS DCO	**VENUE**	Virtual - Teams
CLIENT	Drax Power Limited	**RECORDED BY**	LM
MEETING SUBJECT	Baseline modelling results		

PRESENT	Andrew Pattinson (EA) Rachel Jones (EA) David Piercy (EA) Jenny Blyth (Drax) Christopher Summers (Drax) Jim Doyle (Drax) Andy Smith (WSP) Soledad Berbel Roman (WSP) Nicola Ashworth (WSP) Elzbieta Szostak (WSP) Louise Markose (WSP)
APOLOGIES	None
DISTRIBUTION	As above plus: Maria Marsh
CONFIDENTIALITY	**Restricted**

ITEM	SUBJECT	ACTION	DUE
1	**Introductions**		
1.1	**Flood Modelling Technical Note 08-02-22** Soledad (SBR) led the discussion on the modelling approach proposed by WSP and described in the Flood Modelling Technical Note issued to the EA on 8th February 2022. Main areas to seek agreement on are: • Changing the design event to FT2. • Utilising current built footprints which are to be demolished for no loss of floodplain and no offsite change. R Highlighted that the proposed design life has changed from 60 years to 25 years and outlined the revised climate change approach:		

	• Upper end allowance (Epoch 2050s) for peak river flows: • 29% for the River Ouse catchment. • 31% for the River Aire catchment. • 36% for the River Don catchment, and • 38% for the River Trent catchment. • Sea level rise uplift of 252.6mm based on Environment Agency's climate change allowances for schemes and strategies. AP asked about the rational for reduced lifetime of the development. JD outlined that the 25-year design life will take Drax beyond the 2050 net zero target set out by the government. It doesn't seem rational to extend the design life beyond that. AP highlighted that with the 25 years it is quite short time and will get asked on it at the examination. JD said it was the same as the Keadby project. AP asked if after 25 years the infrastructure will be removed? JD stated that he doesn't think we can make that assumption. We did not expect Drax Power Station to be operating into the 2020s given when it was built. JD stated that the buildings are likely to be there, but BECCS Scheme is not expected to be operational after 25 years At this stage it is not anticipated that the buildings will be repurposed for other uses or technology. However, if it is the case, appropriate mitigation measures will be designed and implemented. AP advised that if the buildings will remain, the mitigation needs to be reassessed for beyond 25 years. AS replied that that it has already been considered as aspects of the modelling was also carried out for the 60 year design life. AS WSP will take this point away and discuss with the Drax team to see what they are willing to commit to beyond the 25 years lifetime. *AP Make it clear in the FRA that we have considered the extended lifetime, considered the increased flood risk in the future and we haven't mitigated but we have considered how we may mitigate it. Also outline the uncertainty around climate change. We have an extra 20-25 years to see how the river flows may change.* AP advised that there are similar schemes which retrofit mitigation. AP stated that adaptive approach should be followed. Evidence needs to be provided that the mitigation is feasible to be implemented after 25 years if it is required. May have a condition or separate legal agreement that in 25 years need to re-look at the flood risk. Delay the decision and mitigation until more information is available.		

	AP Easington Gas terminal has been in place since 1990s and recently been renewed (a couple of years ago). Humber Hull Frontages (EA led scheme) was in place a 5 years ago. AS Lincolnshire Lakes is an example. AP to ask colleagues about how the conditions were put in. *AP regarding managed adaptations need to demonstrate at the outset that adaption is reasonably possible at a later time. So it doesn't look like we are proposing something that is impossible.* *Action to look at the refresh Easington is on East Riding Planning Portal.* *EA happy that the lifetime can be 25 years if we can demonstrate how we will make the scheme safe after 25 years.* AP confirmed that WSP have used the Upper Climate Change allowances for peak river flow which are recommend being used as a sensitivity test. More normally the central and higher central allowances would be used. Therefore, the modelling has been carried out adopting a precautionary approach so in theory WSP have assessed a longer lifetime for a more likely climate change scenario. *Recommend outlining this approach in the FRA.*	AP to action WSP to action	
2	**Flood Design Events** SBR outlined the revised assessment scenarios. AS outlines that the FD is an extreme scenario. The area is fluvially dominated so some of the design events should be used for sensitivity and some for the design life. SBR WSP reviewed the Upper Humber Extreme Water Level Model and we consider FT2 scenario as the revised design flood event and the other events as a sensitivity test. AP the design flood PPG guidance says generally for a fluvial dominated area the 1% design event is used and generally 0.5% for a tidally dominated area. The EA use the word generally rather than specifically. The EA use the guidance to inform that where there is a tidal influence then the 0.5% should be used. So the design event for the scheme is 0.5% AEP event. AS overall in joint probability terms the scenario is still tidally dominated (100 year on the Ouse, 10 year tidal, 1 in 20 year on the Don, 1 in 50 year on the Aire). Thus, we are still assessing the 1 in 200 year event it's just how it is made up. AP the FT2 scenario is the most consequential? AS no it's the most pragmatic, the most consequential is FD scenario which has been proposed to be used as a sensitivity test.		

	Given the chance of all those events happening at the same time is quite rare. The Ouse being in a 200 year flood is not appropriate given its a fluvially dominated scheme. AP stated that the table showing the different scenarios in the Humber Extreme Water Level Model report was carried out by the framework consultant and has gone through QA, hence the FD scenario cannot be ruled out as it has been considered as potential scenario that may happened. AP advised that if the FD scenario is discounted as a design event, evidence needs to be provided that this scenario has been somehow considered in the design. LM we need a single design flood event. AP FT2 scenario is acceptable as a design flood event and seems a sensible approach. As fluvial flooding on the Ouse is the dominant event and the site is on the River Ouse. AP agreed that the following scenarios are used in the assessment: • FT2 Design Event; • FT1, FT5, T, FD will be used as a sensitivity test.		
2.1	**Mitigation** **<u>Floodplain compensation</u>** AS we are still working on the mitigation, but what appears likely is that the existing footprint of the buildings will be more than what is going to be developed as part of the scheme. SBR presented the flood maps with the indicative footprints of the Proposed Scheme. The Proposed Scheme consists of Above Ground Installation (AGI), the southern area and the main area in the west is where we are most interested, and the modelling is showing flood depths of 200mm for FT2 and up to 600mm for other scenarios. Cooling towers are outside of the scheme and have their own drainage channels which the flood waters would just top up. Within the main area of works (western part of the Scheme) there are several existing buildings that will be demolished and pipes that will be above ground level, as well as areas that are bunded. So if we were not to do anything those buildings would already be there and in the floodplain so if we replace with the same or less footprint we will not be displacing any of the floodplain storage. AP confirmed that no compensation will be required if it can be proved that the footprint of demolished solid buildings/bunded areas are equal or less than the footprint of the proposed solid buildings. No change in floodplain displacement in Flood Zone 3 is expected by the EA. AP advised that if there is a floodplain displacement, come back to the EA to talk about what is an acceptable change.		

	AS stated, that we will show total footprint currently and total footprint the future (pre and post-development). DP confirmed that it is a sensible approach. AP also advised that it would need to be demonstrated that those existing buildings which are to be demolished do not flood. The existing guidance states that it has to be a solid building that does not flood. AP advised that it is referenced in PPG – Solid Buildings and Infrastructure and it is linked with functional floodplain and how to define it. AS stated that we will have a think about how best to demonstrate this once we have done the calculations, noting that it is possible to flood proof these buildings now under permitted development rights and thus they would be classed as being flood free. AP advised that post-development modelling may not be required if the footprint balance can be justified. AP advised that the following potential flood compensation are to be considered: - Residual risk – breach scenario -volume for volume compensation is expected beyond any increase in built footprint; - Sensitivity test – need to consider displacement of hazard, change in hazard band, change in speed in onset or change in a local planning allocation. AS stated that Drax BECCS is not located in a major flow route so we should not have a change in flood hazard, onset, so hopefully we will not see a major change. AP agreed with that statement. Hopefully you can balance the footprint so any change will be negligible and therefore do not need to continue to model something on the fringes of the floodplain. AS stated that then we do need to be concerned about the change in hazard as the buildings changing very marginally on the edge of the floodplain. AP agreed with that statement. **Freeboard** AS advised that the mitigation will be provided by either replacement of the buildings or put the sensitive infrastructure on plinths raised above the envisaged flood levels. AS advised that the freeboard may not be exactly 600mm, we may use some of the other extreme modelling to set the freeboard. AP advised that there is a new guidance on freeboard allowances “Accounting for Residual Uncertainty”, which includes a fluvial freeboard update. AP confirmed that WSP local knowledge is more		

	appropriate for the Proposed Scheme, than the guidance. *Should reference this new guidance in the report, but also state that we are using local knowledge on understanding of risk and depths to set the freeboard. Rather than using the wider guide which may mean we need to look at 900mm.* Make sure we state why we have not followed that guidance. AS stated that the proposed freeboard will not be a standard 300mm or 600mm freeboard. AS we have insight into that from the other modelling done. AP agreed. The floodplain depths are not going to change significantly. AS advised that the slab levels for sensitive infrastructure are proposed to be set at flood levels envisaged for the FT2 design scenario plus freeboard, providing that the other sensitive test flood levels are under that. AP confirms that this is an acceptable use of freeboard. AP so all the scenarios that have been run are within the residual risk levels? AS this still needs to be determined, but this is the thought process at the moment. Also accounting for the practicalities of operation side of the site. AP have you got an insight on the breach modelling what are the modelled depths? SBR we are currently running the model for FT2 and FT1, but the results have not been reviewed prior to the meeting. It looks like the levels of FD is the worst case. This will be confirmed.		
	Breach assessment AS stated that it is proposed to do the breach on FT1 and FT2 scenarios. FT1 scenario is very similar to FD scenario. Results have not yet finished but that is where the direction will be. AS asked if the EA agree that breach scenario is more of a residual risk rather than the design flood event and that will not be used to set platforms and plinth levels. AP advised that evidence will have to be provided that the Scheme is operational during breach or it can be shut down safely and people can be evacuated to higher grounds. If the elements of critical infrastructure can be put on plinths then it can be dealt with in a practical way. JB explained that Above Ground Installation (AGI) consist of pipes coming up from the ground. CS confirmed that they are just pipework		

	which water would not affect. CS also stated that there will be a small kiosk which can be mitigated if needed. JB highlighted that there are 3D models to show to the EA which would help with understanding the scheme. AS stated that just before or just after the FRA is submitted, we can have a call with the EA to help explain the scheme and help interpret the FRA. CS explained the scheme compressor buildings likely to be raised up to protect the plant in the building. East of the compressor buildings there will be a bunded tank storage farm. There will also be a number of switch rooms that sit elevated from ground level. The high-level pipe rack is raised. Which links to the AGI. JB / CS the site is raised slightly around 6m AOD. The bulk of the infrastructure is not going to be affected. CS stated that once we the flood levels are known we can look at the infrastructure and buildings and consider the protection to ensure they do not flood. AP confirmed that the approach is acceptable. AP confirmed that there are no significant concerns at the moment on the scheme. AS stated that there is not much time left to prepare for the DCO submission, and Drax/WSP may have to come back with an addendum to the FRA once it is submitted. AP asked if a statement of common ground (SoCG) been put together. AS advised that we are in the process of developing it. JB advised that it the SoCG is planned to be submitted to PINS at the end of April. AS stated that a further discussion with EA may be needed to close out remaining issues. AP stated that would be useful to have a discussion on the SoCG. RJ confirmed that the EA have not seen it. Action for WSP to determine when it will be appropriate to share it with the EA. **Modelling Review** AP advised that the modelling results presented to date are not showing any significant unusual results. But as its DCO and FZ3 the model needs to go through a review. In the SoCG it should be stated that this review will happen but that the EA are comfortable with the results.		

	AP advised that the modelling does not seem unexpected, the breach results may show a little bit more. *Agree in the statement of common ground that the results don't look unexpected. That the EA is broadly in agreement with the results and that a formal model review needs to be carried out. This can be done in the 6 months after submission, pre hearings with a view to seeking agreement.* AS to send the Statement of Common Ground to RJ at the EA for agreement. *AS we will be in touch on the building footprint and the breach results perhaps as a one page technical note so there are no surprises when the applications lands.*		

APPENDIX B – RESULTING INFLOW HYDROGRAPHS OF VARIOUS EVENTS DERIVED FROM HUMBER EWL MODEL

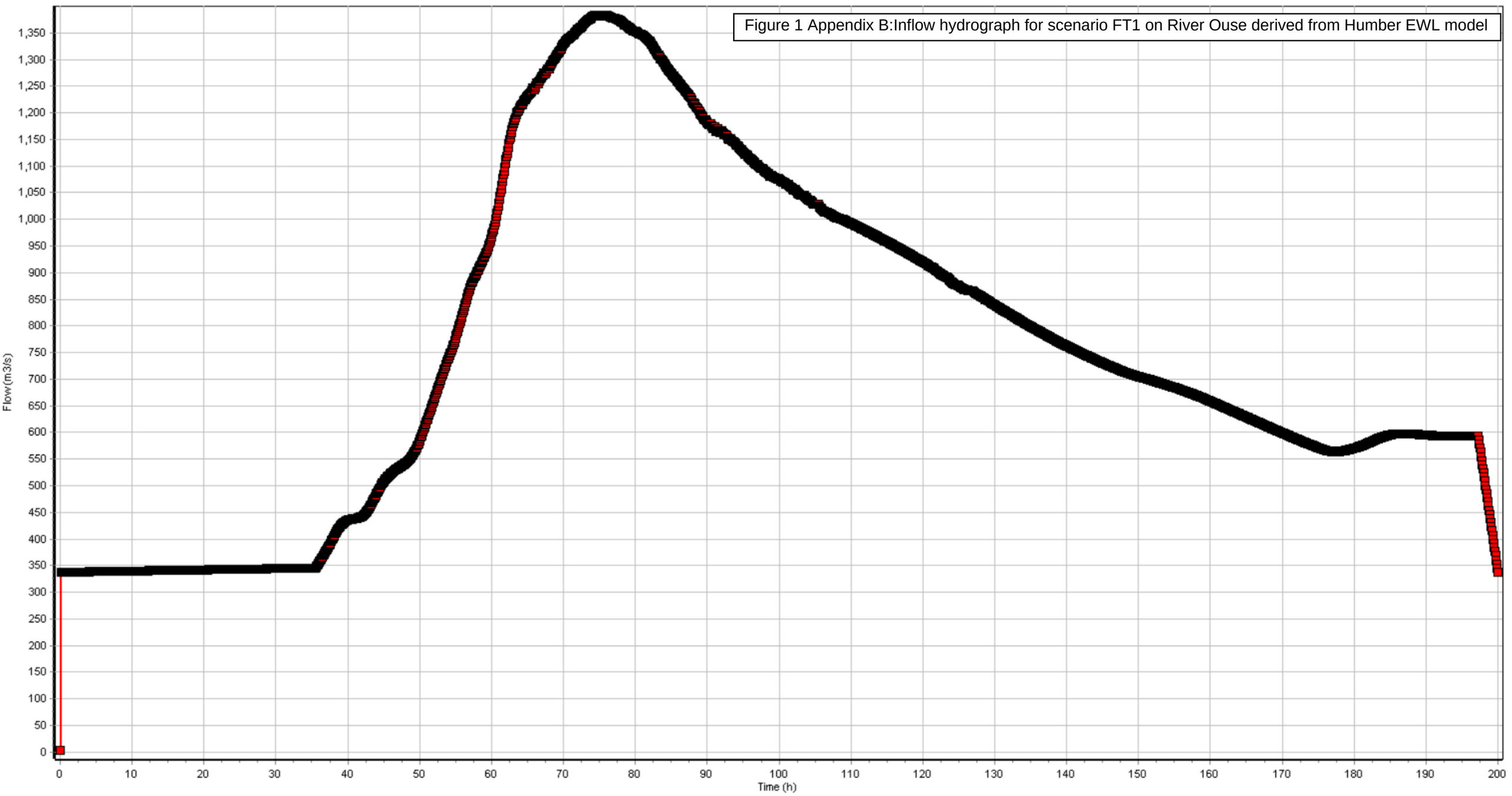


Figure 1 Appendix B:Inflow hydrograph for scenario FT1 on River Ouse derived from Humber EWL model
Flow (m3/s)
1,350
1,300
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Time (h)

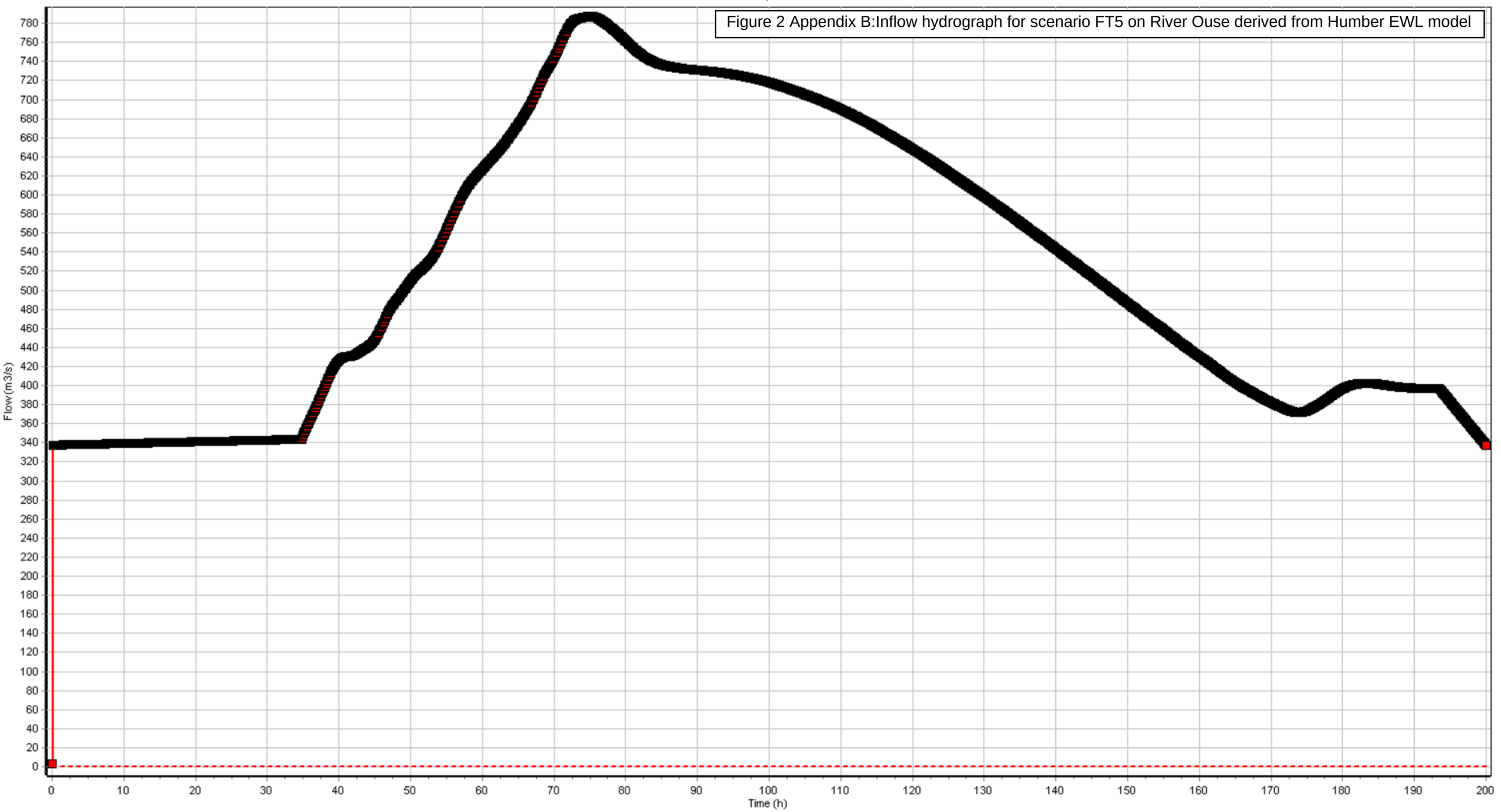


Figure 2 Appendix B:Inflow hydrograph for scenario FT5 on River Ouse derived from Humber EWL model

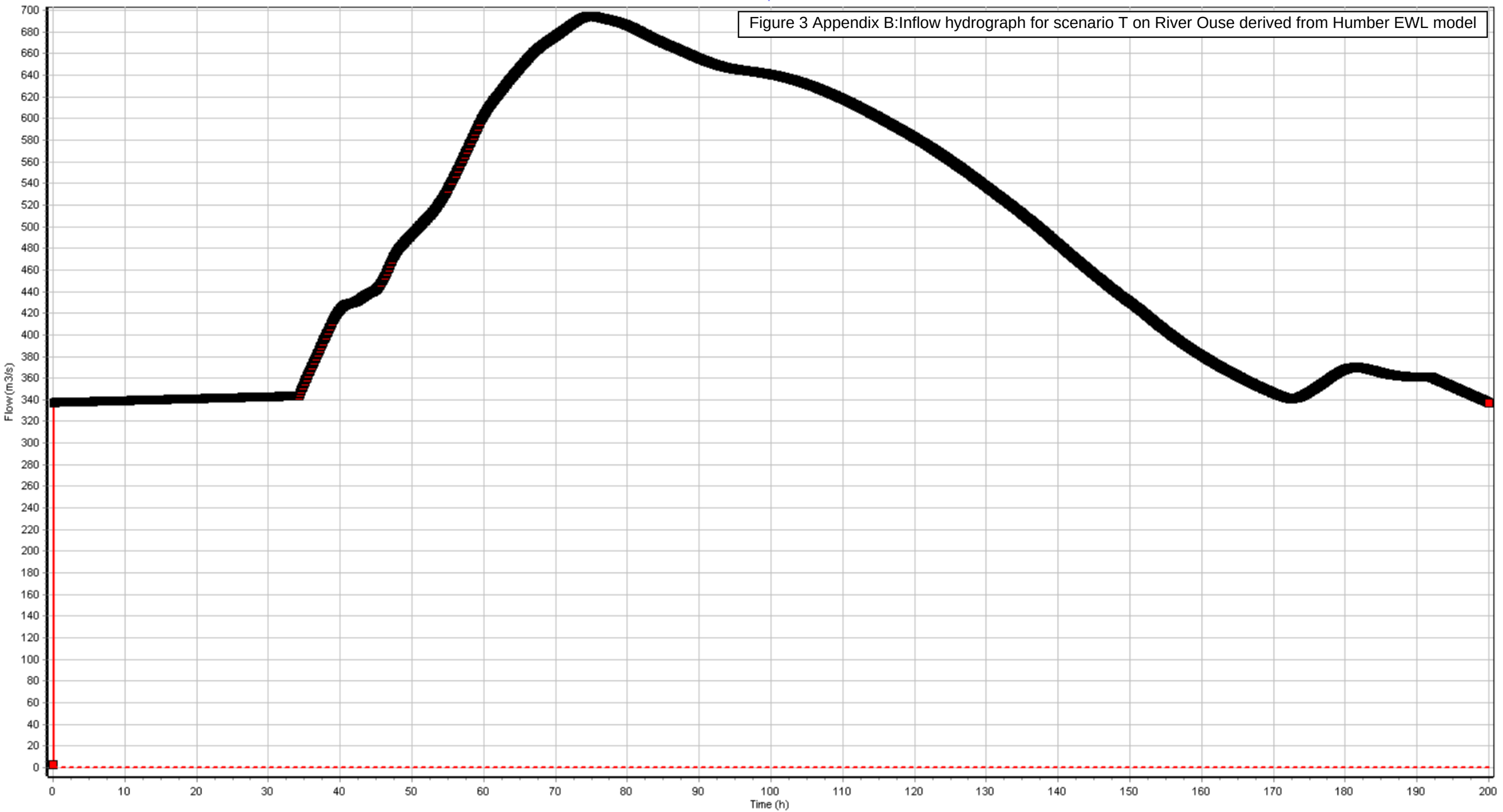
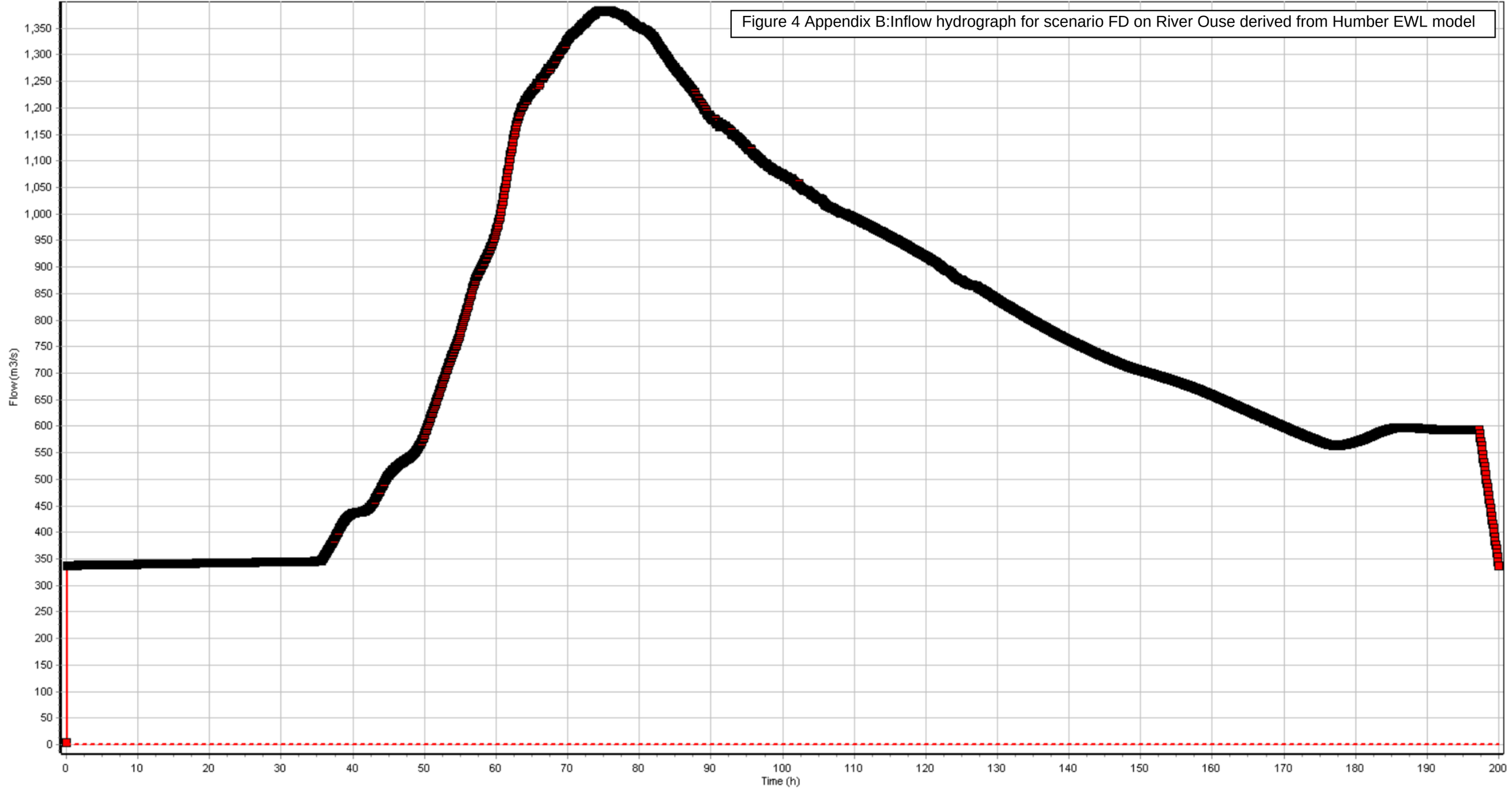


Figure 3 Appendix B:Inflow hydrograph for scenario T on River Ouse derived from Humber EWL model

Figure 4 Appendix B:Inflow hydrograph for scenario FD on River Ouse derived from Humber EWL model



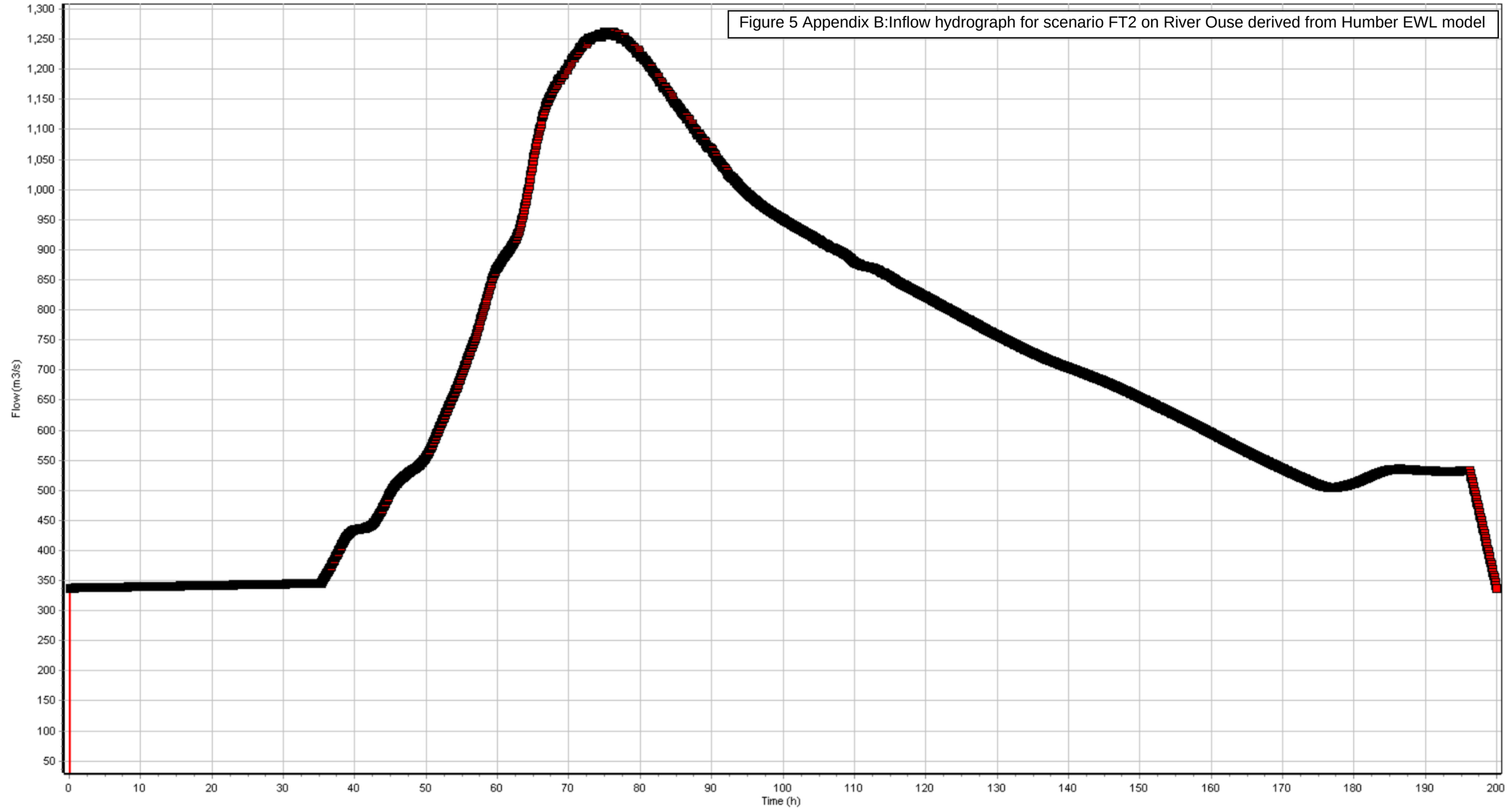


Figure 5 Appendix B:Inflow hydrograph for scenario FT2 on River Ouse derived from Humber EWL model

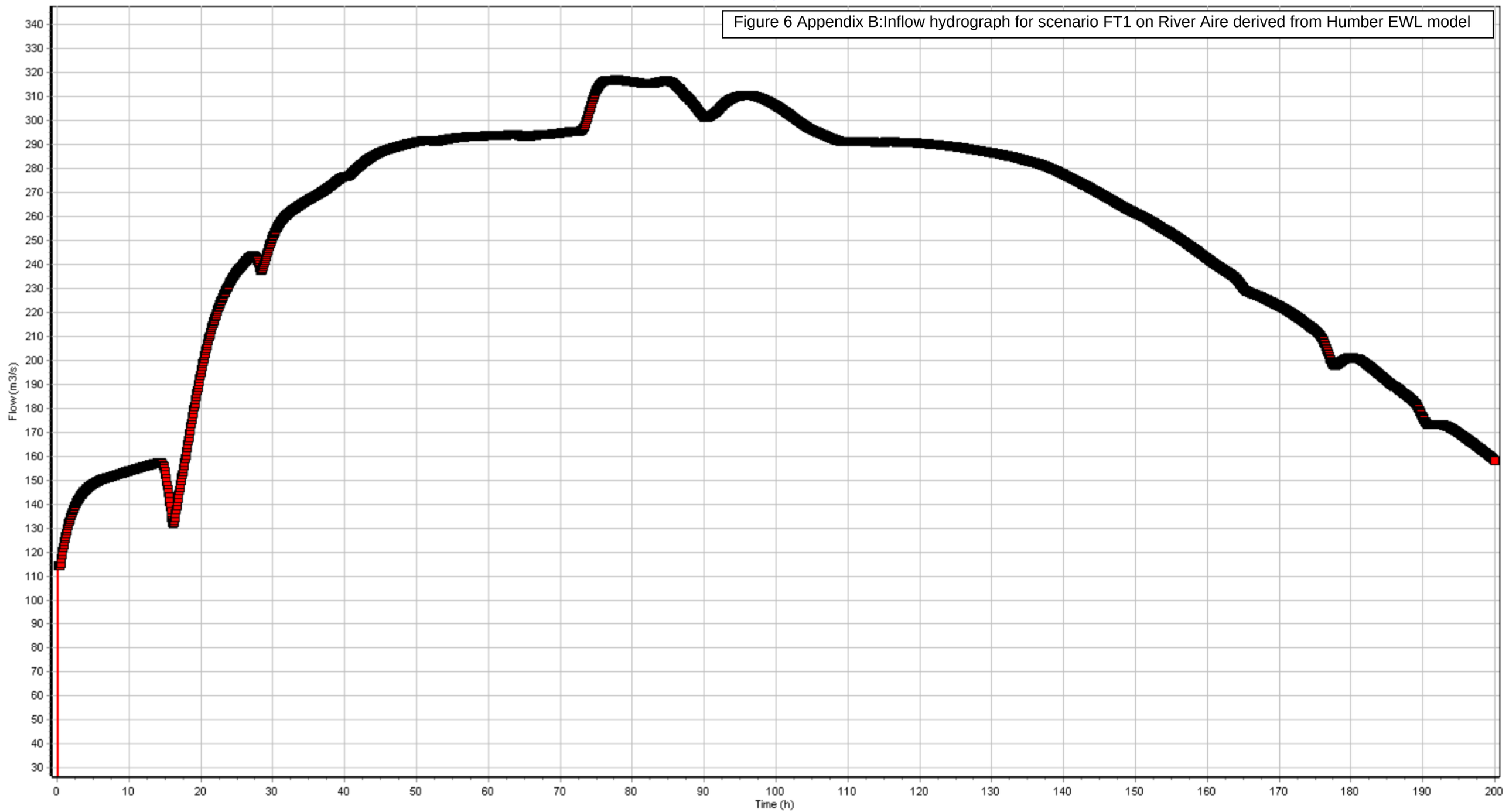


Figure 6 Appendix B:Inflow hydrograph for scenario FT1 on River Aire derived from Humber EWL model

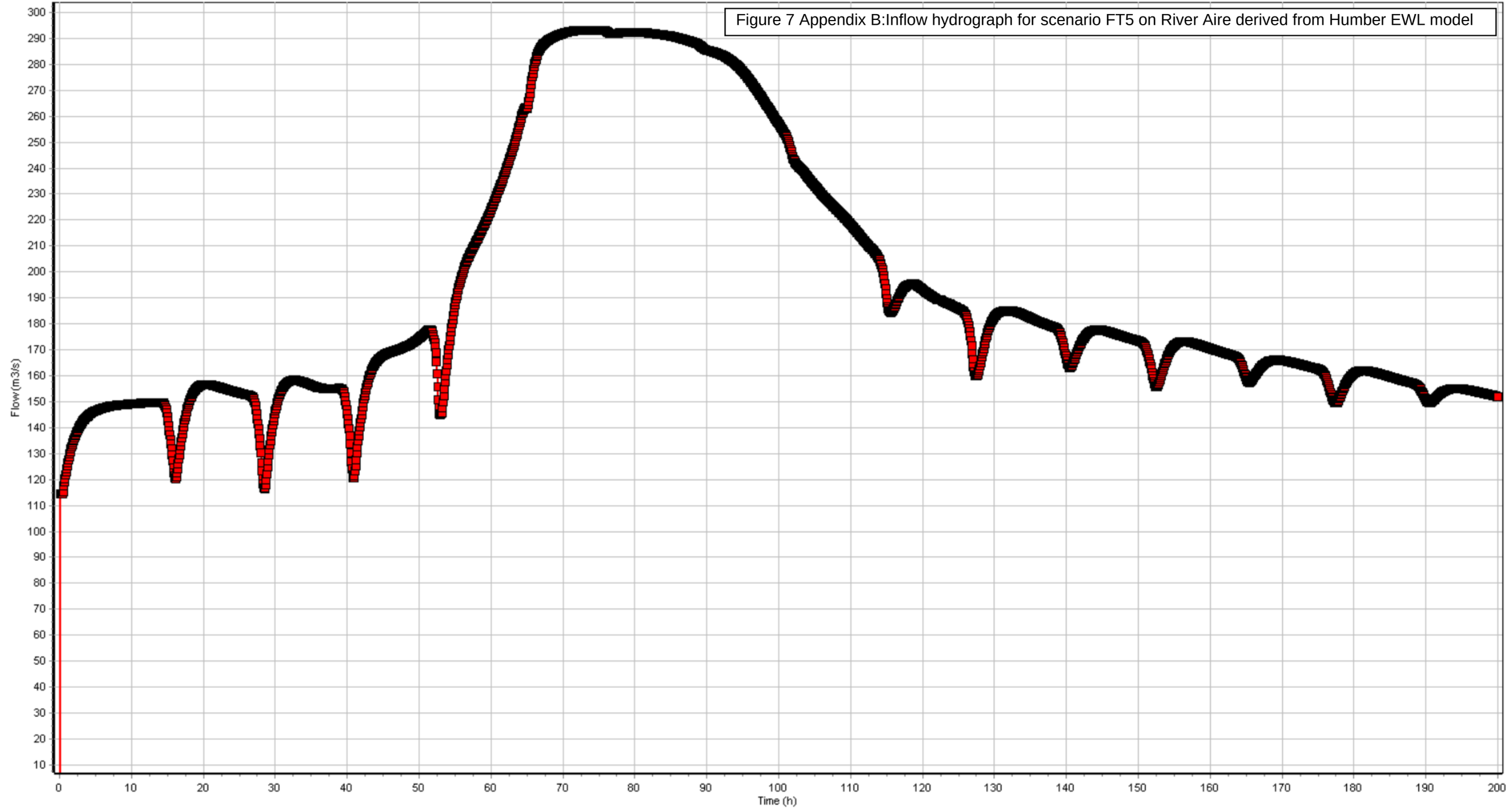


Figure 7 Appendix B:Inflow hydrograph for scenario FT5 on River Aire derived from Humber EWL model

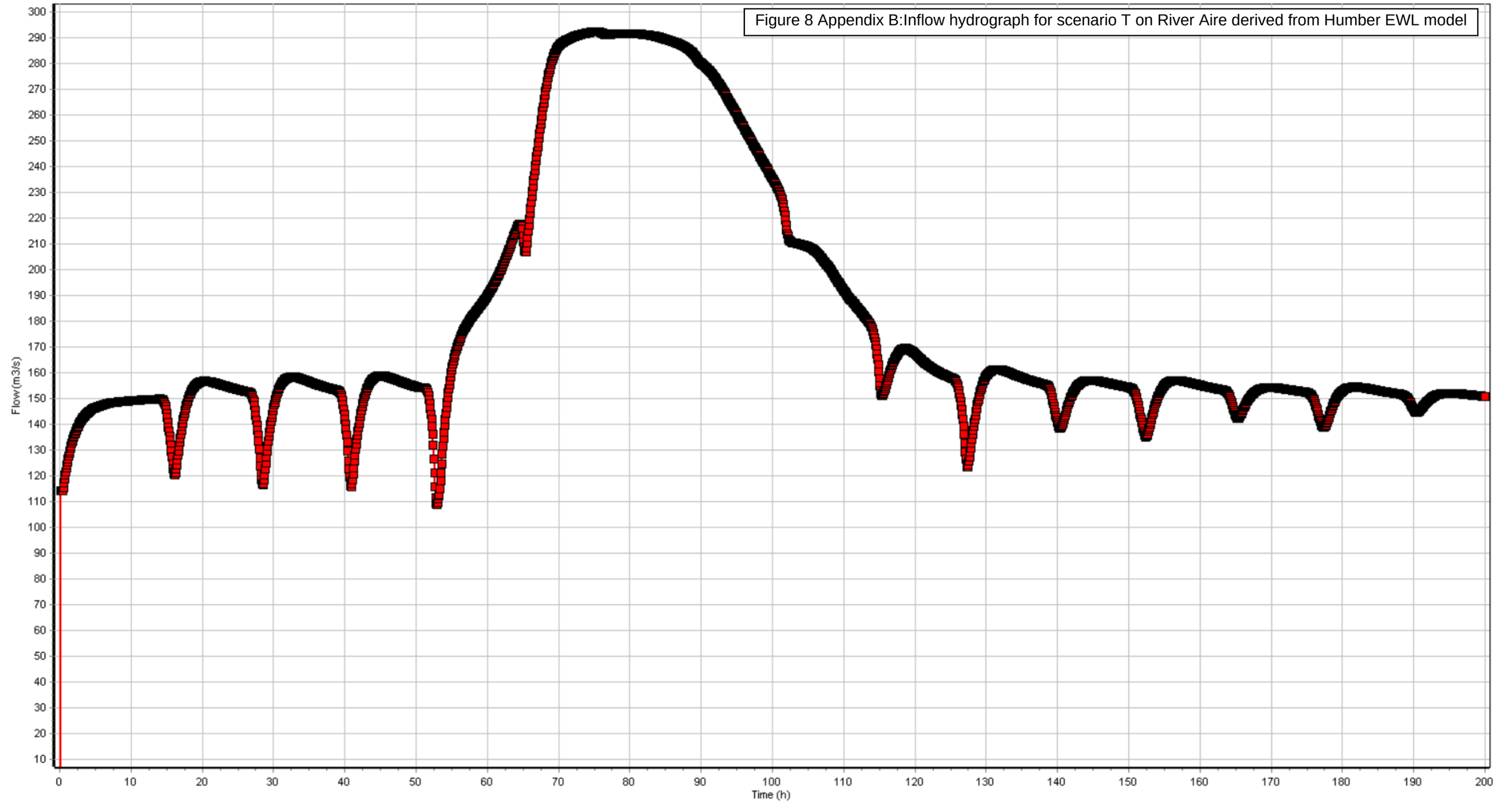


Figure 8 Appendix B:Inflow hydrograph for scenario T on River Aire derived from Humber EWL model

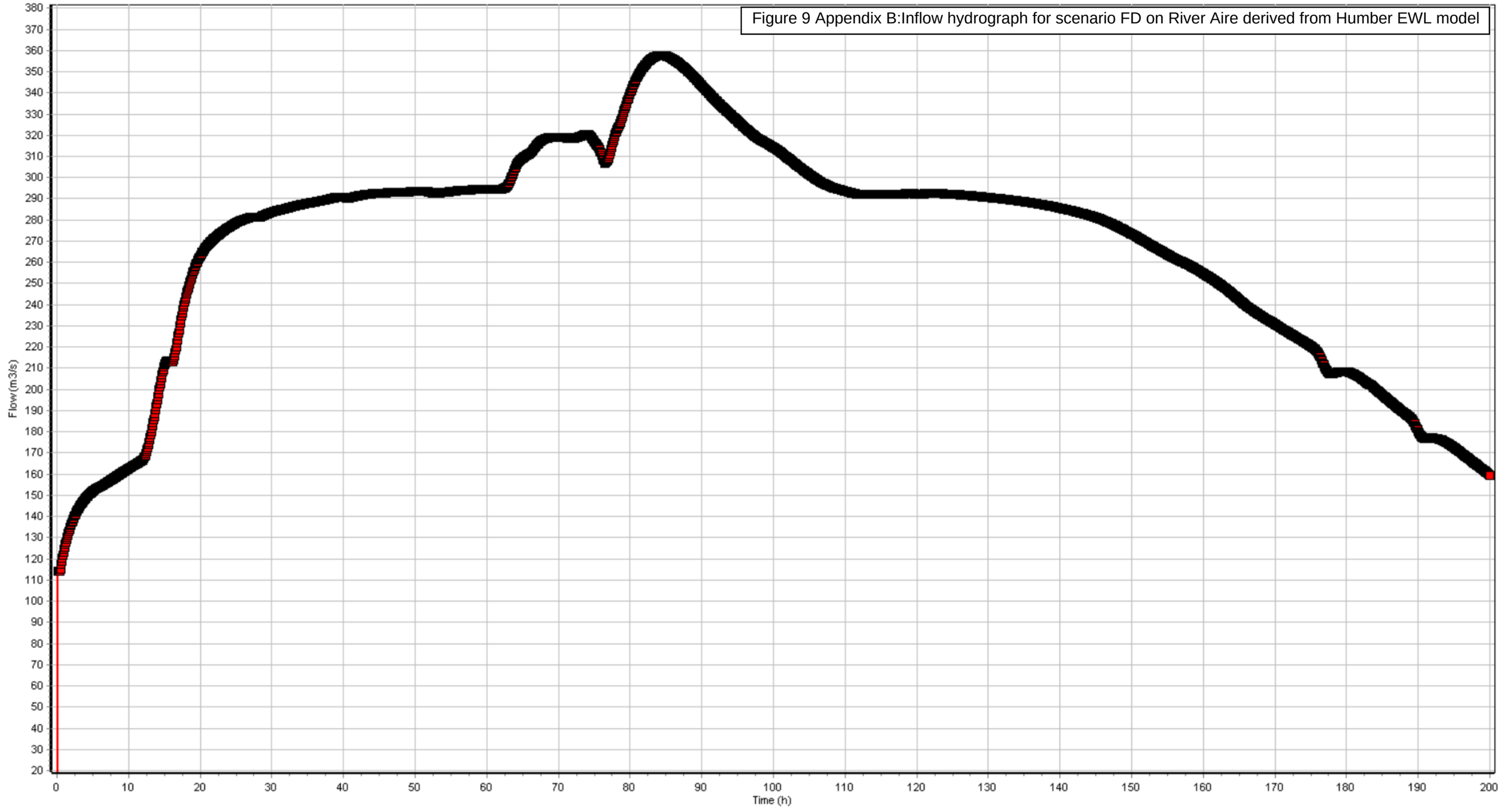


Figure 9 Appendix B:Inflow hydrograph for scenario FD on River Aire derived from Humber EWL model

Figure 10 Appendix B:Inflow hydrograph for scenario FT2 on River Aire derived from Humber EWL model

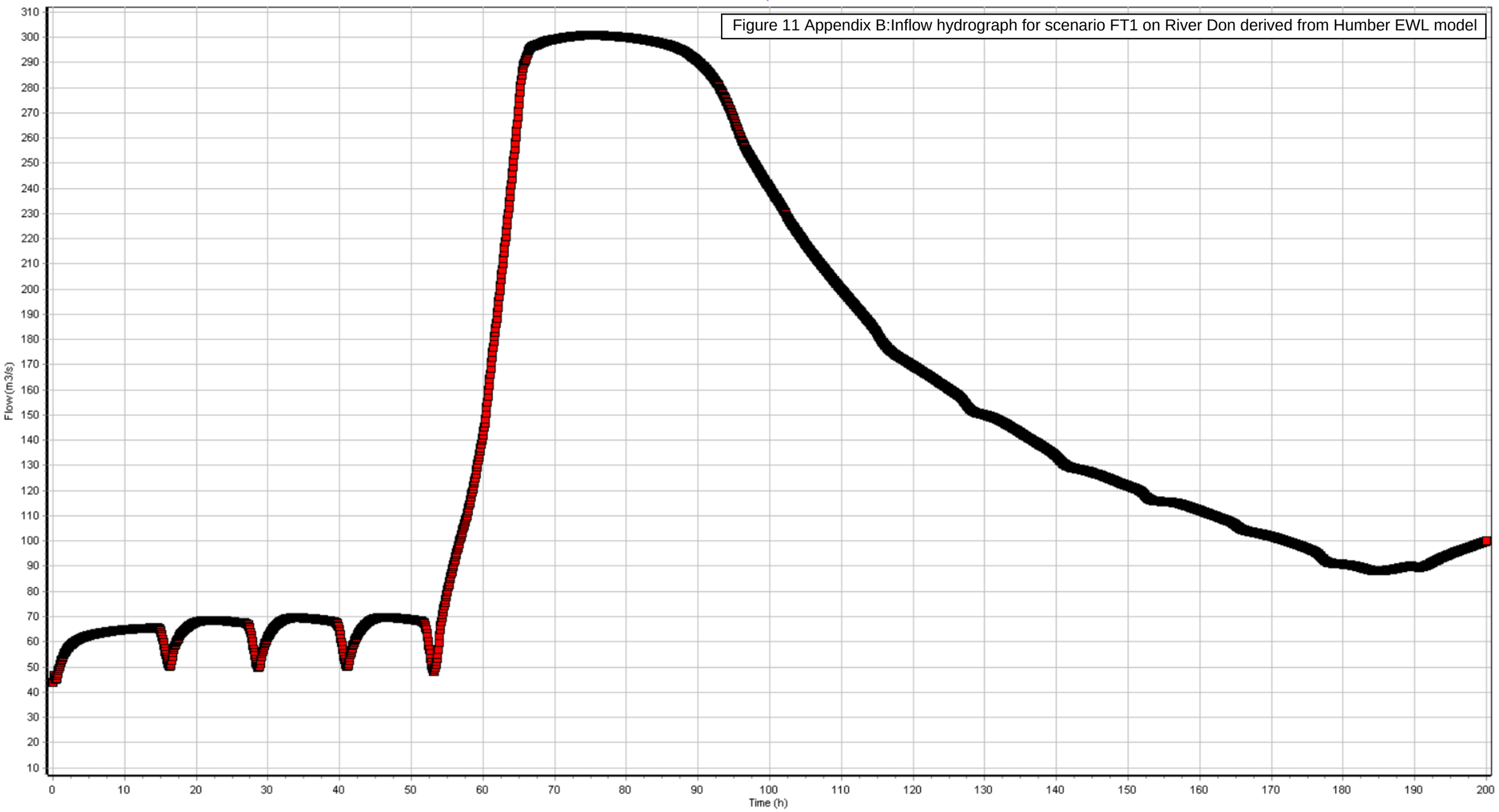


Figure 11 Appendix B:Inflow hydrograph for scenario FT1 on River Don derived from Humber EWL model

Figure 12 Appendix B:Inflow hydrograph for scenario FT5 on River Don derived from Humber EWL model

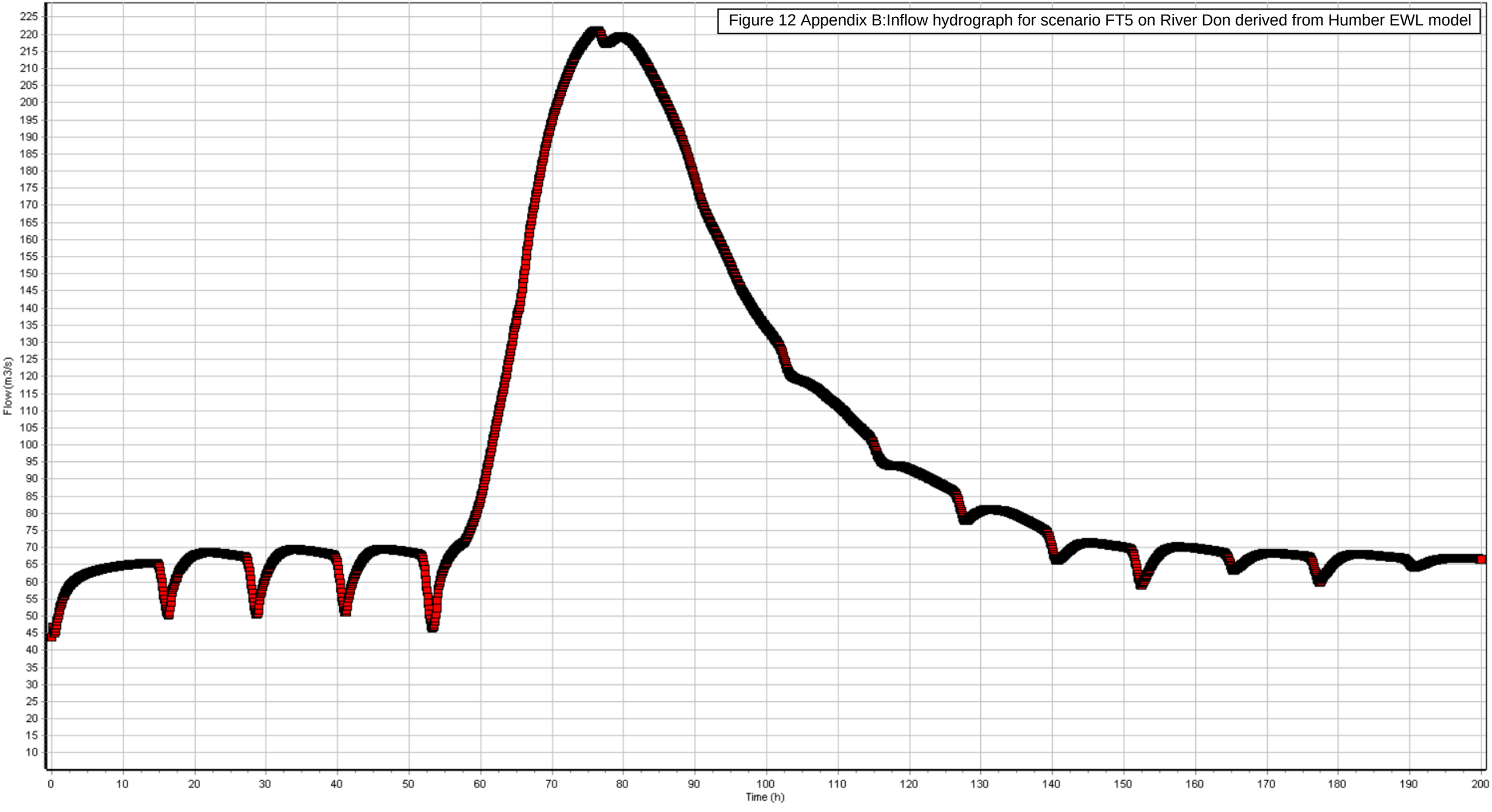


Figure 13 Appendix B:Inflow hydrograph for scenario T on River Don derived from Humber EWL model

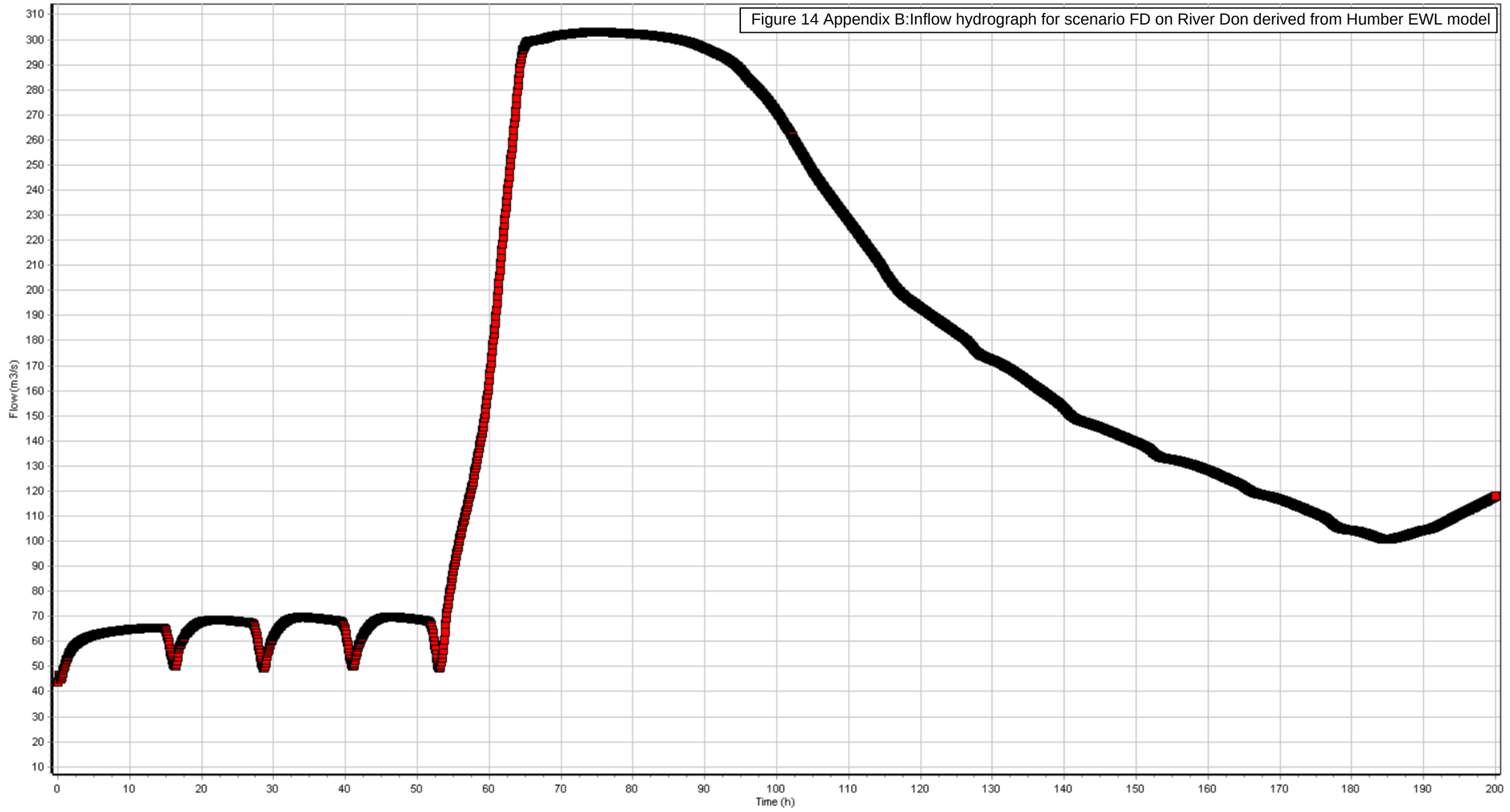


Figure 14 Appendix B:Inflow hydrograph for scenario FD on River Don derived from Humber EWL model

Figure 15 Appendix B:Inflow hydrograph for scenario FT2 on River Don derived from Humber EWL model

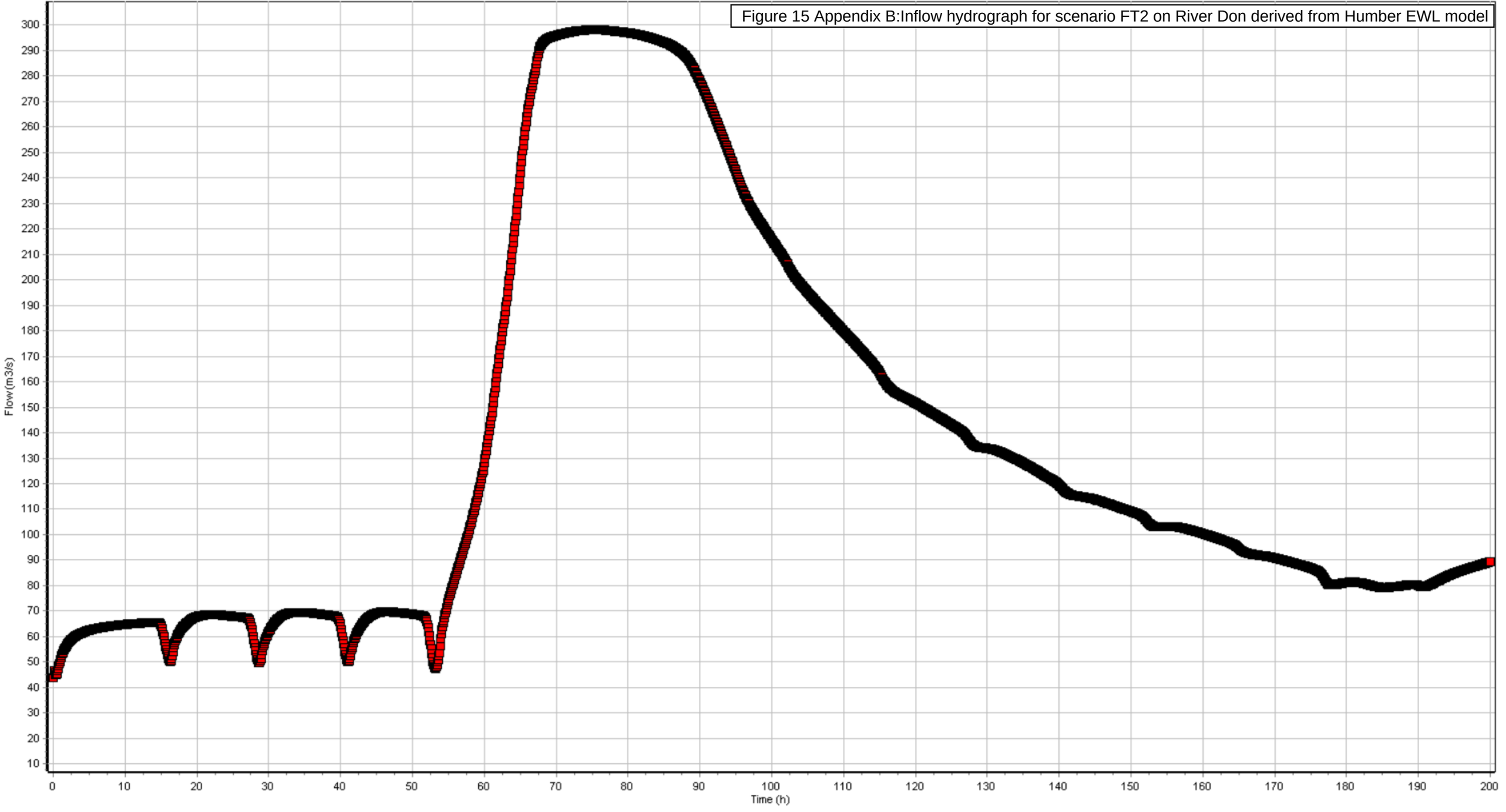


Figure 16 Appendix B:Inflow hydrograph for scenario FT1 on River Trent derived from Humber EWL model

Figure 17 Appendix B:Inflow hydrograph for scenario FT5 on River Trent derived from Humber EWL model

Figure 18 Appendix B:Inflow hydrograph for scenario T on River Trent derived from Humber EWL model

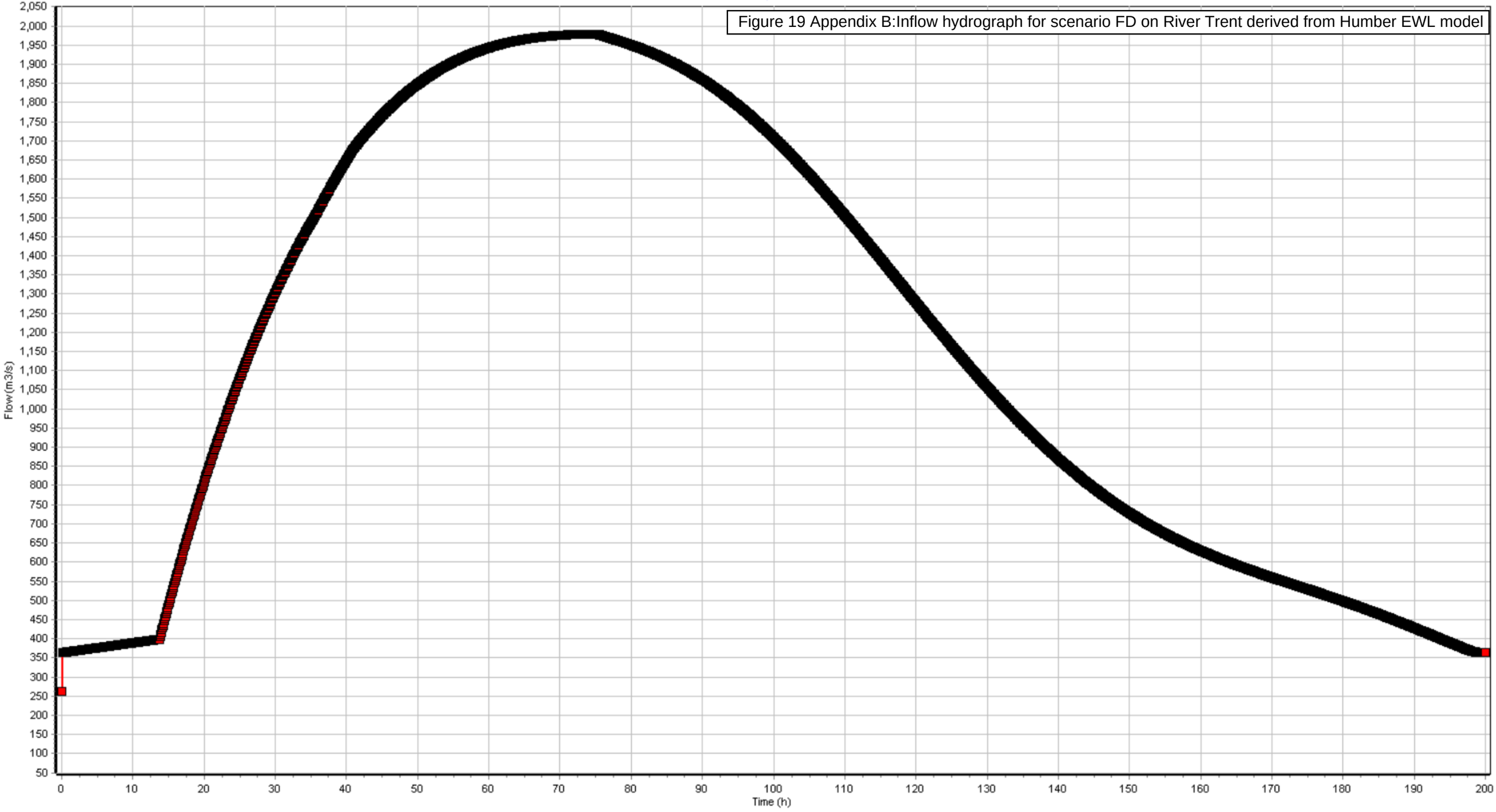


Figure 19 Appendix B:Inflow hydrograph for scenario FD on River Trent derived from Humber EWL model

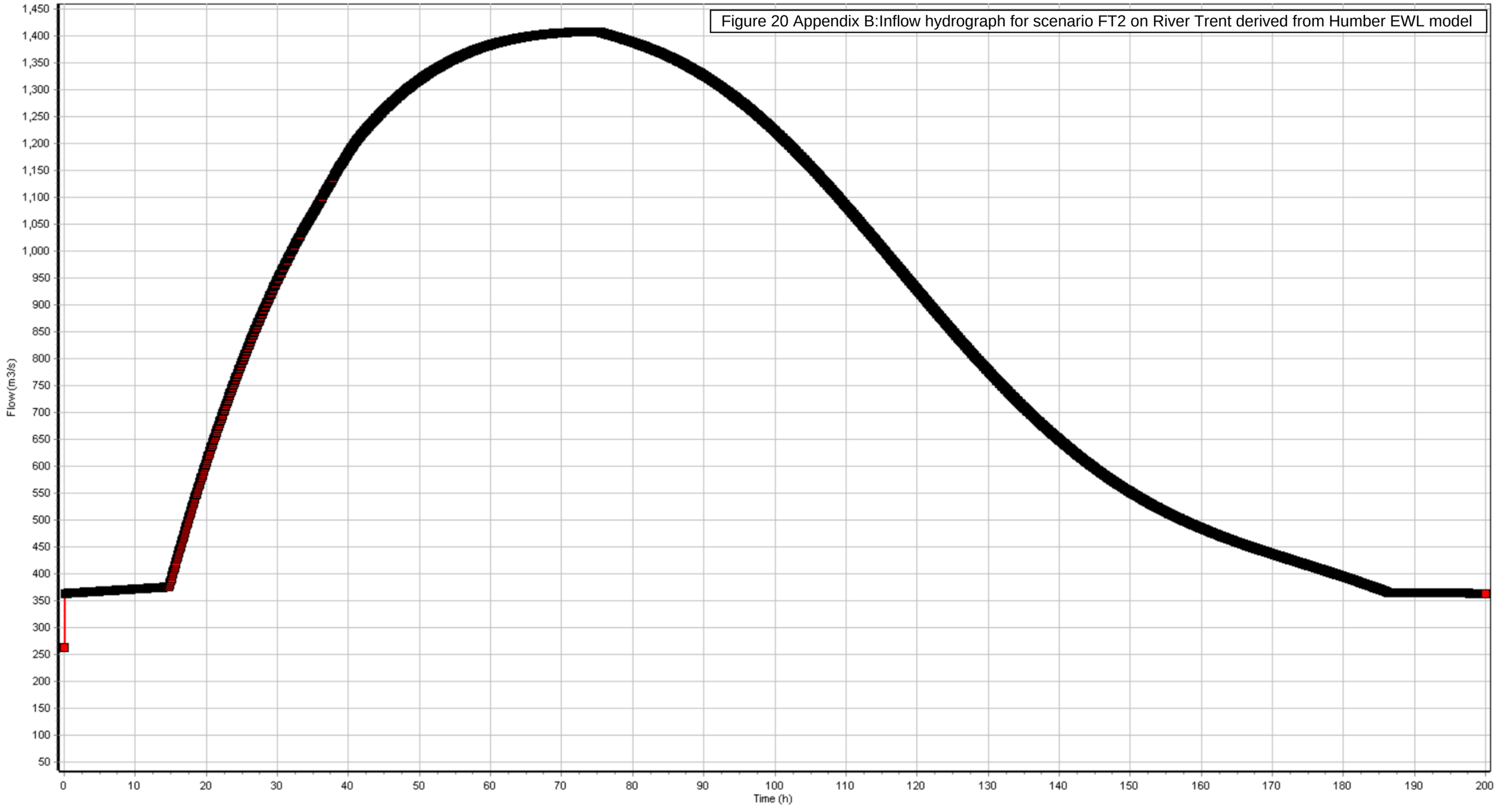


Figure 20 Appendix B:Inflow hydrograph for scenario FT2 on River Trent derived from Humber EWL model

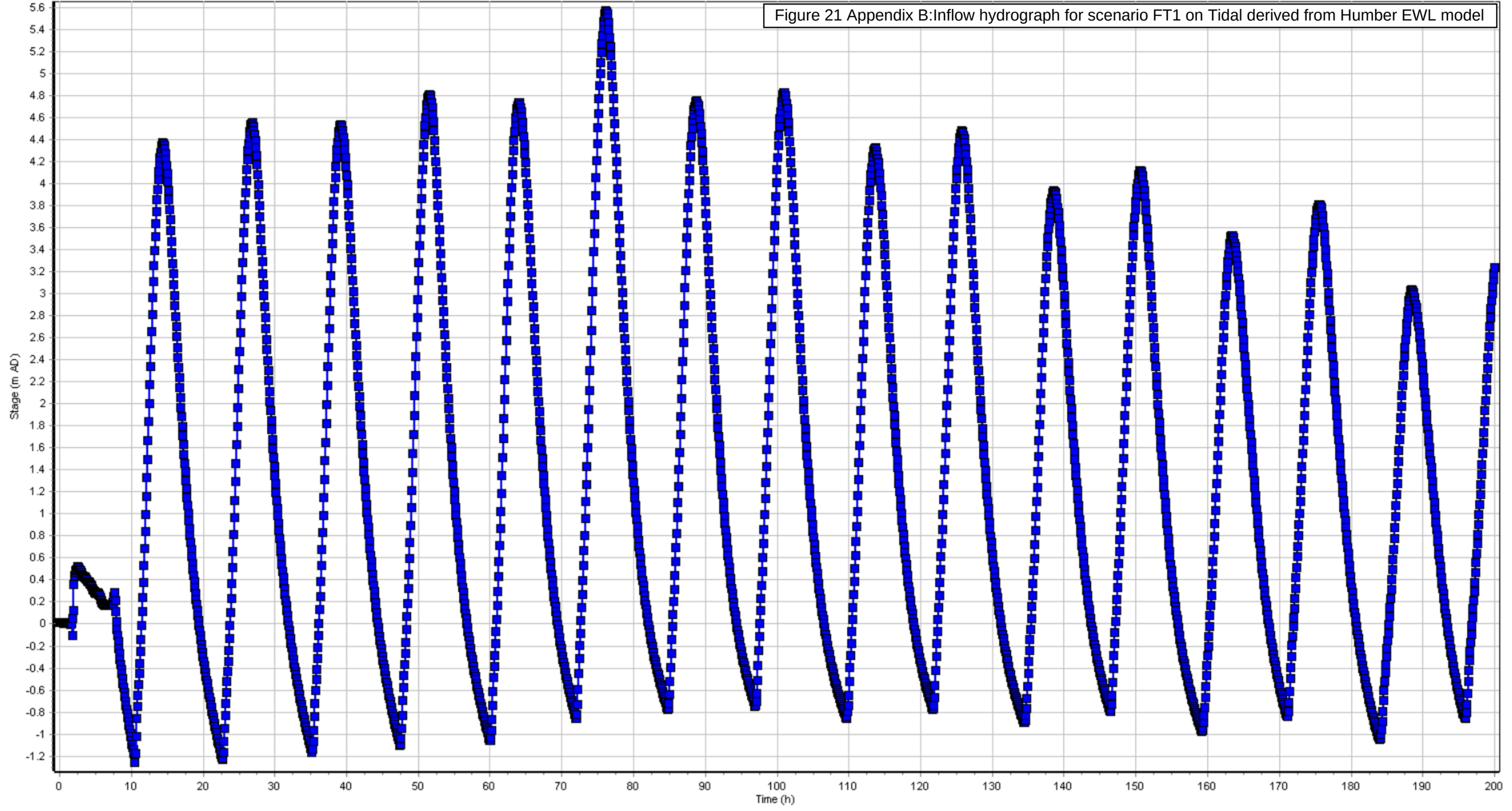


Figure 21 Appendix B:Inflow hydrograph for scenario FT1 on Tidal derived from Humber EWL model

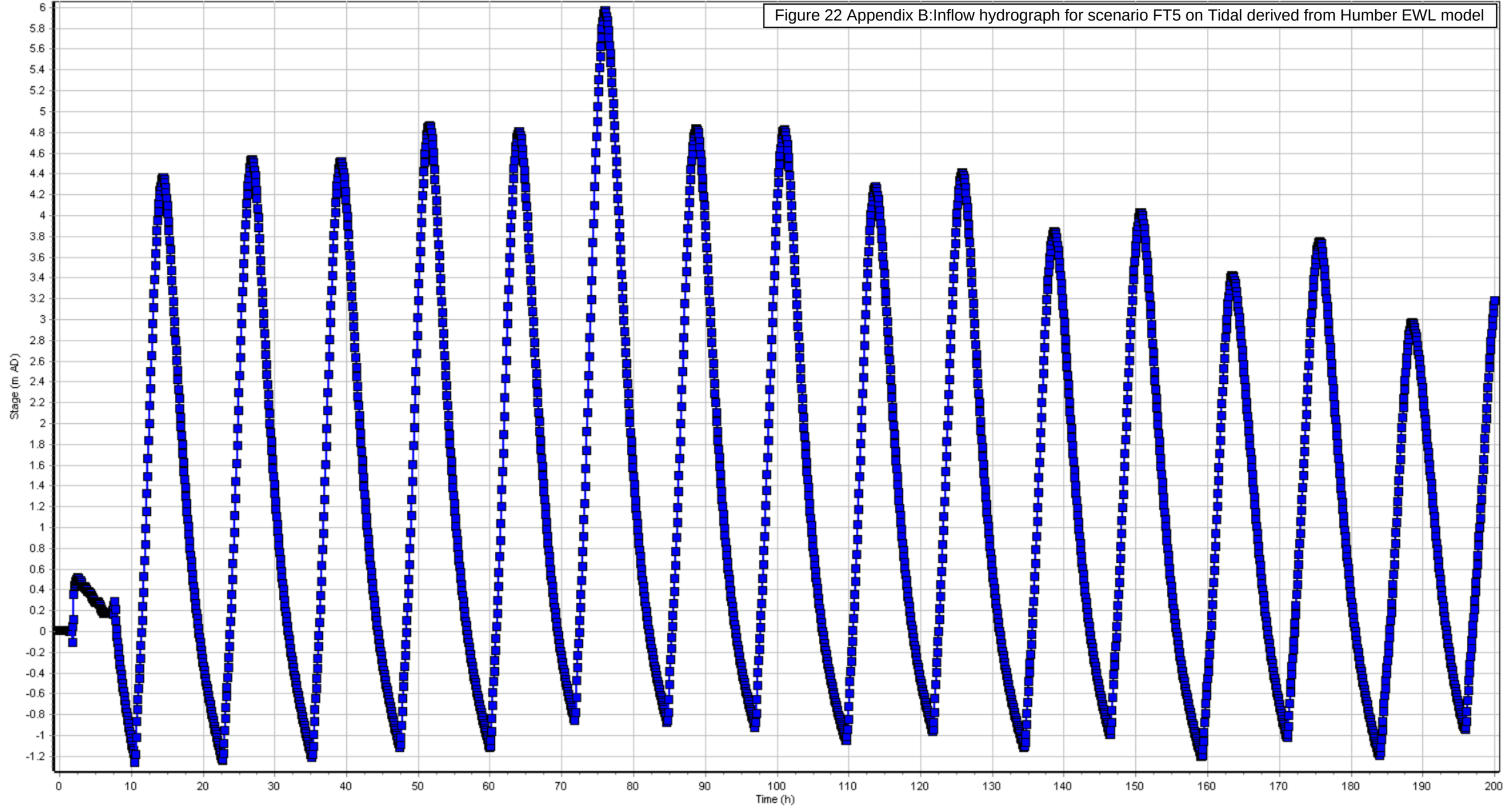
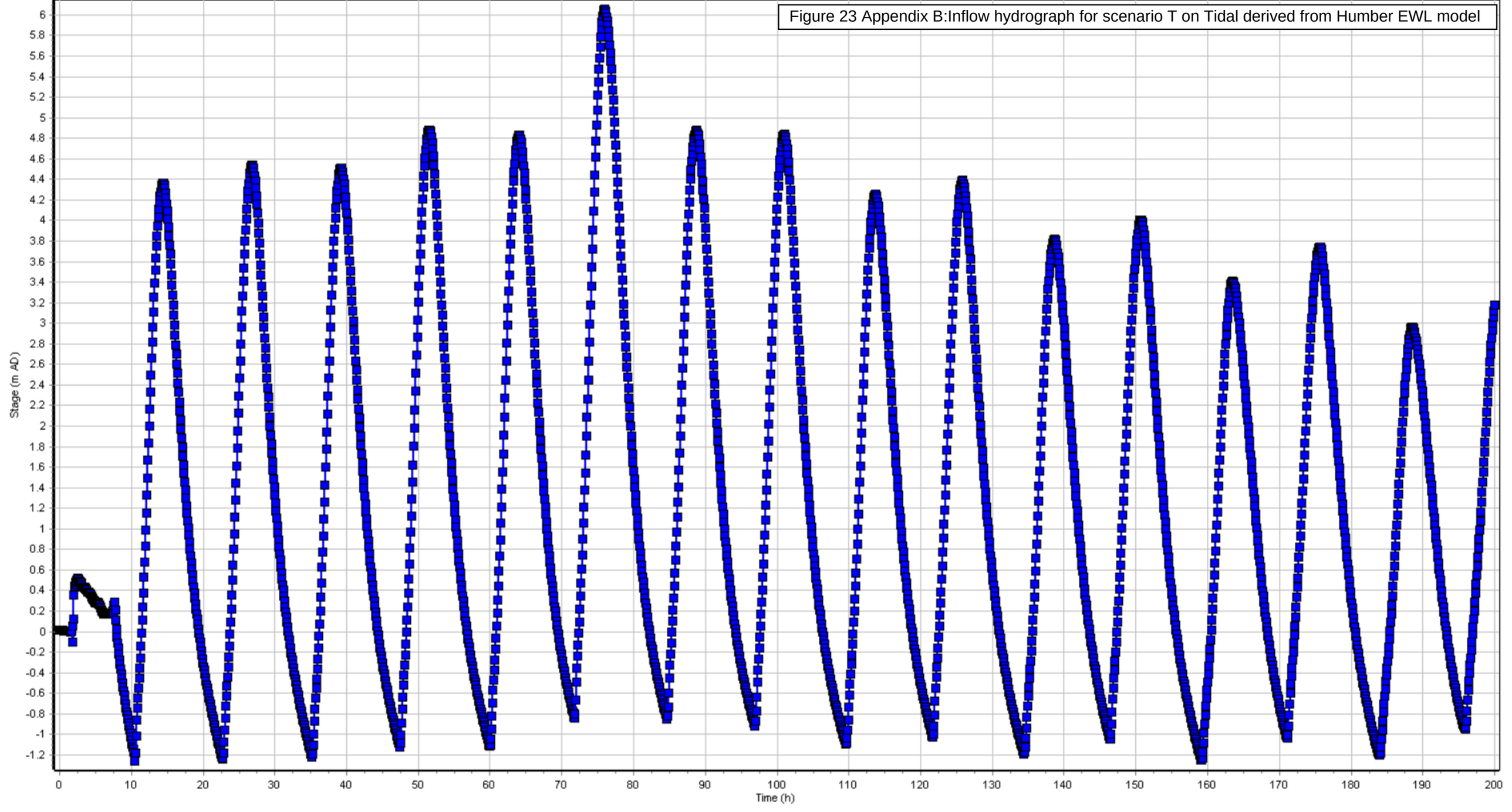
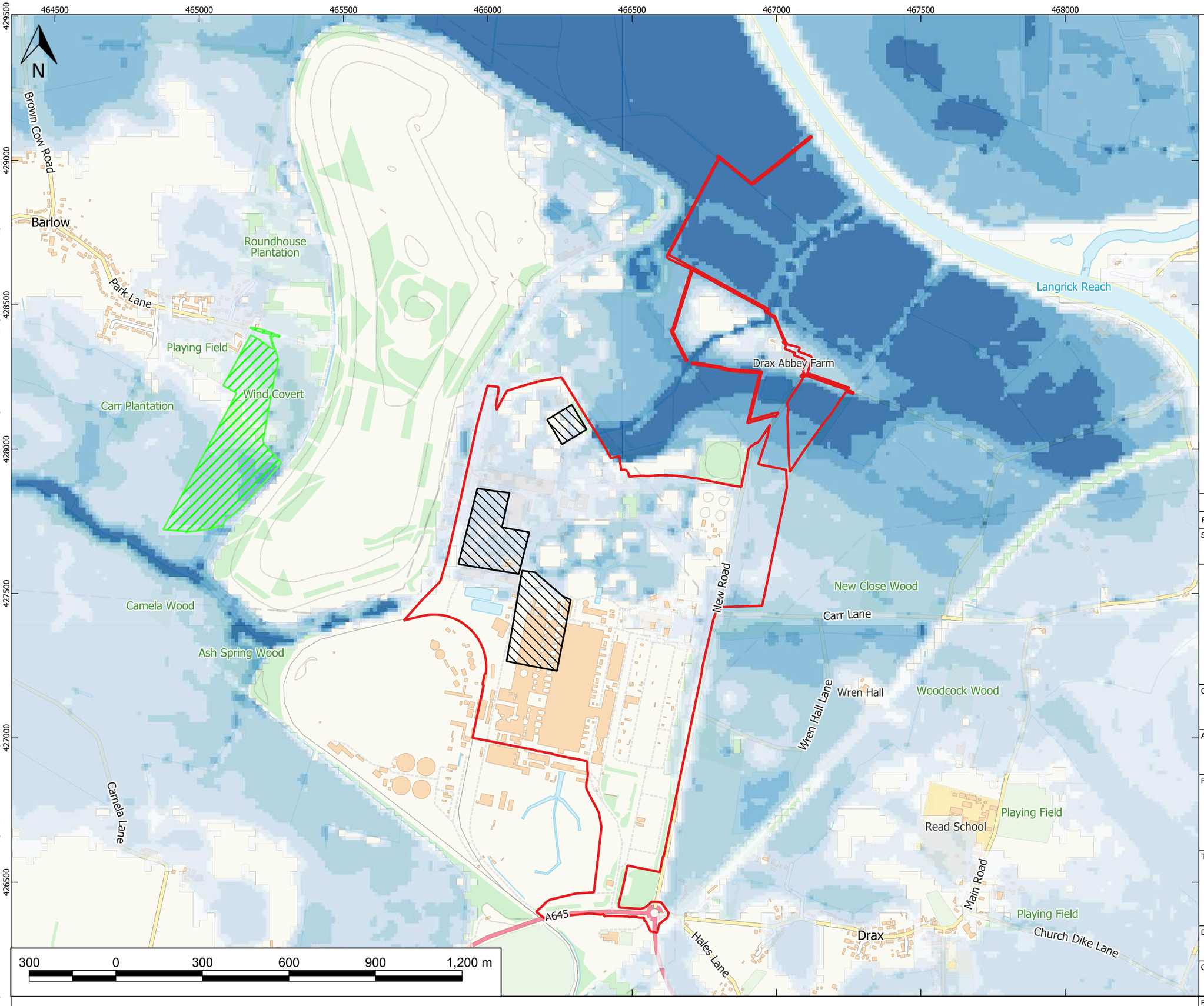


Figure 22 Appendix B:Inflow hydrograph for scenario FT5 on Tidal derived from Humber EWL model

Figure 23 Appendix B:Inflow hydrograph for scenario T on Tidal derived from Humber EWL model



APPENDIX L – MODELLED FLOOD DEPTH AND FLOOD HAZARD MAPS AND FLOOD LEVEL TABLES



KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

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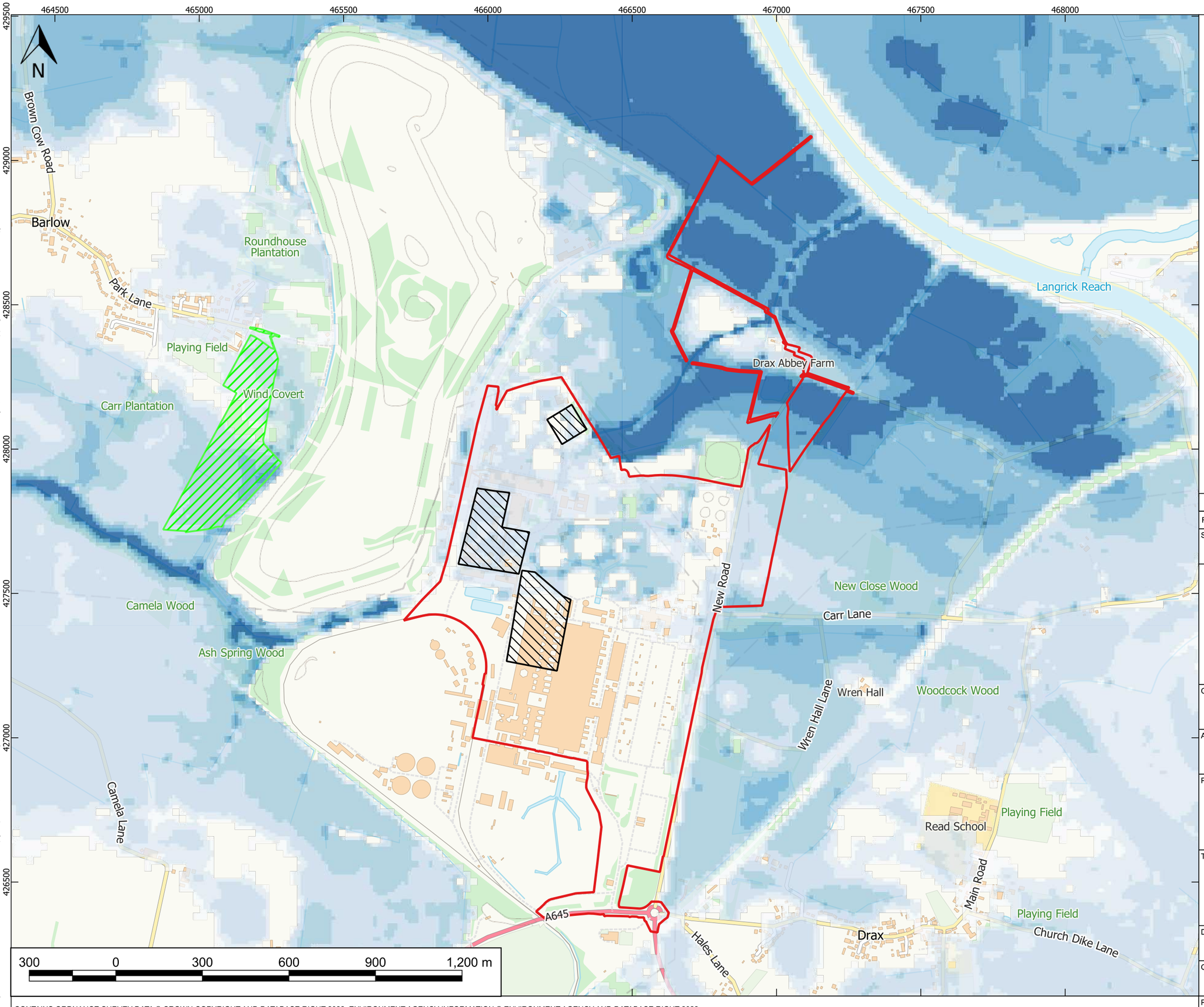

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

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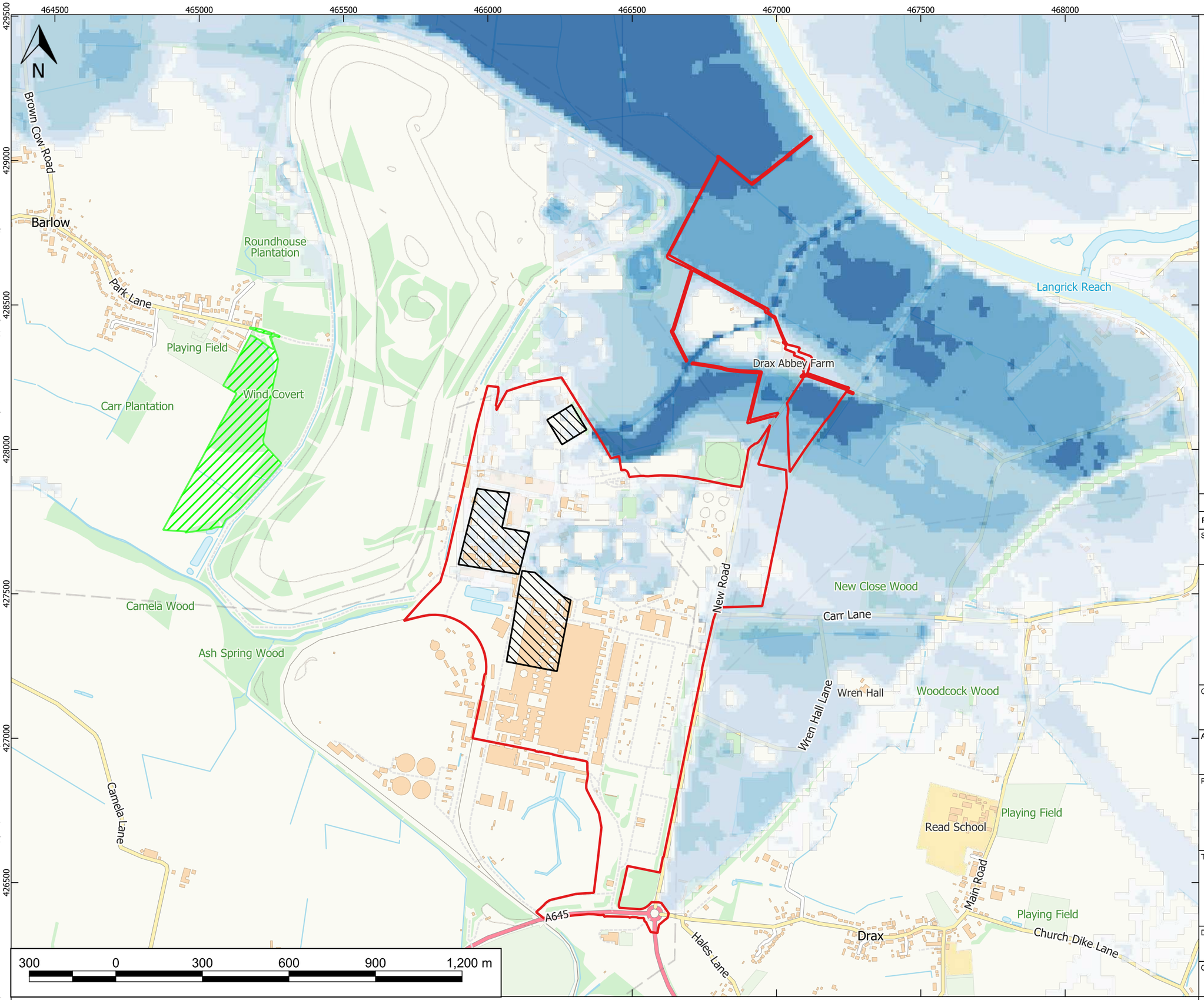

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

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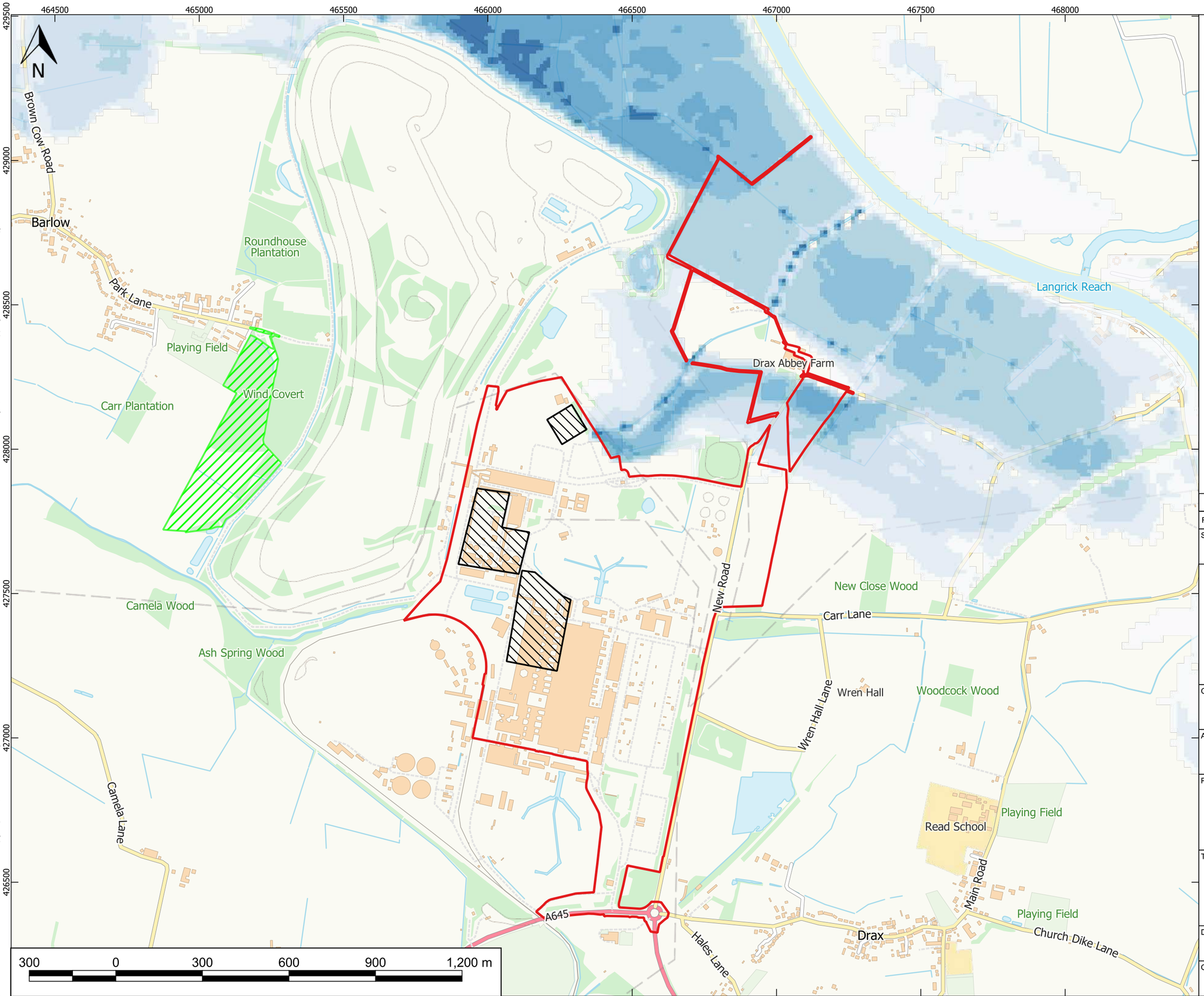

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

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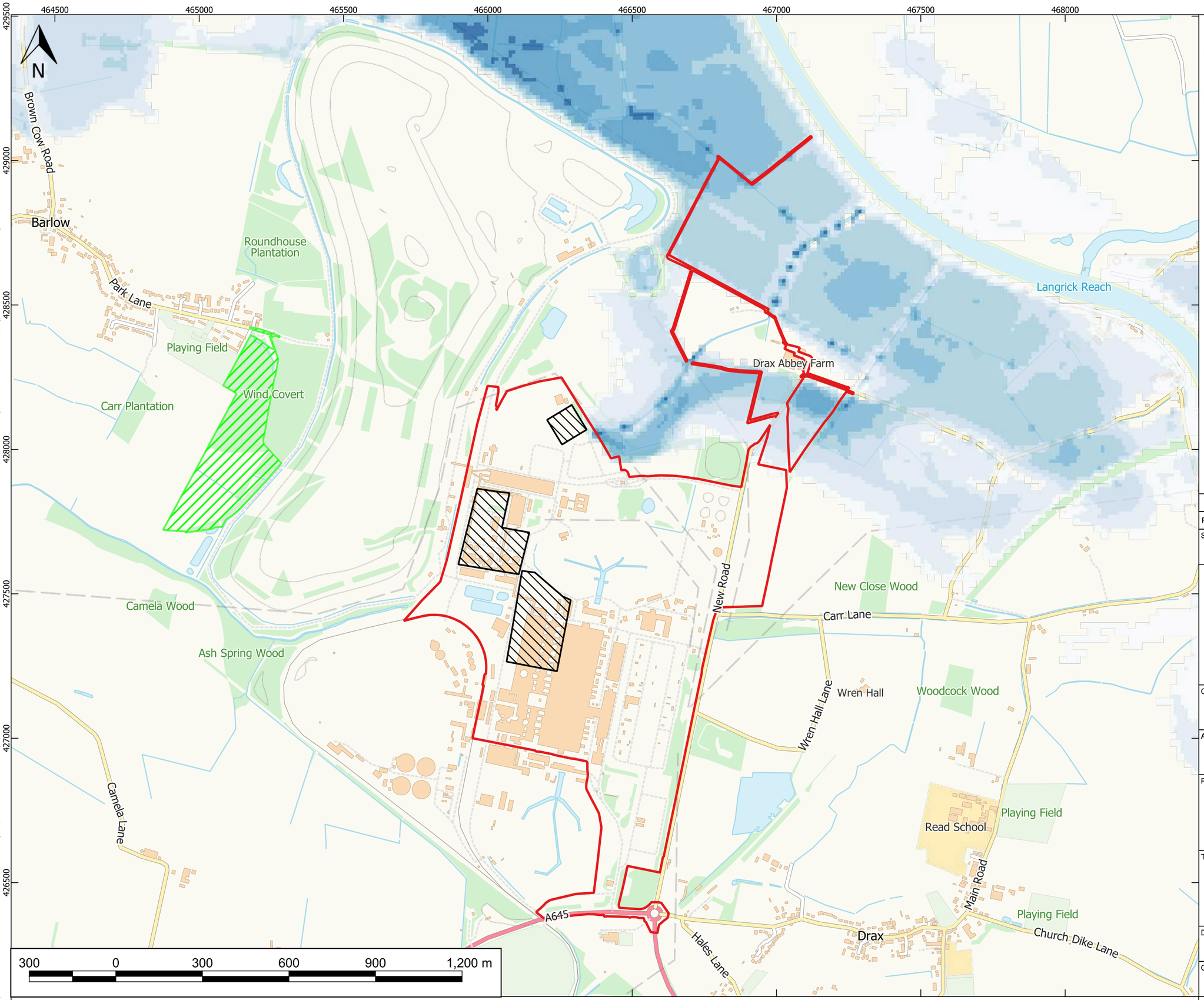

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

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464500 465000 465500 466000 466500 467000 467500 468000

429500 429000 428500 428000 427500 427000 426500

N

Brown Cow Road
Barlow
Roundhouse Plantation
Park Lane
Playing Field
Wind Covert
Carr Plantation
Camela Wood
Ash Spring Wood
Camela Lane
A645
Hales Lane
Drax
Drax Abbey Farm
Langrick Reach
New Road
New Close Wood
Carr Lane
Wren Hall Lane
Wren Hall
Woodcock Wood
Read School
Playing Field
Main Road
Playing Field
Church Dike Lane

300 0 300 600 900 1,200 m

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

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DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
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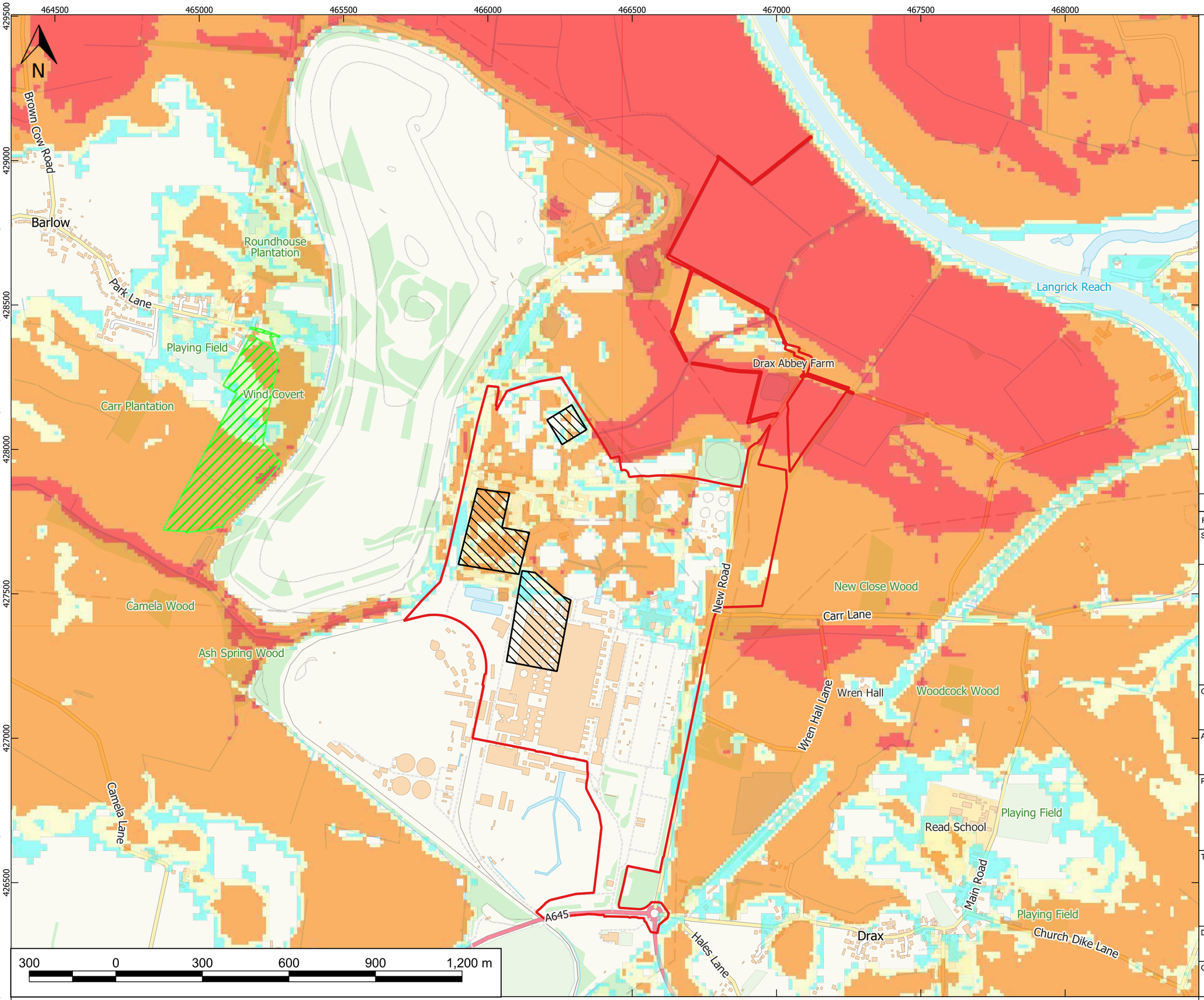

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

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LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
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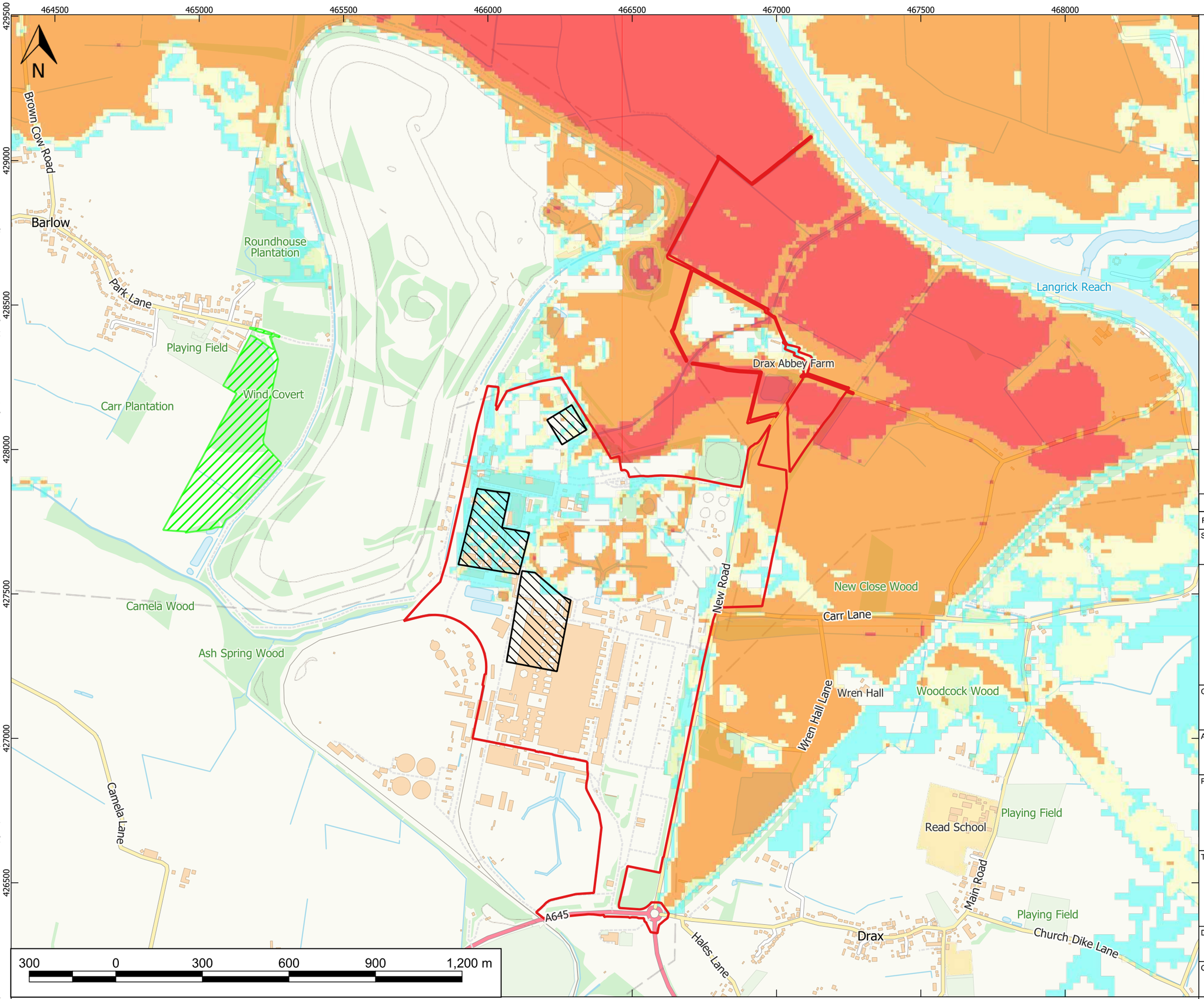

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

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DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
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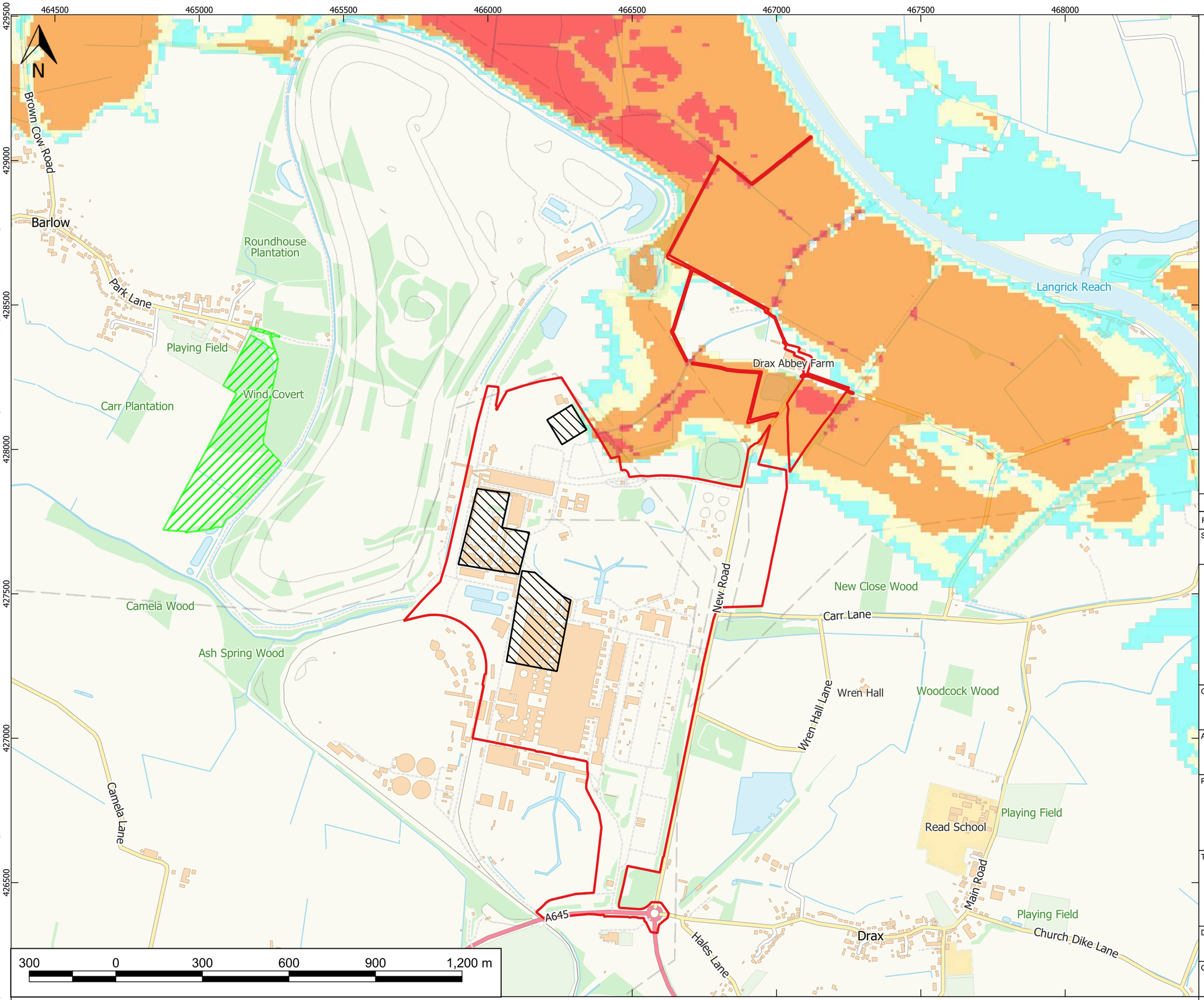
PROJECT No:	DRAWING No:	REV:
70072063	DEFENDED-2046-FT2-FHR	A



KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/06/22	LM	FIRST ISSUE	ES	AS

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ARCHITECT: -

PROJECT: DRAX BECCS DCO

TITLE: FLOOD HAZARD RATING FOR FT5 DEFENDED - DESIGN LIFE 2046

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
70072063	DEFENDED-2046-FT5-FHR	A

464500 465000 465500 466000 466500 467000 467500 468000

429500 429000 428500 428000 427500 427000 426500

N

Brown Cow Road
Barlow
Roundhouse Plantation
Park Lane
Playing Field
Wind Covert
Carr Plantation
Camela Wood
Ash Spring Wood
Camela Lane
A645
Hales Lane
Drax
Drax Abbey Farm
Langrick Reach
New Road
New Close Wood
Carr Lane
Wren Hall Lane
Wren Hall
Woodcock Wood
Read School
Playing Field
Main Road
Playing Field
Church Dike Lane

300 0 300 600 900 1,200 m

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/06/22	LM	FIRST ISSUE	ES	AS

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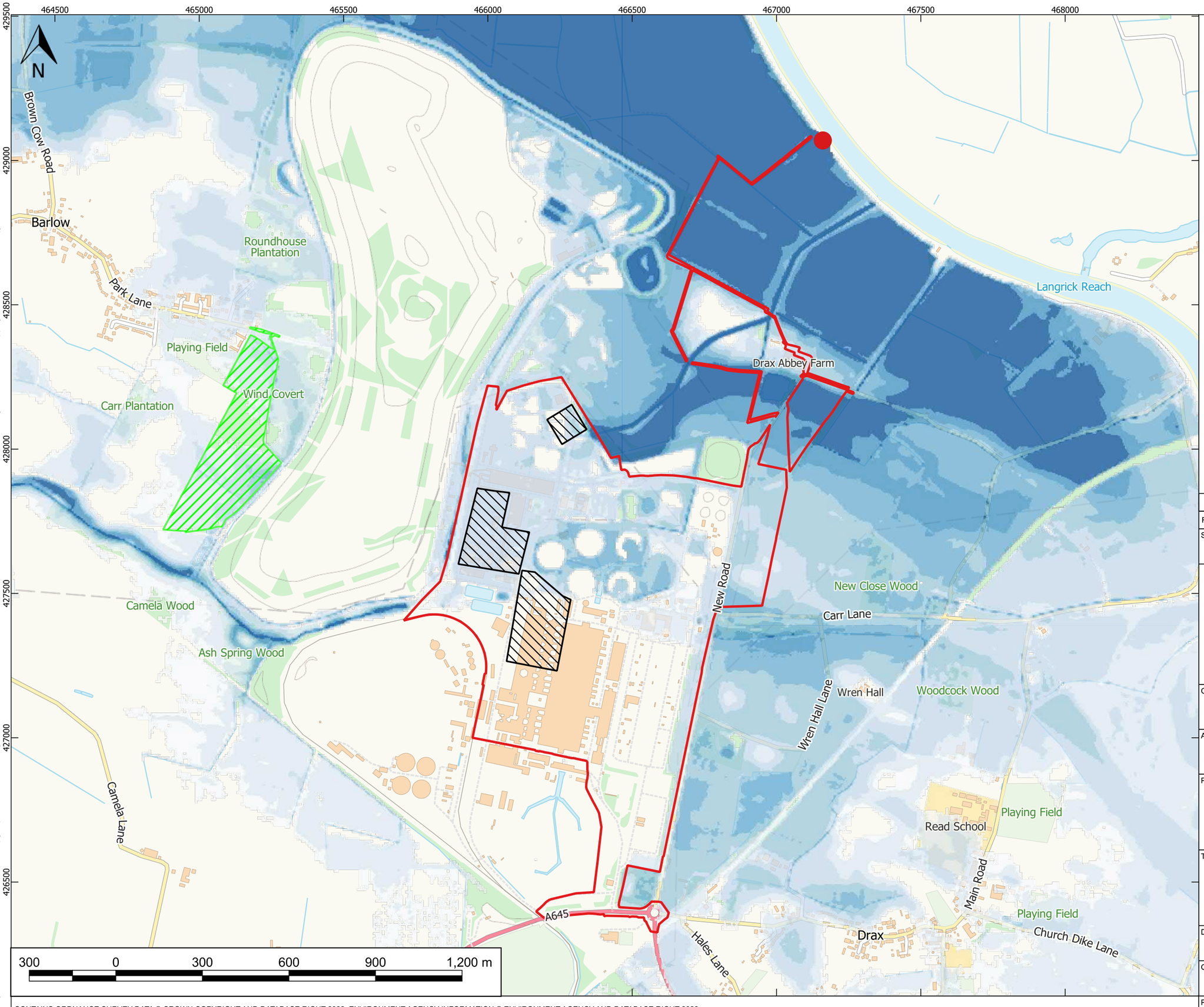
PROJECT: DRAX BECCS DCO

TITLE: FLOOD HAZARD RATING FOR T DEFENDED - DESIGN LIFE 2046

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
70072063	DEFENDED-2046-T-FHR	A



KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works
- Breach Location

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/06/22	LM	FIRST ISSUE	ES	AS

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PROJECT: DRAX BECCS DCO

TITLE: MAXIMUM FLOOD DEPTHS DURING BREACH EVENT FT1

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
70072063	BREACH-FT1-D	A

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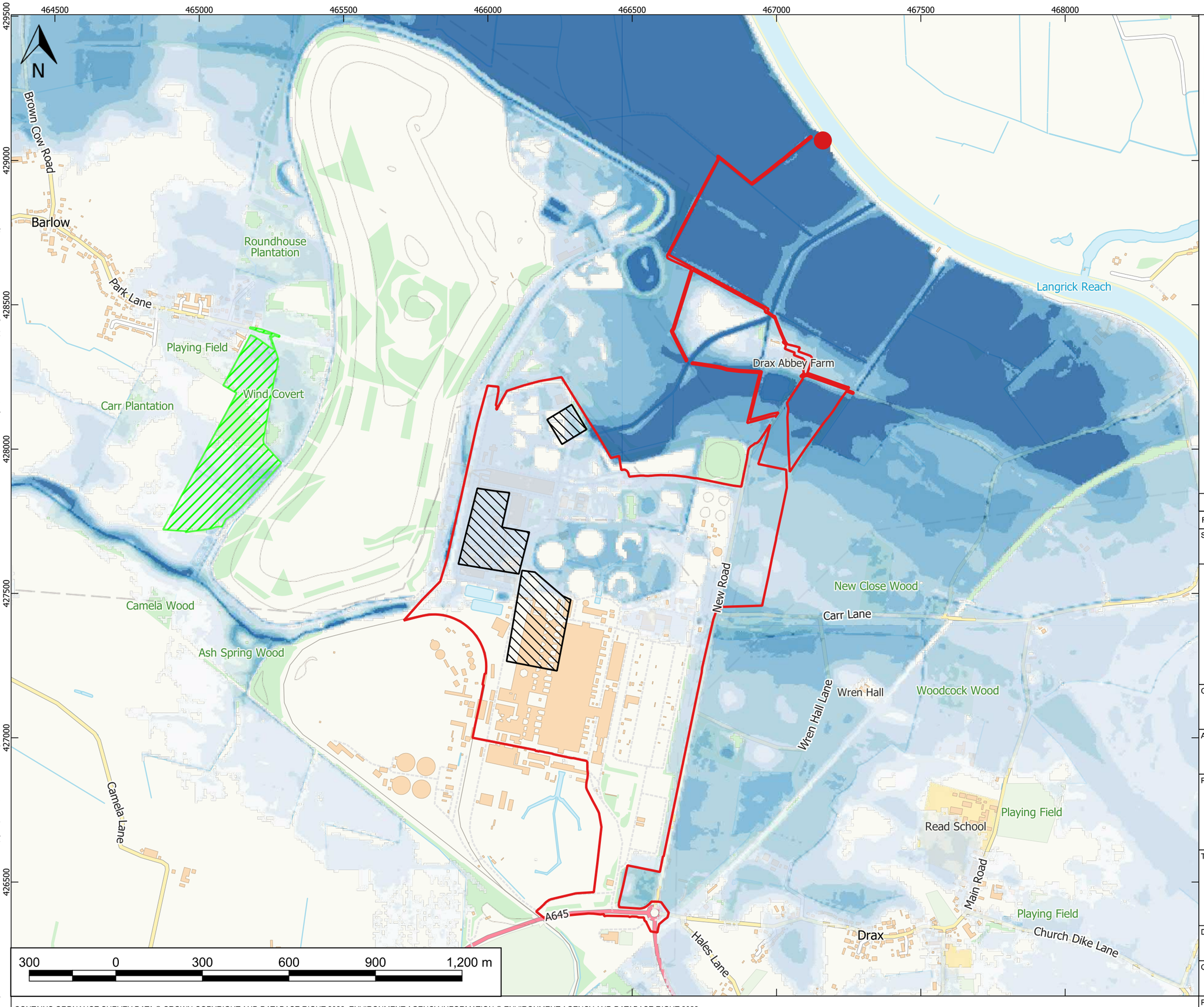

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works
- Breach Location

Maximum Flood Depth (m)

- 0.00 - 0.15 m
- 0.15 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- 2.00 - 2.50 m
- > 2.50 m

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/06/22	LM	FIRST ISSUE	ES	AS

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PROJECT: DRAX BECCS DCO

TITLE: MAXIMUM FLOOD DEPTHS DURING BREACH EVENT FT2

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
70072063	BREACH-FT2-D	A

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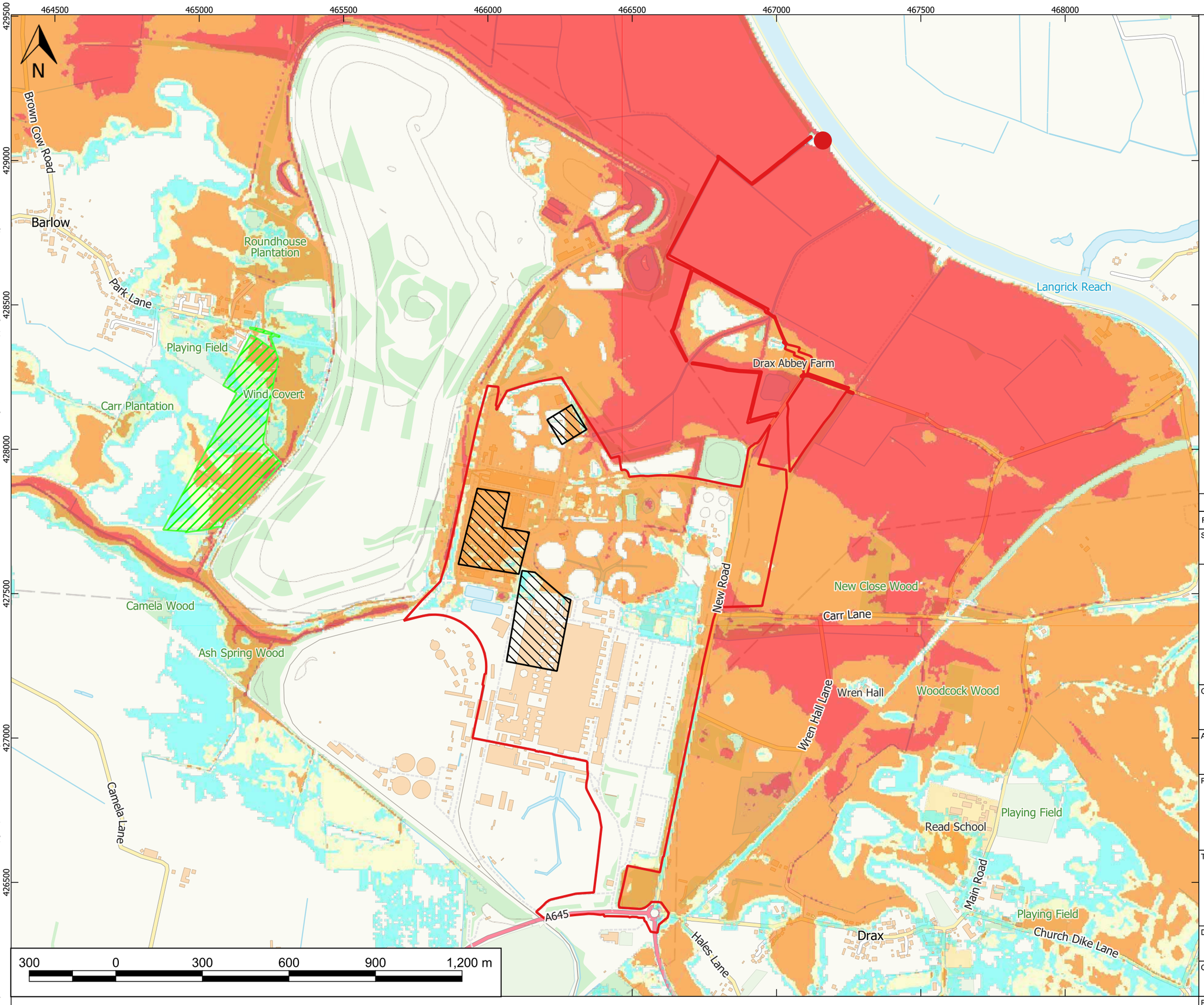

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works
- Breach Location

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.25 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/06/22	LM	FIRST ISSUE	ES	AS

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PROJECT: DRAX BECCS DCO

TITLE: FLOOD HAZARD RATING DURING BREACH EVENT FT1

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
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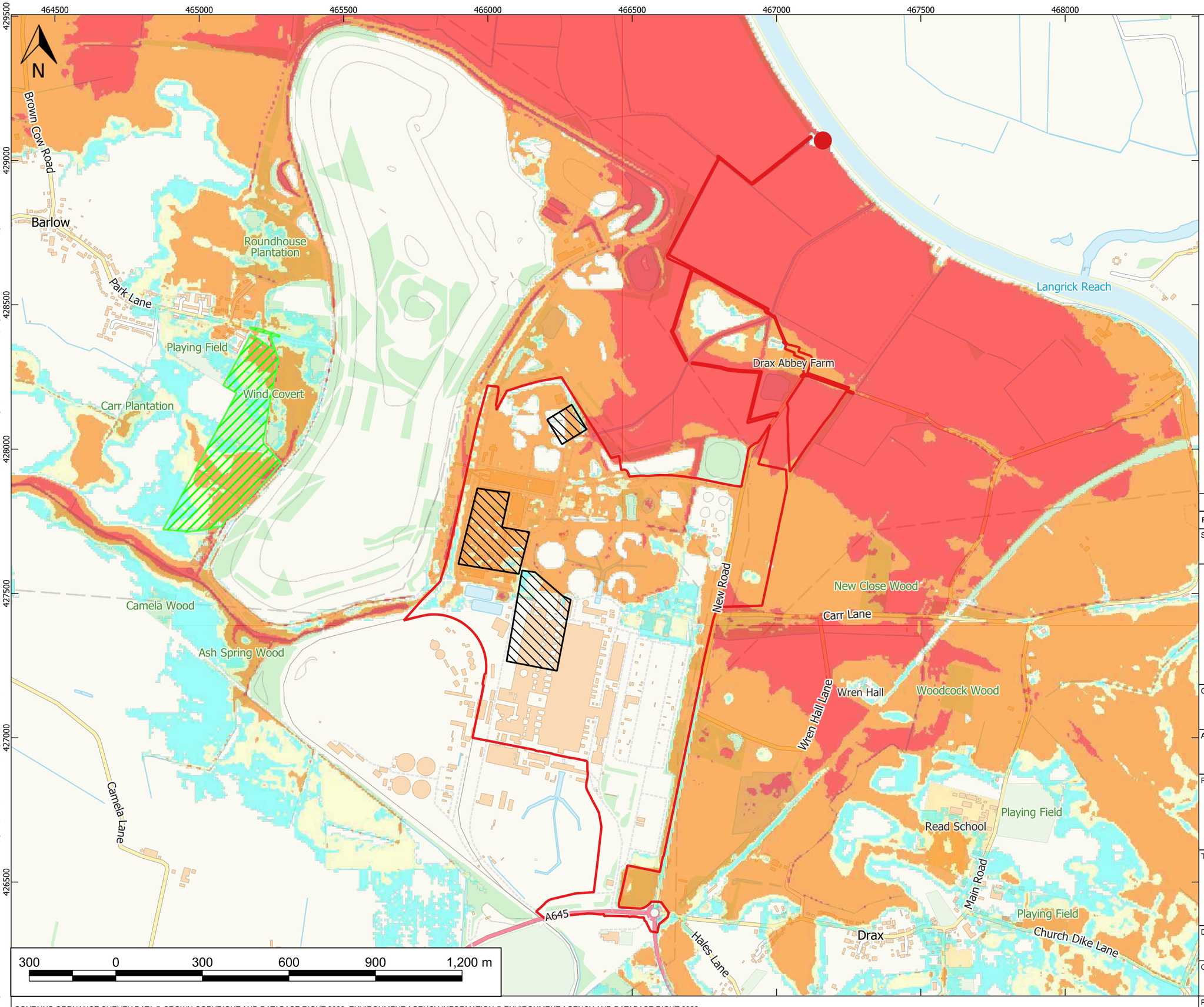

KEY:

- Order Limits
- Off-Site Habitat Provision Area
- Indicative Areas of Proposed Works
- Breach Location

Flood Hazard Rating

- 0.00 - 0.75 Low Hazard
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REV	DATE	DRW	DESCRIPTION	CHK	APP
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ARCHITECT: -

PROJECT: DRAX BECCS DCO

TITLE: FLOOD HAZARD RATING DURING BREACH EVENT FT2

DRAWN:	CHECKED:	APPROVED:
LM	ES	AS

QGIS FILE:	SCALE @A3:	DATE:
Drax Flood Mapping - New Model Data - LM.qgz	1:12,500	22/06/22

PROJECT No:	DRAWING No:	REV:
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