HyNet North West

ENVIRONMENTAL STATEMENT (VOLUME III)

Appendix 18.4 Flood Risk Assessment

HyNet Carbon Dioxide Pipeline DCO

Planning Act 2008

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

Document Reference Number D.6.3.18.4

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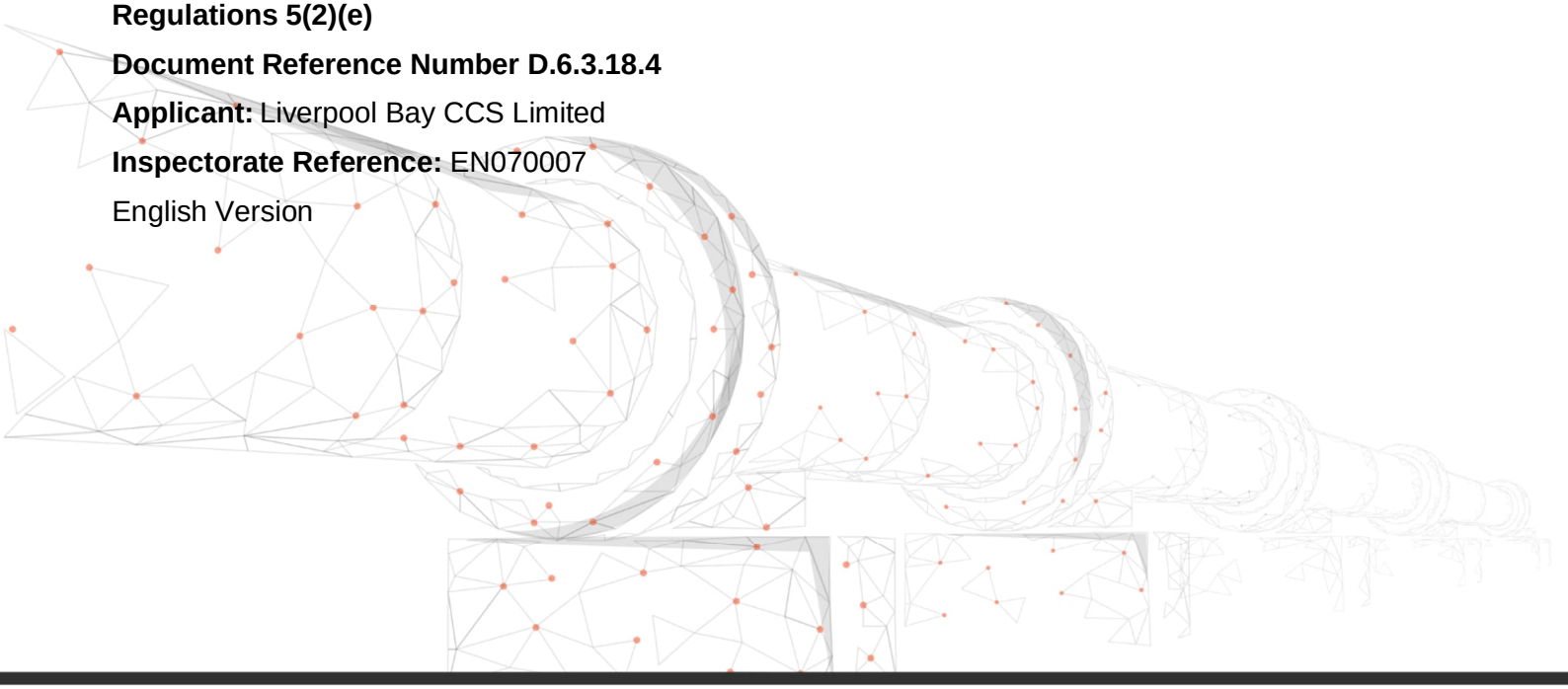

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EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) was developed to support the Development Consent Order (DCO) Application covering the proposed Above Ground Installations (AGI) and Block Valve Stations (BVS) and the Newbuild Carbon Dioxide Pipeline in England (the DCO Proposed Development).

As part of this FRA, the following proposals were assessed:

- Newbuild Carbon Dioxide Pipeline;
- Ince AGI;
- Stanlow AGI;
- Rock Bank BVS;
- Mollington BVS;
- Cathodic Protection (CP);
- Marker Posts;
- Fibre Optic Cable (FOC); and
- Electricity Connections.

This assessment has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and through consultation with key Statutory Consultees, including the Environment Agency, Cheshire West and Chester Council's Lead Local Flood Authority and United Utilities. Other non-statutory consultees were also engaged including third party landowners.

NEWBUILD CARBON DIOXIDE PIPELINE

This FRA has found that, although the Newbuild Carbon Dioxide Pipeline crosses a number of watercourses and Flood Zones 1, 2 and 3 along its alignment, the risk of flooding to the Newbuild Carbon Dioxide Pipeline from various sources is between negligible and low. The Newbuild Carbon Dioxide Pipeline complies with the requirements of NPPF as *"Essential Infrastructure"* Residual risk associated to potential formation of preferential groundwater flow pathways (and subsequent local rises in groundwater level) along the Newbuild Carbon Dioxide Pipeline will require the implementation of mitigation measures, namely, trench breakers (clay plugs) placed in the trench.

ABOVE GROUND INSTALLATIONS

Ince AGI is located in a defended Flood Zone 3. The risks of fluvial and tidal flooding at the Site have been assessed to be low and any residual risk is managed via raising the proposed rising of the AGI platform.

Stanlow AGI is located within Flood Zone 1. In consistency with this, a review of the latest modelling information from the Environment Agency (Jacobs hydraulic model, 2019) (**Ref. 1**) has concluded that the Stanlow AGI Site is at low risk of fluvial flooding. The AGI is defended against tidal flooding: irrespective the data available indicate that the Site is not expected to flood even in case of a breach in the tidal flood defences.

BLOCK VALVES

The proposed BVSs at Rock Bank and Mollington are both located in Flood Zone 1 and therefore at low risk of fluvial flooding. Tidal flooding is not relevant in the area due to the distance from tidal floodplains.

The proposed AGIs and BVSs will increase impermeable areas and will therefore require surface water drainage solutions to manage any associates increase in surface water runoff; those will need to be designed in accordance with the requirements of the Lead Local Flood Authority and other national surface water management policies. An **Outline Surface Water Drainage Strategy (Document Reference Number D.6.5.13)** has been developed alongside this FRA and demonstrates the sustainable management of surface water for the proposed AGIs and BVSs.

The DCO Proposed Development in England is suitable for the areas crossed as “Essential Infrastructure”. The mitigation measures will ensure that the risk of flooding to the DCO Proposed Development is minimised and there is no increase in the risk of flooding elsewhere.

1. INTRODUCTION

1.1. APPOINTMENT AND BRIEF

1.1.1. This FRA reports on the proposed DCO Proposed Development newbuild infrastructure located from the Ince AGI to the England/Wales border only. A separate Flood Consequences Assessment (FCA) (**Appendix 18.5 – Flood Consequences Assessment, (Volume III)**) reports on the DCO Proposed Development newbuild infrastructure within Wales only from the England/Wales Border to the proposed Babell BVS.

1.1.2. In England (Cheshire West and Chester), the DCO Proposed Development includes the installation of the Ince AGI to Stanlow AGI Pipeline and part of the Stanlow AGI to Flint AGI Pipeline (referred to as the Newbuild Carbon Dioxide Pipeline), as well as the installation of two AGIs and two BVSs at:

- Ince AGI;
- Stanlow AGI;
- Mollington BVS;
- Rock Bank BVS;

1.1.3. Other infrastructure includes:

- Cathodic protection (CP) transformer rectifier cabinets, CP test posts and pipeline marker posts;
- Utility Connection's infrastructure: including power utilities and Fibre Optic Cable (FOC);
- Permanent access road to the AGIs and BVSs; and
- Temporary ancillary works integral to the construction of the Carbon Dioxide Pipeline, including Construction Compounds and temporary access tracks. However, these have not been assessed in this FRA as only permanent measures will be taken into consideration.

1.1.4. Additional detail is found in **Chapter 3 – DCO Proposed Development (Volume II).**

1.1.5. For the purpose of this FRA, the Newbuild Carbon Dioxide Pipeline has been separated into different pipe sections between each AGI/BVS and labelled as Pipe Reach 1, 2, 3 and 4a for ease of reference.

1.2. LIMITATIONS

1.2.1. This FRA focuses solely on the permanent works proposed as part of the DCO Proposed Development of the Newbuild Carbon Dioxide Pipeline, Ince AGI, Stanlow AGI, Mollington BVS and Rock Bank BVS. Flood risk for the temporary works and the construction stage of the DCO Proposed Development is not included in this report as it is managed via the **Outline Construction Environmental Management Plan (OCEMP) (Document reference: D.6.5.4)** and **Chapter 18 – Water Environment and Flood Risk (Volume II)** of the **Environmental Statement (ES)**.

1.2.2. The surface water management and drainage proposals for the DCO Proposed Development are included in the **Outline Surface Water Drainage Strategy Report (Document reference: D.6.5.13).**

1.2.3. The Outline Surface Water Drainage Strategy needs to be referred to in conjunction with this FRA report in order to understand the surface water management solutions proposed to manage surface water runoff generated by the DCO Proposed Development.

1.2.4. The latest available information at present on the Ground Investigation (GI) had limited spatial coverage of groundwater monitoring points. Therefore, information on groundwater levels is limited in sections across the DCO Proposed Development. The Environment Agency provided groundwater level data and groundwater level contours and historical borehole records provided publicly by the BGS and which include groundwater level information were used to supplement the GI data where necessary. However, this historic data may not be representative of current conditions. Reasonable worst-case water level assumptions were made for the assessments.

1.2.5. The assessment of flood risk has been undertaken using readily available information including strategic studies (e.g. SFRA **(Ref. 2)**), through consultation with key stakeholders and a review of the hydraulic modelling information provided by the Environment Agency and NRW. No hydraulic modelling has been undertaken to inform the assessment.

1.2.6. WSP assumes these sources of information are reliable and suitable for the purposes of this assessment.

1.2.7. At present, consultation responses on Flood Risk from the Local Lead Flood Authority (LLFA) and United Utilities (UU) have not been received.

1.3. OBJECTIVE THE STUDY AND METHODOLOGY

1.3.1. This FRA investigates the potential sources of flooding in the area and the potential impact of flood risk on the DCO Proposed Development together with any potential effects on flood risk caused by the DCO Proposed Development

elsewhere. It also identifies any necessary mitigation measures to manage such risk in line with policy and best practice.

1.3.2. This FRA has been prepared in accordance with the relevant national, regional, and local requirements and guidance of the following publications and organisations:

- National Planning Policy Framework – (NPPF 2012, last updated 2021) issued by Ministry of Housing, Communities & Local Government[1]
- Flood Risk and Coastal Change Planning Practice Guidance (NPPF PPG 2014, last updated 2021) **(Ref. 4)**
- Cheshire West and Chester Local Plan (Part One) Strategic Policies 2015, by Cheshire Wester and Chester Council **(Ref. 5)**
- Cheshire West and Chester Local Plan (Part two) Strategic Policies 2019, by Cheshire Wester and Chester Council **Ref. 6)**
- Cheshire West and Chester Level 1 Strategic Flood Risk Assessment (SFRA, 2016) **(Ref. 2).**

1.3.3. As part of the preparation of this FRA, the following have been undertaken:

- Liaison with the Environment Agency (EA), Cheshire West and Chester Council (CWCC), Welsh Water (DCWW, as they are responsible for a small section of the application area for the water utilities in England), and United Utilities (UU) to obtain information (including hydraulic modelling from the EA) relating to flood risk within the Newbuild Infrastructure Boundary and any specific recommendations/requirements.
- Review of the Water related information contained in the Utility Search report undertaken by a third party on behalf of the client in 2021.
- Review of all potential sources of flooding at the within the Newbuild Infrastructure Boundary (i.e., fluvial, surface water, tidal, highways, groundwater, reservoir, sewers, and canal) using publicly available information, including a review of the Cheshire West and Chester Level 1 Strategic Flood Risk Assessment, 2016 (**Ref. 2**).
- Consideration of the flood risk implications, taking into account the effect of climate change over the lifetime of the DCO Proposed Development
- Identification of the Above Ground Infrastructure requiring flood risk mitigation measures, where applicable.

[1] The aims of the National Planning Policy Framework (**Ref. 3**) on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process.

2. BASELINE DESCRIPTION

2.1.1. FRA assesses the Newbuild Carbon Dioxide Pipeline, Ince AGI, Stanlow AGI, Rock Bank BVS and Mollington BVS in England (Cheshire). Each of the AGIs and BVSs are assessed individually. Additional information on the layout of the Above Ground Structures can be found in **Annex A**.

2.1.2. A summary of the specifics of the AGIs and BVSs is provided below, as those are the parts of the DCO Proposed Development which are more relevant for a flood risk assessment. However, a more detailed description of the DCO Proposed Development can be found in **Chapter 3 – Description of the DCO Proposed Development (Volume II):**

- **Above Ground Installations**: Securely fenced compounds which provide the transition between the Carbon Dioxide Pipeline system and the industrial emitters. The AGIs will house facilities for inspecting the Carbon Dioxide Pipeline (called Pipeline Inspection Gauges), electrical and instrumentation kiosks, lighting, parking provisions, and other associated infrastructure. The compounds will also include security lighting.
- **Block Valve Stations**: Block valves are used to isolate sections of the Carbon Dioxide Pipeline for maintenance purposes or in case of emergency. The block valves will be installed below ground level, with only limited above ground visible elements, including secure chamber access covers and a containerised electrical and instrumentation kiosk. The block valves will be housed within Block Valve Station compounds, which will also include security lighting.

2.1.3. In addition, and as mentioned in the introduction some additional assets are present along the pipeline and include:

- **Cathodic Protection (CP)**
- **CP Test Posts**
- **Marker Posts**
- **Fibre Optic Cable and connection (FOC)**
- **Electricity Connections**

2.1.4. Additional detail of the items above is found in Chapter 3 – DCO Proposed Development (Volume II).

2.2. LOCATION OF THE DCO PROPOSED DEVELOPMENT

2.2.1. The existing Site and surrounding areas are described in **Chapter 3 – Description of the DCO Proposed Development (Volume II)**. The Site location plans for the DCO Proposed Development can be seen in **Figure 3-2 DCO Proposed Development** (**Volume IV**) of the ES.

2.2.2. For the purpose of this FRA, we have subdivided the Newbuild Carbon Dioxide Pipeline in Pipe Reach 1, Pipe Reach 2, Pipe Reach 3 and Pipe Reach 4a. Please note that this subdivision is different from the sections proposed in **Chapter 18 - Water Resources and Flood Risk (Volume II)** and it has been done to assess individually the AGIs/BVSs and consequently analysing the proposed DCO Carbon Dioxide Pipeline connecting these infrastructures. These pipe reaches are located between the proposed AGIs/BVSs respectively, commencing at the Ince AGI and ending at the England/Wales border, as can be seen in the Site location plans in **Figure 18.4.1 – Stanlow AGI to Flint**

2.2.3. **AGI Pipe Reach (England) (Sheet 1)** (**Annex A)**.

PIPE REACH 1

2.2.4. The proposed alignment of Pipe Reach 1 is located from the Ince AGI at National Grid Reference SJ 46910 76131 (E:346910, N:376131) to the Stanlow AGI at National Grid Reference SJ 44629 74952 (E:344629, N:374952). The approximate pipeline length is 3.7km. Pipe Reach 1 crosses 6 ordinary watercourses, 2 main watercourses, two highways namely: Hill View Way and Cryers Lane and also the Ellesmere Port to Warrington train line. The majority of the fields that will accommodate Pipe Reach 1 are currently used for agricultural purposes.

PIPE REACH 2

2.2.5. The proposed alignment of Pipe Reach 2 is located from the proposed Stanlow AGI at National Grid Reference SJ 44629 74952 (E:344629, N:374952) to the Rock Bank BVS at National Grid Reference SJ 41122 71347 (E:341122, N:371347). The approximate pipe length is 6.8km. Pipe Reach 2 crosses 5 ordinary watercourses, 6 main watercourses, the M56 and M53, and the Shropshire Canal. The majority of the fields that will accommodate Pipe Reach 2 are currently greenfield or used for agricultural purposes.

PIPE REACH 3

2.2.6. The proposed alignment of Pipe Reach 3 is located from the Rock Bank BVS at National Grid Reference SJ 41122 71347 (E:341122, N:371347) to the Mollington BVS at National Grid Reference SJ 38051 70154 (E:338051, N:370154). The approximate pipe length is 2.4km. Pipe Reach 3 crosses 3 ordinary watercourses, 1 main river, Liverpool Road, and the Mersey Rail - Wirral train line. The majority of the fields that will accommodate Pipe Reach 3 are currently greenfield or used for agricultural purposes.

PIPE REACH 4A

2.2.7. The proposed alignment of Pipe Reach 4a is located from the Mollington BVS at National Grid Reference SJ 38051 70154 (E:338051, N:370154) to the England/Wales border. Pipe Reach 4a crosses 2 ordinary watercourses, 1 main

river, Finchetts Gutter Tributary, Seahill Tributary and Seahill Drain respectively. The majority of the fields that will accommodate Pipe Reach 4a are currently greenfield or used for agricultural purposes.

AGI AND BVS

2.2.8. For the proposed AGIs and BVS details please refer to Chapter 3 – Description of the DCO Proposed Development (Volume II)

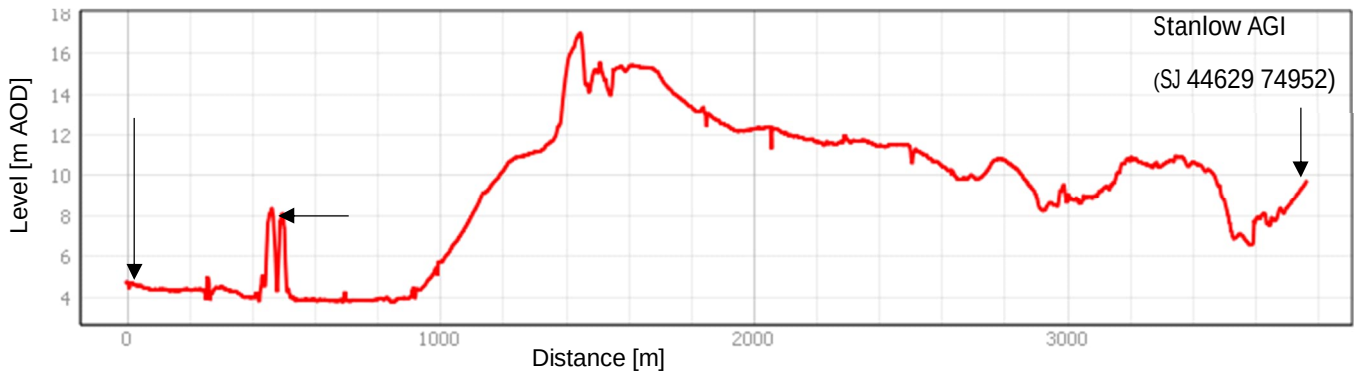
2.3. SITE TOPOGRAPHY

2.3.1. This section provides a general description of the local topography at the Newbuild Carbon Dioxide Pipeline, BVSs and AGIs.

NEWBUILD CARBON DIOXIDE PIPELINE

Pipe Reach 1

2.3.2. The general topography of Pipe Reach 1 is low lying ground (between 4mAOD and 10mAOD) within the tidal floodplain of the River Mersey for the first 1000m which then increases to approximately 10m AOD near the proposed Stanlow AGI. **Insert 1** below shows a general long section through the Pipe Reach 1.



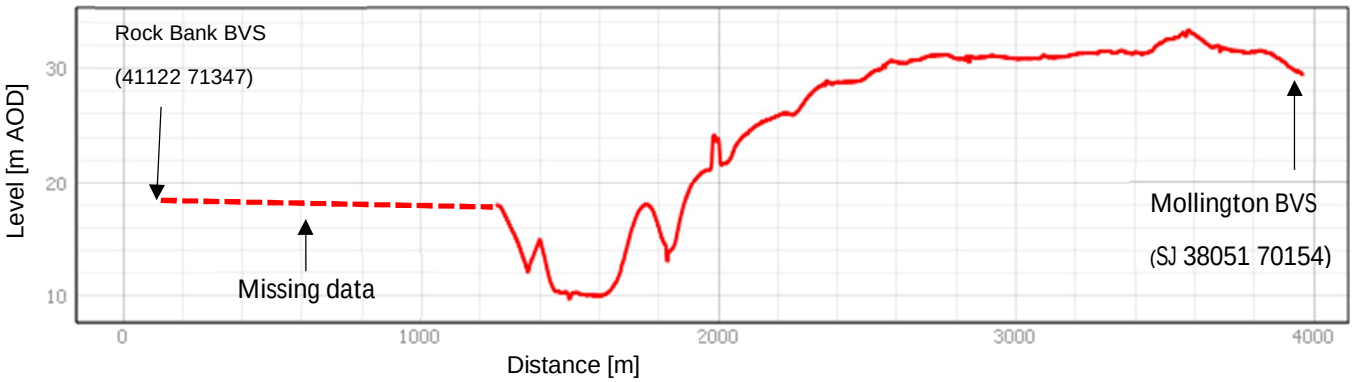
Insert 1 Pipe Reach 1 Long Section

Pipe Reach 2

2.3.3. The existing elevation of Pipe Reach 2 ranges from approximately 10 m AOD at the proposed Stanlow AGI Site to around 19mAOD at the proposed Rock Bank BVS Site. A long section of this pipe reach is not available as the LiDAR data presents a gap in this area.

Pipe Reach 3

2.3.4. The existing elevation of Pipe Reach 3 ranges from approximately 19 m AOD at the proposed Rock Bank BVS Site to around 30mAOD at the proposed Mollington BVS Site. A long section of Pipe Reach 3 is shown in **Insert 2** below.



Insert 2 Pipe Reach 3 Long Section

Pipe Reach 4a

2.3.5. The existing elevation of Pipe Reach 4a ranges from approximately 19mAOD at the proposed Rock Bank BVS Site to around 30mAOD at the proposed Mollington BVS Site. A long section of Pipe Reach 3 is shown in **Insert 3** below.

Insert 3 Pipe Reach 4a Long Section

Ince AGI

2.3.6. The existing elevation at the location of Ince AGI ranges from approximately 3.8mAOD in the northwest to approximately 4.6mAOD in the southeast. Ground levels along the existing private access road to the AGI range from approximately 4.3mAOD to approximately 4.9mAOD.

Stanlow AGI

2.3.7. The existing elevation at the location of Stanlow AGI ranges from approximately 9.3mAOD in the southwest to approximately 10.5mAOD in the northeast. The existing A5117 Chester Road at the entrance of the AGI is at approximately 8mAOD.

Rock Bank BVS

2.3.8. The existing elevation at the location of Rock Bank BVS ranges from 18.1mAOD in the northwest to around 20.0mAOD in the southeast. The existing Chorlton Lane which serves as access road to the BVS ranges from 17.2mAOD to 19.5mAOD.

Mollington BVS

2.3.9. The existing elevation at the location of Mollington BVS ranges from 29.0mAOD in the southeast to around 29.7mAOD in the northwest. The existing Overwood Lane which serves as access to the BVS ranges from 29.8mAOD to 31.5mAOD.

2.4. GEOLOGY AND HYDROGEOLOGY

2.4.1. A general description of the Site geology and hydrogeology is included below for the Newbuild Carbon Dioxide Pipeline, BVSs and AGIs.

2.4.2. A Ground Investigation (GI) was undertaken across the Newbuild Infrastructure Boundary from November 2021 through to March 2022 (**Ref. 8**). The GI involved trial pits, boreholes, CPT tests and groundwater monitoring between the Ince AGI and Flint AGI.

NEWBUILD CARBON DIOXIDE PIPELINE

Pipe Reach 1

2.4.3. The superficial deposits beneath Pipe Reach 1 consist of the following (from east to west):

- Tidal flat deposits – clay, silt and sand
- Glacial Devensian till – Diamicton

2.4.4. Borehole logs from the GI indicated that the tidal flat deposits are present between 0-10 meters below ground level (mbgl) from the Ince AGI to Ash Road, below which glacial deposits are found. The glacial Devensian till has been recorded at the Chester Services at 15 mbgl, while westwards at Thornton le Moors the till is recorded at 3-4 mbgl. Both the tidal flat deposits and glacial Devensian till are categorised by the Environment Agency (**Ref. 9**) as Secondary (undifferentiated) aquifers.

2.4.5. The existing bedrock geology beneath Pipe Reach 1 consists of the following (from east to west):

- Kinnerton Sandstone Formation – aeolian sandstone
- Chester Sandstone Formation – pebbly sandstone

2.4.6. None of the boreholes drilled for the GI were deep enough to reach the Kinnerton Sandstone. BGS historic borehole SJ47NE19 encountered the sandstone at a depth of 85 mbgl. The GI data has indicated that the Chester Formation is deeper around the Chester Services area at approximately 15 mbgl and shallower at Thornton le Moors at approximately 3 – 4 mbgl.

2.4.7. The Kinnerton Sandstone Formation, Chester Sandstone and Wilmslow Sandstone Formation are all in hydraulic continuity and are constituents of the Sherwood Sandstone Group (SSG) aquifer; The SSG aquifer is described by the Environment Agency as a Principal aquifer (**Ref. 9**).

2.4.8. Groundwater levels are recorded in **Chapter 18 – Water Environment and Flood Risk (Volume II)**. Within Pipe Reach 1, the GI has indicated that groundwater levels are shallowest to the south of the Ince AGI (0.4 – 1.1 mbgl) and deepen slightly towards Stanlow AGI (3.2 – 3.7 mbgl).

2.4.9. Further information on the underlying geology and hydrogeology of the Newbuild Carbon Dioxide Pipeline can be found in Superficial and Bedrock Geology in **Chapter 18 – Water Environment and Flood Risk (Volume II).**

Pipe Reach 2

2.4.10. The existing superficial geology beneath Pipe Reach 2 consists of the following (from east to west):

- Glacial Devensian till – Diamicton
- Blown sand – sand
- Peat – peat
- Glaciofluvial deposit – sand and gravel
- Alluvium – clay, silt, sand and gravel

2.4.11. The GI has recorded the glacial Devensian till at Stanlow AGI between 4-7 mbgl, west of the River Gowy the glacial till is proven to a depth of 20 mbgl. The blown sands and peat deposits are thin, between 1-3 m in thickness, while the glaciofluvial deposits have been recorded to a depth of 9 mbgl to bedrock interface.

2.4.12. The blown sand and glaciofluvial deposits are described by the Environment Agency as Secondary A aquifers (**Ref. 9**). The BGS Hydrogeological Map of Clwyd and the Cheshire Basin (**Ref. 10**) has described the sand and gravels of the blown sand, glaciofluvial and head deposits as significant local resources where they overlie impermeable deposits, or the main aquifer is at considerable

depth. Sands and gravels which overlie an aquifer are an important means of recharge to the aquifer both directly and indirectly by providing hydraulic continuity.

2.4.13. The existing bedrock geology beneath Pipe Reach 2 consists of the following:

- Chester Sandstone Formation – pebbly sandstone

2.4.14. The GI has recorded the Chester Sandstone Formation at a depth of 8 mbgl west of Thornton le Moors, before deepening below the superficial deposits, which have been proven by the GI to a depth of 20 mbgl across the River Gowy and M53. The sandstone then shallows around the Shropshire Union Canal with it outcropping on the western side of the canal. The BGS Hydrogeological Map of Clwyd and the Cheshire Basin (**Ref. 10**) has described the sand and gravels of the blown sand, glaciofluvial and head deposits as significant local resources where they overlie impermeable deposits, or the main aquifer is at considerable depth. Sands and gravels which overlie an aquifer are an important means of recharge to the aquifer both directly and indirectly by providing hydraulic continuity.

2.4.15. Groundwater levels are recorded in **Chapter 18 – Water Environment and Flood Risk (Volume II)**. Within Pipe Reach 2, groundwater levels have been recorded by the GI between 3.2 – 3.7 mbgl from Stanlow AGI to the M56. Towards the River Gowy groundwater levels are shallow with the potential for artesian conditions north of Halls Green Lane (recorded in LB_21_114). At the Shropshire Union Canal groundwater levels were recorded at 1.35 – 1.74 mbgl.

2.4.16. Further information on the underlying geology and hydrogeology of the pipeline can be found in **Superficial and Bedrock Geology (Volume IV).**

Pipe Reach 3

2.4.17. The existing superficial geology beneath Pipe Reach 3 consists of the following (from east to west):

- Glacial Devensian till – Diamicton
- Tidal flat deposits – clay, silt and sand

2.4.18. The glacial till is shallow to the west of the Shropshire Union Canal with the GI recording a thickness of 2-3 m. Westwards towards Mollington BVS the GI has proven the glacial till to a depth of 15 mbgl. The tidal flat deposits were not encountered by the GI across Pipe Reach 3 as no boreholes were sited within the deposit.

2.4.19. The existing bedrock geology beneath Pipe Reach 3 consists of the following:

- Chester Sandstone Formation – pebbly sandstone

2.4.20. The BGS GeoIndex (**Ref. 11**) and GI data has indicated that the sandstone may be outcropping or shallow (1-3 mbgl) around Rock Bank BVS, westwards

bedrock deepens and is not encountered by the GI at Mollington BVS. However, BGS historic borehole SJ36NE12 has recorded soft sandstone at a depth of 21 mbgl at Mollington.

2.4.21. Groundwater levels are recorded in **Chapter 18 – Water Environment and Flood Risk (Volume II)**. Within Pipe Reach 3, the GI has recorded groundwater levels at Townfield Lane, north of Mollington at 3.65 mbgl.

2.4.22. Further information on the underlying geology and hydrogeology of the pipeline can be found in Superficial and Bedrock Geology in **Chapter 18 – Water Environment and Flood Risk (Volume II).**

Pipe Reach 4a

2.4.23. The existing superficial geology beneath Pipe Reach 4a consists of the following:

- Glacial Devensian till – Diamicton
- Tidal flat deposits – clay, silt and sand

2.4.24. The GI has proven the glacial till to a depth of 15 mbgl across Pipe Reach 4a, while the tidal flat deposits have been proven to a depth of 18 mbgl when approaching the River Dee.

2.4.25. The existing bedrock geology beneath Pipe Reach 4a consists of the following:

2.4.26. Chester Sandstone Formation – pebbly sandstone

2.4.27. The GI did not encounter bedrock across Pipe Reach 4a, with the superficial deposits proven to over 15 mbgl. As described above, borehole SJ36NE12 has recorded soft sandstone at a depth of 21 mbgl at Mollington.

2.4.28. Groundwater levels are recorded in **Chapter 18 – Water Environment and Flood Risk (Volume II)**. Within Pipe Reach 4a, groundwater data is limited, based on surrounding groundwater levels in Pipe Reach 3 and 4b, groundwater levels would be expected between 1 – 5 mbgl.

2.4.29. Further information on the underlying geology and hydrogeology of the pipeline can be found in Superficial and Bedrock Geology in **Chapter 18 – Water Environment and Flood Risk (Volume II).**

Ince AGI

2.4.30. The superficial deposits beneath the Ince AGI site consist of the tidal flat deposits. The GI recorded the tidal flat deposits to a depth of 8 mbgl, below which glacial deposits are found, proven to a depth of 17 mbgl. The bedrock geology beneath the Ince AGI site consists of Kinnerton Sandstone Formation. The GI did not encounter bedrock in this area, with the superficial deposits proven to a depth of 17 mbgl.

2.4.31. A Cone Penetration Test (CPT) (Location ID: LB_21_202_CPT) was carried out within the footprint of the Ince AGI which recorded a water strike at 0.4 mbgl,

2.4.32. According to the EA Magic Map geological data (**Ref. 9)**, the Site does not lie within a groundwater source protection zone. Cheshire West and Chester Level 1 SFRA (**Ref. 2)** shows the proposed Ince AGI Site in an area susceptible to groundwater flood risk (>75% risk of Groundwater Emergence).

Stanlow AGI

2.4.33. The superficial deposits at the Stanlow AGI have been identified as glacial Devensian till. The GI has described the superficial deposits as sands and gravel with low to medium cobble content. The GI has recorded the superficial deposits at the Stanlow AGI to a depth of 3.7 mbgl before meeting bedrock. The bedrock geology beneath the Stanlow AGI site consists of the Chester Sandstone Formation. At the Stanlow AGI, the Chester Sandstone Formation has been recorded from 3.7 mbgl, proven to 14.7 mbgl.

2.4.34. A groundwater monitoring borehole (Location ID: LB_21_02_BH) located approximately 150 m south of the Stanlow AGI has recorded groundwater levels between 3.2 mbgl and 3.7 mbgl during February 2022.

2.4.35. The EA Magic Map geological data mapping (**Ref. 9**) indicates that the Site does not lie within a groundwater source protection zone. The Cheshire West and Chester Level 1 SFRA (**Ref. 2**), specifies that the Site is not particularly susceptible to risk of groundwater flooding and the SFRA (**Ref. 2)** groundwater map indicates that the risk of groundwater emergence is less than 25%.

Rock Bank BVS

2.4.36. The BGS GeoIndex (**Ref. 11**) has indicated that superficial deposits are not present at the Rock Bank BVS, however a GI borehole at the BVS site (Location ID: LB_21_21_BH) has indicated that 2-3 m of glacial Devensian till deposits are present (consisting of slightly clayey sand), below which bedrock is present. The bedrock geology beneath the Rock Bank BVS site consists of Chester Sandstone Formation. The Chester Sandstone Formation has been recorded by the GI at the Rock Bank BVS from 3.2 mbgl, proven to 5.2 mbgl.

2.4.37. Groundwater was not encountered by the GI at the Rock Bank BVS. Groundwater level data received from the Environment Agency indicates (when inferred) that groundwater may be 5 – 10 mbgl at the Rock Bank BVS.

2.4.38. The EA Magic Map geological data mapping (**Ref. 9)** indicates that the Site does lie not within a groundwater source protection zone. However, the Cheshire West and Chester Level 1 SFRA (**Ref. 2)** indicates that the Site lies in an area susceptible to risk of groundwater flooding. The Cheshire West and Chester Level 1 SFRA (**Ref. 2**) groundwater map indicates that the risk of groundwater emergence is between 25% and 50%.

Mollington BVS

2.4.39. The superficial deposits below the Mollington BVS site consist of glacial Devensian till. The GI has described the glacial till as sandy/gravelly clay and has proven the deposit to 20 mbgl without encountering bedrock (Location ID: LB_21_99_BH). The bedrock geology beneath the Mollington BVS site consists of the Chester Sandstone Formation. The sandstone is found at depth below the thick superficial deposits and was not proven by the GI. However, BGS historic borehole SJ36NE12 in Mollington encountered bedrock at 21 mbgl, recorded as soft sandstone (**Ref. 11)**.

2.4.40. The EA Magic Map geological data mapping indicates (**Ref. 9**) that the Site does not lie within a groundwater protection zone. The Cheshire West and Chester Level 1 SFRA (**Ref.2**) indicates that the Site does not lie in an area susceptible to risk of groundwater flooding.

2.5. EXISTING WATERBODIES

Newbuild Carbon Dioxide Pipeline

2.5.1. The stretch of the Newbuild Carbon Dioxide Pipeline, which stretches from Ince to the England/Wales Border, crosses a total of 27 watercourses, this includes 17 “ordinary” watercourses and 10 “main rivers”. These are presented in **Table 1** below and **Figure 18.4.1 – Watercourse Crossings (England) (Sheet 2) (Annex A).**

2.5.2. The crossing type refers to the proposed construction methodology at each of the watercourse crossings (Open Cut - OC and Trenchless Crossing – TC).

Table 1 Watercourse Crossings

Watercourse	Designation	Proposed Crossing Type
Elton Lane Ditch 1	Ordinary	OC
Elton Lane Ditch 4	Ordinary	OC
Elton Marsh 1	Ordinary	OC
Elton Marsh 2	Ordinary	OC
West Central Drain	Main	OC
Elton Marsh Brook 13	Ordinary	OC
Hapsford Brook	Main	OC
Elton Brook Trib 2	Ordinary	OC
Elton Brook Trib 3	Ordinary	OC
Gale Brook	Main	OC
Thornton Uplands	Main	OC
Hall Green Lane Brook	Ordinary	OC
Thornton Main Drain	Main	OC
River Gowy	Main	TC
Thornton Ditch 1	Ordinary	OC
Thornton Ditch 2	Ordinary	OC
Stanney Main Drain	Main	OC
Stanney Mill Brook	Main	OC
Wervin Hall Ditch Trib	Ordinary	OC
Shropshire Union Canal	Ordinary	TC
Rake Lane Brook	Ordinary	OC
Backford Brook	Main	OC
Friars Park Ditch	Ordinary	OC
Gypsy Lane Brook	Ordinary	OC
Finchetts Gutter Trib	Ordinary	OC
Seahill Trib	Ordinary	OC
Seahill Drain	Main	OC
OC – Open Cut Crossing TC – Trenchless Crossing		

Ince AGI

2.5.3. A review of OS Mapping (2022) **(Ref. 11)** has been undertaken to identify watercourses within and near Ince AGI. The closest main watercourse to the proposed Ince AGI is the East Central Drain, a main watercourse located just north of Ince AGI and located partially within the Newbuild Infrastructure Boundary. This watercourse flows south towards Elton Lane Ditch 2 where it is conveyed eastward into the Hornsmill Brook.

2.5.4. Within a radius of approximately 300m from Ince AGI, there are a number of ordinary watercourses, namely: Elton Lane Ditch 1, Elton Marshes East, Elton Lane Ditch 5, Elton Lane Ditch 6 and Elton Lane Ditch 7.

2.5.5. The above watercourses form part of a network of local open watercourses located within an area known as the Ince Marshes. Water levels within this network of watercourses are managed through the capacity within the ditches and the Ince pumping station. This is also fed by a main north-south channel called West Central Drain (3.6km) which has two tributaries; East Central Drain (2.3km) and Western Boundary Drain (1.6km). Ince Pumping Station has a gravity bypass channel, Tang Running (1km). The catchment draining to the pumping station is approximately 3.2km^2 and is currently operated and maintained by the EA.

Stanlow AGI

2.5.6. A review of OS Mapping (2022) (**Ref. 11**) has been undertaken to identify watercourses near Stanlow AGI. The closest watercourse to Stanlow AGI Site is Gale Brook, a tributary of the main River Gowy. Gale Brook is a main river which is located approximately 150m to the southwest of Stanlow AGI, within the Newbuild Infrastructure Boundary. The watercourse is culverted beneath the A5117 dual carriageway and flows north. There are no other known watercourses in proximity of the Stanlow AGI.

Rock Bank BVS

2.5.7. A review of OS Mapping (2022) **(Ref. 12)** has been undertaken to identify watercourses near Rock Bank BVS. This BVS is located at approximately 400m northwest of the Shropshire Union Canal and 200m north of the Canal Ditch. There are no other known watercourses in proximity of the Rock Bank BVS.

Mollington BVS

2.5.8. A review of OS Mapping (2022) **(Ref. 12)** has been undertaken to identify watercourses near Mollington BVS. The closest watercourse to Mollington BVS is the Overwood Ditch, running 35m southeast of the Mollington BVS, within the Newbuild Infrastructure Boundary. There are no other known watercourses in proximity of the Mollington BVS.

2.6. EXISTING SEWER AND DRAINAGE INFRASTRUCTURE

2.6.1. United Utilities (UU) has been contacted requesting their asset information, and they provided an indicative location of assets near the Newbuild Carbon Dioxide Pipeline. In addition, a utility search has been carried out in 2021, which include sewer asset records of United Utilities and Walsh Water (**Ref. 24**). This asset information will be taken into consideration for the Detailed Design of the Newbuild Carbon Dioxide Pipeline.

2.6.2. At this stage UU has not provided information relation to local sewer flooding issues within the proposed Newbuild Carbon Dioxide Pipeline.

NEWBUILD CARBON DIOXIDE PIPELINE

Pipe Reach 1

2.6.3. Pipe Reach 1 intersects a United Utilities pipe (**Ref. 24**) North-East of the A5117 and west of the B5132 Cryers Lane. At this location the Newbuild Carbon Dioxide Pipeline is designed so that there are no clashes with the UU assets.

Pipe Reach 2

2.6.4. Pipe Reach 2 intersects United Utilities pipes (**Ref. 24**) south of Stanlow AGIand at East Picton Lane. At this location the Newbuild Carbon Dioxide Pipeline is designed so that there are no clashes with the UU assets.

Pipe Reach 3

2.6.5. Pipe Reach 3 intersects United Utilities pipes (**Ref. 24**) west of Liverpool Road A41 and ast of the Mersey Railway. At this location the Newbuild Carbon Dioxide Pipeline is designed so that there are no clashes with the UU assets.

Pipe Reach 4a

2.6.6. Pipe Reach 4a intersects a United Utilities pipe (**Ref. 24**) on Hermitage Road. At this location the Newbuild Carbon Dioxide Pipeline is designed so that there are no clashes with the UU assets.

INCE AGI

2.6.7. The current use of the proposed location for Ince AGI is agricultural. The utility record (**Ref. 24**) of the area shows no buried assets in the proximity of the AGI.

2.6.8. The proposed location for Ince AGI is surrounded by ditches which drain surface water runoff from the proposed location for Ince AGI and adjacent fields. The EA have advised that this low-lying area is drained by pumping stations that are currently operated and maintained by the EA.

2.6.9. Based on the information provided by UUthe nearest surface water sewer asset appears to be located approximately 180m to the north of the proposed location for Ince AGI.

STANLOW AGI

2.6.10. The current use of the proposed location for Stanlow AGI is industrial. The utility record (**Ref. 24**) of the area shows an extensive network of buried assets in the area.

2.6.11. Based on the information provided by UU, the nearest sewer assets are located 100m south of the proposed Stanlow AGI. These are a surface water sewer and a foul water sewer running parallel of the A5117.

ROCK BANK BVS

2.6.12. The proposed location for Rock Bank BVS is currently undeveloped. The utility record (**Ref. 24**) of the area shows only a buried asset, a telecommunication service east of Chorlton Lane in the proximity of the BVS therefore it is assumed that it is not served by any drainage infrastructure.

2.6.13. This is consistent with the information provided by UU, which indicates that there are not sewers assets within 1.5km of the Site.

MOLLINGTON BVS

2.6.14. The current proposed location for Mollington BVS is currently undeveloped, the utility record (**Ref. 24**) of the area shows no buried assets in the proximity of the BVS.

2.6.15. The closest sewer asset belongs to Welsh Water according to the utilities record, and runs under Overwood Lane and Parkgate road. UU, indicates that there are not sewers assets within 1km of the Site.

2.7. EXISTING FLOOD DEFENCES

NEWBUILD CARBON DIOXIDE PIPELINE

2.7.1. The Newbuild Carbon Dioxide Pipeline crosses the following watercourses which have formal flood defences associated with them. **Table 2** below shows a summary of the existing flood defences being crossed by the Newbuild Carbon Dioxide Pipeline. **Table 2** also shows a summary of the method of construction at each of these watercourse crossings and flood defences.

Table 2 Summary of Existing Flood Defences (Environment Agency, July 2022)

Watercourse	Designation	Proposed Crossing Type	Type of defence
West Central Drain	Main	OC	Natural High Ground
Hapsford Brook	Main	OC	Natural High Ground
Gale Brook	Main	OC	Natural High Ground
Thornton Uplands	Main	OC	Natural High Ground
Thornton Main Drain	Main	OC	Natural High Ground
River Gowy	Main	TC	Embankment
Stanny Main Drain	Main	OC	Natural High Ground
Stanny Mill Brook	Main	OC	Natural High Ground
Backford Brook	Main	OC	Natural High Ground
Seahill Main Drain	Main	OC	Engineered High Ground
OC – Open Cut Crossing **TC – Trenchless Crossing**			

INCE AGI

2.7.2. Ince AGI will be located in an area benefitting from fluvial flood defences. These are mainly classed as “Natural High Ground” on the Environment Agency database (**Ref. 7)** and are shown in **Figure 18.4.6 – Flood Defences Ince AGI(Sheet 1) (Annex D)**. This drawing needs to be read in conjunction with **Table 3** below, illustrating the details of the flood defences.

Table 3 Fluvial Flood Defences near the Ince AGI Site (Environment Agency, July 2022)

Fluvial Flood Defences				
	North Defence (id 36290)	**East Defence (id 36292)**	**West Defence (id 185538)**	**Proposed Site Level**
Actual downstream crest level	4.13m	4.77m	4.28m	5.20
Actual upstream crest level	4.45m	4.13m	4.13m	5.20
Condition	Good	Fair	Fair	-

2.7.3. Ince AGI will be in an area also protected by a tidal flood defence system. The flood defence consists of the embankment of the Manchester Ship Canal (MSC) which forms a barrier between the tidal Mersey Estuary and its southern floodplains. This defence is shown in **Figure 18.4.6 –Flood Defences Ince AGI(Sheet 2) (Annex D)**.

2.7.4. **Table 4** below provides details of the tidal flood defence protecting the Ince AGI Site and should be read in conjunction with **Figure 18.4.6 – Flood Defences Ince AGI(Sheet 2) (Annex D)**:

Table 4 Tidal Flood Defences near Ince AGI Site (Environment Agency, July 2022)

Tidal Flood Defences			
	East Defence (id 184369)	**West Defence (id 186433)**	**Site Level**
Actual downstream crest level	6.59m	5.15m	5.20
Actual upstream crest level	5.77m	6.18m	5.20
Condition	Unknown	Unknown	-

STANLOW AGI

2.7.5. Gale Brook, an ordinary watercourse, is located approximately 150m west of the proposed Stanlow AGI. Existing flood defences along the Gale Brook are identified by the EA as being “Natural High Ground”, and in “very poor” condition and is as shown in **Figure 18.4.7 –Flood Defences Stanlow AGI(Sheet 1) (Annex D)**. It is worth noting that, the proposed location for Stanlow AGI is higher (approximately 9.5m AOD) than the crest level of the defences (8.11m AOF) which mitigates any potential fluvial flood risk associated to the poor condition of the defences.

2.7.6. **Table 5** below shows information held by the EA on these defences near the Stanlow AGI and should be read in conjunction with **Figure 18.4.7 –Flood Defences Stanlow AGI(Sheet 1) (Annex D)**.

Table 5 Fluvial Flood Defences near the Ince AGI Site (Environment Agency, July 2022)

Fluvial Flood Defence		
	Gale Brook (Id 48632) Natural High Ground	**Stanlow AGI Level**
Actual Downstream Crest Level	8.09m	9.5m
Actual Upstream Crest Level	8.11m	9.5m
Condition	Very Poor	-

2.7.7. Gale Brook is also tidally influenced by downstream tide level in the River Mersey.

2.7.8. In order to protect land and development sites located upstream from tidal flooding, there is a tidal flap valve along the downstream reach of Gale Brook located next to the Stanlow Thornton train station. This defence is shown in **Figure 18.4.7 –Flood Defences Stanlow AGI(Sheet 1) (Annex D)**.

2.7.9. The BVS at Rock Bank and Mollington do not benefit from flood defences and therefore have not been considered in this section.

2.8. SEQUENTIAL TEST

2.8.1. The aim of this section is to provide an assessment of the suitability of the DCO Proposed Development against the requirements of NPPF in relation to the Sequential Test.

2.8.2. The Environment Agency's Flood Map for Planning (**Ref. 13)** classifies the probability of fluvial and tidal flooding using the following categories:

- Flood Zone 1 – land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Flood Zone 2 – land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5%);
- Flood Zone 3 – land assessed as having a greater than 1 in 100 annual probability of river flooding (>1%) or a greater than 1 in 200 annual probability of sea flooding (>0.5%).

2.8.3. The flood zones above do not take into account the presence of flood defences

2.8.4. As discussed in the NPPF (**Ref. 3**) and NPPF PPG (**Ref.4**), the aim of the Sequential Test is to steer development to areas with the lowest risk of flooding from any sources. Where there are no reasonably available Sites in Flood Zone 1 development in Flood Zone 2 and 3 might be acceptable subject to application of the Exception Test where appropriate.

2.8.5. Due to its scale, the DCO Proposed Development crosses numerous Flood Zones 1, 2 and 3.

2.8.6. **Table 6** has been extracted from the NPPF and provides the classification of the DCO Proposed Development which falls under the "Essential Infrastructure" vulnerability category:

Table 6 NPPF Vulnerability Classification – Essential Infrastructure

Vulnerability Classification	Description
Essential infrastructure	• Essential Transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.

2.8.7. In accordance with the information available within Table 3 in the NPPF PPG (**Ref. 4)** summarised in **Table 7** below, "essential infrastructure" is acceptable within Flood Zone 3 providing that the Exception Test is passed.

Table 7 NPPF PPG Flood risk vulnerability and Flood Zone compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception test required	✓	✓
	Zone 3a	Exception test required	✓	×	Exception test required	✓
	Zone 3b functional floodplain	Exception test required	✓	×	×	×

2.8.8. Other requirements of Table 3 of the NPPF **(Ref. 4)** are as follows:

- In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.
- In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:
  - remain operational and safe for users in times of flood;
  - result in no net loss of floodplain storage;
  - not impede water flows and not increase flood risk elsewhere.

EXCEPTION TEST

2.8.9. The Exception Test, as set out in the NPPF, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable Sites at lower risk of flooding are not available.

2.8.10. The Exception Test requires the DCO Proposed Development to show that:

- it will provide wider sustainability benefits to the community that outweigh flood risk;
- it will be safe for its lifetime, taking into account the vulnerability of its users, without increasing flood risk elsewhere and where possible reduce flood risk overall.

2.8.11. In relation to the first requirement of the Exception Test, as stated in the **Needs Case** (**Document reference**: **D.5.5**) there are clear international, national and local policies, ambitions and statements that support the transition to a low-carbon economy and to act on climate change including legally binding legislation.

2.8.12. There is demonstrable support for the use of Carbon Capture, Usage and Storage (CCUS) to support the transition to a low-carbon economy, to meet the Net-Zero target and help decarbonise industrial clusters in the North-West of England and North Wales. Furthermore, the DCO Proposed Development enables further elements of the HyNet project to be developed which includes the production of low-carbon hydrogen and a hydrogen distribution network. Without the CO2 Pipeline, the wider HyNet project and cluster, cannot take place.

2.8.13. The DCO Proposed Development will enable the HyNet project to deliver many benefits for the local area, region and the country. The timing of the DCO Proposed Development will help the Government meet its targets for carbon capture and low-carbon hydrogen production and will lead to a decarbonised economy, more quickly.

2.8.14. In relation to the Second Requirement of the Exception Test, this FRA assesses the flood risk information available and demonstrate that the DCO Proposed Development will be safe for its lifetime, without increasing the flood risk elsewhere.

3. STAKEHOLDER ENGAGEMENT

3.1. ENVIRONMENT AGENCY

3.1.1. An engagement meeting was undertaken between the EA and the Applicant on 22 March 2022 (**Annex B**) and this did not raise any significant issues relating to the flood risk associated with the DCO Proposed Development. The following key items were noted:

- It is acceptable for this FRA to focus on the permanent works and only make reference to temporary works which will be covered in the Flood Risk Activity Permit applications and the **OCEMP (Document reference: D.6.5.4).**
- Surface water management proposals can form part of a separate report and not be included within this FRA.

3.1.2. Engagement records with the EA that provide information for hydraulic modelling data and site-specific advice are included in **Annex B** of this report. Minutes of the meeting are included in **Annex B**.

3.2. LLFA

3.2.1. Cheshire West and Chester Council were contacted in their role as LLFA, however, at the time of writing, the LLFA have not yet provided their responses to the enquiries for the DCO Proposed Development.

3.3. UNITED UTILITIES

3.3.1. UU were contacted in their role as Statutory Water Authority on the risk of flooding from their existing assets to the DCO Proposed Development. Minutes of the meeting are included in **Annex B.**

3.3.2. UU have provided an indicative asset record, and general guidance on easements. In addition to that, a Utility Search Report carried out in 2021 on behalf of the client provided UU assets record (**Ref. 24**). UU has not yet provided their responses to the flood risk enquiries for the DCO pipeline and at the two AGIs and two BVSs locations.

3.4. WELSH WATER

3.4.1. Welsh Water were contacted in their role as Statutory Water Authority on the risk of flooding from their existing assets to the DCO Proposed Development near the border between Wales and England. They confirmed that no flooding issues have been recorded near the DCO Proposed Development in England.

3.4.2. In addition to the above, a Utility Search Report carried out in 2021 on behalf of the client provided DCWW assets record (**Ref. 24**).

4. CLIMATE CHANGE

4.1.1. Climate change can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. The review of the potential impacts discussed below takes into account the 25 years life span of the Newbuild Carbon Dioxide Pipeline.

4.1.2. This section is meant be read in conjunction with **Chapter 7 – Climate Resilience (Volume II)**, describing the vulnerability of the proposed scheme to climate change and the resilience of the development to the likely significant effects of climate change.

4.1.3. Environment Agency Climate Change allowances (**Ref. 14**) were updated on the 27 May 2022. One of the main changes that the EA brought forward is that the peak rainfall and river flow allowances are now provided for "management catchments" (**Ref. 14**). The Newbuild Carbon Dioxide Pipeline lies on the Weaver Gowy Basin District for Pipe Reaches 1,2 and 3, whilst Pipe Reach 4a falls under the Dee River Basin District.

4.1.4. In the Weaver Gowy Basin District (**Ref. 15**), as well as the Dee River Basin District (**Ref. 17**), wetter winters and more rain falling in wet spells may increase river flooding for rivers and tributaries. More intense rainfall causes more surface water runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers.

4.1.5. **Table 8** below is extracted from the Weaver Gowy District and (**Ref. 16**) shows the peak river flows projected for the 2050s.

Table 8 Weaver Gowy District Peak River Flow Allowances

Allowance Category	Total potential change anticipated for the "2050s"
Upper end	64%
Higher central	40%
Central	30%

4.1.6. **Table 9**, shows the Dee River Basin District (**Ref. 17**), increment peak river flows expected for the 2080s.

Table 9 Dee River Basin District Peak River Flow Allowances

Allowance Category	Total potential change anticipated for the "2050s"
Upper end	32%
Higher central	19%
Central	14%

4.1.7. **Table 10** below shows the increase in rainfall intensity projected for the Weaver, Gowy and Dee Management Catchment in a 1% annual exceedance rainfall event **Ref. 15**.

Table 10 Rainfall Intensity Projection for the Weaver, Gowy and Dee Management Catchment

Allowance Category	Total potential change anticipated for the "2050s"(lifetime up to 2060)
Upper end	40%
Central	25%

4.1.8. Additionally, rising sea levels could lead to increased inundation of coastal areas as well as reducing the hydraulic gradient of rivers (leading to upstream flooding).

4.1.9. The sea level rise allowances are forecast at regional level, with the impact of climate change dependent on location. The mean sea level in the North West Basin District is expected to rise by the year 2065 between approximately 275 mm (70th percentile) and 370mm (95th percentile).

4.1.10. It should be noted that this FRA is mainly based on a range of hydraulic models provided by the EA; these, together with additional information obtained from the various stakeholders and sources of information, has allowed the assessment of representative worst-case scenarios and the identification of appropriate mitigation measures taking the potential impacts of climate change into account.

5. DEFINITION OF FLOOD HAZARD

5.1. OVERVIEW

5.1.1. This section provides an overview of the present-day and future baseline flood risk at the Site and surrounding areas.

5.1.2. This assessment considers flood risk profile, sources, and mechanisms of flooding during the current day scenario and taking into account climate change information where available, in association to construction of the DCO Proposed Development.

5.1.3. Please note that the following assessment in regards of the proposed Newbuild Carbon Dioxide Pipeline it is also valid for the FOC as this will be installed along the length of the Newbuild Carbon Dioxide Pipeline.

5.1.4. Marker posts and CP posts along the proposed Newbuild Carbon Dioxide Pipeline are subject to the same flood hazard; however, they are considered to be negligible from a flood risk prospective as these are simple posts on a concrete base.

5.2. FLOODING HISTORY

5.2.1. The Cheshire West and Chester Level 1 SFRA **(Ref. 2)** indicates that there are no records of historic flooding within the Newbuild Infrastructure Boundary at the Stanlow AGI, Rock Bank BVS and Mollington BVS Sites.

5.2.2. There is anecdotal information on historical flooding within the Newbuild Infrastructure Boundary at the Ince AGI in 1976 and 2007, however it is not known whether the actual proposed location for Ince AGI was affected.

5.2.3. Welsh Water confirmed that there is no record of flooding near the DCO Proposed Development in England.

5.2.4. Additional information on history of flooding had been requested from the LLFA and the EA, however, at the time of writing no detailed responses have been received on historical flooding.

5.3. FLOODING FROM RIVERS (FLUVIAL FLOODING)

NEWBUILD CARBON DIOXIDE PIPELINE

5.3.1. The Newbuild Carbon Dioxide Pipeline crosses 27 open watercourses. A review of the EA Flood Map for Planning **Figure 18.4.1 – Newbuild Carbon Dioxide Pipeline Flood Map for Planning (Sheet 3) (Annex C)** indicates that 9 of these crossings are in flood zone 1, whilst the remaining 18 are located within Flood Zone 3/2 and are listed below:

- Elton Lane Ditch 1

- Elton Lane Ditch 4
- Elton Marsh 1
- Elton Marsh 2
- West Central Drain
- Elton Marsh 13
- Hapsford Brook
- Elton Brook Tributary 2
- Elton Brook Tributary 3
- Gale Brook
- Thornton Main Drain
- River Gowy
- Thornton Ditch 1
- Thornton Ditch 2
- Stanney Main Drain
- Stanny Mill Brook
- Backford Brook
- Seahill Drain

5.3.2. Therefore, the likelihood of fluvial flooding along the route of the Newbuild Carbon Dioxide Pipeline varies from negligible to high.

INCE AGI

5.3.3. Ince AGI will be located within the Ince Marshes. Based on the EA Flood Map for Planning **Figure 18.4.2 –Flood Map for Planning Ince AGI (Sheet 1) (Annex C)** the location is within a defended Flood Zone 3. Hydraulic modelling was undertaken by the EA in 2004 and relevant maps for 1 in 100 year return period plus 20% climate change and 1 in 1000 year return period have been included for reference, **Figure 18.4.8 –** Fluvial Flood Model 1 in 100yr +20CC - Ince AGI **(Sheet 1) (Annex C) and Figure 18.4.8 –** Fluvial Flood Model 1 in 1000yr - Ince AGI **(Sheet 2) (Annex C).** However, such modelling is considered superseded by the more recent models discussed below and has not been used to inform this assessment.

5.3.4. The long-term flood risk map in the GOV.UK portal indicates that the area is at ‘Low Risk’, defined as having a chance of flooding of between 0.1% and 1% every year. This is qualitatively consistent with the presence of flood defences in the area. The low likelihood of fluvial flooding is also confirmed by Cheshire West and Chester Level 1 SFRA **(Ref. 2).**

5.3.5. More detailed flood risk information on the area is available in the Ince and Frodsham Marshes Maintenance Strategy Study (the Ince Study hereafter), produced by Halcrow on behalf of the EA in 2011 (**Ref. 19).**

5.3.6. The Ince Study states "*The Ince and Frodsham marshes system is a mainly pumped catchment, drained by a mixture of land drains, channels and Main Rivers which are pumped by the Ince or Frodsham Pumping Stations*." (**Ref. 19).**

5.3.7. The Ince Study investigated a range of options for the future management of the marshes including:

- Stop or reduce the active management of levels within the marshes through pumping (Do Nothing Scenario)
- keeping the ongoing arrangements which rely on pumping into the Manchester Ship Canal (Ince) and River Weaver (Frodsham) at the two pumping stations and proactive Environment Agency maintenance of the channels (i.e. 'Do Minimum' Scenario).

5.3.8. The ISIS-TUFLOW 1D-2D hydraulic model undertaken as part of the Ince Study show that for an event of a 1% Annual Expected Probability (AEP), 1 in 100 year return period, the proposed location for Ince AGI does not flood in a "do minimum" scenario, **Figure 18.4.21 – Flood Extent Do Minimum Scenario (Sheet 1) (Annex J)**.

5.3.9. An additional scenario, assuming that only the Ince pumping station would be operational, shows the same results for the proposed location of Ince AGI i.e. no flooding in a 1 in 1000 year scenario affecting the DCO Proposed Development, **Figure 18.4.21 - Flood Extent Pump At Ince Only (Sheet 2) (Annex J)**.

5.3.10. It is worth noting that the model shows that, even if pumping stopped ("Do Nothing Scenario), the proposed location of the Ince AGI would still be on the edge of the area affected in a 1% AEP, 1 in 100 year return period scenario and only the south-western part of the structure would be affected. Please refer to **Figure 18.4.21 - Flood Extent Do Nothing Scenario (Sheet 3) (Annex J)**.

5.3.11. In order to understand the future strategy for the area and whether the active management of the marshes would continue, engagement has been undertaken with Peel Natural Resources and Energy (NRE); this is because Peel NRE have an interest in the area and are developing a commercial Proposed Development (Protos) just north of the Ince AGI.

5.3.12. Through the engagement with Peel NRE, the following was confirmed:

- Water levels within the Ince marshes have historically been managed through a series of ditches/watercourses together with pumps at Ince and Frodsham, which control levels when level of water in the ditches increase.

- The above-mentioned pumps were considered non-critical assets by the Environment Agency, therefore the option of abandoning them increasing the amount of standing water in the marshes was considered by the EA.
- Peel and the nearby farmers raised concerns in relation to a potential increase of flooding in the area which could affect development/activities. Therefore, pumps at Ince and Frodsham and Ince have been updated with new fish friendly pumps in 2015.
- The pumps are still operated by the Environment Agency however it is possible/likely that the EA will dispose of them in the future.
- If that was the case, local business (farmers) and Peel would form a joint venture and acquire the pumps at Ince, whilst the pump at Frodsham would be acquired only by Peel. In this scenario, a contractor will be appointed to manage the pumps at Ince and Frodsham.
- The existing ditches in the Ince Marshes are currently maintained (e.g. cleaning and de-silting) by Peel as part of their riparian ownership duties.

5.3.13. Based on the above it is expected that the active management of the marshes will continue in the future. As the pumps will keep working in normal conditions for the long term, the likelihood of fluvial flooding at the proposed Ince AGI area is assessed as low. Uncertainties related to the potential effects of climate change will be managed through raising the proposed Ince AGI platform as discussed in the mitigation measures (**Section 6.2**).

STANLOW AGI

5.3.14. The EA Flood Map for planning **Figure 18.4.3 –Flood Map for Planning Stanlow AGI (Sheet 1) (Annex C)** shows that Stanlow AGI will be located almost entirely within Flood Zone 1. Only the western end of the Stanlow AGI will be located on the edge of Flood Zone 3**.** This is consistent with the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** mapping.

5.3.15. In 2019, Jacobs carried out the Stanlow and Tranmere Flood Risk Management study **(Ref. 1)** (the Stanlow Study hereafter) on behalf of the EA. The study, which has been made available from the EA, includes hydraulic modelling and provides a more detailed assessment of fluvial flood risk in the area. The results of the Stanlow study shows that the actual flood plain extent in the area is more limited than the one shown in the Flood Map for Planning (**Ref. 13**) as discussed below.

5.3.16. The Stanlow Study was developed by updating a previous hydraulic model of the River Gowy developed by JBA Consulting **(Ref. 20)**. However, the Stanlow Study model includes an explicit representation of Gale Brook, which is the main potential source of fluvial flooding as running close to Stanlow AGI location.

5.3.17. The results of the Stanlow Study have been used to inform the assessment of the likelihood of fluvial flooding at the location of the proposed Stanlow AGI.

5.3.18. **Figure 18.4.20 – Stanlow Study Area Stanlow AGI (Sheet 1) (Annex I)** has been extracted from the Stanlow Study to illustrate the different elements of the fluvial hydraulic model. The hydraulic model results show that the localised flooding from Gale Brook is relatively independent from the fluvial flooding caused by the River Gowy and its tributaries located further downstream.

5.3.19. Based on the updated hydraulic model results contained in the Stanlow Study*: Flooding from the Gale Brook occurs in the 3.33% AEP event (1 in 30 year return period) due to surcharge of the culvert under the A5117 (highways south of proposed Stanlow AGI location). Out-of-bank-flows from the upstream section of the culvert are spilled onto the A5117 before reaching the downstream section of the culvert, north of the A5117. During larger magnitude events, 1% AEP and 0.1% AEP events (1 in 100 and 1 in 1000 year return period), flooding remains confined to the area north of the culvert under the A5117 with a maximum water level of approximately 8.4m AOD generating a water depth of approximately 0.2m approximately 50m southwest of the proposed Stanlow AGI location*. (**Ref. 1**)

5.3.20. The ground levels at the location of the proposed Stanlow AGI are about 9.5m AOD, significantly higher. **Figure 18.4.9 –Gowy River model - 1 in 1000 yr Stanlow AGI (Sheet 1) (Annex E)** shows the flood extent from the model for an event of 1 in 1000 year return period, excluding climate change.

5.3.21. Within the Stanlow Study climate change has been taken into account for two epochs: 50 years (2069) and 100 years (2119) taking 2016 as baseline year for a 1% AEP storm event.

5.3.22. The Stanlow Study shows that, even for the climate scenarios mentioned above, flooding will be confined to the area immediately north of the A5117. This flood extent excludes the proposed location of the Stanlow AGI. For a simulation of 1% AEP, 1 in 100 year return period including 30% climate change (**Figure 18.4.9 – Gowy River model - 1 in 100 year + 30CC Stanlow AGI (Sheet 2) (Annex E)**), the model shows similar results to the 0.1% AEP, 1 in 1000 year without climate change described above.

5.3.23. From a fluvial breach scenario perspective, the Stanlow Study illustrates a situation where, along the River Gowy, only the left hand bank failed. No simulation was undertaken on the right bank as the potential breach location did not comply with the required hydrostatic head for a breach to occur **(Ref. 1).**

5.3.24. Based on the findings of the latest available hydraulic model (Stanlow Study) provided by the EA, the likelihood of fluvial flooding at the location of the proposed Stanlow AGI is assessed as low.

ROCK BANK BVS

5.3.25. According to the EA Flood Map for planning **Figure 18.4.4 –Flood Map for Planning RockBank BVS(Sheet 1) (Annex C)** the proposed location of Rock Bank BVS lies within area defined as Flood Zone 1, i.e. having less than 0.1% probability of flooding in any year. This information is also confirmed by the Cheshire West and Chester Chester Level 1 (SFRA) **(Ref. 2),** showing the proposed location of Rock Bank BVS to be at low risk of flooding from rivers, and over 1 km away of the closed fluvial flood plain.

5.3.26. Based on the above, the likelihood of fluvial flooding is assessed as low.

MOLLINGTON BVS

5.3.27. According to the EA map for planning **Figure 18.4.5 –Flood Map for Planning Mollington BVS(Sheet 1) (Annex C** the proposed location of Mollington BVS lies within area defined as Flood Zone 1, i.e. having less than 0.1% probability of flooding in any year. This information is also confirmed by the Cheshire West and Chester Chester Level 1 SFRA **(Ref. 2)**, showing the Site to be at low risk of flooding from rivers.

5.3.28. Based on the above, the likelihood of fluvial flooding is assessed as low.

5.4. TIDAL FLOODING

NEWBUILD CARBON DIOXIDE PIPELINE

5.4.1. Based on EA Flood map for planning **Figure 18.4.1 – Newbuild Carbon Dioxide Pipeline Flood Map for Planning (Sheet 3) (Annex C),** Pipe Reach 1 and Pipe Reach 2 lie partially within Flood Zone 3, however, this is a tidal defended area.

5.4.2. Pipe Reach 3 and Pipe Reach 4a are also partially located in areas identified at flood risk (due to fluvial flooding) with no tidal defences as these locations are not subject to tidal flooding.

INCE AGI

5.4.3. According to the EA Flood Map for planning **Figure 18.4.2 –Flood Map for Planning Ince AGI(Sheet 1) (Annex C)**, the proposed location of Ince AGI is within the defended Flood Zone 3. EA's Long-Term Flood Risk Map (March 2022) **(Ref. 21)**, indicates that the area is at 'Low Risk', defined in the portal as having a chance of flooding of between 0.1% and 1% every year. This is qualitatively consistent with the presence of flood defences in the area. This is also confirmed by the Cheshire West and Chester Level 1 SFRA **(Ref. 2),** which shows the risk of flooding from rivers and sea to be low.

5.4.4. The Mersey Estuary, Ditton Brook and River Gowy **(Ref. 20)** (the Mersey Study hereafter) is a study conducted by JBA (2018) on behalf of the Environment

Agency illustrating the level of tidal flood risk posed to different reaches of the Mersey Estuary including the Ince Marshes and the Stanlow Oil Refinery.

5.4.5. The Mersey Study shows that the proposed location of the Ince AGI is defended (Manchester Ship Canal Embankment **Figure 18.4.6 –Flood Defences Ince AGI(Sheet 2) (Annex D)**). The simulations undertaken as part of the Mersey Study are shown in **Table 11** below:

Table 11 Mersey Study Simulations Summary

Simulation	Return period in years (climate change)
Design	75, 100, 200, 1000
Including climate change	200 (2065), 200 (2115)
Undefended	200, 1000

5.4.6. The results of the model show that extreme 0.1% AEP event (1 in 1000 year return period) **(Figure 18.4.10 –Mersey Tidal Model 1 in 1000 yr Ince AGI(Sheet 1) (Annex F)**) and 0.5% AEP plus climate change (2065 -1 in 200 year return period +CC) **(Figure 18.4.10 –Mersey Tidal Model 1 in 200 yr (2065) Ince AGI (Sheet 2) (Annex F)**) would not flood the proposed location of Ince AGI.

5.4.7. The landward side of the existing MSC is almost always higher than the MSC embankment (modelled spill level). If there were to be any flooding in this area of Ince Marshes, the defences would therefore be overtopped anyway. As a result, there was no benefit to removing these defences for the undefended model scenario and this avoided any major assumptions regarding the undefended spill crest.

5.4.8. Based on the above, the likelihood of tidal flooding in the area is expected to be low.

STANLOW AGI

5.4.9. According to the EA Flood Map for planning **Figure 18.4.3 –Flood Map for Planning Stanlow AGI (Sheet 1) (Annex C)**, shows the proposed location of Stanlow AGI to lie almost entirely within Flood Zone 1. Only the western end of proposed location of Stanlow AGI is on the edge of Flood Zone 3. This is consistent with the SFRA **(Ref. 2)** mapping.

5.4.10. The Mersey Study indicates that the proposed location is in fact no subject to tidal flooding up to extreme events including the 0.5% AEP, 1 in 200 year return

period plus climate change (2065), **Figure 18.4.11 –Mersey Tidal Model 1 in 200 yr (2065) Stanlow AGI(Sheet 1) (Annex F).**

5.4.11. The Stanlow Study includes two tidal breach scenarios, the left and the right bank of the River Gowy. The former is less relevant for this FRA as it would not affect area east of the River Gowy. The latter, the right bank of the River Gowy downstream of the railway crossing for the 4% AEP (1 in 25 year return period) and 0.5% AEP, 1 in 200 year return period events.

5.4.12. In this simulation the Gale Brook is not affected by the breach on the River Gowy. The SFRA (**Ref. 2)** refers to improvements made along both banks of the River Gowy including the replacement of the tidal gate to Gale Brook. According to the EA Asset Management website (accessed in June 2022) (**Ref. 7**), the last inspection was carried out on the 10-05-2021 and determined that the condition of the tidal gates was good. The tidal gate location is shown in **Figure 18.4.7 – Flood Defences Stanlow AGI(Sheet 1) (Annex D)**.

5.4.13. In the Stanlow Study **(Ref. 1)**, one location was selected to simulate a breach scenario of the Manchester Ship Canal. The reason behind this location is due to its embankment width which is shorter in comparison to other locations and therefore more likely to breach/fail.

5.4.14. For an event of magnitude 0.5% AEP, 1 in 200 years return period, a breach of the MSC northern bank would result in a localised flooding area north of the East Gate Road (approximately 2.1km north of the proposed location for Stanlow AGI) due to overtopping of the coastal berth and the N38 interceptor channel. This is shown in **Figure 18.4.20 – Stanlow Tidal Flooding MSC Breach Scenario 1 in 200 yr (Sheet 2) (Annex I)**.

5.4.15. This simulation shows that the proposed location for Stanlow AGI is not subject to flood risk caused by a breach of the MSC.

5.4.16. Based on the above, the likelihood of tidal flooding in the area is expected to be low.

ROCK BANK BVS

5.4.17. According to the EA Flood Map for planning **Figure 18.4.4 –Flood Map for Planning RockBank BVS(Sheet 1) (Annex C)**, the proposed location of Rock Bank BVS lies within an area defined as Flood Zone 1, i.e. having less than 0.1% probability of flooding in any year. This information is also confirmed by the Cheshire West and Chester Level 1 SFRA **(Ref. 2),** showing the proposed location to be at low risk of tidal flooding.

5.4.18. Based on the above, the likelihood of tidal flooding is considered to be negligible.

MOLLINGTON BVS

5.4.19. According to the EA Flood Map for planning **Figure 18.4.5 –Flood Map for Planning Mollington BVS(Sheet 1) (Annex C),** the proposed location of Mollington BVS lies within area defined as Flood Zone 1, i.e. having less than 0.1% probability of flooding in any year. This information is also confirmed by the Cheshire West and Chester Level 1 SFRA **(Ref. 2),** showing the Site to be at low risk of tidal flooding.

5.4.20. Based on the above, the likelihood of tidal flooding in the area is considered to be negligible.

5.5. FLOODING FROM SURFACE WATER

NEWBUILD CARBON DIOXIDE PIPELINE

5.5.1. The EA's Long-Term Flood Risk Map (March 2022) **(Ref. 21)**, indicates that the Newbuild Carbon Dioxide Pipeline partially lies within areas that are at risk of surface water flooding. This is consistent with the large scale of the Newbuild Infrastructure Boundary for the Newbuild Carbon Dioxide Pipeline, which covers approximately 35 km between England and Wales. This is consistent with the mapping shown in the Cheshire West and Chester Level 1 SFRA **(Ref. 2)**.

INCE AGI

5.5.2. The EA's Long-Term Flood Risk Map (March 2022) **Figure 18.4.12 – Surface Water Flood Map Ince AGI (Sheet 1) (Annex G)**, on the GOV.UK portal indicates that the proposed location for Ince AGI lies outside of the surface water flood extent, in an area at 'very low' risk of surface water flooding, defined as having a chance of flooding of less than 0.1% every year. This is also confirmed by the SFRA (**Ref. 2)** which indicates that the location of the AGI is outside the flood extents for the 1 in 30, 1 in 100 and 1 in 1000-year return period.

5.5.3. According to the Appendix A of the Cheshire West and Chester Level 1 SFRA **(Ref. 2),** the proposed location for Ince AGI lies outside a Critical Drainage Area. The closest one is located is 500m west of Ince AGI.

5.5.4. Based on the above it is considered that the likelihood of surface water flooding is low.

STANLOW AGI

5.5.5. The EA's Long-Term Flood Risk Map (March 2022) **Figure 18.4.13 –Surface Water Flood Map Stanlow AGI(Sheet 1) (Annex G)**, indicates that the proposed location for Stanlow AGI lies outside the surface water flood extent, in an area at 'very low' risk of surface water flooding, defined as having a chance of flooding of less than 0.1% every year. This is also confirmed by the SFRA

(Ref. 2), which shows the surface water flood extents for the 1 in 30, 1 in 100 and 1 in 1000-year return periods.

5.5.6. In addition, the Site is not located within a Critical Drainage Area (CDA) SFRA **(Ref. 2)**.

5.5.7. Based on the above it is considered that the likelihood of surface water flooding in the area is low.

ROCK BANK BVS

5.5.8. The EA's Long-Term Flood Risk Map (March 2022) **Figure 18.4.14 –Surface Water Flood Map BVS(Sheet 1) (Annex G)**, indicates that the proposed location for Rock Bank BVS is in an area at 'very low' risk of surface water flooding, defined as having a chance of flooding of less than 0.1% every year. This is also confirmed by the SFRA **(Ref. 2)**, which shows the flood extent for the flood event of 1 in 30, 1 in 100 and 1 in 1000 years return period.

5.5.9. However south of the proposed BVS location a surface water flow path is identified in the EA's Long-Term Flood Risk Map, with areas at 'high' risk, defined as having a chance of flooding greater than 3.3% every year. This would partially affect the area of the proposed access road.

5.5.10. The Site is not located within a critical drainage area (CDA) SFRA **(Ref. 2)**.

5.5.11. Based on the above it is considered that the likelihood of surface water flooding in the area is generally low, increasing to medium-high in locations along the flow path to the south.

MOLLINGTON BVS

5.5.12. The EA's Long-Term Flood Risk Map (March 2022) **Figure 18.4.15 –Surface Water Flood Map Mollington BVS(Sheet 1) (Annex G)**, on the Gov.UK portal indicates that the proposed location for Mollington BVS is in an area at 'very low' risk of surface water flooding, defined as having a chance of flooding of less than 0.1% every year. This is also confirmed by the SFRA **(Ref. 2)**, which shows the flood extent for the flood event of 1 in 30 1, in 100 and 1 in 1000 years return period.

5.5.13. The Site is not located within a critical drainage area (CDA) SFRA **(Ref. 2)**.

5.5.14. Based on the above it is considered that the likelihood of surface water flooding in the area is low.

5.6. FLOODING FROM GROUNDWATER

5.6.1. Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may

be more susceptible to groundwater flooding because the water table is usually at much shallower depth and often intersects the surface in valley bottoms providing baseflow for rivers and streams.

NEWBUILD CARBON DIOXIDE PIPELINE

5.6.2. The buried depth of the Newbuild Carbon Dioxide Pipeline would be a minimum of 1.2 m to the crown of the pipe in open cut sections and deeper for trenchless crossings to avoid existing services and physical obstructions. The open cut trench will be between approximately 2.5m and 6m deep to enable pipeline installation. A review of the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** shows that the pipeline crosses areas that are within low, medium, and high risk of groundwater emergence.

5.6.3. Two regions of shallow groundwater have been identified through the current GI data, to the south of the Ince AGI and surrounding the River Gowy. These areas may be at risk from groundwater flooding. There are a number of monitoring locations with telemetry data loggers along the Newbuild Carbon Dioxide Pipeline including the areas of shallow groundwater. However, the data for understanding the seasonal variation in groundwater levels is limited due to the groundwater monitoring regime commencing less than a year ago.

INCE AGI

5.6.4. A **Groundsure Report** (**Annex B of Appendix 11-1 Phase I Land and Soil (Contaminated Land) Baseline, Volume III**) (**Ref. 18**) is available and shows that the proposed location of Ince AGI lies within a High groundwater flood risk area due to shallow groundwater levels. This information is consistent with the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** which identifies the proposed location of Ince AGI in an area susceptible to groundwater flood risk (>75% risk of Groundwater Emergence).

5.6.5. In consistency with the above, the groundwater levels at the Ince AGI have been identified by the GI as potentially shallow (0.4 mbgl), indicating a possible groundwater flooding risk. However, site-specific groundwater levels at Ince AGI, along with seasonal variation of groundwater level are not currently known. Monitoring of the groundwater level at the Ince AGI Site might be required to inform the design process and identify any associated groundwater flood risk.

STANLOW AGI

5.6.6. According to the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** the risk of groundwater flooding at the proposed location for Stanlow AGI is low as the area has a less than 25% of risk of groundwater to emerge.

5.6.7. It is assumed that there is hydraulic continuity between local groundwater levels and Gale Brook due to the presence of underlying alluvial deposits. It is likely

that the main influence on groundwater levels at the proposed location for Stanlow AGI is determined by the local river levels.

5.6.8. The effect and the extent of groundwater flooding will most likely be masked by the primary source of flooding from the Gale Brook, but there is no groundwater monitoring information from the proposed location of Stanlow AGI available to confirm this.

5.6.9. Groundwater levels have been recorded at a monitoring borehole 200 m southwest of the Stanlow AGI at 3.2 – 3.7 mbgl during February 2022, indicating groundwater levels may be similar at the Stanlow AGI, **Chapter 18 – Water Environment and Flood Risk (Volume II)**. Site-specific groundwater levels (seasonal variations) are currently unavailable for the proposed location for Stanlow AGI to inform this assessment. Further investigation of the groundwater level at the Site might be required to inform the design process and identify any associated risk.

ROCK BANK BVS

5.6.10. According to the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** the risk of groundwater flooding is low within the proposed location for Rock Bank BVS. The GI did not encounter groundwater at Rock Bank BVS, with Environment Agency groundwater level data suggesting groundwater levels may be 5 – 10 mbgl.

MOLLINGTON BVS

5.6.11. According to the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** the risk of groundwater flooding is low within the proposed location for Mollington BVS.

5.6.12. The GI did not encounter groundwater at the Mollington BVS, however groundwater levels are expected to be between 2 – 5 mbgl (based on GWL 350 m north at 3.65 mbgl).

5.7. FLOODING FROM SEWER AND DRAINAGE INFRASTRUCTURE

NEWBUILD CARBON DIOXIDE PIPELINE

5.7.1. Given that the Newbuild Carbon Dioxide Pipeline will be a subsurface structure, the risk of flooding to the Newbuild Carbon Dioxide Pipeline from existing sewers and drainage infrastructure is considered to be low.

INCE AGI

5.7.2. The proposed location for Ince AGI is not situated in an urban area and according to the existing utilities records is not served by drainage network.

5.7.3. The data provided by UU indicated that the nearest asset is located 180m north of the proposed location for Ince AGI. Based on the existing ground levels between the asset and Ince AGI, it is possible to conclude that in a sewer

flooding scenario the flooding water would be confined locally and would not reach Ince AGI.

5.7.4. Based on the above, the likelihood of sewer flooding in the area is considered to be low.

STANLOW AGI

5.7.5. The proposed location of Stanlow AGI is located in an industrial area (Stanlow Oil Refinery) which is served by extensive private surface water and foul drainage networks based on the existing utilities records.

5.7.6. In addition to this, the wider area is also served by sewers. The proposed drainage system has been designed to ensure that there is no surcharge in the existing drainage system and no impacts on the Site or elsewhere.

5.7.7. Based on the above, the likelihood of sewer flooding in the area is considered low.

ROCK BANK BVS

5.7.8. The proposed location for Rock Bank BVS is not situated in an urban area and according to the utilities record is served by any surface water or combined sewers.

5.7.9. Based on the above, the likelihood of sewer flooding in the area is considered low.

MOLLINGTON BVS

5.7.10. The proposed location for Mollington BVS is not situated in an urban area and the closed existing sewer is located over 100m north of the proposed, belonging to Welsh Water.

5.7.11. Based on the above, the likelihood of sewer flooding in the area is considered to be low.

5.8. FLOODING FROM ARTIFICIAL SOURCES (RESERVOIRS, CANALS, AND OTHER ARTIFICIAL STRUCTURES)

5.8.1. The EA's Long-Term Flood Risk Map (March 2022) **includes reservoir flood maps** which show where water may go in the unlikely event of reservoir failure. Such information has been used to identify the related hazard for the DCO Proposed Development.

NEWBUILD CARBON DIOXIDE PIPELINE

Reservoir

5.8.2. The EA's Long-Term Flood Risk Map (March 2022) (**Ref. 21**), indicated that Pipe Reach 1 lies within a reservoir flood outline due to the Manley Mere

Reservoir and the Bosley Reservoir. None of the other Pipe Reaches lie within an area subject to reservoir flooding.

INCE AGI

Reservoir

5.8.3. The EA's Long-Term Flood Risk Map (March 2022) **(Ref. 21),** indicates that the area in which the Ince AGI will be located is within the maximum extent of flooding from the following reservoirs in case of failure and consequent water release:

5.8.4. Manley Mere Reservoir, which is located approximately 4.5km (2.8miles) southeast from the proposed Stanlow AGI. **Figure 18.4.16 – Ince Reservoir Flood Map - Manley Mere Wet/Dry day (Sheet 1) (Annex H)**.

5.8.5. Bosley Reservoir, which is located approximately 50km (31miles) east from the proposed Stanlow AGI. **Figure 18.16 – Ince Reservoir Flood Map - Bosley Mere Wet/Dry day (Sheet 2) (Annex H)**.

5.8.6. As confirmed by the EA's Long-Term Flood Risk Map **(Ref. 23),** flooding would be possible only when there is also flooding from the rivers rather than from the reservoirs alone.

Canal

5.8.7. The MSC is located 1.4km north of the Ince AGI and the difference in ground levels range is around 5m between the two features, Ince being the higher.

5.8.8. The SFRA (**Ref. 2)** identifies the risk from Canal flooding to be residual. Not only the canal is heavily controlled, but it would also respond in a different way in comparison to a watercourse during a storm. Moreover, it is stated in the SFRA (**Ref. 2)** "*stop plank arrangements, stop gates and continued inspection and maintenance of the assets by the Canal and River Trust help to manage the overall risk of a flood event*".

5.8.9. Peel Port have indicated that "*The MSCCL is the owner and Navigation Authority for the MSC and as such we monitor and maintain our assets and canal infrastructure to meet our statutory obligations and commercial requirements to maintain the navigable water way.*"

5.8.10. Peel Port has also confirmed that there has been no reporting of major failure of the canal banks during its approximately 130 years of operational life.

5.8.11. Based on the above information it is considered that the likelihood of Canal flooding and Canal Failure to be low.

STANLOW AGI

Reservoir

5.8.12. The EA's Long-Term Flood Risk Map (March 2022) **(Ref. 21)**, shows that the proposed location for Stanlow AGI does not lie within a reservoir flood extent. **Figure 18.4.17 – Stanlow Reservoir Flood Map - Wet/Dry day (Sheet 1) (Annex H)**.

Canals

5.8.13. Refer to the section for Ince AGI above.

5.8.14. Based on the above information it is considered that the likelihood of Canal flooding and Canal Failure to be low.

ROCK BANK BVS

Reservoirs

5.8.15. The reservoir flood map produced by the EA (**Ref. 21**), shows that proposed location for Rock Bank BVS does not lie within a reservoir flooding outline. **Figure 18.4.18 – Rock Bank Reservoir Flood Map - Knolls Bridge Wet/Dry day (Sheet 1) (Annex H)**.

Canal

5.8.16. The Shropshire Union Canal is located approximately 300m to the southeast of the Rock Bank BVS and its level is approximately 12m AOD, whilst the proposed location for Rock Bank BVS shows existing ground levels ranges between 18.00m and 20.00m AOD.

5.8.17. The canal is owned and maintained by the Canal & River Trust. According to the Cheshire West and Chester Level 1 SFRA **(Ref. 2)** the risk of flooding from canal is considered residual as canals are artificial structures and consequently heavily controlled.

5.8.18. The history of the flooding of the canal has been recorded in the Cheshire West and Chester Level 1 SFRA **(Ref.2)**, and the canal was overtopped once in 2009 near Nixon's Bridge and previous to that, in 1991 there was a minor breach at Stanthorne.

5.8.19. Anecdotal evidence found online shows that that more recently another breach of the Shropshire Union Canal happened at Wardle lock & Stanthorne Lock.

5.8.20. All these accidents happened in further upstream sections of the Canal.

5.8.21. Based on the above and considering that the level difference of the canal to the existing levels is approximately 7m, the risk of canal flooding is considered residual, in accordance with the Cheshire West and Chester Level 1 SFRA (**Ref.2**).

MOLLINGTON BVS

Reservoir

5.8.22. The reservoir flood map produced by the EA **(Ref. 21)** shows that proposed location for Mollington BVS is not at risk of reservoir flooding. **Figure 18.4.19 – Mollington Reservoir Flood Map – Knolls Bridge Wet/Dry day (Sheet 1) (Annex H)**.

Canal

5.8.23. The closest canal is the MSC and is located 7.5km away from the Site. This location would not be affected by a potential breach of the Manchester Ship Canal.

6. MITIGATION MEASURES AND RESIDUAL RISK

6.1.1. This Section takes into account the hazard associated to the various potential sources of flooding, and discusses the general flood mitigation measures required as part of the DCO Proposed Development and mitigation measures for specific infrastructure.

6.2. GENERAL MITIGATION MEASURES

6.2.1. During the construction stage specific procedures and mitigation measures required to ensure the management of flood risk for the proposals and no impact on flood risk elsewhere will be detailed as part of the **OCEMP (Document reference: D.6.5.4).** These are not discussed further in this report.

6.2.2. For the operational stage an **Outline Surface Water Drainage Strategy Report (Ref. D.6.5.13)** has been prepared for the proposed Ince AGI, Stanlow AGI, Rock Bank BVS and Mollington BVS; this is in accordance with policy and best practice to ensure the sustainable management of surface water runoff for the DCO Proposed Development and that there is no increase in the risk of surface water flooding at these locations or elsewhere, as a consequence of the DCO Proposed Development.

6.2.3. The Outline Surface Water Drainage Strategy for the BVSs and AGIs includes sustainable drainage solutions and attenuation structures, as appropriate, to restrict discharge of surface water, in accordance with the requirements of LLFA (D-WR-043 of the REAC, Document Reference: D.6.5.1) and the EA and appropriate allowances for climate change considered.

6.2.4. Care will be taken to ensure that no topographical low spots are created in the proposed cuttings and that the proposed drainage system installed can cope with any additional overland runoff generated on the cutting slopes or intercepted by the Site from adjacent catchment areas.

6.2.5. Outdoor equipment in the proposed AGIs and BVSs will be designed to be water-resistant, but not to operate under water. In order to mitigate any potential flood risk from the various sources of flooding the equipment and kiosk will be standing on plinths, raised a minimum of 200mm above proposed working platform elevation further reducing the likelihood of flooding. Additional associated infrastructure is going to be raised above ground.

6.2.6. A Flood Action Plan will be put in place for all AGIs and BVSs for the operational phase (D-WR-040 of the REAC, Document Reference: D.6.5.1). The Flood Action Plan will identify roles and responsibilities and emergency procedures including, where applicable, closure of the premises and evacuation in case of expected flooding/during a flood emergency. The Flood Action Plan will be informed by subscription to the Flood Warning Service where available.

The level of detail of the Flood Action Plan will reflect the level of flood risk at each location.

NEWBUILD CARBON DIOXIDE PIPELINE

6.2.7. Given the Newbuild Carbon Dioxide Pipeline will be a subsurface structure, the flood risk associated to the various sources of flooding e.g. existing sewers and drainage infrastructure, fluvial, tidal, surface water is considered to be negligible and therefore do not require mitigation measures. The same is applicable for the Fibre Optic Cable and the electricity connections.

6.2.8. Marker posts along the proposed Newbuild Carbon Dioxide Pipeline are subject to the same flood hazard; however, they are considered to be negligible from a flood risk prospective as these are simple posts on a concrete base.

6.2.9. During the operational phase, trench breakers (clay bunds) will prevent the formation of preferential groundwater flow pathways as a consequence of the Newbuild Carbon Dioxide Pipeline being constructed. Note, groundwater flood risk will not be affected from pre to post-construction stage. The excavated trenches will generally be filled with the same material previously removed, with the exception of sand being used for bedding and pipe surround (which will have quite a high permeability in any case), and therefore hydraulic properties will be very similar to pre-construction conditions.

6.2.10. In areas where there is risk of ground water emergence, the risk of buoyancy of the Newbuild Carbon Dioxide Pipeline structures will need to be mitigated by the provision of anchorage measures (in such locations the pipeline will be coated in concrete or installed with concrete ballast) to prevent buoyancy and damage to the proposed buried infrastructure. Groundwater monitoring might be required at specific locations to inform the Detailed Design.

ABOVE GROUND INSTALLATIONS AND BLOCK VALVES

Ince AGI

6.2.11. The proposed location for Ince AGI is defended against tidal flooding by the MSC embankment. Even in a climate change scenario the data available indicate that the proposed location would not be affected by tidal flooding.

6.2.12. As discussed in **paragraph 2.5.5** the Ince marshes are drained by a mixture of land drains, channels and main rivers which are pumped by the Ince pumping station. Ongoing active management of the marshes and the Ince pumping section is expected to continue as discussed with Peel NRE and it has been shown that the proposed location for Ince AGI would not flood in a 1 in 100 year return period flood event. The existing modelling information also shows that even in a worst-case scenario (i.e. both pumps at Ince and Frodsham not working) the Ince AGI would only be partially affected (southwest part of the AGI) by fluvial flooding.

6.2.13. The potential malfunctioning of the pumping station at Ince has been discussed with the EA (7 June 2022) **Annex B**, the EA stated that "*The two pumping Stations mentioned above [i.e. Ince and Frodsham] are monitored and alarms are generated should the pumping stations fail. The EA would respond to these failures by investigating the faults within the 4 hours. A repair or Contingency would be implemented if needed later*"To mitigate any residual risk, for example associated to the potential effect of climate change and the high groundwater level in the area, the proposed slab level at the Ince AGI is proposed to be raised to 5.2mAOD (approximately 1m above existing ground levels). No negative effects on flood risk in the area are expected as a consequence of raising the slab level locally. This is because the Ince AGI is not located within an active floodplain, it is defended by tidal flood defences and in an area where water levels are controlled through a pumped system which does not allow flooding on the proposed location for Ince AGI.

6.2.14. Groundwater monitoring will be considered to inform the Detailed Design.

6.2.15. Please note, Ince AGI fenceline will be located at least 8 metres away from the main watercourse to the north of it (i.e. East Central Drain). As far as reasonably practicable permanent earthworks will also be located 8 metres away from the watercourse at the detailed design. The Environment Agency and the Lead Local Flood authority will be consulted on the detailed alignment for comments e.g. in relation to the proposed outfall into the watercourse. (**D-WR-068** of the **REAC**, **Document Reference: D.6.5.1**)

Stanlow AGI

6.2.16. The proposed location for Stanlow AGI is defended from tidal flooding by the MSC embankment and as discussed in **paragraph 5.4.10**, the proposed location is not expected to be affected by flooding for tidal events of up to and including 0.5% AEP, 1 in 200 year return period plus climate change (2065).

6.2.17. Similarly, for the 1 in 1000 year and 1 in 100 year return period including 30% climate change, the model undertaken as part of the Stanlow Study (**Ref. 1**) shows no fluvial flooding at the proposed location for the Stanlow AGI Site.

Rock Bank BVS

6.2.18. The proposed location for Rock Bank BVS is at a negligible risk of tidal flooding and low risk of fluvial flooding sources respectively.

6.2.19. The access road slightly intersects a surface water runoff flow path. However, this does not alter the natural flow path based on local topography; the proposed access road will be raised by approximately 0.3m from existing ground levels which reduces the likelihood of flooding of the road (D-WR-060 of the REAC, Document Reference: D.6.5.1).

6.2.20. Based on the above, no extra mitigation measure will be required apart from the general measures discussed above in **paragraphs 6.2.1-6.2.6**.

Mollington BVS

6.2.21. The proposed location for Mollington BVS is at negligible risk of tidal flooding and low risk of fluvial flooding sources respectively.

6.2.22. Mollington BVS will require some shallow cut and fill groundworks to provide level platforms for the installation of the proposed equipment.

6.2.23. Based on the above, no extra mitigation measure will be required apart from the general measures discussed above in **paragraphs 6.2.1-6.2.6**.

7. CONCLUSIONS

7.1.1. This Flood Risk Assessment (FRA) has been produced for the DCO Proposed Development for infrastructure located in England.

7.1.2. An **Outline Surface Water Drainage Strategy Report** (**Document reference: D.6.5.13)** has also been produced to support the DCO Application and demonstrates the sustainable management of surface water runoff at the AGIs and BVSs.

NEWBUILD CARBON DIOXIDE PIPELINE

7.1.3. As the Newbuild Carbon Dioxide Pipeline is a linear scheme, it is required to cross through various flood zones throughout its alignment. Given that the proposed pipeline is classed as “Essential Infrastructure”, it therefore complies with the requirements of NPPF for development within the floodplain.

7.1.4. The flood risk for the Newbuild Carbon Dioxide Pipeline and associated to the various potential sources including sewers, fluvial, tidal, and reservoir has been assessed as negligible. This is due to the Newbuild Carbon Dioxide Pipeline being a buried structure which is going to remain unaffected from sources of flooding above ground.

7.1.5. Potential risks associated to groundwater include migration of the groundwater through the pipe bed and surrounding material (after the construction) and, the risk of buoyancy of the proposed buried pipework. These risks will be mitigated by the implementation of measures to prevent groundwater migration e.g. clay plugs as part of the reinstatement of the proposed trenches and designing out the risk of buoyancy through appropriate measures (e.g. anchorage) in key areas of concern for groundwater emergence.

ABOVE GROUND INSTALLATIONS

Ince AGI

7.1.6. There are two working pumping stations in the Ince Marshes area and Frodsham Area that control the water levels (including in a 1% AEP, 1 in 100 years return period event) ensuring that the proposed location for Ince AGI does not flood. The pumps are currently owned and maintained by the EA.

7.1.7. It is a possibility in the future that the EA may stop the operation and maintenance of the pumping stations. In this scenario, engagement with Peel (**Annex B)** has confirmed that local businesses (farmers) and Peel would take over the operation and maintenance of the pumps at Ince Marshes area, whilst Peel would take over the operation and maintenance of the pump for the Frodsham Area. In this scenario the risk of fluvial flooding will remain low.

7.1.8. Tidal flood risk is also low given the presence of the existing tidal defences and the standard of protection available.

7.1.9. To mitigate any residual risk from all sources of flooding the proposed slab level of Ince AGI will be raised by approximately 1m to 5.20m AOD.

Stanlow AGI

7.1.10. The Environment Agency's Flood Map for Planning (**Ref. 13)** shows the proposed location for Stanlow AGI to be within Flood Zone 1 and on the edge of Flood Zones 3. Recent flood risk modelling for the area (Jacobs, 2019) has been provided by the EA and confirms the low risk of fluvial flooding at the proposed location for Stanlow AGI. Even for a flood event up to and including 0.1% AEP, 1 in 1000 years return period the proposed location for Stanlow AGI is located outside the fluvial flood extent of Gale Brook.

7.1.11. The Stanlow AGI Site lies in an area defended from tidal flooding and associate flood risk is low.

7.1.12. Flood risk to the Site from other sources including reservoir, sewers, etc have been assessed to be between negligible and low.

BLOCK VALVE STATIONS

7.1.13. The proposed locations for Rock Bank BVS and Mollington BVS are on land classified as Flood Zone 1 and not subject to other significant sources of flooding.

7.1.14. The access road to Rock Bank BVS intersects a surface water flow path. However, this does not alter the natural runoff, and the proposed access road is raised from existing ground levels to minimise the risk of flooding.

7.2. RECOMMENDATIONS

7.2.1. Long term groundwater monitoring is recommended to inform the Detailed Design of the Ince AGI.

7.2.2. It is also recommended that, as part of the development of the Detailed Design, further engagement is undertaken with the LLFA at Cheshire West and Chester Council, to ensure the all the surface water management requirements are discussed and agreed.

7.2.3. It is also recommended that engagement with the LLFA and the EA is undertaken to discuss and agree the mitigation measures required to be in place for temporary and permanent works through, near, beneath or on floodplains and flood defences. This will be required as part of the Flood Risk Activity Permit (FRAP) applications (D-WR-045 of the REAC, Document Reference: D.6.5.1) and **OCEMP** (**Document reference: D.6.5.4**), which will be submitted for temporary and permanent works consent from the relevant Statutory Authorities (EA/LLFA) to prevent any increase in flood risk and prevent pollution.

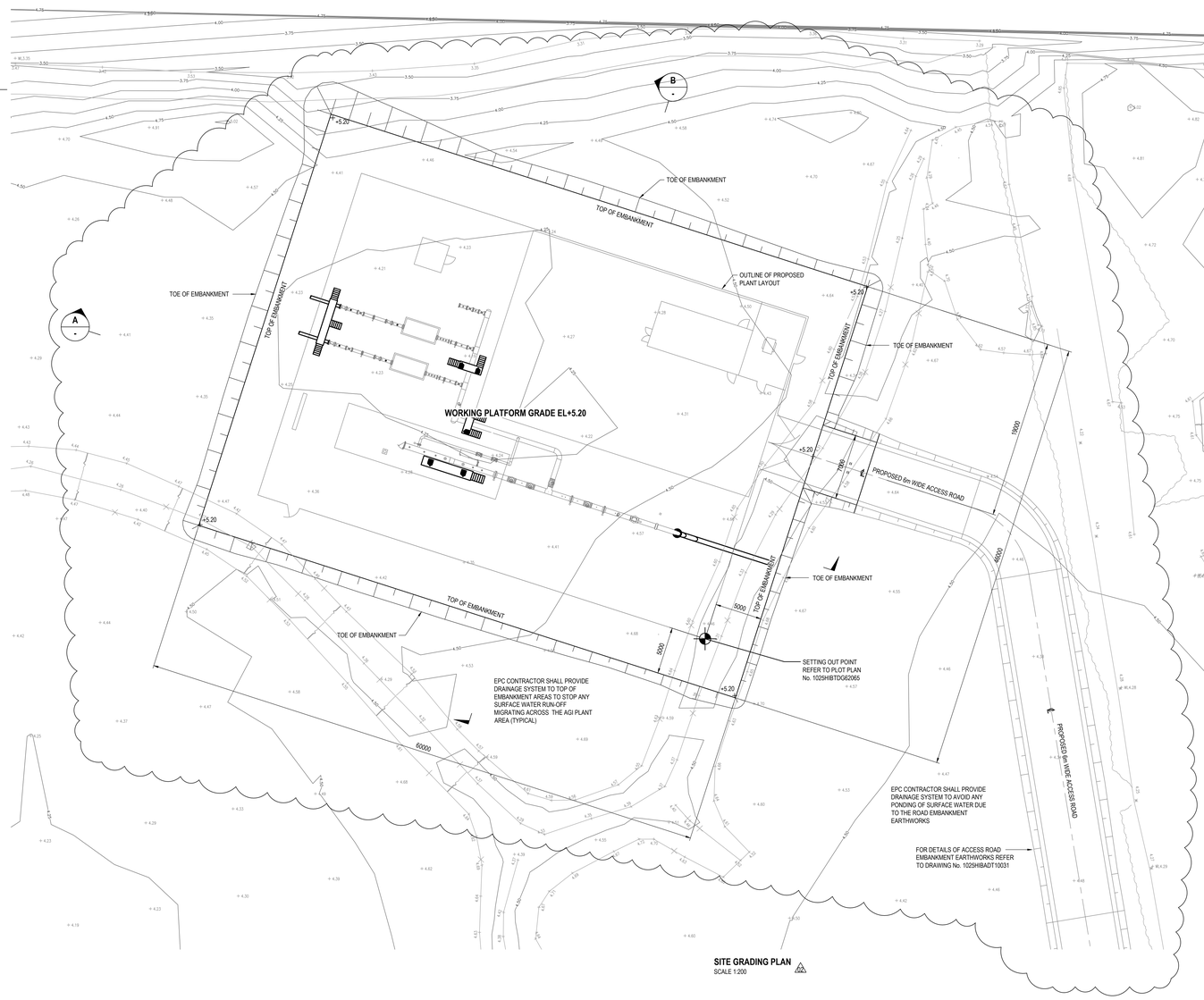
7.2.4. The OCEMP will provide information about planning and managing works during the construction stage in a fluvial environment, taking into consideration the need to prevent any direct or indirect damage to existing fluvial flood defence assets within these areas. Refer to **Chapter 18 – Water Environment and Flood Risk (Volume II)** of the ES for more information.

8. REFERENCES

- **Ref. 1:** Environment Agency. (2019). *Stanlow and Tranmere Flood Risk Management Scheme.*
- **Ref. 2:** Cheshire West and Chester Council. (2016, March). *Level 1 Strategic Flood Risk Assessment.*
- **Ref. 3** HM Government. (2019). *National Planning Policy Framework*. Available online: https://www.gov.uk/government/publications/national-planning-policy-framework--2
- **Ref. 4:** HM Government. (2021). *Planning Practice Guidance*. Available online: https://www.gov.uk/government/collections/planning-practice-guidance
- **Ref. 5** Cheshire West and Chester. (2015). *Local Plan (Part One) Strategic Policies.* Available online: https://inside.cheshirewestandchester.gov.uk/policies_plans_and_strategies/planning_policy/local_plan/local_plan__part_one
- **Ref. 6** Cheshire West and Chester (2015). *Local Plan Land Allocations and Detailed Policies.* Available online: https://inside.cheshirewestandchester.gov.uk/policies_plans_and_strategies/planning_policy/local_plan/local_plan__part_two
- **Ref. 7:** Environment Agency. (2022) *Asset Information and Maintenance Programme.* Available online: https://environment.data.gov.uk/asset-management/index.html
- **Ref. 8:** Fugro (2022) LBA CCS Transport and Storage Project Ground Investigations - Geoenvironmental Interpretive Report.
- **Ref. 9:** DEFRA. (2021). *MAGIC mapping.* Available online: https://magic.defra.gov.uk/MagicMap.aspx
- **Ref. 10:** British Geological Survey. (1989). *Hydrogeological map of Clwyd and the Cheshire Basin including parts of the hydrometric areas 54, 65, 66, 67, 68 69 and 70.* British Geological Survey. Retrieved from British Geological Survey.
- **Ref 11:** British Geological Survey. (2021) *GeoIndex.* Available online: http://mapapps2.bgs.ac.uk/geoindex/home.html
- **Ref. 12:** Ordinance Survey. (2021). Available online: https://osmaps.ordnancesurvey.co.uk
- **Ref. 13:** Environment Agency. (2021) *Flood Maps for Planning.* Available online: https://flood-map-for-planning.service.gov.uk/
- **Ref. 14:** Environment Agency. (2022). *Flood Risk Assessment: Climate Change Allowances.* Available online: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

- **Ref. 15:** Environment Agency. (2021). *Catchment Data Explorer.* Available online: https://environment.data.gov.uk/catchment-planning
- **Ref 16:** Environment Agency (2021). Weaver Gowy Basin *District River Basin Management Plan.*
- **Ref. 17:** Environment Agency. (2022). *River Dee Basin Management Plan.* Available online: https://www.gov.uk/government/publications/dee-river-basin-management-plan
- **Ref. 18:** Groundsure. (2021). *Location Intelligence Enviro + Geo Insight Reports. Hynet – Block Valve (separate reports for Block Valves 1, 2, and 3/4).*
- **Ref. 19**: Environment Agency. (2011). *Ince and Frodsham Marshes Management Study.* Available online: [redacted]
- **Ref. 20:** JBA Consulting (2018). Mersey Estuary, Ditton Brook and River Gowy
- **Ref. 21**: Environment Agency. (2021). *Long Term Risk of Flooding.* Available online: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
- **Ref. 22:** JBA Consulting (2016). River Mersey Estuary model.
- **Ref. 23:** Environment Agency. (2021). *Risk of Flooding from Reservoirs – Maximum Flood Extent.* Available online: https://data.gov.uk/dataset/44b9df6e-c1d4-40e9-98eb-bb3698ecb076/risk-of-flooding-from-reservoirs-maximum-flood-extent-web-mapping-service
- **Ref. 24:** Utility Search Report (2021).

Annex A



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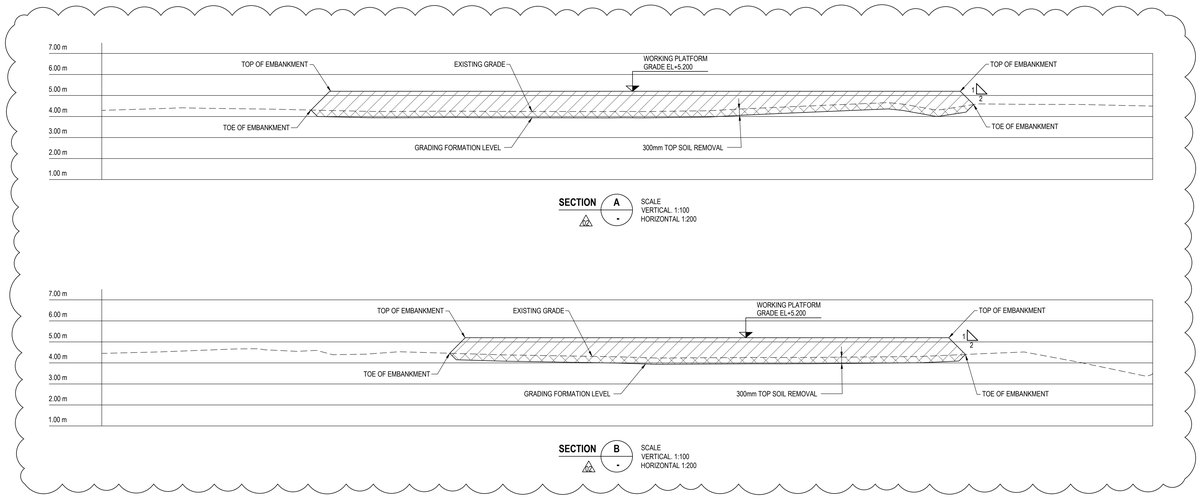

SECTION A
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SECTION B
SCALE
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HORIZONTAL 1:200

REFERENCE DOCUMENTS

NUMBER	TITLE
1025HIBTOG62065	INCE AGI PLOT PLAN
1025HIBADT10031	INCE AGI SITE ACCESS ROAD SITE PREPARATION LAYOUT

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH CIVIL WORK STANDARD GENERAL NOTES 28816.ENG.CIV.DWG.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. ALL COORDINATES AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE FUGRO TOPOGRAPHICAL SURVEY DOCUMENT No. TBC (HOLD). ALL ELEVATIONS AND EXISTING FEATURES HAVE BEEN TAKEN FROM THE TOPOGRAPHICAL SURVEY.
5. ALL TOPSOIL TO BE REMOVED IS AS SHOWN ON THE DRAWING AND IT IS TO BE STORED LOCALLY TO A MAXIMUM HEIGHT OF 2M FOR LATER RE-USE ON COMPLETION OF ALL WORKS.
6. THE CONTRACTOR IS RESPONSIBLE FOR THE PROVISION AND MAINTENANCE OF ALL TEMPORARY WORKS INCLUDING TEMPORARY DRAINAGE, HAUL ROADS, STOCKPILES AND SECURITY FENCING.
7. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING ALL LOCAL ROADS THAT PROVIDE ACCESS TO THE SITE ARE KEPT CLEAN AND FREE FROM DUST AND DIRT THAT MAY RESULT FROM THE SITE WORKS. THIS WILL INCLUDE THE PROVISION OF WHEELWASHES, ROAD SWEEPERS, BOWSERS, ETC.
8. EPC CONTRACTOR SHALL DEVELOP EARTHWORKS DESIGN TO OPTIMISE CUT AND FILL IN ORDER TO MINIMISE IMPORT AND/OR EXPORT OF MATERIALS TO AND FROM THE SITE.
9. EPC CONTRACTOR TO ENSURE THAT THE FINAL EARTHWORKS DESIGN IS DEVELOPED WITH DUE CONSIDERATION OF THE EXISTING FIELD DRAINAGE SYSTEM AND SO AVOID ANY DETRIMENTAL CHANGES SUCH AS WATERLOGGING, SURFACE PONDING, ETC. WHICH CAN LEAD TO IMPAIRED CROP GROWTH, ETC.
10. EPC CONTRACTOR TO ENSURE THAT WHERE ACCESS ROAD CROSSES ANY EXISTING CULVERTS OR DRAINS THAT THESE ARE STRENGTHENED/PROTECTED AS NECESSARY TO AVOID DAMAGE DURING BOTH THE TEMPORARY CONSTRUCTION PHASE AND FOR THE PERMANENT CONDITION.
11. WHERE NECESSARY ADDITIONAL EXCAVATION MAY BE REQUIRED TO ESTABLISH ROAD CONSTRUCTION FORMATION LEVELS BEYOND THE GENERAL GRADING FORMATION. THIS WILL BE DEPENDANT ON ROAD CONSTRUCTION ELEVATIONS AND CBR VALUES. EPC CONTRACTOR TO CONSIDER THIS IN THE FINAL DESIGN.

EARTHWORKS QUANTITIES	
TOP SOIL REMOVAL	960m³
CUT	0m³
FILL	3082m³
BALANCE	3082m³ (FILL)

LEGEND

+ 17.59 EXISTING SPOT LEVEL

+18.00 PROPOSED ELEVATION

DENOTES FILL MATERIAL

DENOTES CUT MATERIAL

DENOTES CUT & FILL MATERIAL

DENOTES PROPOSED ROAD CONSTRUCTION

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0 1 2 3 4 5 10 m
1:100

Rev.	Date	Description	Prepared	Checked	Approved	Approved Eni UK
CO-FE	02	15/05/2022	FINAL ISSUE	S.NORRISH	M. SHOEIB	M.BERGAMASCHI
CO-FE	01	15/03/2022	FINAL ISSUE	S.NORRISH	N.THARAKAN	M. WATERTON
CO-FE	00	02/03/2022	ISSUED FOR COMMENT	S.NORRISH	N.THARAKAN	M. WATERTON

Validity Status: In Force
Revision index

Company logo and business name: eni uk / eni progetti

Company Document ID: 1025HIBADT10017
Job N. JA0614
Scale: 1:200
Sheet of Sheets: 1 OF 1
Facility and Sub Facility Name
Project Name: LBA CCS Transport and Storage
Document Title: INCE AGI SITE PREPARATION LAYOUT
Supersedes N.
Superseded by N.
Plant Area: 00
Plant Unit: 000

Software AutoCad

Filename: 1025HIBADT10017_CDFE02_01.DWG

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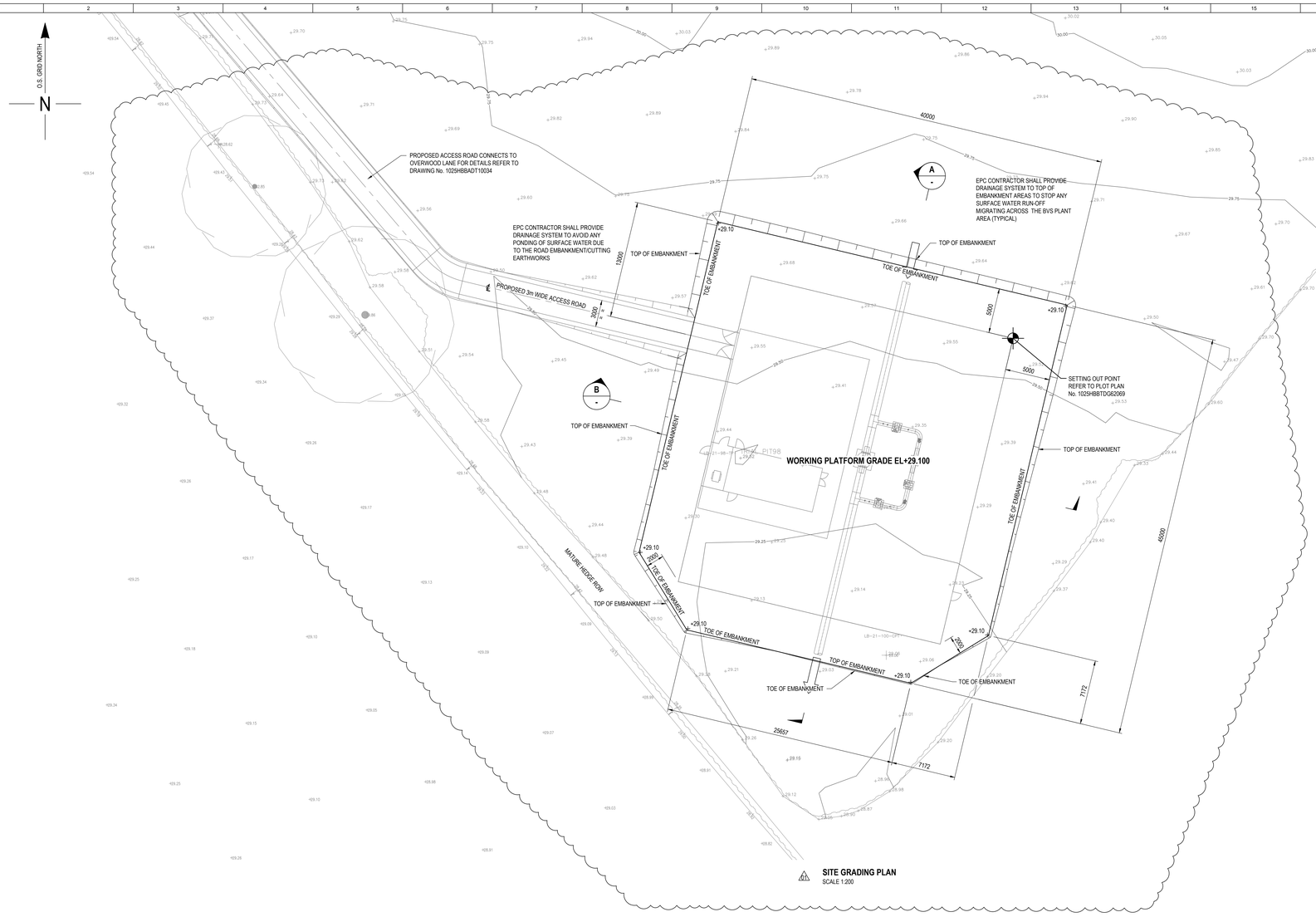

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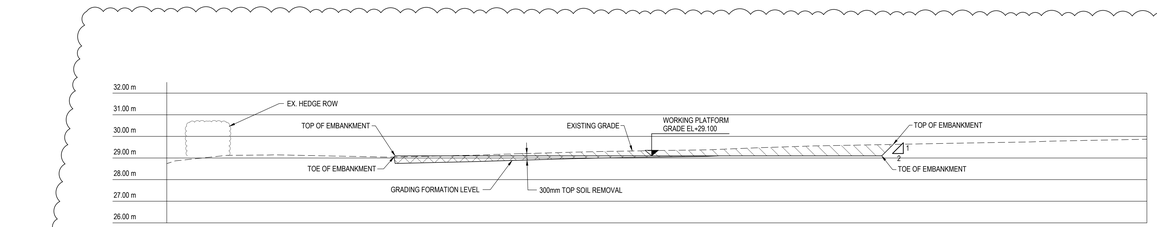

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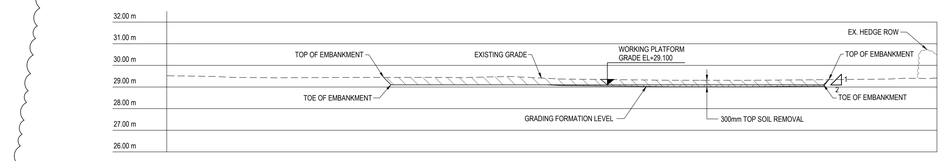

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REFERENCE DOCUMENTS

NUMBER	TITLE
1025HBBTDG02069	MOLLINGTON BVS (36" LINE) PLOT PLAN
1025HBBADT10034	MOLLINGTON BVS (36" LINE) SITE ACCESS ROAD SITE PREPARATION LAYOUT

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH CIVIL WORK STANDARD GENERAL NOTES 28816 ENG.CIV.DWG.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. ALL COORDINATES AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
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9. EPC CONTRACTOR TO ENSURE THAT THE FINAL EARTHWORKS DESIGN IS DEVELOPED WITH DUE CONSIDERATION OF THE EXISTING FIELD DRAINAGE SYSTEM AND SO AVOID ANY DETRIMENTAL CHANGES SUCH AS WATERLOGGING, SURFACE PONDING, ETC. WHICH CAN LEAD TO IMPAIRED CROP GROWTH, ETC.
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11. WHERE NECESSARY ADDITIONAL EXCAVATION MAY BE REQUIRED TO ESTABLISH ROAD CONSTRUCTION FORMATION LEVELS BEYOND THE GENERAL GRADING FORMATION, THIS WILL BE DEPENDANT ON ROAD CONSTRUCTION ELEVATIONS AND CBR VALUES. EPC CONTRACTOR TO CONSIDER THIS IN THE FINAL DESIGN.

EARTHWORKS QUANTITIES	
TOP SOIL REMOVAL	560m³
CUT	105m³
FILL	157m³
BALANCE	52m³ (FILL)

LEGEND

+ 17.59	EXISTING SPOT LEVEL
+ +18.00	PROPOSED ELEVATION
	DENOTES FILL MATERIAL
	DENOTES CUT MATERIAL
	DENOTES CUT & FILL MATERIAL
	DENOTES PROPOSED ROAD CONSTRUCTION

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0 1 2 3 4 5 10 m
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Rev.	Date	Description	Prepared	Checked	Approved	Approved Eni UK
CD-FE	01	16/03/2022	FINAL ISSUE	S.NORRISH	N.TRARAKAN	M. WATERTON
CD-FE	00	18/02/2022	ISSUED FOR COMMENT	S.NORRISH	M. WATERTON	N.TRARAKAN

Validity Status: Revision Index

Company logo and business name: eni uk / eni progetti

Company Document ID: **1025HBBADT10020**
Job. N. JA0814

Facility and Sub Facility Name

Project Name: LBA CCS Transport and Storage

Scale: 1:200

Sheet of Sheets: 1 OF 1

Document Title

MOLLINGTON BVS (36" LINE)
SITE PREPARATION LAYOUT

Supersedes N.

Superseded by N.

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Plant Unit: 000

Software:AutoCad

Filename.1025HBBADT10020_CDFE01_01.DWG

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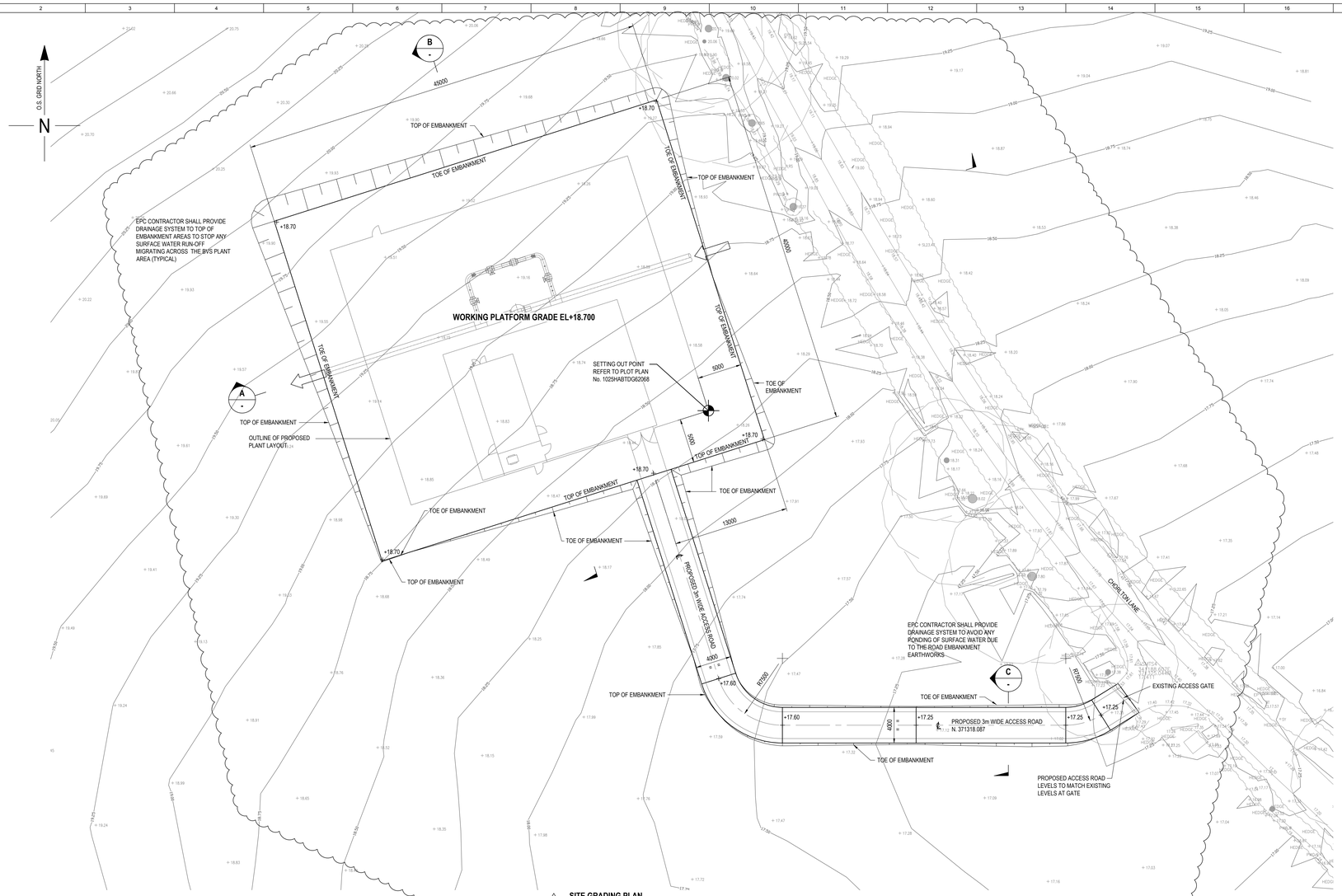

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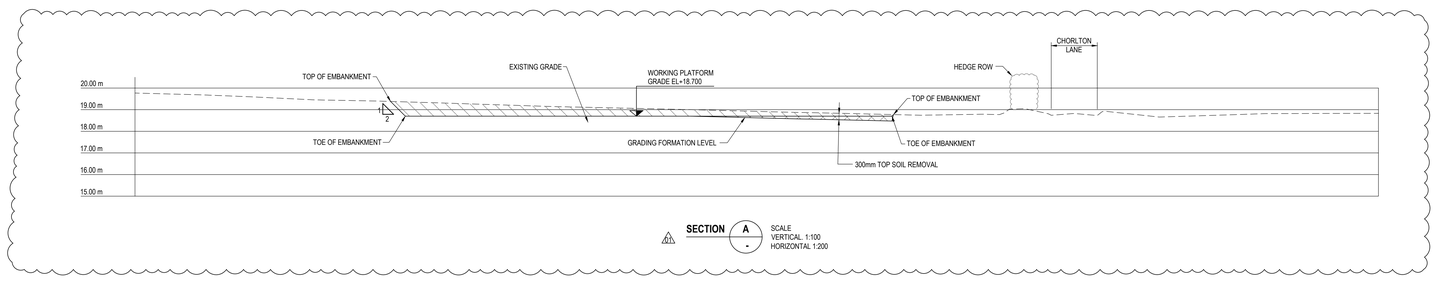

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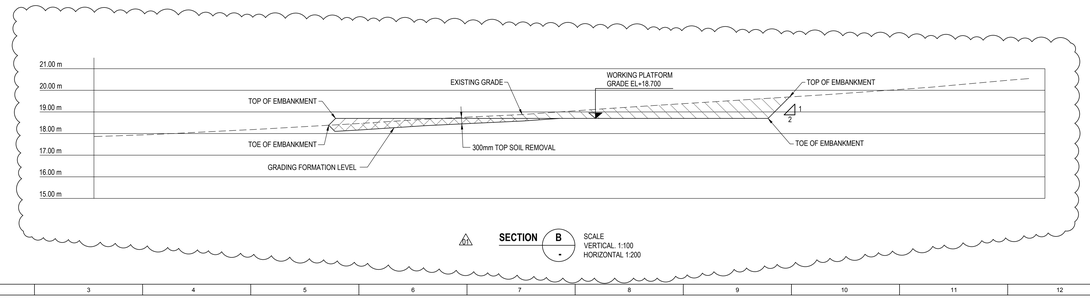

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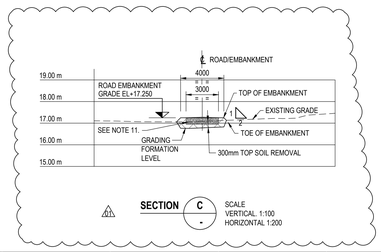

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REFERENCE DOCUMENTS

NUMBER	TITLE
1025HABTDGI2068	ROCK BANK BVS (36" LINE) PLOT PLAN

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH CIVIL WORK STANDARD GENERAL NOTES 28816.ENG.CIV.DWG.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
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11. WHERE NECESSARY ADDITIONAL EXCAVATION MAY BE REQUIRED TO ESTABLISH ROAD CONSTRUCTION FORMATION LEVELS BEYOND THE GENERAL GRADING FORMATION, THIS WILL BE DEPENDANT ON ROAD CONSTRUCTION ELEVATIONS AND CBR VALUES. EPC CONTRACTOR TO CONSIDER THIS IN THE FINAL DESIGN.

EARTHWORKS QUANTITIES	
TOP SOIL REMOVAL	700m³
CUT	323m³
FILL	455m³
BALANCE	132m³ (FILL)

LEGEND

+17.59	EXISTING SPOT LEVEL
+18.00	PROPOSED ELEVATION
	DENOTES FILL MATERIAL
	DENOTES CUT MATERIAL
	DENOTES CUT & FILL MATERIAL
	DENOTES PROPOSED ROAD CONSTRUCTION

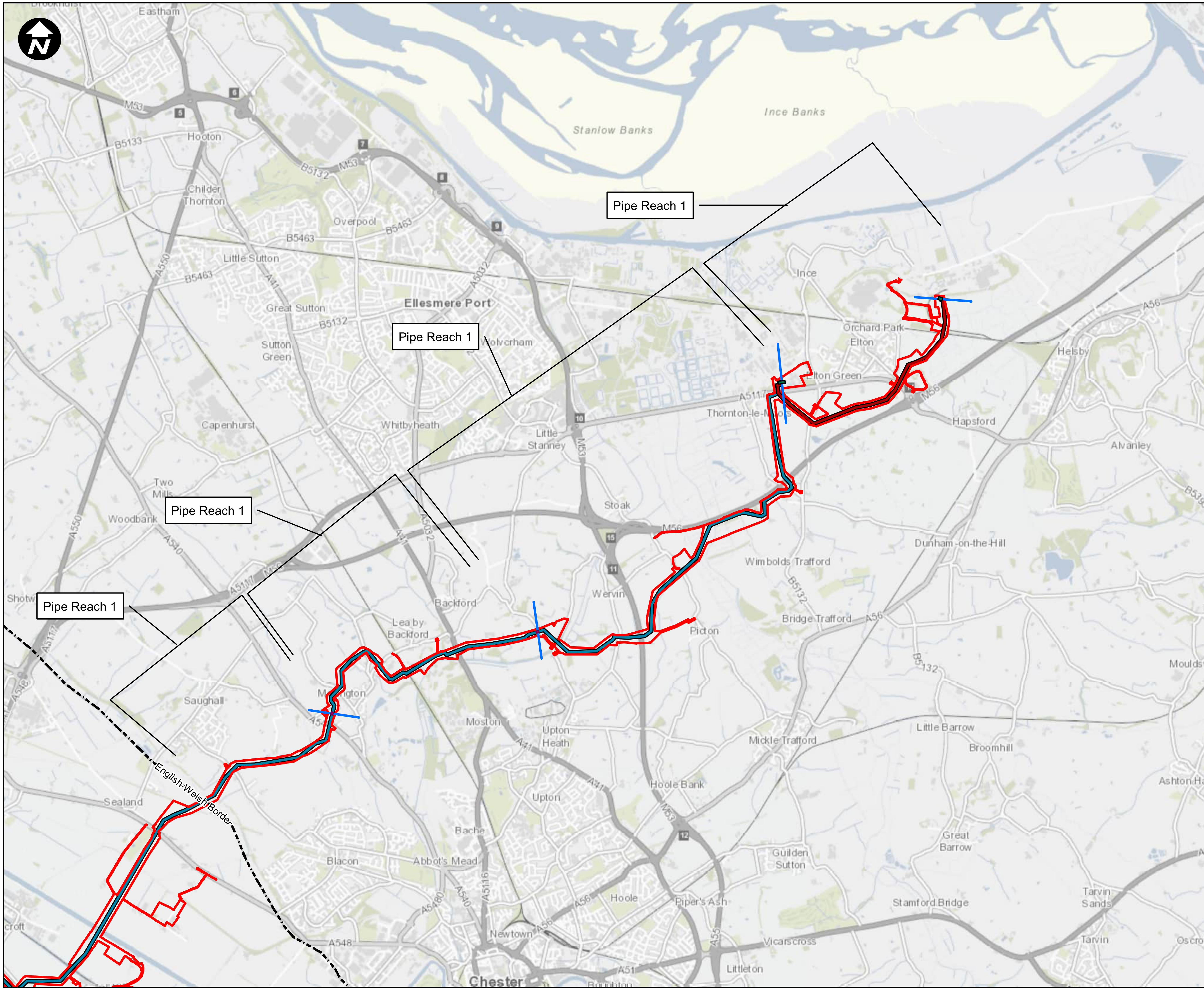
0 2 4 6 8 10 20 m
1:200

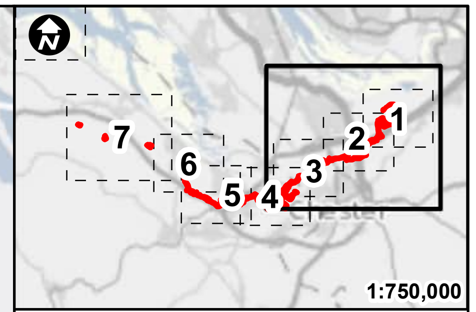
0 1 2 3 4 5 10 m
1:100

Revision Index							
Issue Number	Date	Description	Prepared	Checked	Approved	Approved Eni UK
CD-FE	01	16/03/2022	FINAL ISSUE	S. NORRISH	N.THARAKAN	M.WATERTON	
CD-FE	00	19/01/2022	ISSUED FOR COMMENT	S. NORRISH	M.WATERTON	M.WATERTON	

Company logo and business name: eni uk / eni progetti
Company Document ID: 1025HABADT10022
Job. N. JA0614
Facility and Sub Facility Name
Project Name: LBA CCS Transport and Storage
Scale: 1:200
Sheet of Sheets: 1 OF 1
Document Title: ROCK BANK BVS (36" LINE) SITE PREPARATION AND ACCESS ROAD LAYOUT
Supersedes N.
Superseded by N.
Plant Area: 00
Plant Unit: 000

Software AutoCad
Filename: 1025HABADT10022_CDFE01_01.DWG





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI To Flint AGI Pipeline
- Above Ground Installation (AGI)
- Block Valve Station (BVS)
- English_Welsh_Border
- Pipe Reach

SCALE: 1:50,000

0 500 1,000 2,000 Metres

HyNet North West

PROJECT TITLE

HyNet Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 18.4.1
Stanlow AGI to Flint AGI
Pipe Reach (England)

DRAWING STATUS

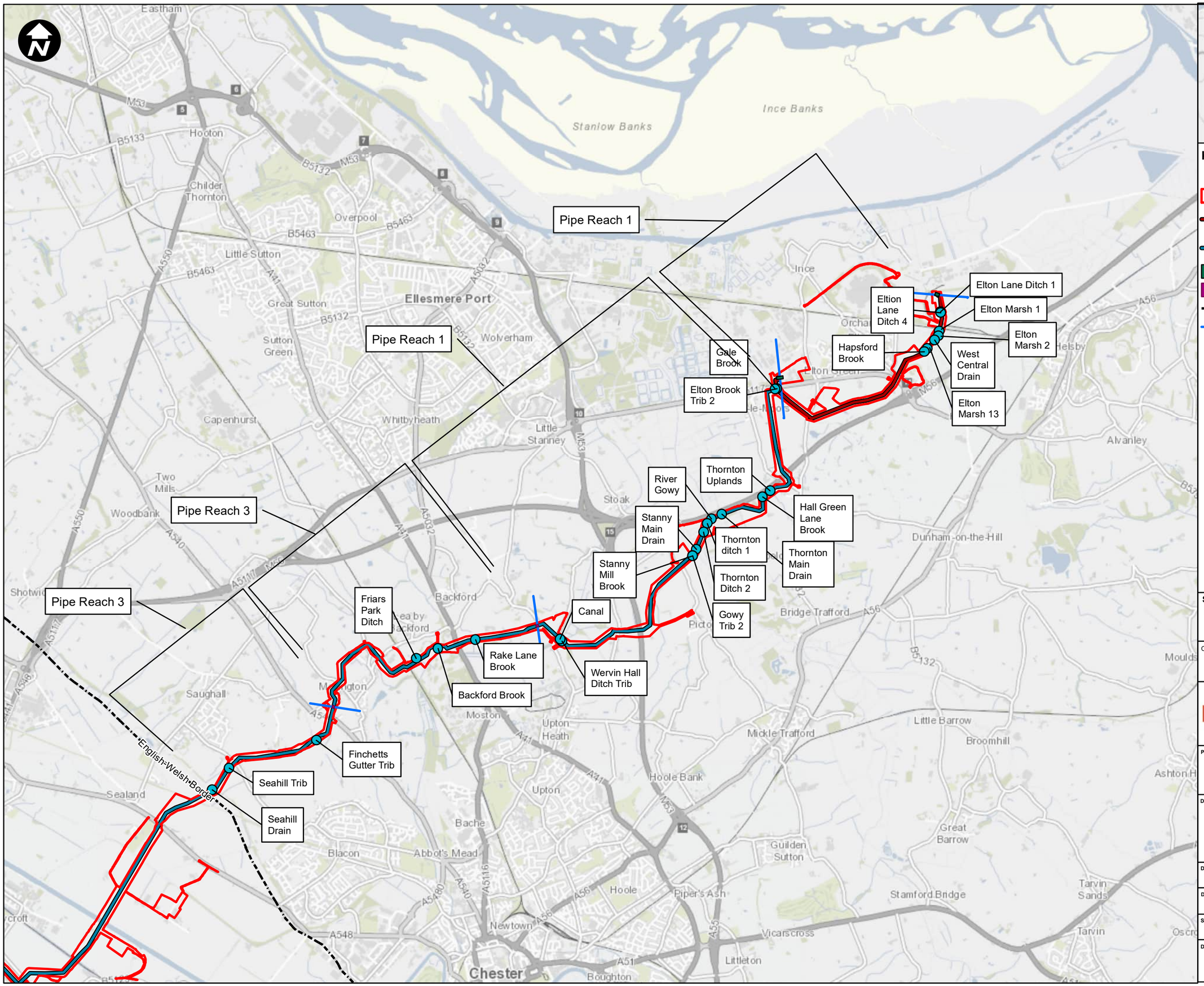
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:50,000	13/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.1



HyNet North West

PROJECT TITLE
HyNet Carbon Dioxide Pipeline DCO

DRAWING TITLE
Figure 18.4.1
Watercourse crossing
(England) - Sheet 2

DRAWING STATUS
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
JH	NC	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:50,000	18/03/2023	B

DRAWING NUMBER
EN070007-APP-ES-18.4.1 Sheet 2

Annex B

Solis, Gabriel

From: Hewitt, Dawn [redacted]
Sent: 06 June 2022 15:29
To: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Gabriel

Thank you for your email dated 10th May 2022, as the majority of your enquiry is requesting Environment Agency data, this will be provided by our Customer & Engagement Officer Sarah Walters.

However, further to your assumptions highlighed below, we would provide the following information:-

Regarding Tidal flooding, the modelling information provided (Mersey Tidal model 2016) shows that the site is defended against tidal flooding up to a 1 in 1000yr return period and for a 1 in 200yr return period plus climate change scenario until 2065. As such, the risk is low and in light of the standard of protection and the location within a tidal floodplain, we assume that no floodplain storage compensation will be required. Please note that it is proposed to slightly raise the proposed Above Ground Installation at Ince to mitigate any residual risk.

no floodplain storage compensation will be required
There is usually no requirement for compensatory flood storage for development either in areas located behind flood defences (areas benefitting) or in locations at risk of tidal flooding only.

the proposal to slightly raise the proposed Above Ground Installation at Ince to mitigate any residual risk
Without reviewing a draft Flood Risk Assessment (FRA) with all the relevant details included, it is difficult to provide a definitive response to confirm whether any particular flood mitigation or specific flood protection measures proposed are considered appropriate or acceptable. However, raising ground or finished floor levels above the design flood and accounting for future climate change is usually considered a simple and effective way of reducing the risk of flooding to most new development located in or close to known flood risk areas.

We would suggest that due to the complexities of the proposal, once a draft FRA has been produced, that prior to any formal submissions it is provided to us to review under our charging regime. This will help us to work with you to eliminate any problems early in the process.

Thanks
Dawn

Dawn Hewitt
Pronouns: she/her *(why is this here?)*
Planning Advisor, Sustainable Places | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
Email: [redacted]
Team email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: [redacted]

From: [redacted]
Sent: 06 June 2022 11:08
To: [redacted]
Cc: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Hi Dawn,

Hope you had a very good Jubilee weekend.

I just tried to call you but did not get through.

Further to your email from last week, I want to check if there is any update on the Fluvial model request and the points made on the email of the 10th May (below)?

As previously mentioned, this project has a very tight deadline, and we are getting closer to it. Any help is greatly appreciated.

Looking forward to hearing from you.

Kind regards,

Gabriel

From: [redacted]
Sent: 26 May 2022 17:05
To: Solis, Gabriel [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Gabriel

Apologies but once I double checked, it wasn't your enquiry I had received part of the information for.

I have sent your enquiry to the relevant teams and once they comment I will let you know.

Thanks
Dawn

Dawn Hewitt
Pronouns: she/her *(why is this here?)*
Planning Advisor, Sustainable Places | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
Email: [redacted]
Team email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: [redacted]

From: [redacted]
Sent: 24 May 2022 09:18
To: Hewitt, Dawn [redacted]

Cc: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Hi Dawn,

Hope you had a good weekend and thank you for our chat last week.

Could you send over the response to our email please?

Also, is there any update on the fluvial models for the Ince Marshes?

Looking forward to hearing from you.

Kind regards,

Gabriel

From: [redacted]
Sent: 19 May 2022 10:10
To: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Gabriel

My apologies, I was unavailable for a catch up yesterday.

I will confirm with Graham when he is next available for a catch up and I will be in touch shortly.

Thanks
Dawn

Dawn Hewitt
Pronouns: she/her *(why is this here?)*
Planning Advisor, Sustainable Places | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough [redacted]
Team email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: [redacted]

From: [redacted]
Sent: 18 May 2022 15:14
To: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Hi Dawn,

Hope you are doing well.

Did you have a chance to look at the email below?

If you are free, could we discuss this over the phone tomorrow, say at 11.00?

Looking forward to hearing from you.

Kind regards,

Gabriel

From: [redacted]
Sent: 12 May 2022 07:56
To: [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Gabriel

Apologies but I am unavailable now until Wednesday next week, as soon as I return to work I will prioritise your enquiry.

I will be in touch on Wednesday and we can set something up.

Thanks
Dawn

Dawn Hewitt
Pronouns: she/her *(why is this here?)*
Planning Advisor, Sustainable Places | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
Email: [redacted]
Team email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: [redacted]

From: [redacted]
Sent: 11 May 2022 19:29
To: [redacted]
Subject: FW: GMMC218782SW Response attached from the Environment Agency- Follow on

Kind Regards

Steve Sayce
Strategic Planning (*Focus on Liverpool City Region*)

The Environment Agency
Sustainable Places

Email: [redacted]
Team email: SPPlanning.RFH@environment-agency.gov.uk

Does Your Proposal Have Environmental Issues or Opportunities? Speak To Us Early!

If you are planning a new project or development, we want to work with you to make the process as smooth as possible. Early engagement can improve subsequent planning applications to you and your clients' benefit and deliver environmental outcomes. For a cost recovery fee of £100 per hour + VAT we will provide you with a project manager who will coordinate all meetings and reviews in order to give you detailed specialist advice with guaranteed delivery dates. More information can be found on our website here.

Creating a better place for people and wildlife

From: [redacted]
Sent: 10 May 2022 17:28
To: [redacted]
Subject: GMMC218782SW Response attached from the Environment Agency- Follow on

Hi Stephen,

Hope you are doing well. As you know we are in the process of producing the FRA for the English part of the Hynet DCO application. I recently submitted a request (see email below) to obtain some outstanding modelling results information as the data previously provided was corrupted.

In addition we have a number of additional questions to inform our assessment which you will hopefully be able to answer.

We understand that according to a study carried out by the EA "Ince and Frodsham Marshes Maintenance strategy study 2011" (attached) there are two working pumping stations in the Ince Marshes area, that those control the water levels and are maintained by the EA itself. The study shows that even for an event of 1 in 100 years return period the site does not flood in a do minimum scenario (The Marshes system remains actively pump drained). We understand that this is the current maintenance regime and includes proactive Environment Agency maintenance of the system and assumes that both pumping stations are operating. An additional scenario, assuming that only the Ince pumping station would be operational, shows the same results for the site i.e. no flooding in a 1 in 100 yr scenario affecting the proposed scheme. Both scenarios are attached.
Based on the above and assuming that the pumps will keep working in normal condition for the long term, fluvial flood risk of the marshes is considered to be low and has not been raised as a potential concern at our meeting in 02/03/2022.

We verified that the FRA for the Protos development in Ince stated "The EA have confirmed that the current emergency procedures are, that following the reporting of a failure via the telemetry system at the station, the EA

would respond immediately to assess the problem with a 4-hour response time." Could you please confirm if this is still applicable?

Regarding Tidal flooding, the modelling information provided (Mersey Tidal model 2016) shows that the site is defended against tidal flooding up to a 1 in 1000yr return period and for a 1 in 200yr return period plus climate change scenario until 2065. As such, the risk is low and in light of the standard of protection and the location within a tidal floodplain, we assume that no floodplain storage compensation will be required. Please note that it is proposed to slightly raise the proposed Above Ground Installation at Ince to mitigate any residual risk.

We assume you have no concerns regarding the Manchester Ship in terms of flood risk, however, we would be grateful for any information that you could provide relating to potential associated flood risk and the maintenance regime.

Due to the tight timescale of this project, it would be good to have a reply as soon as possible. Are you able to assist in our enquiries? I will try to contact you to discuss the above and would be happy to organise a short online meeting if that might help.

Kind regards,

Gabriel

From: Solis, Gabriel
Sent: 02 May 2022 14:33
To: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>
Cc: Mohun, [redacted]
Subject: RE: GMMC218782SW Response attached from the Environment Agency- Follow on

Hello,

Thank you very much for providing this.

Would it be possible to share the "Ince and Frodsham 2011" results? This was shared already on the 09/06/2021 (email attached) however the files are not working or corrupted based on their size (around 1kb). Please refer to screenshot below:

Solis, Gabriel

From:	GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>
Sent:	07 June 2022 11:19
To:	Solis, Gabriel
Subject:	GMMC218782SW Response attached from the Environment Agency- Follow on

Dear Gabriel,

Thank you for your enquiry which was received on 02/05/22.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

The two pumping Stations mentioned below are monitored and alarms are generated should the pumping stations fail, The E A would respond to these failures by investigating the faults within the 4 hours. A repair or Contingency would be implemented if needed later.

The data that you previously requested in the corrupted files is now available via a different route. Please use the following Defra Data Services Platform link to access the requested information; [redacted]

Please refer to the [redacted] which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Sarah

Sarah Walters | Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire

Direct email: **Inforequests.GMMC@environment-agency.gov.uk**
Office address: Richard Fairclough House, Knutsford Road, Latchford, Warrington, WA4 1HT

HyNet North West

AGENDA & MEETING NOTES

PROJECT NUMBER	70070865	**MEETING DATE**	02 March 2022
PROJECT NAME	HyNet North West Carbon Dioxide Pipeline - DCO	**VENUE**	Teams
CLIENT	Progressive Energy	**RECORDED BY**	GK
MEETING SUBJECT	WFD and FRA – EA Consultation		

PRESENT	Frances Marlow (FM) (WSP), Georgie Kleinschmidt (WSP), Helen Parsons (WSP), Gabriel Solis (WSP), Vic Mohun (WSP), Luke Mitchell (WSP), Trevor Croft (PEL), Stephen Sayce (EA), Graham Todd (EA), Duncan Revell (EA)
APOLOGIES	Apologies
DISTRIBUTION	As above plus:
CONFIDENTIALITY	**Restricted**

ITEM	SUBJECT	ACTION	DUE
1	Introductions		
2	Agenda		
3	GK provided summary of the Project and DCO		
3.1	Stephen: currently reviewing the PEIR. EA required to provide statutory response. Will charge for information beyond initial consultation as part of the PEIR. Will fall outside the statutory process. FM: Screening and scoping of WFD elements has not been included within the PEIR		
4	FM provided list of Main Rivers and WFD waterbodies and WFD Groundwater bodies in the vicinity of the Order Limits. See slides attached to these minutes.		
5	FM: Presented the screening of waterbodies (see attached slides). FM explained works to smaller watercourses within the wider WFD water body will be assessed. Tributaries of the Mersey transitional waterbody will be assessed using surface water quality elements and summarised within the transitional water body section of the assessment. DR agreed with this approach. DR: Generally agree with the screening conclusion. Main Rivers don't match with WFD waterbodies. Stanney Main Drain also need to be assessed. FM: all Main Rivers and relevant ordinary watercourses will be assessed		

	within each WFD catchment SS to confirm is Garden City Drain is in Wales or England. FM explained that the tributary of Garden City Drain, which is crossed by a trenched crossing, is located in England. FM: groundwater team unable to conclude on screening whether groundwater bodies should be included. May be requesting further meeting about whether they should be screened in. DR and SS need to speak to EA groundwater team before providing comment. FM: Propose to do one WFD assessment for whole scheme, including England and Wales HP: are EA happy with the approach to undertake one WFD assessment and send to both NRW and EA? DR: Yes happy with this approach	SS SS/DR	
6	FM: Outlined activities involved in the DCO (See information on attached slides) FM: still awaiting final design freeze information which may provide more detail about the temporary crossings.		
7	FM: Presented the screening exercise for the proposed activities. (See attached slides) HP: Asked for mitigation measures for all watercourses. Specifically asked for those proposed on the River Gowy and whether there are any plans to re-naturalise the floodplain and set the embankment further back. DR: Will send the mitigation measures for all relevant water bodies. There are plans on the Gowy to move the left bank embankment further back from the channel. The proposed scheme would need to make sure it did not prevent this from occurring. DR to confirm plans for the Gowy. DR: Asked what the temporary crossings would be. FM: Unsure what the crossing type will be yet. Expecting Bailey Bridge for larger watercourses and culverts for smaller watercourses. SS: Only concern on the screening is excluding River Continuity for temporary watercourse crossings. Could be seeking to hold flow, so need to consider this too. Depends on final design. The EA also retains the no culvert policy but understands that temporary ones may be required for construction. Where possible, temporary crossings that span the watercourse without affecting the channel should be used. If culverts are required for temporary crossings, an assessment of effects would be needed. GT stated that modelling of temporary effects of culverts would not be required but the structures would need to be of appropriate capacity. A design process and optioneering would need to	DR DR FM	

	be presented along with justification for using culverts and not just due to cost. FM: Screening conclusion will be included in minutes as slide pack and EA can formally responded to scoping opinion. DR: Ince marshes drain towards the Ince pumping station operated by the EA. This pumps water into the Manchester Ship Canal. Therefore, this may need to be screened in for assessment, but water quality elements only (not morphological or biological). DR: Necessary to consider screens on pumps for temporary diversions so that fish are not in danger. Size of screen will depend on species in the watercourse. There may be eels in the River Gowy. Small mesh size would therefore be required if eels are present and screens will then need monitoring for debris and its effect on efficiency throughout construction.		
7.1	HP: regarding biodiversity calculations and river condition, do the EA consider the reinstatement of the watercourse after the pipeline is laid as reinstatement, despite the bed having been disturbed? DR: If the pipe is laid and the bed is returned to as it was with no bed reinforcement then this is considered as reinstatement. TC: pipeline to be 2m minimum below bed level for trenchless crossings. Part of current FEED activity. Design standards are deeper than 2m.		
8	FM presented the proposed methodology for the WFD assessment (see attached slides). SS: sediment sampling may be needed for land contamination risks FM: this will be picked up by the land contamination team but is not proposed for WFD.		
9	FM presented the proposed approach to mitigation (see attached slides). DR: Why is the project not aiming for Biodiversity Net Gain(BNG)? TC: BNG is still under consideration, however no net loss is the minimum position currently HP: Is providing WFD mitigation to neutralise impacts acceptable or does the EA expect us to provide any improvements? DR: Ensure no deterioration to waterbodies and that mitigation measures aren't impacted. The government announced that projects like this would be considered for providing BNG. HP: Design team will need to know the mitigation measures proposed in the area as this may affect the pipeline depths. HP to inform wider project team of implications to design.	HP	

10	FM provided an overview of the flood risk areas near the proposed scheme (see attached slides). Ince AGI is in the tidal floodplain according to the Mersey Tidal model received from the EA. Area is also benefitting from flood defences. Stanlow AGIs shown on map at partly flood zone 3. Model for Stanlow Refinery (based on River Gowy model) shows that it is not actually within FZ2 outline. Central compound has been located outside the floodplain at the River Gowy. Temporary compounds will be for the unguided auger boring works. VM: Which model should we rely on for Stanlow AGI, given the EA website and the previous FRA report on the Stanlow AGI show different levels of flood risk? GT: Unsure of details around this. Needs to be examined in FRA. Usually latest and up to date info best to go with, but there may be a caveat surrounding why the model hasn't been published yet. Just need to make sure that it's been done correctly. WSP to request the latest Gale Brook model from the EA. VM: Lots of modelling info requests put to EA, have been sent some files but can't work with a lot of them. Request some more refined data requests for those which we can't open/haven't received. Should this be redirected within the EA? SS: send to normal address but cc SS in.	VM/GS VM/GS	
10.1	VM: What is the expectation for presentation or format of FRA given linear nature of scheme, i.e would it be suitable to assess all the trenchless crossing within a similar section and the AGIs and BVs separately? GT: as long as all covered, format less important. VM: propose to capture main pipeline in one section, as impacts likely to be the same. The AGIs and BVS will be assessed individually in the same FRA. GT: Is a FCA being completed for Wales? Vic: Separate FCA is being completed for the Welsh leg of the DCO application. Currently undertaking separate consultation with NRW. GT: Ensure whatever format adopted complies with each separate country's legislation.		
10.2	VM: Drainage design and strategy prepared by another consultant, would normally include in same report. Would it be sufficient to make reference to a separate document by the other designer? SS: This would appear reasonable, but also need to consult with the LLFA for their individual requirements. EA's principal interest is fluvial flood maps and tidal. SS: Areas known as having groundwater table – could be creating pathway, need to ensure that the design does not create pathways for flooding.		

	VM: Anti-buoyancy measures will be included in the report. The detail design will need to ensure that groundwater information along the pipeline is taken into consideration to prevent groundwater flooding.		
10.3	VM: Regarding flood risk activity permits (FRAPs), are the EA expecting one application for each watercourse or one application covering them all? GT: programming and sequencing needs to be considered. Think about how to progress it. EA don't have a preference. If there are elements which aren't going to change but want the certainty up front, could apply for those. Hold back on applications for less certain elements to avoid abortive work.		
10.4	VM: Is it acceptable to submit an FRA limited to permanent works not temporary measures? GT: make reference to temporary works, but detail of methodology is better covered off as part of FRAPs, due to later engagement with contractors. Planning and pre-planning doesn't necessarily need the temporary works. VM: Don't want to prescribe the temporary process without engaging with the contractor. SS: will still need to make reference to construction impacts. VM: construction impacts will still be included in ES chapter which the FRA will make reference to.		
10.5	VM: The design life of AGIs and BVs is 25 years so what is the correct approach for climate change allowances? GT: won't be much modelling done since last July when the climate change allowances updated. Existing models might encompass 25 year climate allowance. If not, might need some adaptation in modelling, e.g. manipulation of a stage/discharge graph. SS: Operational life might exceed that, so worth considering extension for safeguarding the design and ensuring future resilience.		
10.6	VM: What would the flood risk vulnerability category for the scheme be? SS: Vulnerability of pipeline to be water compatible but if AGIs need hazardous substance consent it would be highly vulnerable.		
10.7	FM: When applying for FRAP for temporary crossings, what will the EA need to see? GT: If there is a clear span structure, then everything is beyond limits of channel. The EA retain a no culverting policy in the construction phase. Want to ensure short term impacts are as minimal as possible. No dig methods may not necessarily require FRAPs and the guidance regarding this needs to be consulted by the designer/applicant		

	FM: Does the EA expect hydraulic modelling of temporary pipes? GT: No, but would consult Duncan's team (WFD/biodiversity) as well. EA would want to ensure that the capacity of any structure is commensurate with the watercourse. The EA would want assurance that the capacity is correct. An optioneering exercise for why clear span crossings are not adopted would be appreciated. LM: Pipes / culverts will have aquatic ecology/mammal crossing implications.		
10.8	FM: Does the EA have concerns about boring under earth embankments on River Gowy? GT: these are likely to be privately owned but maintained and inspected by EA. If going with the FRAP exemption for this activity there are specific criteria around no-dig techniques. If work can't meet standard then need to apply for a permit. EA would look at proximity of the excavated work areas to the embankments and ensure any construction in close proximity to defences has been well considered.		
11	SS: if there is any change in personnel, will let WSP know.		

NEXT MEETING

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

Solis, Gabriel

From: [redacted]
Sent: 16 May 2022 06:17
To: [redacted]
JA0614 DCOConsult
Subject: RE: [EXTERNAL] RE: HyNet NW / United Utilities Meeting
Attachments: Utilities Pack (Interface with Hynet 36 and 20 Pipelines) with Temp Compounds.kmz

Hi All,

Google Earth KMZ files updated with Temp Compounds and Lay Down Areas

Regards

Kola

Regards

Kola

From: [redacted]
Sent: 06 May 2022 19:57
To: [redacted]
Subject: [EXTERNAL] RE: [EXTERNAL] RE: HyNet NW / United Utilities Meeting

> Security Warning: This email originated from outside of the organization. Do not click links or open attachments unless you verified the sender mail address and know the content is safe!

Hi Kola,

Thanks for making notes and sending these out. Notes / amends on the below in blue for incorporation into others' feedback

Have a good weekend.

United Utilities
Water for the North West

Jonathan Cartledge
Asset Manager - Strategic Development
Integrated Network Strategy
Water & Wastewater Network
M: [redacted]

From: Kuponiyi Kolapo
Sent: 05 May 2022 15:18
To: [redacted]
Subject: RE: [EXTERNAL] RE: HyNet NW / United Utilities Meeting

Hi All,

Notes and actions from today's meeting:

- ENI to send GIS File to UU showing temporary compounds and watercourse crossing locations- Kola
  - Grey Colour Polygons – Lay down areas
  - Red Colour Polygons – Temporary Construction Compounds
- UU raised concerns on risk of flooding greater if UU assets are to be diverted
- ENI confirms there are no plans to divert UU assets to accommodate new pipelines
- UU raised question on B & G (not sure I have this right??), James to send mitigation plans.

Regards

Kola

From: Kuponiyi Kolapo
Sent: 04 May 2022 18:51
To: [redacted]
Subject: RE: [EXTERNAL] RE: HyNet NW / United Utilities Meeting

Hi Gabriel,

See comments in red below.

Regards

Kola

From: Solis, Gabriel [redacted]>
Sent: 03 May 2022 09:12
To: [redacted]

[redacted]

Subject: [EXTERNAL] RE: HyNet NW / United Utilities Meeting

Hi all,

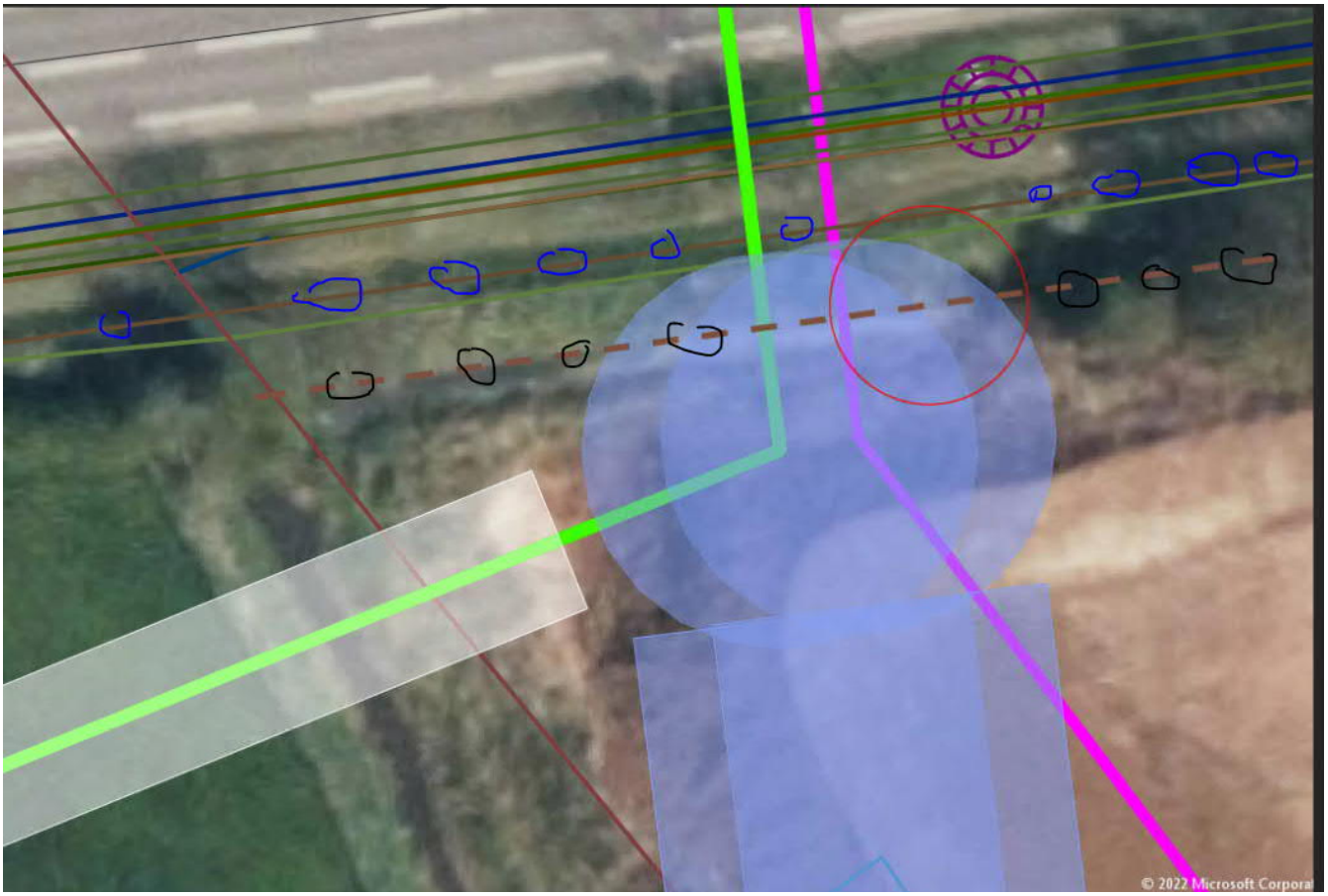
Hope you had a nice bank holiday weekend.

I look forward to seeing you in our meeting on Thursday, and ahead of our discussion, I would like to provide you with some of the points raised by UU which I would like to discuss.

- "UU noted that the exceedance paths of any modelled sewer flood risk should not be affected by the proposed development. UU specifically noted a potential exceedance path which impacts on the proposed works at approximate grid reference SJ 44583 74797". Nearby this location there is a proposed above ground installation (Stanlow). Please find attached a site location plan (Stanlow potential interaction with UU asset.jpg) illustrating the proposed pipelines, above ground installation and the location mentioned by UU. We would like to request more detailed information on the asset that UU owns in this area to be able to understand impacts, if any.

The UU asset in question we believe is the brown line with blue circle mark ups. Hynet 5 utility search places it north of provided grid reference SJ 44583 74797" by 4.5m (The brown line with black circle mark ups)
The UU comment uses the word "approximate" in reference to grid reference provided.
See attached KMZ file for the 36" and 20" pipeline route showing locations where it crosses UU assets.

At these crossing locations, we intend to have a minimum vertical clearance of 0.6m between the bottom of any buried UU asset and the top of the new pipelines.
All construction compounds associated with the crossing will also be located a minimum of 5m clear of any UU asset to comply with UU easement requirements.
An updated KMZ file with construction compounds at UU asset crossing points is being updated and will be sent hopefully by end of this week or Monday.
Kindly review ahead of tomorrows meeting so we can discuss further. Pls note route is not final yet.



- "UU expresses the wish to liaise with WSP to confirm the impact on any watercourses that interact with UU's assets and ensure that there are no detrimental consequences of these works in terms of asset operation, flood risk and changes of fluvial geomorphological processes. The proposed pipeline will use a standardised river crossing defined as open trench, For crossings of railway lines, specified roads, main rivers, and other major infrastructure, specialist trenchless techniques would be used." Please find attached "HyNet CO2 Pipeline – English side.pdf" and "England LLFA HyNet Map.pdf" which are two maps of the proposed pipeline. Could you please review and advise if there are any potential clashes with UU assets?

Not sure I fully understand this comment, however see attached KMZ file for all identified crossing points with UU assets.

- A drainage strategy for this project is currently being produced, and we are aware that UU is likely to be a statutory consultee and be kept informed of the surface and foul water strategy. Do you have any contact within your pre development team we can discuss with regarding the drainage strategy?

Also, please find below the outstanding information requested on the 09/03/2022 in regards flooding from UU assets/sewers.

- Any known surface water or foul sewer flooding issues in this area
- Are any properties within this area on the DG5 flooding register?
- Are there any plans for the construction of new foul and / or surface water sewers in this area for flood risk management purposes?
- Is there any on-going Section 104 adoptions or Section 185 sewer diversions currently being undertaken in the area?
- Is there any capital development sewer upgrading schemes planned in this area in the near future?
- Are you aware of any unrecorded United Utility assets within 200m of the proposed pipeline which may require diversion or relocating as part of the proposed development?

kind regards,

Gabriel

Gabriel N. Solis
Assistant Engineer
MEng GMICE
He/Him
Water Risk Management & Engineering, WEI
Health and Safety Champion

[redacted]

WSP House
70 Chancery Lane
London
WC2A 1AF

“ [redacted]

-----Original Appointment-----
From: Kuponiyi Kolapo [redacted]
Sent: 25 April 2022 14:37
To: [redacted]
Subject: HyNet NW / United Utilities Meeting
When: 05 May 2022 14:00-15:00 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.
Where: Microsoft Teams Meeting

Hi All,

Follow on discussions on Hynet Pipelines route interface with United Utilities assets.

See attachment MOM from last meeting and United Utilities Standard Conditions for Works adjacent to Pipelines Doc Ref 90048.

Kindly forward to anyone I may have missed.

Regards

kola Kuponiyi

Microsoft Teams meeting

Join on your computer or mobile app

[redacted]

Join with a video conferencing device

[redacted]

[redacted]

[redacted]

[redacted]

Learn More | Meeting options

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R.E.A. Venezia n. 122522
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Società con unico socio

Message for the recipient only, if received in error, please notify the sender and read [redacted]

-LAEmHhHzdJzBlTWfa4Hgs7pbKI

Solis, Gabriel

Subject: FW: Requests for Information

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 26 April 2022 12:36
To: [redacted]
Subject: Requests for Information

Our Reference: **EIR/1106/2022**

Dear Rebecca Potts & Gabriel Solis,

Requests for Information

We write further to your request for information dated the 7th and 23rd of March 2022 which we have been considering under the Environmental Information Regulations 2004.

Please find below your questions alongside our responses:

- **Any known surface water or foul sewer flooding issues in this area**

We have traced the pipeline route, and largely it skirts our infrastructure so there are only a couple of locations we should highlight in terms of sewer flooding issues.
The first is the area around Chester Road, Pentre and Leaches Lane, Mancot where we have a number of locations of both internal and external sewer flood risks due to hydraulic incapacity.
The second is postcode area CH5 3HJ (Blackbrook Avenue, Hawarden). We have a number of risks of external flooding in this vicinity.

- **Are any properties within this area on the DG5 flooding register**

We do have properties within this area on our Flooding Register, specifically at Pentre and Hawarden. There are 35 properties on our Register at Pentre (at varying levels of risk but including some properties at risk of internal flooding).
There are 9 properties on our Register at Blackbrook Avenue, Hawarden, although these are all risks of external flooding only.

- **Are there any plans for the construction of new foul and / or surface water sewers in this area for flood risk management purposes?**

This area is not currently in our investment programme to resolve flood-risk.

- **Is there any on-going Section 104 adoptions or Section 185 sewer diversions currently being undertaken in the area?**

There aren't any live S104/S185 applications along the proposed work extent route.

- **Is there any capital development sewer upgrading schemes planned in this area in the near future?**

There are currently no schemes planed in/around the new pipeline route.

- **Are you aware of any unrecorded DCWW assets within 200m of the proposed pipeline which may require diversion or relocating as part of the proposed development?**

We are not aware of any unrecorded DCWW assets within 200m of the proposed pipeline.
To explain, our sewer records include all our known recorded assets, but there may be pipes that haven't been recorded, as we have not been made aware of the apparatus.
DCWW gives this information as to the position of its underground apparatus, by way of general guidance only, and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavation, or other works made in the vicinity of the company's apparatus.
The onus of locating apparatus before carrying out any excavation's rests entirely on you. The information, which is supplied by the company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available.

We hope that this response is clear. Should you have any questions, you can contact us at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Dŵr Cymru Welsh Water Linea, Fortran Road, St. Mellons, Cardiff, Wales, CF3 0LT.

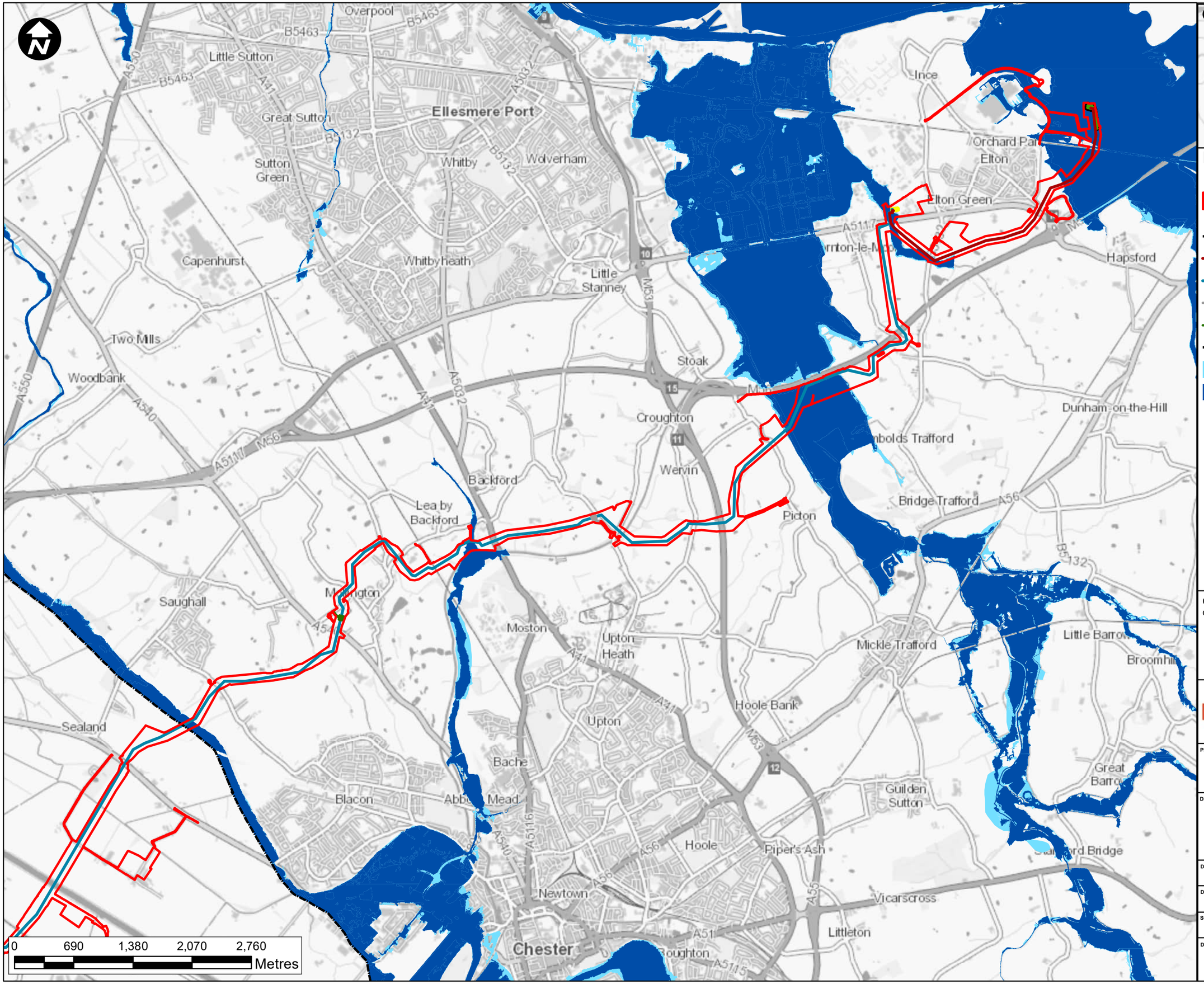
If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

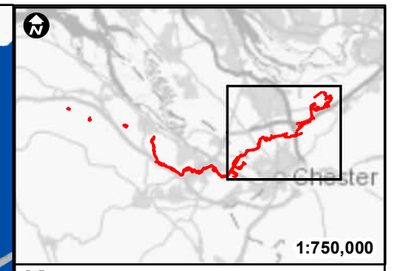
Yours faithfully

Dŵr Cymru Welsh Water

_____ Dwr Cymru Welsh Water is firmly committed to water conservation and promoting water efficiency. Please log on to our website [redacted] wedi ymrwymo i warchod adnoddau dwr a hyrwyddo defnydd dwr effeithiol. Mae cyngor i' ch helpu i ddefnyddio dwr yn ddoeth yn [redacted]

Annex C





Key

- Indicative Alignment of the Newbuild Carbon Dioxide Pipeline
- English Welsh Border
- InceAGI to StanlowAGI Pipeline
- StanlowAGI To Flint AGIPipeline
- RockBank BVS
- Mollington BVS
- English Welsh Border
- Flood Zone 2
- Flood Zone 3

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.1 (Sheet 3) - Newbuild Carbon Dioxide Pipeline Flood Map for Planning

DRAWING STATUS

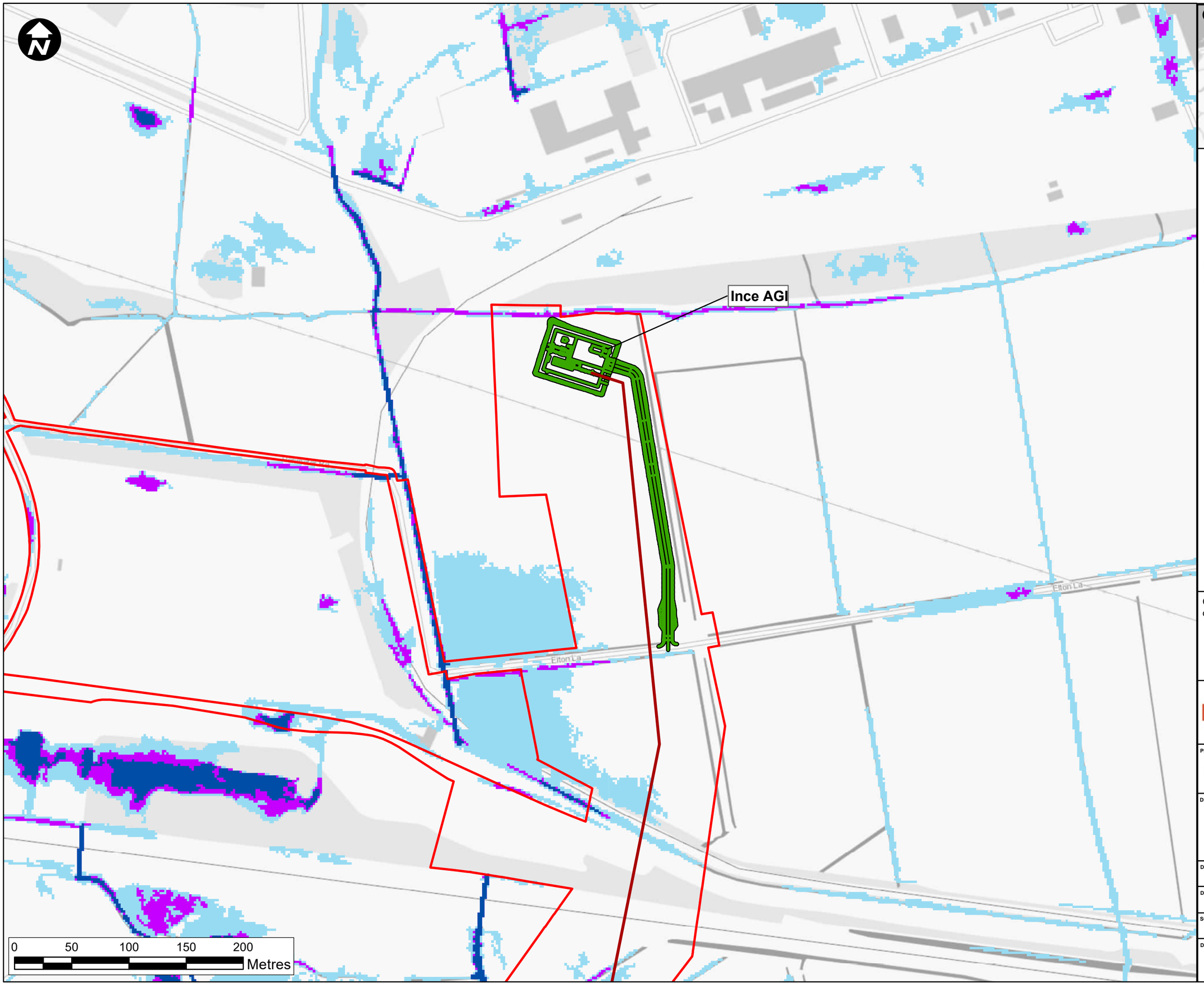
FOR DESIGN CHANGE REQUEST 1

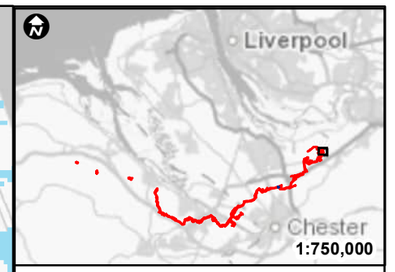
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:40,000	27/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.1 sheet 3





Legend

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Ince AGI (Indicative Location)

Flood Risk from Surface Water and small Watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.2: Flood Map for Planning Ince AGI

DRAWING STATUS

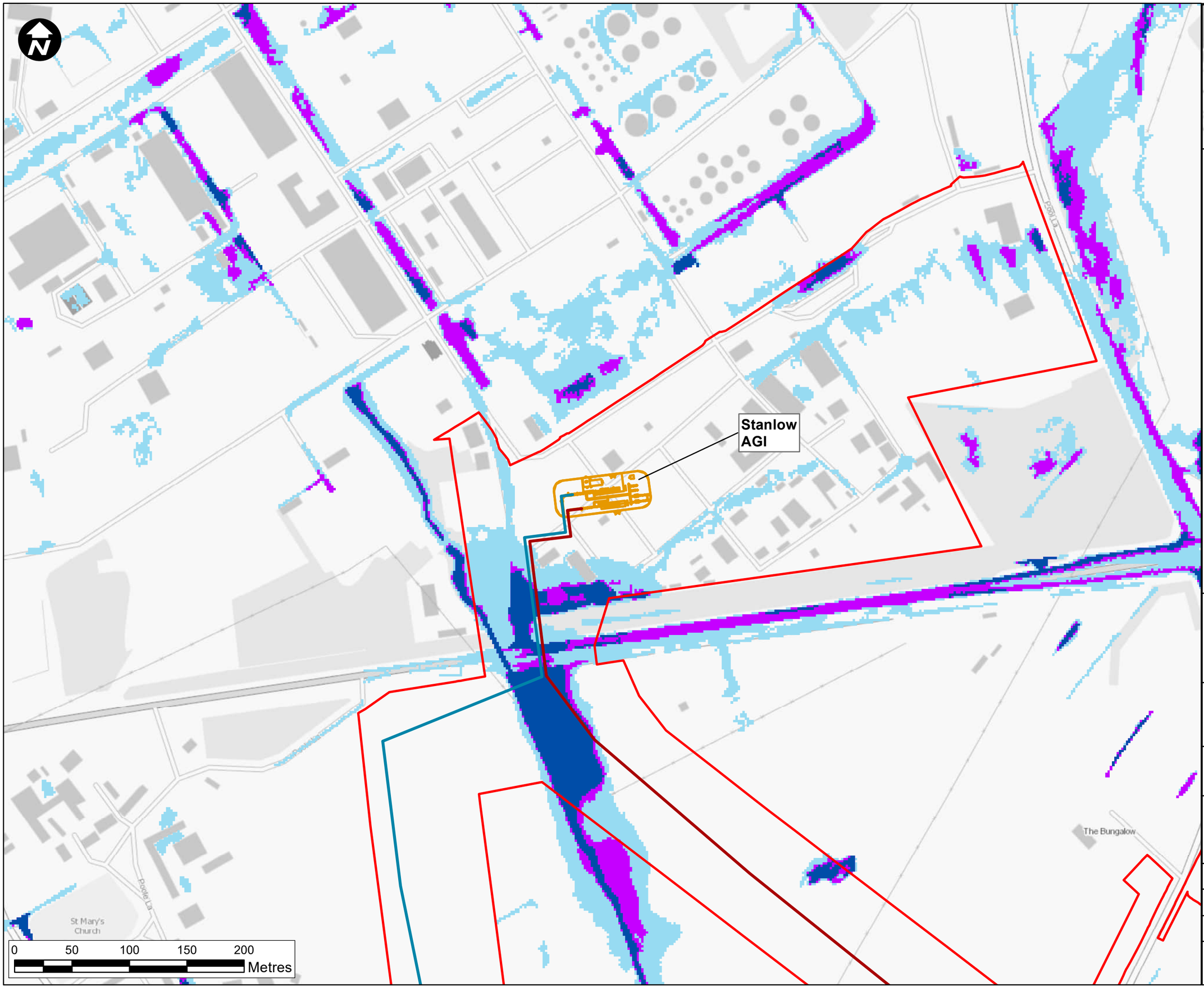
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	13/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.2



Legend

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- Stanlow AGI (Indicative Location)

Flood Risk from Surface Water and small Watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.3: Flood Map for Planning Stanlow AGI

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	13/03/2023	B

DRAWING NUMBER

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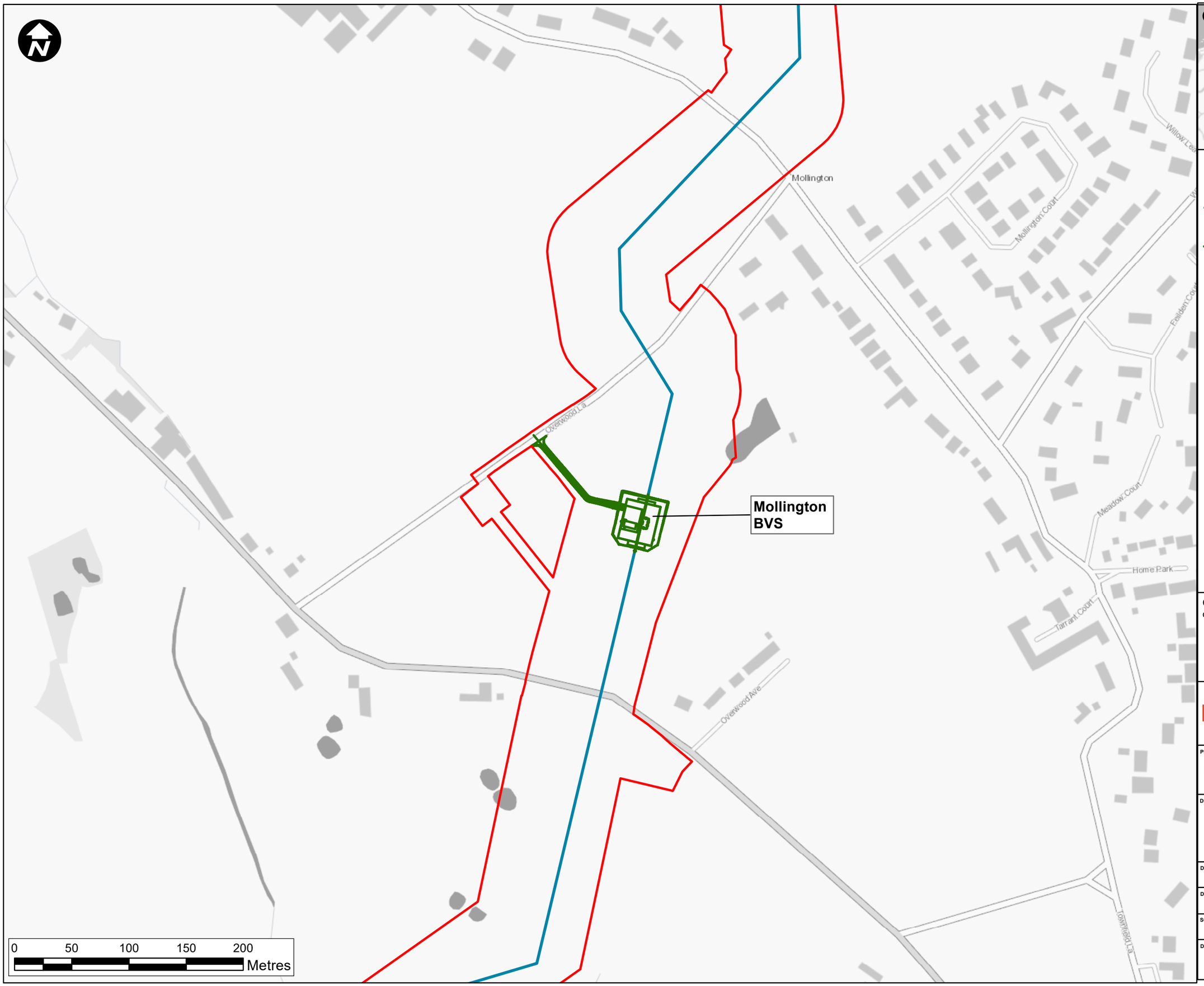
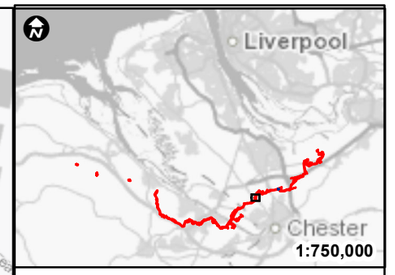




Legend

- Newbuild Infrastructure Boundary
- StanlowAGI To Flint AGI Indicative Alignment of the Newbuild Carbon Dioxide Pipeline
- Mollington BVS (Indicative Location)
- Flood Zone 3
- Flood Zone 2

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.4: Flood Map for Planning Mollington BVS - Sheet 1

DRAWING STATUS

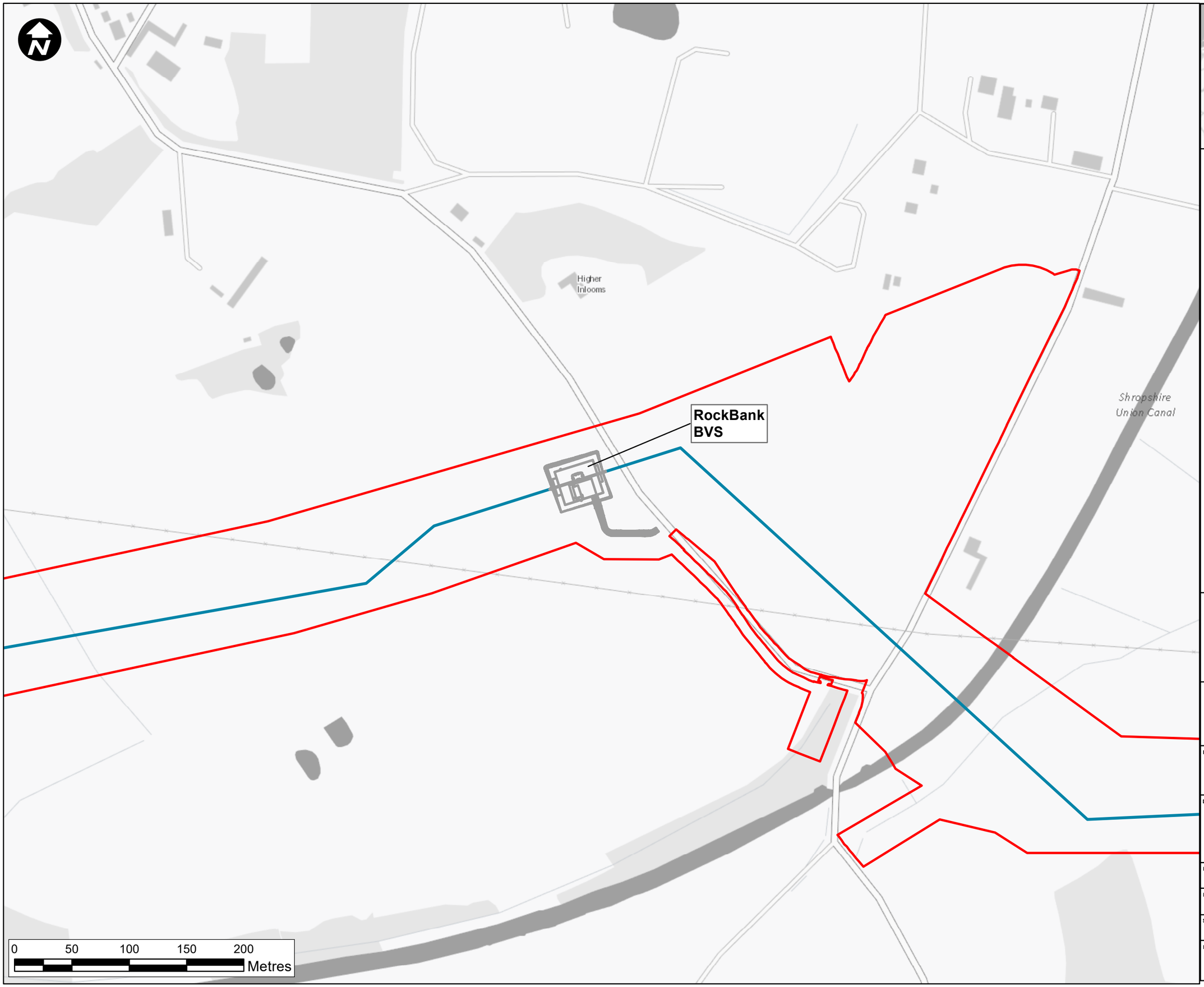
FOR INFORMATION

DRAWN	CHECKED	APPROVED	AUTHORISED
NM	GS	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	14/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-18.4.4-Sheet 1



Legend

- Newbuild Infrastructure Boundary
- StanlowAGI To Flint AGI Indicative Alignment of the Newbuild Carbon Dioxide Pipeline
- RockBank BVS (Indicative Location)
- Flood Zone 3
- Flood Zone 2

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.5: Flood Map for Planning RockBank BVS - Sheet 1

DRAWING STATUS

FOR INFORMATION

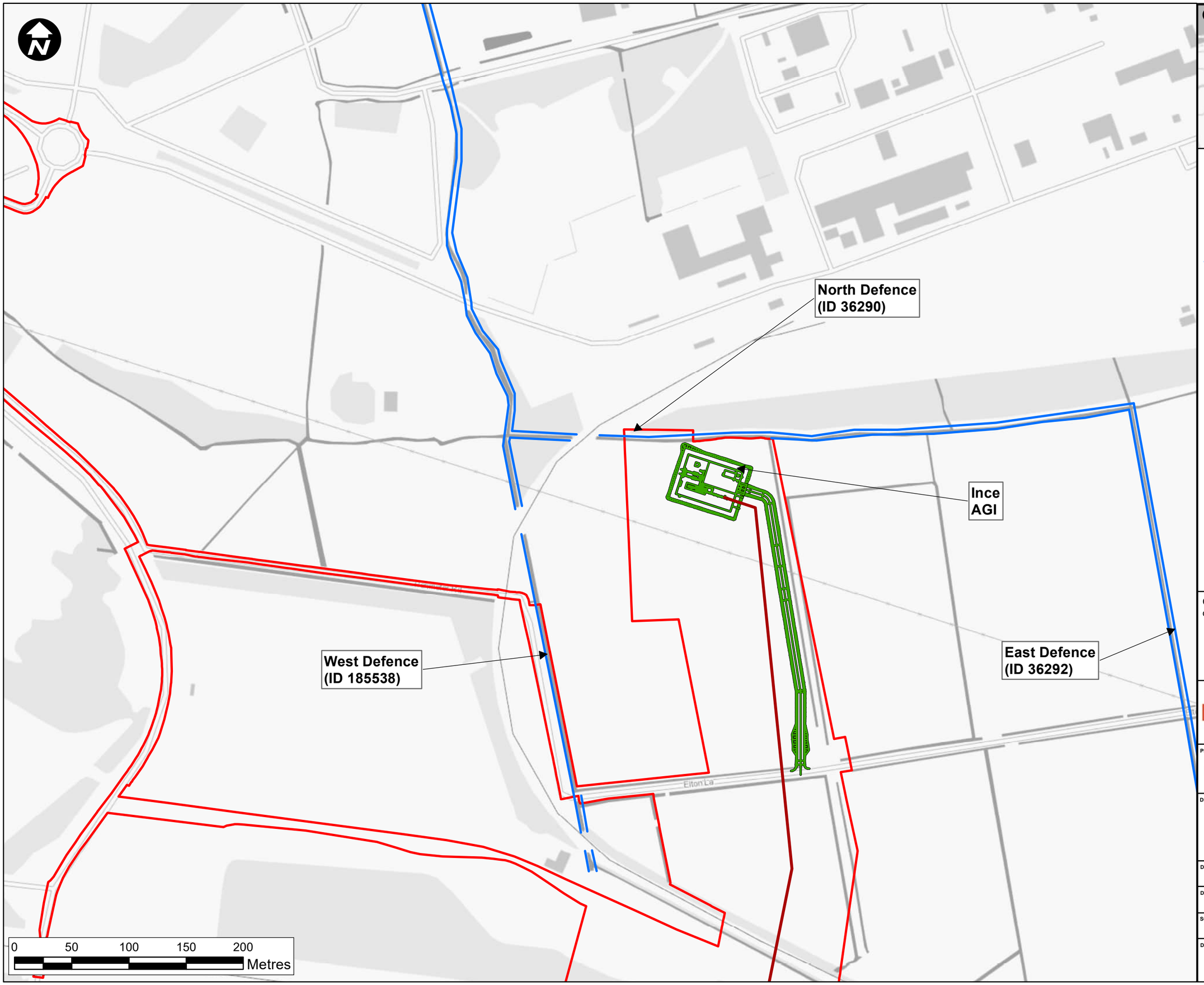
DRAWN	CHECKED	APPROVED	AUTHORISED
NM	GS	EI	MT

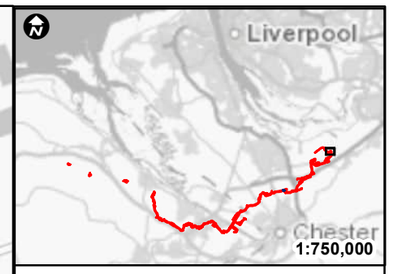
SCALE @ A3 SIZE	DATE	REVISION
1:3,000	14/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-18.4.5-Sheet 1

Annex D





Legend

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Ince AGI (Indicative Location)
- Flood Defences

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.6: Flood Defences
Ince AGI - Sheet 1

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
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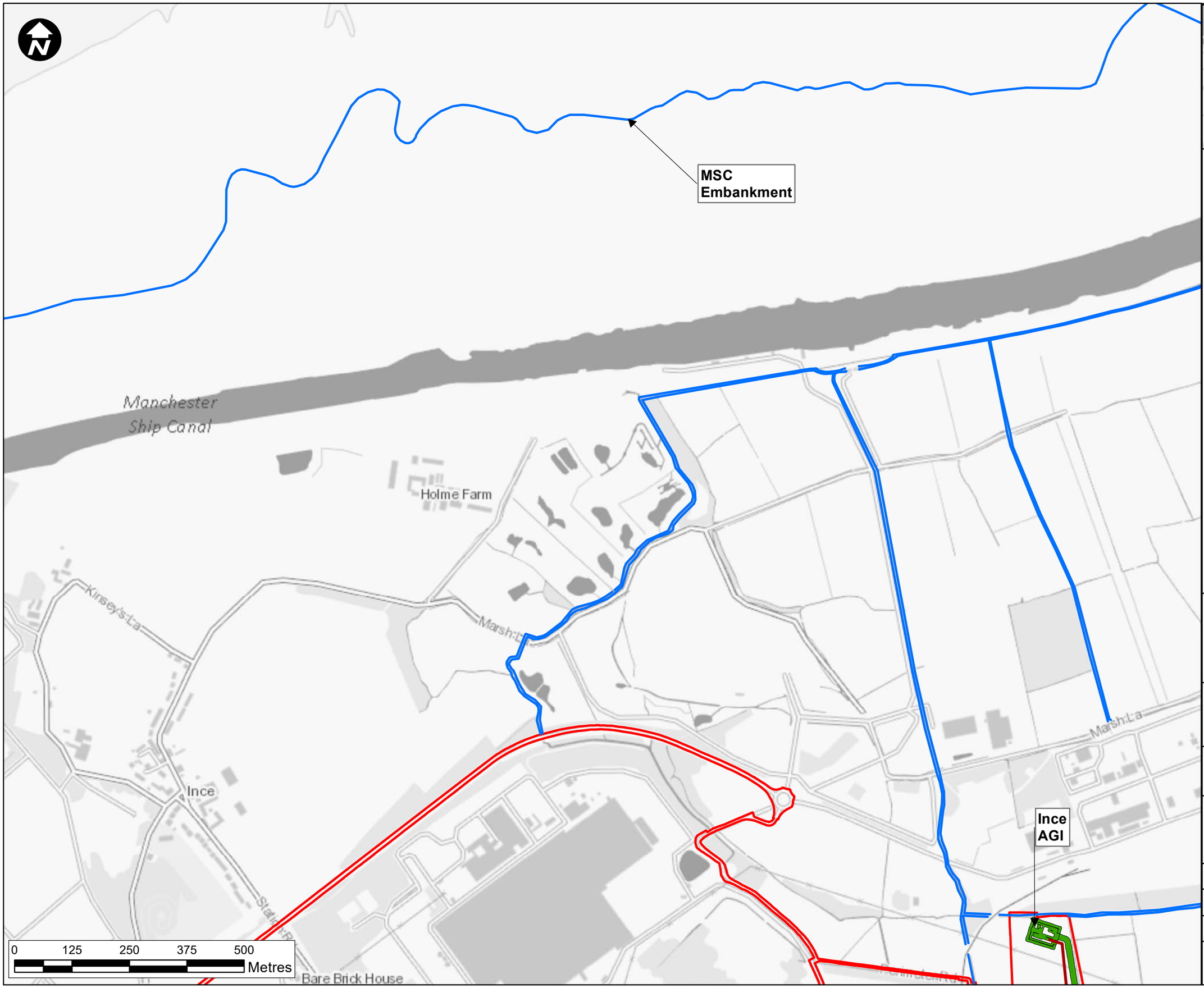
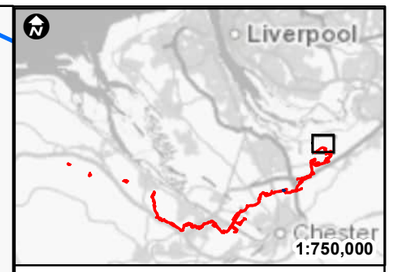
SCALE @ A3 SIZE	DATE	REVISION
1:3,000	15/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.6- Sheet 1





Legend

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Ince AGI (Indicative Location)
- Flood Defences

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.6: Flood Defences
Ince AGI - Sheet 2

DRAWING STATUS

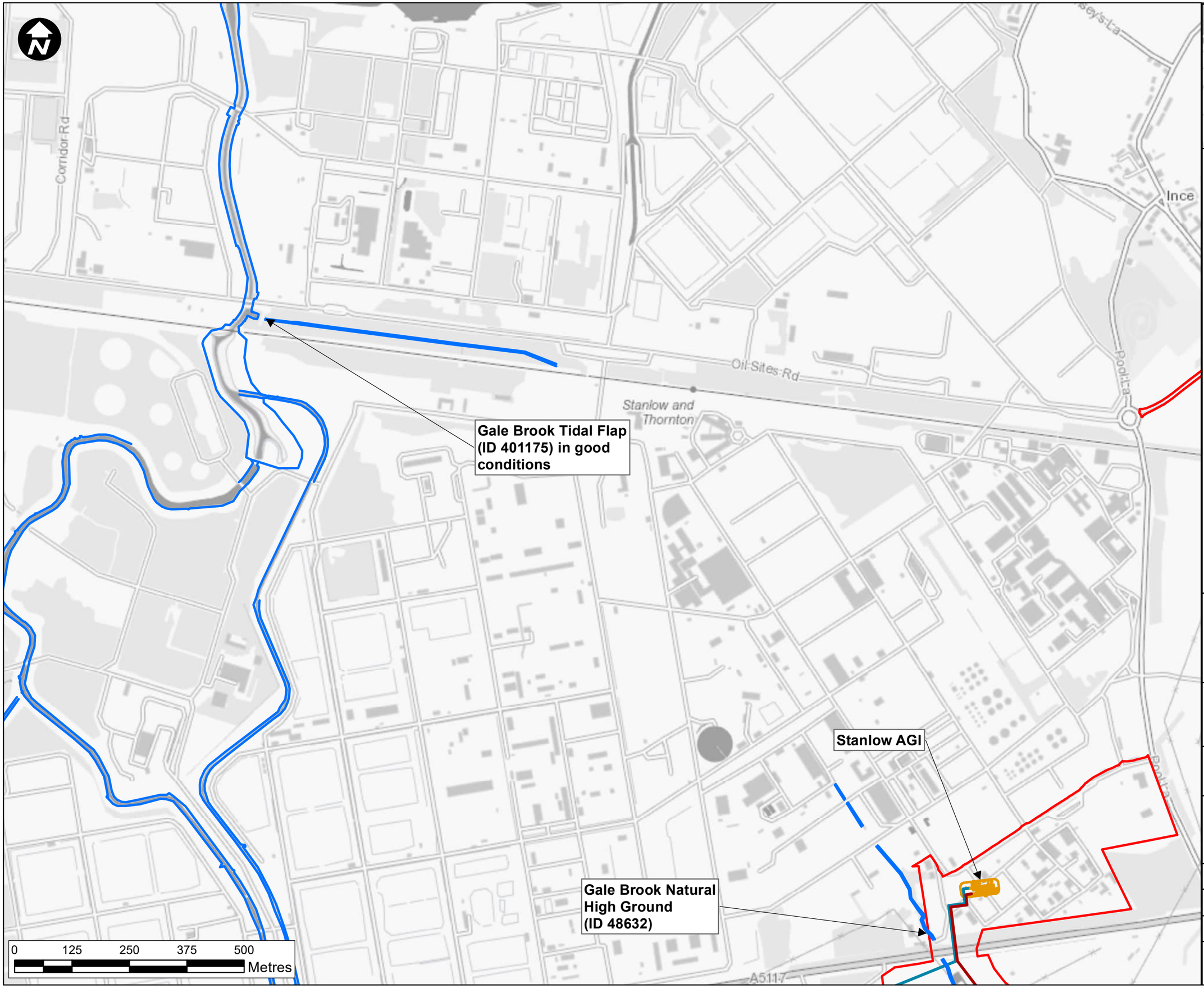
FOR DESIGN CHANGE REQUEST 1

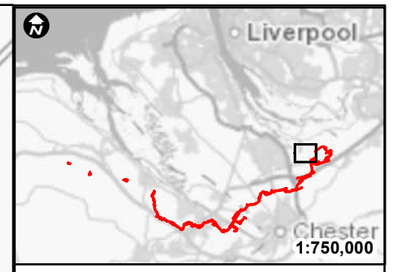
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:7,500	15/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.6- Sheet 2





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- Stanlow AGI (Indicative Location)
- Flood Defences

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.7: Flood Defences Stanlow AGI - Sheet 1

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

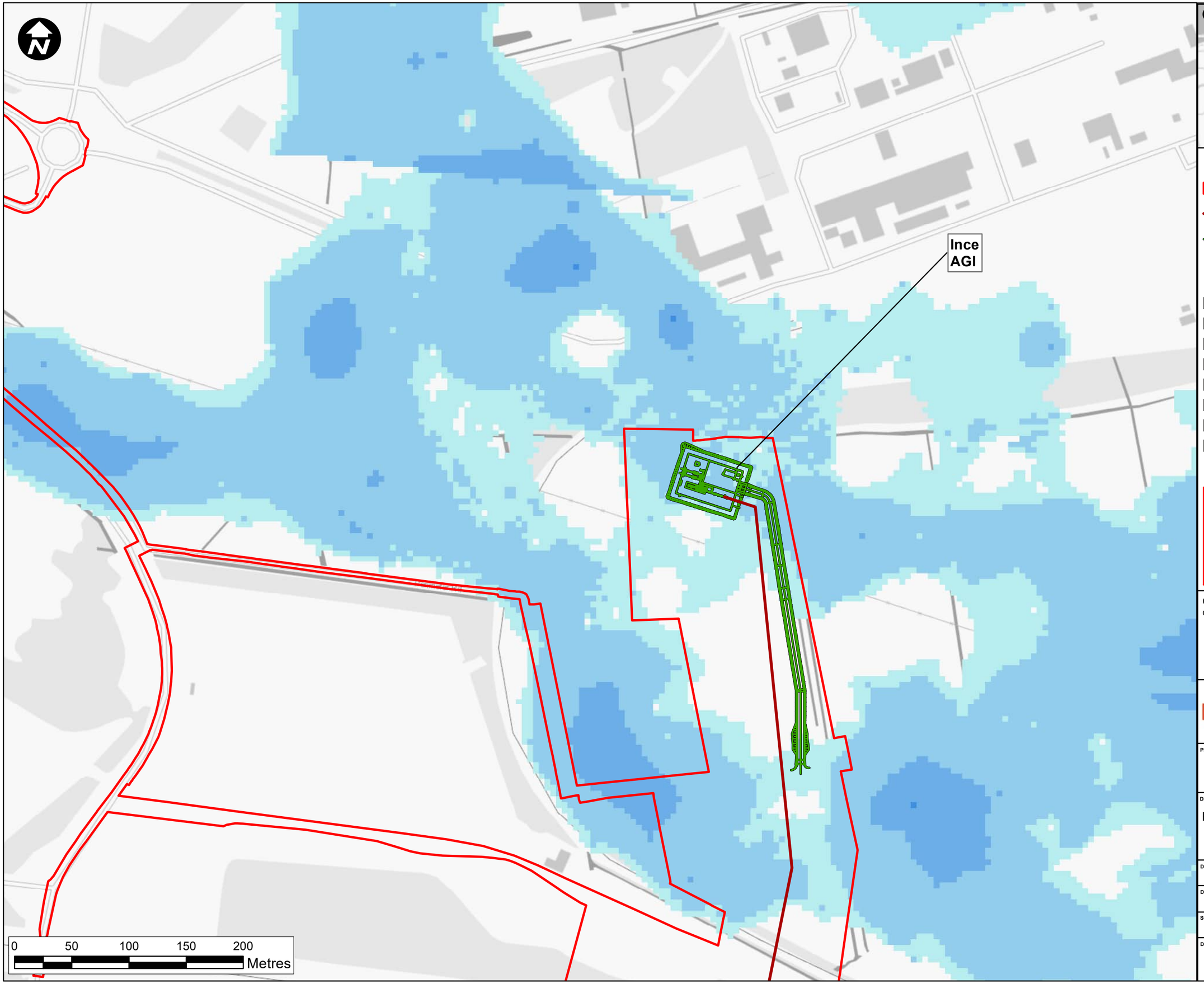
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

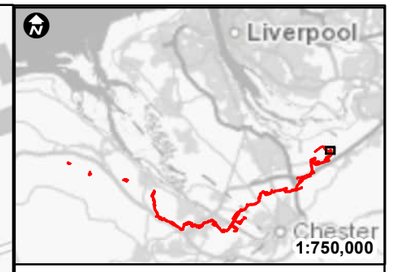
SCALE @ A3 SIZE	DATE	REVISION
1:7,500	19/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.7

Annex E





key

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- InceAGI (Indicative Location)

Flood depth mAOD

<VALUE>

- 0 - 0.1 m
- 0.1 m - 0.5 m
- 0.5 m - 1 m
- 1 m - 1.5 m
- 1.5 m - 2 m
- 2 m - 2.5 m
- 2.5 m - 3 m
- > 3m

Note:This map is based on the EA Fluvial Model (2004) (source:https://environment.data.gov.uk/) and it is included for reference. However, the map is considered out of date and more up to date information has been used to inform the Flood Risk Assessment process

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.8 - Fluvial Flood Model 1 in 1000 +20 CC - Ince AGI - Sheet 1

DRAWING STATUS

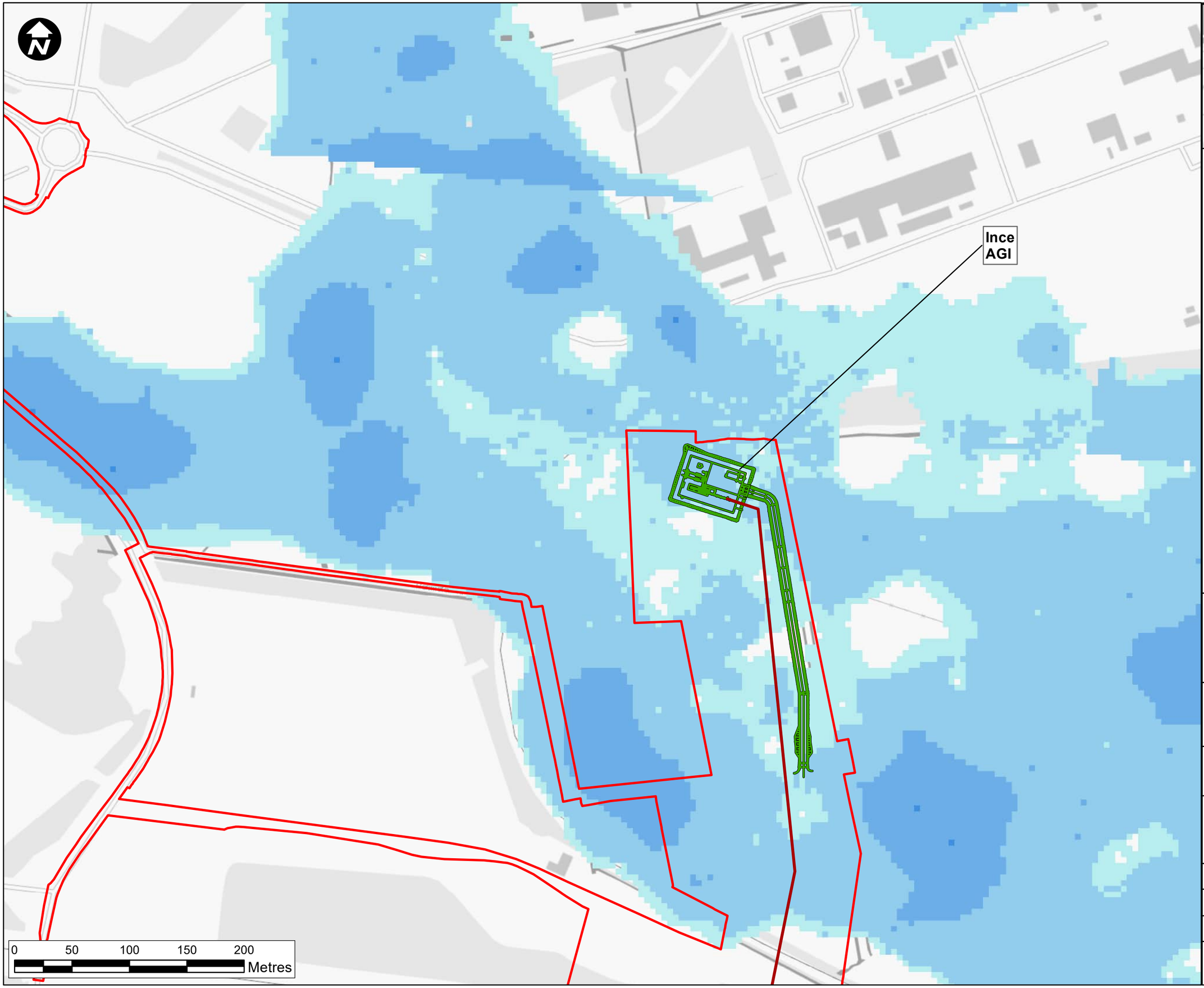
FOR DESIGN CHANGE REQUEST 1

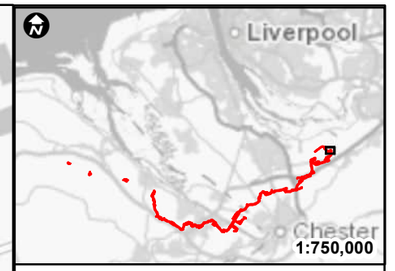
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	20/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.8- Sheet 1





Key

- Newbuild Infrastructure Boundary
- English Welsh Border
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- InceAGI (Indicative Location)

Flood depth

- 0 - 0.1 m
- 0.1 m - 0.5 m
- 0.5 m - 1 m
- 1 m - 1.5 m
- 1.5 m - 2 m
- 2 m- 2.5 m
- 2.5 m - 3 m
- > 3 m

Note:This map is based on the EA Fluvial Model (2004) (source:https://environment.data.gov.uk/) and it is included for reference. However, the map is considered out of date and more up to date information has been used to inform the Flood Risk Assessment process

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.8 - Fluvial Flood Model 1 in 1000 +20 CC - Ince AGI - Sheet 2

DRAWING STATUS

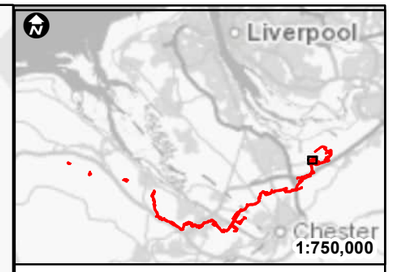
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	20/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.8- Sheet 2



Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- Stanlow AGI (Indicative Location)
- Flood Extent - 1 in 1000 yr fluvial event

Note:This map is based on the Stanlow and Tranmere Flood Risk Management study (2019) Drawing number: ENVIMNW000998-JAC-0-00-MP-HY-0012 and shows the maximum fluvial flood extent for a 1 in 1000 year return period event.

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.9 - Gowy River Model 1 IN 1000 yr - Stanlow AGI - Sheet 1

DRAWING STATUS

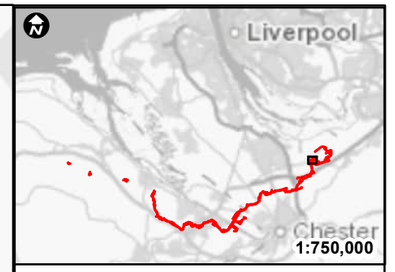
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	20/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.9-Sheet 1



Key

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- Stanlow AGI (Indicative Location)
- Flood Extent - 1 in 100+30CC yr fluvial event

Note:This map is based on the Stanlow and Tranmere Flood Risk Management study (2019) and shows the maximum fluvial flgood extent for a 1 in 100 + 30CC year return period event.

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.9 - Gowy River Model 1 IN 100 yr +30 CC - Stanlow AGI - Sheet 2

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

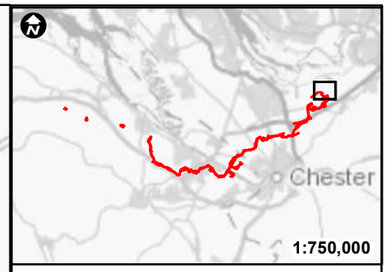
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	20/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.9- Sheet 2

Annex F



Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Ince AGI (Indicative
- Flood Extent - 1 in 1000 year tidal event

Note:This map is based on the Mersey Estuary, Ditton Brook and River Gowy Study (2018) and shows the maximum tidal flood extent for a 1 in 1000 year return period event.

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.10 - Mersey Tidal Flood Model 1 in 1000YR - Ince AGI Sheet 1

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
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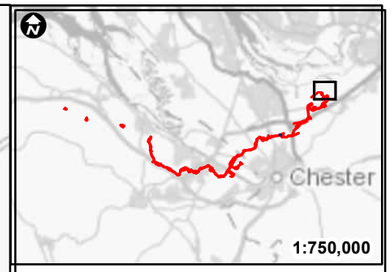
DRAWING NUMBER

EN070007-APP-ES-18.4.10- Sheet 1



Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- InceAGI (Indicative Location)
- Flood Extent - 1 in 200 yr (2065 CC) tidal event

Note:This map is based on the Mersey Estuary, Ditton Brook and River Gowy Study (2018) and shows the maximum tidal flood extent for a 1 in 200 (2065CC) year return period event.

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.10 - Mersey Tidal Flood Model 1 in 200YR (2065) - Ince AGI Sheet 2

DRAWING STATUS

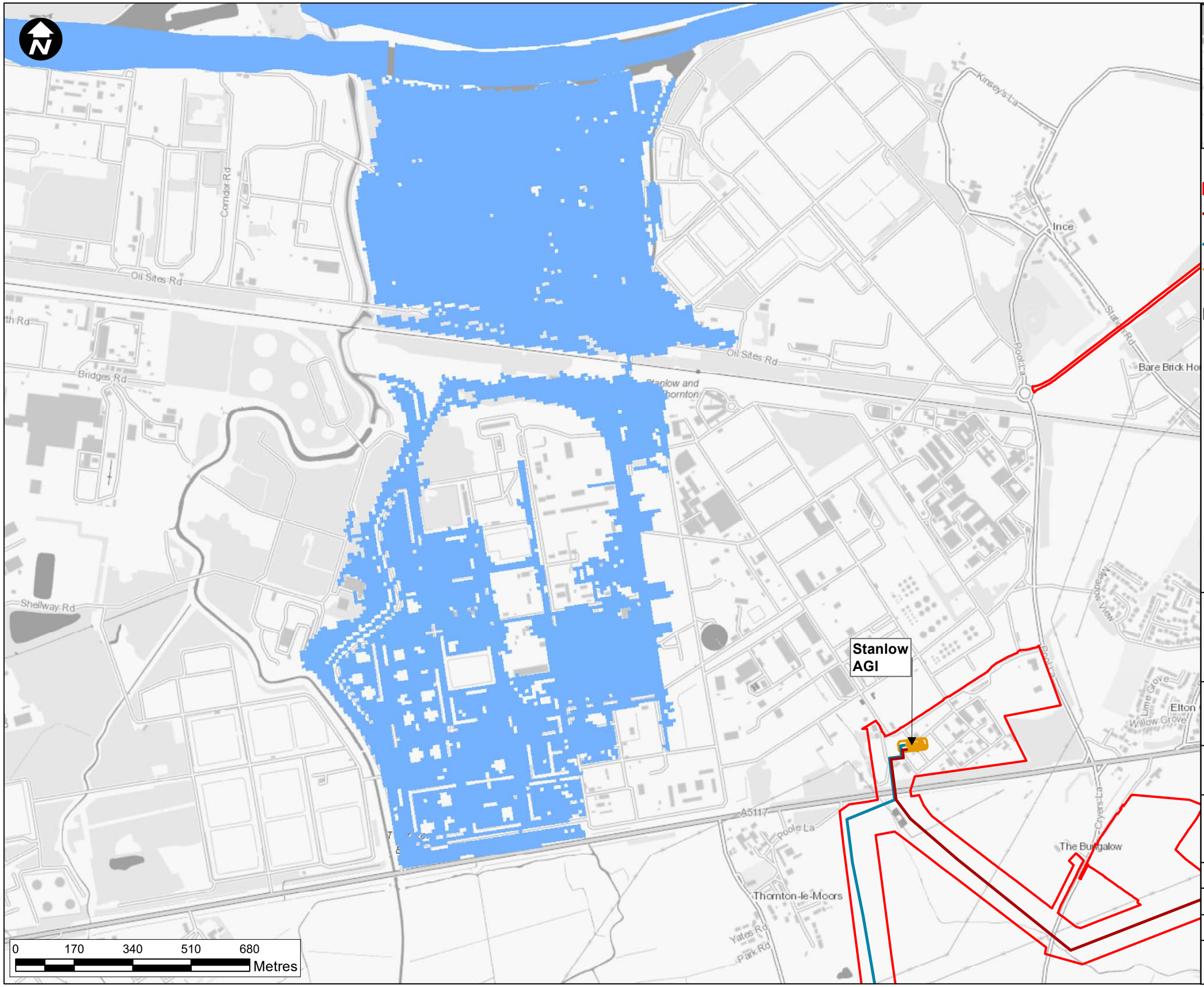
FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:7,500	20/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.10- Sheet 2



Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- StanlowAGI (Indicative Location)

Flood Extent

- Flood Extent - 1 in 200 yr (2065 CC) tidal event

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.11 - Mersey Tidal Model 200YR (2065) - Stanlow AGI

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

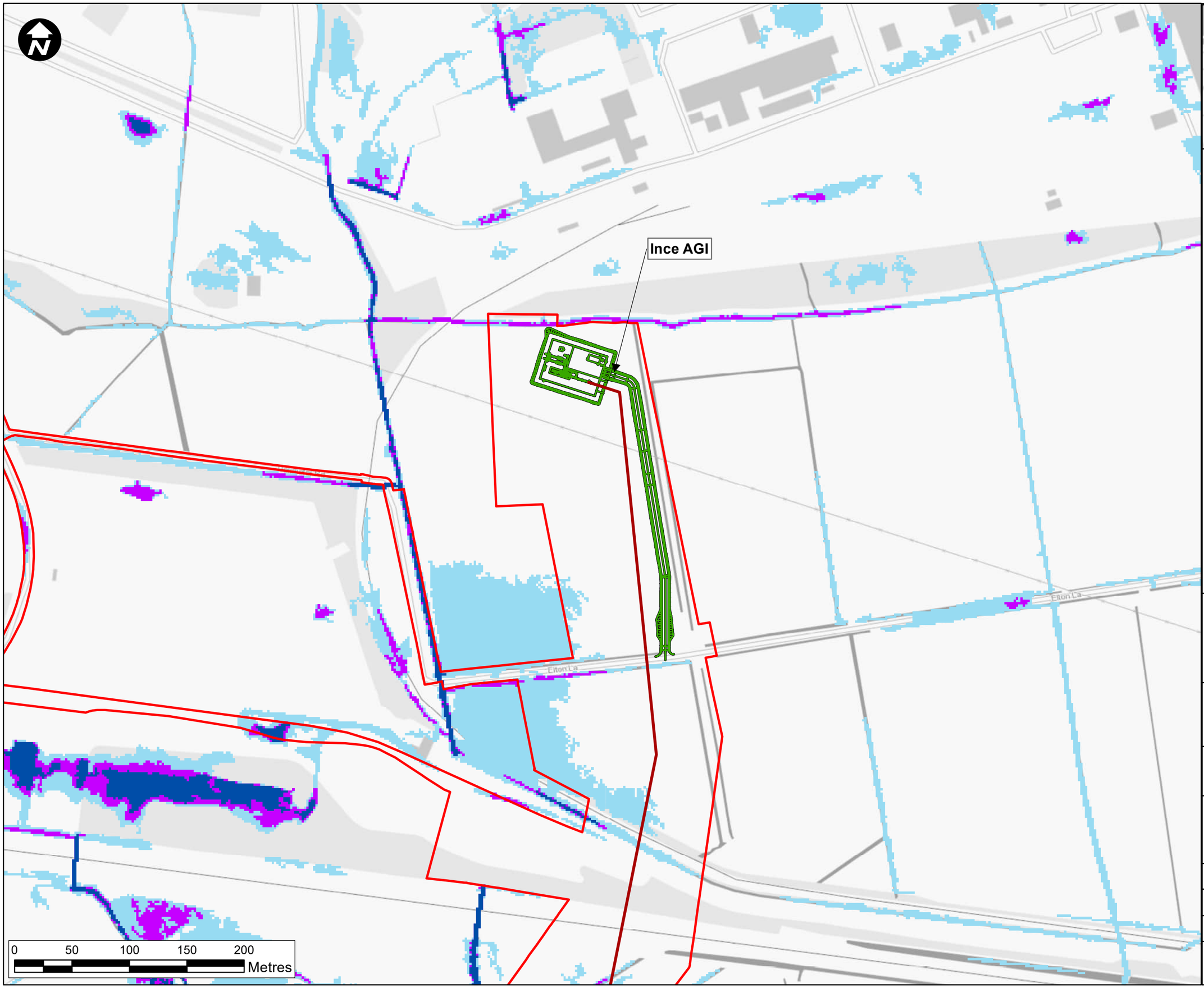
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

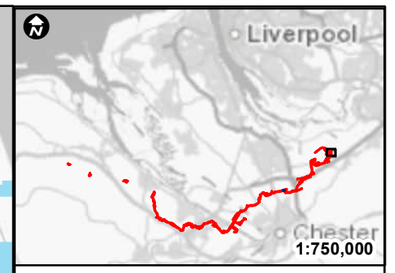
SCALE @ A3 SIZE	DATE	REVISION
1:10,000	17/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.11

Annex G





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- InceAGI (Indicative Location)

Flood Risk from Surface Water and small watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.12: Surface Water Flood Map Ince AGI

DRAWING STATUS

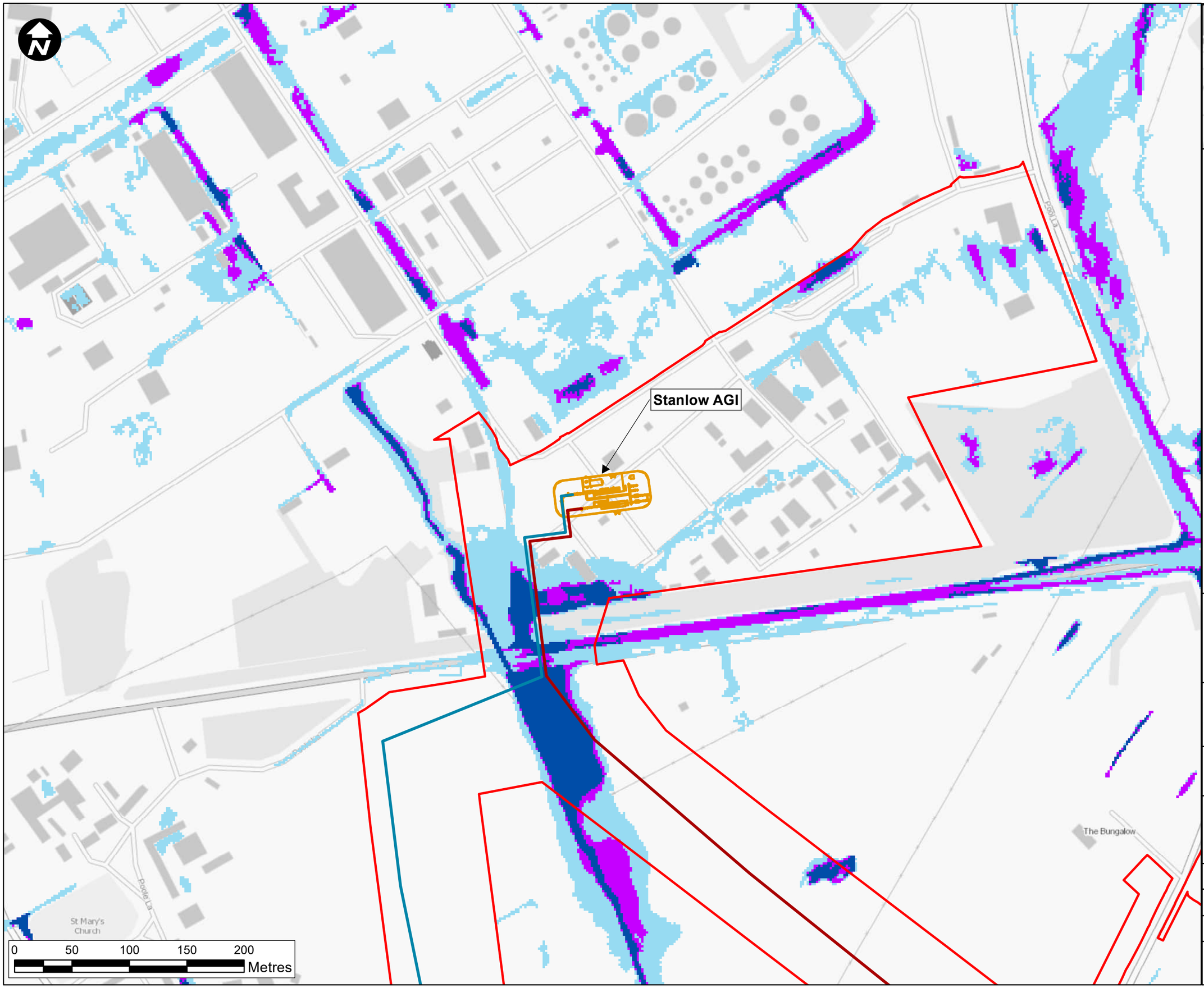
FOR DESIGN CHANGE REQUEST 1

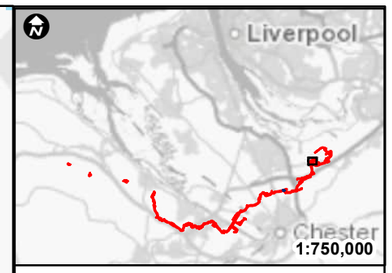
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	16/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.12





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI to Flint AGI Pipeline
- Stanlow AGI (Indicative Location)

Flood Risk from Surface Water and small watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.13: Surface Water Flood Map Stanlow AGI

DRAWING STATUS

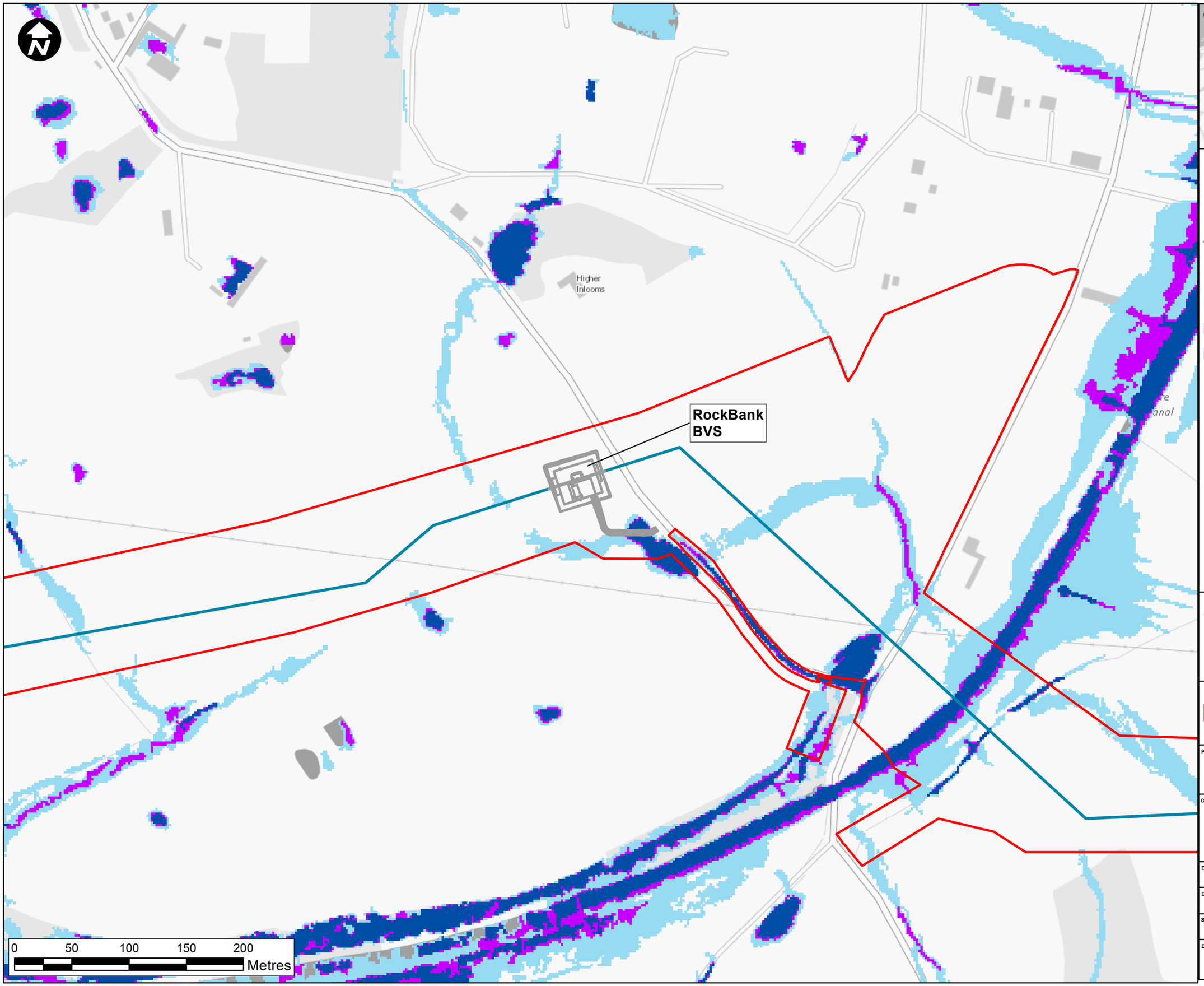
FOR DESIGN CHANGE REQUEST 1

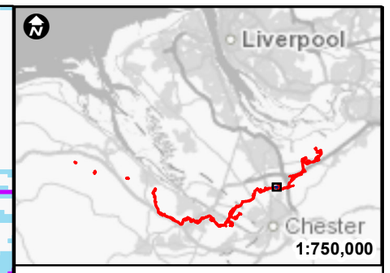
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	16/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.13 1





Legend

- Newbuild Infrastructure Boundary
- StanlowAGI To Flint AGI Indicative Alignment of the Newbuild Carbon Dioxide Pipeline
- RockBank BVS (Indicative Location)

Flood Risk from Surface Water and small Watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.14: Surface Water Flood Map RockBank BVS - Sheet 1

DRAWING STATUS

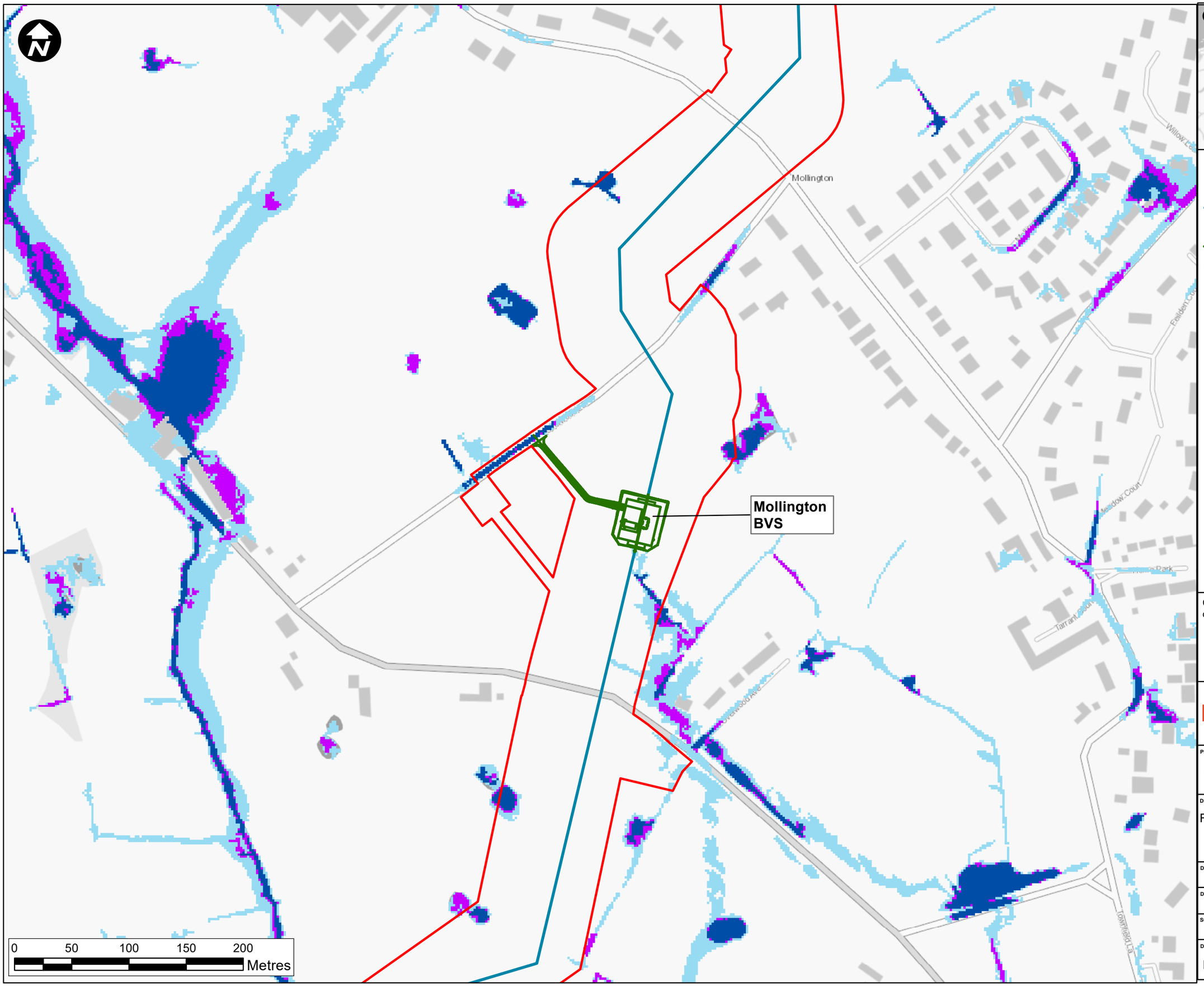
FOR INFORMATION

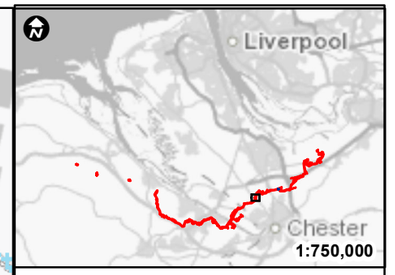
DRAWN	CHECKED	APPROVED	AUTHORISED
NM	GS	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:3,000	14/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-18.4.14-Sheet 1





Legend

- Newbuild Infrastructure Boundary
- StanlowAGI To Flint AGI Indicative Alignment of the Newbuild Carbon Dioxide Pipeline
- Mollington BVS (Indicative Location)

Flood Risk from Surface Water and small Watercourses

- Low Risk (Chance of flooding of between 0.1% and 1%)
- Medium Risk (Chance of flooding of between 1% and 3.3%)
- High Risk (Chance of flooding of greater than 3.3%)

HyNet North West

PROJECT TITLE

Hynet Carbon Dioxide Pipeline

DRAWING TITLE

Figure 18.4.15: Surface Water Flood Map Mollington BVS - Sheet 1

DRAWING STATUS

FOR INFORMATION

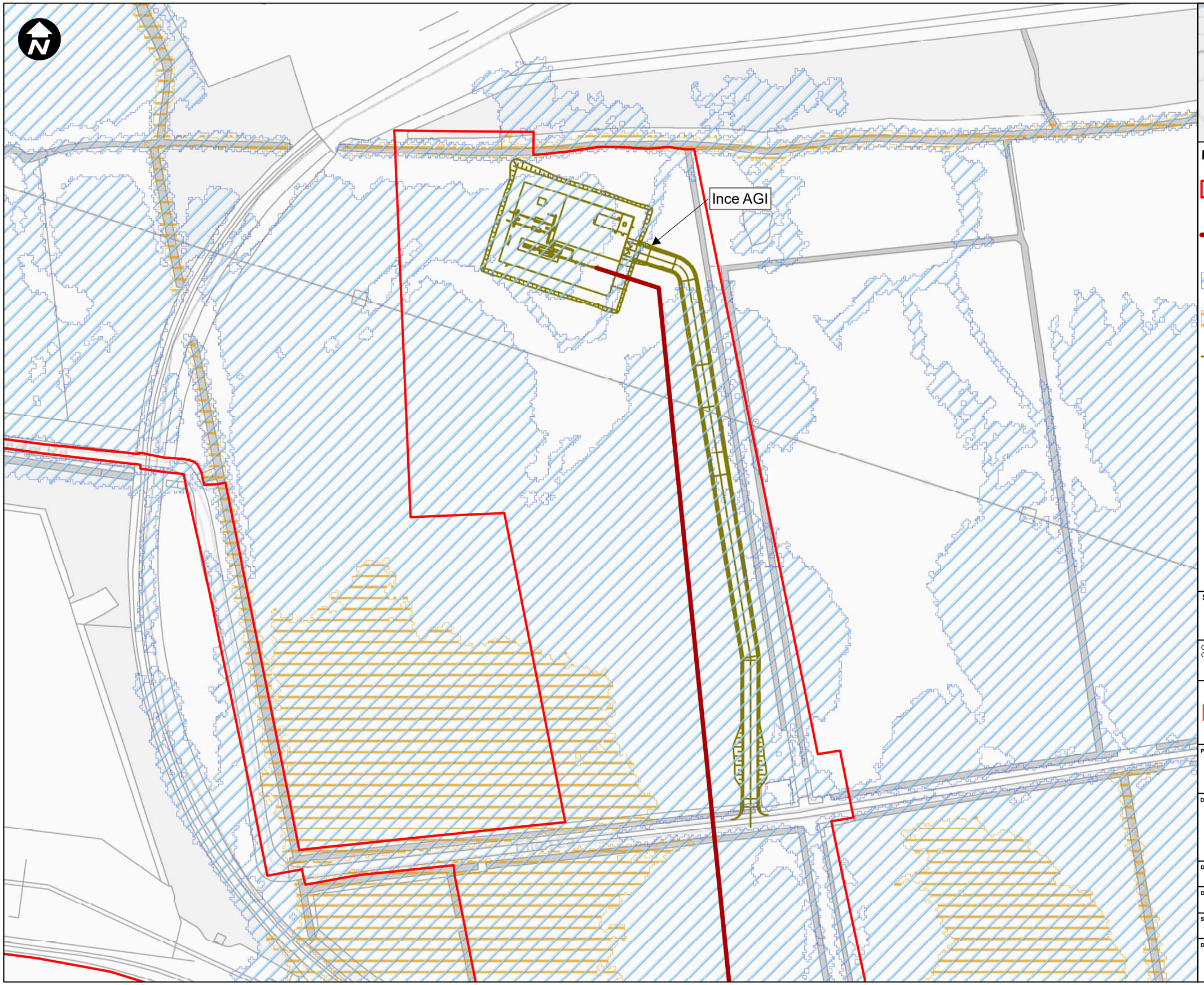
DRAWN	CHECKED	APPROVED	AUTHORISED
NM	GS	EI	MT

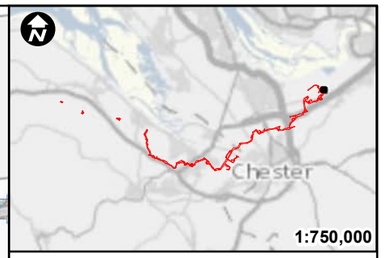
SCALE @ A3 SIZE	DATE	REVISION
1:3,000	14/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-18.4.15-Sheet 1

Annex H





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Reservoir Flood Extents Wet Day
- Reservoir Flood Extents Dry Day
- Ince AGI (Indicative Location)

SCALE: 1:1,500

0 12.5 25 50 Metres

HyNet North West

PROJECT TITLE

HyNet Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 18.4.16
Ince Reservoir Flood Map - Manley Mere Wet/Dry
Sheet 1

DRAWING STATUS

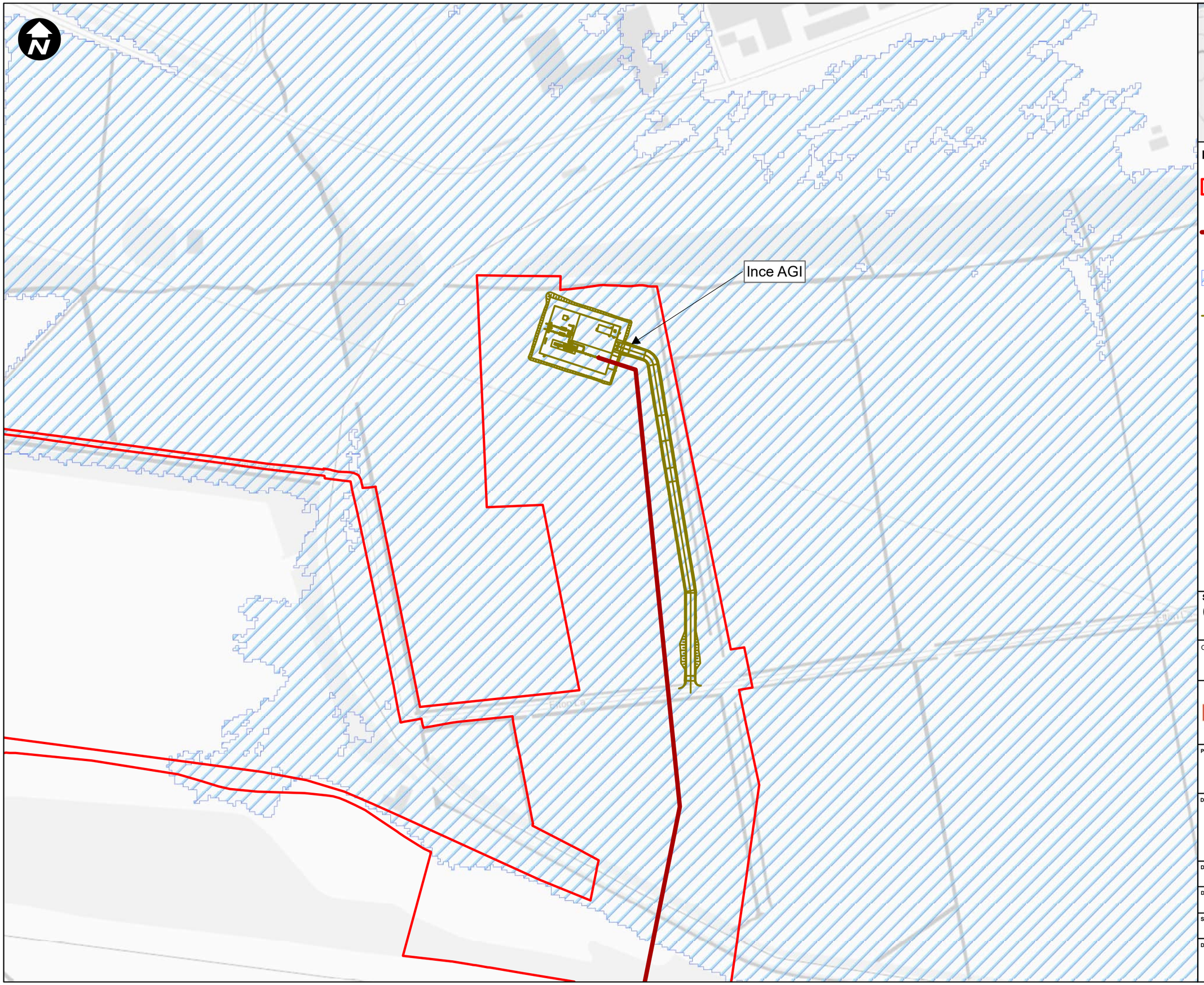
FOR DESIGN CHANGE REQUEST 1

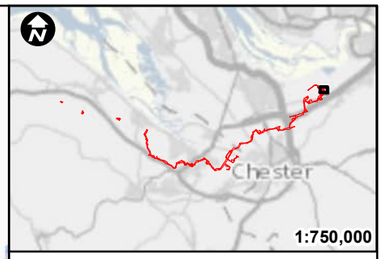
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:1,500	17/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.16 Sheet 1





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Reservoir Flood Extents Wet Day
- Ince AGI (Indicative Location)

SCALE: 1:2,500

0 25 50 100 Metres

HyNet North West

PROJECT TITLE

HyNet Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 18.4.16
Ince Reservoir Flood Map - Bosley Wet/Dry
Sheet 2

DRAWING STATUS

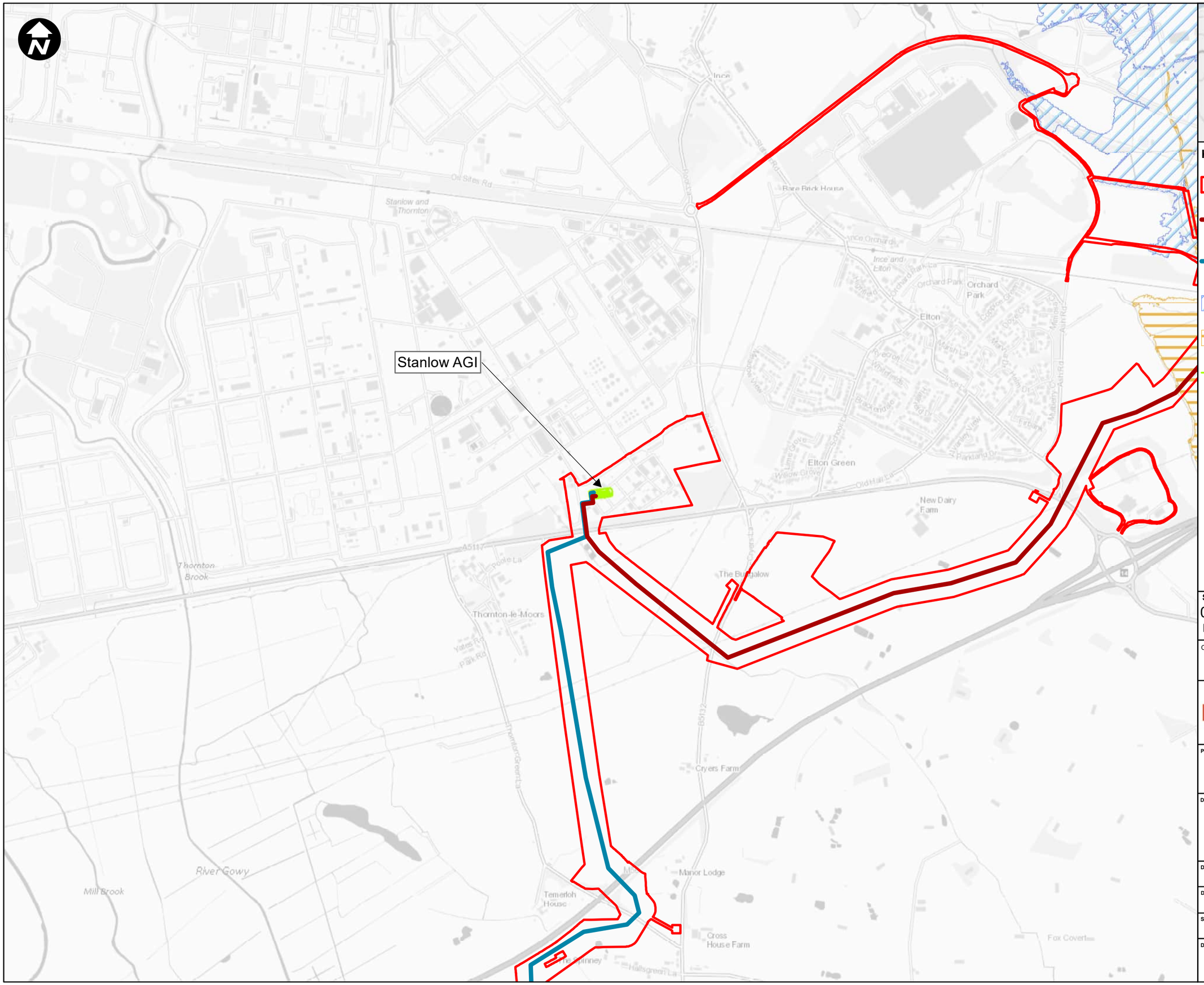
FOR DESIGN CHANGE REQUEST 1

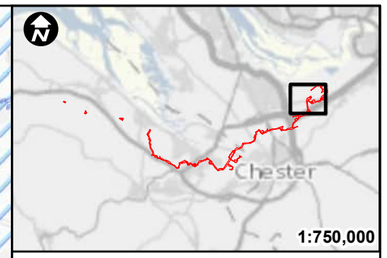
DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:2,500	17/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.29 Sheet 2





Key:

- Newbuild Infrastructure Boundary
- Indicative alignment of the Ince AGI to Stanlow AGI Pipeline
- Indicative alignment of the Stanlow AGI To Flint AGI Pipeline
- Reservoir Flood Extents Wet Day
- Reservoir Flood Extents Dry Day
- Stanlow AGI (Indicative Location)

SCALE: 1:12,500

0 125 250 500 Metres

HyNet North West

PROJECT TITLE

HyNet Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 18.4.17
Stanlow Reservoir Flood Map Wet/Dry

DRAWING STATUS

FOR DESIGN CHANGE REQUEST 1

DRAWN	CHECKED	APPROVED	AUTHORISED
KD	JH	EI	MT

SCALE @ A3 SIZE	DATE	REVISION
1:12,500	17/03/2023	B

DRAWING NUMBER

EN070007-APP-ES-18.4.17