HyNet North West

ENVIRONMENTAL STATEMENT (VOLUME III)

Appendix 9.4 Bats and Hedgerows Assessment

HyNet Carbon Dioxide Pipeline DCO

Planning Act 2008

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

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1. INTRODUCTION

1.1. DCO PROPOSED DEVELOPMENT

1.1.1. This technical appendix supports the assessment contained in **Chapter 9 - Biodiversity (Volume II).**

1.1.2. The Applicant intends to build and operate a new underground carbon dioxide (CO_2) pipeline from Cheshire, England to Flintshire, Wales with necessary Above Ground Installations (AGIs) and Block Valve Stations (BVSs). It is classed as a Nationally Significant Infrastructure Project (NSIP) and will require a Development Consent Order (DCO) under the Planning Act 2008 ('PA2008') granted by the Secretary of State for Business, Energy and Industrial Strategy (BEIS).

1.1.3. The DCO Proposed Development will form part of HyNet North West ('the Project'), which is a hydrogen supply and Carbon Capture and Storage ('CCS') project. The goal of the Project is to reduce CO_2 emissions from industry, homes and transport and support economic growth in the North West of England and North Wales. The wider Project is based on the production of low carbon hydrogen from natural gas. It includes the development of a new hydrogen production plant, hydrogen distribution pipelines, hydrogen storage and the creation of CCS infrastructure. CCS prevents CO_2 entering the atmosphere by capturing it, compressing it and transporting it for safe, permanent storage.

1.1.4. The DCO Proposed Development is a critical component of HyNet North West which, by facilitating the transportation of carbon, enables the rest of the Project to be low carbon. The hydrogen production, distribution and CO_2 capture and storage elements of the Project do not form part of the DCO Proposed Development and will be delivered under separate consenting processes.

1.1.5. The DCO Application will seek consent for the construction, operation and maintenance of the following components which are part of the DCO Proposed Development, namely:

- **Ince Above Ground Installation** (AGI) to Stanlow AGI Pipeline – a section of new underground onshore pipeline (20" in diameter) to transport CO_2;
- **Stanlow AGI to Flint AGI Pipeline** – a section of new underground onshore pipeline (36" in diameter) to transport CO_2;
- **Flint AGI to Flint Connection Pipeline** – a section of new underground onshore pipeline (24" in diameter) to transport CO_2;

- **Flint Connection to Point of Ayr (PoA) Terminal Pipeline** – a section of existing Connah's Quay to Point of Ayr (PoA) underground onshore pipeline (24" in diameter) which currently transports natural gas but would be repurposed and reused to transport CO_2. The Flint Connection to PoA Terminal Pipeline is scoped out of the EIA, except for the areas adjacent to the three BVSs that are within the Newbuild Infrastructure Boundary;
- **Four AGIs** - Ince AGI, Stanlow AGI, Northop Hall AGI, and Flint AGI;
- **Six Block Valve Stations (BVSs)** - located along:
  - The new Stanlow AGI to Flint AGI Pipeline (three in total);
  - The existing Flint Connection to PoA Terminal Pipeline (three in total);
- **Other above ground infrastructure**, including Cathodic Protection (CP) transformer rectifier cabinets and pipeline marker posts;
- **Utility Connection infrastructure**, including power utilities and Fibre Optic Cable (FOC); and
- **Temporary ancillary works** integral to the construction of the Carbon Dioxide Pipeline, including Construction Compounds and temporary access tracks.

1.1.6. Further details of each element of the DCO Proposed Development are set out in **Chapter 3 – Description of the DCO Proposed Development (Volume II).**

1.2. ECOLOGICAL BACKGROUND

1.2.1. Extended Phase 1 habitat surveys were undertaken from March 2021 to June 2022 across the Newbuild Infrastructure Boundary for the DCO Proposed Development. The Newbuild Infrastructure Boundary is predominantly arable through industrial and rural village landscapes. Hedgerows, woodland, and grassland habitats were present throughout and will be subject to both the direct and indirect effects of the DCO Proposed Development. A detailed description of habitats is provided in **Appendix 9.1 Habitats and Designated Sites Survey Report (Volume III)**.

1.2.2. The Extended Phase 1 habitat surveys incorporated an ecological desk study that was completed in November 2021. The desk study reviewed existing ecological baseline information, recorded the habitats present and identified the presence, or potential presence, of protected habitats or species which could pose legal and, or planning constraints. This included bat species data recorded within 5km of the Newbuild Infrastructure Boundary from the last 10 years (as of February 2020). Additionally, habitat with high suitability for bats was reviewed, with Ancient Woodland data from Natural Resources Wales (NRW) and Natural England (NE), along with Ancient Hedgerow data compiled from digitised historical maps from Cheshire Archives and Local Studies and National Library of Wales utilised.

1.3. BRIEF SCOPE AND OBJECTIVES

1.3.1. The Applicant commissioned hedgerow surveys of all hedgerows located within the Newbuild Infrastructure Boundary. The purpose of this survey was to:

- Assess the potential for hedgerows along the Newbuild Infrastructure Boundary to support bats and determine the type of activity and the species utilising the hedgerows;
- Determine whether the hedgerows could be classed as ‘Poor', ‘Good’ or ‘Excellent’ under the criteria developed by the Applicant that would inform survey effort, such as, automated static detectors and crossing point surveys;
- Identify any resultant legal or planning constraints; and
- Make recommendations with regards to mitigation/compensation requirements should loss or breaching of 'Good' or ‘Excellent’ be unavoidable.

1.3.2. The results of these surveys are presented within this report. The impact assessment and recommendations for compensation and mitigation are presented within **Chapter 9 - Biodiversity** (**Volume II**).

1.3.3. The bats and hedgerow assessment detailed within this report, is an innovative approach developed by the Applicant. Liaison regarding this innovative approach has been completed with Natural Resources Wales and Natural England, with methodologies and approach agreed and detailed within **Table 9.1, Chapter 9 - Biodiversity (Volume II)**.

1.4. RELEVANT LEGISLATION AND POLICY

1.4.1. This report has been compiled with reference to the following relevant nature conservation legislation, planning policy and the UK Biodiversity Framework from which the protection of sites, habitats and species is derived in England.

1.4.2. In England and Wales, the Wildlife and Landscape Criteria in the Hedgerow Regulations 1997 (**Ref. 5**) (hereafter referred to as ‘the Regulations’) are intended to protect ‘Important’ countryside hedgerows from destruction or damage. Hedgerows are assessed against a number of criteria in relation to their archaeology, and history, and wildlife and landscape value, from which it is determined whether a hedgerow is Important as defined by the Regulations.

1.4.3. As laid out in **Section 2**, the criteria outlined in the Regulations were adapted to fit with a tailored approach aimed towards bat interactions with hedgerows. This drew on several important criteria from the Regulations – see **paragraph 2.2.4** – and as such both ‘Excellent’ and ‘Good’ Bat Hedgerow Suitability Assessment (BHSA) classified hedgerows were recognised as equivalents to Important under the Regulations.

1.4.4. Under the Regulations, any person wishing to remove a hedgerow must submit a hedgerow removal notice to the Local Planning Authority (LPA). The LPA will then decide whether to approve the notice or issue a hedgerow retention notice if the hedgerow has been identified as Important under the Regulations.

1.4.5. All native hedgerows are also listed as Habitats of Principal Importance (HPI) in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) (**Ref. 6**). HPIs are habitats in England and Wales that were identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the UK Post-2010 Biodiversity Framework which superseded the UK BAP. The definition of this priority habitat has been amended from the pre-existing Habitat Action Plan for ancient and/or species-rich hedgerows and is as follows: A hedgerow is defined as any boundary line of trees or shrubs over 20m long and less than 5m wide, and where any gaps between the trees or shrub species are less that 20m wide (**Ref. 2**; **Ref. 5**).

1.4.6. Under Section 40 of the NERC Act (2006) (**Ref. 6**), LPAs are required to have due regard for these habitats when exercising their functions, including determining planning applications.

1.4.7. Bat species are afforded a high level of protection under the Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations') (**Ref. 3**). The legislation outlines that it is an offence to

- *'Deliberately capture, injure, or kill a bat,*
- *Damage or destroy a breeding site or resting place of a bat*
- *Deliberately disturb bats in such a way as to be likely*

  a) to impair their ability -

  i) to survive, to breed or reproduce, or to rear or nurture their young; or

  ii) to hibernate or migrate; or
- *to affect significantly the local distribution or abundance of the species'.*

1.4.8. Protection is also partially afforded under the Wildlife and Countryside Act 1981 (as amended) (**Ref. 4**) with respect to disturbance of animals when using places of shelter or protection, and obstruction of access to places of shelter or protection.

1.4.9. Certain species of bats including noctule *Nyctalus noctula*, brown long-eared bat *Plecotus auritus* and soprano pipistrelles *Pipistrellus pygmaeus* are also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in accordance with Section 41 of the NERC Act 2006 (**Ref. 6**). Under Section 40 of the NERC Act (**Ref. 6**), public bodies (including local

planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.

1.4.10. Certain species of bat, including barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii*, noctule, brown long-eared bat, lesser horseshoe bat *Rhinolophus hipposideros*, greater horseshoe bat *Rhinolophus ferrumequinum*, common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle are also listed as SPI for the purpose of maintaining and enhancing biodiversity in relation to Wales under Section 7 of the Environment (Wales) Act 2016 (**Ref. 8**). Section 6 under Part 1 introduced an enhanced biodiversity and resilience of ecosystems duty (the S6 duty) for public authorities in the exercise of functions in relation to Wales, superseding provisions previously set out in the NERC Act 2006 (**Ref. 6**).

2. BASELINE METHODOLOGY

2.1. DESK BASED ASSESSMENT

POTENTIAL HEDGEROW MAPPING

2.1.1. Before field surveys commenced, potential hedgerows were mapped using freely available aerial imagery to help gain an understanding of the extent of the hedgerow count across the Newbuild Infrastructure Boundary and plan surveys accordingly.

ANCIENT HEDGEROW SEARCH

2.1.2. An Ancient Hedgerow search was undertaken for the DCO Proposed Development, using digitised maps from the National Library of Wales and Cheshire Archives.

2.1.3. Any results of the ancient hedgerow search were then checked against the potential hedgerow database before Phase 1 surveys of the hedgerow locations would determine if these ancient hedgerows still exist.

EXTENDED PHASE 1 HABITAT SURVEYS

2.1.4. Extended Phase 1 habitat surveys were undertaken from March 2021 until November 2021 and continued from January 2022 until June 2022. The data collected on these surveys was utilised to ground-truth the desk based data and add additional optimal bat habitat for consideration within the final BHSA calculation. Once hedgerows were identified/confirmed through Phase 1 surveys, a hedgerow survey was undertaken.

TREE AND STRUCTURE ROOST ASSESSMENT

2.1.5. Preliminary Bat Roost Assessments (PBRA), Aerial Inspections, and Dusk Emergence/ Dawn Re-entry Surveys were undertaken to assess the potential direct and indirect effects of the DCO Proposed Development during construction and operation (emphasis on construction rather than operation due to the nature of the DCO Proposed Development) on bats.

2.1.6. The roost surveys were completed within the Newbuild Infrastructure Boundary and were taken into consideration when undertaking the BHSA. Potential and known roosts identified throughout the survey season were mapped alongside the desk-study data and where possible were included within the BHSA.

2.1.7. Roosts recorded after the completion of BHSA were taken into consideration during the data analysis and mitigation design. Bat activity data from roost surveys are available in **Appendix 9.3 Bat Activity Survey Report (Volume III)**.

2.2. HEDGEROW ASSESSMENT

2.2.1. Hedgerow survey data was recorded using the ArcGIS Collector application (© ESRI) on tablets. Digital proformas were filled in on the application. The location of the hedgerow was recorded and images of the hedgerow captured. This method of recording data commenced during June 2021, as all previous surveys undertaken using paper proformas were subsequently digitised.

HEDGEROW FIELD SURVEYS

2.2.2. The hedgerow field survey undertaken across the Newbuild Infrastructure Boundary aimed to collect data on specific characteristics taken to be beneficial to bat community and diversity. Aligning with Biodiversity Net Gain (BNG) assessment, a hedgerow condition assessment within the Higher Level Stewardship Farm Environment Plan (FEP) Manual (**Ref. 11**) was used to influence elements of the assessment categories, alongside a literature review (**Annex B**) of relevant research and guidance notes.

2.2.3. In accordance with the Regulations, the hedgerows were measured from the point or points where there was a gap of more than 20 metres between the end of the hedgerow and the nearest line of hedgerow. Gaps within a hedgerow were included in the total length provided they were 20 metres or less in length.

2.2.4. Notes were made on the following in accordance with the criteria outlined in **Table 1**:

- Hedgerow length, calculated automatically in the ArcGIS Collector application;
- Hedgerow height; measured from the base of woody growth, excluding trees and banks;
- Hedgerow width, measured from the widest point of the hedgerow canopy;
- Number of woody species in the hedgerow length, including species name;
- Number of standard trees, across the entire hedgerow. This was then used with the hedgerow length to calculate the number of trees within each 50m stretch of hedgerow;
- Number of gaps in the hedge, measured as a percentage of the total length of the hedgerow; and
- Presence of ditches (whether wet, dry or absent).

BHSA CALCULATION

2.2.5. All hedgerows within the Newbuild Infrastructure Boundary were surveyed with regard for the information required by the criteria in the BHSA calculator. This was developed using a similar approach to the Great Crested Newt (GCN)

Habitat Suitability Index (HSI) survey, where a number of factors are assessed for hedgerows that provide an estimate of the likely use of that habitat by bats. With the aim that by undertaking this BHSA, survey effort can be better focused across the Newbuild Infrastructure Boundary, resulting in a proportionate survey effort.

2.2.6. The criteria, outlined in **Table 1,** were developed to help establish the habitat suitability of each hedgerow for supporting the extant bat populations. This was developed after a literature review looking at which features and characteristics of hedgerows and surrounding habitat influence bat populations positively and negatively (**Annex D**).

2.2.7. The findings of the literature review, combined with the expert opinion of a full member of CIEEM and specialist bat ecologist with over 15 years bat survey and analysis experience, informed the final criteria. This approach was further ratified by stakeholder liaison with NE and NRW, with feedback from both informing the final criteria.

Table 1 BHSA criteria developed by WSP

Criteria	Output	BHSA scoring
Height	Metres	≥2 = 3 ≥1 = 2 ≥0 = 1
Width	Metres	≥1.5 = 3 ≥1 = 2 ≥0 = 1
Gappiness	As a percentage of the total length.	>20 = 1 >10 = 2 ≥0 = 3
Woody Species Diversity	Number of woody species present along the entire length of the hedgerow.	>6 = Important = 3 >3 = Good = 2 ≥0 = Poor = 1
Ditch present	Wet/ Dry/ Absent	Wet = 2 Dry/Absent = 1

Criteria	Output	BHSA scoring
Arable field margin	Metres	≥5.1 = 4 ≥2.1 = 3 ≥0.1 = 2 ≥0 = 1
Number of trees	Number of trees present per 50m of hedgerow[1]	≥6 = 4 ≥3 = 3 ≥1 = 2 ≥0 = 1

2.2.8. Each of the outputs from the criteria were given a score that was then used to calculate an overall BHSA number. The equation outlined shows how the BHSA score was reached. The score was then used to categorise the hedgerows into the three BHSA categories. The score thresholds for each BHSA category can be seen in **Table 2**.

$$BHSA = (Sl1 * Sl2 * SI3 * SI4 * Sl5 * SI6 * Sl7)^{1/7}$$

2.2.9. The above criteria and calculations give a maximum score of 3.07, a minimum score of 1, and a range of 2.07. The threshold scores for each BHSA category were set using calculated by dividing the range by three and using the intervals of the calculated thirds from the minimum BHSA score upwards.

Table 2 BHSA score translation

BHSA Category	BHSA Score
Excellent	≥2.4
Good	1.7 – 2.39
Poor	1 -1.69

[1] Hedgerow length was calculated automatically using the ESRI ArcGIS Collector application and was then used to calculate the number of trees per 50m post survey.

2.2.10. The BHSA categories attributed to each hedgerow set the level of further survey effort. All 'Good' and 'Excellent' category hedgerows were subject to further survey using Song Meter SM4BAT Full Spectrum (FS) static bat detectors (© Wildlife Acoustics Inc.) (hereafter referred to as 'Statics'). Whereas 'Poor' category hedgerows were discounted and not subject to further survey.

2.2.11. Parameters were developed, highlighted in **Table 3,** that discounted 'Not assessed' 'Good' and 'Excellent' hedgerows when certain criteria were met.

2.2.12. Hedgerows categorised as 'Not Yet Assessed' are listed within **Annex E** as rows with n/a inputs. These hedgerows are categorised as such due to field surveys not yet having taken place on the hedgerow, with the intention to undertake a survey. Additionally, hedgerows that have been scoped out using the parameters outlined in **Table 3** in advance of surveying are also detailed in **Annex E**.

Table 3 – Hedgerow discount parameters

Hedgerow Parameters	Justification	Hedgerows Impacted
Adjoining residential	Hedgerows adjoining residential are under the assumption that they will be avoided by the DCO Proposed Development and thus any bat activity along the hedgerow is unlikely to be severed by the Proposed Development.	8
Hedgerow located parallel to proposed route and thus easier to avoid.	Where the hedgerow is located parallel to the indicative Newbuild Carbon Dioxide Pipeline route, with space to allow avoidance, assumptions have been made that the hedgerow will be avoided in favour of open fields and thus the direct and indirect effects on the hedgerow and any associated bat activity will be reduced significantly.	52
Over 50% of hedgerow located within 50m of main roads[2].	If over 50% of the hedgerow's length (within the Newbuild Infrastructure Boundary) was within 50m of a main road then the hedgerow was downgraded to poor due to the environment main roads create not being	20

[2] 'Main roads' were defined by expert opinion from field ecologists based on vast experience working across the entire Development and the typical flow of traffic and any on-street lighting they experienced on those roads. The only caveat for not

Hedgerow Parameters	Justification	Hedgerows Impacted
	conducive to bat activity, as is referenced in Berthinussen and Altringham's research (**Ref. 1**).	

BHSA MODIFICATIONS

2.2.13. Due to the BHSA being an innovative assessment, liaison was undertaken with NE and NRW. Through liaison and completing the initials stages of the assessment, the BHSA approach was modified. Alterations and justifications for the changes are detailed within **Annex C.**

2.3. AUTOMATED STATIC DETECTOR ASSESSMENT

FIELD SURVEY

2.3.1. The automated static detector assessment was utilised as a comparison between BHSA categorised 'Good' and 'Excellent' hedgerows. The process described in **Section 2.2** outlines the criteria that was involved in calculating a hedgerows BHSA score and the parameters that could discount an eligible hedgerow from requiring an automated static detector assessment.

2.3.2. Statics were located on 'Good' and 'Excellent' hedgerows to collect recordings of bat echolocation calls and help identify bat activity levels along each hedgerow.

2.3.3. Statics were positioned to cover either individual or groups of hedgerows depending on proximity and connectivity. The hedgerows were assessed as individuals or groups based on the professional judgement of a suitably experienced ecologist and reviewed by a bat specialist with over 15 years bat survey and analysis experience. Statics were deployed once per season[3] and set recording for a minimum of five consecutive nights. The detectors were programmed to start recording 30 minutes before sunset and stop recording 30 minutes after sunrise on each night.

DATA ANALYSIS

2.3.4. Bat echolocation call recordings gathered from the automated static detector assessment were analysed using specialist computer software Wildlife Acoustics Kaleidoscope Pro 5.4.7.

downgrading due to proximity to main roads was that the hedgerow was tall and dense enough to provide sufficient cover from noise and light pollution.

[3] Seasons = spring (April/May); summer (June/July); autumn (August/September).

2.3.5. All .wav files recorded on the Statics (hereafter referred to as ‘Static data’) were cut into 15 second files using Kaleidoscope Pro software and auto-analysed by the auto-identification feature within Kaleidoscope Pro. The 15 second file was used to define a single ‘bat pass’. If multiple species were recorded within a single file, bat pass would be one for each species recorded. This approach was used to standardise the definition of a bat pass.

2.3.6. It should be recognised that a series of separate sound files may represent a series of different bats commuting within the range of an automated detector, or a smaller number of bats repeatedly triggering the detector (e.g. bats making repeated foraging passes within the range of a detector).All files categorised as ‘noise’, ‘no.id’, any species that was not a *Pipistrellus* sp., and *Pipistrellus* sp. calls with a confidence rating of 0.7 or below by the auto-identification analysis were analysed by a suitably experienced ecologist.

2.3.7. A random 10% of common pipistrelle *Pipistrellus pipstrellus* and soprano pipistrelle *Pipistrellus pygmaeus* and a separate random 10% of all other species, that were manually analysed, were then quality assured by suitably qualified ecologists with many years’ experience analysing bat data to ensure no bat echolocation calls were being routinely mis-identified by the auto-identification analysis.

2.3.8. The number of bat passes recorded was utilised to calculate a Bat Activity Index Value (BAIV), which provides an indication of each bat species activity levels for each automated static detector assessment, in each season, and overall, for the Newbuild Infrastructure Boundary.

2.3.9. The BAIV of each species was calculated for each automated static detector assessment. The Static data is represented as bat passes per night for each automated static detector assessment. This BAIV was calculated by dividing the number of bat passes recorded during each automated static detector assessment by the total number of nights the automated static detector assessment consisted of. This provided an average passes per night (ppn) for each automated static detector assessment and each species.

2.3.10. The bat activity data from the automated static detector assessments also provided information on the timings of the bat activity. This data can be seen in **Annex G**, **Table G.2 – G.102** and will be scrutinised along with summer and autumn 2022 Static data in an updated version of this report and provided as part of the Supplementary Information of the DCO Application.

2.3.11. If the presence of any Annex II species was identified during Static data analysis, then the hedgerow/hedgerows associated with that automated static detector assessment would be automatically updated to ‘Excellent’ BHSA classification.

2.4. MODIFIED DEFRA LOCAL SCALE SURVEYS

FIELD SURVEY

2.4.1. 'Excellent' hedgerows were assessed using a modified version of the DEFRA Local Scale methods that have been designed to detect important commuting routes in terms of linear infrastructure[4].

2.4.2. Two suitably qualified surveyors were equipped with Elekon Batlogger M or Echometer Touch Pro 2 (©Wildlife Acoustics Inc.) for the recording of echolocation calls and positioned on crossing points, 30m apart, the potential extent of hedgerow loss, or a modified location based on the connections between hedgerows.

2.4.3. Two surveys took place for 60 minutes at each crossing point, starting at sunset, or commencing 60 minutes prior to dawn. Surveyors used crossing point methods to take note of the height of bat activity (only making a note if the bats activity was clearly not associated with the hedgerows presence), species and behaviour exhibited.

2.4.4. After the initial two surveys were completed, up to four additional surveys were subsequently undertaken if the existing DEFRA thresholds were reached. These thresholds are defined by when any site records more than 10 bats of a single species or genus, using a flight path (1-5 for rare species[5], depending upon rarity) then a full set of surveys should be conducted (**Ref. 1**). Survey timings were also subject to alteration depending on the presence of Annex II species.

2.4.5. Modifications to the DEFRA Local Scale surveys occurred in the definitions attributed to the safe and unsafe crossing assessment. As there is no risk of collision post-construction the assessment was limited to the 'in use' definition and the 'at risk' definition was removed. This meant all passes were included within the assessment of use of linear features.

DATA ANALYSIS

2.4.6. The data recorded on data survey sheets (Proformas) were used for the crossing point analysis. Raw data will be included in subsequent updates of this report when surveys have been completed.

2.4.7. Proformas were assessed for each for each surveyor and each survey, to remove duplicate crossing events. A duplicate 'crossing event' was defined as any bat recorded crossing at the same time, height, and direction by both

[4] WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure – Local Scale Effects

[5] Rare species are defined as Annex II species which include *Barbastella barbastellus*, *Myotis bechsteinii*, *Rhinolophus hipposideros* and *Rhinolophus ferrumequinum*.

surveyors. This step within the analysis is to prevent double counting of a single bat.

2.4.8. All recorded events, including any 'heard not seen' (HNS) instances, were assigned a species based on comparing times between Proformas and the sound recordings for consistency.

2.4.9. When calls from bats were heard on the bat detectors but the surveyor did not see the bat pass, the data was recorded as heard not seen. Each potential crossing point feature was considered on a case-by-case basis as to whether heard not seen records should be included within results. Where both sides of the feature were observed by surveyors, heard not seen data was not used in the analysis of results. Where both sides of the feature could not be observed by a surveyor, heard not seen data was included in the analysis of data. In this case, heard not seen data was analysed under a precautionary principle of being an unsafe crossing event as it cannot be confirmed that the bats were not using the potential crossing point feature at the time it was heard.

2.4.10. Data was then assessed as to whether the bats recorded were considered to be crossing the features:

- 'Crossing' or 'in use' is defined as bats passing within 5m of the feature.
- 'Non-use' is considered bat passing in proximity of the potential crossing point feature but at a distance further than 5m from the feature.

2.4.11. Further to the above definitions, any bats foraging in a circle next to the feature were not recorded as a pass.

2.4.12. In conjunction with the surveyors' notes made during each modified DEFRA Local Scale surveys, analysis of recorded files resulted in the identification / confirmation of species of bats and their level of activity.

2.4.13. Bat echolocation call recordings gathered from the modified DEFRA Local Scale surveys were analysed using specialist computer software Kaleidoscope Pro 5.4.7.

2.4.14. For modified DEFRA Local Scale surveys, total counts for each species were taken for each crossing point visit. Overall crossing point data is represented as bat passes per hour; this BAIV is calculated by dividing the total number of bat passes during the crossing point by the number of hours spent surveying each crossing point.

2.5. CALL IDENTIFICATION

2.5.1. Where possible, bat calls are identified to species level. However, species of the genus Myotis are grouped together in most cases as their calls are similar in

structure and have overlapping call parameters, making species identification problematic (Russ, 2013). For Pipistrellus species the following criteria based on measurements of peak frequency are used to classify calls:

- Common pipistrelle ≥ 42 and <49KHz;
- Soprano pipistrelle ≥ 51KHz;
- Nathusius' pipistrelle <39KHz;
- Common/soprano pipistrelle ≥49 and <51KHz; and
- Common/Nathusius' pipistrelle ≥39 and <42KHz.

2.5.2. In addition, the following categories are used for calls, which cannot be identified with confidence due to the overlap in call characteristics between species or species groups:

- *Myotis/Plecotus* sp.;
- *Nyctalus* sp. (either Leisler's bat or noctule);
- Serotine/Leisler's; and
- Serotine/*Plecotus* sp.

2.6. OVERALL ASSESSMENT

2.6.1. All the 'Excellent' hedgerows were assessed as to the type of activity recorded. This included assessing the number of passes recorded during both the DEFRA-based assessment and the automated bat detector analysis. Notes on behaviour were utilised to assess if the hedgerow was utilised by foraging or commuting bats, individuals on multiple occasions or multiple bats passing only once.

2.6.2. As DEFRA Local Scale surveys are yet to be undertaken (as of June 2022 month end), scrutinization of the DEFRA-based assessment data cannot yet be undertaken and a decision on whether or not the data could be extrapolated to be applicable for the remaining 'Good' hedgerows cannot be made. The scrutinization of this data and a decision on whether it could be extrapolated to remaining 'Good' hedgerows will be made available in subsequent updates of this report.

2.6.3. BAIVs calculated from the automated static detector assessment and modified DEFRA Local Scale data sets were utilised to assess the usage of all 'Good' and 'Excellent' hedgerows. The data from this informed and was used to modify the recommendations for mitigation and compensation on each hedgerow depending on where the activity levels fell, if required.

2.7. NOTES AND LIMITATIONS

2.7.1. The majority of hedgerow surveys took place between April and October 2021, in-line with the guidelines outlined by the DEFRA Hedgerow Survey Handbook:

A Standard Procedure for Local Surveys in the UK, 2nd edition (**Ref. 2**). Those that were not surveyed within the recommended window and were surveyed before April 2021 were revisited later in the year to confirm initial surveying was accurate.

2.7.2. Methodologies within the Regulations, which are used for specific hedgerow assessment, were adapted within this innovative assessment approach. In contrast to the Regulations, the approach taken by the Applicant did not stop measuring a hedgerow after intersection or junction with another hedgerow provided the hedgerow in question continued, after the intersect or junction, on a similar trajectory. This was done as bats using these linear features will not discern between a hedgerow before or after a junction. Therefore, it is not deemed necessary to define hedgerow limits by junctions but by the tangible cessation of the hedge, a clear change in hedgerow direction or the Newbuild Infrastructure Boundary. This deviation from a standard hedgerow assessment technique is deemed a valid approach for this bat assessment.

2.7.3. Ground flora data was collected for phase 1 habitat mapping but not taken into consideration when calculating BHSA score of hedgerows. This was due to the optimum time to gather data on ground flora being June-July and the size of the hedgerow data set not allowing for all hedgerows to be practicably surveyed in that time window. Whilst this data would help further substantiate the BHSA scoring for the hedgerows, it is considered that the existing method for calculating the BHSA score is substantiative enough to provide robust BHSA results.

2.7.4. In order to avoid referencing confusion throughout the different survey methods, hedgerows were assigned a permanent hedgerow (H) number during the initial desk study drawing of all potential hedgerows across the original Newbuild Infrastructure Boundary. As the Newbuild Infrastructure Boundary has been refined and phase 1 surveys have taken place, many potential and actual hedgerows have been ruled out. This is the reasoning behind ‘missing’ H numbers from the results seen in **Annex D**.

2.7.5. As of the end of June 2022, automated static detector assessments are required for a number of hedgerows. A breakdown of further automated static detector assessment requirements is detailed in **Table 4** and is explained in **Section 3.4**.

2.7.6. Several automated static detector assessments have been moved from Spring 2022 – Summer 2022 survey effort to a Summer 2022 – Autumn 2022 survey effort due to land access limitations.

2.7.7. The outstanding survey effort is the result of the exceptionally high quantity of hedgerows within the Newbuild Infrastructure Boundary, and issues surrounding land access. As the survey effort is not yet complete, sound analysis has not yet been completed. Further data will be published in an updated version of this

report and provided as part of the Supplementary Information of DCO Application.

2.7.8. As of the end of June 2022, no Modified Defra Local Scale surveys had taken place. The outstanding survey effort is the result of the exceptionally high quantity of hedgerows within the Newbuild Infrastructure Boundary and the practicable limit on resources. Further data will be published in an updated version of this report and provided as part of the Supplementary Information of DCO Application. Where the Modified DEFRA Local Scale surveys are not completed in full within the 2022 bat survey season, these will be completed during the 2023 bat survey season. The 2023 surveys will form pre-construction requirements.

2.7.9. Automated static detector assessments are scheduled to be completed by end of October 2022. Conclusions are based on the available data. Once surveys have been completed, the additional data will be collated to confirm the findings. Further data will be published in an updated version of this report and provided as part of the Supplementary Information of the DCO Application.

3. RESULTS

3.1. ANCIENT HEDGEROW SEARCH

3.1.1. An Ancient Hedgerow search was undertaken for the DCO Proposed Development, which returned two records of ancient hedgerow within the Newbuild Infrastructure Boundary. These are highlighted in **Figure 9.4.2 (Annex A)**.

3.1.2. The results of the ancient hedgerow search were initially checked against the potential hedgerow database before Phase 1 surveys of the hedgerow locations determined that these ancient hedgerows no longer exist.

3.2. HEDGEROW FIELD SURVEYS

3.2.1. Hedgerow field surveys identified 360 hedgerows within the Newbuild Infrastructure Boundary. Details of the data collected for each hedgerow can be seen in **Annex D**. All identified hedgerows were subject to a BHSA.

3.3. BHSA CALCULATIONS

3.3.1. The data provided by the hedgerow field surveys allowed for the BHSA score and categories to be calculated for each hedgerow. The score and category for each hedgerow can be seen in **Annex D** but **Table 4** provides a summary breakdown of the quantity of hedgerows within each category.

Table 4 – BHSA Summary

BHSA Category	Total Number
Excellent	23
Good	243
Poor	82
n/a (Not yet assessed)	12

3.3.2. The BHSA calculations identified 23 ‘Excellent’ hedgerows and 243 ‘Good’ hedgerows that would potentially require automated static detector assessment.

3.3.3. **Table 3** highlights the discounting parameters that would rule out an ‘Excellent’ or ‘Good’ hedgerow from requiring an automated static detector assessment. **Table 5** shows a breakdown, following the implementation of each parameter, of the number of hedgerows requiring automated static detector assessments.

Table 5 – BHSA Category Discount Parameters

Hedgerow Parameters	'Excellent' Hedgerows Impacted	'Good' Hedgerows Impacted	'Not yet assessed' Hedgerows Impacted
Adjoining residential	0	6	2
Hedgerow located parallel to proposed route and thus easier to avoid.	6	44	3
Majority of hedgerow located within 50m of main roads.	1	18	1
No longer classified as a hedgerow.	0	2	2

3.3.4. In total, 7 'Excellent', 70 'Good', and 8 'Not yet assessed' hedgerows were discounted through these parameters.

3.3.5. Those remaining after the discounting process were allocated either an individual Static or were grouped depending on location. A full breakdown of automated static detector assessment distribution for individual and grouped Statics can be seen in **Annex E** though a summary can be seen in **Table 6**.

Table 6 – BHSA Category Static Distribution

BHSA Category	Individual Static	Grouped Static
Excellent	6	10
Good	69	104
Not Assessed	0	2[6]

3.3.6. The 116 grouped hedgerows requiring Statics are grouped into 49 groups, each requiring one Static. Combined with the 75 requiring an individual Static, there were 124 Statics required.

[6] Potential only, requires assessment to verify BHSA category and eligibility for static assessment.

3.4. AUTOMATED STATIC DETECTOR ASSESSMENT

3.4.1. The survey effort as of June 2022 for automated static detector assessments on qualifying hedgerows can be seen in **Table 7**.

Table 7 – Automated static detector assessment effort as of the end of June 2022

	1st Deployment	2nd Deployment	Requiring 1st Deployment	Requiring 2nd Deployment
Individual Static	53	9	13	66
Group Static	30	15	4	34

3.4.2. There are still 13 individual and 4 grouped hedgerows requiring a 1st automated static detector assessment and 66 individual and 34 grouped hedgerows requiring a 2nd automated static detector assessment.

3.4.3. Results for the number of recordings registered by each Static can be seen in **Annex F.**

3.4.4. At least 10 bat species were recorded across the Newbuild Infrastructure Boundary during the automated static detector assessments undertaken during April and May 2022 (Spring 2022). The following species were recorded:

- Serotine *Eptesicus serotinus;*
- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle *Pipistrellus nathusii;*
- Noctule *Nyctalus noctule;*
- Leisler's bat *Nyctalus leisleri;*
- *Myotis* sp.;
- Brown long-eared bat *Plecotus auritus;*
- Lesser horseshoe bat *Rhinolophus hipposideros.*

3.4.5. Bat data recorded from the automated static detector assessments can be seen in-depth in **Annex G Table G.2 – G.102,** but a summary of bat passes per night can be seen in **Table G.1**.

3.4.6. The Static data from Spring 2022, shown in **Annex G**, included the data from 104 Statics and recorded an average of 245.84ppn over a combined 622 nights of automated static detector assessments. The thresholds for data displayed in

summary **Table 8 – 13** has been determined based on hedgerows scoring average ppn in the 3rd quartile for each respective species. The exception to this is **Table 9** which displays all hedgerows with recorded lesser horseshoe activity. This is due to only two hedgerows with recorded activity being outwith the 3rd quartile threshold for that species.

SPRING 2022 SURVEY RESULTS

3.4.7. The hedgerows with the highest bat activity levels throughout automated static detector assessments in Spring 2022 were hedgerows 145 and 429. These two hedgerows recorded average activity levels of 1888.00ppn over 6 nights and 1628.17ppn over 6 nights, respectively. Hedgerows 67 and 64 also had over 1000.00ppn with 1445.17ppn over 6 nights and 1130.80ppn over 5 nights, respectively.

3.4.8. The hedgerows with the lowest bat activity levels throughout automated static detector assessments in Spring 2022 was hedgerow 113 which had no recorded activity. A further 5 hedgerows (117, 78, 156, 27, 954) had an average activity level of <1.00ppn.

Brown long-eared (BLE)

3.4.9. The average activity for brown long-eared bats across all automated static detector assessments in April and May 2022 was 1.54ppn. Hedgerow 398 was recorded as having the most BLE activity with an average of 16.33ppn across 6 nights. The hedgerows with the next highest amount of BLE activity were hedgerows 64 and 1004 that had 13.80ppn and 13.33ppn, respectively, over 5 and 6 nights respectively. **Table 8** highlights all the hedgerows with an average of >1.16ppn for BLE.

Table 8 Summary of hedgerows with BLE activity >1.16ppn during Spring 2022

Hedgerow Number	BLE ppn
398	16.33
64	13.80
1004	13.33
30	11.40
491	10.43
202	9.80
420	8.00

Hedgerow Number	BLE ppn
489	7.57
53	7.17
419	5.80
51	5.33
59	4.83
811	4.50
403	3.00
438	2.83
956	2.50
206	2.40
199	2.20
133, 145	2.17
246	2.14
422, 940	1.60
251	1.57
67, 187	1.17

3.4.10. Of the remaining hedgerows, 2 hedgerows had activity between 1.16-1.00ppn with the remaining 76 hedgerows having an activity level below 1.00ppn. 38 of these hedgerows recorded no BLE activity.

Lesser horseshoe

3.4.11. The average activity for lesser horseshoe bats across all automated static detector assessments in April and May 2022 was 0.26ppn. Hedgerow 419 was recorded as having the highest lesser horseshoe activity with an average of 5.40ppn across 5 nights. The hedgerows with the next highest amount of lesser horseshoe activity were hedgerows 1004 and 420 that had an average 4.00ppn

and 3.40ppn across 6 and 5 nights respectively. **Table 9** highlights all the hedgerows that recorded lesser horseshoe activity.

Table 9 Summary of hedgerows with lesser horseshoe activity during Spring 2022

Hedgerow Number	Lesser horseshoe ppn
419	5.40
1004	4.00
420	3.40
199	1.20
429, 434	1.17
246	1.14
414	0.80
348	0.69
206, 422, 196, 229, 974	0.60
251	0.57
353	0.43
202, 940, 268, 1011	0.40
438, 396, 223	0.33
403, 394	0.20
398, 956, 267, 426, 427, 369	0.17
247, 354, 255	0.14

3.4.12. The remaining 70 hedgerows did not record any lesser horseshoe activity during Spring 2022.

***Myotis* sp.**

3.4.13. The average activity for *Myotis* sp. bats recorded across all automated static detector assessments in April and May 2022 was 15.93ppn. Hedgerow 429 was

recorded as having the highest *Myotis* sp. activity with an average of 347.83ppn across 6 nights. Hedgerow 1004 recorded the second highest *Myotis* sp. activity with an average of 227.33ppn across 6 nights. Hedgerows 51, 199, 818 and 145 all had an average activity level of over 100.00ppn. **Table 10** highlights all the hedgerows with an average *Myotis* sp. activity level of ≥8.93ppn.

Table 10 Summary of hedgerows with Myotis sp. activity ≥8.93ppn during Spring 2022

Hedgerow Number	*Myotis* sp. ppn
429	347.83
1004	227.33
51	142.83
199	129.00
818	115.57
145	105.50
206	51.40
398	47.50
368	34.83
403	32.40
956	30.83
419	30.20
196	26.60
414	20.80
426	19.67
810	18.17
202	17.80
491	17.00

Hedgerow Number	*Myotis* sp. ppn
67	14.33
940	14.00
420	13.80
394	13.40
396	13.33
819	12.14
229	9.80
374	9.29
438	9.00

3.4.14. Of the remaining hedgerows, 9 hedgerows had an average of 8.93-5.00ppn and 58 hedgerows had an average activity level 4.99->0.00ppn. Only 10 hedgerows recorded no *Myotis* sp. activity during automated static detector assessments in Spring 2022.

Common pipistrelle

3.4.15. The average activity for common pipistrelle bats across all automated static detector assessments in April and May 2022 was 154.50ppn. Hedgerow 67 was recorded as having the highest common pipistrelle activity with an average of 1393.00ppn across 6 nights. Hedgerows 64, 810, 819 and 145 had average activity scores of 795.20ppn over 5 nights, 711.83ppn over 7 nights, 656.86ppn over 7 nights, and 647.33ppn over 6 nights, respectively. **Table 11** highlights all the hedgerows with an average common pipistrelle activity level of >221.41ppn.

Table 11 Summary of hedgerows with common pipistrelle activity >221.41ppn during Spring 2022

Hedgerow Number	Common pipistrelle ppn
67	1393.00
64	795.20
810	711.83

Hedgerow Number	Common pipistrelle ppn
819	656.86
145	647.33
199	536.80
403	522.00
811	473.67
429	399.33
398	394.00
420	374.00
818	366.14
1004	352.67
206	339.40
422	329.40
804	328.71
69	312.00
374	274.43
342	272.57
956	272.17
434	272.00
51	271.33
343	267.00
251	265.86
262	259.40
438	226.17

3.4.16. Of the remaining hedgerows, 1 hedgerow had an average recorded activity level of >200.00ppn, a further 21 hedgerows had an average recorded activity level of 199.99-100.00ppn, 15 hedgerows had an activity level of 99.99-50.00ppn, and 38 hedgerows had an average recorded activity level of 49.99->0.00ppn. Only 3 hedgerows recorded no common pipistrelle activity during automated static detector assessments in Spring 2022, hedgerows 78, 81 and 113.

Soprano pipistrelle

3.4.17. The average activity of soprano pipistrelle bats across all automated static detector assessments in April and May 2022 was 58.83ppn. Hedgerows 145 and 429 had the highest average recorded soprano pipistrelle activity scores of 967.55ppn over 6 nights and 864.50ppn over 6 nights, respectively. Hedgerows 30 and 199 had the next highest average recorded activity scores of 391.60ppn over 5 nights and 304.80ppn over 5 nights, respectively. **Table 12** highlights all the hedgerows with an average soprano pipistrelle activity level of >45.83ppn.

Table 12 Summary of hedgerows with soprano pipistrelle activity >45.83ppn during Spring 2022

Hedgerow Number	Soprano pipistrelle ppn
145	967.50
429	864.50
30	391.60
199	304.80
64	294.40
422	268.60
31	209.40
403	182.00
811	168.67
351	151.43
427	127.67
810	127.50

Hedgerow Number	Soprano pipistrelle ppn
1004	112.83
426	111.33
819	110.29
420	109.60
434	106.83
206	102.00
438	91.67
398	86.00
956	81.33
374	70.00
354	52.14
268	50.40
251	48.86
187	46.17

3.4.18. Of the remaining hedgerows, 27 hedgerows had an average recorded activity level of 45.83-10.00ppn, and 43 hedgerows had an average recorded activity level of 9.99->0.00ppn. 8 hedgerows recorded no soprano pipistrelle activity during automated static detector assessments in Spring 2022.

***Pipistrellus* sp.**

3.4.19. The average activity of *Pipistrellus* sp. bats recorded across all automated static detector assessments in April and May 2022 was 9.49ppn. Hedgerows 145 and 482 had the highest average recorded *Pipistrellus* sp. activity scores of 153.33ppn over 6 nights and 129.43ppn over 7 nights, respectively. Hedgerows 398 and 374 had the next highest average recorded activity scores of 100.17ppn over 6 nights and 88.71ppn over 7 nights, respectively. **Table 13** highlights all the hedgerows with an average *Pipistrellus* sp. activity level of >4.21ppn.

Table 13 Summary of the hedgerows with Pipistrellus sp. activity >4.21ppn during Spring 2022

Hedgerow Number	*Pipistrellus* sp. ppn
145	153.33
482	129.43
398	100.17
374	88.71
810	67.83
1004	65.33
403	57.20
422	51.00
426	49.00
51	22.50
49	20.57
64	18.40
427	16.50
438	14.33
199	13.20
804	11.57
22	8.83
196	8.60
491	6.43
202	6.20
940	5.80
188	5.60

Hedgerow Number	*Pipistrellus* sp. ppn
189	5.40
956, 791	4.67
811	4.50

3.4.20. Of the remaining hedgerows, 42 hedgerows had an average recorded activity level of 4.21->0.00ppn. 36 hedgerows recorded no *Pipistrellus* sp. activity during automated static detector assessments in Spring 2022.

4. REFERENCES

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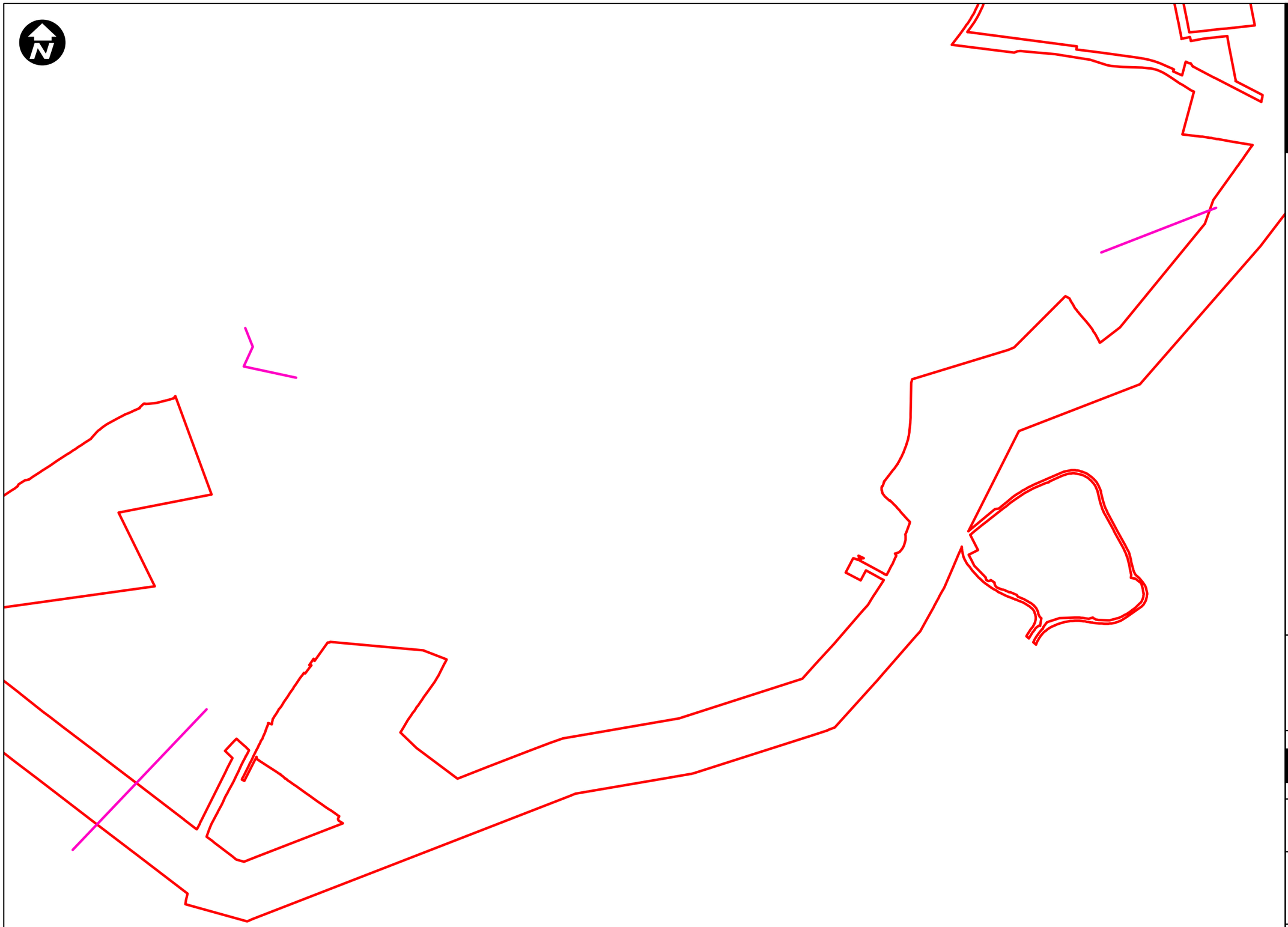
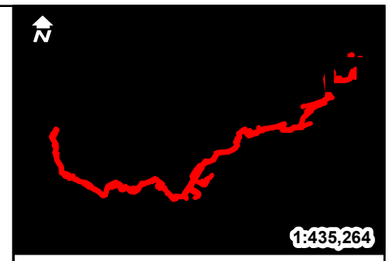
- **Ref. 11 -** Natural England (2010). *Higher Level Stewardship Farm Environment Plan (FEP) Manual: Technical Guidance on the Completion of the FEP and Identification, Condition Assessment and Recording of HLS FEP Features. Third Edition*. NE. Peterborough. Available at: http://www.adlib.ac.uk/resources/000/251/202/PB10383.pdf [Accessed on 08/02/2022]

Annex A

FIGURES





Key:
- Newbuild Infrastructure Boundary
- Ancient Hedgerows

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.1 - Ancient Hedgerow Locations

DRAWING STATUS

For Information

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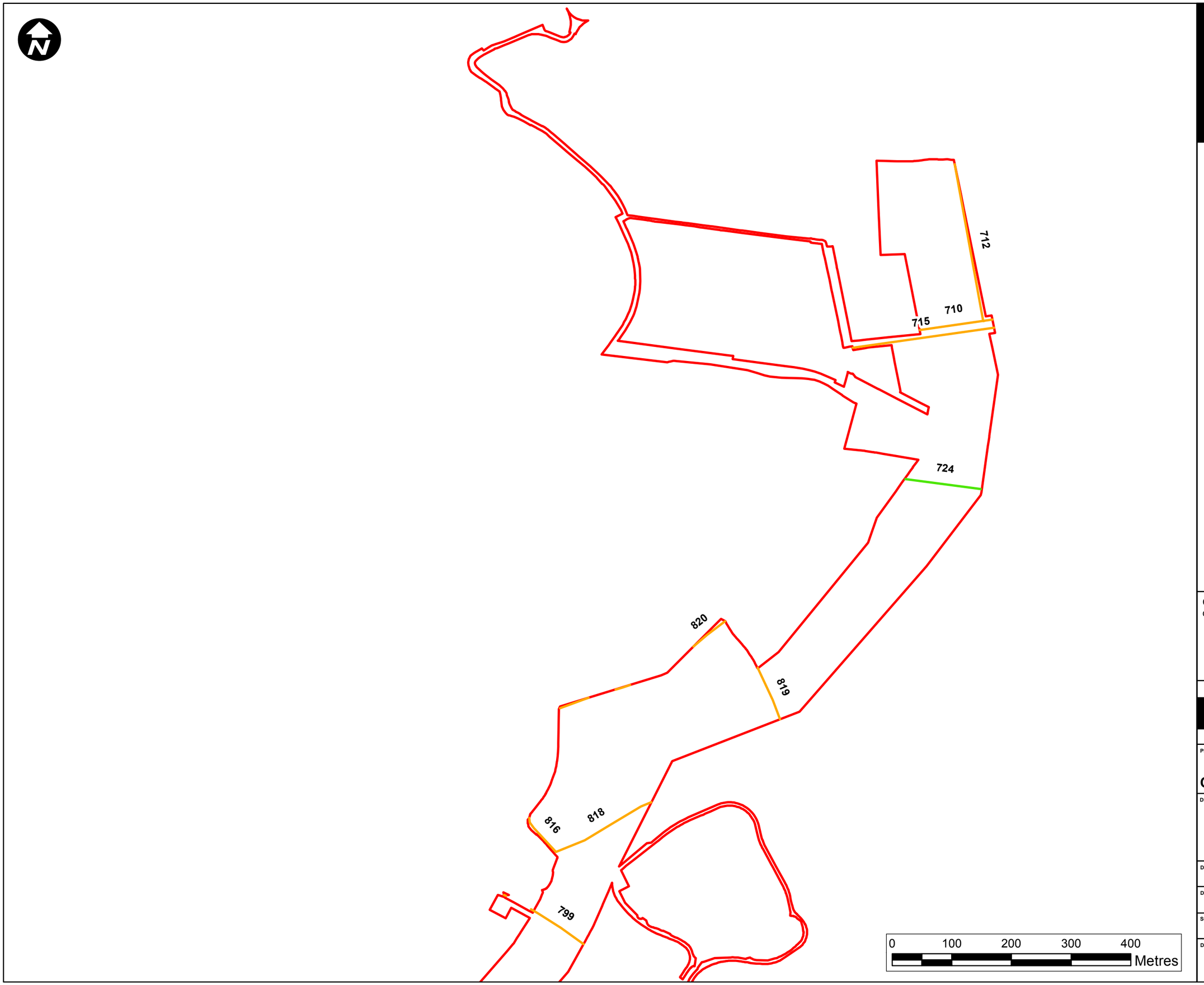

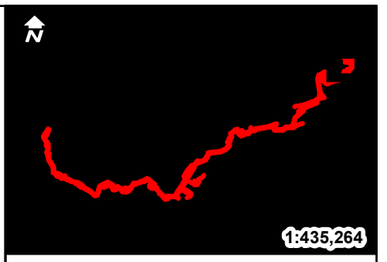

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- Good
- Poor

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PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 1

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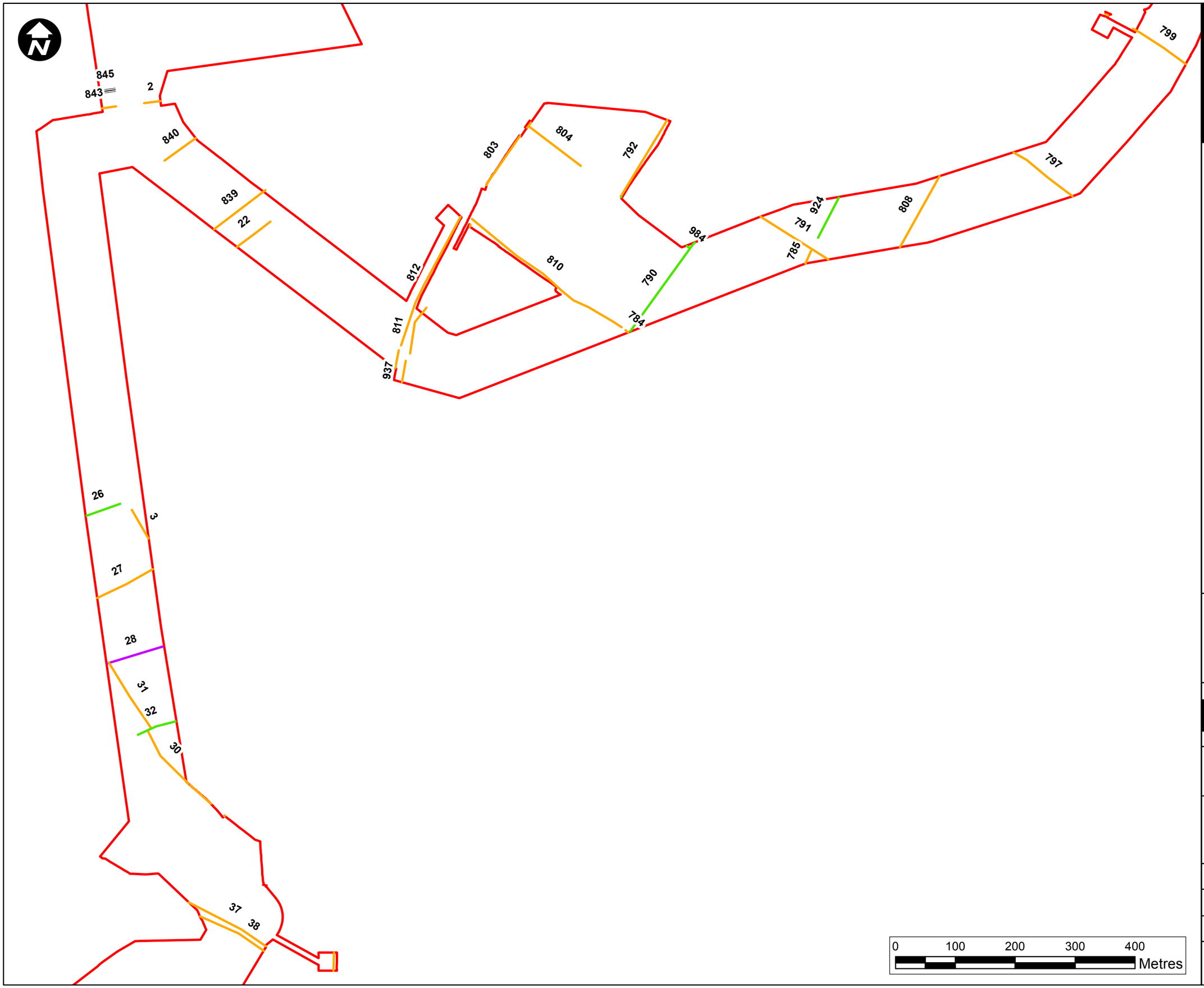

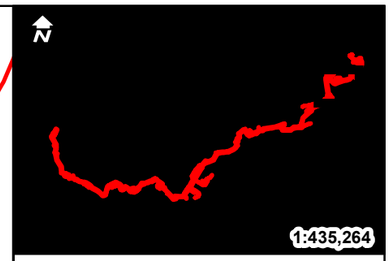

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- Newbuild Infrastructure Boundary
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PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 2

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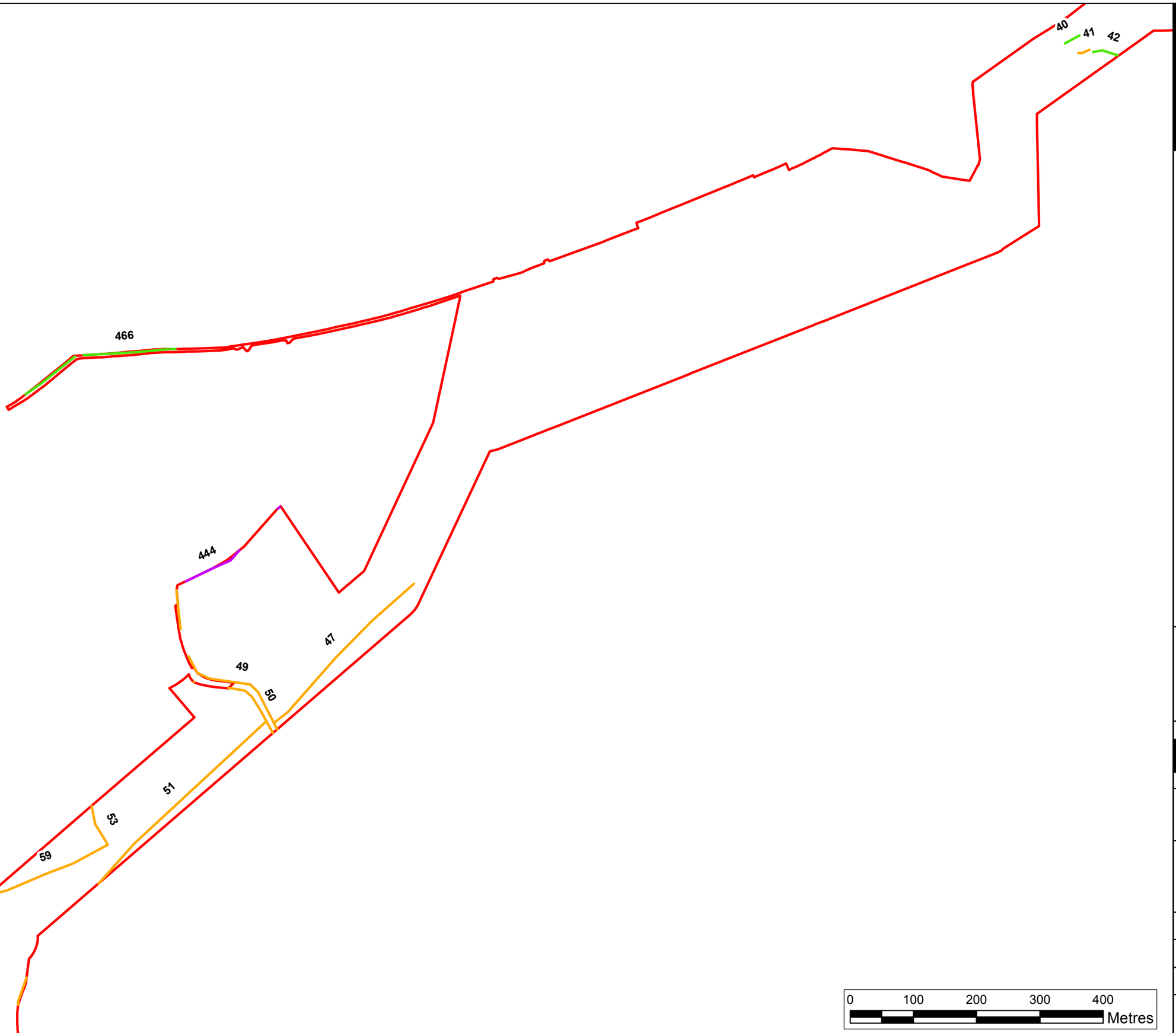

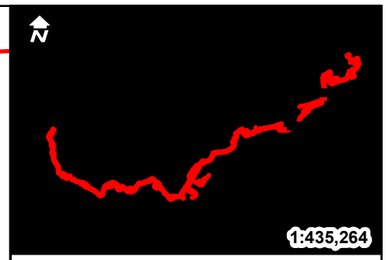

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PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 3

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For Information

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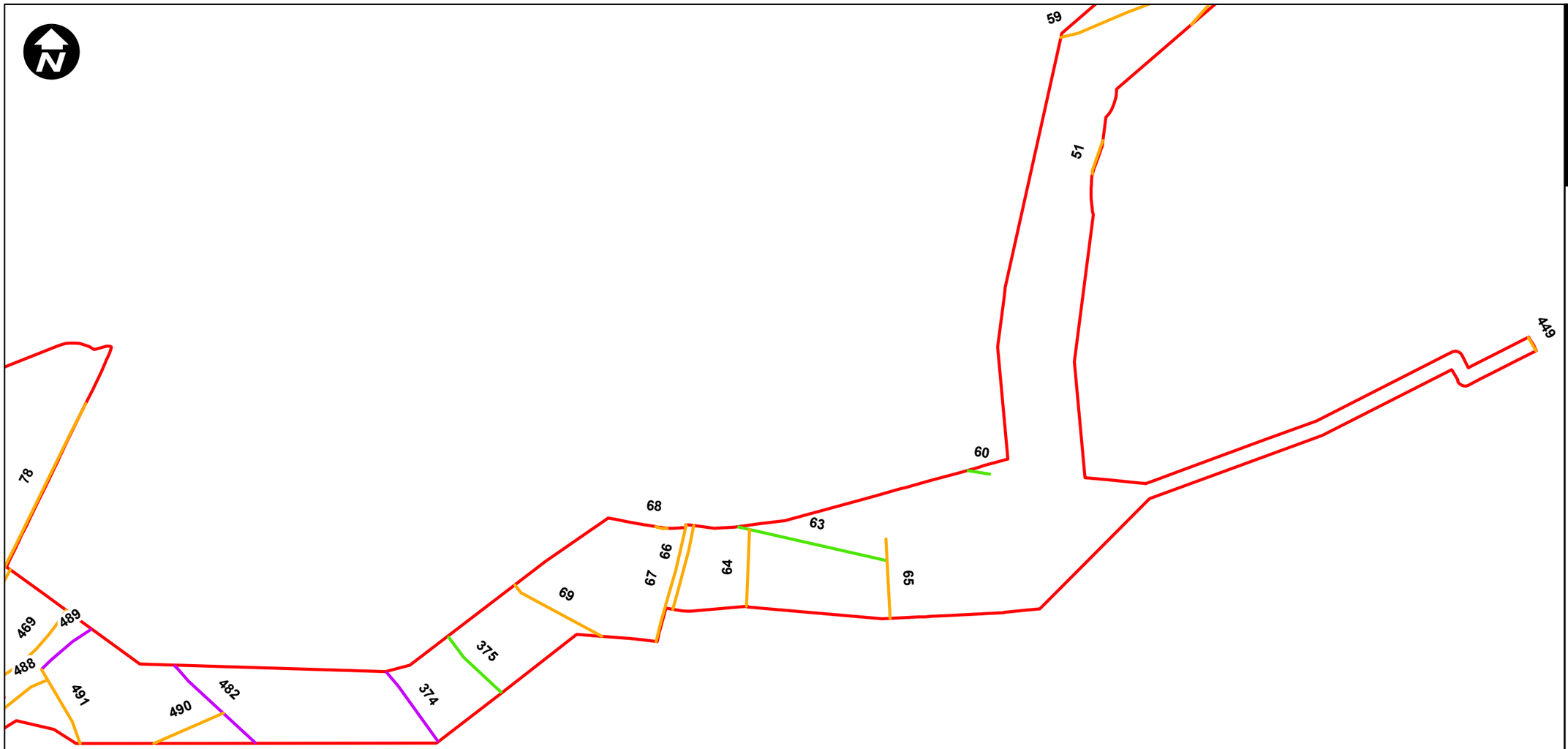

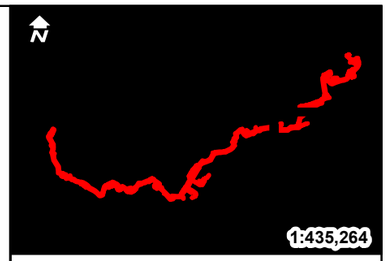

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PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 4

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For Information

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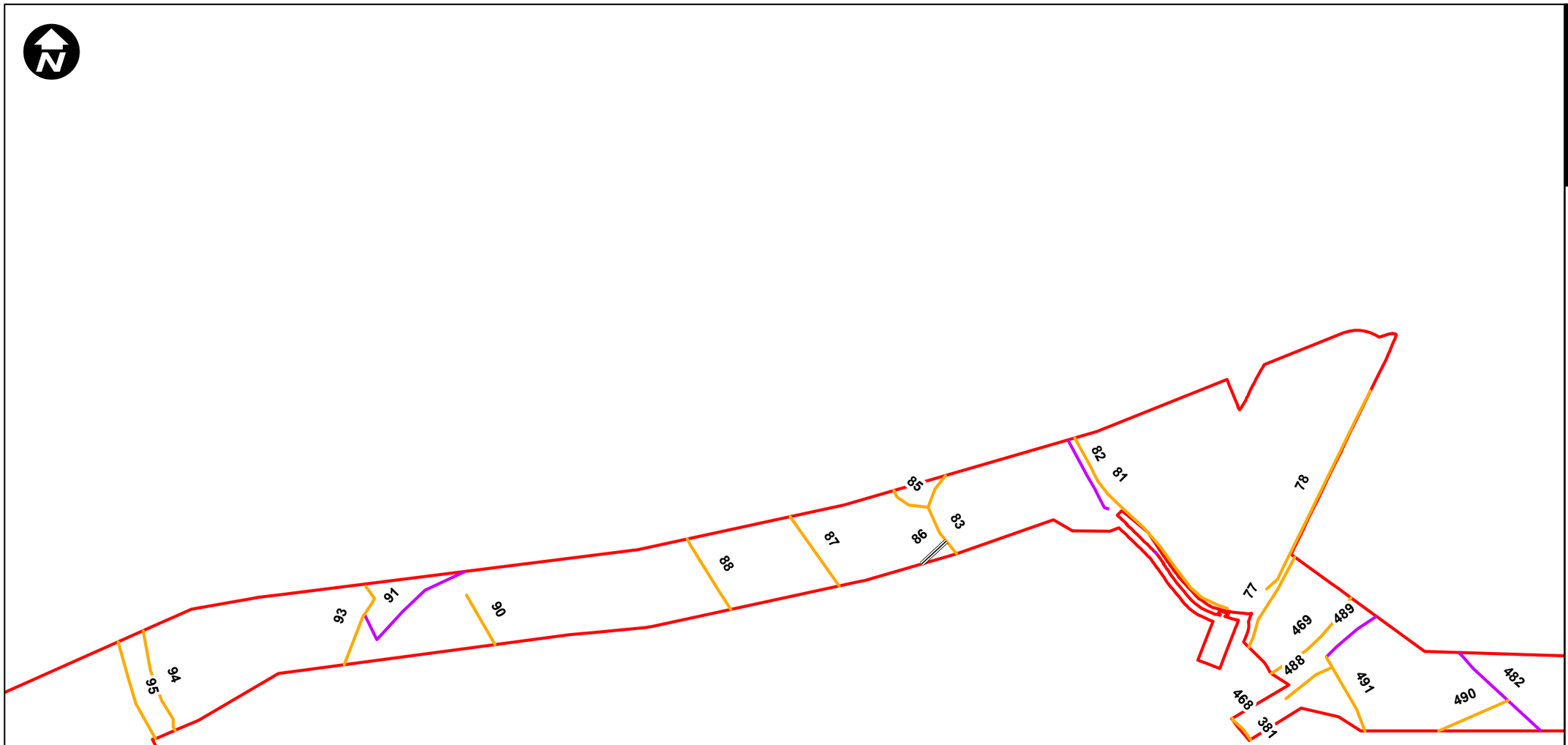
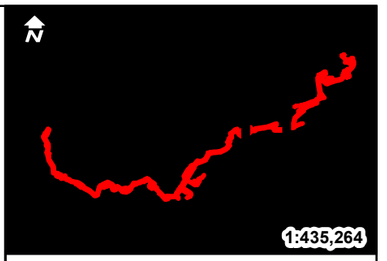




Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 5

DRAWING STATUS

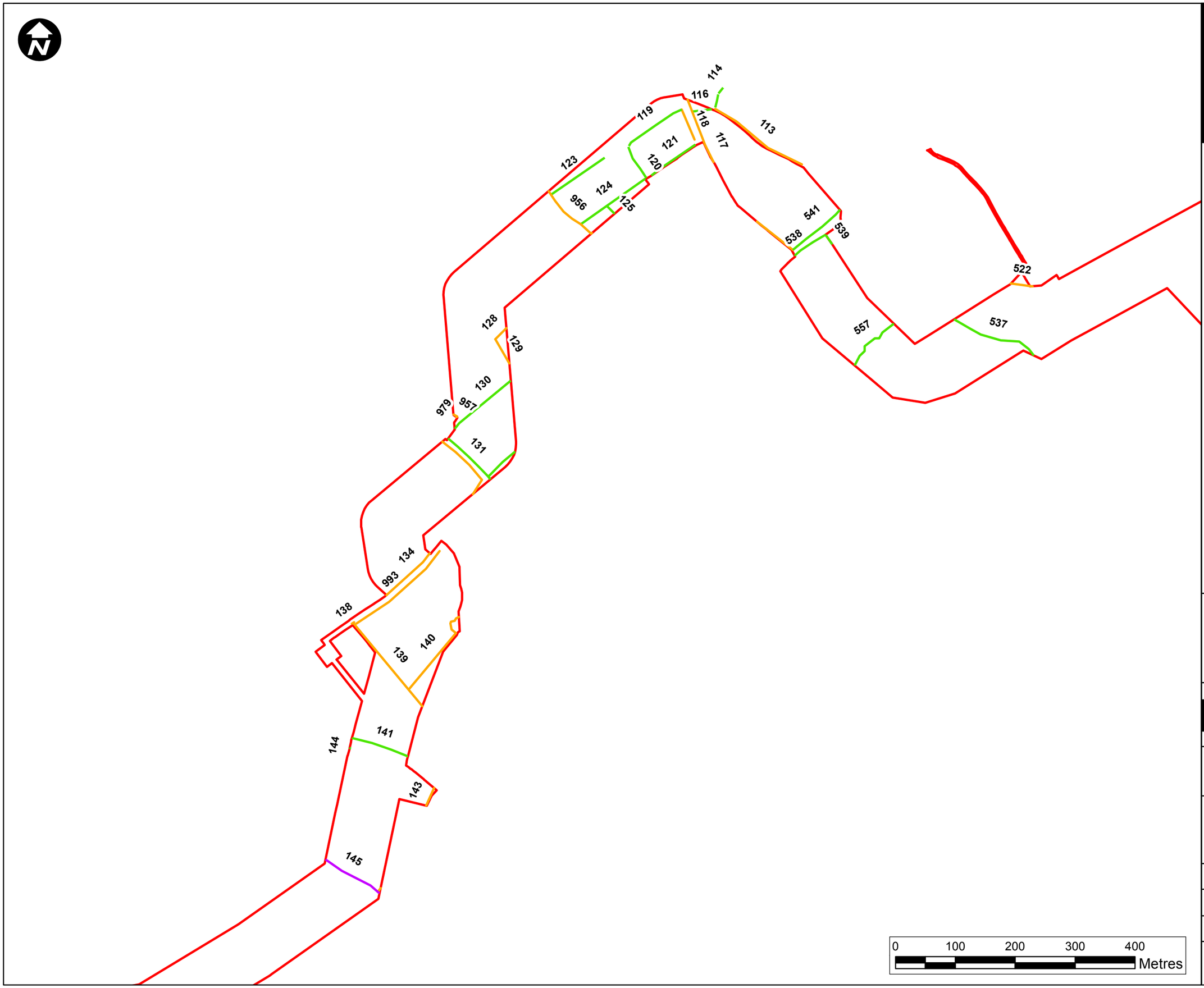
For Information

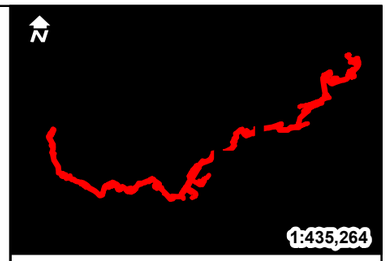
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet5





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

0 100 200 300 400 Metres

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 6

DRAWING STATUS

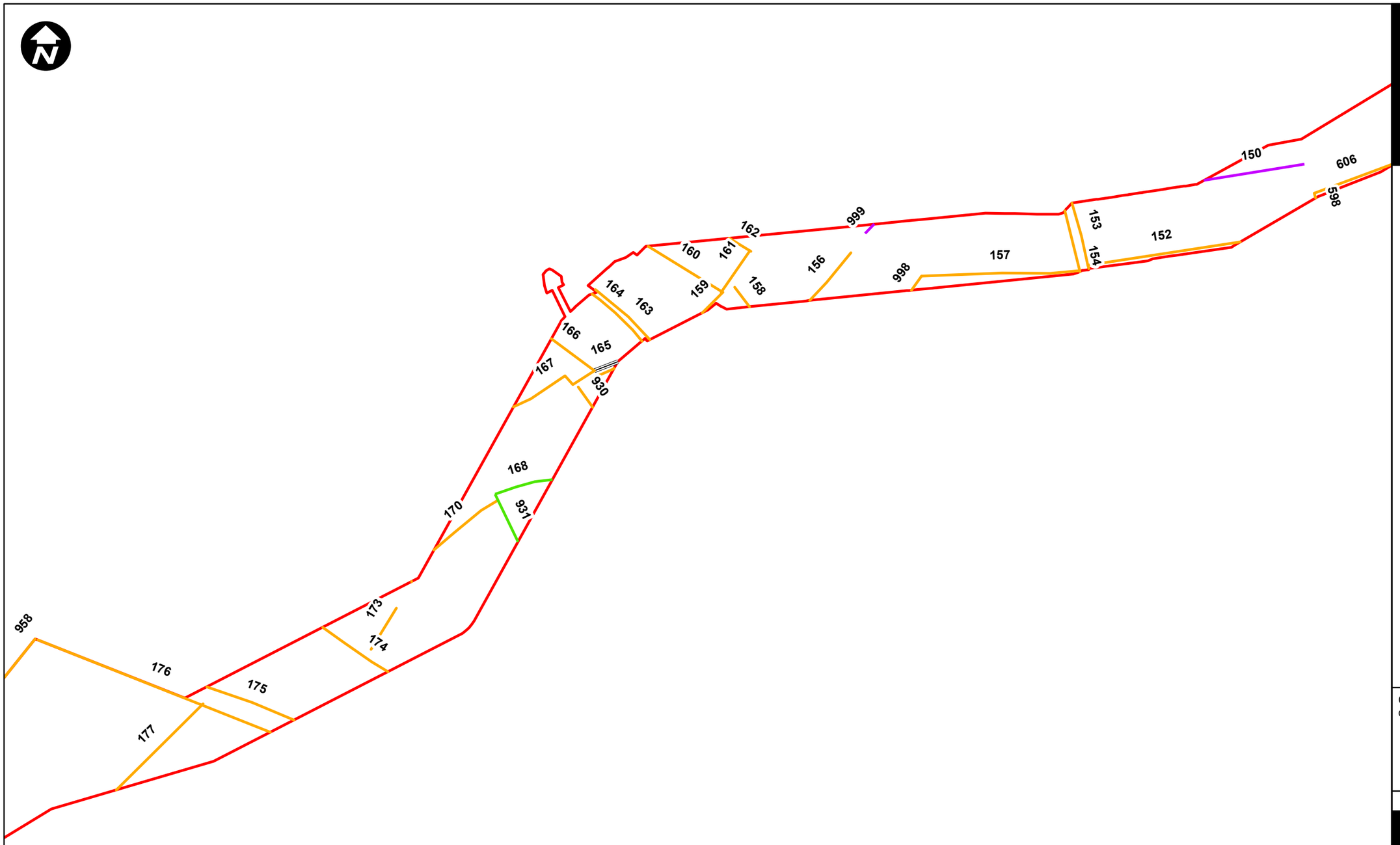
For Information

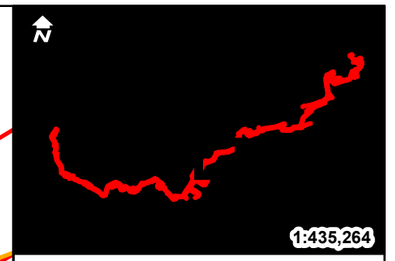
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet6





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

0 100 200 300 400 Metres

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 7

DRAWING STATUS

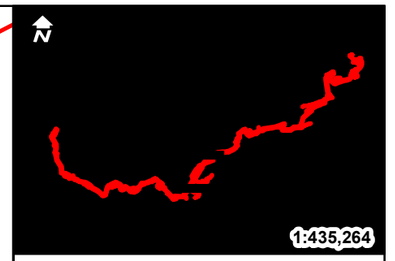
For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet7



Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 8

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
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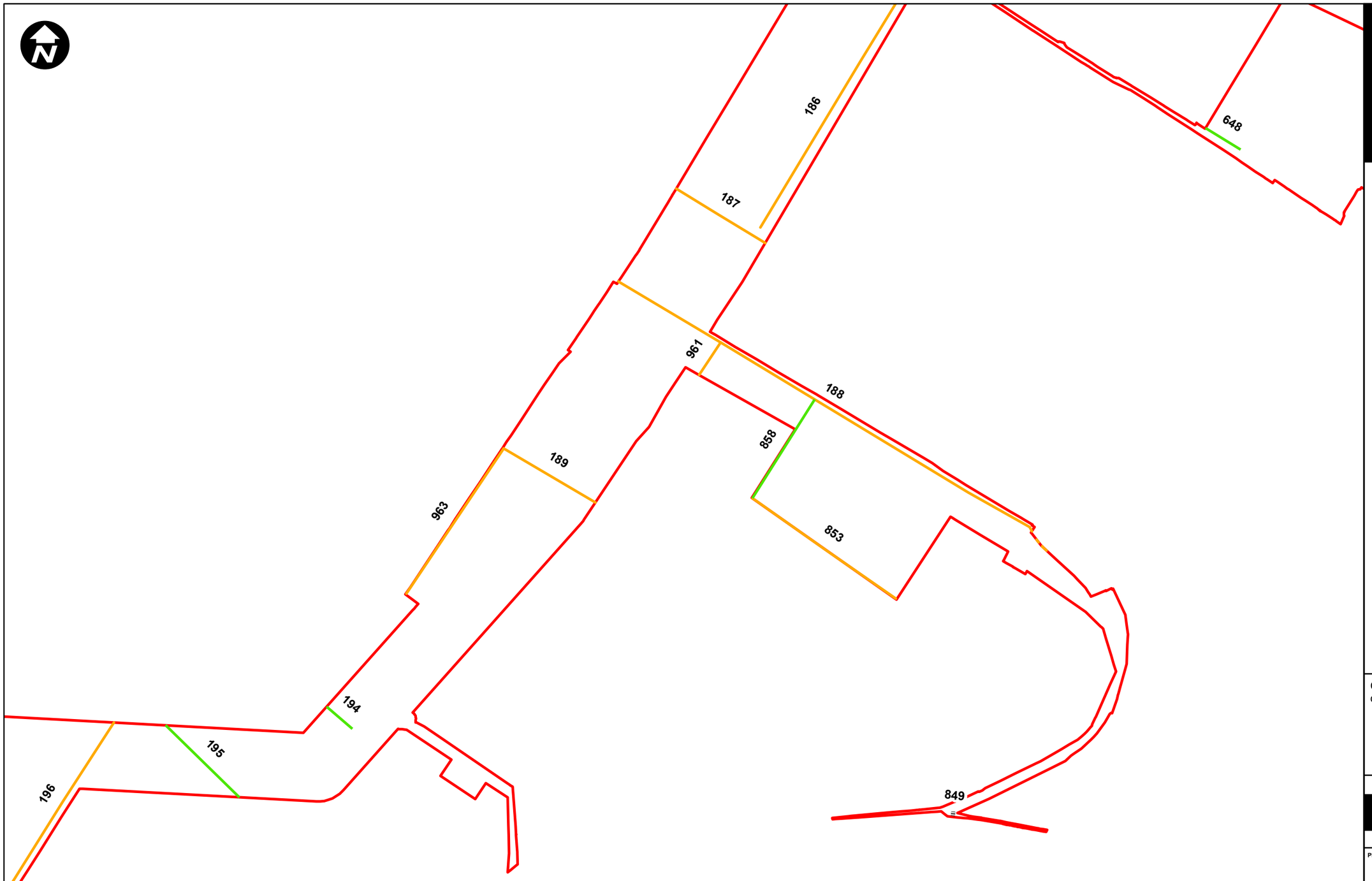
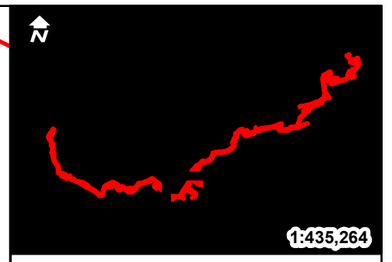
DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet8





Key:
- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

0 100 200 300 400 Metres

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 9

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
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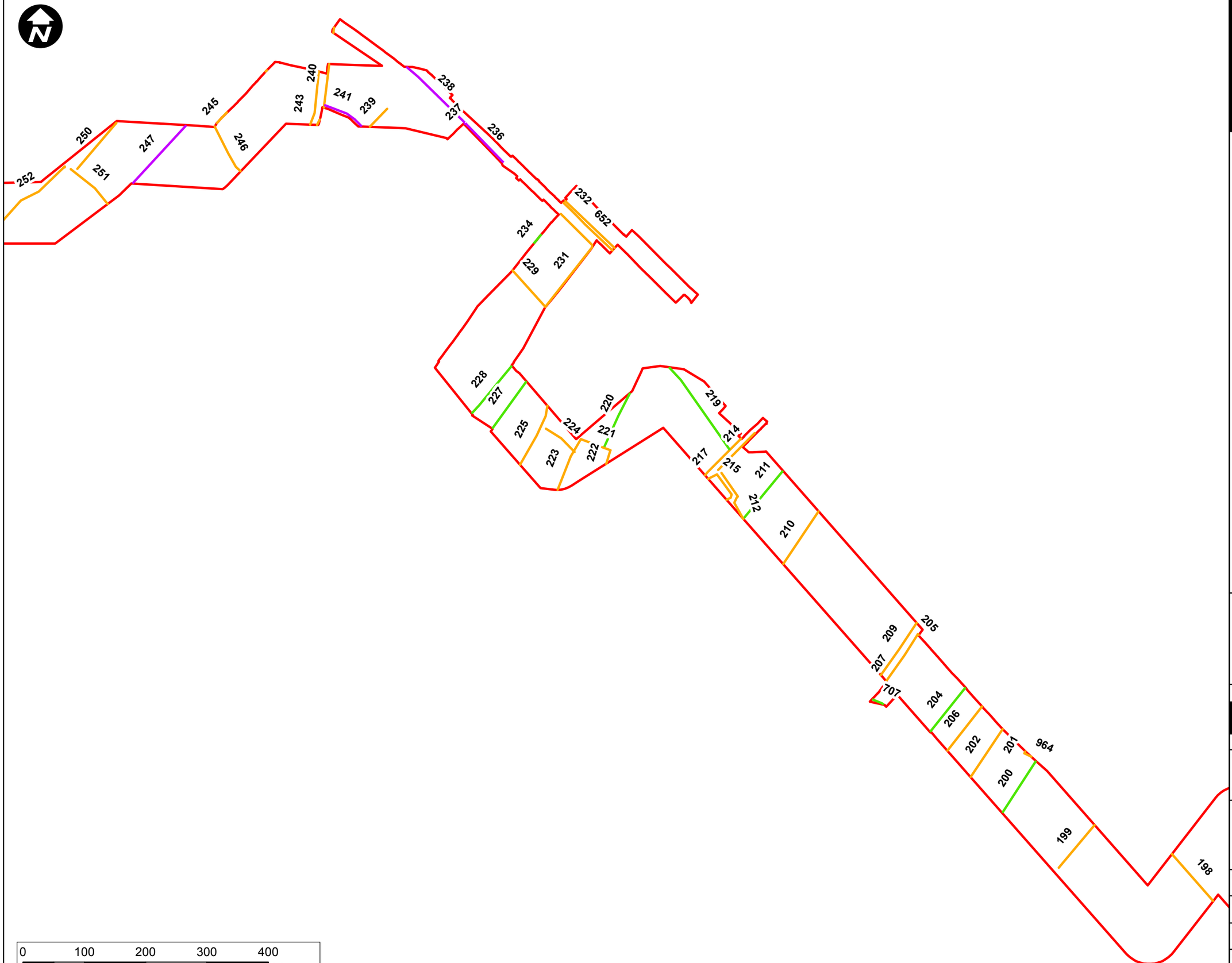
DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet9



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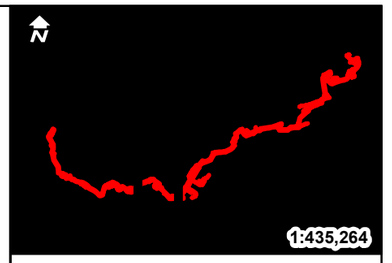


Key:
- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 10

DRAWING STATUS

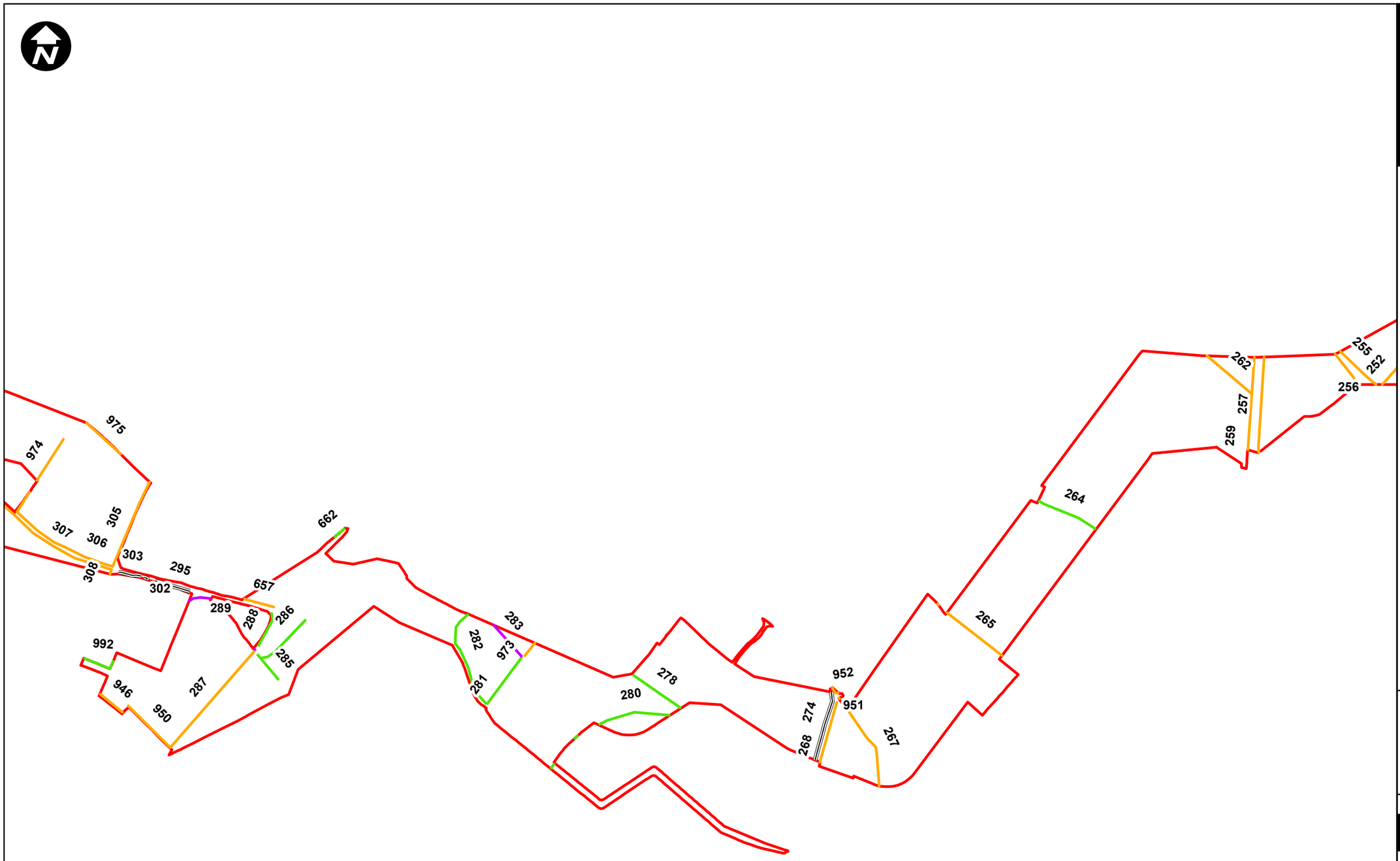
For Information

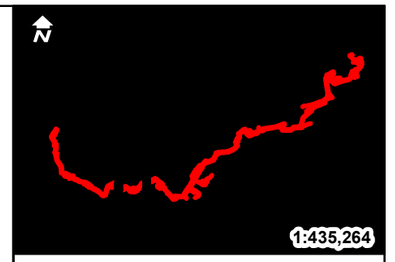
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet10





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 11

DRAWING STATUS

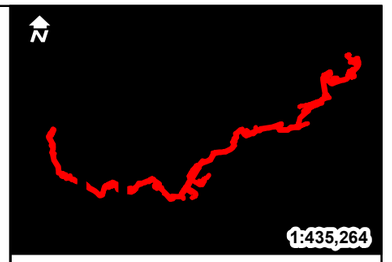
For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet11



Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 12

DRAWING STATUS

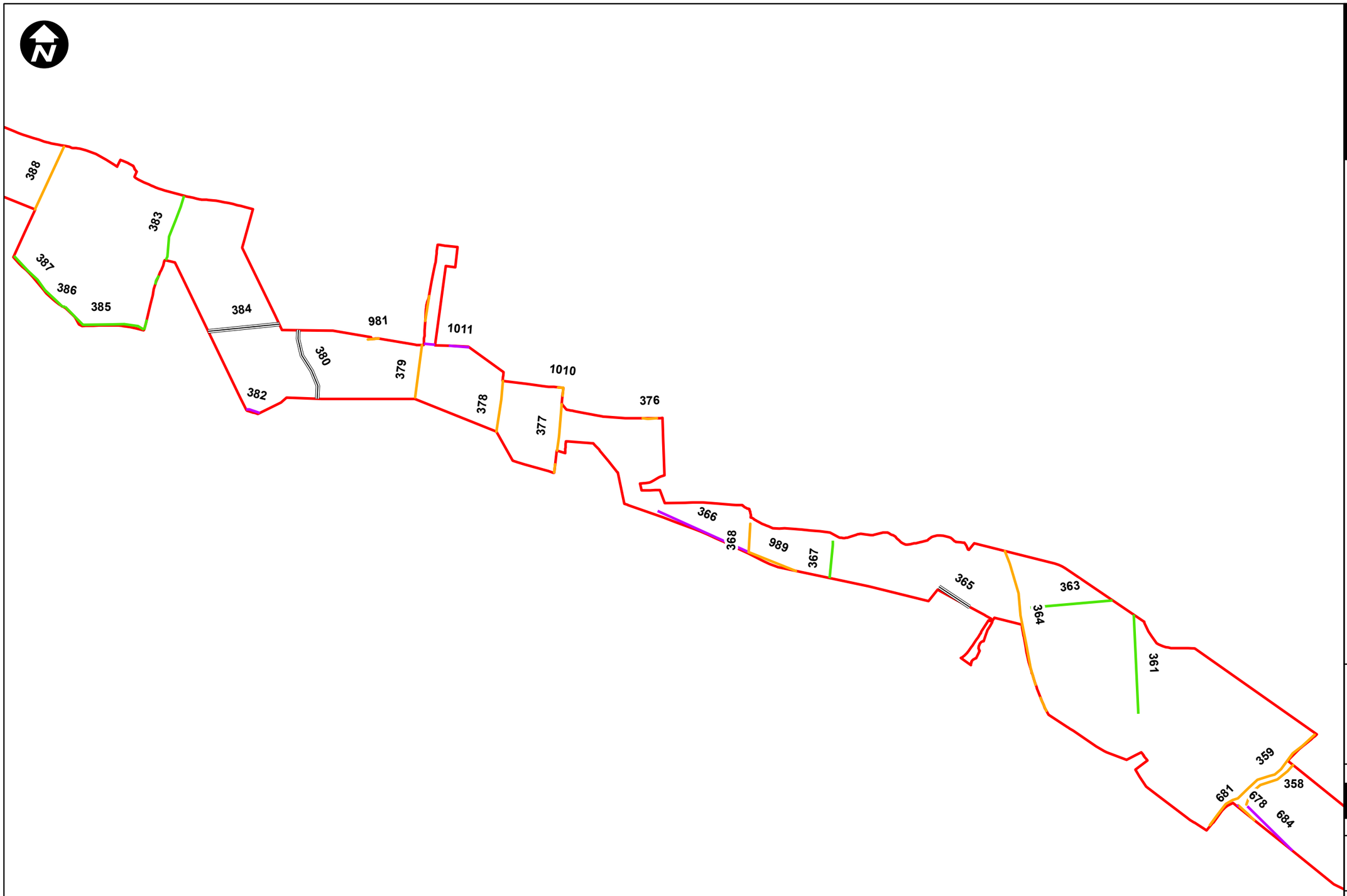
For Information

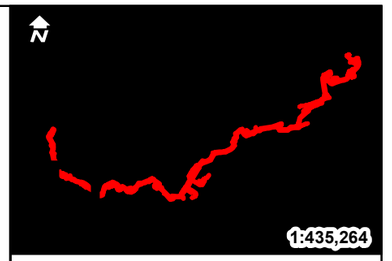
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet12





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 13

DRAWING STATUS

For Information

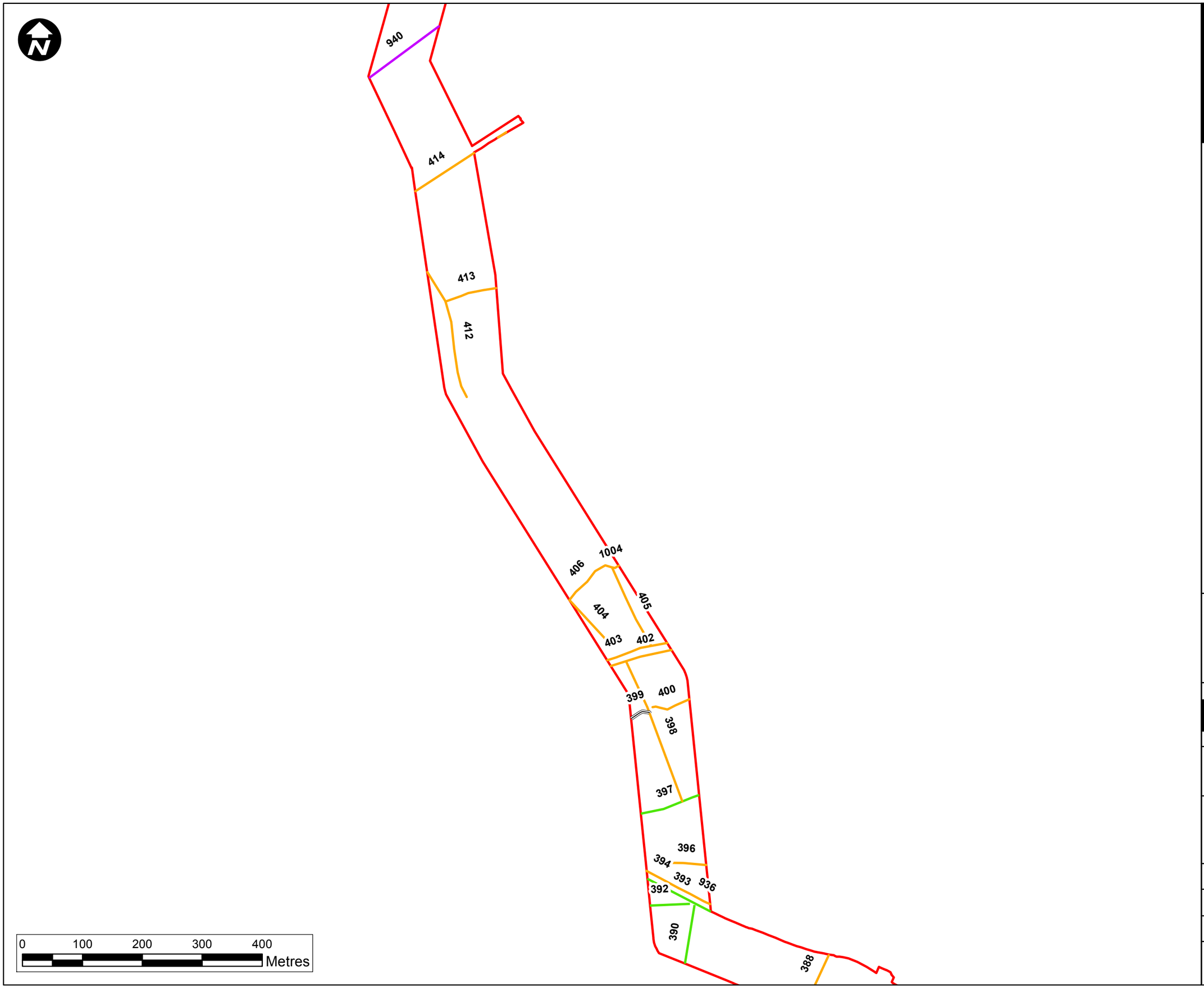
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

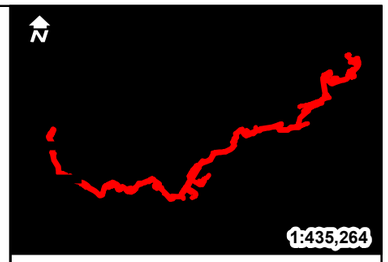
SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet13

0 100 200 300 400 Metres





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 14

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet14

Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.2 - Hedgerow Locations Sheet 15

DRAWING STATUS

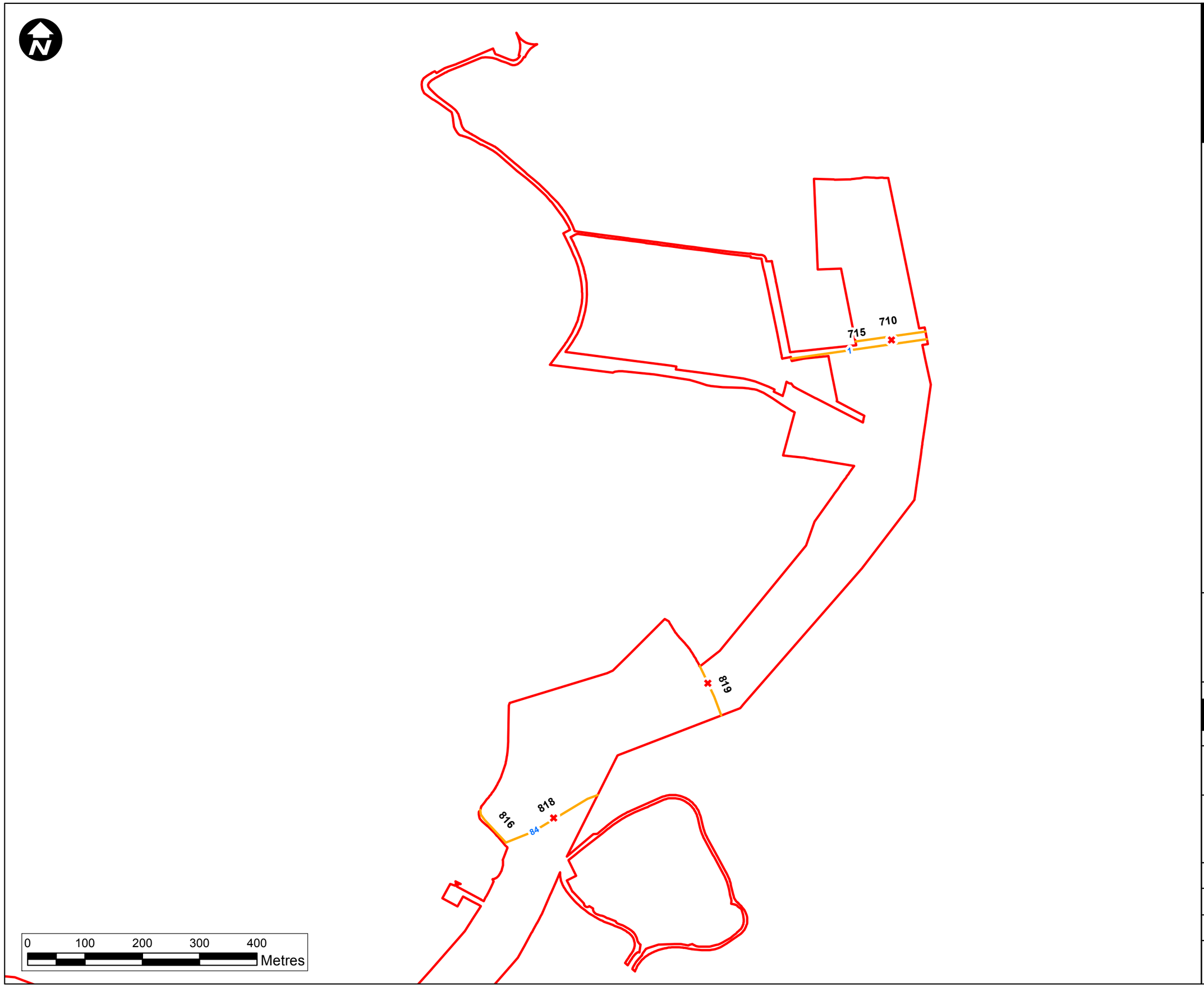
For Information

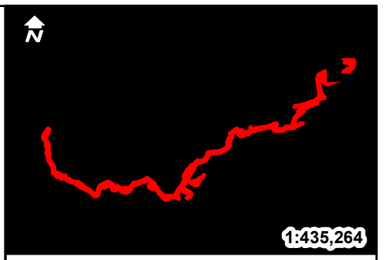
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:5,750	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.2-Sheet15





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 1

DRAWING STATUS

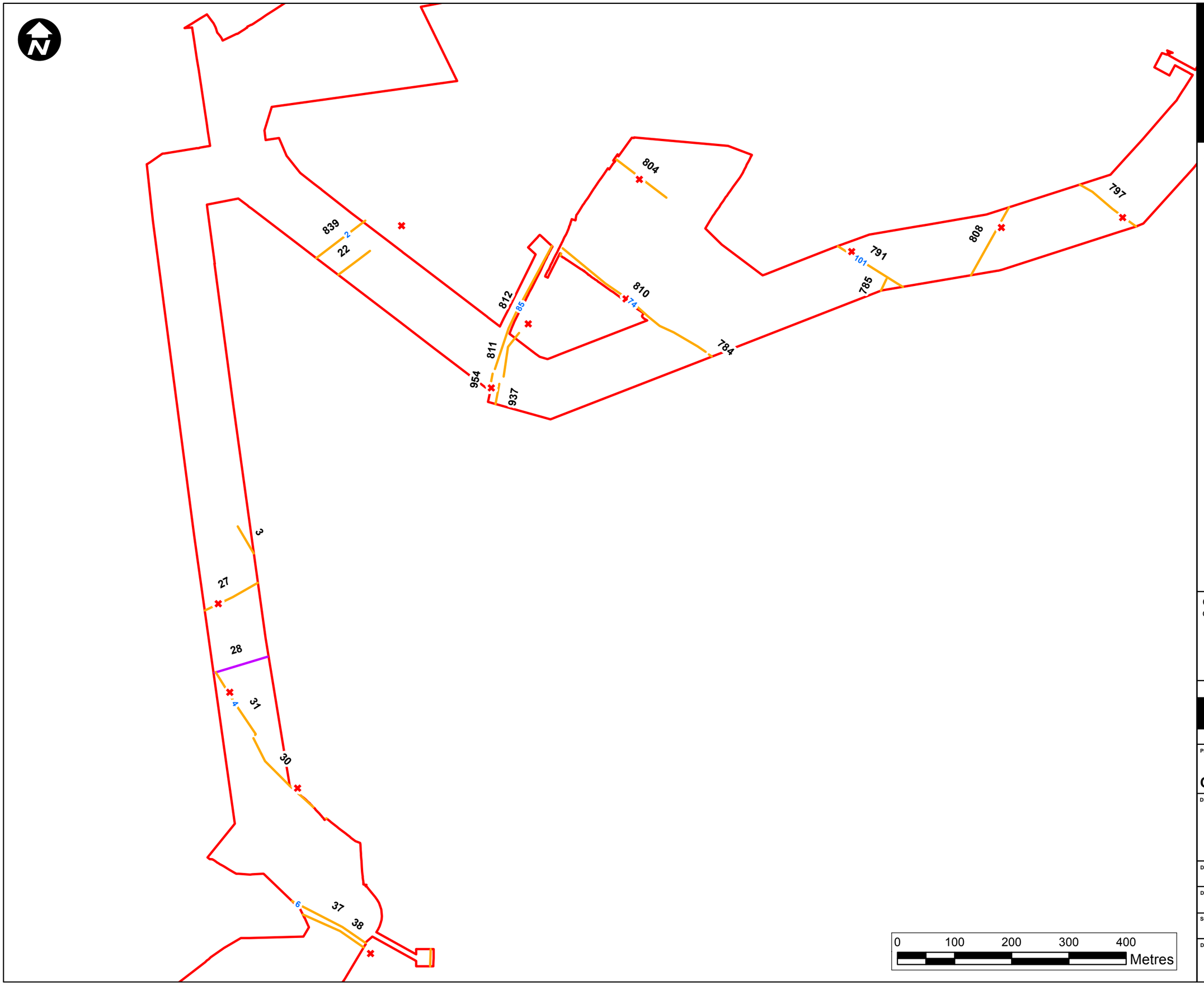
For Information

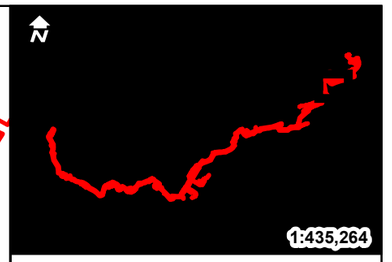
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet1





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 2

DRAWING STATUS

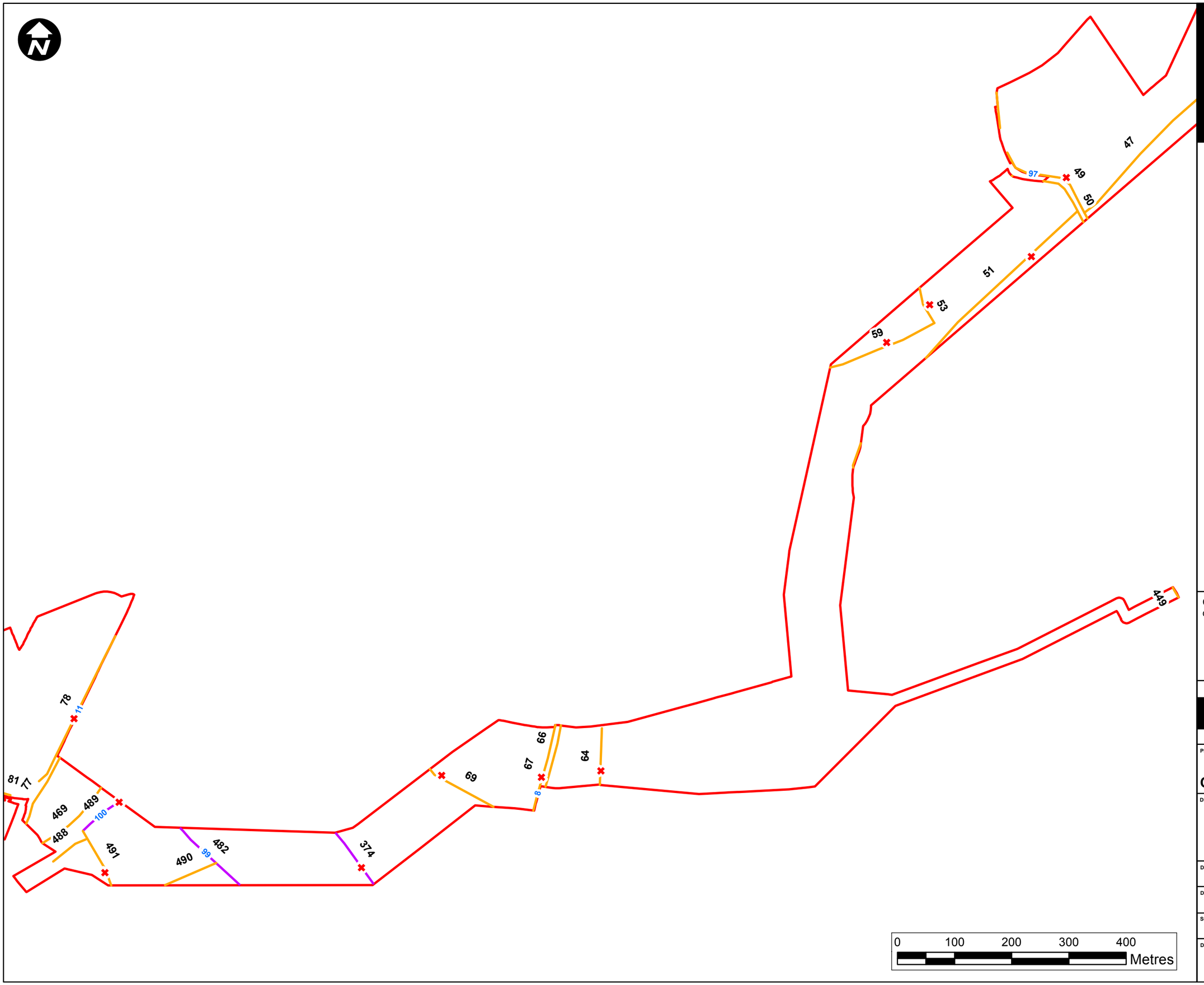
For Information

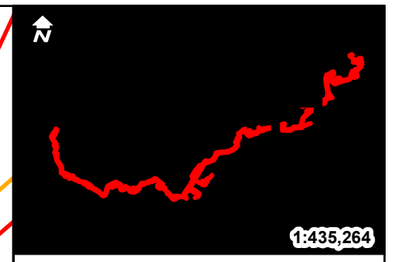
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet2





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 3

DRAWING STATUS

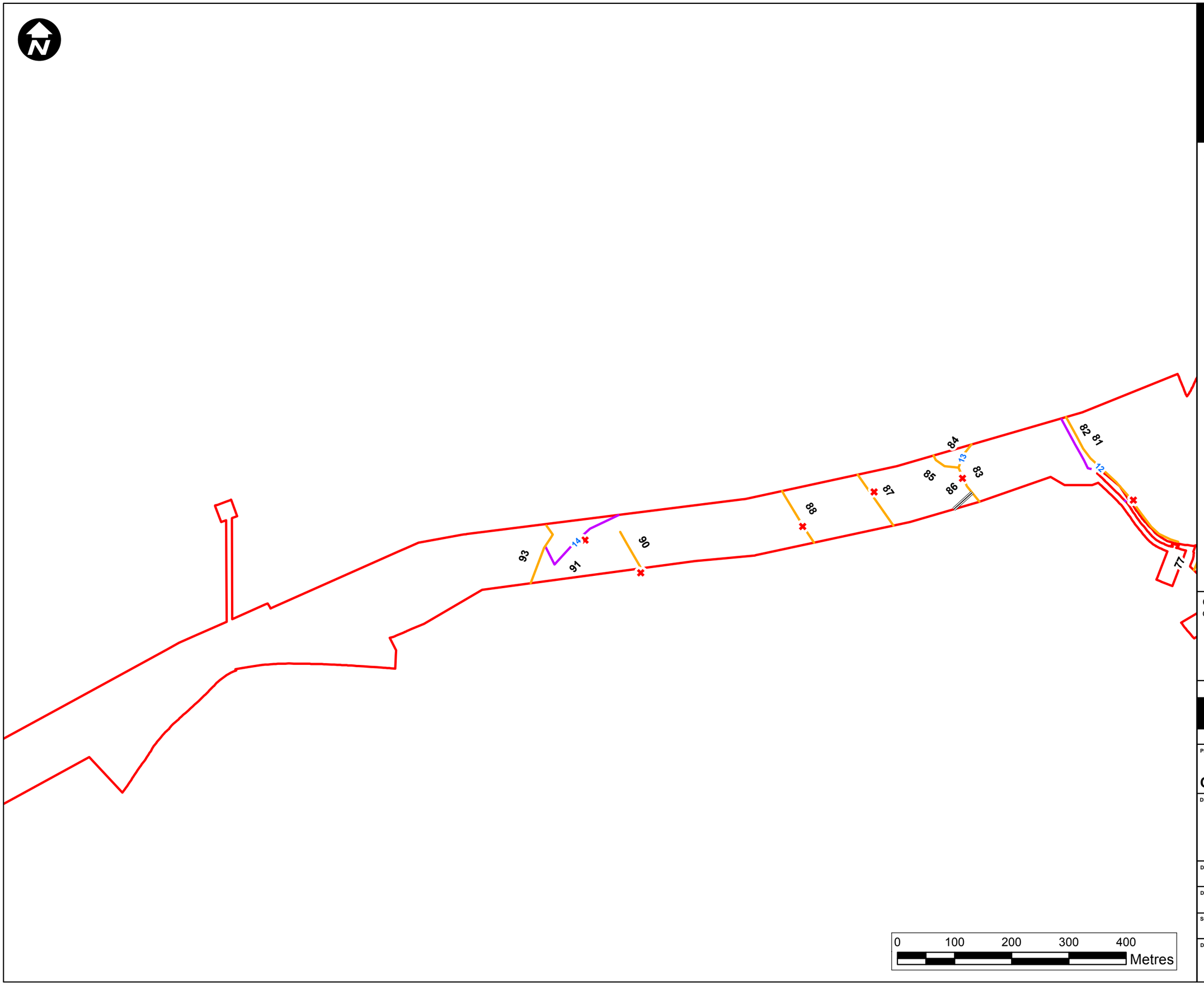
For Information

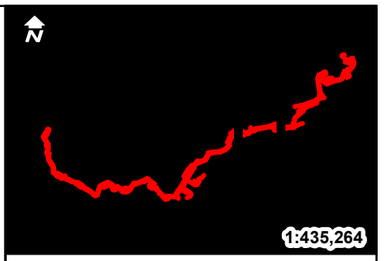
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet3





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 4

DRAWING STATUS

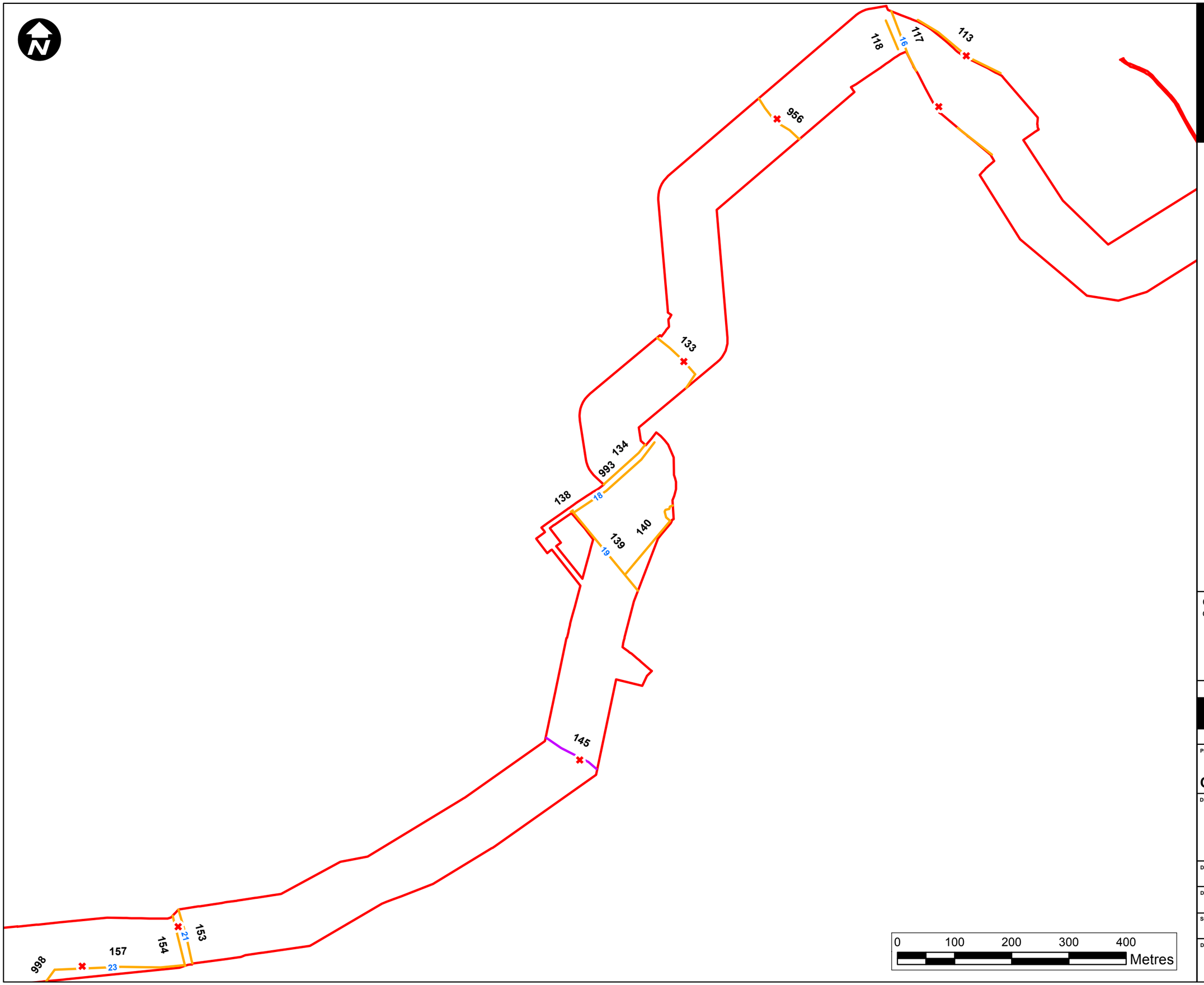
For Information

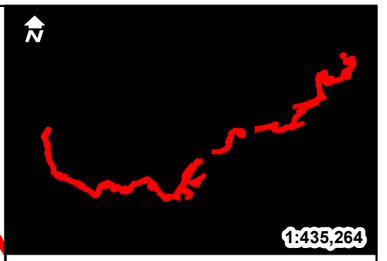
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet4





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

0 100 200 300 400 Metres

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 5

DRAWING STATUS

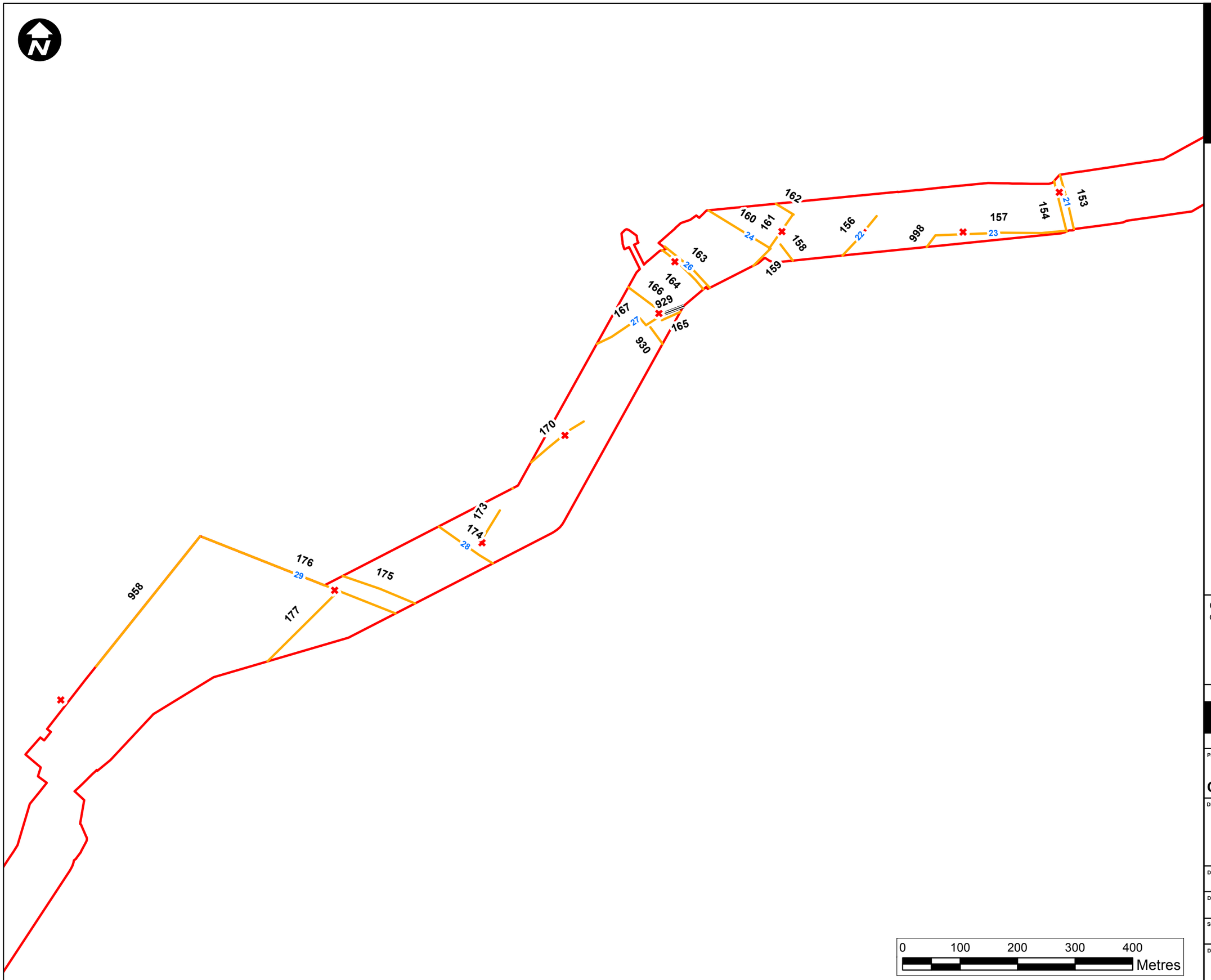
For Information

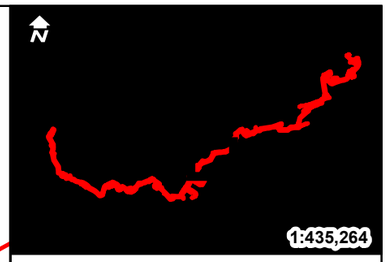
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet5





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

[redacted]

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 6

DRAWING STATUS

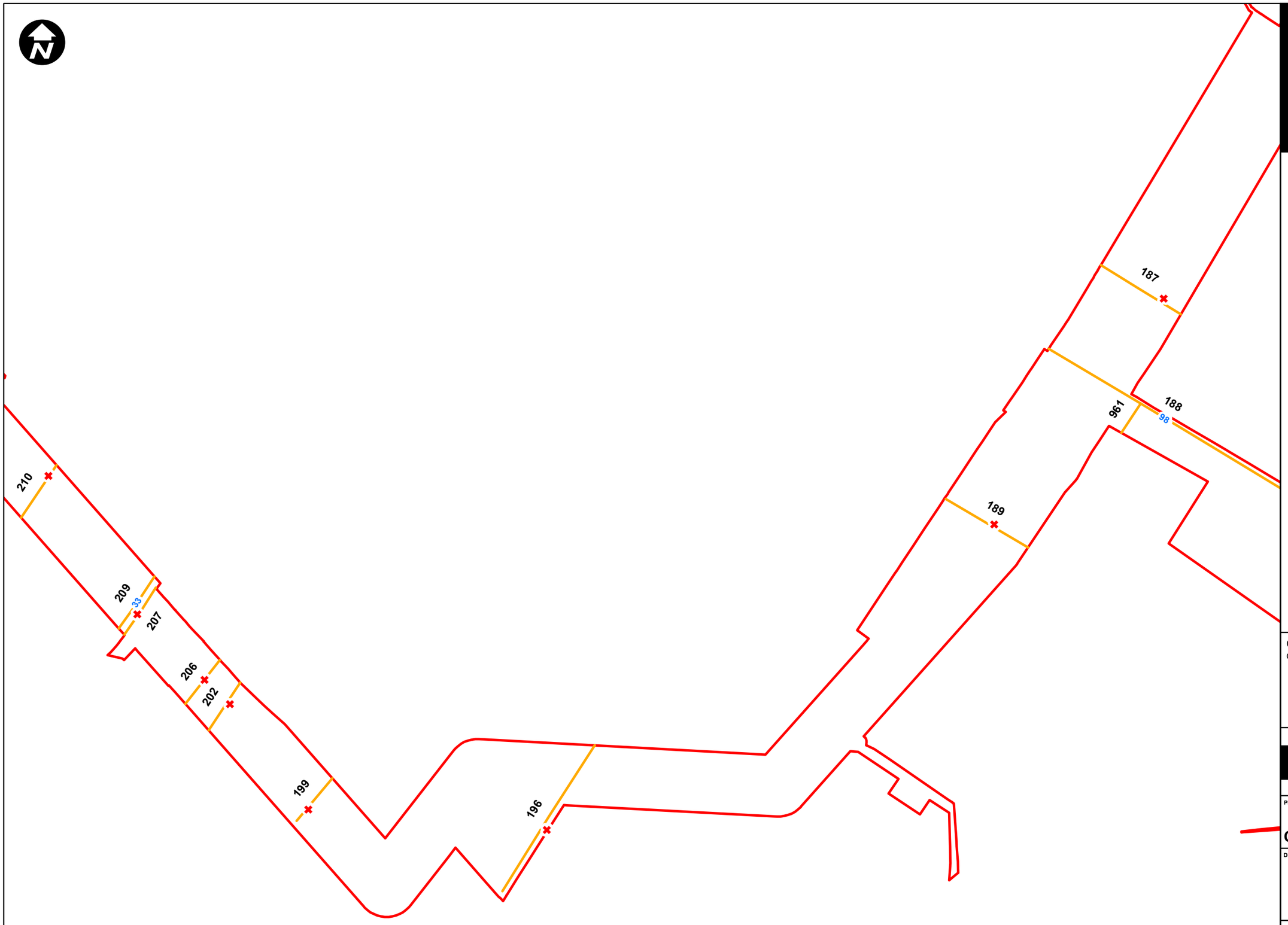
For Information

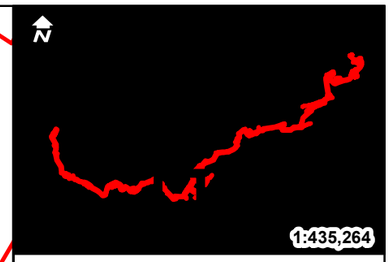
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet6





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 7

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
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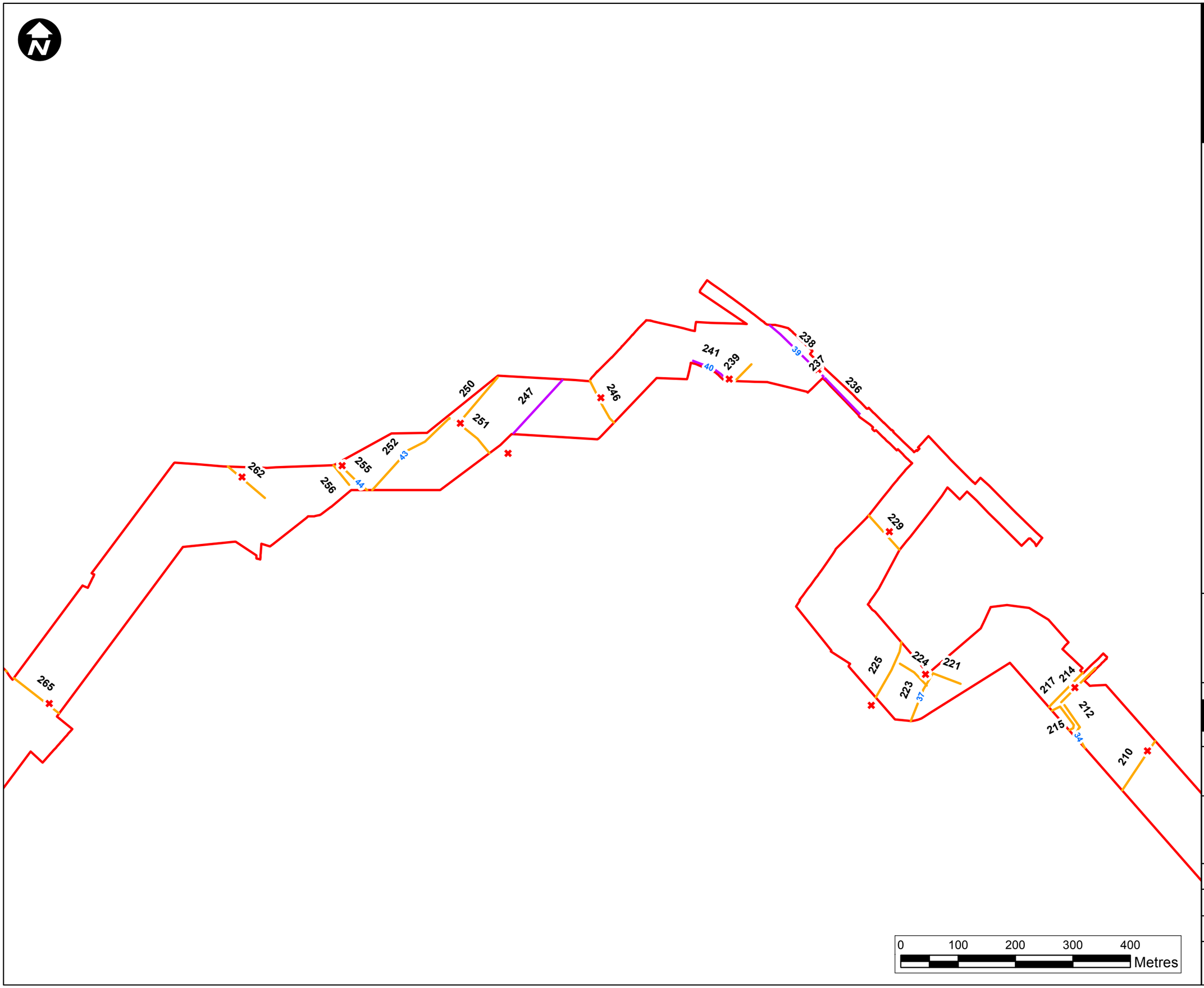
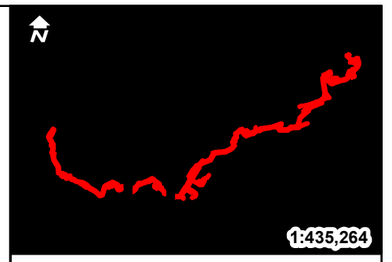
DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet7





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 8

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
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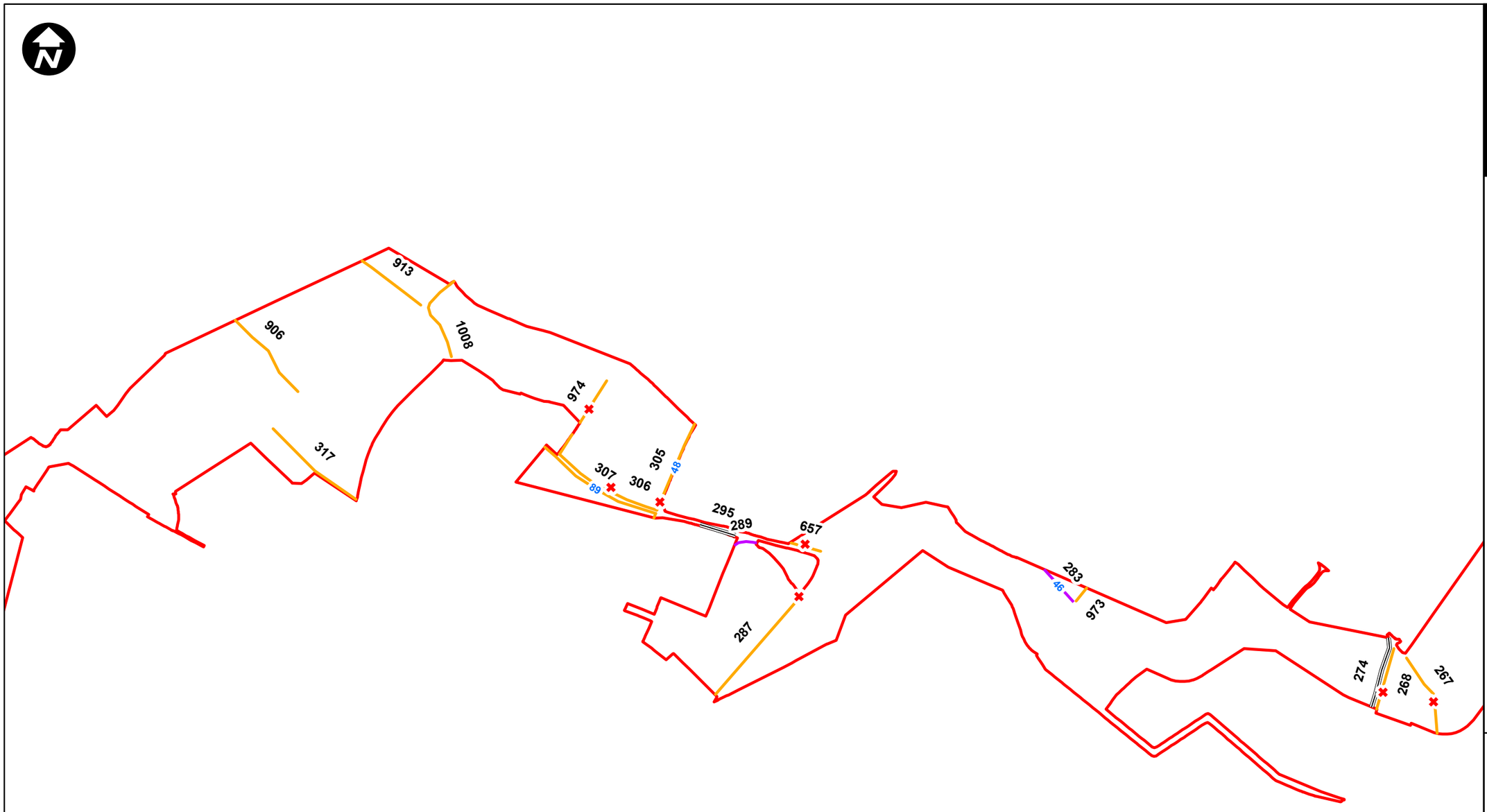
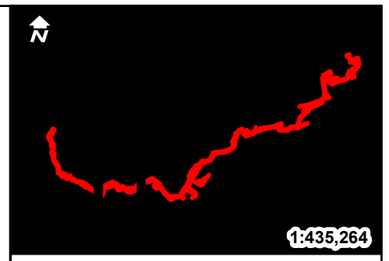
DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet8





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 9

DRAWING STATUS

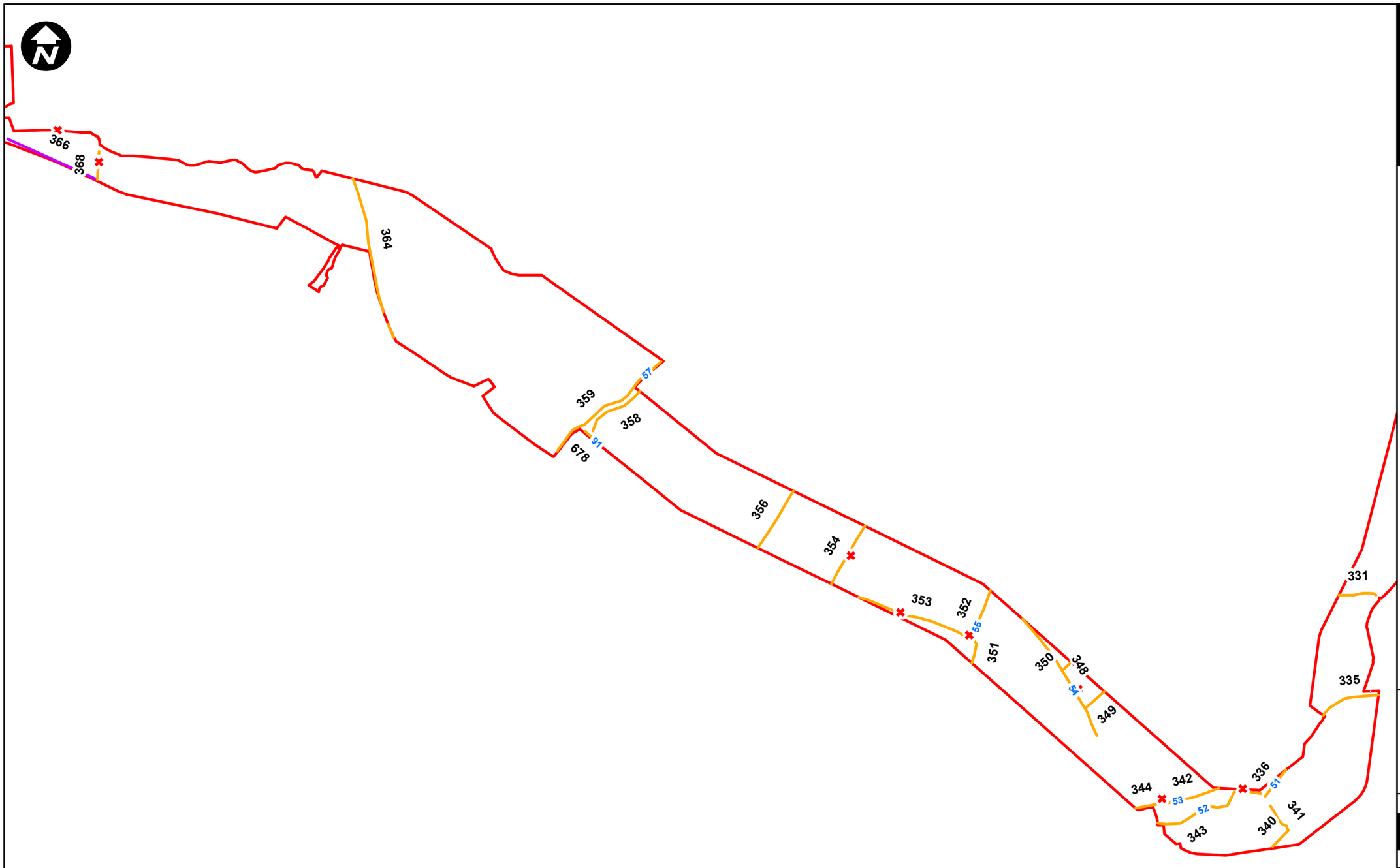
For Information

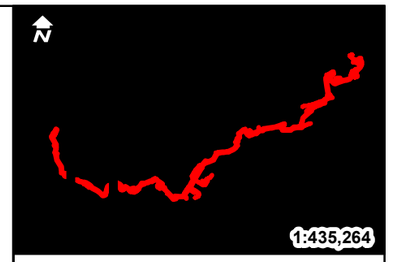
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet9





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

0 100 200 300 400 Metres

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 10

DRAWING STATUS

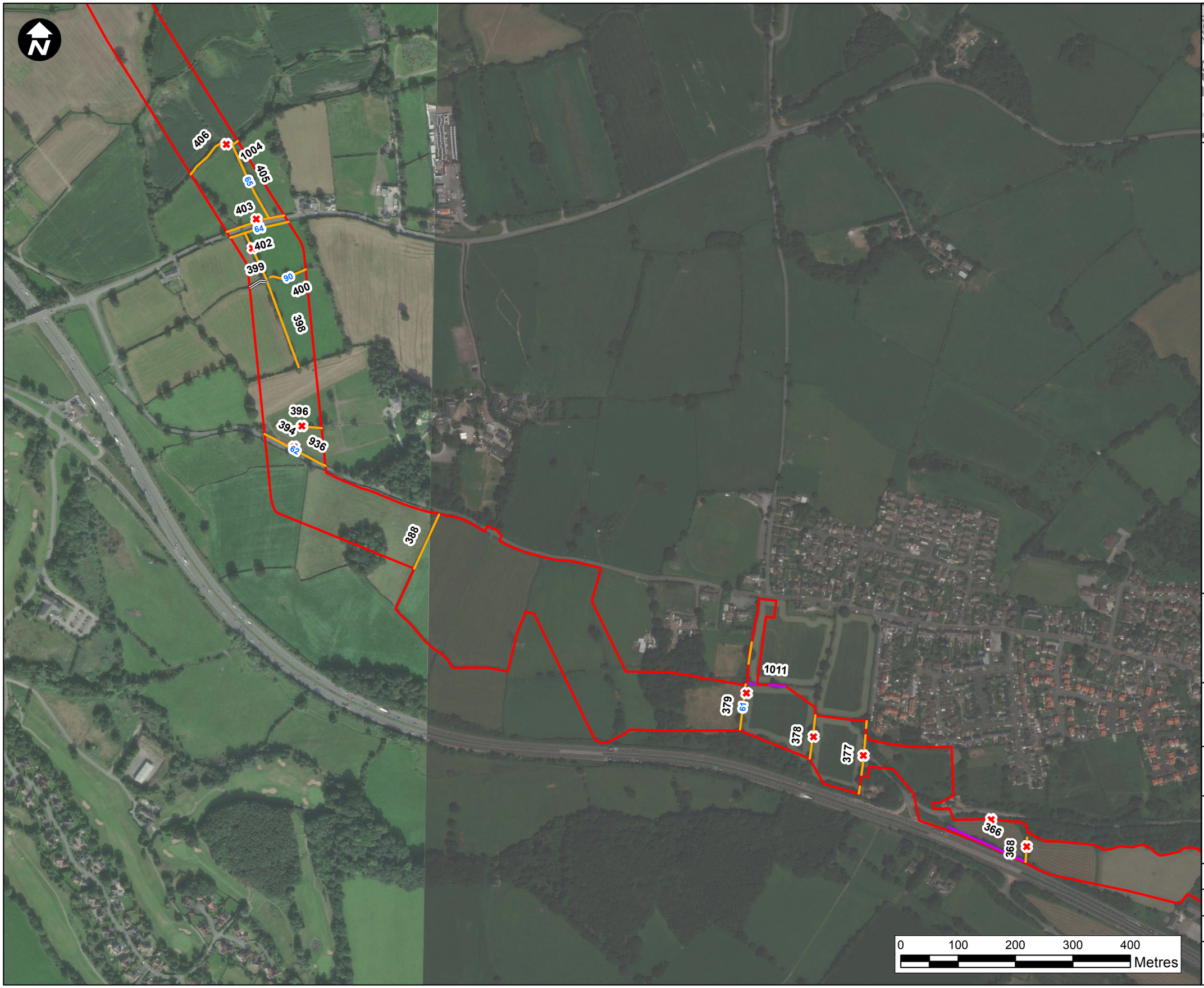
For Information

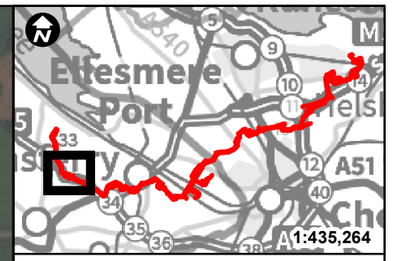
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet10





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 11

DRAWING STATUS

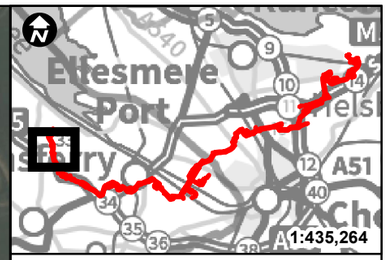
For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet11



Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 12

DRAWING STATUS

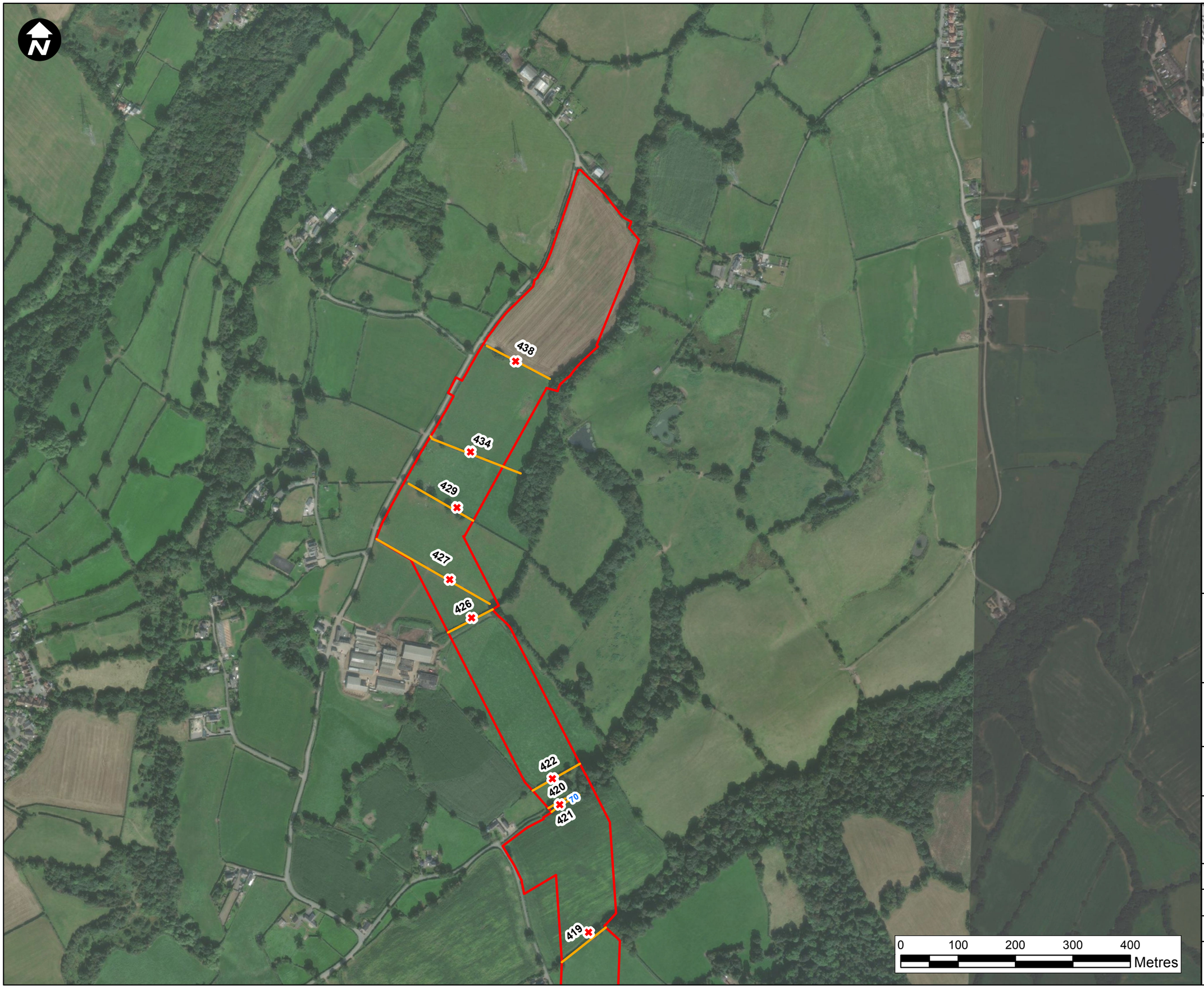
For Information

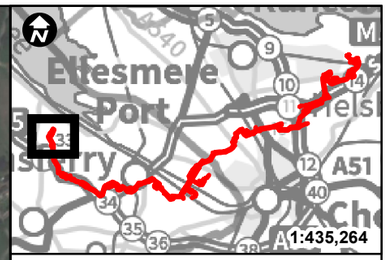
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet12





Key:

- Newbuild Infrastructure Boundary
- Not Yet
- Excellent
- Good
- Poor
- Static Locations

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.3 - Hedgerow Static Locations Sheet 13

DRAWING STATUS

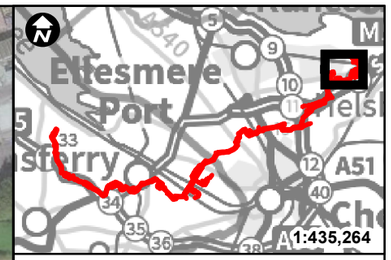
For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:6,000	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.3-Sheet13



Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

Average ppn total

- 0.00 - 9.99
- 10.00 - 29.99
- 30.00 - 59.99
- 60.00 - 99.99
- 100.00 - 159.99
- 160.00 - 249.99
- 250.00 - 409.99
- 410.00 - 679.99
- 680.00 - 1119.99
- 1120.00 - 1900.00

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.4 - Average Bat Activity Sheet 1

DRAWING STATUS

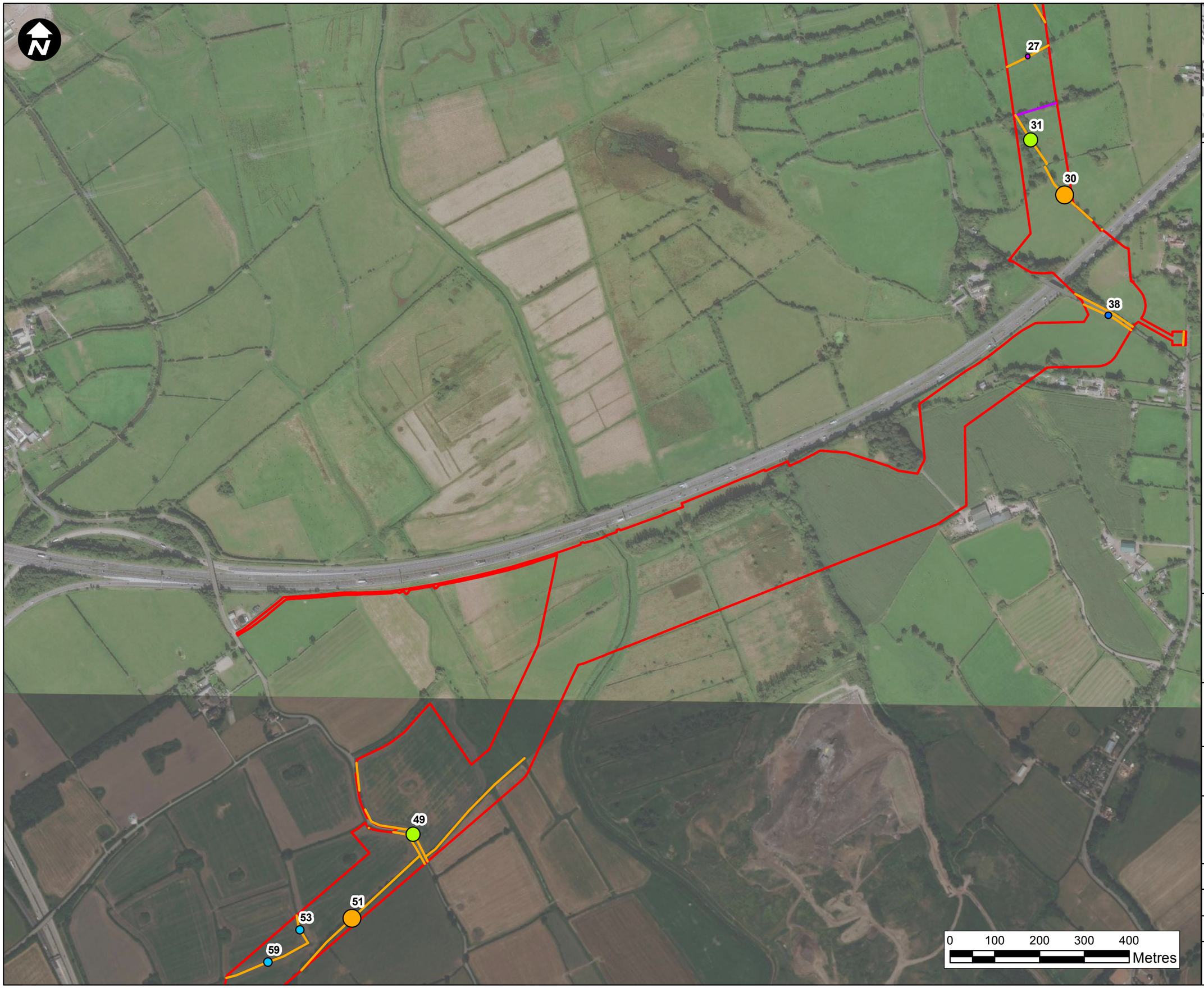
For Information

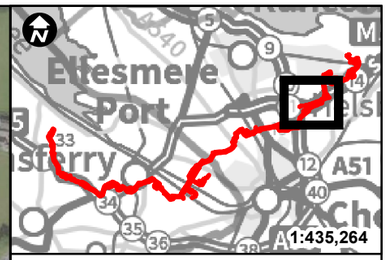
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:7,700	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.4-Sheet1





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

Average ppn total

- 0.00 - 9.99
- 10.00 - 29.99
- 30.00 - 59.99
- 60.00 - 99.99
- 100.00 - 159.99
- 160.00 - 249.99
- 250.00 - 409.99
- 410.00 - 679.99
- 680.00 - 1119.99
- 1120.00 - 1900.00

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.4 - Average Bat Activity Sheet 2

DRAWING STATUS

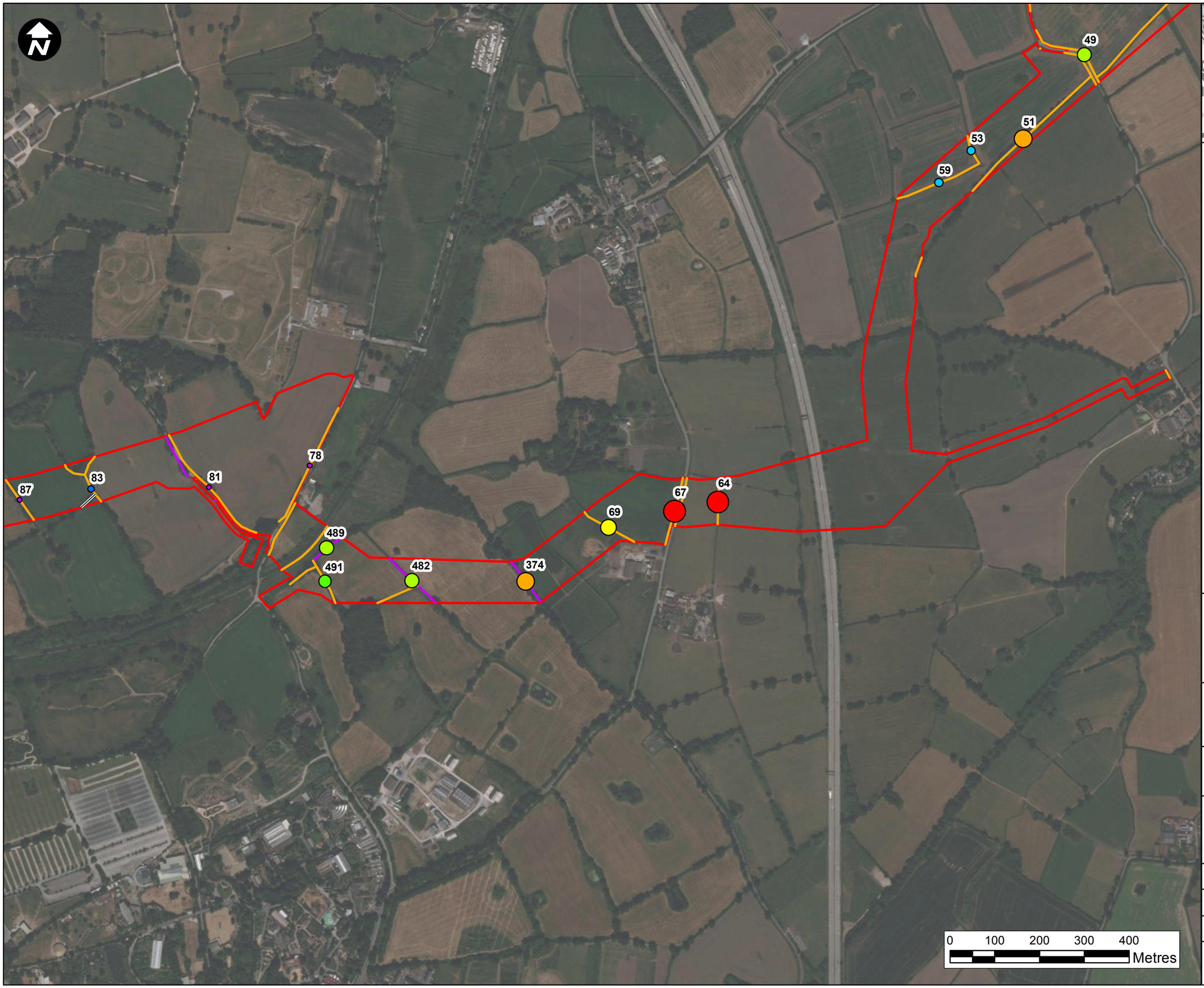
For Information

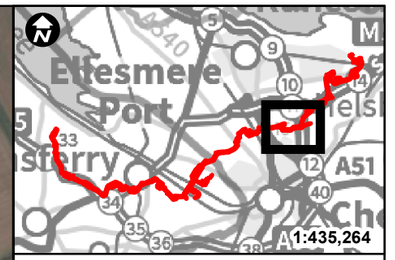
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:7,700	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.4-Sheet2





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

Average ppn total

- 0.00 - 9.99
- 10.00 - 29.99
- 30.00 - 59.99
- 60.00 - 99.99
- 100.00 - 159.99
- 160.00 - 249.99
- 250.00 - 409.99
- 410.00 - 679.99
- 680.00 - 1119.99
- 1120.00 - 1900.00

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.4 - Average Bat Activity Sheet 3

DRAWING STATUS

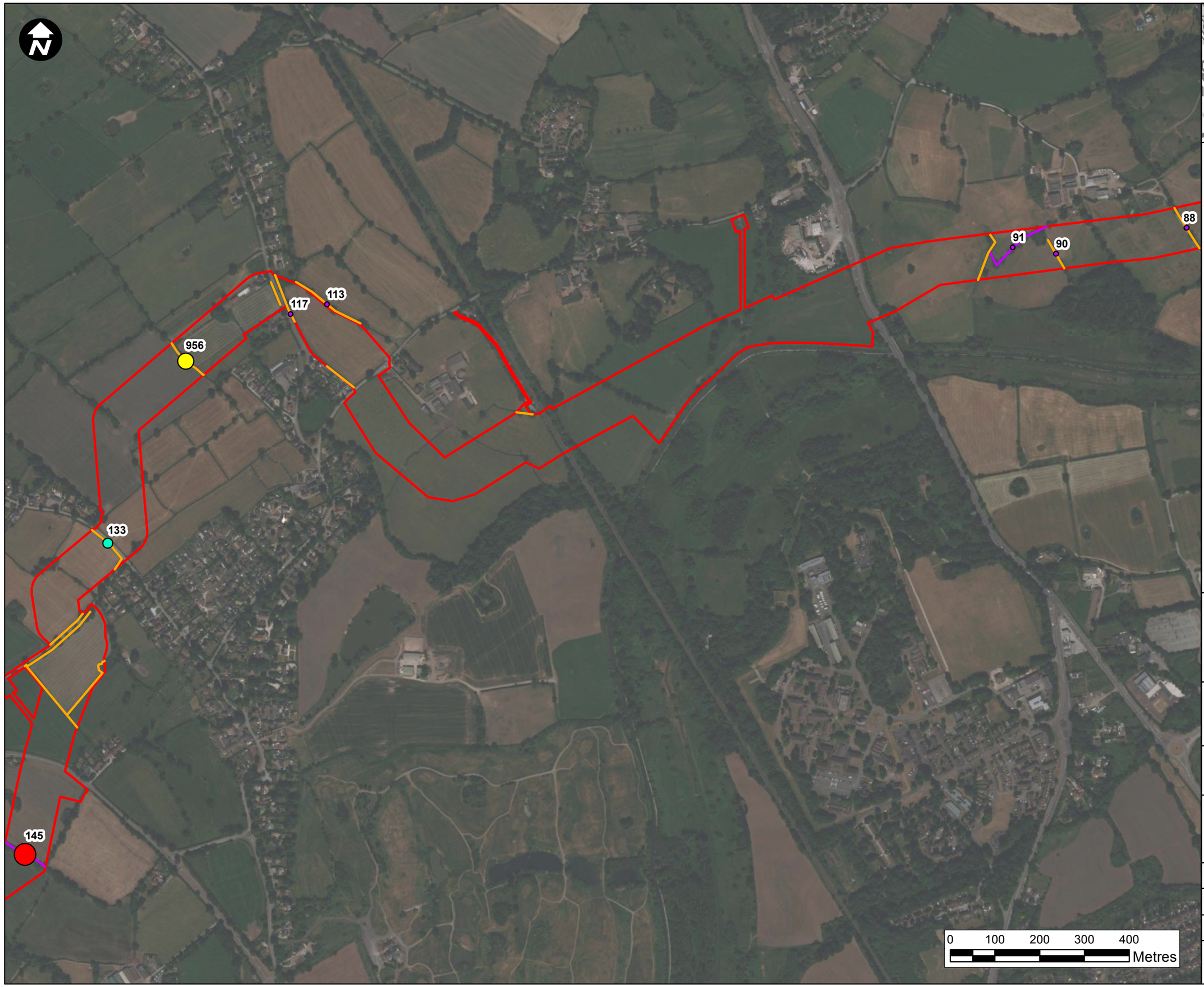
For Information

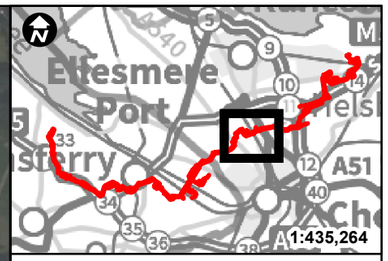
DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:7,700	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.4-Sheet3





Key:

- Newbuild Infrastructure Boundary
- Not Yet Assessed
- Excellent
- Good
- Poor

Average ppn total

- 0.00 - 9.99
- 10.00 - 29.99
- 30.00 - 59.99
- 60.00 - 99.99
- 100.00 - 159.99
- 160.00 - 249.99
- 250.00 - 409.99
- 410.00 - 679.99
- 680.00 - 1119.99
- 1120.00 - 1900.00

HyNet North West

PROJECT TITLE

HyNet North West Carbon Dioxide Pipeline DCO

DRAWING TITLE

Figure 9.4.4 - Average Bat Activity Sheet 4

DRAWING STATUS

For Information

DRAWN	CHECKED	APPROVED	AUTHORISED
SW	SW	JO	SP

SCALE @ A3 SIZE	DATE	REVISION
1:7,700	19/09/2022	P01

DRAWING NUMBER

EN070007-APP-ES-9.4.4-Sheet4