Appendix B1(i): Landscape and Visual Addendum

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Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

Supplementary Environmental Information

Appendix B1(i): Landscape and Visual Addendum

February 2022

Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

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Contents

1. Introduction 3
1.1 Assumptions and Limitations 3
2. Impacts and Mitigation 4
2.1 Landscape Effects 4
2.2 Visual Effects 5
2.3 Environmental Masterplan 7
3. Summary 8

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1. Introduction

1) This report provides supplementary information to the June 2021 Landscape and Visual Impact Assessment (LVIA) (hereafter referred to as the 'June 2021 LVIA'), which was submitted as Chapter 6: Landscape and Arboriculture, as part of the Proposed Bowland Section Environmental Statement for the Haweswater Aqueduct Resilience Programme (HARP) (hereafter referred to as the 'June 2021 Environmental Statement').

1.1 Assumptions and Limitations

2) This report assesses the landscape and visual impacts of the revised development proposals when compared to the previous assessment. It should therefore be read in conjunction with the June 2021 LVIA and the June 2021 Environmental Statement.

3) Supplementary arboricultural information is included within Appendix B2: Off-site Highways Arboricultural Technical Note and Section 3.8 of the Bowland Supplementary Environmental Information report.

4) Following submission of the June 2021 Environmental Statement the number of trees within the two construction compounds categorised as being either 'removal / partial removal' or 'at risk' has been reduced when compared with number reported in the June 2021 Environmental Statement. This outcome has been achieved through additional embedded mitigation measures. With fewer trees being at risk of removal within the two main construction compounds, the number of trees categorised as 'Retained with Protection Measures' (RwPM) has consequently increased. These changes are reflected in the updated assessment below, and in the revised Figure 20.1 Environmental Masterplan (Rev 1) (Appendix B9).

5) A review of the photomontages presented in Volume 3 of the June 2021 Environmental Statement has been undertaken. It is considered that there would be a barely perceptible or perceptible change in the previously-submitted photomontages resulting from the revised number of tree losses, taking account of the landscape mitigation planting shown on the Proposed Bowland Section. As such, the ability to determine the visual impacts arising from the Proposed Bowland Section on identified receptors would not be materially altered from the situation described in Volume 2 of the June 2021 Environmental Statement. The photomontages therefore remain unchanged from the June 2021 LVIA.

6) The assessment methodology and criteria used within this report is as per the June 2021 LVIA. Refer to Chapter 6, Section 6.4 of the Proposed Bowland Section June 2021 Environmental Statement for further details. Landscape baseline conditions are as presented in Chapter 6, Section 6.5 of the June 2021 Environmental Statement.

7) This review of the June 2021 LVIA for the Proposed Bowland Section has been undertaken as part of a desk-based exercise only. As such, landscape and visual receptors have not be revisited to reassess the potential change arising from the revised design and embedded mitigation proposals. However, it is anticipated that no material changes in the landscape and visual context of the assessment area have taken place over the intervening period.

8) The assessment of the Lower Houses off-site highways works have been revisited in the field. These surveys were conducted by a Chartered Landscape Architect in December 2021.

2. Impacts and Mitigation

9) A review of the proposed design changes described within the Proposed Bowland Section SEI Report has been undertaken to determine whether there would be any change to the landscape and visual effects reported in the June 2021 LVIA.

2.1 Landscape Effects

10) The following section summarises the changes to the assessment of landscape effects for the Lower Houses Compound, the Newton-in-Bowland Compound and the off-site highways works.

2.1.1 Lower Houses Compound

11) There would be no change to the likely significant effects on the following affected landscape receptors reported in the June 2021 LVIA. As such, the anticipated landscape effects would remain consistent with those identified within the June 2021 LVIA.

- 2b. Central Bowland Fells LCA
- 4d. Bowland Gritstone Fringes LCA
- 5j. North Bowland Fringes LCA
- 10b. North Bowland Valleys LCA
- B9. Goodber Common LCA
- D2. Tatham LCA
- D13. Park House LCA
- I3. Hindburndale LCA.

12) The amended proposals would result in some beneficial changes to the existing vegetation at the Lower Houses Compound with a small number of the previously surveyed trees and tree groups now being retained where previously considered at risk of removal. No additional or other previously identified landscape receptors from the June 2021 LVIA would be impacted. This is because the effects of these changes would be negligible and non-material in the context of the landscape effects previously described in Volume 2 of the June 2021 Environmental Statement.

2.1.2 Newton-in-Bowland Compound

13) There would be no change to the likely significant effects experienced by the following affected landscape receptors reported in the June 2021 LVIA. As such, the anticipated landscape effects would remain consistent with those identified within the June 2021 LVIA.

- 2b. Central Bowland Fells LCA
- 4e. Bowland Limestone Fringes LCA
- 5a. Upper Hodder Valley LCA
- D5. Beatrix to Collyholme LCA
- G3. Upper Hodder LCA.

14) Specific changes at the Newton-in-Bowland Compound would include a revised layout to the to the access track off B6478 Hallgate Hill; a revision to the planning application boundary to accommodate the widening of the below-ground tunnel construction easement; and alterations to the previously assessed vegetation (hedges, individual trees and tree groups). There would also be the inclusion of the proposed temporary Gamble Hole Farm Pasture BHS crossing during the enabling works, construction and commissioning phases.

15) No additional or other previously identified landscape receptors from the June 2021 LVIA would be impacted. This is because the effects of these changes would be negligible and non-material in the

context of the landscape effects previously described in Volume 2 of the June 2021 Environmental Statement.

2.1.3 Off-site highways works

16) Additional off-site highways works would be required at Lower Houses, including the provision of eight new road widening locations along Eskew Lane and the inclusion of the Spen Brow Holding Area. Furthermore, there would also be a revision to the Lower Houses Compound access strategy around Wray, including changes to the usage of the Wray Satellite Compound.

17) Landscape effects would remain consistent with those identified within the June 2021 LVIA. There would continue to be no likely significant effects on identified landscape receptors when determining the impacts arising from the proposed individual works at specific locations. However, intra-project cumulative (in-combination) effects arising from the off-site highways works in combination with the construction activity for the compounds would continue to occur on landscape receptors within the wider area. The intra-project cumulative effects are discussed in Volume 2, Chapter 19 of the June 2021 Environmental Statement and its conclusions would remain the same.

2.2 Visual Effects

18) The following section summarises the changes to the assessment of visual effects for the Lower Houses Compound, the Newton-in-Bowland Compound and the off-site highways works.

2.2.1 Lower Houses Compound

19) As a result of the increased in retained vegetation at the Lower Houses Compound, the following 10 previously assessed visual receptors would experience a slight beneficial change to their views and visual amenity when compared to the findings from the June 2021 Environmental Statement:

- T3/02: The Hill (Grade II), Spen Lodge, Green farm and surrounding residential properties, Lancaster FP 23, FP 64 and FP 26, and Spen Brow
- T3/05b: Lower House Cottage, North Bowland Traverse Long distance path and Lancaster FP 21
- T3/07a / TR03_01: North Bowland Traverse long distance path, Lancaster PRoW FP22, FP23 and FP44 and Park House Lane
- T3/07: North Bowland Traverse Long distance path and Lancaster FP 23
- T3/08: Lancaster FP 22
- T3/09: Lancaster FP 19
- T3/10: North Bowland Traverse Long distance path, Lancaster FP 21 and a local moor road
- T3/16a: Open Access Land
- T3/16b: Overhouses (farm), Bottom Hall Farm and Lancaster FP 22, FP 25 and FP 26
- T3/17: Higher Stock Bridge Farm (Grade II), Lancaster FP 29 and surrounding PRoW network, and High Road.

20) However, this visual change would be experienced in the wider context of the other changes at the compound (e.g. construction activity during the Construction Period) and therefore the predicted likely significant effects on visual receptors would remain unchanged from the June 2021 LVIA.

21) The remaining visual receptors identified in the June 2021 LVIA would experience a barely perceptible change or no change to their views and visual amenity. No additional visual receptors would be significantly impacted.

2.2.2 Newton-in-Bowland Compound

22) As a result of the overall increase in the retention of existing trees and woodland within affected views changes at the Newton-in-Bowland Compound, the 10 visual receptors listed below from the June 2021

LVIA would experience a slight change to their views and visual amenity when compared to the findings from the June 2021 Environmental Statement.

- T3/26: Brown Hills Farm, Ribble Valley FP 14, Back Lane
- T3/28: Newton settlement edge, Newton Road to Dunsop Bridge
- T3/29: The Heaning (Farm), Ribble Valley FP 15
- T3/30: Fober Farm, Dunsop Road
- T3/33 / TR03_04: The Hodder Way and the Pendle Witches Way Long distance paths, Ribble Valley FP 31 and the surrounding footpath network
- T3/34: Long Stripes Farmhouse, Grade II Listed, Ribble Valley FP 26 and the surrounding footpath network
- T3/35 / TR03_03: Residential properties Farrowfield and surrounding properties, the Hodder Way Long distance path, Ribble Valley FP 35, FP 40, FP 43 and the surrounding footpath network, Easington Road
- T3/36: The Hodder Way Long distance path, Ribble Valley FP 26, Hallgate Hill
- T3/39: Ribble Valley FP 36
- T4/03: Newlaithe Farm, Ribble Valley FP 43.

23) The proposed temporary Gamble Hole Farm Pasture BHS crossing would also be a perceptible new feature where present, although it would be largely seen against a backdrop of trees and woodland and construction activity. On balance, this would result in an additional beneficial change to views and visual amenity for these remaining visual receptors, although this change would be experienced in the context of the other changes at the Newton-in-Bowland Compound (e.g. construction activity). There would therefore be no overall change to the likely significant visual effects previously reported in Volume 2 of the June 2021 Environmental Statement.

24) The remaining visual receptors identified in the June 2021 LVIA would experience a barely perceptible change or no further change to their views and visual amenity. No additional visual receptors would be significantly impacted.

2.2.3 Off-site highways works

25) The locations of the following visual receptors are shown on Figure 1: Lower Houses Highways Works – Landscape Assessment.

26) Due to the additional off-site highways works along Eskew Lane, the residents at Oxenforth Green and the users of PRoW 1-32-FP 69 (T3H/28) would continue to experience a likely significant effect from visual impact during construction. These visual receptors, previously assessed as part of the June 2021 Environmental Statement, would now have views towards the additional passing places along Eskew Lane (RW34 and RW35), in addition to the continued presence of RW09 from the June 2021 Environmental Statement.

27) Furthermore, the following visual receptors would be significantly impacted by the additional off-site highways works along Eskew Lane and the inclusion of the Spen Brow Holding Area. These new visual receptors, supplementary to those identified in the June 2021 ES, would experience likely significant effects as a result of the visual impact during construction.

- The users of PRoW 1-32-FP 20
- The users of PRoW 1-32-FP 21
- The users of PRoW 1-32-FP 22
- The users of PRoW 1-32-FP 23
- The residents at Old Moor Road.

28) The users of PRoW 1-32-FP 20 and PRoW 1-32-FP 22 would now have views towards the additional passing places at RW36, RW37 and RW38, along with the continued presence of RW11 from the June 2021 Environmental Statement. These receptors would now experience noticeable visual disturbance from the construction activity for these off-site highways works along Eskew Lane.

29) The users of PRoW 1-32-FP 20 and the residents at Old Moor Road would now have views towards the additional passing places at RW32, RW33, RW34, RW35, along with the continued presence of RW09 from the June 2021 Environmental Statement. These receptors would now experience noticeable visual disturbance from the construction activity for these highway improvements along Eskew Lane.

30) The users of PRoW 1-32-FP 23 would now have views towards the Spen Brow Holding Area, resulting in noticeable visual disturbance and deterioration in visual amenity during construction. Although visual effects wouldn't be experienced at close proximity, they would be possible from multiple sections of the footpath route.

31) Other visual receptors within the immediate surrounding landscape would be unlikely to experience significant visual effects. The remaining visual receptors from the June 2021 Environmental Statement would be unaffected by the additional off-site highways works at Lower Houses and minor changes to the layout and usage of the Wray Satellite Compound.

2.3 Environmental Masterplan

32) The Environmental Masterplan (EMP) (refer to Figure 20.1: Environmental Masterplan (Rev1) (Appendix B9)) comprises a series of drawings illustrating the locations where site-specific mitigation measures are proposed, including mitigation notes to highlight the design response to reduce or offset the identified effects. The EMP covers a limited number of EIA topic areas, namely: Landscape and Arboriculture, Ecology, Cultural Heritage, Water Environment, Public Access and Recreation and Noise and Vibration.

33) The EMP has been updated to account for the proposed amendments to vegetation loss and retention at the Lower Houses and Newton-in-Bowland Compounds, as well as amendments to the defined working area boundaries. This mitigation strategy follows the same design approach to the June 2021 Environmental Statement.

3. Summary

34) There would be no change to the likely significant effects experienced by the visual and landscape receptors as a consequence of the changes at the Proposed Lower Houses and Newton-in-Bowland Compounds. Changes would be localised in nature and experienced in the context of the wider scheme proposals at each compound. No new landscape or visual receptors identified in the June 2021 LVIA would be significantly affected.

35) The additional off-site highways works at Lower Houses would increase the number of visual receptors in the surrounding vicinity that would be likely to experience significant effects as a result of the visual impacts during construction. These five additional visual receptors (users of PRoW 1-32-FP 20; users of PRoW 1-32-FP 22; users of PRoW 1-32-FP 21; users of PRoW 1-32-FP 23; and residents at Old Moor Road) would be impacted by the eight additional off-site highways works along Eskew Lane and the inclusion of the Spen Brow Holding Area. These would also be viewed in conjunction with the continued presence of the highways improvements from the June 2021 Environmental Statement.

36) From the June 2021 Environmental Statement, the residents at Oxenforth Green and the users of PRoW 1-36-FP 2 (T3H/26) would continue to experience a likely significant effect from visual impact during construction, although they would now towards the additional passing places along Eskew Lane at RW34 and RW35. The remaining visual receptors from the June 2021 Environmental Statement would be unaffected by the additional highways improvement works. No likely significant landscape effects would remain, although intra-project cumulative effects would continue to occur on landscape receptors within the wider area.

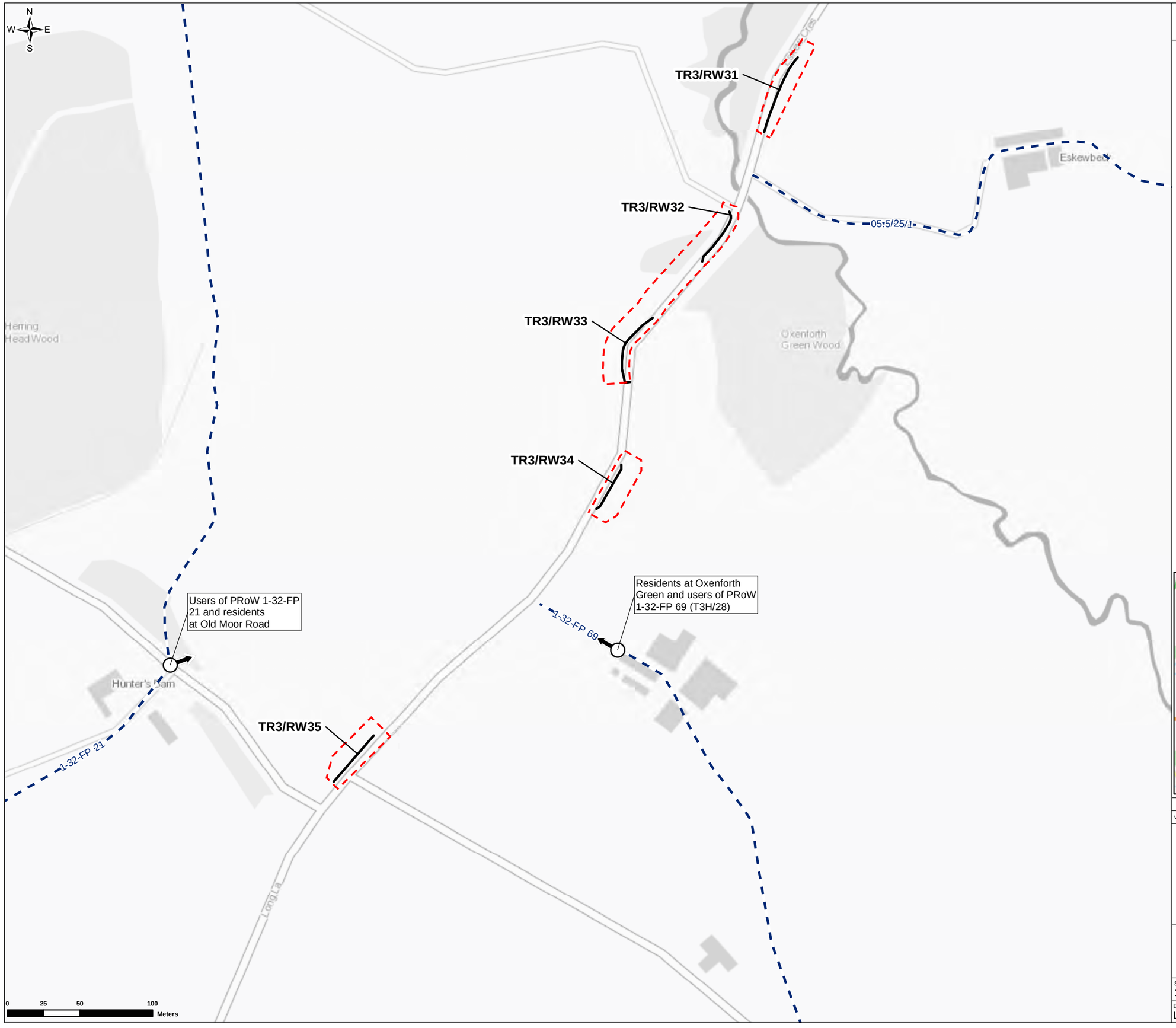
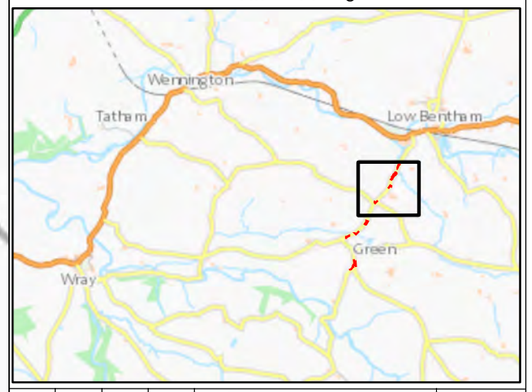


FIGURE 1

Legend

- Planning Application Boundary
- Road Widening (RW)
- Viewpoint
- Public Right of Way

Label Abbreviations:
RW - Road Widening



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United Utilities
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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
LOWER HOUSES HIGHWAYS WORKS - LANDSCAPE ASSESSMENT
PAGE 1 OF 2

SCALE	SHEET SIZE
1:2,500	A3
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LCC_RVBC-BO-FIG_B1	0

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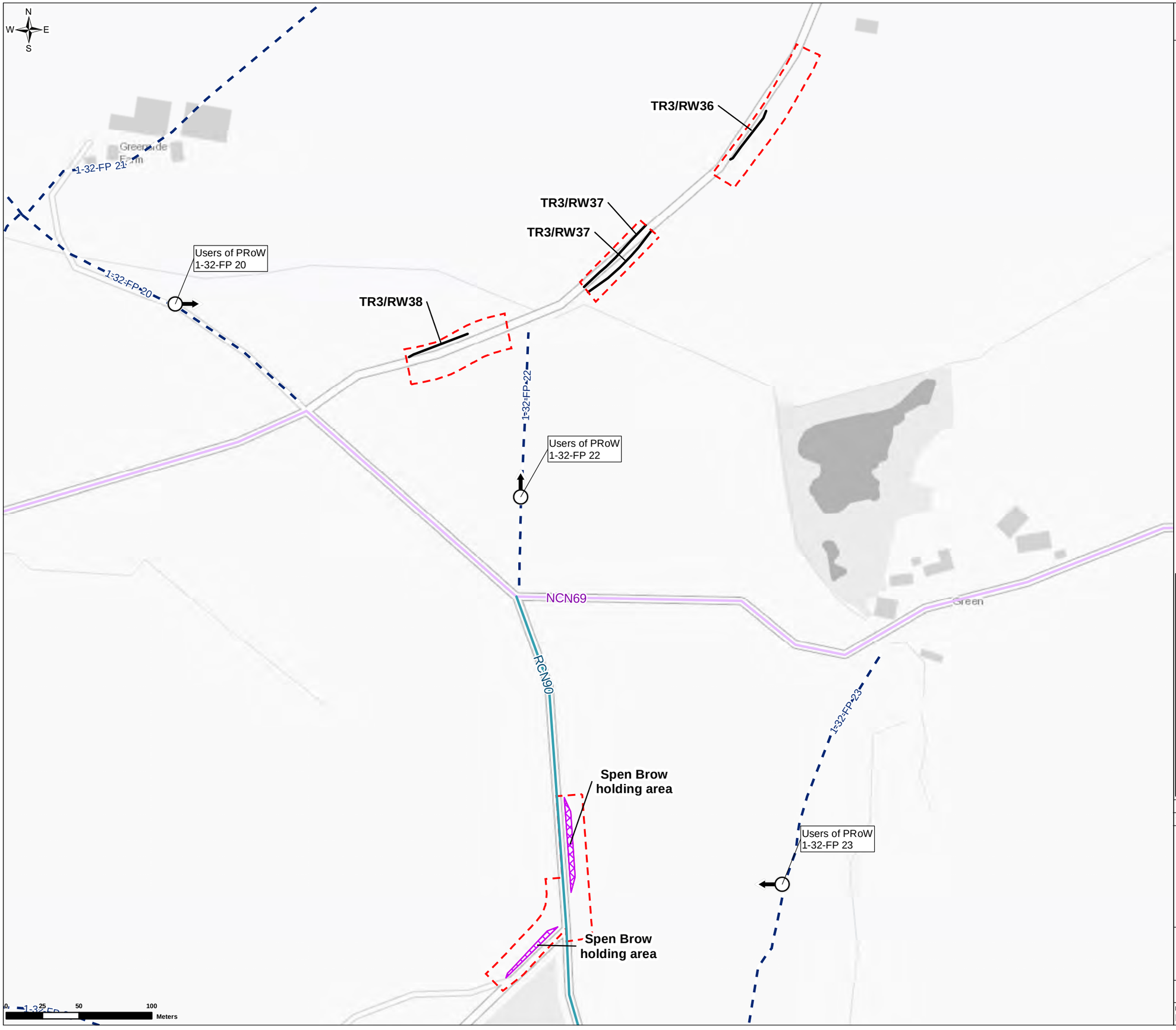
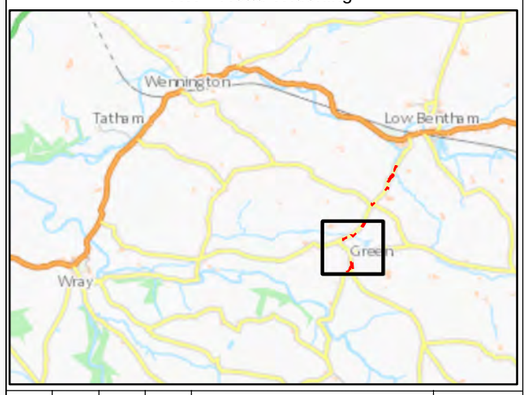
FIGURE 1



Legend

- Planning Application Boundary
- Road Widening (RW)
- Passing Place (PP)
- Viewpoint
- Public Right of Way
- National Cycle Route
- Regional Cycle Route

Label Abbreviations:
RW - Road Widening



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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
LOWER HOUSES HIGHWAYS WORKS - LANDSCAPE ASSESSMENT
PAGE 2 OF 2

SCALE	SHEET SIZE
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Appendix B1(ii): Planting Proposals

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Haweswater Aqueduct Resilience Programme – Proposed Bowland Section

Supplementary Environmental Information

Appendix B1(ii): Planting Proposals

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Haweswater Aqueduct Resilience Programme – Proposed Bowland Section

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Contents

1. Planting Proposals 1
1.1 Background to the Document 1
1.2 Objectives 1
2. Planting Schedules 3
3. Specification and Maintenance 5

1. Planting Proposals

1.1 Background to the Document

1) The Proposed Bowland Section would result in vegetation removal, including hedgerows, and hedgerow trees and loss of other features such as dry-stone walls and fence lines. The document sets out the approach for reinstatement for individual trees, woodland and hedgerows. The Environmental Masterplan (EMP) shows reinstatement locations (refer to Figure 20.1).

2) A series of planting schedules have been developed for the areas of mitigation vegetation by landscape architects in conjunction with Ecologists and Arboriculturalists. The schedules have been developed to ensure proposed mitigation vegetation is of a similar character to that found within Lancashire and to ensure the mitigation vegetation meets its objectives such as providing screening or creating habitats. Ash species are not specified due to Ash dieback.

3) Tables 20.2 and 20.5 below include suitable species mix and specification for better establishment in the exposed Lowerhouses location.

4) Seeding mixes have not been included in this document as consultation should be carried out with landowners to confirm seeding requirements. Seeding mixes would, therefore, be developed as part of detailed design.

1.2 Objectives

5) The following is a list of objectives for each planting type shown on the EMP:

1.2.1 Proposed Trees

6) Trees appropriate to the specific location, identifiable as individual trees separate from other woody vegetation, planted to replace individual trees lost as part of the scheme and to aid landscape integration.

1.2.2 Proposed Native Woodland Planting

7) Planting dominated by tree species appropriate to the location, to replace woodland lost as part of the Proposed Bowland Section, create habitat and provide a screening function. Evergreen and coniferous species have been included to aid visual screening.

1.2.3 Proposed Reinstatement of Native Hedgerow

8) Shrub planting species appropriate to the location, used to create linear features along boundaries in keeping with local landscape character, to enhance biodiversity and help with landscape integration. The suggested mix identified in Table 20.4 represents the “average” mix and that individual hedge mixes should be adjusted nominally on site according to location and composition of retained hedge sections.

1.2.4 Proposed Reinstatement of Important Hedgerows (Hedgerow Regulations 1997) and Species Rich Hedgerows

9) Important Hedgerows (Hedgerow Regulations 1997) and Species Rich Hedgerows are to be reinstated as they occur in the landscape so local distinctiveness and variation of species can be recreated. The composition of both tree/shrub species and the hedgerow ground flora should mimic the species mix found naturally, according to locality. Table 20.3 below identifies the required specification of larger plants to achieve quicker re-establishment. However, the precise species mixes specific to individual locations would be provided at detailed design stage.

1.2.5 Proposed Reinstatement of Grassland and Species Rich Grassland (Seeding)

10) The EMP identifies areas for reseeding although detailed seed mixes have not been specified. Throughout the arable and pastoral areas agreement would be required with landowners to determine seed mixes to be reinstated.

11) The seed mix for areas of species rich grassland, species rich hedgerows (i.e. seeding to hedgerow bottoms) and riparian areas should fit the species mix found naturally, according to locality. Seed mixes would be developed using recorded data from the Phase 1 Habitat survey and details provided at detailed design stage.

2. Planting Schedules

12) Planting shall be in accordance with Figure 20.1, EMP.

13) The following tables provide details of the planting mixes for the areas of mitigation vegetation shown on the EMP. Final planting positions and numbers would be identified during detailed design and shall comply with United Utilities' guidelines for planting near pipeline routes, Standard Conditions for Works Adjacent to Pipelines, 2015[1].

Table 20.1: Proposed Trees

Species	Girth (cm)	Root Condition	Specification
Acer campestre	8-10	Bare-root	Standard: 2x: 250-300cm height
Alnus glutinosa	8-10	Bare-root	Standard: 2x: 250-300cm height
Betula pendula	8-10	Bare-root	Standard: 2x: 250-300cm height
Prunus avium	8-10	Bare-root	Standard: 2x: 250-300cm height
Prunus padus	8-10	Bare-root	Standard: 2x: 250-300cm height
Quercus robur	8-10	Bare-root	Standard: 2x: 250-300cm height
Sorbus aucuparia	8-10	Bare-root	Standard: 2x: 250-300cm height

Table 20.2: Proposed Tree Species for Lowerhouses (exposed location)

Species	Girth (cm)	Root Condition	Specification
Quercus robur	40-60	150cc min	1+0: Seedling; cell grown

Table 20.3: Proposed Native Woodland Planting

Species	Height (cm)	Root Condition	Specification	%
Betula pendula	175-200	Bare-root	Feathered: 2x: 5 breaks	15
Corylus avellana	40-60	Bare-root	1+1: Transplant	10
Crataegus monogyna	40-60	Bare-root	1+1: Transplant	15
Ilex aquifolium	40-60	2L Container	Leader with laterals	10
Quercus robur	40-60	Bare-root	1+1: Transplant	15
Pinus sylvestris	40-60	3L Container	Leader with laterals	5
Prunus avium	40-60	Bare-root	1+1: Transplant	10
Prunus spinosa	40-60	Bare-root	1+1: Transplant	10
Sorbus aucuparia	175-200	Bare-root	Feathered: 2x: 5 breaks	10

[1] United Utilities Standard Conditions for Works Adjacent to Pipelines Document Ref. 90048 Issue 3.1 July 2015 http://programmeofficers.co.uk/Preston/CoreDocuments/LCC144.pdf

Table 20.4: Proposed Native Hedgerows

Species	Height (cm)	Root Condition	Specification	%
Corylus avellana	60-80	Bare-root	1+2: Transplant	20
Crataegus monogyna	40-60	Bare-root	1+1: Transplant	50
Ilex aquifolium	40-60	2L Container	Leader with laterals	15
Prunus spinosa	40-60	Bare-root	1+1: Transplant	15

Table 20.5: Proposed Native Hedgerows for Lowerhouses (exposed location)

Species	Height (cm)	Root Condition	Specification	%
Corylus avellana	40-60	150cc min	1+0; Seedling; cell grown	20
Crataegus monogyna	40-60	150cc min	1+0; Seedling; cell grown	50
Ilex aquifolium	20-40	150cc min	1+0; Seedling; cell grown	15
Prunus spinosa	40-60	100cc min	1+0; Seedling; branched; cell grown	15

Table 20.6: Proposed Important Hedgerows (Hedgerow Regulations 1997) and Species Rich Hedgerows

Species	Height (cm)	Root Condition	Specification	%
Acer campestre	80-100	Bare-root	1+2: Transplant	10
Corylus avellana	90-120	Bare-root	1+2: Transplant	15
Crataegus monogyna	100-125	Bare-root	1+1: Transplant	40
Ilex aquifolium	40-60	2L Container	Leader with laterals	10
Prunus spinosa	80-100	Bare-root	1+2: Transplant	15
Rosa canina	40-50	Bare-root	1+0: Branched	5
Ulex europaeus	30-40	3L Container	Bushy	5

3. Specification and Maintenance

14) Planting works would be undertaken in accordance with BS3936, BS5837 and BS4428 and a specification for planting would be developed fully at the detailed design stage. Below is a summary of operations:

- Soil preparation including subsoil decompaction and topsoil cultivation
- Supply of slow release fertiliser
- Hedgerow planting at 5 no. plants per linear metre in a double staggered row with plants at 330 mm centres with 450 mm between the rows
- Tree and shrub planting in woodland at 1.5-2 m centres in single species groups of 5-7 no.
- Transplants notch planted in a T or H shaped notch and evergreen species in a pit 400 mm deep x 450 mm diameter
- Standard and feathered trees planted within pits 600 mm deep x 1000 mm diameter with sides thoroughly broken up to 250 mm. Backfill mix to include compost at a rate of 1 part topsoil to 1 part compost. Trees to be supplied with stakes and ties
- Transplants and shrubs supplied with tree and shrub guards
- Evergreen species supplied with anti-desiccant before and immediately after planting.

3.1.1 Maintenance

15) Habitats, trees, shrubs, grasslands would be planted, seeded and established by appropriate aftercare including replacement of dead/dying individual plants in line with requirements set out and agreed with Lancaster City Council and Ribble Valley Borough Council.

Appendix B2: Arboricultural Technical Note -Off-site Highways Works

Document reference: LCC_RVBC-BO-V5-P1-B2

Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

Supplementary Environmental Information

Appendix B2: Arboricultural Technical Note - Off-site Highways Works

February 2022

Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

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Contents

1. Introduction 1
1.1 Purpose of Technical Note 1
1.2 Basis of Assessment 1
1.3 Scope of Assessment and Survey Methodology 1
1.4 Red Amber Green (RAG) Impact Assessment Methodology 2
1.5 Survey Limitations 2
1.6 Assessment Limitations 3
1.7 Assumptions 3
2. Site Observations 5
2.1 Quantitative Results of the Tree Survey 5
3. Discussion 6
3.1 Significant arboricultural impacts 6
3.2 Irreplaceable habitat within the assessment area 6
3.3 Statutorily Protected Trees within the assessment area 6
3.4 Notable Tree Impacts - overview 7
3.5 RAG Assessment – preliminary tree removals 7
3.6 RAG Assessment – preliminary tree retention 7
3.7 General Recommendations 8
3.8 Arboricultural Action Required 8
3.9 Site Supervision 9
4. References 10

Appendix A. Reference Material

Appendix B. Scope and Methodologies

B.1 Survey Methodology

B.2 RAG Assessment Methodology

B.3 Ancient/Veteran Tree Assessment Methodology

Appendix C. Cascade Chart of Tree Quality Assessment (taken from BS5837:2012)

Appendix D. Tree Survey Schedule Key

Appendix E. Tree Survey Schedule including Preliminary AIA impacts- Lancaster City Council

Appendix F. Tree Survey Schedule including Preliminary AIA impacts- Ribble Valley Borough Council

1. Introduction

1.1 Purpose of Technical Note

1) This Technical Note has been developed for various off-site highways works associated with the Proposed Bowland Section which forms part of the overall Proposed Programme of Works.

2) 59 locations across the Proposed Bowland Section have been proposed for off-site highways works as part of the enabling works phase. Design information and the Planning Application Boundary for these proposals are shown on LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003 and include the following works:

- Construction of passing places (typical dimensions approximately 35 m long x 2.5 m wide)
- Construction of road widening sections (typically 1-2 m widening of the existing carriageway).

3) The locations of these design proposals are shown on LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003 in the June 2021 Environmental Statement. Offsite highways work areas associated with Proposed Marl Hill Section are confined to a single planning authority, Ribble Valley Borough Council.

1.2 Basis of Assessment

4) The design information used to inform this assessment is referenced in Appendix A. Should further design development impacting on arboricultural resources be proposed at a later date, this technical note should be reviewed and updated accordingly by an appropriately qualified arboriculturist.

1.3 Scope of Assessment and Survey Methodology

5) As part of a wider arboricultural impact assessment, tree surveys were undertaken at the location of and in proximity to off-site highways work areas associated with the Proposed Marl Hill Section. Reference to trees in this technical note should be taken to include individual trees, woodland, tree groups and hedgerows where appropriate. The technical note has been produced with reference to '*BS 5837:2012- Trees in relation to design, demolition and construction – Recommendations*'[1]. Scope requirements comprised:

- Surveying and recording information about trees that are potentially impacted by off-site highways works required for the Proposed Marl Hill Section
- Assessing the potential impact on trees including tree removals
- Provision of survey information within a technical report.

6) The survey considered trees located within and up to 15 m from the Planning Application Boundary for each off-site highways work areas, referenced in Appendix A. The spatial scope of surveys is referred to as the 'assessment area' within this technical note. The assessment area was refined by focusing surveys upon trees located on the side of the carriageway where off-site highways work areas are proposed.

7) Baseline survey visits to multiple locations were undertaken by arboricultural surveyors between January and February 2021 and November 2021. The tree survey was conducted in accordance with BS 5837:2012[2] with the exception of the following deviations:

- Estimated Remaining Contribution for each survey feature
- Structural and/or physiological condition details for each survey feature. Key observations on the condition of trees considered unsuitable for retention were included

[1] British Standards Institute (2012). *British Standard 5837: 2012 Trees in relation to design, demolition and construction – Recommendations. London: BSI Ltd.*

[2] British Standards Institute (2012). *op. cit.*

- Canopy or branch height dimensions of tree survey features. This information may be required at a later date to determine specific associated pruning requirements. This technical note and LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003 in the June 2021 Environmental Statement should be provided as a reference document for any associated pruning works specification in line with BS3998:2010 'Tree Work – Recommendations'[3].

1.4 Red Amber Green (RAG) Impact Assessment Methodology

8) The assessment of potential tree impacts has been informed by spatial data parameters calculated with Geographic Information Systems (GIS). The RAG assessment uses traffic light colour symbology and is based upon a survey feature's Root Protection Area (RPA) or canopy constraint relative to the indicative Planning Application Boundary. Full details on the impact assessment methodology are detailed in Section B.2 of Appendix B and are summarised below:

- Red features are trees subject to varying extents of removal based upon stem or canopy encroachment within the Planning Application Boundary. It is understood that vegetation clearance plus soil strip would be fully required within the Planning Application Boundary
- Amber features are trees considered to be a 'Removal Risk Aiming to Retain' (RRAtR) and are determined on the basis of encroachment by the Planning Application Boundary. Individual trees are identified as at risk of removal if the Planning Application Boundary encroaches upon a tree's total RPA by 20 % or over (in square metres). Contiguous/linear features i.e. tree groups, hedgerows or woodland are identified as at risk based upon canopy encroachment within an indicative 'at risk' spatial buffer external to the Planning Application Boundary. The 'at risk' buffer is determined by the RPA of encroached features located outside the Planning Application Boundary. The variable width of this buffer is calculated using the greatest radial RPA value intersected at each separate section of the Planning Application Boundary. RRAtR trees are reported to be removed within the technical note on a worst-case scenario basis
- Green features are considered to be 'Retained with Protection Measures' (RwPM). Encroached RwPM features, considered likely to require protection measures, are identified by an 'E' within the 'AIA' column of the Tree Survey Schedule of Appendix E. Individual trees are identified as RwPM if the Planning Application Boundary encroaches upon a total RPA by below 20 % (in square metres). Contiguous/linear features i.e. tree groups, hedgerows or woodland are identified as RwPM if their canopy does not intersect the indicative 'at risk' buffer outlined in the previous bullet point. Non-encroached RwPM features are identified by a 'N' within the 'AIA' column of the Tree Survey Schedule because no RPA encroachment within the At Risk Buffer is anticipated.

1.5 Survey Limitations

9) Limitations to the tree survey include the following key points:

- Plotting the location of trees was based on surveyor use of a GPS-enabled survey tablet and open-source aerial imagery. There was no topographical information relating to tree positions available at the time of surveys. In common with other GPS-enabled devices GPS locations are considered accurate to within 5 m, therefore all tree positions must be assumed to be indicative for planning purposes only. Later stage verification of all tree feature locations shall be required once a full topographical survey becomes available
- Due to restricted access and safe working limitations at some locations, the stem diameter of some trees was estimated where appropriate rather than measured. This is identified by a '#' suffix within the stem diameter at breast height (DBH) column of the Tree Survey Schedule of Appendix E
- Indicative root RPAs have been calculated for tree groups, hedgerows and woodland and are based on either the maximum or average DBH taken for a collective feature. Limited individual tree data for trees within collective features were recorded e.g. stem count for proposed mitigation

[3] British Standards Institute (2010). *British Standard 3998:2010 : 2012 Tree work – Recommendations. London: BSI Ltd.*

- Additional arboricultural site visits for more detailed tree data recording may be required at a later stage to inform detailed design including:
  - The determination of accurate tree clearance limits where tree impacts are expected (including impacts to trees on the external margins of the Planning Application Boundary)
  - The formation of a tree protection strategy (i.e. a Site Specific Arboricultural Method Statement (SS-AMS))
- A BS5837:2012 tree survey does not include a specific veteran/ancient tree assessment methodology. Refer to Section B.3 of Appendix B for more details on the adopted Ancient/Veteran Tree Assessment Methodology

1.6 Assessment Limitations

10) Limitations to the assessment include the following key points:

- Indicative assessment of tree removal, trees at risk and tree retention are informed by the RAG methodology outlined in Section 1.6. The RAG status of a feature and spatial extent of tree removals, RRAtR trees and RwPM trees are indicatively shown in LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003.
- Tree surveys focus upon trees with a stem diameter of over 75 mm. It is assumed that the assessment of trees lost below this size threshold and other low-level vegetation would be captured by Phase 1 ecology survey data.
- This assessment is specific to offsite highways work areas associated with the Proposed Bowland Section only. This TIN does not take into account any potential vegetation clearance or mitigation associated with the Arboricultural Impact Assessment submitted with the Proposed Bowland Section.

1.7 Assumptions

11) Assumptions for this assessment include the following key points:

- This assessment is based upon a fixed design however there is potential for additional construction details to become available at detailed design stage. Examples of additional elements/construction detail may include:
  - The provision of full topographical survey of existing tree stems and vegetation extents within the assessment area
  - Location specific detail of new or existing hard surfaced areas to be constructed/improved/demolished including passing places or road widening areas
  - Location specific detail of new/existing drainage infrastructure be constructed/improved within the Planning Application Boundary
  - Areas requiring soil level changes within the Planning Application Boundary i.e. soil stripping activities or earthwork extents
  - Compound or parking area layout arrangements
  - The diversion/removal/reinstatement of underground or overground utility services within the Planning Application Boundary
  - Facilitation access requirements relating to visibility splays, turning circles, new road furniture or signage
  - Working widths requirements for task-specific construction/demolition activities located within the Planning Application Boundary e.g. laydown areas or plant access routes
  - Re-alignment and construction detail of diverted public footpaths
  - Notification of project commitments e.g. confirmed working width reductions

- It is assumed that the above listed design detail will be positioned outside the constraints of retained tree features shown on the LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003 with no further assessment required.

2. Site Observations

2.1 Quantitative Results of the Tree Survey

12) Full tree survey results are described in the Tree Survey Schedule (Appendix E) and explanation of terms used in the schedule can be found in Appendices C and D.

13) Based upon the grading methodology of BS5837:2012, 'A' grade trees are of high quality and value and should be prioritised for retention. 'B' grade trees are of moderate quality and value and should be considered for retention where possible, although care should be taken to avoid misplaced retention. Any scheme should take into account the retention and protection of trees, but also the tree's future growth. The 'C' grade trees are of low quality and value and should not place a constraint on the proposals. U grade trees are those that are dead or are showing signs of significant, immediate, and irreversible overall decline.

14) Table 1 and Table 2 summarise the number of trees surveyed and their relative grading categories within the assessment area.

Table 1: Totals table of tree survey features and grading categories (Lancaster City Council)

BS5837:2012 grades	Trees	Tree Groups	Woodlands	Hedges	Subtotals
A	4	1	1	1	**7**
B	23	21	2	30	**76**
C	31	19	0	14	**64**
U	4	1	0	0	**5**
Subtotals	**62**	**42**	**3**	**45**	**152**

Table 2: Totals table of tree survey features and grading categories (Ribble Valley Borough Council)

BS5837:2012 grades	Trees	Tree Groups	Woodlands	Hedges	Subtotals
A	2	0	0	0	**2**
B	11	3	0	4	**18**
C	11	12	0	10	**33**
U	4	0	0	0	**4**
Subtotals	**28**	**15**	**0**	**14**	**57**

3. Discussion

3.1 Significant arboricultural impacts

15) Schedule 4(4) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 highlights the need to describe "significantly affected…fauna…and landscape" however there is no recognised arboricultural methodology for assessing the significance of effects associated with tree loss. Chapter 6 :Landscape and Arboriculture considers tree loss in the wider context of impacts to landscape character and visual amenity.

16) The Woodland Trust defines 'notable trees' to be "*usually a mature tree which may stand out in the local environment because they are large in comparison with other trees around them…in parts of the UK, where trees are less common, a tree may be relatively small…but notable because it is significant in its local environment*"[4]. In the context of national planning policy, significant tree loss is assessed where the following notable features are considered at risk of removal:

- Veteran or ancient trees
- Ancient woodland
- Statutorily protected trees
- High quality trees i.e. A grade features.

3.2 Irreplaceable habitat within the assessment area

17) Section 15 paragraph 175 of the National Planning Policy Framework (NPPF, 2019) states that 'development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists'. The NPPF refers to veteran and ancient trees as irreplaceable habitat due to their "age, size and condition, is of exceptional biodiversity, cultural or heritage value".

18) A desktop search, made on 23 March 2021, of the Woodland Trust's Ancient Tree Inventory (ATI) database indicates the absence of existing verified veteran or ancient trees within or immediately adjacent to the assessment area. Nevertheless, it should be noted that the ATI is not a definitive database for veteran/ancient trees.

19) It should be noted that no potential veteran or ancient trees were identified within the assessment area on the basis of criteria outlined in Section B.3 of Appendix B. It should also be noted that no ancient woodland has been identified within or immediately adjacent to the assessment area.

3.3 Statutorily Protected Trees within the assessment area

20) Trees which provide significant biodiversity or landscape value may be afforded protection based upon their location within a designated site e.g. Areas of Outstanding Natural Beauty (AONB) or Sites of Special Scientific Interest (SSSIs). At the time of writing, potential tree loss associated with any national or local designated site have not been specified within this TIN.

21) Trees which provide a significant amenity value to a local area may be afforded protection under the Town and Country Planning (Tree Preservation) (England) Regulations 2012 or Town and Country Planning Act 1990. At the time of writing, no LPA checks have been made regarding the presence of Tree Preservation Orders (TPOs) or Conservation Area (CA) within or immediately adjacent to the assessment area.

22) The Hedgerows Regulations 1997 protect most countryside hedgerows from being removed (including being uprooted or otherwise destroyed). The Regulations are administered by the LPA who decide if a

[4] Woodland Trust (2020) *Notable trees*. [online] Available at: https://ati.woodlandtrust.org.uk/what-we-record-and-why/what-we-record/notable-trees/ [Accessed: 06 October 2020]

[5] Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework

hedgerow is important. At the time of writing, potential tree loss associated to identified Important Hedgerows have not been specified within this TIN.

3.4 Notable Tree Impacts - overview

23) The proposed offsite highways work areas would result in the loss of trees through both permanent and temporary land-take. The locations of impacted features are indicatively shown in LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003. Based on the RAG assessment, design proposals would result in:

- the notable loss of the five high quality features i.e. A grade features
- the potential cumulative loss of approximately 69 % (145/209) of all surveyed vegetation within the assessment area i.e. features considered subject to varying extents of removal or assessed to be at risk of removal.

3.5 RAG Assessment – preliminary tree removals

24) All features RAG assessed as 'Red' or 'Amber' are reported to be removed for the purposes of this TIN as summarised in Table 3. This table breaks down impacts into feature type, RAG status and category grading.

Table 3: Summary RAG status table of tree removals (Red and Amber)

Feature type	RAG status (Red and Amber)			BS5837:2012 grades			
	Removal	Partial removal	RRAtR	A	B	C	U
Tree (T)	36	0	7	2	21	15	5
Tree Group (G)	4	31	16	1	24	26	0
Hedgerow (H)	12	33	3	1	31	16	0
Woodland (W)	0	3	0	1	2	0	0
Subtotals	52	67	26	5	78	57	5

25) 82 % (119/145) of total potential tree loss comprises of trees RAG assessed as 'Red' i.e. features located within the Planning Application Boundary. It should be noted that the RAG assessment is a precautionary approach to reporting impacts with location-specific protection measures not available for 'Red' or 'Amber' features at planning submission stage. It is anticipated that further consideration shall be given to these features as the design process progresses and engineering constraints are further defined.

26) 18 % (26/145) of total potential tree loss comprises of trees RAG assessed as 'Amber' i.e. margin features encroached by the Planning Application Boundary. This includes two trees assessed as notable. Further consideration should be given to 'Amber' trees as the design process progresses and engineering constraints become further defined. RRAtR trees are identified by an amber colour within the 'RAG status' column of the Tree Survey Schedule.

3.6 RAG Assessment – preliminary tree retention

27) The remaining 31 % (64/209) of surveyed vegetation is assessed as encroached but retainable with protection measures. It is understood that encroached vegetation considered RwPM will be subject to pre-construction tree protection measures specified in a SS-AMS and shown on a Tree Protection Plan (TPP). Further mitigation measures designed to protect retained features can be provided by documents listed in Table 5 of Section 3.8.

28) Retained trees within the assessment area are tabulated in Table 4 which breaks down tree impacts into feature type, RAG status and category grading.

Table 4: Summary RAG status table of tree retention (Green)

Feature type	RAG status (Green)		BS5837:2012 grades			
	RwPM - encroached	RwPM - not encroached	A	B	C	U
Tree (T)	15	32	4	13	27	3
Tree Group (G)	2	5	0	0	6	1
Hedgerow (H)	0	10	0	3	7	0
Woodland (W)	0	0	0	0	0	0
Subtotals	17	47	4	16	40	4

29) Non-encroached features are reported as RwPM due to a general requirement to site verify all surveyed tree feature locations against topographical information at detailed design stage - see Section 3.7 for general recommendations.

3.7 General Recommendations

30) It is recommended that site verification of all assessed survey features should reference a full topographical survey of existing stem locations at a later design stage.

31) Prior to the removal of the trees or groups listed in this report, or any tree surgery works being undertaken, it is essential that the trees are subsequently checked again for legal protected status. These include TPOs and CAs, locally or nationally designated sites.

32) Established trees, especially those of mature (and above age class), should be prioritised for retention wherever possible. Ideally all works should be sited outside the more sensitive RPAs of these trees.

33) Alternative working practices should be considered where construction/demolition activities are in close proximity to retained tree RPAs and cannot be avoided.

3.8 Arboricultural Action Required

34) Table 5 lists the standard elements, as referenced in BS5837, to satisfy arboricultural concerns for this scheme if planning permission is granted. These standard elements are recommended to ensure appropriate tree protection is considered and applied throughout the duration of the works.

Table 5: Follow up arboricultural input relating to this scheme

Recommended Arboricultural Input	Purpose	Timing
Continued arboricultural support for the project	Technical advice provided during the detailed design phase to avoid tree impacts.	Following any major design changes or advance works design development e.g. provision of topographical survey of existing tree stems and vegetation extents
Site Specific Arboricultural Method Statement (SS-AMS)	The SS-AMS provides contractors with works information to implement aspects of development that are either within the RPA or has the potential to result in loss of or damage to a tree to be retained e.g. ground protection, 'no-dig' construction methods, hand-dig areas or site supervision.	Following final design agreement and all construction detail being made available.

Recommended Arboricultural Input	Purpose	Timing
Tree Protection Plan (TPP)	Provide schematic details of where protective measures (i.e. fencing or ground protection) shall be installed.	Following final design agreement in conjunction with the SS-AMS.
Site monitoring and supervision by the project arboriculturist or Arboricultural Clerk of Works (ACoW)	Ensure protection measures and the method statement are being implemented correctly i.e. for encroached retained features	At agreed intervals before and during the construction phase of the project.

35) It is recommended to maintain contact with the project arboriculturist throughout the planning and design stage for the relevant additional input to be addressed at the appropriate point.

3.9 Site Supervision

36) Consideration should be given to a competent project arboriculturist or ACoW visiting the site and monitoring the works at a time agreed at the pre-commencement site meeting. The role of the project arboriculturist/ACoW role is to monitor compliance with arboricultural protection recommendations and providing on site advice on any tree problems that arise or modifications that become necessary.

37) A recommended programme of site supervision will be detailed within the SS-AMS.

4. References

Ancient Tree Inventory online database. Available at: https://ati.woodlandtrust.org.uk/tree-search

British Standards Institute (2010). British Standard 3998: 2010 Tree Work – Recommendations. London: BSI Ltd.

British Standards Institute (2012). British Standard 5837: 2012 Trees in relation to design, demolition and construction – Recommendations

Hedgerows Regulations 1997. London: HMSO.

Lonsdale, D. (ed.) (2013). Ancient and other veteran trees: further guidance on management. London: The Tree Council.

Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework

National Tree Safety Group (2011). Common Sense Risk Management of Trees

Natural England/Forestry Commission (2018). Ancient woodland, ancient trees and veteran trees: protecting them from development. Standing advice. Available here: https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences

Town and Country Planning Act 1990 (as amended). London: HMSO.

Town and Country Planning (Environmental Impact Assessment) Regulations 2017. London: HMSO

Town and Country Planning (Tree Preservation) (England) Regulations 2012. London: HMSO.

Appendix A. Reference Material

Reference name within TIN	Description	Document/drawing title	Document/ drawing no.
Planning Application Boundary	• The Planning Application Boundary is understood to be based upon the post June 2021 Environmental Statement submission amendments	Planning Application Boundary Proposed Bowland Section	LCC_RVBC-BO-FIG-003-001B
Off-site highways work areas	At the time of writing the offsite highways work areas are assumed to comprise of the following layers: • Red Line Boundary • Highway Improvements - Remote Compound • Highway Improvements - Alternative Parking • Polygons • Polylines	Bowland Arboriculture	LCC_RVBC-BO-FIG-V5-P1-003 RVBC-BO-FIG-V5-P1-003

Appendix B. Scope and Methodologies

B.1 Survey Methodology

Table 6 lists the tools and techniques used to conduct the tree survey and the parameters measured.

Table 6: Survey tools and techniques used

Parameters Recorded	Tools Used or Estimated
Tree height and cardinal points	Metres measured from ground level using a clinometer and laser distance measure. Cardinal points for tree groups/hedgerows and woodland features are typically reported upon the greatest single lateral crown spread found within the feature.
Stem diameter at breast height (DBH) taken from 1.5 m at ground level for trees over 75 mm DBH. (Unless specified otherwise in tree schedule).	Diameter measuring tape and recorded in millimetres (mm)
Root Protection Area (RPA)	Calculation method in BS 5837:2012 (BSI, 2012)
Tree quality assessment	Cascade chart and grading methodology in BS 5837:2012 (BSI, 2012) – see Appendix C.
Tree location data capture	ArcGIS collector app software on GPS-enabled survey tablet for plotting of features using open source high resolution aerial imagery.

Individual trees are recorded individually if they represent standout features in terms of their age class, DBH or BS5837 category grading as outlined in Appendix C.

At planning submission stage it is considered appropriate to collectively group tree stems when features are the same BS5837 category grading/feature type, similar size/age class/DBH range and are located close together. For tree group, hedgerows or woodland features, the largest or average size stem near the outer margins of each feature was measured. The DBH of this measured tree will then provide the basis of the collective RPA of this group.

The health and condition of trees can change rapidly and all trees, even healthy ones, are at risk from unpredictable climatic and man-made events. The assessment is based on the observed defects of trees at the time of survey by suitably qualified inspectors. The health, condition and safety of trees should be checked on a basis commensurate with the level of risk and preferably on an annual basis, as recommended in Common sense risk management of trees (National Tree Safety Group, 2011). The tree survey conducted for this report is not a tree health and safety survey and should not be used as such.

B.2 RAG Assessment Methodology

An interim assessment of potential impacts was made on the basis of the Planning Application Boundary and RAG assessment principles detailed in Table 7 below.

Table 7: Summary table of RAG status

RAG status	Parameter/s	Reporting
Red	Survey features considered to be removed on the assumption that full vegetation clearance would be required within the Planning Application Boundary. For individually surveyed trees this is based upon the feature's indicative stem location within the Planning Application Boundary. Impacts on contiguous/linear survey features i.e. tree groups, hedgerows or woodland is based on the feature's direct canopy encroachment within the Planning Application Boundary.	Red features will be figuratively indicated on the below legend items of the LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003: ▪ 'Arboriculture Tree Point - RAG Impacts' – for individually surveyed trees ▪ 'Arboriculture Tree Group Canopies - RAG Impacts' – for tree groups, hedgerows or woodlands Red features are correspondingly reported within the 'RAG Status' column of the Tree Survey Schedule of Appendix E. Trees to be removed or requiring partial removal are identified within the Tree Survey Schedule's 'AIA' column with an 'R' or 'P' respectively.
Amber	Survey features considered at risk are determined on the basis of RPA encroachment by the Planning Application Boundary or 'at risk' buffer. Individual trees are identified as RRAtR if the Planning Application Boundary intersects a tree's RPA by 20% or over (in square metres). This is based on BS5837:2012's design principle of section 7.4.2 which recommends that "*New permanent hard surfacing should not exceed 20% of any existing unsurfaced ground within the RPA*". Margin impacts on contiguous/linear survey features i.e. tree groups, hedgerows or woodland are identified based upon canopy encroachment within an indicative 'at risk' buffer external from the Planning Application Boundary. The 'at risk' buffer is determined by the RPA of encroached features located outside the Planning Application Boundary. The variable width of this 'at risk' buffer is calculated using the greatest radial RPA value intersected at each separate section of the Planning Application Boundary.	Amber features will be figuratively indicated on the below legend items of the LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003: ▪ 'Arboriculture Tree Point - RAG Impacts' – for individually surveyed trees ▪ 'Arboriculture Tree Group Canopies - RAG Impacts' – for tree groups, hedgerows or woodlands Amber features are correspondingly reported within the 'RAG Status' column of the Tree Survey Schedule of Appendix E. Amber features are identified as encroached within the Tree Survey Schedule's 'AIA' column by an 'E'.

RAG status	Parameter/s	Reporting
Green	RwPM survey features are determined on the basis of RPA encroachment by the Planning Application Boundary or 'at risk' buffer. Individual trees identified as RwPM if: ▪ the Planning Application Boundary intersects a tree's RPA by under 20% (of total square metres) or ▪ There is no RPA encroachment by the Planning Application Boundary Margin impacts on contiguous/linear survey features i.e. tree groups, hedgerows or woodland are identified based upon canopy encroachment within the indicative 'at risk' buffer from the Planning Application Boundary.	Green features will be figuratively indicated on the below legend items of the LCC_RVBC-BO-FIG-V5-P1-003 and RVBC-BO-FIG-V5-P1-003: ▪ 'Arboriculture Tree Point - RAG Impacts' – for individually surveyed trees ▪ 'Arboriculture Tree Group Canopies - RAG Impacts' – for tree groups, hedgerows or woodlands All encroached RwPM features are identified within Tree Survey Schedule's 'AIA' column by an 'E'. Non-encroached RwPM trees are identified by a 'N' within the 'AIA' column.

B.3 Ancient/Veteran Tree Assessment Methodology

Arboricultural surveys at this stage of the project have been undertaken based on BS5837: 2012 surveying guidance. The initial assessment of potential ancient and veteran trees is determined by surveyor experience, site surveyors' observations/comments and site photographs. Arboricultural surveyors determine this potential status of trees using visual tree assessment methods and the observation of features that include but are not limited to the list below:

- Tree species
- Life stage and tree size
- Extensive decay/hollowing
- Crown retrenchment/senescence
- Large quantity of crown deadwood
- Major limb fractures/storm damage
- Habitat spaces such as decay holes/hazard splits/crevices
- Presence of fungi, sap runs/slime flux
- Presence of epiphytic plants/lichens
- Bark loss/lightning strikes
- Water pools/aerial rooting.

Within publications and guidance offered by various organisations and government bodies such as the Woodland Trust and Natural England there is no agreed definition on what constitutes an ancient or veteran tree. Based on Annex 2 of the NPPF, as adopted by the Arboricultural discipline, the definition is of an ancient or veteran tree:

"A tree which, because of its age, size and condition, is of exceptional biodiversity, cultural or heritage value. All ancient trees are veteran trees. Not all veteran trees are old enough to be ancient but are old relative to other trees of the same species. Very few trees of any species reach the ancient life-stage"

The emphasis within the above statement is on the word "exceptional", which by its own definition creates a level of subjectivity amongst arboriculturists and other disciplines i.e. Ecology.

Following on from the Veteran Tree Initiative (English Nature 1996-2000), there have been various publications detailing tree characteristics associated with aging trees. In addition, some systems have been published and used to formalise surveying of ancient, veteran and notable trees such as Special Survey Method (SSM) developed by Treework Environmental Consultancy and Recognition of Ancient Veteran and Notable Trees (RAVEN) developed by Forbes Laird Arboricultural Consultancy. At the time of writing no recognised method to survey ancient/veteran trees (i.e. RAVEN) has been agreed or used to substantiate the quantity/quality of individual features associated with any given tree identified as a potential ancient/veteran by the projects arboricultural surveyors.

Indicative RPAs are reported based upon the guidance provided within BS5837:2012 and shown figuratively in the TCAP and PTRP. Indicative protection buffers based on Governmental Standing Advice for ancient and veteran trees in England should also be considered at a later stage to inform detailed design. These greater protection zones are also shown figuratively in the TCAP and PTRP as a separate legend item entitled 'Standing Advice Buffer Zone'. Governmental Standing Advice recommends a minimum 15 m buffer zone from Ancient Woodland and potentially larger distances for ancient and veteran trees which is:

- calculated as a minimum of 15 times larger than the diameter of the tree; or
- 5m from the edge of the tree's canopy if greater than the above value.

Appendix C. Cascade Chart of Tree Quality Assessment (taken from BS5837:2012)

Category and definition	Criteria (including subcategories where appropriate)		
Trees unsuitable for retention (see note)			
Category U			
Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline Trees infected with pathogens of significance to health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve.		
Trees to be considered for retention			
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values including conservation**
Category A			
Trees of high quality with an remaining estimated life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran or semi-formal arboricultural trees or wood-pasture)
Category B			
Trees of moderate quality with an remaining estimated life expectancy of at least 20 years	Trees that might be included in Category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such as they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value
Category C			
Trees of low quality with an remaining estimated life expectancy of at least 10 years, or younger trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value

Appendix D. Tree Survey Schedule Key

Column Header	Explanation
Tree ID and Est.	T – Tree G – Group W – Woodland H - Hedgerow # – DBH measurements estimated due to access restrictions or safety concerns. Observations limited to those made from a distance or full access to tree impeded (e.g. prolific ivy, uneven ground, brambles etc).
Diameter at breast height (DBH)	Tree stem diameter measured at 1.5 m from the ground. This reported figure relates to either single stemmed trees or the calculated DBH for multi-stemmed trees. In some instances, DBH will be taken from a different height as specified in 'Observations'
Canopy spread – N E S W	Canopy extents from main stem of individual tree will be shown using cardinal points in metres i.e. N (north) 7, E (east) 6, S (south) 5, W (west)7. Single largest canopy extent reported for groups/woodland/hedgerows.
Age Class	Young (Y) – A tree in the first quarter of its life span. Semi Mature (SM) – A tree in the latter stages of its first quarter, well established. Early Mature (EM) – A tree half way through its life span, significant further growth potential. Mature (M) – A tree at or near its potential maximum size which is still growing vigorously in its third quarter of life span. Over Mature (OM) – A tree in decline in its final quarter of life span. Potential Veteran (V) – A tree which, because of its age, size and condition, is of exceptional biodiversity, cultural or heritage value. Refer to Section B.3 of Appendix B for more context.
Root Protection Area (RPA) radius	Root Protection Area dimensions as calculated using formulae in BS5837:2012. Applied as either radially from an individual tree stem (individually surveyed trees) or as an off-set from the canopy extents of a collective feature (tree group, hedgerow or woodland).
AIA	R - Remove P – Partial removal E - Encroached RPA/canopy N - No encroachment
RAG status	Refer to symbology explained in Appendix B Section B.2

Appendix E. Tree Survey Schedule including Preliminary AIA impacts- Lancaster City Council

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T1#	Common ash	10	300	1	4	2	5	SM	Small, unremarkable tree immediately south of roadside stone wall. Reduced vigour; likely Chalara ash dieback. Ivy cover, limited inspection.	C1	3.6	R	Red
G22#	Scots pine, pedunculate oak	12	650	6	6	6	6	M	Roadside group, south of stone wall and watercourse. Predominantly pine with one mature oak. Limited access and inspection from roadside. Healthy, pines vigorous. Occasional shade deadwood in pines, typical, low risk.	B2	7.8	P	Red
T2#	Common ash	14	450	4	3	3	4	EM	Large roadside tree set back from road beyond stone wall and watercourse. Reduced vigour; likely Chalara ash dieback. Limited access and inspection.	C1	5.4	N	Green
G21#	Scots pine	9	400	4	4	4	4	EM	Roadside group, south of stone wall and watercourse. Limited access and inspection from roadside. Healthy, vigorous. Occasional shade deadwood, typical, low risk. Central stem failed previously.	B2	4.8	P	Red
T3#	Holly	6	245	3	3	4	3	SM	Multi stemmed tree in field south of road. Healthy, unremarkable. 6 stems x 100 mm av.	C1	2.9	N	Green
G20#	Sycamore, common ash, hawthorn, common alder	16	600	6	6	6	6	M	Group of trees either side of watercourse in field south of road. Surveyed from roadside; max DBH estimated. Ivy cover throughout, may be obscuring defects. Limited inspection. Ash displaying reduced vigour; likely Chalara ash dieback.	B2	7.2	E	Amber
T4#	Scots pine	12	300	2	2	2	3	SM	South of road, beyond stone wall and watercourse; limited access. Healthy, vigorous tree with good form. No apparent defects observed.	B1	3.6	E	Green
G19#	Hawthorn, elder, horse chestnut, hazel, oak sp.	8	180	3	3	3	3	SM	Scrubby trees at roadside, beyond stone wall. One small, standing dead, ivy covered hawthorn stem noted at roadside. Numerous failed stems towards field north. Unremarkable trees and group. Recommend removal of dead stem(s) at roadside.	C2	2.2	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T5#	Sitka spruce	12	350	3	3	3	3	EM	Individual conifer at field boundary fence line. Healthy, prolific cone production. Lower canopy suppressed south. Limited access and inspection.	B1	4.2	N	Green
W18#	Sycamore, common ash, horse chestnut, hawthorn, hazel, wych elm, holly, elder, cypress sp.	20	600	6	6	6	6	M	Self-seeded woodland cover that has matured with many large trees and some developing understorey. South of road and growing around ruins of stone building and associated retaining walls. Ivy cover throughout. Occasional failed stems and decaying stumps with habitat value. Ponds and watercourses. Horse chestnut bleeding canker and Chalara ash dieback symptoms observed. Predominantly bramble understorey: hart's tongue fern observed (ancient woodland indicator). Limited access in some areas.	B2	7.2	P	Red
G23#	Common ash, sycamore, wych elm	9	150	3	3	3	3	SM	Unremarkable self-seeded trees on steep river embankment, immediately south of road. Ivy cover developing. Chalara ash dieback symptoms observed. Average stem diameter reported.	C2	1.8	E	Amber
T6	Wild cherry	10	420	4	5	5	5	M	Roadside tree beyond roadside boundary wall. Ganoderma wood decay fungi fruiting from base of trunk to north east: full extent of internal decay unknown but not thought to be extensive given small size of fruiting body. Canopy vigour reduced. Twin stemmed at circa 1.5 m with acute union and included bark. Stem east weighted over road. Recommend tree risk and condition survey.	C1	5.0	N	Green
T7	Sessile oak	14	970	6	7	8	3	M	Large mature roadside tree in hedgerow. Canopy asymmetric and weight biased east towards field. Occasional branch dieback and small diameter deadwood, posing low risk. Burring around lower trunk west.	B1	11.6	R	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G24#	Common ash, wych elm, sessile oak, common beech	15	600	5	5	5	5	EM	Belt of broadleaf canopy cover located on river embankment south of road; embankment narrows and steepens to west. Max. DBH circa 600 mm, majority of stems <400 mm; numerous small diameter and multi stemmed trees between 100-200 mm DBH along edges of group. Chalara ash dieback throughout. Average stem is 400 mm DBH.	B2	7.2	P	Red
T14#	Lime sp.	12	1000	2	5	4	4	M	Large lower stem diameter, visibility heavily obscured by dense basal epicormic shoots. Upper stem diameter above basal shoots significantly reduced (circa 600 mm DBH); potential historic stem failure with mature regrowth. Upper canopy retrenchment, becoming stag headed. Moderately poor condition overall but some potential historic value: consider pollarding to circa 5 m.	C3	12.0	R	Red
G26#	Sycamore, common ash, hawthorn	10	100	3	3	3	3	SM	Unremarkable self-seeded trees at road edge. Stems previously reduced to circa 1m and layered. Squirrel damage and Chalara ash dieback symptoms observed. Ivy developing. Occasional dead tops, low risk. Average stem diameter reported.	C2	1.2	P	Red
G25#	Common ash, sycamore	15	150	3	3	3	3	SM	Unremarkable self-set trees along riverbank. Ivy cover developing. Tall narrow forms; canopies displaying reduced winter bud presence and vigour. Chalara ash dieback observed. Average stem diameter reported.	C2	1.8	E	Amber
T19#	Hawthorn	4	246	1	2	1	2	SM	Multi stemmed tree atop raised roadside verge. Unremarkable. 5 stems x 110 mm ave DBH.	C1	3.0	R	Red
G27	Leyland cypress, sawara cypress	18	872	3	3	3	2	M	One large twin stemmed (DBH 700 mm, 520 mm) and one smaller tree (DBH 250 mm) behind stone wall at road edge. Healthy.	B2	10.5	P	Red
T20#	Rowan	5	224	3	2	3	2	SM	Multi stemmed tree in wide verge, slightly raised above road level. Unremarkable. Max DBH of 160 mm. 5 stems of 100 mm ave DBH.	C1	2.7	R	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G28#	Aspen, sycamore, common beech, Leyland Cypress, Lawson cypress	18	500	4	4	4	4	EM	Linear group of trees along river embankment. Deciduous trees with tall narrow forms, cohesive canopies and occasional declining trees posing low risk. Short row of tall cypress with typical form. Inclusions. Average stem diameter reported.	B2	6.0	P	Red
T33#	Pedunculate oak	10	650	6	6	6	7	EM	Open grown tree at boundary fence between field parcels. Ivy cover a lot of trunk and into canopy. Healthy, good form, no apparent defects of note.	B1	7.8	N	Green
T34	Common ash	8	255	3	4	4	1	SM	Small tree to southern end of larger group. Reduced vigour, Chalara ash dieback observed. Three stems: 160 mm, 140 mm and 140 mm DBH.	C1	3.1	N	Green
G17#	Leyland Cypress	7	300	3	2	3	2	EM	Short row of trees at roadside; assumed third party owned. Surveyed from road; low hanging canopies and channel of running water limited inspection. Some trees appear twin stemmed, some multi stemmed. Average stem diameter reported.	B2	3.6	P	Red
T35	Common ash	7	500	4	4	4	4	SM	Self-seeded tree growing immediately adjacent to and overhanging stone barn. Dense ivy up stem. Presence and vigour of winter buds appears normal; some discolouration on twigs, symptomatic of Chalara ash dieback.	C1	6.0	R	Red
G15#	Hawthorn, hazel	5	90	3	3	3	3	SM	Multi stemmed, self-seeded trees beyond roadside boundary wall. Healthy, unremarkable. Average stem diameter reported.	C2	1.1	E	Amber
T36#	Hawthorn	5	200	1	1	1	2	SM	Unremarkable tree, south of barn, set back from road.	C1	2.4	N	Green
G14#	Common ash, wild cherry, hawthorn	5	100	2	2	2	2	Y	Small, self-seeded understorey trees on northern edge of wide ditch. Unremarkable. Limited access and inspection. Average stem diameter reported.	C2	1.2	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T38#	Hawthorn	8	500	5	2	5	5	M	Third party tree set back from road within field. Mature example of species of notable age and size. Asymmetric canopy suppressed east by neighbouring tree. Very dense crown structure. Limited inspection from roadside.	A1	6.0	E	Amber
H16#	Hawthorn, elder, common ash, hazel	1	110	1	1	1	1	SM	Managed roadside hedgerow, neatly clipped. Predominantly hawthorn. Chalara ash dieback. Many stems <75 mm DBH. Becomes wider to north.	B2	1.3	P	Red
T39#	Common ash	9	600	5	5	5	6	EM	Roadside tree in hedgerow. Reduced vigour and dieback; likely Chalara ash dieback but limited visibility from ground to confirm. Dense ivy along trunk and into canopy. Recommend tree is felled, low priority.	C1	7.2	R	Red
G13	Wild cherry, common ash, sessile oak,	10	410	5	5	5	5	SM	Portion of wider group of mixed native broadleaf trees at roadside, north of stone wall. Between road and third-party access track with river north of track. Group narrows to north east. Occasional cherry with reduced vigour. Chalara ash dieback, including stem lesions; recommend tree risk survey and management of ash and cherry.	B2	4.9	E	Amber
H29#	Hawthorn, elder	1	200	1	1	1	1	EM	Hedgerow, predominantly hawthorn with elder. 1.5 m high; 1 to 1.5 m wide becoming wider to north. More mature stems to north (up to 200 mm DBH), becoming younger to south (<100 mm DBH). Managed hedge with historic evidence of layering.	B2	2.4	R	Red
T40#	Sessile oak	12	600	5	1	6	7	EM	Third party tree within field. Est. from verge. Asymmetric crown biased west towards field. No significant defects observed.	B1	7.2	N	Green
H39#	Hawthorn, blackthorn, common ash, holly	2	170	1	1	1	1	EM	Managed roadside hedge: flailed east along road, more outgrown above to circa 2 m in places; up to circa 1.5 m wide. Occasional larger stems to circa 170 mm diameter; majority less than 100 mm DBH.	B2	2.0	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T41#	Common ash	14	500	5	8	7	1	EM	Twin stemmed tree at field boundary, east side of fence within wide verge. Epicormic response along primary limbs; likely reactive response to Chalara ash dieback. Limited visibility from ground level. Asymmetric crown biased east. Winter bud presence and vigour appears moderately good.	C1	6.0	N	Green
H41#	Common beech, holly, hawthorn	1	130	1	1	1	1	EM	Hedgerow: 1 m height; 1 m width. Managed. Predominantly beech with hawthorn, holly. Layered stems to max 130 mm diameter.	C2	1.6	P	Red
T42#	Goat willow	7	381	5	5	5	5	EM	Larger tree to field boundary side of roadside willow thicket. Est. 7 stems: 100 mm, 130 mm, 130 mm 150 mm, 200 mm, 150 mm and 150 mm, limited access and inspection. Healthy. Average of 144 mm DBH.	B1	4.6	N	Green
H12#	Hawthorn, elder, common ash, blackthorn	2	150	3	3	3	3	SM	Hedge, predominantly hawthorn with elder, ash, blackthorn. 2 m high, up to 3 m wide in places where more outgrown. Some gaps with more recent in fill planting. Healthy. Average DBH of 100 mm.	C2	1.8	P	Red
T43#	Pedunculate oak	8	400	5	5	5	5	SM	On far side of field boundary ditch, overhanging road. Limited access, est. from roadside. Occasional lower branches broken and dead, posing low risk. Appears in good health.	B1	4.8	R	Red
G52#	Hawthorn, holly	5	120	1	1	1	1	SM	Short section of predominantly hawthorn. Appears as outgrown and dilapidated hedgerow with numerous gaps. Flailed at roadside. Unremarkable feature with occasional dead stems and limited function or value other than partial screening at roadside. Average DBH of 75 mm.	C2	1.4	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T44	Common ash	10	480	3	5	5	6	SM	Between road and field on east side of intersecting ditch. Lower branches broken and hanging west. Epicormic response along branches; Chalara ash dieback noted on basal shoots. Presence of winter buds looks moderately good. Wound to lower trunk, occluding well.	C1	5.8	R	Red
T45#	Common alder	10	509	5	5	6	5	EM	Multi stemmed roadside tree at field boundary, on far side of ditch from road with limited access. 4 stems est. from roadside: 300 mm, 300 mm, 250 mm and 130 mm DBH	B1	6.1	R	Red
H103#	Hawthorn	1	120	2	1	2	1	EM	Managed roadside hedgerow, neatly clipped. Majority 1 m width, becoming wider to circa 2 m to west. Stem diameters increase to west also to max. circa 120 mm DBH.	B2	1.4	P	Red
T46#	Pedunculate oak	14	600	6	6	7	6	EM	Open grown roadside tree at field boundary. On far side of verge and ditch from road, limited access. Good form, healthy; no significant defects observed.	B1	7.2	R	Red
H5#	Hawthorn, elder, holly	1	110	1	1	1	1	EM	Predominantly hawthorn. Roadside hedge managed and neatly clipped. Occasional holly. Layered stems up to circa 110 mm DBH; majority of arising regrowth <75 mm DBH. Limited access and inspection; fast section of road with no verge and blind corners; estimated via drive-by survey.	B2	1.3	P	Red
T47#	Common ash	14	190	1	2	3	1	SM	Standing dead tree in roadside verge at field boundary.	U	2.3	R	Red
H4#	Hawthorn, elder, holly	1	110	1	1	1	1	EM	Predominantly hawthorn. Roadside hedge. Managed and neatly clipped. Occasional holly. Layered stems up to circa 110 mm DBH; majority of arising regrowth <75 mm DBH.	B2	1.3	P	Red
T48#	Common ash	11	200	3	4	3	3	SM	Reduced vigour, likely Chalara ash dieback. Large wound along trunk to north, circa 2 m length.	C1	2.4	R	Red
H3#	Hawthorn	1	110	1	1	1	1	EM	Short section of managed roadside hedgerow.	C2	1.3	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T49#	Pedunculate oak	10	1000	9	8	10	5	M	Large, mature tree within wider woodland area, growing from steep embankment adjacent road. Limited access and visibility from road. Numerous moderately large dead limbs and occasional limb and branch failures. Good example of species despite fair condition; potential next generation ancient or veteran tree.	A3	12.0	N	Green
H2#	Hawthorn	1	130	1	1	1	1	EM	Short section of managed hedgerow at roadside.	C2	1.6	R	Red
T50#	Common beech	20	800	5	5	10	3	M	Large, mature third-party roadside tree; growing atop of steep embankment down to river. Bifurcate at circa 1.5 m with further stem bifurcations above; all with included bark and naturally bracing branches: moderate structural condition but stable at time of inspection. Asymmetric crown. Good health. Notable tree within wider woodland area.	B1	9.6	R	Red
H1#	Hawthorn, elder	1	120	1	1	1	1	EM	Portion of long roadside hedgerow. Managed, neatly clipped.	B2	1.4	N	Green
T51#	Hawthorn	6	450	4	4	4	4	M	Excellent mature example of species with good form and in good condition. On third party land adjacent roadside.	A1	5.4	R	Red
G101#	Hazel, holly, hawthorn, sycamore	5	100	3	3	3	3	SM	Bushy, roadside understorey species. Unremarkable.	C2	1.2	E	Amber
G100#	Holly, hazel, hawthorn	5	100	2	2	2	2	SM	Layered stems creating short linear group between field parcels. Unremarkable	C2	1.2	E	Amber
G99#	Pedunculate oak, sycamore	10	800	6	6	6	6	M	One mature oak, est. 800 mm DBH, set back from road beside field gate: limb failures, bark damage and cavitation; small diameter deadwood, low risk; vigour normal; squat form. One sycamore at road edge: three stems 480 mm, 290 mm and 150 mm DBH; two stems failed previously, decay at base of trunk, full extent unknown; vigour normal.	B2	9.6	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G98#	Hawthorn, hazel, sycamore, common ash, holly	6	100	3	3	3	3	SM	Unremarkable, scrubby understorey trees either side of deep ditch. Chalara ash dieback observed. Two larger sycamore stems felled previously with regrowth to 6 m. Wildlife value. Average DBH of 60 mm.	C2	1.2	E	Amber
G97#	Common ash	16	600	5	7	7	6	M	Third party trees within residential garden, overhanging road. Occasional small diameter deadwood. Moderate branch failures, low risk. Reduced vigour, likely Chalara ash dieback but limited visibility from ground level to confirm.	B2	7.2	E	Amber
H96#	Hawthorn, common ash, elder	1	200	1	1	1	1	M	End section of roadside hedge. Larger, layered stems with many smaller stems including stems <75 mm DBH. Managed, tightly clipped. Average DBH of 150 mm.	B2	2.4	P	Red
H95#	Hawthorn, elder, holly	2	150	1	1	1	1	M	Managed roadside hedge, tightly clipped. Layered stems, some between 100-150 mm DBH; majority of stems <75 mm. Well established hedge.	B2	1.8	P	Red
H94#	Hawthorn, sycamore, common ash, holly	1	140	1	1	1	1	SM	Managed roadside hedge. Majority of stems <75 mm but layered stems up to circa 140 mm DBH. Becomes wider to west.	B2	1.7	P	Red
H93#	Hawthorn, holly, hazel, common ash	1	100	1	1	1	1	EM	Managed roadside hedge. Majority of stems <75 mm but contains stems up to circa 100 mm DBH.	B2	1.2	P	Red
H92#	Hawthorn	1	200	2	1	2	1	M	Single stem managed as short hedge section. Short, stout trunk which breaks into 2 stems of circa 200 mm DBH, just above ground level.	C1	2.4	P	Red
H91#	Hawthorn, holly, hazel	1	140	1	1	1	1	EM	Managed roadside hedge. Majority of stems <75 mm but contains layered stems >100 mm DBH.	B2	1.7	R	Red
H90#	Hawthorn, holly, hazel, common ash	1	200	1	1	1	1	M	Managed roadside hedge. Majority of stems <75 mm but contains layered stems up to circa 200 mm DBH.	B2	2.4	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G89#	Common ash	14	590	6	6	8	3	M	Two third party trees in field east of road. No access, limited inspection from roadside. Presence and vigour of buds appears normal. No significant defects observed.	B2	7.1	E	Amber
H88#	Hawthorn, holly, sessile oak, common ash, elder	1	200	2	2	2	2	M	Managed roadside hedge, mixed native species. Some large stems, elder and ash, suggesting hedge of some age. Tightly clipped with recurrent damage and occlusion evident. Width to circa 2m.	A3	2.4	R	Red
G87#	Common ash, common alder, goat willow, hawthorn, silver birch	10	350	5	6	5	6	SM	Self-seeded roadside trees of moderate size. Ash displaying reduced vigour; likely Chalara ash dieback; limited visibility from ground level to confirm. Otherwise healthy group in good condition. Average DBH of 200 mm.	B2	4.2	P	Red
G84#	Sessile oak	17	580	6	6	6	6	M	Portion of wider linear feature on third party land. Stem appear to have been layered historically and now matured, resulting in obscure forms. Possible remnants of historic hedge or boundary feature. No access, limited inspection from roadside.	A3	7.0	E	Amber
G85#	Sessile oak	10	750	6	2	6	7	M	Three trees beyond roadside boundary. No access, limited visibility and inspection from roadside. No significant defects observed, healthy. Largest DBH recorded, remaining DBH est. 580 mm and 480 mm.	B2	9.0	P	Red
G86#	Goat willow	8	150	6	5	6	5	EM	Dense roadside group of willow. Multi stemmed with heavily leaning stems, end weighted towards road; some stems and branches partially failed. Canopies flailed at roadside. Habitat value; screening function. Average stem diameter reported.	C2	1.8	P	Red
G83#	Sessile oak, downy birch	10	240	3	1	3	5	SM	Linear group of tall, narrow roadside trees. Unremarkable individuals; slightly greater collective value. Interspersed with understorey stems of hazel <75 mm. One failed birch stem with Fomitopsis betulinas bracket. Average DBH of 150 mm.	C2	2.9	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G82#	Goat willow	8	150	6	6	6	6	EM	Two multi stemmed trees between road and field. Larger than other adjacent willows. Wide spreading canopies, occasional failed stems and branches. Healthy. Average stem diameter reported.	B2	1.8	P	Red
G81#	Goat willow, hawthorn, hazel	10	200	5	5	5	5	SM	Dense roadside thicket of willow with hawthorn and hazel along field boundary. Occasional failed stems and hanging branches, low risk. Habitat value. Screening along road. Healthy. Many stems <75 mm diameter. Average DBH of 100 mm.	C2	2.4	P	Red
G80#	Goat willow	9	480	6	5	8	6	EM	Three multi stemmed roadside trees, one significantly larger; max. DBH recorded from larger tree; average DBH of 250 mm estimated. Numerous small diameter dead branches, low risk. Healthy.	B2	5.8	P	Red
G50#	Hawthorn, hazel	4	110	3	3	3	3	SM	Self-seeded, scrubby understorey trees at roadside. On far side of ditch, est. from roadside. Many stems <75 mm diameter.	C2	1.3	R	Red
G79#	Common ash, beech, hawthorn, hazel, holly, rowan, sycamore pedunculate oak	7	220	4	4	4	4	SM	Self-seeded roadside trees beneath occasional larger individuals along field boundary ditch.	C2	2.6	R	Red
G78#	Common ash, Norway maple, sycamore, common beech	18	800	6	6	8	6	M	Middle aged to mature roadside trees growing from steep embankment with limited access. Ash displaying reduced vigour, likely Chalara ash dieback. Occasional small diameter deadwood over road, posing low risk. No significant defects observed; dense ivy into canopy of some trees displaying reduced vigour, may be obscuring defects. Largest DBH estimated from roadside. Residential dwelling immediately north, screening function.	B2	9.6	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G76#	Common ash, hawthorn, hazel, common alder, sycamore, downy birch, elder	17	350	5	5	5	5	EM	Sporadic tree cover to edge of woodland. On third party land adjacent road and access to Smear Hall. Occasional ferns by no particularly notable ground flora.	B2	4.2	P	Red
W77#	Pedunculate oak, Norway maple, holly, common ash, hawthorn, hazel, downy birch, common beech	18	800	9	9	9	9	M	Continuation of third-party woodland around access to Smear Hall. Lower proportion of large mature trees but some notable individuals. Occasional limb failures over road but no significant defects observed. Holly, hazel, hawthorn understorey; some age structure with regen of climax species including oak and beech. No access.	B2	9.6	P	Red
W75#	Pedunculate oak, common beech, hazel, holly, downy birch, elder, common ash	20	1000	10	10	10	10	M	Portion of roadside woodland cover located along steep roadside embankment down to river. Numerous large notable trees, predominantly oak. Holly, hazel and elder understorey with some age structure developed throughout. Good health and condition overall; occasional dead branches typical of woodland context, posing low risk. Ash displaying reduced vigour, likely Chalara ash dieback. Third party access track through woodland adjacent river.	A3	12.0	P	Red
G74#	Common alder	8	400	5	5	5	5	M	Three trees within newly planted hedgerow dividing field parcels, no access. Fair condition. Tree appears healthy. Growing stop small earth bund. DBH est. from roadside 400 mm, 220 mm and 350 mm. Max DBH reported.	B2	4.8	P	Red
H6	Hawthorn, elder, common ash, hazel	1	250	1	1	1	1	M	Managed, roadside hedge; layered stems, up to c.250mm DBH in places. Predominantly hawthorn. Chalara ash dieback observed.	B2	3	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
H7	Hawthorn, elder, common ash, blackthorn, hazel	1	250	1	1	1	1	M	Managed, roadside hedge; layered stems, up to c.250mm DBH in places. Predominantly hawthorn. Chalara ash dieback observed. Occasional dead elder stems; Auricularia auricula-judae saprophytic fungi on some elder stems.	B2	3	R	Red
H8	Hawthorn, elder, blackthorn, hazel	1	150	1	1	1	1	M	Managed, roadside hedge; layered stems, up to c.150 mm DBH in places. Predominantly hawthorn and blackthorn. Waterlogged ground north in field. Occasional elder stems in fair to poor structural condition.	B2	1.8	R	Red
G10	Hawthorn, elder	5	250	2	2	2	2	EM	Linear group of predominantly hawthorn, occasional elder. Layered stems. Appears as outgrown hedgerow. Surveyed from field to west; saturated ground immediately west within channel of running water, limited access.	C2	3	E	Green
G11	Hawthorn, blackthorn, goat willow	5	200	2	2	2	2	EM	Portion of larger linear group feature at field boundary. On east side of fence; surveyed from west within field. Screening function. Saturated ground immediately west within channel of running water, limited access.	C2	2.4	E	Green
T21	Common alder	5	170	1	3	2	2	EM	Twin stemmed; first stem is 130 second DBH est. 100mm. On east side of fence, surveyed from west side within field parcel. Healthy. Appears as remnant of old hedgerow. Saturated ground immediately west within channel of running water, limited access.	C1	2	E	Green
T22	Goat willow	6	330	3	5	2	3	EM	Larger, outgrown tree within linear group feature. Good crown form and vigour. On east side of boundary fence, DBH estimated from field. Saturated ground immediately west within channel of running water, limited access.	B1	4	E	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T8	Wych elm	1	180	3	1	2	1	Y	Stem DBH estimated: 90/80/70/90/70. Unremarkable roadside tree; Dutch elm disease symptoms but reasonable health.	C1	2.2	R	Red
T9	Wych elm	3	100	2	1	2	1	Y	Single stemmed roadside tree; unremarkable.	C1	1.2	R	Red
H30	Sycamore, common ash, common hazel, common hawthorn	2	75	1	1	1	1	SM	Roadside hedge with patchy canopy cover and numerous gaps; growing alongside dry stone wall south of road; Chalara ash dieback disease symptoms; DBH range est. 50-100mm, average recorded; estimated 30 stems.	C2	0.9	R	Red
H31	Sycamore, common hazel, common ash, blackthorn, elder, Rowan	3	130	2	2	2	2	EM	Roadside hedge to south of road; hazel dominant; outgrown, bushy and wide form; occasional larger stems, flailed; majority of stems under 75mm diameter; DBH range est. 50-250, average recorded; well established screening function.	B2	1.6	P	Red
H32	Common hazel, common hawthorn, elder	3	75	2	2	2	2	EM	Outgrown roadside hedge, currently unmanaged; DBH range est. 50 to 100mm, average recorded	B2	0.9	P	Red
H33	Common hawthorn	1	75	1	1	1	1	SM	Short section of hedge beneath trees; DBH range est. 50 to 100mm, average recorded.	C2	0.9	R	Red
H34	Common hawthorn	2	75	1	1	1	1	SM	Short hedge section beneath trees; DBH range est. 50 to 100, average recorded	C2	0.9	N	Green
T1a	Pedunculate oak	14	550	6	5	3	3	EM	Prominent roadside tree located atop 2m high banking; heavily burred at base with epicormic shoots on stem; moderate sized deadwood throughout, posing low risk currently.	B1	6.6	R	Red
T2a	Pedunculate oak	14	550	4	5	5	3	EM	Roadside tree, prominent atop 2m high banking; moderate deadwood throughout, posing low risk currently; slight lean east.	B1	6.6	E	Amber
T3a	Common alder	14	550	4	5	5	5	EM	Roadside tree set back from road within field, limited access; burred at base; acute union at 6m; tree weighted east.	B1	6.6	R	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G36	Common alder, silver birch, downy birch, common hawthorn	12	200	5	5	5	5	EM	Third party trees forming portion of wider single, linear canopy area; no access, limited inspection and visibility from roadside; assumptions made as to group attributes; DBH range est. 100-200, average recorded.	B2	2.4	P	Red
G37	Common hawthorn	8	270	3	3	3	3	M	Three trees in third party field north west of road; forming single canopy area; no access, limited survey from roadside with limited visibility through hedge; largest diameter stem appears to have decay present; canopies healthy; DBH range est. 200-340,	B2	3.2	R	Red
H35	Sycamore, common hazel, common hawthorn, English holly, blackthorn	2	75	1	1	1	1	SM	Roadside hedge atop embankment north west of road; mixed species, but hawthorn dominant; screening function; stem count est. 100; DBH range est. 50-100, average recorded.	B2	0.9	R	Red
T4a	Small leaved lime	14	550	6	6	7	5	M	Roadside tree located within dense hedgerow; dense basal epicormic shoots, limited inspection; precious crown reduction work.	B1	6.6	E	Amber
H38	Common hawthorn, common hazel	2	75	2	2	2	2	EM	Portion of roadside hedgerow; maintained, flailed; DBH range est. 50 too 100, average recorded.	B2	0.9	P	Red
T10	Common lime	10	680	6	5	5	5	M	Upper canopy displaying dieback; deadwood in upper canopy with potential habitat features; limited access and visibility from roadside. Tree may need to be subject to ecological assessment prior to any works.	C1	8.2	E	Green
T11	Sycamore	10	770	3	6	7	4	M	Large standing dead tree at roadside, south of road; decay column apparent within lower trunk, full extent unknown; dead primary limbs and secondary branch deadwood; posing risk to road users. Recommend tree is felled as a priority within next 6 months.	U	9.2	E	Amber

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T12	Common ash	11	700	6	6	7	6	M	Mature roadside tree, south side of road; Chalara ash dieback disease symptoms, tree in decline with several dead primary limbs to c. 150mm diameter; posing risk to road users. Recommend tree is felled within next 12 months.	U	8.4	E	Amber
T13	Sycamore	11	780	6	7	6	3	M	Large roadside tree, south side of road; largely dead upper canopy, some lower canopy displaying reduced vigour; dead primary limbs to c. 150mm diameter; tree posing risk to road users. Recommend tree is felled within next 12 months.	U	9.4	N	Green
H40	Common hawthorn, common hazel	2	75	2	2	2	2	EM	Portion of roadside hedgerow; predominantly hawthorn; managed as agricultural field boundary feature; DBH range est. 50 to 100, average recorded.	B2	0.9	R	Red
H42	Common hazel, sycamore, common hawthorn	4	90	2	2	2	2	SM	Layered hazel stems recently underplanted with hawthorn; occasional layered sycamore.	C2	1.1	P	Red
G43	Sycamore, common ash	11	320	5	5	5	5	EM	Portion of wider linear shelter belt along boundary of third party wood yard; no access, limited inspection with estimates made as to group attributes; DBH range est. 150-500, average recorded.	B2	3.8	P	Red
T15	Sessile oak	16	800	7	8	5	7	M	Roadside tree to east of road in grassy verge; good form, health and condition; prominent arboricultural feature.	B1	9.6	R	Red
T16	Sycamore	16	866	3	6	6	7	M	Twin stemmed tree set back from road within field boundary hedge; individual stem DBH est. 740 and 450, limited access to measure accurately; canopy in decline with deadwood to c. 140mm diameter, posing low risk.	C1	10.4	R	Red
G44	Common hazel	3	125	3	3	3	3	SM	Understory vegetation, unremarkable but healthy; forming part of field boundary vegetation with screening function; DBH range est. 100-150, average recorded.	C2	1.5	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
H45	Common hazel, common hawthorn	1	75	1	1	1	1	SM	Recently flailed field boundary hedge, set back from roadside; stem DBH range est. 50-100mm, average recorded.	C2	0.9	R	Red
H46	Common hazel, common hawthorn, English holly, blackthorn, elder	3	150	2	2	2	2	EM	Outgrown, bushy hedge along southern side of road; mixed species but hawthorn and blackthorn dominant; occasional larger stems; DBH range est. 50-250, average recorded.	B2	1.8	P	Red
T17	Sessile oak	14	670	6	6	6	6	M	Roadside tree behind hedge on south side of road; excellent well balanced form; ivy cover to 6m.	B1	8	E	Green
H48	Common hawthorn, common hazel	2	75	2	2	2	2	EM	End section of wider length of roadside hedgerow, south of road; DBH range est. 50 to 100mm, average recorded	B2	0.9	P	Red
T5a	Pedunculate oak	10	500	4	4	6	4	EM	Open grown roadside tree north of road in hedgerow; good health, form and condition; minor localised deadwood, posing low risk.	B1	6	R	Red
H47	Common hawthorn, common hazel	1	75	2	2	2	2	EM	Portion of flailed roadside hedge beneath open grown roadside trees; occasional gaps and areas where hedge cover becomes sparse.	B2	0.9	P	Red
T6a	Pedunculate oak	13	520	5	5	5	5	EM	Open grown roadside tree within hedgerow south of road; balanced open grown form; no significant defects observed.	B1	6.2	R	Red
T7a	Pedunculate oak	10	500	6	6	7	6	EM	Open grown roadside tree in hedgerow north of road; good health, form and condition.	B1	6	R	Red
T8a	Pedunculate oak	13	520	5	5	5	4	EM	Open grown tree within roadside hedge, south of road; slightly asymmetric crown shape due to proximity of adjacent tree cover.	B1	6.2	R	Red
H49	Common hawthorn, common hawthorn	2	75	2	2	2	2	EM	Portion of roadside hedge south of road, containing open grown trees; maintained, flailed.	B2	0.9	P	Red
T18	Common alder	6	160	3	2	2	3	SM	Small self-seeded tree on south side of road and beck; limited inspection.	C1	1.9	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T9a	Common ash	12	236	3	5	3	3	SM	Roadside tree within hedgerow; twin stemmed, respective stem DBH: 200 and 125mm, single stem diameter calculated and recorded; Chalara ash dieback disease symptoms, recommend tree condition is monitored via annual inspection to assess canopy condition an	C1	2.8	R	Red
H50	Common hazel, common hawthorn	2	100	2	2	2	2	EM	Roadside hedge south of road in elevated position atop embankment; no access, limited inspection; recently flailed; bramble, dog rose and other vegetation along northern edge of hedge forming single wide area of vegetation; DBH range 50-150, average reco	B2	1.2	P	Red
H51	Common hazel, common hawthorn	2	75	2	2	2	2	EM	Portion of flailed hedgerow along northern edge of road; DBH range estimated 50 to 100mm, average recorded.	B2	0.9	P	Red
T10a	Holly	9	250	3	3	3	3	EM	Growing atop roadside banking; unremarkable tree.	C1	3	R	Red
T11a	Common ash	12	305	4	4	4	5	SM	Growing within dense roadside hedge, limited visibility; appears to be multi stemmed trees; respective Stem DBH estimated at 150, 175 and 200mm	B1	3.7	N	Green
G53	Common hawthorn	4	125	2	2	2	2	SM	Unremarkable, windswept trees; outgrown hedge stems; DBH range 100-150, average recorded.	C2	1.5	N	Green
T23	English holly	6	130	1	1	1	1	SM	Outgrown stem in hedgerow with canopy dieback; unremarkable.	C1	1.56	N	Green
H56	N/A	2	75	1	1	1	1	SM	Portion of roadside hedge colonised by bramble and dog rose; stem DBH range est. 50-100, average recorded.	C2	0.9	N	Green
G54	Common hawthorn	4	90	2	2	2	2	SM	Unremarkable wind swept trees; outgrown lapsed hedgerow stems; canopy dieback and dead stems; DBH range 70-100, average recorded.	U	1.1	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
H57	Common hawthorn, common sallow, elder	2	75	1	1	1	1	SM	Continuing portion of hedgerow along south west side of road; stem DBH range est. 50-100, average recorded.	C2	0.9	N	Green
H55	Common hawthorn, English holly, elder	1	75	1	1	1	1	SM	Portion of roadside hedge north east of road; recently flailed; stem DBH range est. 50-100, average recorded.	C2	0.9	N	Green
T24	English holly	6	130	1	1	1	1	SM	Outgrown hedge stem, healthy but unremarkable.	C1	1.6	N	Green
H58	Sycamore, common hawthorn, elder	2	75	1	1	1	1	SM	Portion of roadside hedge west of road; hawthorn dominant with self-seeded sycamore and elder; dog rose and bramble throughout; stem DBH range est. 50-100mm, average recorded.	B2	0.9	N	Green
H59	Sycamore, common hawthorn, elder	2	75	1	1	1	1	SM	Portion of roadside hedge east of road; hawthorn dominant, occasional self-seeded sycamore and elder; dog rose and bramble throughout; stem DBH range est. 50-100mm, average recorded.	B2	0.9	P	Red
H60	Sycamore, common hawthorn, English holly, pedunculate oak, common sallow	2	75	1	1	1	1	SM	Continuation of roadside hedgerow west of road; field access gate at junction of Furnessford Road dividing into two sections; hawthorn dominant; short section flailed otherwise slightly outgrown; stem DBH range est. 50-100mm, average recorded.	C2	0.9	P	Red
T37	Sessile oak	14	800	7	9	8	9	M	Large, mature open grown roadside tree within hedge. Set atop circa 1m embankment, limited access. Good, rounded form and spreading canopy. Good structural condition with no apparent defects.	A1	9.6	N	Green
H102	Hawthorn, elder	1	150	1	1	1	1	M	Layered roadside hedgerow atop embankment which slopes to north. Some non-layered stems to c. 150mm DBH.	B2	1.8	N	Green
T25	Rowan	4	150	1	1	1	1	SM	Small, third party planted tree. Healthy.	C1	1.8	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T26	Sessile oak	7	190	4	4	4	4	SM	Relatively young planted tree on third party land north of road. Open grown with good form. Healthy.	C1	2.3	E	Green
T27	Hawthorn	7	424	4	5	3	5	M	Large, mature tree on third party land behind stone wall, north of road. Dense, congested crown structure, typical; numerous acute stem unions. Healthy. 8 stems x 150 ave.	B1	5.1	N	Green
T28	Rowan	4	180	1	1	1	1	SM	Small, third party planted tree. Healthy.	C1	2.2	E	Green
T29	Rowan	3	110	1	1	1	1	SM	Small, third party planted tree. Healthy.	C1	1.3	E	Green
T30	Rowan	3	100	1	1	1	1	SM	Small, third party planted tree. Healthy.	C1	1.2	E	Green
T31	Oak sp.	7	210	2	2	3	3	SM	Third party planted amenity tree adjacent seating area. Healthy. Bark damage to stem., occluding.	C1	2.5	N	Green
T32	Rowan	3	120	1	1	1	1	SM	Small, third party planted tree. Healthy.	C1	1.4	N	Green

Appendix F. Tree Survey Schedule including Preliminary AIA impacts- Ribble Valley Borough Council

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T68	Common beech	15	900	6	6	5	5	M	Moderately large mature tree within field, set back from roadside behind field boundary hedge. Lower branches reduced over field east. Good health. Some bark included unions and natural braces, typical. Surveyed from roadside, limited inspection.	B1	10.8	E	Amber
T69	Common beech	19	900	5	6	5	4	M	Large, mature tree within field, set back from roadside behind field boundary hedge. Slightly windswept form, canopy shape biased east. Lower branches reduced over field east. Good health and structural condition. Surveyed from roadside, limited inspection	A1	10.8	E	Green
T70	Hawthorn	5	245	2	3	1	2	SM	Self-seeded, scrubby tree growing at field boundary. Set back from road c. 2m. Unremarkable. 6 stems x 100 ave.	C1	2.9	N	Green
T71	Common alder	8	450	2	3	5	4	M	Twin stemmed tree in field, set back from road and lay-by. Leader to north dead at top, otherwise appears healthy.	B1	5.4	N	Green
T72	Hawthorn	2	200	1	1	1	1	EM	Self-seeded, scrubby tree growing from base of alder. Unremarkable.	C1	2.4	N	Green
T73	Sycamore	11	600	5	6	4	5	EM	Moderately large roadside tree in field boundary hedge. Occasional small diameter deadwood, low risk. No significant defects observed.	B1	7.2	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T74	Common ash	11	240	2	4	2	3	SM	Self-seeded roadside tree in field boundary hedge. Presence of winter buds moderately good. Chalara ash dieback symptoms observed but not advanced.	C1	2.9	N	Green
T75	Hawthorn	5	400	5	2	3	4	M	Open grown tree in field boundary hedge adjacent road. Good form. Occasional damaged branches east over road. Healthy. Ivy covering trunk and primary limbs.	B1	4.8	R	Red
T76	Hawthorn	4	186	2	1	2	2	Y	Small, self-seeded roadside tree. Unremarkable. 4 stems: #150 and #110 mm DBH; 2 stems undersize.	C1	2.2	N	Green
T77	Hawthorn	2	100	2	2	2	2	SM	Small, self-seeded roadside tree. Unremarkable. 3 stems; 2 stems undersize.	C1	1.2	R	Red
T78	Hawthorn	4	100	2	2	2	2	SM	Small, self-seeded roadside tree. Unremarkable. Average stem diameter recorded.	C1	1.2	R	Red
T79	Hawthorn	5	180	3	3	3	4	M	Multi stemmed from circa 0.5 m. Roadside tree elevated above highway on sloped verge. Not particularly remarkable but good form and healthy.	B1	2.2	R	Red
T80	Common ash	6	160	1	2	2	1	SM	Beyond roadside wall, west of ditch at field boundary. Horses in field, limited inspection from roadside. Dead tree; Chalara ash dieback.	U	1.9	R	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T81	Hawthorn	6	443	3	4	4	2	M	Mature example of species at roadside, west of wall in verge. Twin stemmed: DBH 190 & #400. Acute union between stems; natural brace above. Crown reduced west, roadside. Healthy.	B1	5.3	R	Red
T82	Common ash	5	110	1	1	1	1	SM	Dead tree; Chalara ash dieback.	U	1.3	R	Red
T83	Hawthorn	4	330	3	4	2	1	M	Mature example of species at roadside, west of wall in verge. Crown reduced west, roadside. Healthy.	B1	4.0	R	Red
T84	Common ash	9	470	3	5	4	5	EM	Roadside tree in narrow verge, immediately east of stone wall. Many lower twigs dead. Chalara ash dieback symptoms observed.	C1	5.6	E	Green
T85	Common ash	11	500	5	6	5	6	EM	Roadside tree in narrow verge, immediately east of stone wall. Many lower twigs dead. Chalara ash dieback symptoms observed. Twin stemmed: DBH 400 300. Well established basal epicormic shoots; dead with Daldinia concentrica fruiting bodies.	C1	6.0	E	Green
T86	Elm sp.	12	438	7	6	7	5	SM	Layered elm that has matured to notable height at roadside. 11 stems #: 150, 350, 310, 330, 190, 190, 200, 110, 140, 90 and 200 mm DBH. Ave. 132 mm DBH.	B1	5.3	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T87	Common ash	17	1100	5	7	6	3	M	Large roadside tree. Reduced vigour, Chalara ash dieback likely causal but unable to confirm, limited visibility from ground level. Dense ivy throughout entire structure into canopy, may be obscuring defects, very limited inspection. Recommend spring / summer risk and condition inspection.	B1	13.2	R	Red
T88	Common ash	17	1200	7	8	8	9	M	Large roadside tree. Reduced vigour, chalara ash dieback likely causal but unable to confirm, limited visibility from ground level. Dense ivy throughout entire structure into canopy, may be obscuring defects, very limited inspection.	U	14.4	N	Green
T91	Sycamore	8	500	2	7	6	7	EM	Survey data used from main ES surveys. Decking tree east of field boundary fence line atop small bund. Exposed, damaged roots west. Limb failures. Remaining canopy biased south east. Tree in decline with stem hollow, fungal rot at base and knot holes.	C3	6.0	N	Green
T92	Pedunculate oak	12	650	6	5	5	5	M	Open grown tree atop small bund at field boundary fence. Healthy with no significant defects observed.	B1	7.8	N	Green
T97	Pedunculate oak	12	600	3	5	4	5	EM	Roadside tree set back within field. Declining with stag headed form; deadwood to c. 100mm diameter, low risk to road users. Remaining canopy healthy.	C1	7.2	N	Green

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
T99	Common beech	10	600	5	6	5	5	M	Roadside tree in hedgerow with moderate form. Many winter buds, bursting. Crown raised west over road; slight asymmetric crown shape biased east. Bifurcate at c. 1.5m, ivy covering unions but appear acute; may contain included bark. Healthy.	B1	7.2	E	Amber
T100	Sycamore	17	900	5	8	8	7	M	Large, mature tree on third party residential land. Wide, spreading canopy. Appears healthy with no significant defects. Limited access and inspection, surveyed from distance at roadside to west. Burring on limbs. Ivy on trunk.	A1	10.8	E	Green
T101	Oak sp.	9	750	1	1	3	6	M	Large, standing dead tree at roadside, atop c. 1m high earth bund. Mature ivy cover colonised entire structure, limited visibility. Weight biased west. Recommend fell tree.	U	9	E	Green
T102	Common ash	17	450	3	4	3	3	EM	Growing from bund immediately at roadside. Reduced vigour, likely Chalara ash dieback; Limited visibility from ground level to observe symptoms. Ivy developing up trunk.	C1	5.4	E	Green
H104	Hawthorn, common ash	1	160	1	1	1	1	EM	Layered hedge delineating field boundary from roadside verge. Layered stems to c. 160mm diameter; majority of arising stems <75mm. Predominantly hawthorn.	C1	1.9	P	Red
H105	Hawthorn	1	100	1	1	1	1	SM	Section of wider field boundary hedge; set back from and elevated above road, atop sloped verge side embankment. Layered stems, occasionally up to c. 100mm diameter; vast majority of stems <75mm.	C1	1.2	N	Green

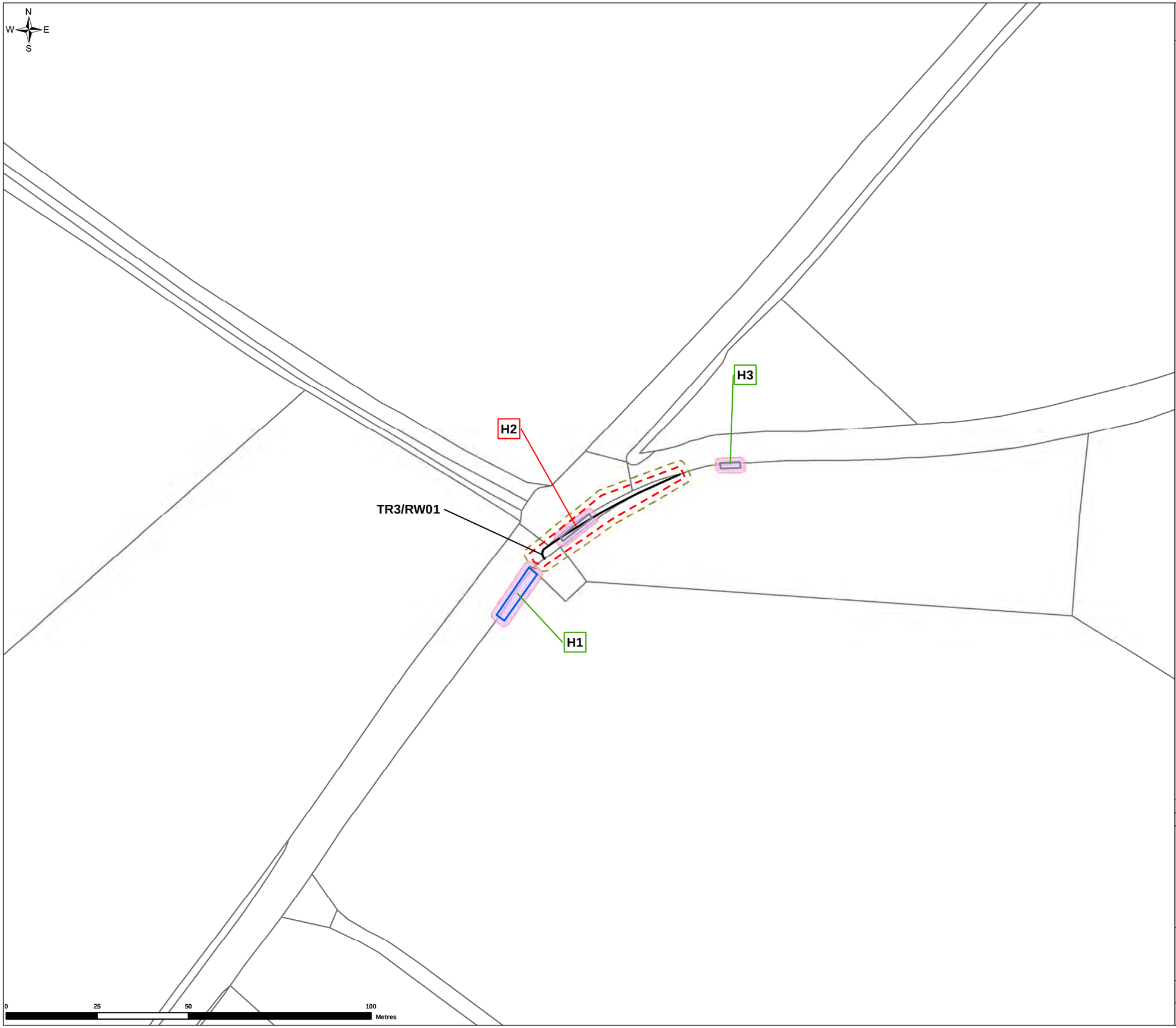
Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
H106	Hawthorn	1	120	1	1	1	1	SM	Section of long roadside hedge delineating field boundary from verge. Layered and non-layered stems, many <75mm diameter.	C1	1.4	P	Red
H107	Holly, hawthorn, common ash	1	150	1	1	1	1	M	Neatly clipped roadside hedge delineating field boundary. Layered stems to c. 150mm diameter; majority of arising stems <75mm.	C2	1.8	P	Red
G108	Hawthorn, common ash	13	781	5	7	5	5	M	Mature, twin stemmed ash: DBH 560mm & #600mm; and small, semi mature hawthorn: DBH #200mm. Chalara ash dieback symptoms; ash covered in ivy. Hawthorn unremarkable.	C2	9.4	E	Amber
H109	Hawthorn	1	190	1	1	1	1	M	Short section of neatly clipped roadside, field boundary hedge. Ivy throughout.	C2	2.3	E	Amber
G110	Sycamore	12	820	6	6	6	6	M	Two mature roadside trees at field boundary. Reduced vigour and bud presence. Previous branch failures. No significant defects observed. Tree south: DBH 820; north: 640	B2	9.8	P	Red
H111	Hawthorn	1	100	1	1	1	1	SM	Survey data used from main ES surveys. Max DBH reported. End section of neatly clipped roadside, field boundary hedge. Majority of stems <75mm diameter.	B2	1.2	P	Red
H112	Hawthorn, Beech, Hazel, Rowan	9	170	3	3	3	3	SM	Survey data used from main ES surveys.	B2	2	E	Amber

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G113	Goat willow, grey willow	9	240	3	3	3	3	SM	Survey data used from main ES surveys. Fair condition. Patchy group located within working quarry.	C2	2.9	E	Amber
G114	Cypress sp.	5	90	2	2	2	2	SM	Small copse of planted trees, fenced off in field; set back from road circa 12-15 m. Limited access and inspection from roadside.	C2	1.1	N	Green
G115	Cypress sp.	4	90	2	2	2	2	SM	Small copse of planted trees, fenced off in field; set back from road. Limited access and inspection from roadside.	C2	1.1	N	Green
G116	Hawthorn, holly	4	300	3	3	3	2	EM	Self-seeded roadside trees, unremarkable. Max. DBH estimated at 0.5 m from roadside.	C2	3.6	R	Red
G117	Common ash, hawthorn	12	600	6	6	6	6	M	Linear roadside group of middle aged to mature ash with hawthorn beneath. Lower canopies of ash dead with epicormic response; canopies displaying reduced vigour. Chalara ash dieback observed. Hawthorn healthy but unremarkable.	C2	7.2	P	Red
G118	Common ash, sycamore, hawthorn, holly	10	400	4	4	4	4	SM	Linear group of unremarkable roadside trees. Predominantly ash in reduced health and condition; Chalara ash dieback observed. Many stems reduced beneath utility wires. Partial screening along road but numerous gaps. Largest DBH estimated (felled tree with basal epicormic regrowth); majority of stems average 150 mm DBH.	C2	4.8	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
H119	Hawthorn, holly, common beech	5	150	2	2	2	2	SM	Roadside hedgerow, outgrown but managed at roadside. Max. DBH recorded; majority of stems <100 mm DBH. Layered stems.	B2	1.8	P	Red
H121	Hazel, blackthorn	2	180	1	1	1	1	M	Section of roadside hedge. Appears historically layered with stems up to circa 180 mm diameter; majority of arising stems <75 mm DBH. Limited visibility, ivy.	B2	2.2	R	Red
G122	Hawthorn, hazel	5	200	3	3	3	3	M	Outgrown layered stems at boundary between field parcels; likely managed as hedgerow historically. Healthy. Layered stems up to circa 200 mm diameter; majority of arising stems <75 mm DBH.	C2	2.4	P	Red
H123	Hawthorn	1	100	1	1	1	1	SM	Portion of roadside hedge, neatly clipped. Layered stems up to circa100 mm diameter; numerous arising stems <75 mm DBH.	C1	1.2	E	Amber
H124	Hawthorn	1	100	1	1	1	1	SM	Roadside hedge, neatly clipped. Layered stems up to circa 100 mm diameter; majority of arising stems <75 mm DBH.	C1	1.2	P	Red
H125	Common beech, cherry laurel	1	75	1	1	1	1	SM	Third party hedge. Limited access and inspection. Majority of stems appear <75 mm diameter, limited visibility.	C1	0.9	N	Green
H126	Holly, cherry Laurel	2	75	1	1	1	1	SM	Third party hedge. Limited access and inspection. Stems may be <75 mm diameter, limited visibility.	C1	0.9	P	Red

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G127	Common beech, field maple, fir sp.	7	180	2	2	2	2	SM	Some third-party conifers. Outgrown broadleaf hedge stems.	C2	2.2	P	Red
G128	Sycamore, common beech, field maple	8	300	3	3	3	3	SM	Relatively young roadside trees within outgrown hedgerow along residential garden boundary. Screening function. Healthy.	C2	3.6	P	Red
G129	Sitka spruce	9	200	2	2	2	2	SM	Linear shelter belt within third party garden, screening function roadside boundary. Healthy. Estimated from roadside.	C2	2.4	P	Red
G130	Sycamore, pedunculate oak, field maple, common ash, common beech	18	600	7	7	7	7	EM	Mature roadside trees growing atop and beyond steep, circa 1, tall verge side bund; limited access and inspection from roadside. Occasional ash that lacks in vigour; likely Chalara ash dieback infection. Ivy cover on most trees	B2	7.2	E	Amber
G131	Hawthorn, holly, hazel, sycamore, common ash, goat willow	6	100	2	2	2	4	EM	Understorey trees to western edge of linear group of mature roadside trees. Located atop and beyond densely vegetated, steep roadside bund, limited access and inspection from roadside. Group bounds and slightly spills out into residential garden to south. Average stem diameter recorded.	C2	1.2	E	Amber
G132	Sycamore, common ash, pedunculate oak	11	580	5	5	5	5	EM	Large roadside trees displaying reduced vigour and structural defects. Chalara ash dieback likely causal factor of reduced vigour in ash. Ivy cover. Limited visibility and inspection from roadside.	C2	7.0	E	Amber

Tree Ref. No.	Species	Height (m)	DBH (mm)	Canopy spread (m)				Age class	General Observations and Comments	Category grading	RPA radius (m)	AIA	RAG status
				N	E	S	W						
G133	Sycamore, pedunculate oak, field maple, common beech	12	600	5	5	5	5	M	Mature roadside trees growing atop and beyond steep, circa 1, tall verge side bund; limited access and inspection from roadside. Ivy cover on most trees. Small diameter deadwood over road, low risk.	B2	7.2	P	Red



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Legend

- Red Line Boundary
- Road Widening (RW)
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- Individual Trees
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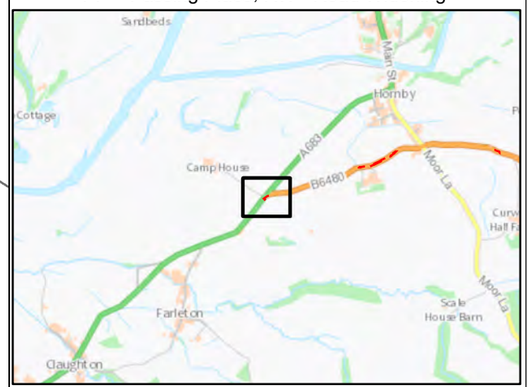
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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Water for the North West

UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
1 OF 23

SCALE	SHEET SIZE
1:1,000	A3
DRAWING NUMBER	REVISION
LCC_RVBC-BO-FIG-V5-P1-003	0

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N
W E
S

TR3/RW02

H4

H5

0 25 50 100 Metres

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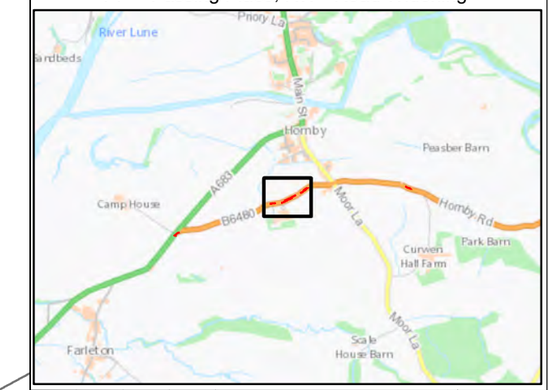

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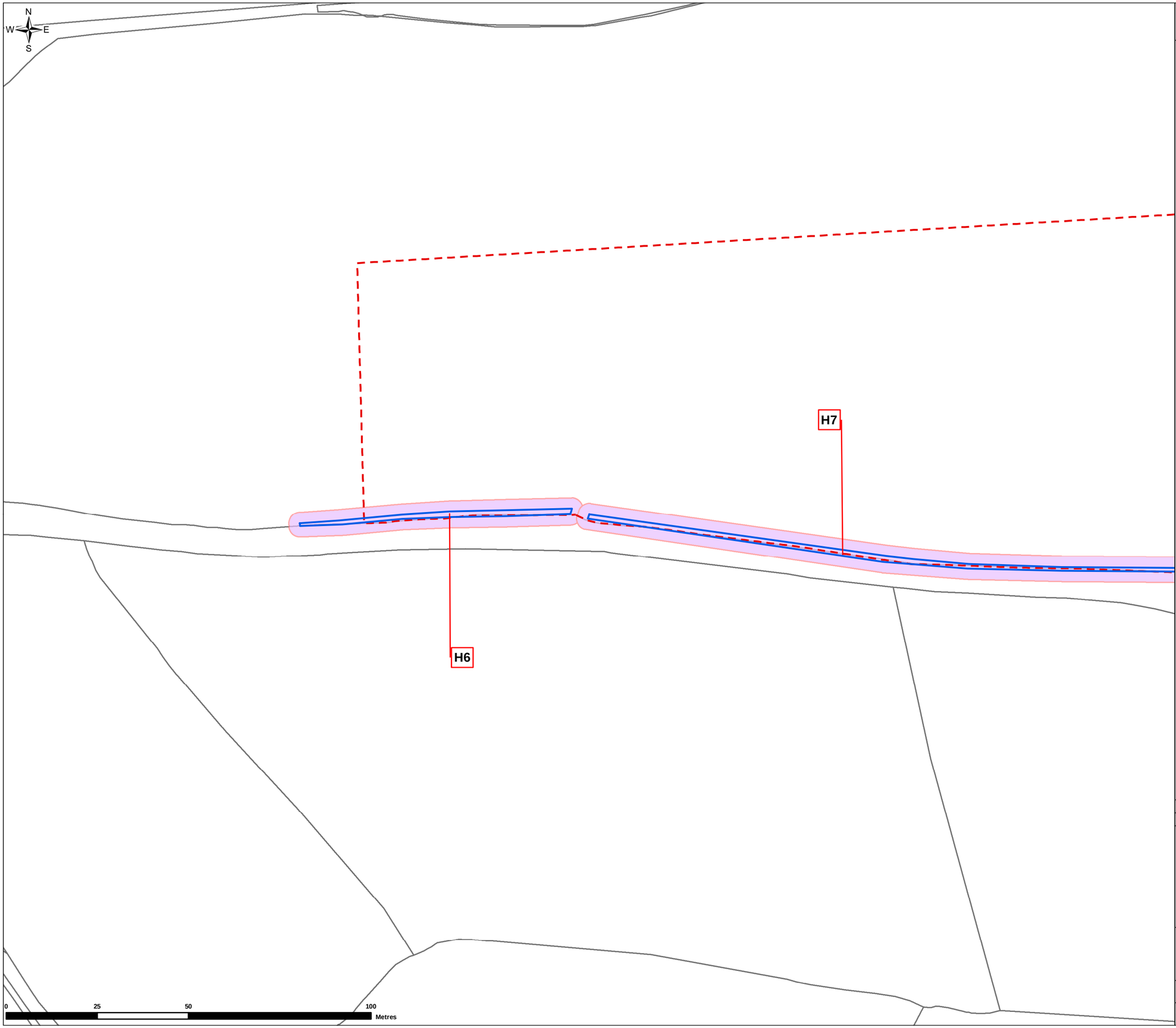

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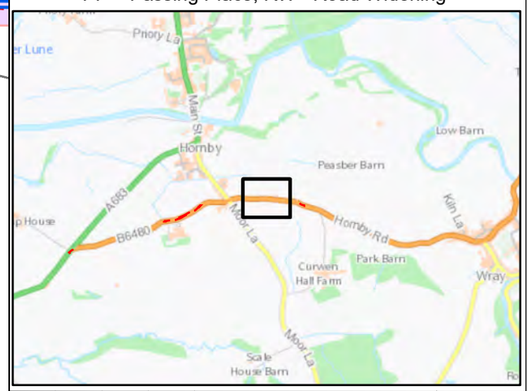

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3 OF 23

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N
W E
S

G11
T21
T22
G10
H7
H8
TR3/RW03
H103

0 25 50 100
Metres

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4 OF 23

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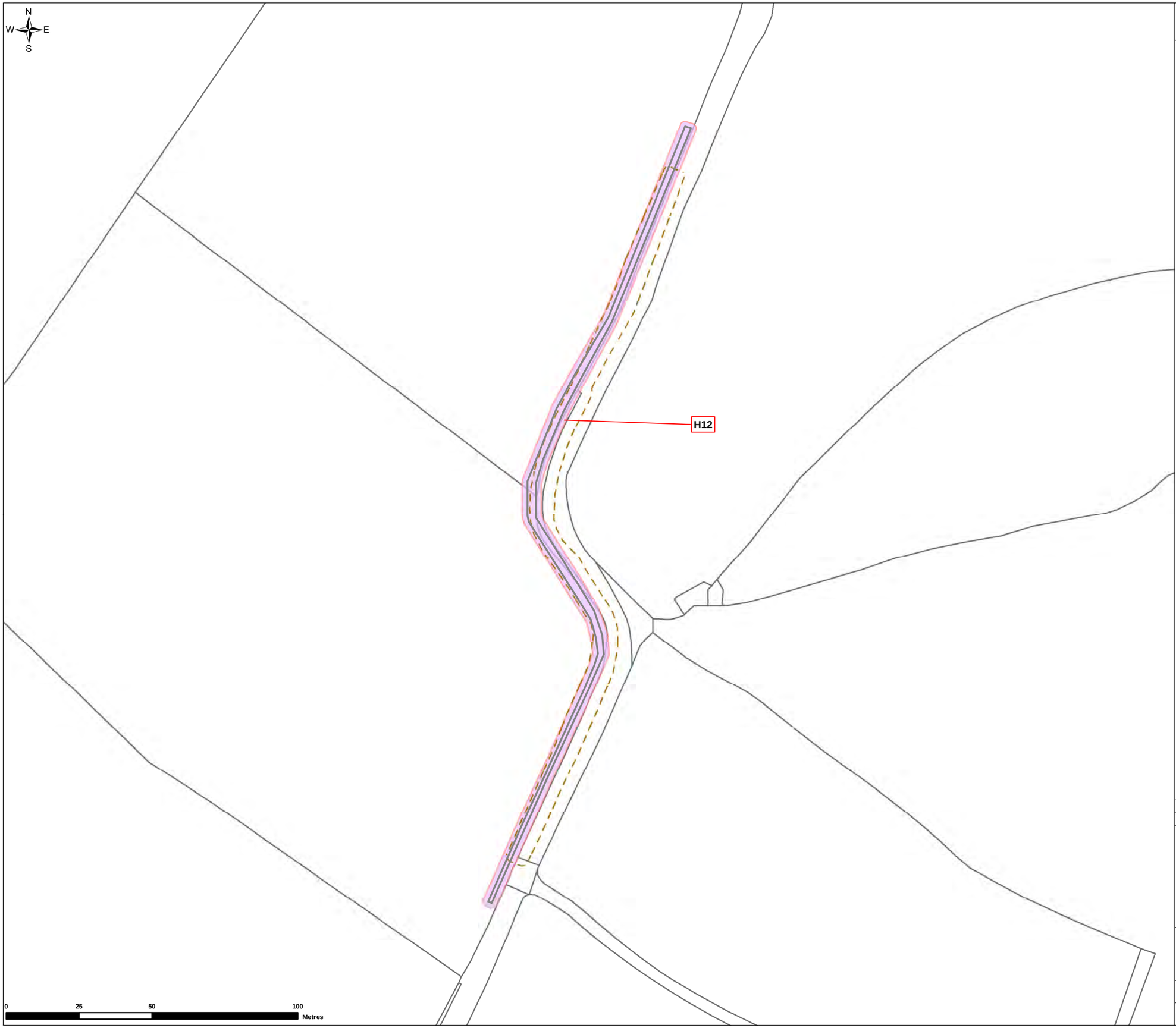

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5 OF 23

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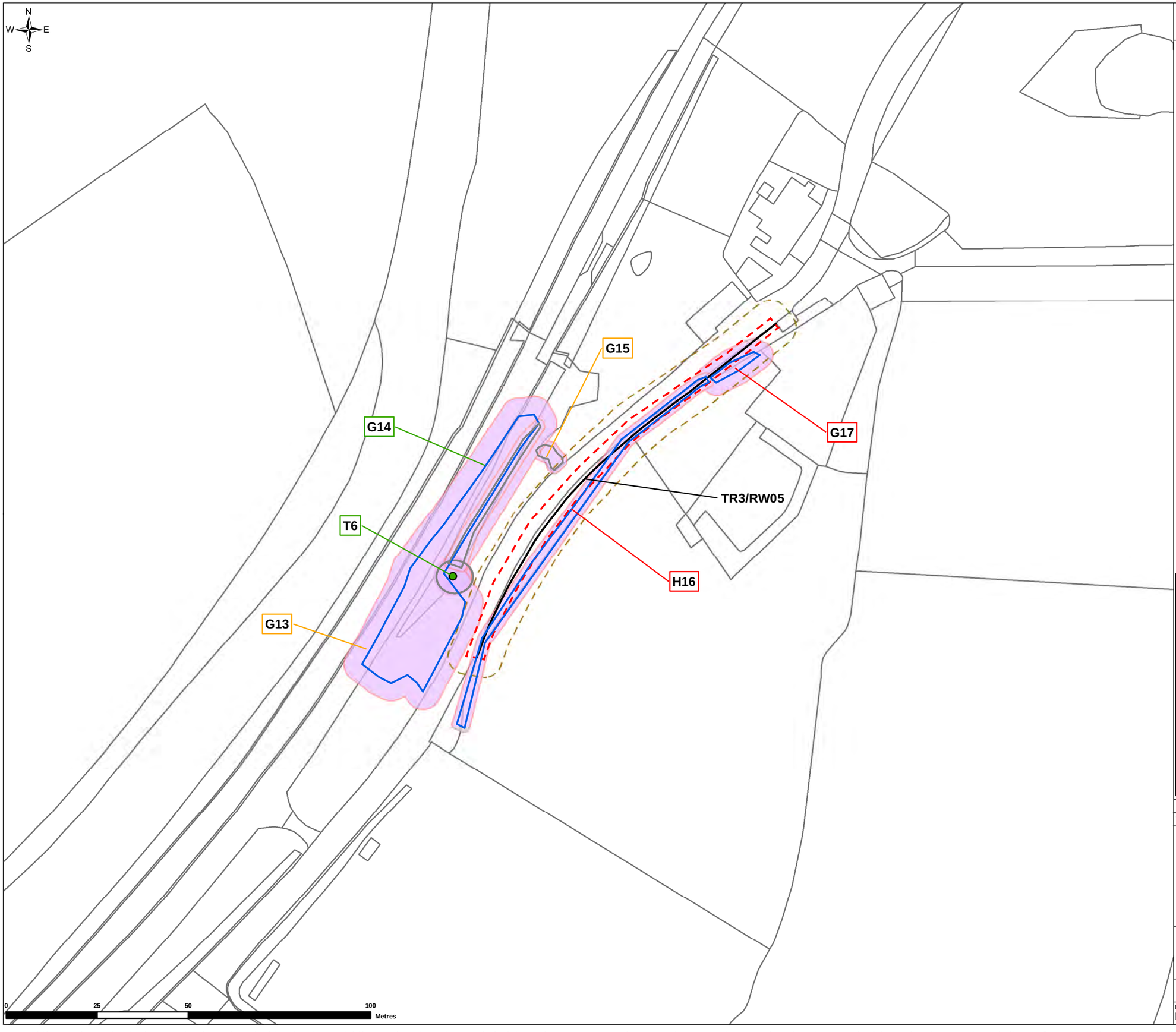

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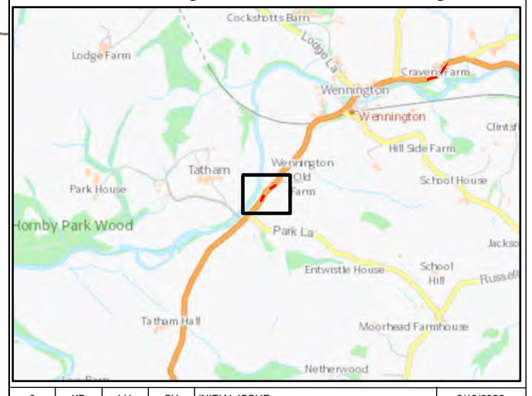

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N
W E
S

T1
G22
G21
T4
T2
T3
T5
TR3/RW06
G20
W18
G19

0 25 50 100
Metres

FIGURE P1.3

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Legend

- Red Line Boundary
- Road Widening (RW)
- At Risk Buffer

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening

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Water for the North West

UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
7 OF 23

SCALE	SHEET SIZE
1:1,000	A3
DRAWING NUMBER	REVISION
LCC_RVBC-BO-FIG-V5-P1-003	0

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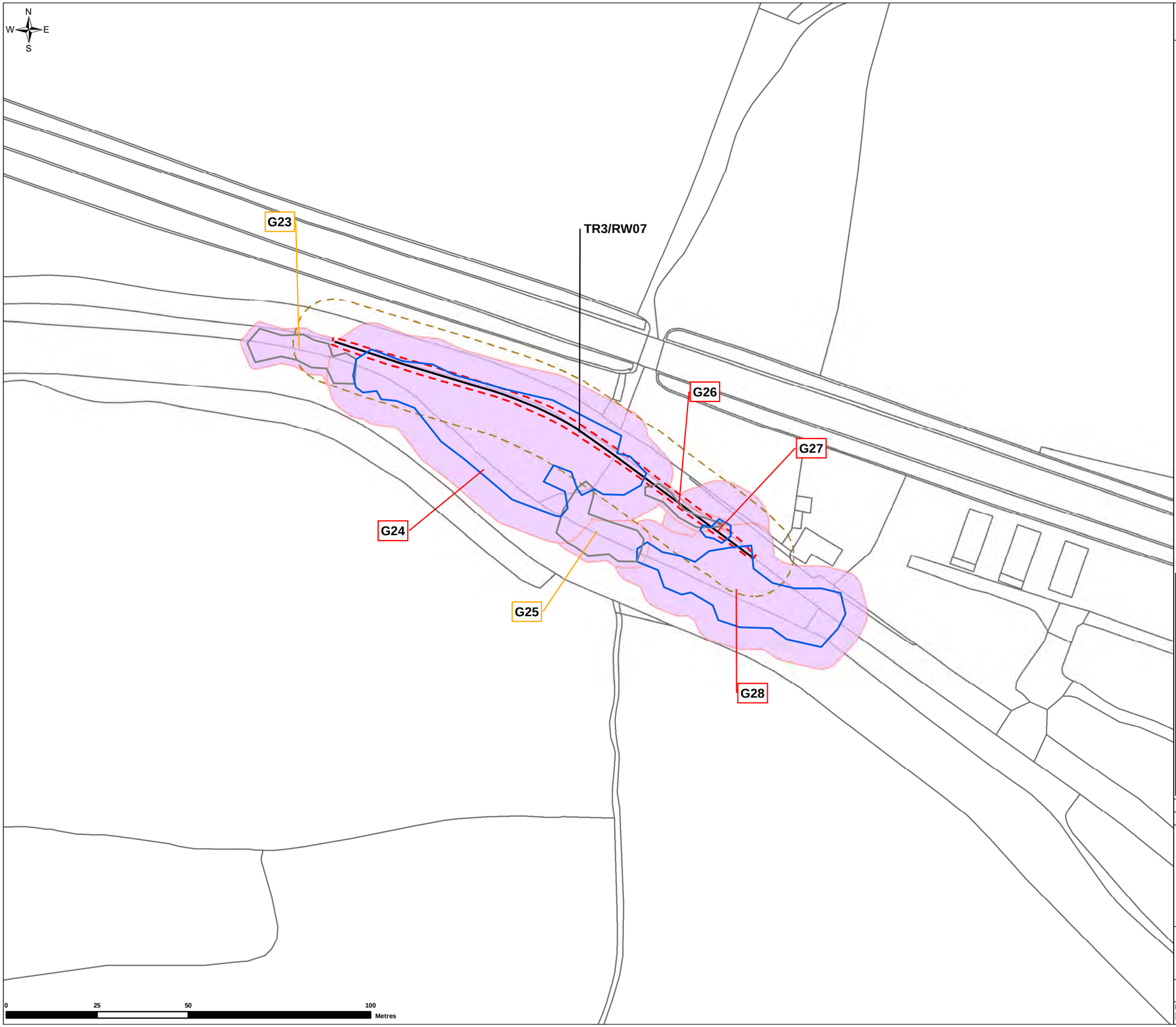

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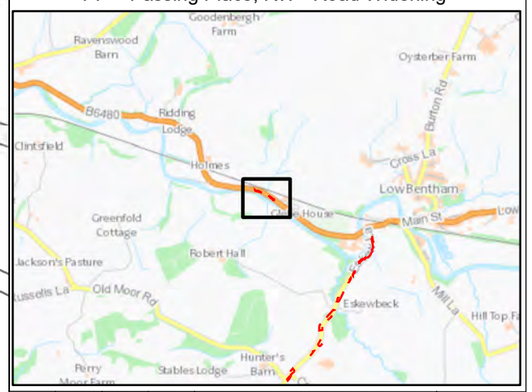

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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
8 OF 23

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N
W E
S

H29
T7
T8
T9
H30
TR3/RW08
TR3/RW08

0 25 50 100 Metres

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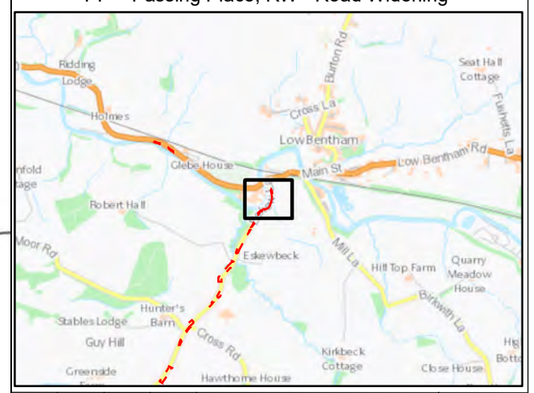

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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
9 OF 23

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N
W E
S

TR3/RW08

TR3/RW08

H31

H32

TR3/RW31

H33

T1a

H34

T2a

0 25 50 100
Metres

FIGURE P1.3

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- Root Protection Area

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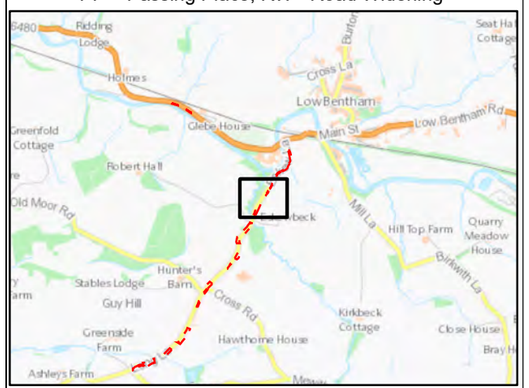

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BOWLAND ARBORICULTURE
10 OF 23

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H33
T1a
H34
T2a
T3a
G36
TR3/RW32
G37
H35
TR3/RW33
T4a
TR3/RW34
H38

0 25 50 100 Metres

Legend

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- Category U Feature
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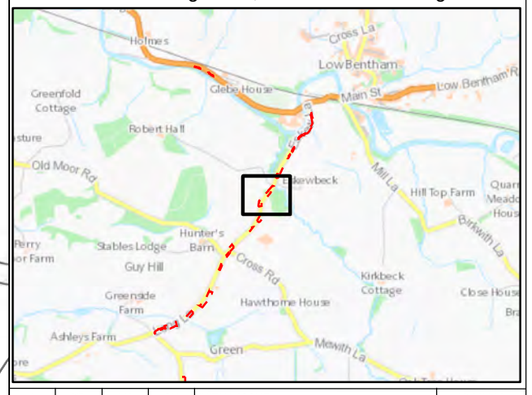

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11 OF 23

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N
W E
S

T4a
TR3/RW34
H38
T10
H39
T11
TR3/RW09
T12
T13
H40
TR3/RW35
T14

0 25 50 100
Metres

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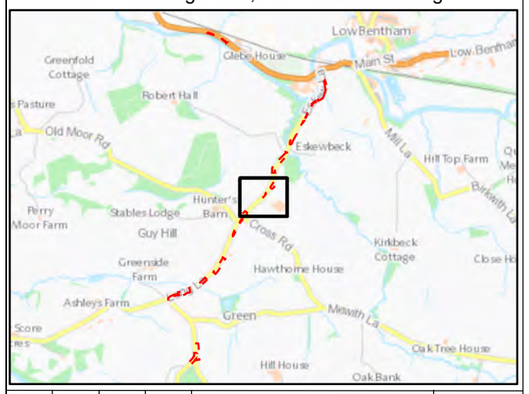

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BOWLAND ARBORICULTURE
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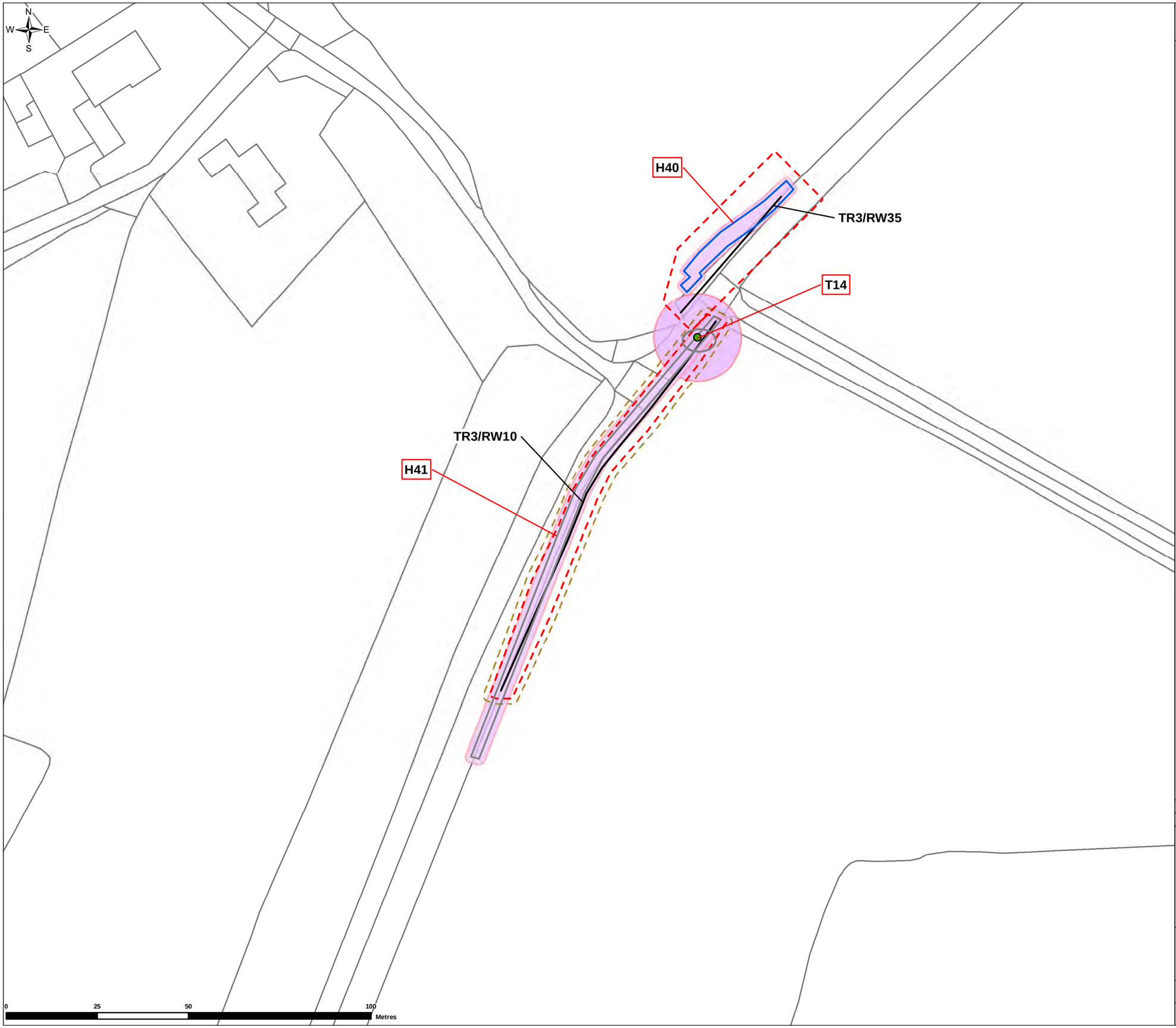

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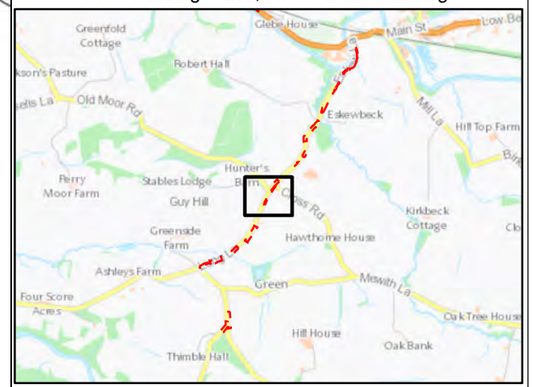

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13 OF 23

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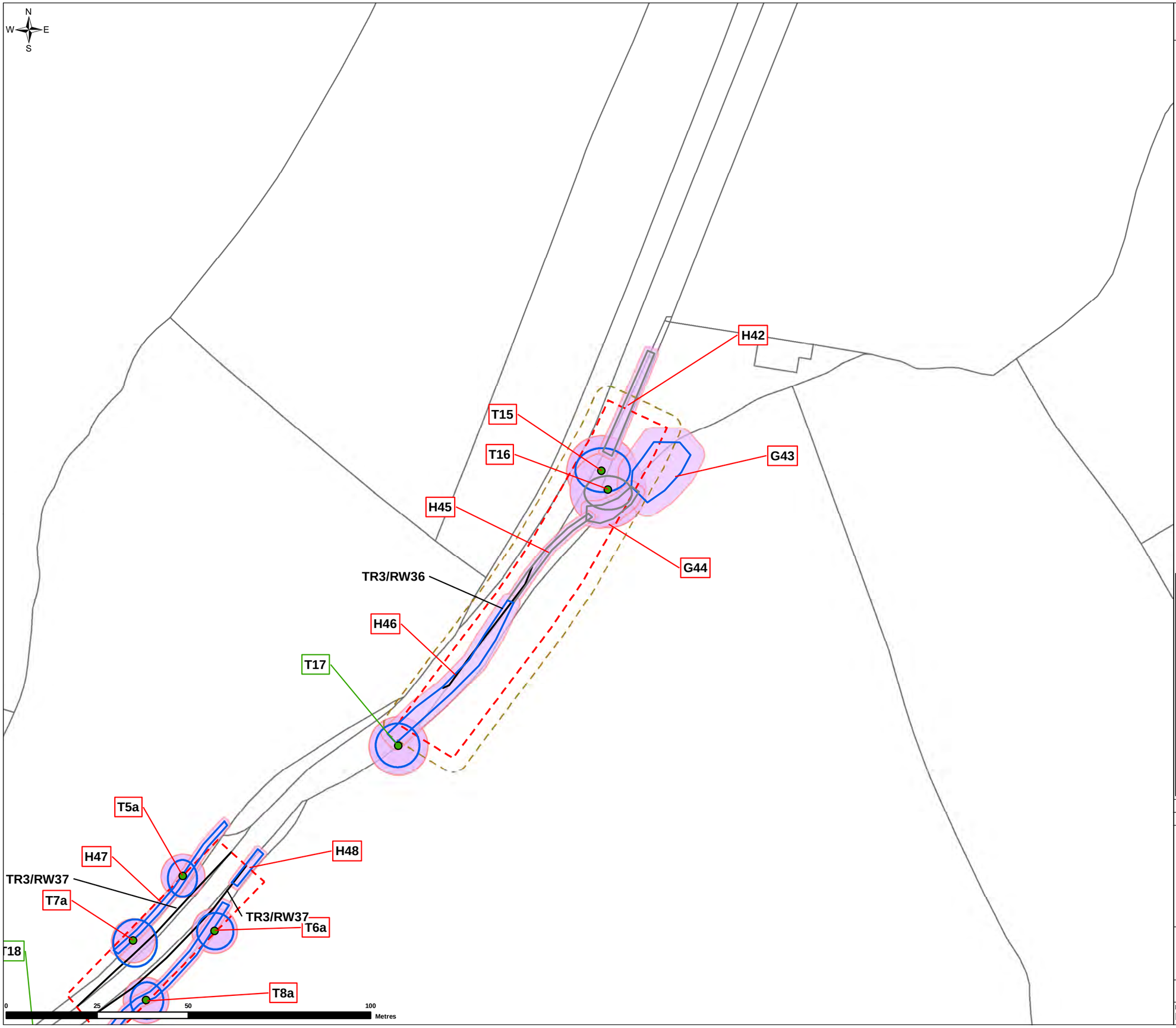

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BOWLAND ARBORICULTURE
14 OF 23

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N
W E
S

T5a
H47
H48
TR3/RW37
T7a
TR3/RW37
T6a
T18
T8a
T9a
TR3/RW38
H51
T10a
T11a
H49
TR3/RW11
H50
T20
T19
G52
G53
G54
H55
T23
H56
H57
T24

0 25 50 100
Metres

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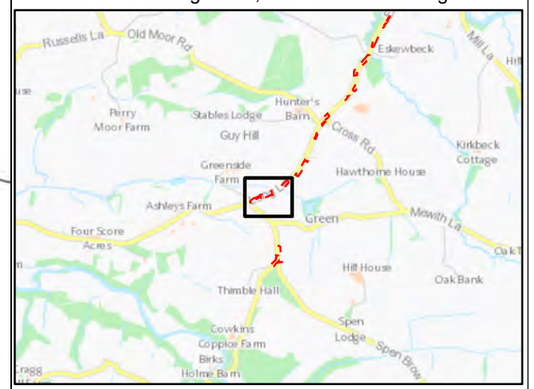

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15 OF 23

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N
W E
S

H58

Spen Brow holding area

H60

Spen Brow holding area

H59

0 25 50 100 Metres

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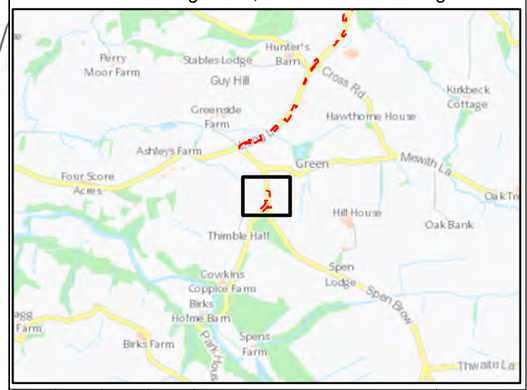

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16 OF 23

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N
W E
S

TR3/RW17

G74

TR3/RW17

0 25 50 100
Metres

FIGURE P1.3

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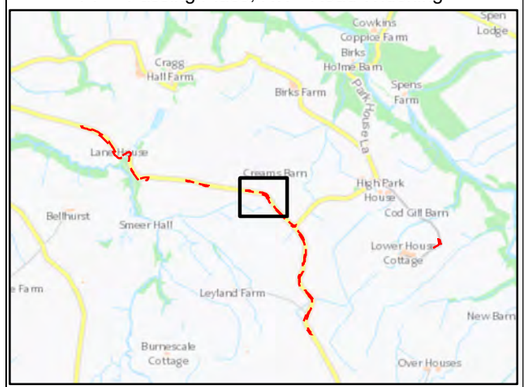
Legend

- Red Line Boundary
- Road Widening (RW)
- At Risk Buffer

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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Water for the North West

UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
17 OF 23

SCALE	SHEET SIZE
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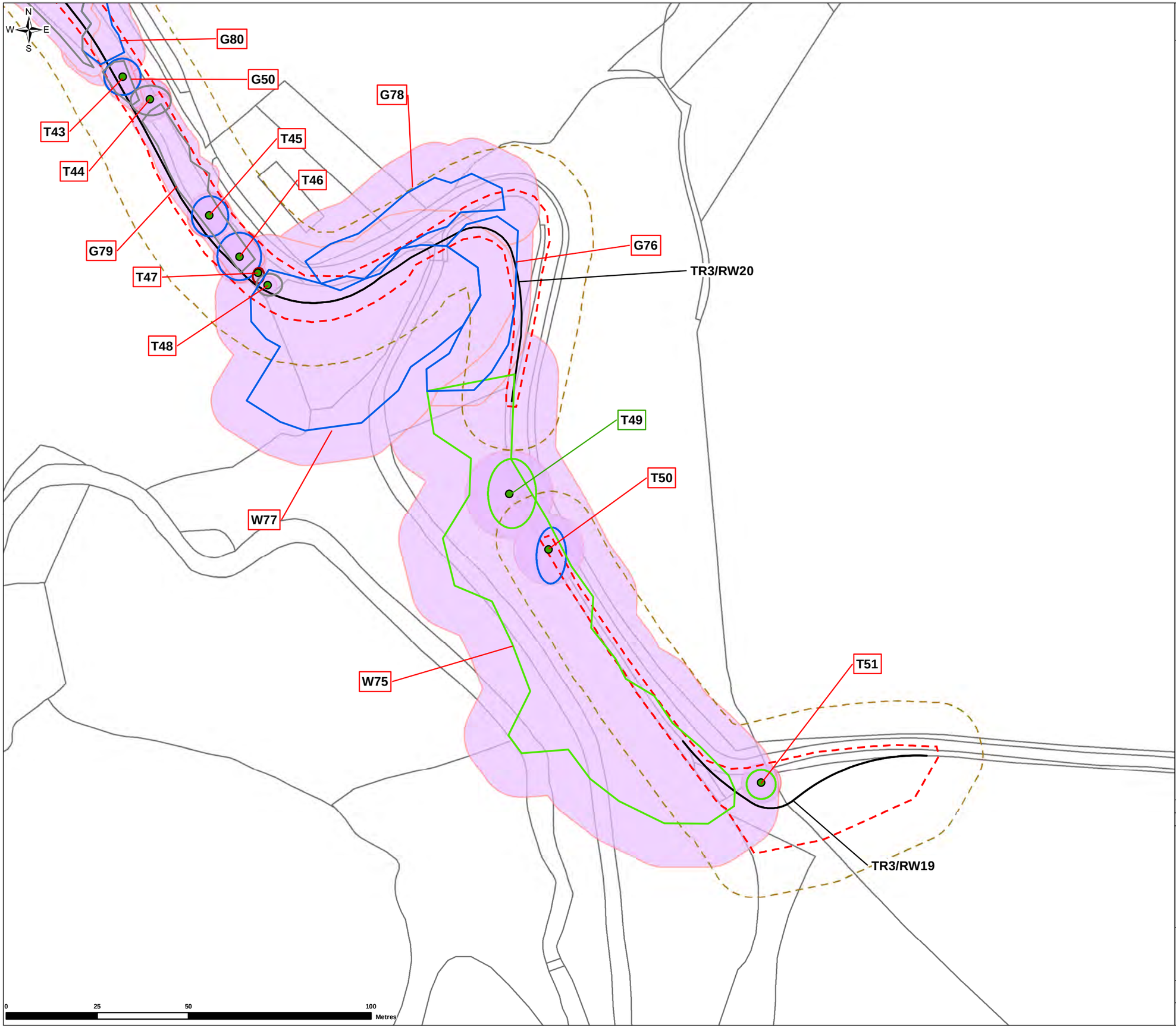

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- Category U Feature
- Root Protection Area

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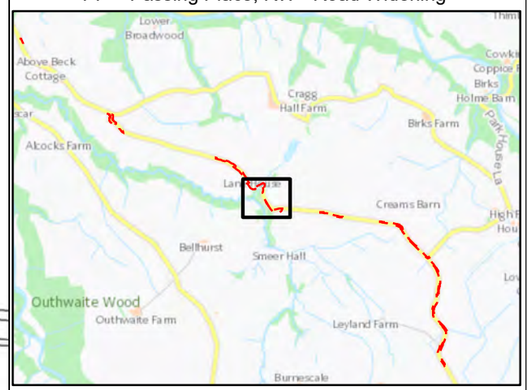

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BOWLAND ARBORICULTURE
18 OF 23

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N
W E
S

G89
T39
G86
G85
TR3/RW21
T38
H88
G84
G87
G83
G82
T40
T41
G81
T42
G80
G50
G78
T43
T45
T44
T46
G79
T47

0 25 50 100
Metres

FIGURE P1.3

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Label Abbreviations:
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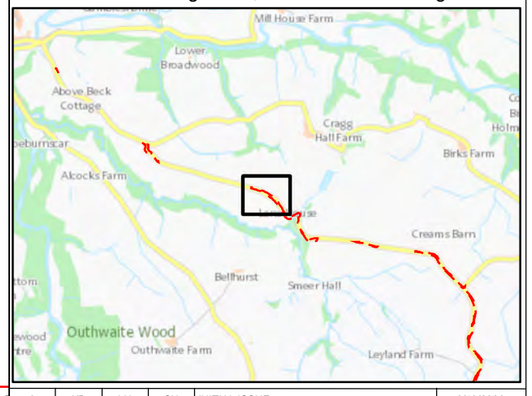

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BOWLAND ARBORICULTURE
19 OF 23

SCALE	SHEET SIZE
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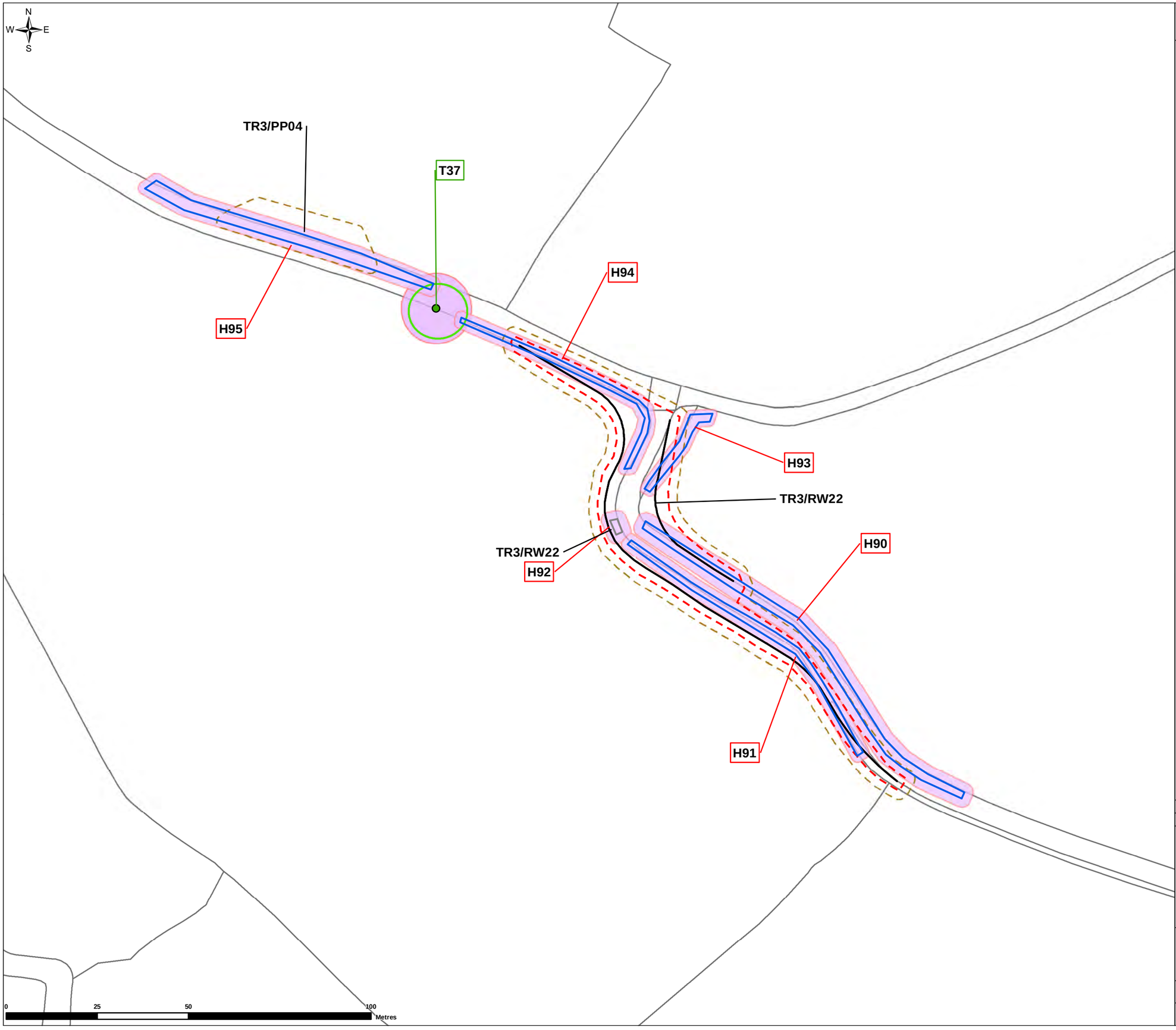

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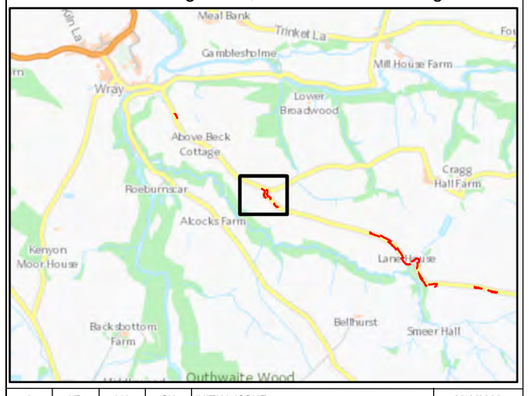

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BOWLAND ARBORICULTURE
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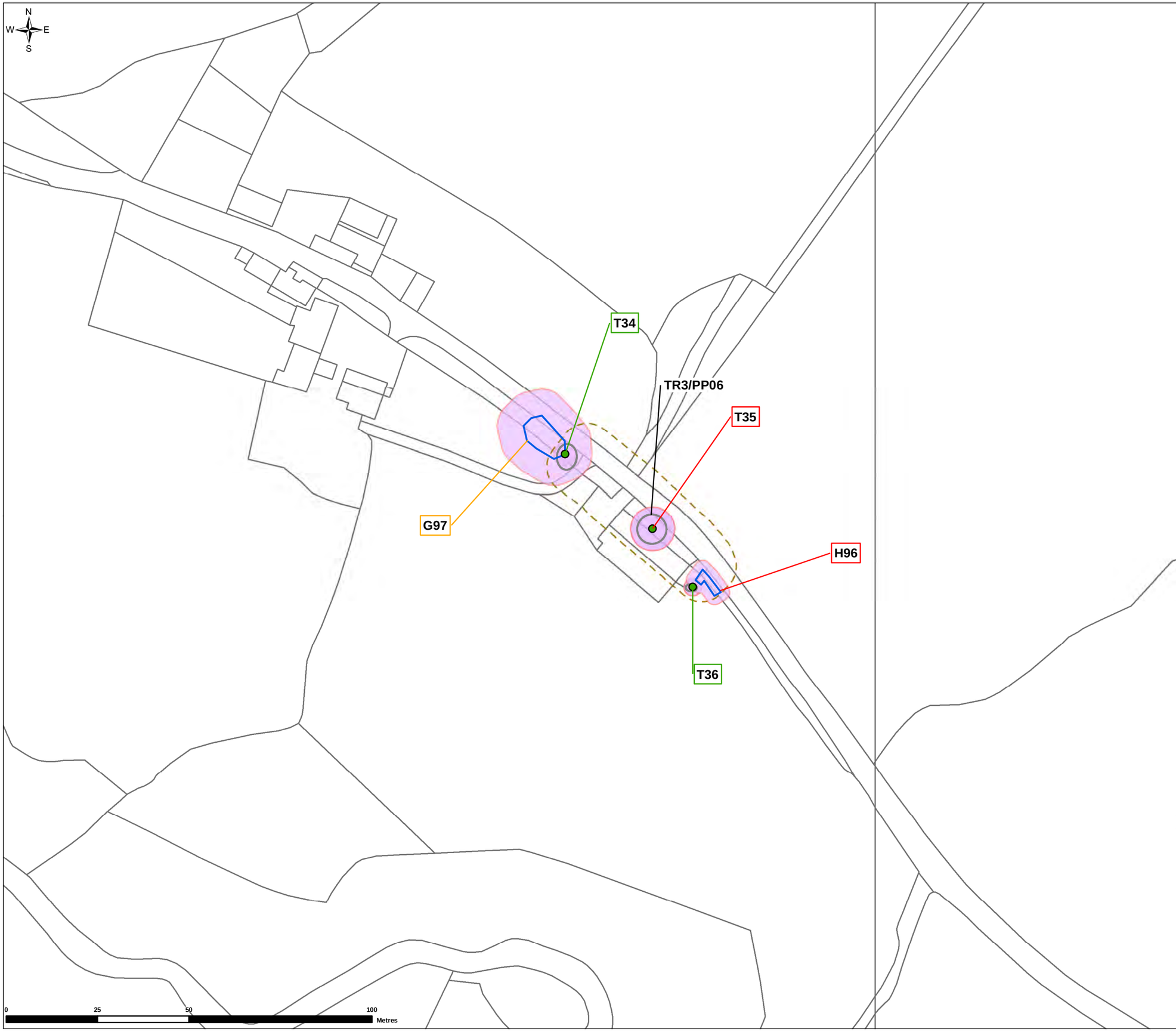

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Legend

At Risk Buffer

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Label Abbreviations:
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BOWLAND ARBORICULTURE
21 OF 23

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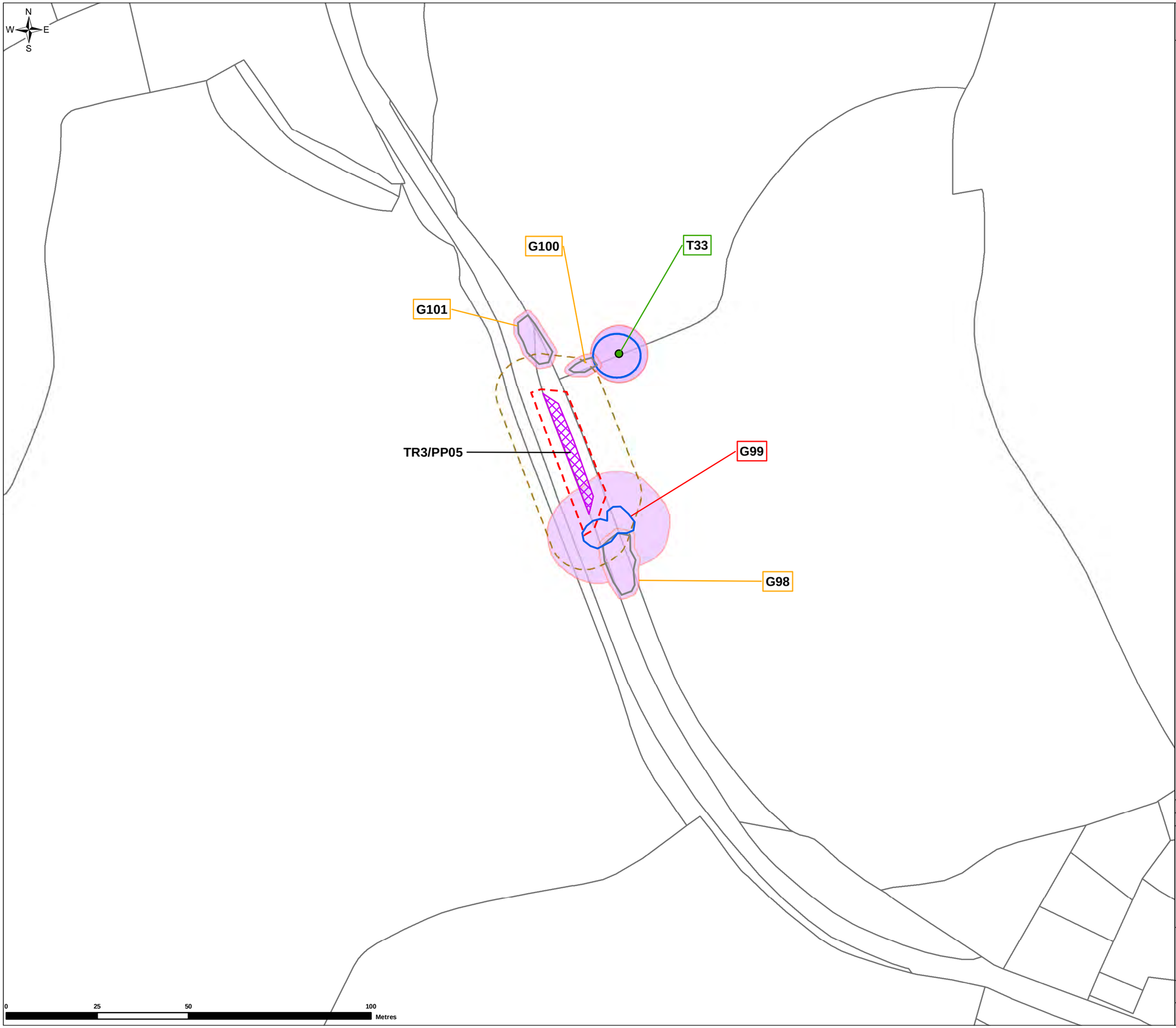

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Legend

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- Passing Place (PP)
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- Category A Feature
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- Category C Feature
- Category U Feature
- Root Protection Area

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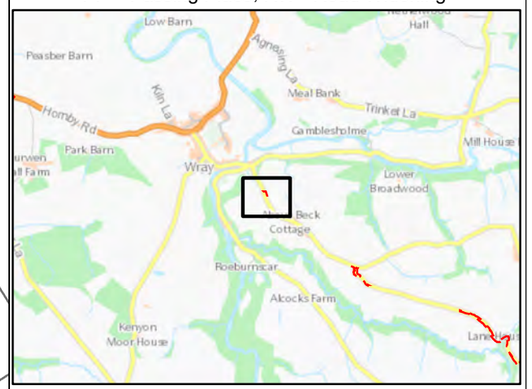

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BOWLAND ARBORICULTURE
22 OF 23

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N
W E
S

T25
T26
T29
T28
T31
T30
T32
T27
H102

0 25 50 100 Metres

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Label Abbreviations:
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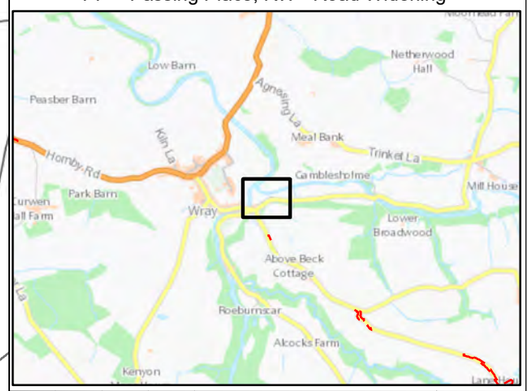

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BOWLAND ARBORICULTURE
23 OF 23

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- Category C Feature
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- Root Protection Area

Label Abbreviations:
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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
1 OF 17

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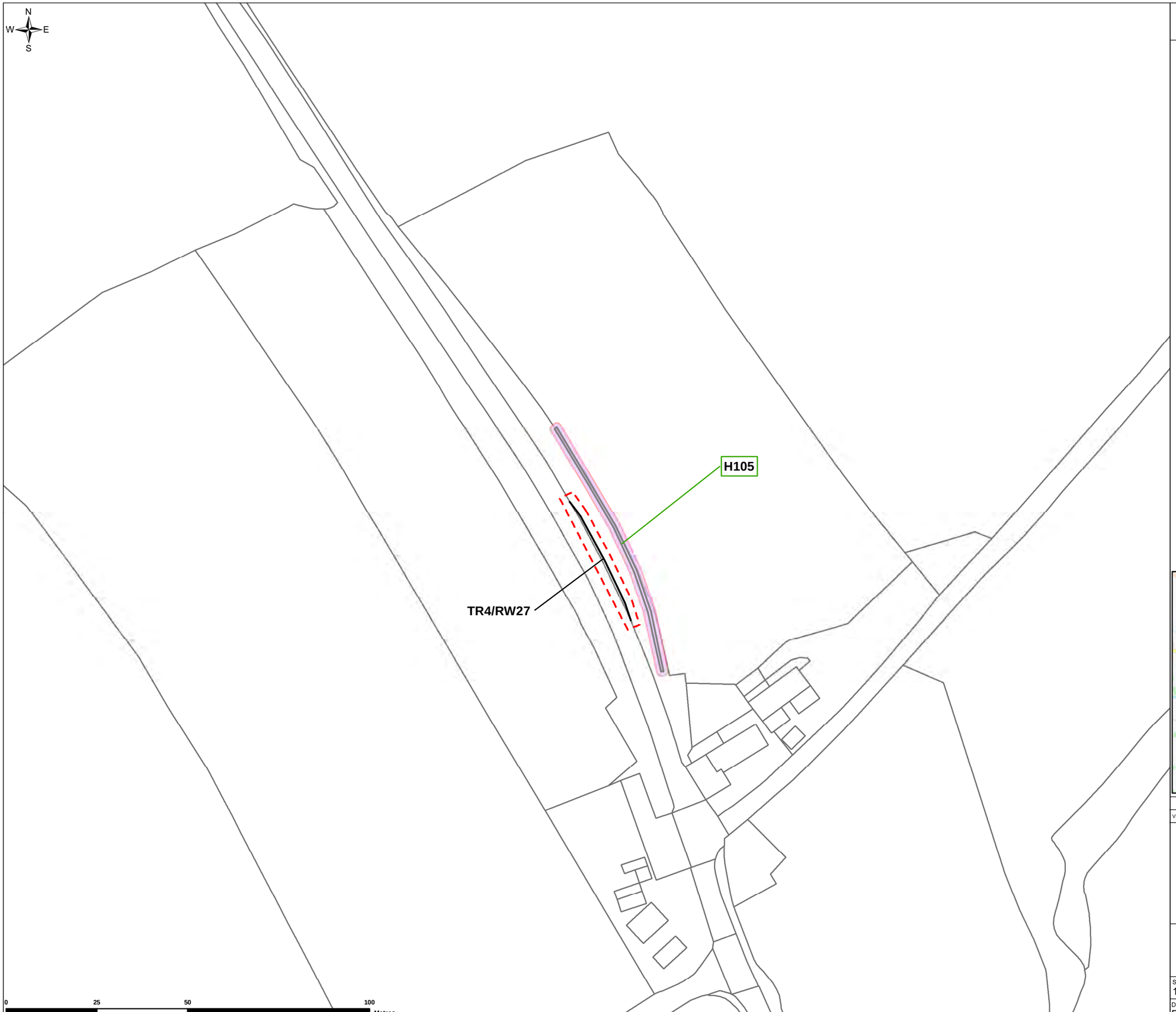

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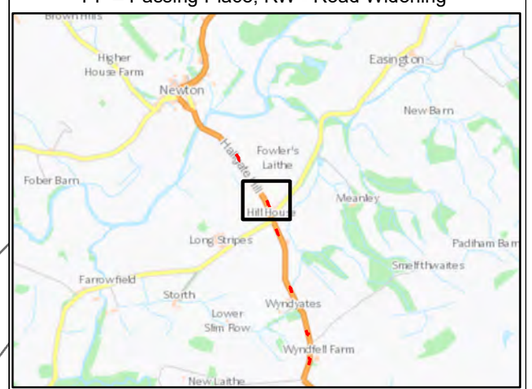

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BOWLAND ARBORICULTURE
2 OF 17

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N
W E
S

TR4/RW26

H106

0 25 50 100
Metres

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3 OF 17

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N
W E
S

T70
T71
T72
TR4/PP02

0 25 50 100
Metres

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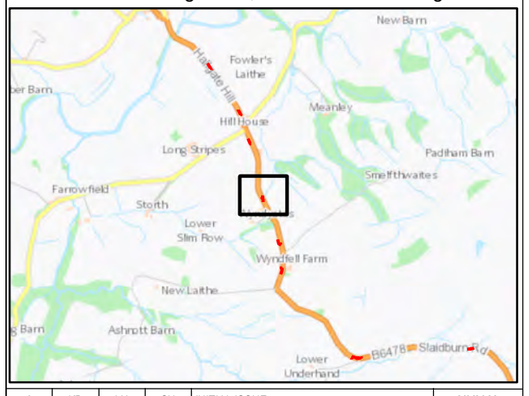
Legend

- Planning Application Boundary
- Passing Place (PP)

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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Water for the North West

UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
4 OF 17

SCALE	SHEET SIZE
1:1,000	A3
DRAWING NUMBER	REVISION
RVBC-BO-FIG-V5-P1-003	0

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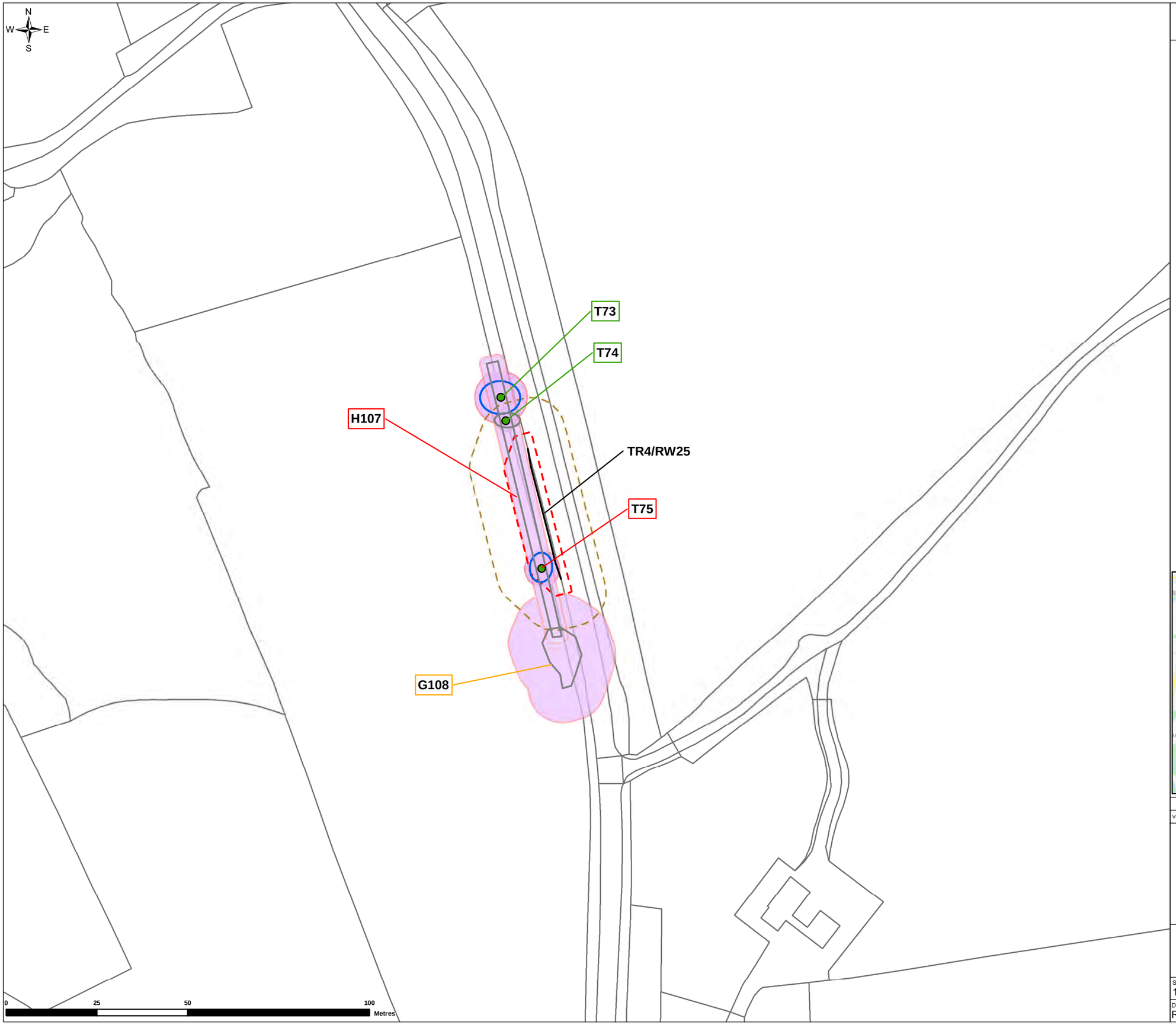

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Legend

- Planning Application Boundary
- Road Widening (RW)
- At Risk Buffer

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Label Abbreviations:
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United Utilities
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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
5 OF 17

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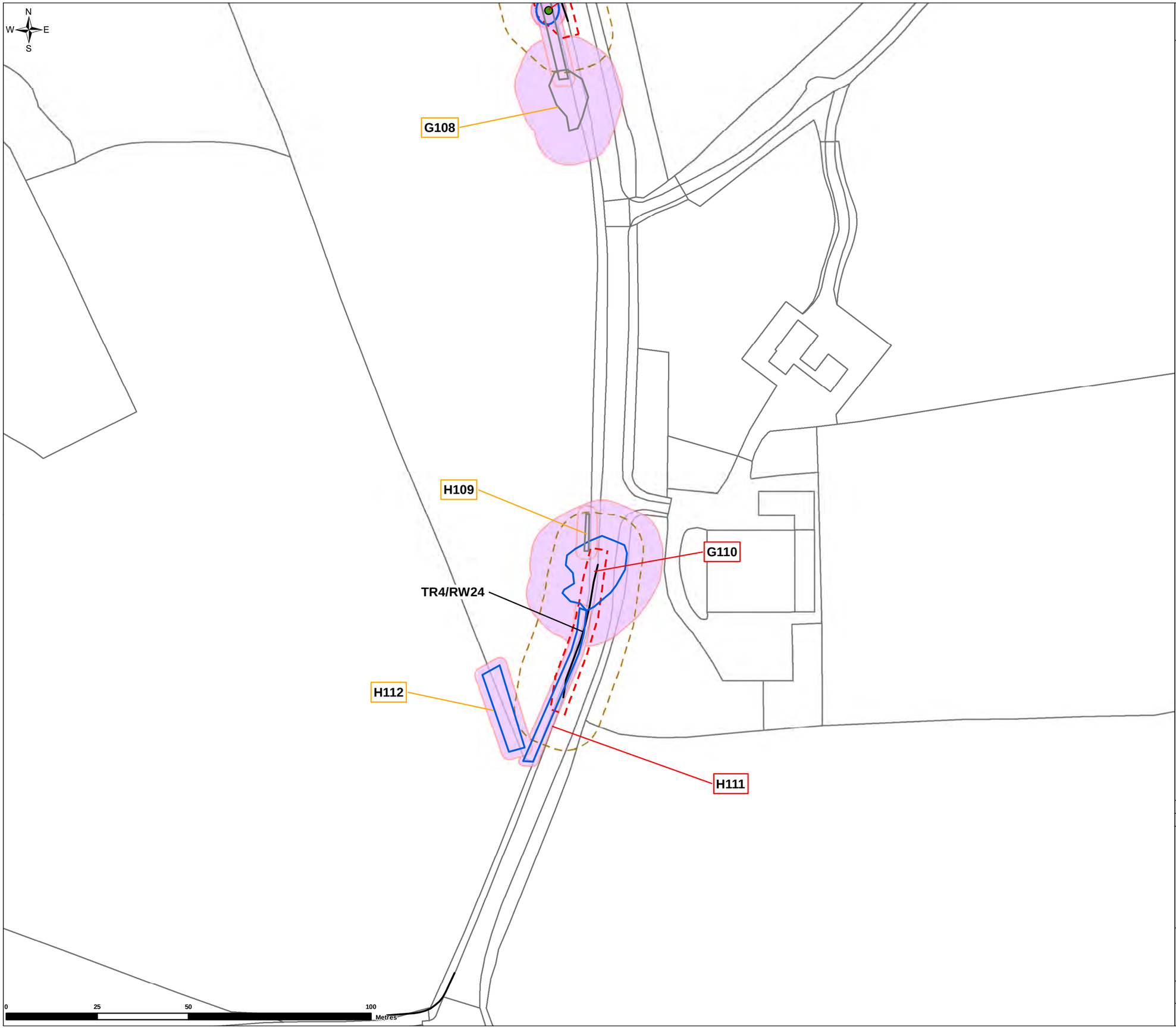

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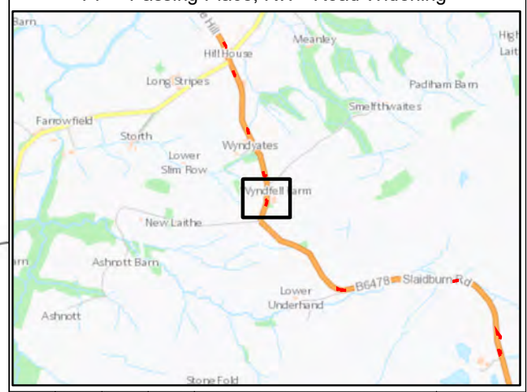
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
6 OF 17

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1:1,000	A3
DRAWING NUMBER	REVISION
RVBC-BO-FIG-V5-P1-003	0

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N
W E
S

G113

TR4/RW19

0 25 50 100
Metres

FIGURE P1.3

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Tree Survey Information

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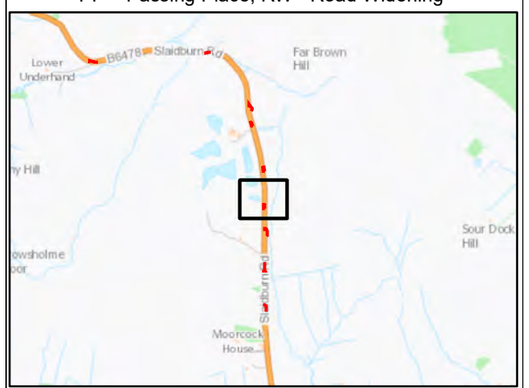
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
7 OF 17

SCALE	SHEET SIZE
1:1,000	A3
DRAWING NUMBER	REVISION
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N
W E
S

T76
T77
T78
T79
TR4/RW17

0 25 50 100
Metres

FIGURE P1.3

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Legend

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Label Abbreviations:
PP – Passing Place, RW - Road Widening

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UNITED UTILITIES WATER LIMITED
HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
8 OF 17

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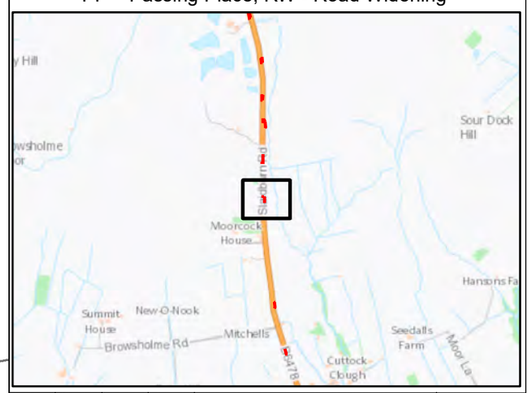

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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
9 OF 17

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N
W E
S

T80
T81
T82
T83
TR4/RW15
G116

0 25 50 100
Metres

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Legend

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Tree Survey Information

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Label Abbreviations:
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BOWLAND ARBORICULTURE
10 OF 17

SCALE	SHEET SIZE
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DRAWING NUMBER	REVISION
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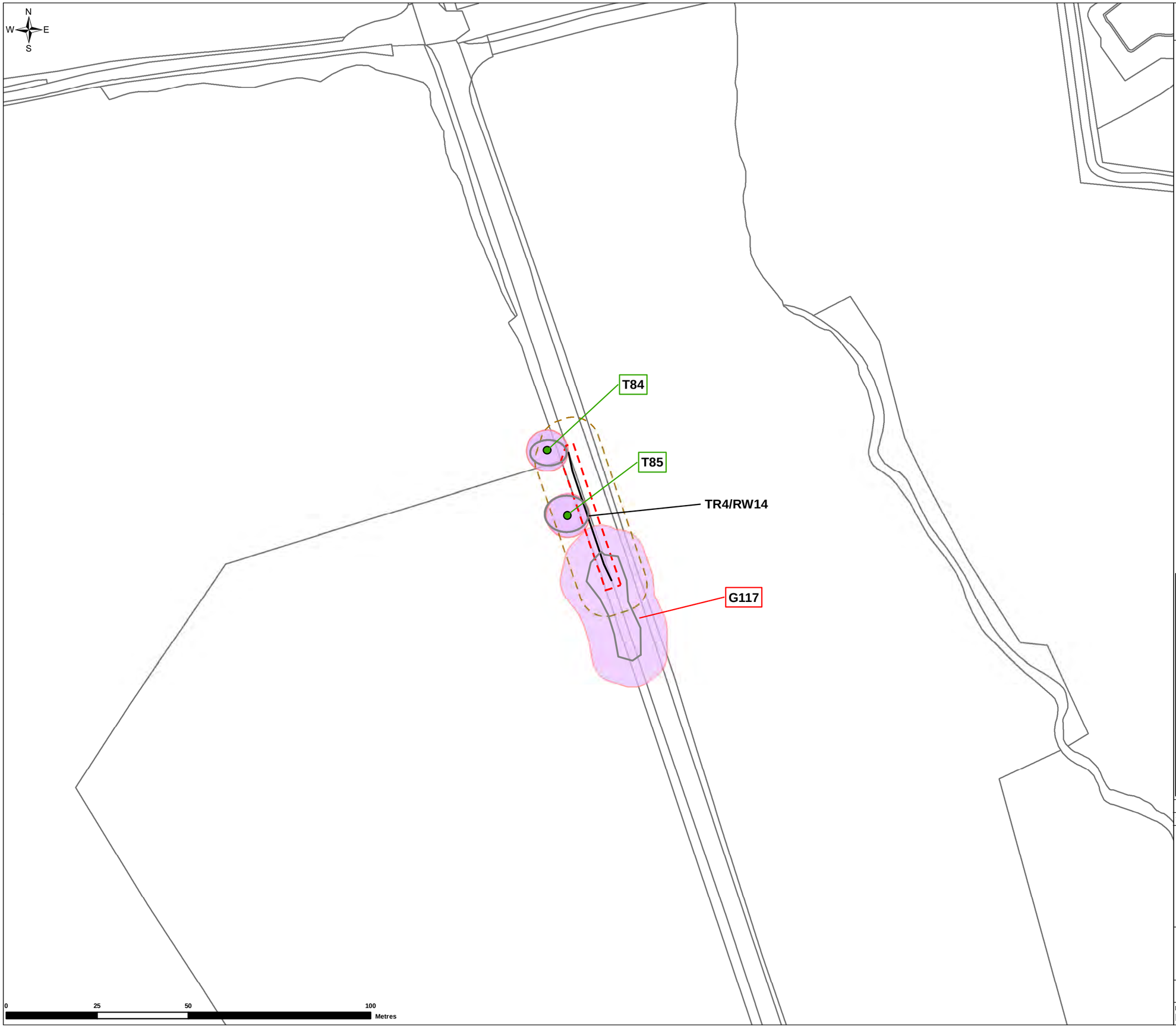

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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
11 OF 17

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DRAWING NUMBER	REVISION
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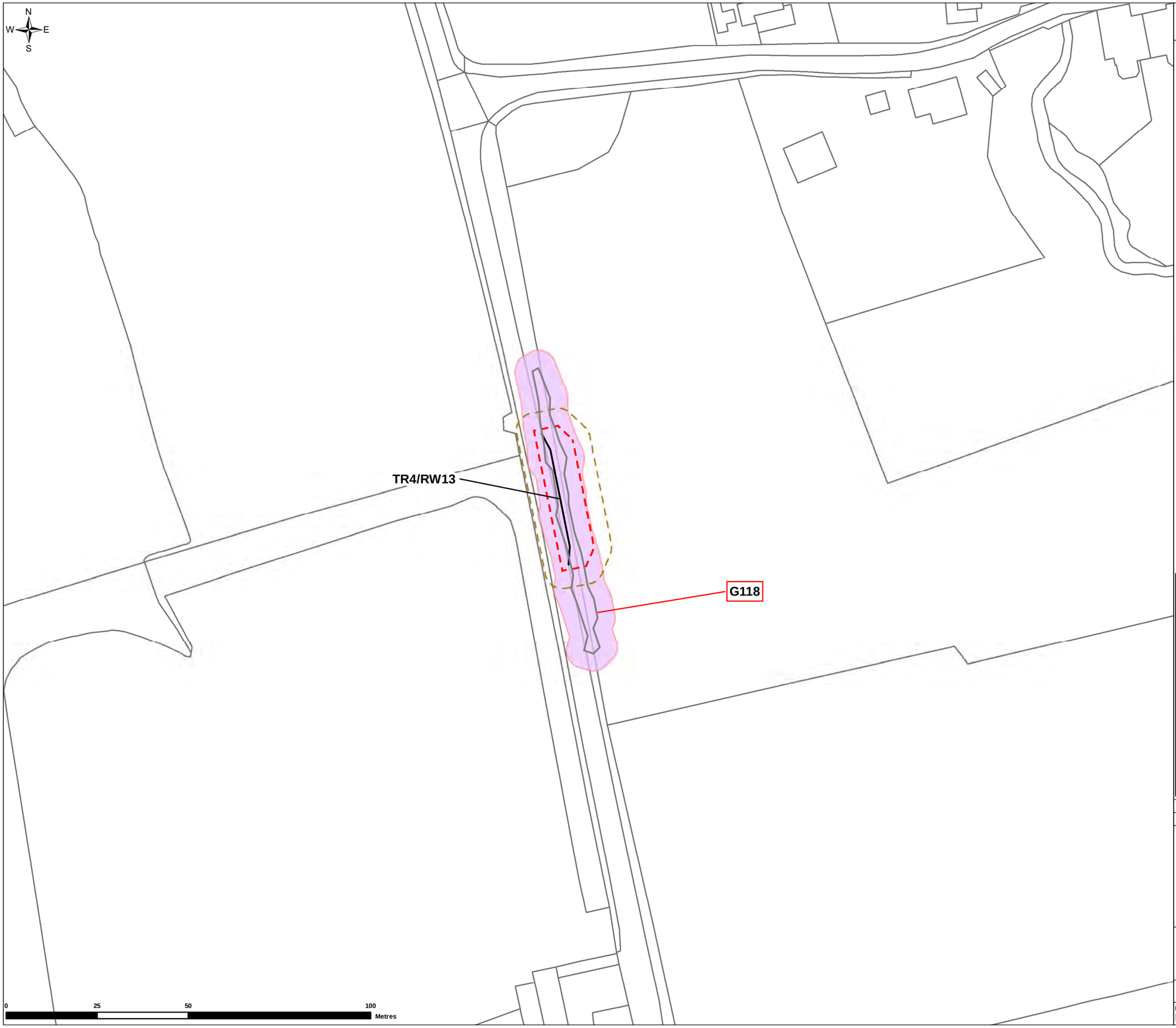

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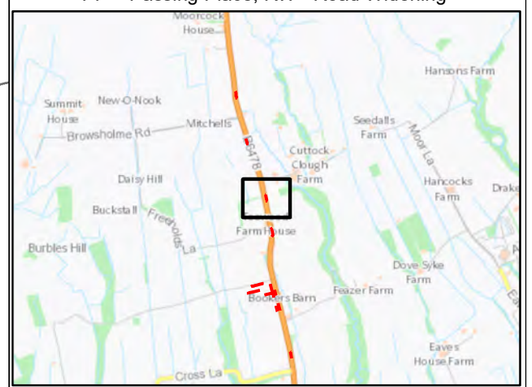

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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
12 OF 17

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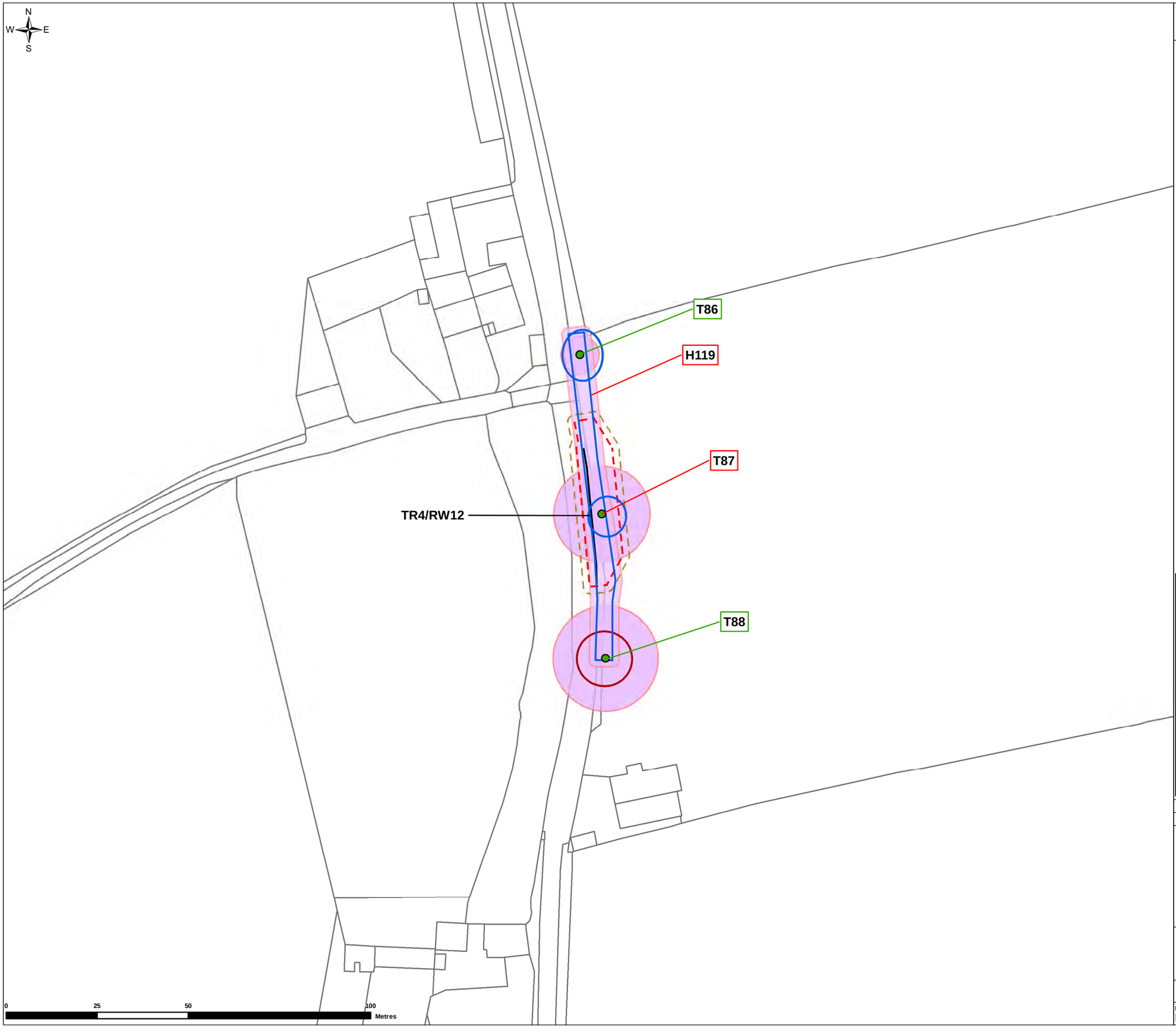

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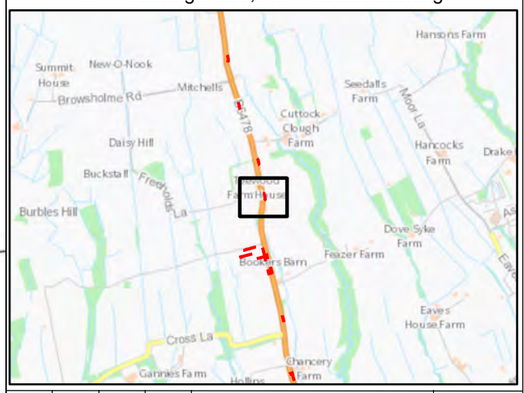

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BOWLAND ARBORICULTURE
13 OF 17

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N
W E
S

T91

T92

G122

H121

TR4/RW11

0 25 50 100
Metres

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HAWESWATER AQUEDUCT RESILIENCE PROGRAMME
BOWLAND ARBORICULTURE
14 OF 17

SCALE	SHEET SIZE
1:1,000	A3
DRAWING NUMBER	REVISION
RVBC-BO-FIG-V5-P1-003	0

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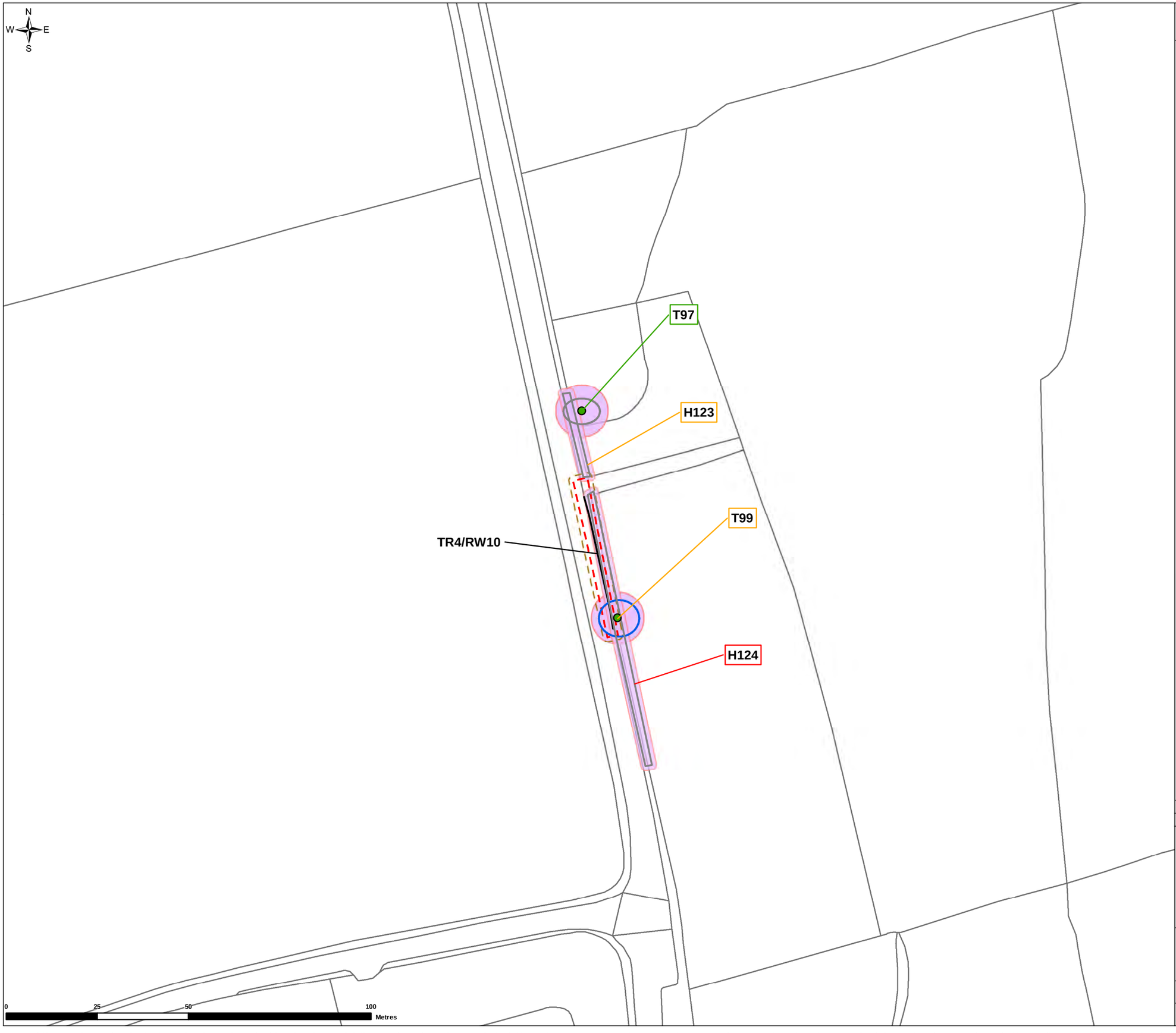


FIGURE P1.3

Tree survey features are prefixed with a 'T', 'G', 'H' or 'W' to identify respective feature type as an individual tree , tree group, hedgerow or woodland. Each survey feature is numbered sequentially from north to south for the Proposed Bowland Section Off-Site Highways Works.
Plan to be viewed with corresponding report (Highways technical note within LCC_RVBC-BO_SEI) and used for planning purposes only.
Indicative plan is not to be used for enabling works or construction purposes. Contractor to confirm with local planning authority all tree retention, protection and removal requirements prior to commencement of enabling works.
Indicative locations of survey features should be site-verified against a full topographical survey of existing stem locations at a later design stage prior to commencement of works. Indicative RAG impacts should be reviewed against any detailed design information within the Planning Application Boundary.

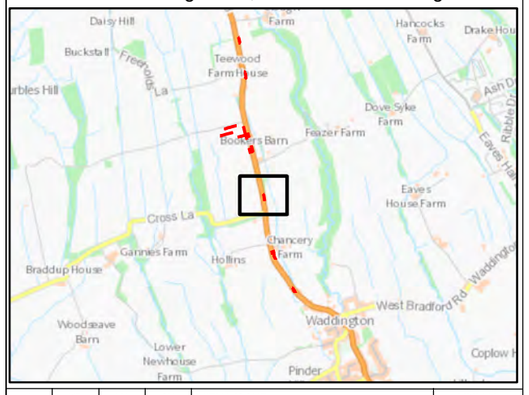
Legend

- Planning Application Boundary
- Road Widening (RW)
- At Risk Buffer

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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VERSION	AUTH	CHKD	REVD	REASON FOR ISSUE	DATE

United Utilities
Water for the North West

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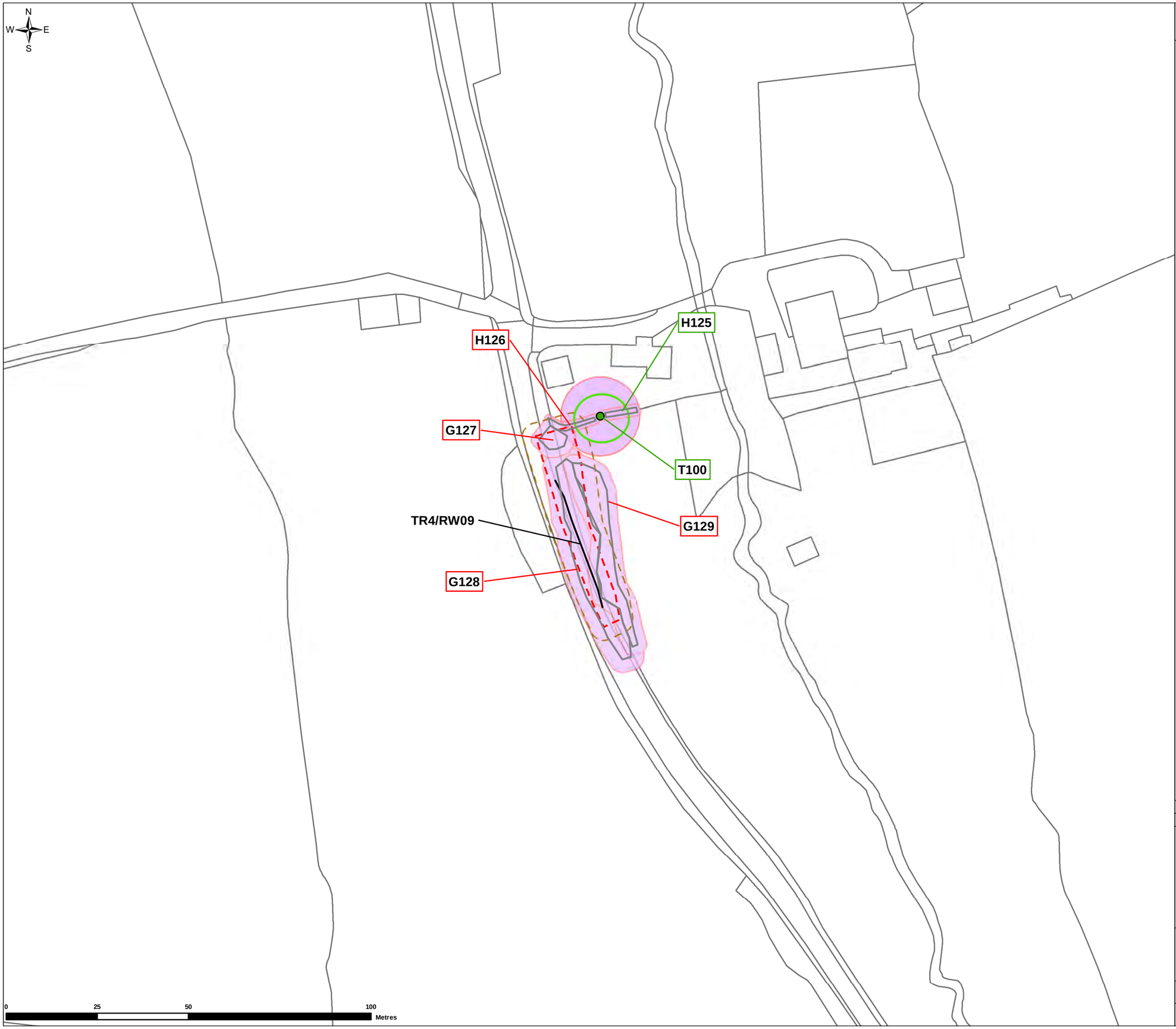

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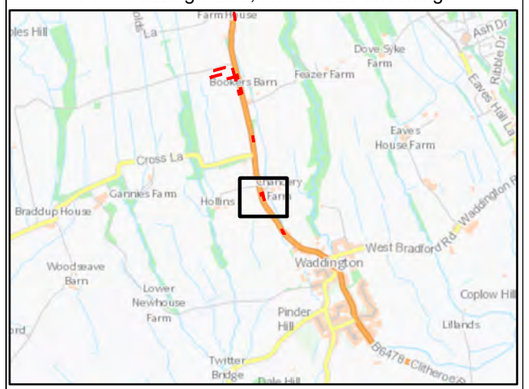
Legend

- Planning Application Boundary
- Road Widening (RW)
- At Risk Buffer

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
PP – Passing Place, RW - Road Widening



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N
W E
S

G130
G132
TR4/RW08
G133
T101
T102
G131

0 25 50 100
Metres

FIGURE P1.3

Tree survey features are prefixed with a 'T', 'G', 'H' or 'W' to identify respective feature type as an individual tree , tree group, hedgerow or woodland. Each survey feature is numbered sequentially from north to south for the Proposed Bowland Section Off-Site Highways Works.
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Legend

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- Road Widening (RW)
- At Risk Buffer

Tree Survey Information

- Individual Trees
- Category A Feature
- Category B Feature
- Category C Feature
- Category U Feature
- Root Protection Area

Label Abbreviations:
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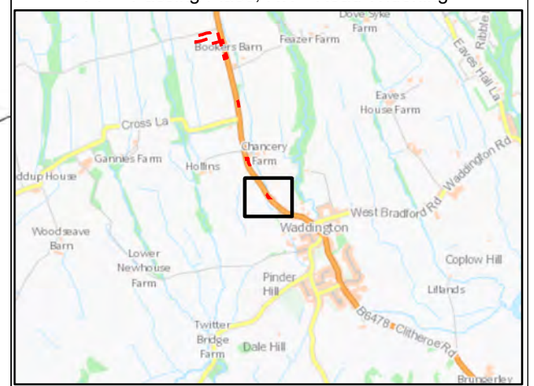

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Appendix B3: GWDTE Assessment: Off-site Highways Works

Document reference: LCC_RVBC-BO-V5-P1-B3

Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

Supplementary Environmental Information

Appendix B3: GWDTE Assessment: Off-site Highways Works

Jacobs

Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

Project No:	B27070CT
Document Title:	Proposed Bowland Section Supplementary Environmental Information Appendix B3: Off-site Highways Works GWDTE Assessment
Document Ref:	LCC_RVBC-BO-V5-P1-B3
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Client Name:	United Utilities Water Ltd

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Contents

1. Introduction 1
1.1 Purpose of the Report 1
1.2 Assessment Approach 1
2. Site-Specific GWDTE Proformas 3
3. Summary of Potential Effects 13
4. Water Framework Directive 15

1. Introduction

1.1 Purpose of the Report

1) This report provides supplementary information to support the SEI Report for the Proposed Bowland Section.

2) The purpose of this report is to assess the potential impacts on groundwater levels and flows sustaining Groundwater Dependent Terrestrial Ecosystems (GWDTEs), that could arise during the proposed off-site highways works (planned to take place during the enabling phase of the development).

1.2 Assessment Approach

3) This report follows the UK Technical Advisory Group (UKTAG) guidance[1] to identify, prioritise and assess the impacts of the Proposed Bowland Section on GWDTEs, during the proposed off-site highways works. This is the same approach as that used in Chapter 7: Water Environment, of the Bowland Section Environmental Statement (ES) and associated Appendix 7.2: GWDTE Assessment.

4) This report only discusses potential impacts on groundwater levels and flows that support ecosystems. Other impacts on vegetation and habitats are discussed in Chapter 9A: Terrestrial Ecology of the ES. Only GWDTEs with the potential to experience significant potential impacts have been reported here.

5) In some instances, the ecological sites listed in Chapter 9A: Terrestrial Ecology have been grouped together within this assessment to form one larger GWDTE site. In most cases, this is due to the habitats being of similar nature, geographically connected, and/or hydrologically linked. Where this is the case, this is clearly stated in the relevant habitats and vegetation sections for each site.

6) The Bowland Section comprises off-site highways works, which include:

- Areas of road widening of the existing carriageway (typically 1-2 m)
- Establishment of temporary compounds
- Provision of alternative parking locations
- Construction of passing places; and
- Junction realignment/widening/grading works.

7) It has been assumed that no excavations deeper than 0.8 m would be required for most of the off-site highways works. As such, no dewatering assessment has been carried out. Based on the maximum excavation depth of 0.8 m, a 100 m buffer is considered appropriate; in accordance with the UKTAG and Scottish Environment Protection Agency (SEPA)[2] GWDTE guidance (which requires a 100 m buffer around all excavations less than 1m in depth). This 100 m buffer has been used either side of the off-site highways works red line boundary, as a way of prioritising those sites which could experience significant direct or indirect effects, and which would require the creation of individual, site-specific proformas. This is referred to as the *GWDTE off-site highways works assessment area*.

8) It should be noted that the design for the Newton-in-Bowland compound access track has evolved since the June 2021 Environmental Statement. The previous design comprised the access track bisecting Gamble Hole Farm Pasture Biological Heritage Site (BHS) in its centre, which would result in direct and significant impacts, with a total loss of part of the GWDTE. Instead, a 'Bailey' type bridge is now proposed over Gamble Hole Farm Pasture. This would avoid the need for excavation in the centre of the site and

[1] UKTAG (2005) Draft Protocol for Determining "Significant Damage" to a "Groundwater Dependant Terrestrial System"
[2] SEPA (2018) Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems

would reduce potential direct impacts as much as practically possible to highly sensitive habitats. The new design would, however, likely require excavations deeper than 2 m maximum depth for foundations either side of the bridge span. If these excavations were to take place adjacent to the edges of the GWDTE, the water table could be at, or close to, the ground surface during construction of the bridge. As such, a dewatering assessment would need to be carried out for these works during the detailed design phase, to determine the magnitude and extent of any localised impacts to groundwater flows within or supporting the GWDTE.

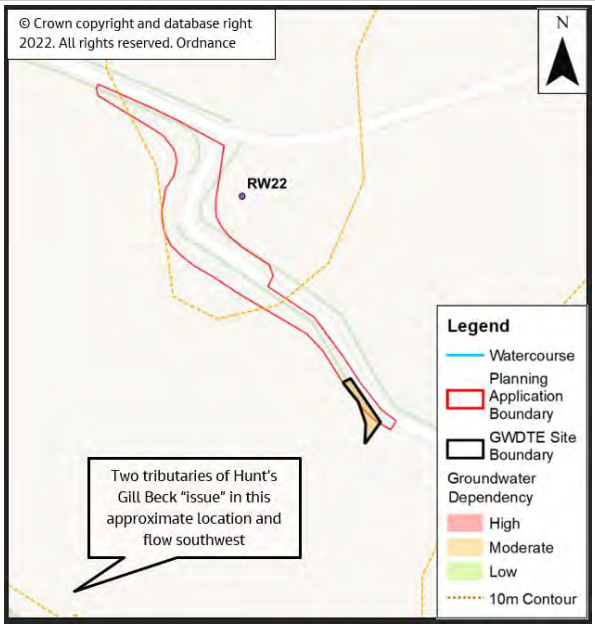
9) The proforma format for reporting was chosen to reflect the high-level desk-based assessment undertaken, and the similar nature of the potential impacts expected to each GWDTE site, i.e. due to the similar construction activities proposed at each location. In addition, given that the desk-based assessment is high-level, the review of potential GWDTE sites has been carried out with no Ground Investigation (GI) data, and no information relating to site-specific groundwater features, that would otherwise be identified, for e.g. through hydrogeology walkover surveys. As a consequence, the level of uncertainty associated with the assessment is reflected in the initial classification of groundwater dependency for each site.

10) As shown on Figure 1, there are eight sites in total within the GWDTE off-site highways works assessment area with the potential to be impacted significantly, and for which individual, site-specific proformas have been developed (presented in Section 2). It should be noted that there are other potential GWDTE sites that lie within the GWDTE off-site highways works assessment area, but no assessment is reported here. This is because they lie sufficiently upgradient, and/or are separated from the works area by the existing carriageway, watercourse, or both, and are therefore unlikely to experience significant direct or indirect effects.

2. Site-Specific GWDTE Proformas

11) Tables 2.1 to 2.6 provide the site-specific proformas for each GWDTE, compiled using a desk-based assessment of available baseline information, which includes ecological habitat (and vegetation) survey data (where present). The proformas summarise the findings to determine groundwater dependency, sensitivity, and potential impacts to each site.

Table 2.1: Site Description and Summary of Effects for Pike Gill Wood North

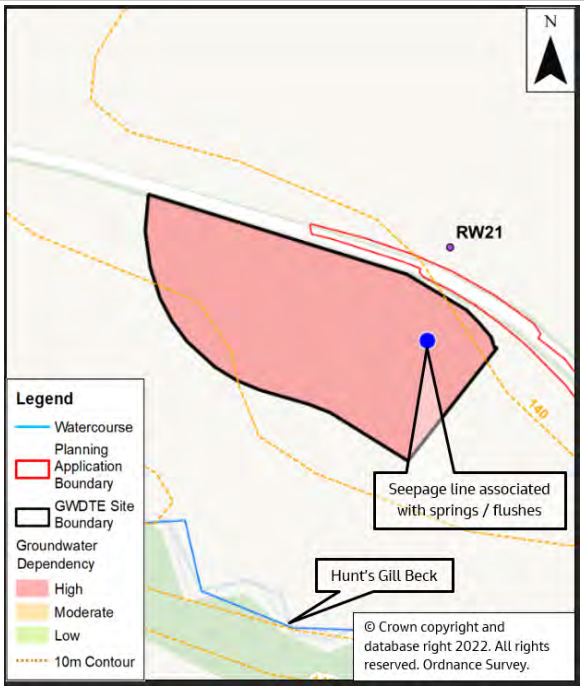
Overview	
	
	NGR: SD 61282 66743
	Location: North of Pike Gill Wood, adjacent to Helks Brow and RW22
	Ecological designation(s): None
	Reason for selection: Phase 1 Habitat Survey classified site as a marsh/marshy grassland habitat type (TR3.HTN29)
Hydrological features	None within site. Two tributaries of Hunt's Gill Beck issue 120 m and 150 m southwest
Hydrological catchment	Extends 70 m northwest, with a peak elevation of 120 mAOD. A dip in the topography separates the site from higher ground to the east
Soil type	Slowly permeable seasonally wet acid loamy and clayey soils
BGS superficial geology	Glacial till
BGS Bedrock geology	Close Hill Siltstone, comprised of siltstone and sandstone
BGS / GI borehole records	None available
Groundwater features	None identified (from Ordnance Survey maps/ecology data)
BGS / GI groundwater level data	None available

Initial conceptual site model	**Groundwater dependency**
Both shallow groundwater and surface water flows are expected to follow the topography and flow south. The site lies within a localised dip in the topography, with field boundaries/walls along its eastern and southern edges. There is potential, therefore, for both surface water and shallow groundwater to accumulate within the site. The low permeability soils may limit infiltration (in places), but the till is heterogenous in nature, and groundwater stored in the more permeable horizons may be able to locally sustain the marsh habitat present.	**Moderate**

Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	Medium	Major (direct but localised impact to northern half of site)	Large (in northern half)

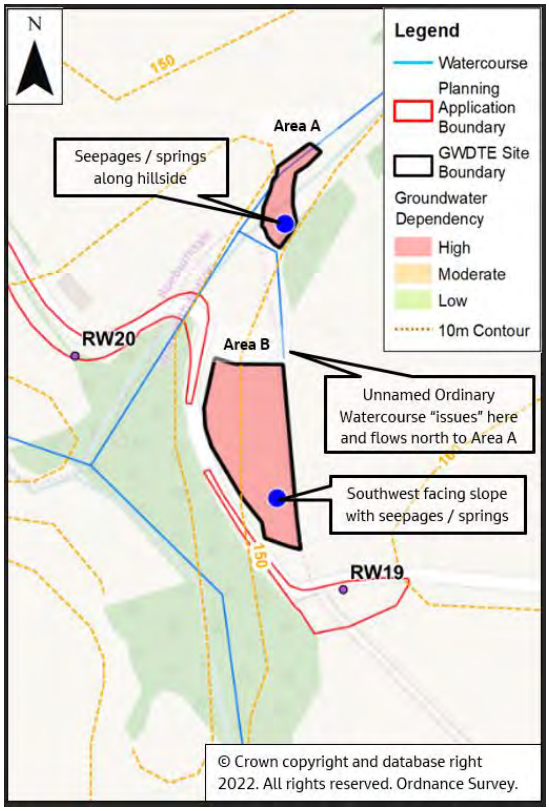
Overview			
Groundwater flows/levels (long term)		Major (direct but localised impact to northern half of site)	Large (north only)
Groundwater quality		Moderate (direct but localised impact to northern half of site)	Moderate (north only)

Table 2.2: Site Description and Summary of Effects for Hunt's Gill Beck North

Overview			
			
		NGR: SD 61854 66537	
		Location: North of Hunt's Gill Beck, adjacent to Helks Brow and RW21	
		Ecological designation(s): None	
		Reason for selection: Phase 1 Habitat Survey classified site as a marsh/marshy grassland habitat type (TR3.HGWDTE3), with M23 rush pasture vegetation (from high-level NVC survey)	
Hydrological features		None within site. Hunt's Gill Beck located 80 m to the south	
Hydrological catchment		Extends 220 m northeast, with a peak elevation of 153 mAOD	
Soil type		Slowly permeable seasonally wet acid loamy and clayey soils	
BGS superficial geology		Glacial till	
BGS Bedrock geology		Close Hill Siltstone, comprised of siltstone and sandstone	
BGS / GI borehole records		None available	
Groundwater features		Ecology data notes the presence of a seepage line associated with springs/flushes within the site	
BGS / GI groundwater level data		None available	
Initial conceptual site model			**Groundwater dependency**
Shallow groundwater is generally expected to follow the topography and flow southwest within the glacial till (and potentially in the siltstone/sandstone bedrock), towards Hunt's Gill Beck. Where the field drops below the road level, there is a break in slope in the far north of the site, promoting shallow groundwater emergence in the form of a seepage line - as observed on site. The seepage line was found to be associated with springs. With this flushing mechanism observed, through the surface/shallow subsurface, the marsh/flush vegetation present is expected to be highly groundwater dependent.			**High**
Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**

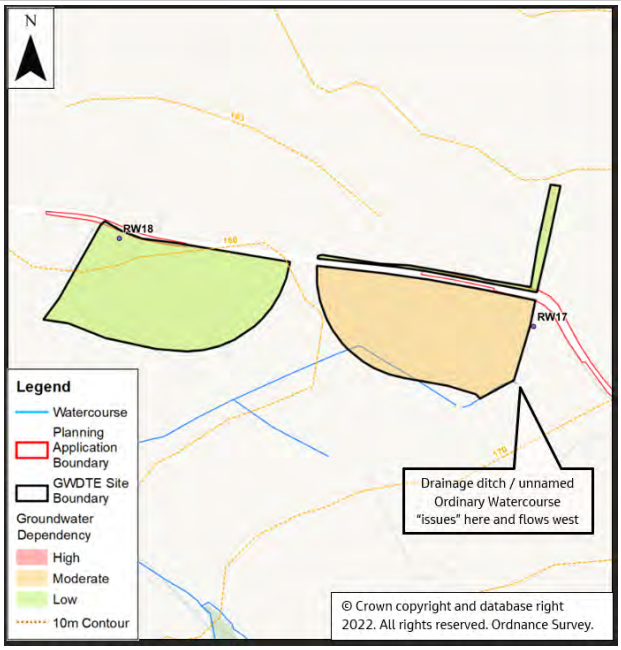
Overview			
Groundwater flows/levels (short term)	Medium	Minor (works other side of road/further upgradient)	Slight (in far north of site)
Groundwater flows/levels (long term)		Negligible	Neutral
Groundwater quality		Minor	Slight

Table 2.3: Site Description and Summary of Effects for Lane House East

Overview	
	 **NGR:** SD 62158 66351 **Location:** East of Lane House, adjacent to Helks Brow and RW19/20. Split into two areas (Area A in the north and Area B in the south) **Ecological designation(s):** None **Reason for selection:** Phase 1 Habitat Survey classified Area B/most of Area A as a marsh/marshy grassland habitat type (TR3.HGWDTE5 and 6), with M23 rush pasture vegetation (from high-level NVC survey). Swamp habitat (TR3.HGWDTE4) mapped in west of Area A, with S3 swamp vegetation
Hydrological features	"Issues" in northeast corner of Area B, which forms an unnamed Ordinary Watercourse that flows northeast through Area A to a pond
Hydrological catchment	Includes several sub-catchments to the northwest, northeast, and east with the largest extending 400 m east, and peaking at 166 mAOD
Soil type	Slowly permeable seasonally wet acid loamy and clayey soils
BGS superficial geology	Absent from Area A, and south/east of Area B. Head deposits comprised of clay, silt, sand, and gravel mapped in north/west of Area B. Both areas near to edge of mapped extent of glacial till
BGS Bedrock geology	Close Hill Siltstone, comprised of siltstone and sandstone. An east/west trending fault lies 20 m south
BGS / GI borehole records	None available
Groundwater features	Ecology data notes the presence of springs/seepages within the two areas of marsh habitat

Overview			
BGS / GI groundwater level data	None available		
Initial conceptual site model			**Groundwater dependency**
The site lies on the eastern flank of a steep sided valley, where groundwater flows are expected to flow west towards the Ordinary Watercourse. The presence of springs/seepages were noted on site, indicating that groundwater contributes to sustaining the marsh habitats present. Groundwater levels may also be high in the valley basin, where the swamp habitat was identified.			**High**
Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	Medium	Negligible (GWDTE upgradient of works)	Neutral
Groundwater flows/levels (long term)		Negligible	Neutral
Groundwater quality		Minor	Slight

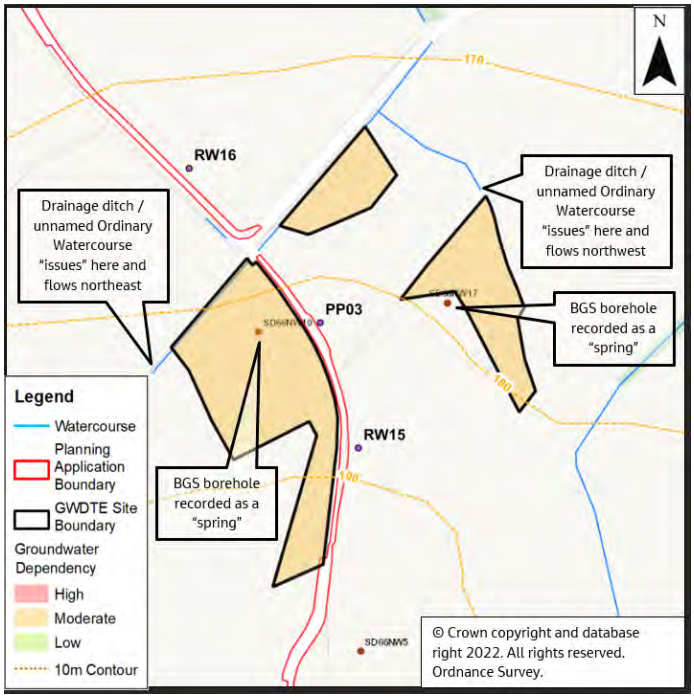
Table 2.4: Site Description and Summary of Effects for Creams Barn Southwest

Overview	
	
	NGR: SD 62857 66152
	Location: Southwest of Creams Barn, adjacent to Helks Brow and RW17/18
	Ecological designation(s): None
	Reason for selection: Phase 1 Habitat Survey classified site as two areas of a marsh/marshy grassland habitat type (TR3.TN19)
Hydrological features	"Issues" in southeast corner, which forms a drainage ditch/unnamed Ordinary Watercourse that flows west
Hydrological catchment	Extends 350 m southeast, with a peak elevation of 192 mAOD. A dip in the topography separates the site from higher ground to the south
Soil type	Slowly permeable seasonally wet acid loamy and clayey soils in the west and along northern edge. Slowly permeable wet very acid upland soils with a peaty surface in centre and east
BGS superficial geology	Peat in southeast, overlying glacial till (whole site)
BGS Bedrock geology	Ward's Stone sandstone in the north and Caton Shale in the south, separated by an east-west trending fault. The Claughton Member, comprising siltstone and sandstone, is present in the southeast

Overview			
BGS / GI borehole records	None available		
Groundwater features	None identified (from Ordnance Survey maps/ecology data)		
BGS / GI groundwater level data	None available		
Initial conceptual site model			**Groundwater dependency**
The peat in the southeast of the site could locally store a significant quantity of groundwater, with limited recharge rates likely through the underlying glacial till (and shale bedrock). Saturated conditions in the soil profile could sustain moderately groundwater dependent marsh vegetation in this location. The ditch/ watercourse likely drains the peat, including shallow groundwater, and the marsh habitat downgradient, i.e. in the west, and far north of the site, are therefore expected to have a low groundwater dependency.			**Moderate to low**
Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	Medium	Minor (further downgradient)	Slight
	Low	Major (direct but localised impact to small area in northeast of site)	Moderate (in northeast only)
Groundwater flows/levels (long term)	Medium	Negligible	Neutral
	Low	Moderate (direct but localised impact to small area in northeast of site)	Slight (in northeast only)
Groundwater quality	Medium	Negligible	Neutral
	Low	Moderate	Slight (in northeast only)

Table 2.5: Site Description and Summary of Effects for Creams Barn Southeast

Overview



NGR: SD 63126 65931

Location: Southeast of Creams Barn, and at the junction between Helks Brow and Park House Lane, adjacent to RW15/16 and PP03

Ecological designation(s): None

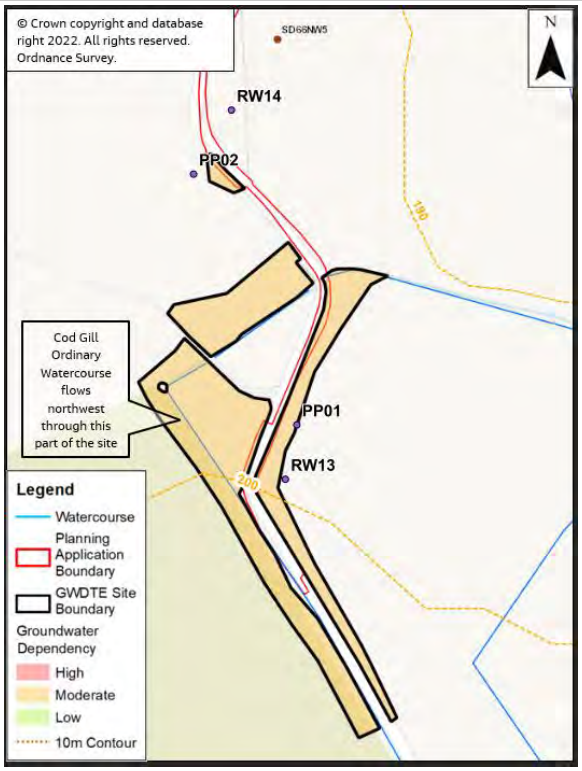
Reason for selection: Phase 1 Habitat Survey classified site as three areas of a marsh/marshy grassland habitat type (TR3.HGWDTE2/ TR3.HTN27) with M23/MG10 rush pasture vegetation (from high-level NVC survey)

Overview	
Hydrological features	Two drains/unnamed Ordinary Watercourses "issue" from the northwest and northeast corners of the site, with one flowing along the site's northern border
Hydrological catchment	Extends 1.8 km south, with a peak elevation of 250 mAOD
Soil type	Slowly permeable wet very acid upland soils with a peaty surface
BGS superficial geology	Glacial till
BGS Bedrock geology	Claughton Member, comprising siltstone and sandstone. An east/ west trending fault lies 25 m north
BGS / GI borehole records	SD66NW10 and SD66NW17 contain no lithological information
Groundwater features	Ecology data notes the presence of standing water (unknown if surface water or groundwater origin)
BGS / GI groundwater level data	SD66NW10 and SD66NW17 are recorded as "springs"

Initial conceptual site model	**Groundwater dependency**
In all three locations, the marsh habitats have formed adjacent to, and upgradient of field/road boundaries, where surface water and shallow groundwater could accumulate. Peaty soils mean that rainfall could directly recharge the soil profile and saturate the ground surface. Based on the presence of springs, as suggested by BGS information, the marsh areas could be moderately groundwater dependent.	**Moderate**

Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	Medium	Minor (localised to eastern edge of southern part of site)	Slight (edge of southern area only)
Groundwater flows/levels (long term)		Negligible	Neutral
Groundwater quality		Minor	Slight

Table 2.6: Site Description and Summary of Effects for Leyland Farm East

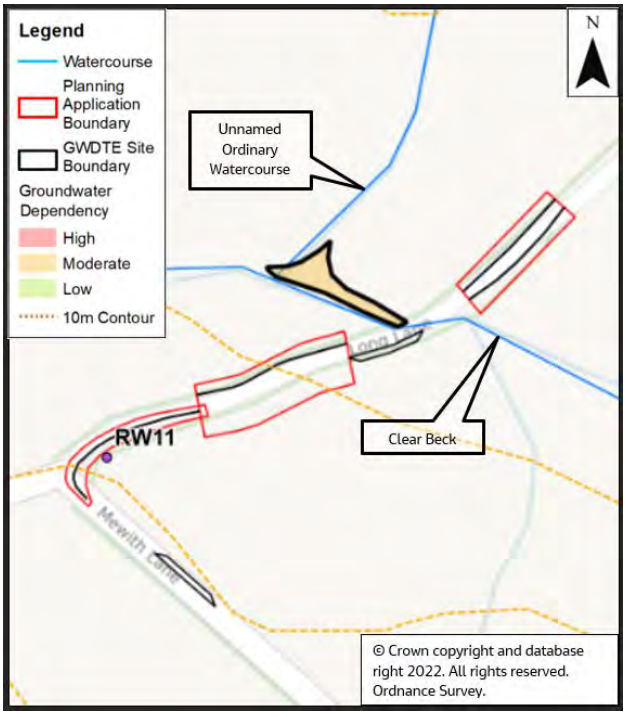
Overview	
	
	NGR: SD 63159 65456
	Location: At the junction between Helks Brow and the access track to Leyland Farm, adjacent to RW13/14 and PP01/2
	Ecological designation(s): None
	Reason for selection: Phase 1 Habitat Survey classified site as four areas of a marsh/marshy grassland habitat type (TR3.HGWDTE1/ TR3.HTN25/ TR3.HTN15) with M23/MG10 rush pasture vegetation (from high-level NVC survey)
Hydrological features	Cod Gill Ordinary Watercourse flows northwest through the west of the site, reaches a small pond in the far west, and then turns east
Hydrological catchment	Extends 1.3 km south, with a peak elevation of 250 mAOD
Soil type	Slowly permeable wet very acid upland soils with a peaty surface
BGS superficial geology	Glacial till
BGS Bedrock geology	Claughton Member, comprising siltstone and sandstone
BGS / GI borehole records	SD66NW5 contains no lithological information
Groundwater features	None identified (from Ordnance Survey maps/ecology data)
BGS / GI groundwater level data	None available

Initial conceptual site model	**Groundwater dependency**
There are no sudden changes in topography, no springs shown on Ordnance Survey maps, and no site-specific hydrogeological data to suggest that groundwater levels are particularly shallow in this location. However, given the marsh habitat present, and uncertainties associated with the absence of localised GI data, this site cannot be ruled out as being a GWDTE, or partially a GWDTE. The peaty soils may become saturated following periods of prolonged or intense rainfall/recharge, which may locally sustain groundwater dependent vegetation.	**Moderate**

Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	Medium	Major (direct but localised impact to edges of site)	Large (edges only)
Groundwater flows/levels (long term)		Moderate (direct but localised impact to edges of site)	Moderate (edges only)

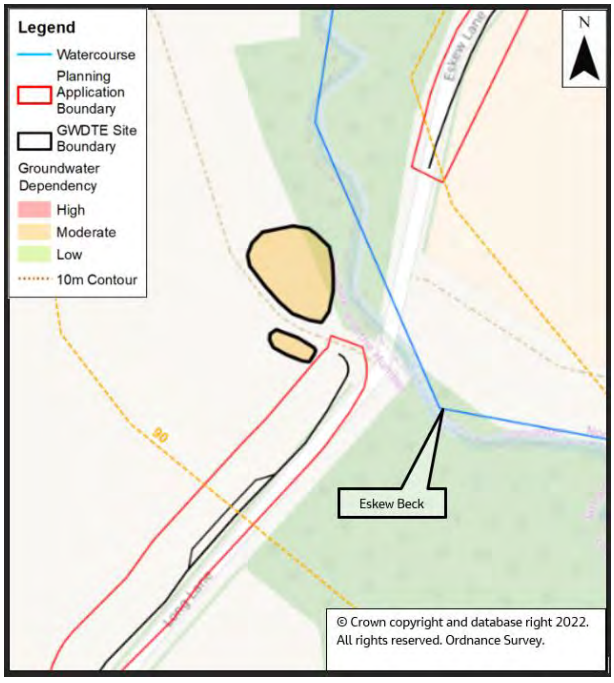
Overview			
Groundwater quality		Moderate (direct but localised impact to edges of site)	Moderate (edges only)

Table 2.7: Site Description and Summary of Effects for Clear Beck North

Overview			
			
		NGR: SD 63833 68052	
		Location: Northeast of the junction between Mewith Lane and Long Lane. Located 25 m downgradient of the works area situated northeast of RW11	
		Ecological designation(s): None	
		Reason for selection: Phase 1 Habitat Survey classified site as a marsh/marshy grassland habitat type (TR3.HTN31/ TR3.HTN48) with MG10 rush pasture vegetation (from high-level NVC survey)	
Hydrological features		Clear Beck flows west along the southern boundary of the site. An unnamed Ordinary Watercourse flows southwest to join Clear Beck along the western edge of the site	
Hydrological catchment		Extents 1.5 km east, with a peak elevation of 270 mAOD	
Soil type		Slowly permeable seasonally wet acid loamy and clayey soils	
BGS superficial geology		Glacial till	
BGS Bedrock geology		Claughton Member, comprised of siltstone and sandstone	
BGS / GI borehole records		None available	
Groundwater features		None identified (from Ordnance Survey maps/ecology data)	
BGS / GI groundwater level data		None available	
Initial conceptual site model			**Groundwater dependency**
The site lies in a topographic low, where both groundwater and surface water flows are expected to be routed from the east, towards Clear Beck. Situated immediately upgradient of the confluence of Clear Beck and its tributary, saturated conditions in the soil profile could contribute as baseflow to the two watercourses. Infiltration rates are likely to be low through the clay soils in this location, but the flat topography would promote natural groundwater and surface water accumulation, such that the storage potential within the glacial till is increased. Shallow groundwater could, therefore, sustain moderately groundwater dependent marsh vegetation within the site boundary.			**Moderate**
Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**

Overview			
Groundwater flows/levels (short term)	Medium	Minor (works across / up-gradient of GWDTE)	Slight (far east of site)
Groundwater flows/levels (long term)		Negligible	Neutral
Groundwater quality		Minor	Slight

Table 2.8: Site Description and Summary of Effects for Eskew Beck West

Overview	
	 **NGR:** SD 64398 68863 **Location:** West of Eskew Bridge, at the junction between Eskew Lane and the access track to Robert Hall. Adjacent to the works area located northeast of RW09 **Ecological designation(s):** BHS (area north of access track only) **Reason for selection:** Phase 1 Habitat Survey classified site as two areas of a marsh/marshy grassland habitat type (TR3.HTN39)
Hydrological features	None within site. Eskew Beck flows north, 4.5 m east of the site, and is culverted beneath Eskew Lane
Hydrological catchment	Includes two sub-catchments to the southeast and southwest, with the largest extending 1.7 km southeast, and peaking at around 170 mAOD
Soil type	Slowly permeable seasonally wet acid loamy and clayey soils
BGS superficial geology	Glacial till
BGS Bedrock geology	Millstone Grit Group, comprised of mudstone, siltstone and sandstone
BGS / GI borehole records	None available
Groundwater features	Ecology data describes the area as being waterlogged (unknown if surface water or groundwater origin)
BGS / GI groundwater level data	None available

Initial conceptual site model	Groundwater dependency
Both areas of marsh habitat coincide with localised depressions in the topography, where either surface water runoff, shallow groundwater, or a combination of the two could accumulate. The natural hydrological regime at the site may have been altered, in part, by the access track separating the two marsh areas. Although there are no site-specific hydrogeological data to suggest that groundwater levels are particularly shallow in this location, the presence of the topographic hollows, and the heterogenous	**Moderate**

Overview			
nature of the underlying glacial till, means that the marsh areas could be susceptible to prolonged periods of standing water (as evidenced by the ecology data). Both parts of the site are therefore classified as having a moderate groundwater dependency.			
Potential effects	**GWDTE sensitivity**	**Magnitude of impact**	**Significance of effect**
Groundwater flows/levels (short term)	High	Minor (works across / up-gradient of GWDTE but red line boundary lies 5 m from the site's eastern edge)	Slight (far east only)
	Medium	Moderate (works across gradient of GWDTE but red line boundary lies adjacent to the site's eastern edge)	Moderate (far east only)
Groundwater flows/levels (long term)	High	Negligible	Neutral
	Medium	Minor	Slight
Groundwater quality	High	Minor	Slight
	Medium	Minor	Slight

3. Summary of Potential Effects

12) Table 3.1 presents a summary of the initial assessment of groundwater dependency of each GWDTE and the associated magnitudes of impacts to existing groundwater flows and quality. As mentioned in Section 2, the impacts predicted to GWDTEs from the off-site highways works are expected to be very localised in nature, with the highest impact magnitudes listed here.

Table 3.1: Summary of GWDTE Effects – Off-site Highways Works

Site	Works ID*	Groundwater Dependency	Sensitivity	Highest Magnitude of Impact	Highest Significance of Effect[3]
Pike Gill Wood North	RW22	Moderate	Medium	Major	Large
Hunt's Gill Beck North	RW21	High	Medium	Minor	Slight
Lane House East	RW19 & RW 20	High	Medium	Minor	Slight
Creams Barn Southwest	RW17 & RW18	Moderate to low	Medium to low	Major	Moderate
Creams Barn Southeast	RW15, RW16 & PP03	Moderate	Medium	Minor	Slight
Leyland Farm East	RW13, RW14 & PP01, PP02	Moderate	Medium	Major	Large
Clear Beck North	RW11	Moderate	Medium	Minor	Slight
Eskew Beck West	RW09	Moderate	High	Moderate	Moderate

* All GWDTEs assessed are located within Lancaster City Council / Craven District Council areas

13) As discussed in Section 1.2, the assessment of potential significant effects is based on a high-level desk study, with no GI data, and no hydrogeology walkover surveys having been undertaken. As a result, the level of uncertainty associated with the assessment is reflected in the initial classification of groundwater dependency for each site.

14) Given that the potential significance of effect is derived from this precautionary approach to determine GWDTE groundwater dependency and corresponding receptor sensitivity, it is recommended that hydrogeology walkover surveys are carried out for each of the sites listed in Table 3.1. This would enable the groundwater dependency classifications to be refined, and perhaps in some instances, act as a second screening assessment before site-specific mitigation measures need to be identified for remaining significant effects.

15) Four sites listed in Table 3.1 (Pike Gill Wood North, Creams Barn Southwest, Leyland Farm East, and Eskew Beck West) are predicted to experience significant potential effects. Impacts to groundwater flows and quality would be significant due to the direct nature of the works footprint within or adjacent to the GWDTE boundaries. However, these impacts would be very localised in nature.

16) Specific mitigation is recommended for the Eskew Beck West site, which would include avoiding topsoil stripping and any activity that could have a direct / significant impact on groundwater flows or quality within the red line boundary adjacent to the southern part of the GWDTE (including for e.g., materials

[3] *Moderate* and *Large* effects are considered to be significant in the context of the EIA Regulations.

storage/laydown areas). Mitigation would reduce the impact from moderate to negligible in the southeast of the site.

17) Several good practice mitigation measures are also embedded in the Construction Code of Practice which was presented in the June 2021 Environmental Statement. In addition, Table 3.2 provides a list of additional standard mitigation measures for reducing the potential significance of effect caused by impacts to groundwater flows and quality at GWDTE sites.

Table 3.2: Additional Standard Mitigation to Reduce Potentially Significant Effects to GWDTEs

Mitigation	Groundwater Flow / Quality	Benefits Provided
Stagger topsoil stripping activities, i.e., small sections at a time	Groundwater quality	Would limit the concentration of suspended solids and associated solutes entering the aquifer(s) and would reduce peak contaminant concentrations.
Monitor weather forecasts, including rainfall / flood warnings and alerts	Groundwater quality	To restrict topsoil stripping and vegetation clearance activities when heavy rainfall is forecast, to further reduce the likelihood of suspended solids entering the groundwater environment.
Minimise footprint of topsoil stripping and vegetation clearance wherever possible	Groundwater quality and flow	There is no mitigation for direct habitat loss due to topsoil stripping so minimising this area would have a direct beneficial impact on reducing the extent of potentially significance effects caused by this activity.

18) In summary, although impacts to groundwater flows and quality are generally expected to be minor when considering each site as a whole, localised significant residual effects would remain. Further opportunities to mitigate adverse effects over and above those described in this report and in the June 2021 Environmental Statement would be considered once a contractor has been appointed.

4. Water Framework Directive

19) All GWDTE sites lie within the Lune and Wyre Carboniferous Aquifers (GB41202G102700) Water Framework Directive (WFD) groundwater body (Environment Agency, 2021). As of 2019, the groundwater body was achieving 'good' overall status, with good quantitative status and good chemical status.

20) As described in Section 2, excavating to a maximum depth of 0.8 m, as a result of the proposed off-site highways works, could lead to changes in shallow groundwater levels, flows, and quality, supporting the GWDTEs. With the data gaps present, precautionary short-term major and moderate changes in groundwater levels, flows, and/or quality have been predicted in parts of four out of eight of the GWDTE sites identified.

21) However, given that the GWDTEs are not nationally or internationally designated, impacts would not result in a deterioration of the groundwater body status. No additional WFD mitigation is therefore required.