

Lower Thames Crossing

6.3 Environmental Statement Appendices Appendix 8.20 - Draft water vole conservation licence application (Clean version)

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications:
Prescribed Forms and Procedure)
Regulations 2009

Volume 6

DATE: December 2023
DEADLINE: 8

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VERSION: 2.0

Revision history

Version	Date	Submitted at
1.0	31 October 2022	DCO Application
2.0	5 December 2023	Deadline 8

A05a Licence Application Form

You need to use this form to apply for a licence to kill, take or disturb plants and animals protected under [schedules 5, 6 and 8 of the Wildlife and Countryside Act 1981](#) (excluding birds and European protected species) for the purpose of overriding public interest.

If your application is for the purpose of preventing serious damage or spread of disease, or preserving public health and public safety, use the [A05 application form](#) instead of this one.

- all questions should be answered as appropriate. Questions marked with ‘*’ are mandatory and failing to complete these may result in delays to your application
- if there is insufficient space for completing answers on this form, attach a separate sheet
- Natural England will aim to determine the outcome of a completed licence application within its published service standards
- if you experience any problems completing this application, contact Wildlife Licensing by email at wildlife@naturalengland.org.uk or call us on 020 802 61089

Submit the form

Submit your completed form either by

- email to: wildlife@naturalengland.org.uk
- post to:

Wildlife Licensing
Natural England
Horizon House
Deanery Road
Bristol
BS1 5AH

Section 1: Applicant details

Enter the details of the person or organisation who will become the licensee.

*Title

For example, Mr, Mrs, Mx or Other (specify)

Mr

*First name

Gareth

*Last name

Protheroe

*Address (including the postcode)

Beaufort House
Lower Thames Crossing
5 St Botolph Street
EC3A 7DT

*Email address

██████████@lowerthamescrossing.co.uk

*You must provide either a telephone number or a mobile number

Telephone number

Mobile number

██████████

*Applicant type (for example, farmer, householder or ecologist)

Motorway and major A-road operator

If you are registering on behalf of an organisation, you should also complete this section

*Organisation name

National Highways

*Position

Development Phase Lead

Alternative contact details

If the applicant will be unavailable to discuss the application, you should provide details of an alternative contact person. By completing this section, you are confirming that this person is authorised to act on behalf of the applicant.

Full name

Email address

Telephone number

Section 2: Named ecologist details

A named ecologist is required for all development and mitigation applications. Enter the details of the named ecologist.

*Title

Type Mr, Mrs, Mx or Other (specify)

*First name

*Last name

*Email address

*You must provide either a telephone number or a mobile number

Telephone number

Mobile number

If you are registering on behalf of an organisation, you should also complete this section.

*Organisation name

*Position

Named ecologist alternative contact details

If the named ecologist will be unavailable to discuss the application, you should provide details of an alternative contact person. By completing this section, you are confirming that this person is authorised to act on behalf of the named ecologist and has a detailed knowledge of the application.

Name

Email address

Telephone number

Section 3: Main contact for the application

Should we contact the applicant or the named ecologist to discuss the application?

Should we send the outcome documentation for this application to the applicant or the named ecologist?

Section 4: Previous applications

(a) To your knowledge, have there been any previous applications or licence decisions concerning this site?

Type yes or no

Yes

If 'no', go to question 4(g). If 'yes', answer the following questions:

(b) *Date of most recent application

Nov 2020

(c) *Which species was the subject of the previous application?

Water Vole

(d) *What was the application or licence reference number?

Water vole: 2020-50229-SCI-SCI Water vole_Lower
Thames Crossing

(e) *What was the outcome of the previous application?

Choose one of these options: granted, not granted, advice only, deferred, or not known

Deferred

(f) Does this application relate to any previously licensed mitigation work on the site being applied for?

Type yes or no

No

If 'yes' to question (f), provide application or licence reference numbers, species details and outcome details.

(g) To your knowledge, is the site being applied for subject to any recent, concurrent, pending or future applications for licences for the same species or any other protected species?

Type yes or no

No

If 'yes' to (g), provide application or licence reference numbers and species information.

Pre-submission screening service

[Natural England's pre-submission screening service](#) provides advice on draft applications, prior to consents being in place and prior to a formal licence application being submitted.

We strongly advise customers to use this service rather than trying to pursue a licence under 'exceptional circumstances', particularly where there are concerns about financial implications resulting from delays in obtaining a licence once planning consents are in place.

Fill out this section if your application is part of Natural England's pre-submission screening service.

Is this your first draft application or is it a subsequent draft application?

Subsequent

If this is not first draft application, provide any reference numbers for earlier applications

Water vole: 2020-50229-SCI-SCI Water vole_Lower
Thames Crossing

Is this a formal application?

Type yes or no

Draft

If your case has previously been reviewed by Natural England, who gave the advice and when did they provide it?

Sonya Gray (2018 – 2022)

Nationally significant infrastructure projects

Only fill out this section of the form if your application is part of a nationally significant infrastructure project.

Is this a first draft application or a subsequent draft application?

Draft

If this is not first draft application, provide any earlier reference numbers

Water vole: 2020-50229-SCI-SCI Water vole_Lower
Thames Crossing

Is this a formal application?

Type yes or no

Draft

Section 5: Purpose of application

Confirm that this application is for the purpose of overriding public interest, under section 16(3)(j).

Type yes or no

Yes

- Note: If your application is not for the purpose of overriding public interest, you cannot use this form.
- Use the separate [A05 form](#) if your application is for the purpose of preventing serious damage or spread of disease, or preserving public health and public safety.

(a) *Provide a brief description of the proposed work you are applying to carry out.

For example, construction of a new road, bridge repairs, or construction of five flats with an access road and car parking area.

The Project provides a connection between the A2 and M2 in Kent, east of Gravesend, crossing under the River Thames through two bored tunnels, before joining the M25 south of junction 29 in Essex. The road would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13 and junction 29 of the M25. The tunnel portals would be located to the east of the village of Chalk south of the Thames, and to the west of East Tilbury to the north of the Thames.

The Project would be three lanes in both directions, except for link roads; stretches of carriageway through junctions; and the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes.

The licence application covers the translocation and displacement of water voles away from a construction of a major road.

(b) *Tell us why you need a licence to carry out your proposed work.

For example, the relevant species' resting place will be destroyed.

The construction of the new road the A122 Lower Thames Crossing will require the translocation and displacement of water voles from the construction areas due to potential for disturbance, habitat loss and mortality.

*You must confirm which of the following categories your proposed work relates to:

- agriculture, fishing or forestry
- archaeological investigation or site investigation
- barn conversion
- commercial
- communications
- energy generation
- energy supply
- flood and coastal defences
- health and safety
- heritage
- housing
- industrial or manufacturing
- mineral extraction
- nationally significant infrastructure projects (NSIPs)
- places of worship
- public community projects (for example, schools, universities, hospitals, care facilities and other public buildings)
- small-scale repair and maintenance works
- transport
- waste management

- water management
- other

(c) *Which of the categories listed here most appropriately describes your proposed work?
Choose one category only.

Transport

(d) If choosing 'other', provide details of the type of work you will be carrying out:

Section 6: Site details

*Site name

Lower Thames Crossing

*Ordnance Survey National Grid Reference (in format XX123456)

The [Defra Magic map tool](#) can be used to find the grid reference.

TQ 56934 92188 (northern extent) to TQ 66809 70028
(southern extent)

*If the site to be licensed is different to the applicant's address, you must provide the details of the site's location.

Site address (including postcode)

M25 junction 28 across southern Essex to A2/M2 in
northern Kent.

Section 7: Conservation considerations

Designated sites may include Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs) or Special Areas of Conservation (SACs).

(a) *Will any of the proposed activity take place on or adjacent to a Designated Site? You can use the [Defra Magic map tool](#) to see if your site is within or adjacent to a Designated site

Type yes or no

Yes

If 'yes', answer the following questions. If 'no', go to the next section of the form.

(b) *Provide details of the Designated Sites, including the site name and type, and specify whether the proposed activity will take place on or adjacent to the site.

Thames Estuary and Marshes SPA and Ramsar (adjacent), South Thames Estuary and SSSI (adjacent), Mucking Flats and Marshes SSSI (adjacent)

(c) *Have you consulted with Natural England for advice on the implications of the application on the designated site?

Type yes or no

Yes

*Tell about us either the outcome of your consultations or the reasons why you have not consulted Natural England. Provide us with details of any relevant correspondence and the name of the local Natural England adviser or reserve manager consulted.

Multiple discussions with Patrick McKernan, Sean Hanna, Jonathan Bustard and Phil Williams.

Section 8: Authorisation

It is your responsibility as the applicant to obtain the owner's or occupier's permissions to act under licence on their property.

You may be asked to provide documentation confirming that you have the owner's or occupier's permissions. We will contact you if this is necessary.

* (a) Is the applicant the owner or occupier of the land?

Type yes, no, or not applicable

Not applicable

If 'yes' or 'not applicable', go to the next section of the form. If 'no', go to question (b)

(b) *Have you received the owner's or occupier's permission to apply?

Type yes or no

Section 9: Application details

You must provide details of licensable activities you wish to carry out under this A05a application.

The following activities are licensable if they apply to animals and plants protected under schedules 5, 6 and 8 of the Wildlife and Countryside Act 1981:

- kill
- injure
- take
- possess or control
- damage or destroy any structure or place used for shelter or protection
- disturb any such animal while it is occupying a structure or place used for shelter or protection
- obstruct access to any structure or place used for shelter or protection
- disturb (dolphin, whale, basking shark)
- pick (plants only)
- uproot (plants only)
- destroy (plants only)

(a) *Enter the details of licensable activities you wish to perform. Complete one column per species:

Details	Licensable activity 1	Licensable activity 2	Licensable activity 3
Species of animal or plant	Water Vole		
Licensable activities you want to carry out for that species. Enter more than one activity, if applicable.	Disturb, translocate, damage/destroy structure		
Proposed start date	2024		
Proposed end date	2029		

(b) *Provide details of the proposed methods and field techniques to be used as part of the licensable activities.

Displacement and translocation.

Prohibited methods or techniques

Under section 11(1) and (2) of the Wildlife and Countryside Act 1981, prohibited methods or techniques of killing or taking certain wild animals include:

- snare
- use a decoy
- trap
- electrical device for killing or stunning
- poisonous, poisoned or stupefying substance
- automatic or semi-automatic weapon
- use of device for illuminating a target
- sighting device for night shooting
- any form of artificial light or any mirror or dazzling device

(c) *Are you applying to use a prohibited method or technique?

Type yes or no

No

(d) *If 'yes', provide us with details of the prohibited method or field technique you wish to use.

Complete one column per species.

Details	Licensable activity 1	Licensable activity 2	Licensable activity 3
Species of animal			
Prohibited methods or techniques you want to carry out for that species. Enter more than one, if applicable.			
Proposed start date			
Proposed end date			

Section 10: Experience

For guidance on completing this section please refer to the [Experience in Great Crested Newt Mitigation document](#) on GOV.UK.

(a) *Does the named ecologist associated with this application have either relevant qualifications or experience of the methods and procedures proposed?

Type yes or no

N/a

(b) If you said yes, provide details of any relevant qualifications or experience of the methods and procedures proposed.

(c) *Has the named ecologist held or been named on a licence in the past 3 years for the same species and in relation to a project of similar scale, methodology and mitigation?

Type yes or no

If 'yes', complete question (c) and then move on to Section 11 ('Consent status'). If 'no', go to question (d).

(d) *If you have been named on or currently hold any relevant licences, provide the name of the issuing authority, the licence reference number and date of issue.

Survey licence

(c) Does the named ecologist for the application, currently hold a valid personal survey licence, or are they registered to use a class survey licence for the same species?

Type yes or no

If 'yes', complete all of the following questions. If 'no', go to question (f).

(d) Survey licence reference numbers

(e) Number of years, you have held the survey licences

(f) *Provide a brief description of the named ecologist's current science, education or conservation licence, or any other licences issued to the ecologist in the last 3 years relevant to the species in this application.

(g) *Provide a brief description of the named ecologist's experience on mitigation projects relevant to the species in this application, including in what capacity they acted. Give the site names and reference numbers of any licences and the type of mitigation involved.

(h) *Provide details of the named ecologist's qualifications, including any Continual Professional Development (CPD) training relevant to the species in this application.

References

If you have not held a mitigation licence within the last 3 years you will need to provide written references from 2 people who are familiar with the named ecologist's work. Attach these references with your application.

References provided in support of your licence application should:

- vouch for the named ecologist's suitability and competence to prepare and deliver mitigation projects
- state how long referees have known the named ecologist and in what capacity
- provide details of the named ecologist's mitigation experience with the relevant species or a related species
- provide details of the referees' own mitigation experience and mitigation licences held (if appropriate); at least one referee must have held a mitigation licence within the last 3 years

(i) * Have you attached the references to this application?

Type yes or no

If 'yes', provide contact details for the referees. We may need to contact these referees to verify their statements.

First referee

Full name

Telephone number

Email

Second referee

Full name

Telephone number

Email

Section 11: Consent status

You may be required to apply for one of following types of consents to carry out your proposed work:

- full planning permission
- outline planning permission
- demolition consent (under the Building Act 1984), including prior notice to demolish
- conservation area consent
- listed building consent
- tree preservation order
- Highways Act consent
- utilities consent
- mineral consent
- mineral consent with review of mineral planning permission
- mineral consent (review of mineral planning permission submitted to mineral planning authority)
- other type of consent (for example, Secretary of State Decision Letter, compulsory purchase order, Environment Agency consent)

If your proposed work is carried out as 'permitted development' under the Town and Country Planning Act 1990, then no specific consent required.

(a) *Is any consent required for the project that is the subject of this licence application?

Type yes or no

Yes

If you answered 'no' to (a), complete question (b). If you answered 'yes' to (a), complete questions (c) and (d).

(b) Provide details of why no consent is required for your proposed work

(c) Tell us what types of consent you require to carry out your proposed work

Secretary of State Decision Letter

(d) Have you obtained the necessary consents to allow the proposed activity to begin?

Type yes or no

No

If you answered 'yes' to (d), complete the 'Consent not obtained' section, if 'no' to (d), complete the 'Consent not obtained' section.

Consent not obtained

Explain why you are applying for a licence before obtaining the necessary consent to commence the development.

For example, site investigation work which is required to inform the planning consent decision and where, after avoidance measures, the risk of affecting a protected species is high. Note that your application is unlikely to be processed until this issue has been resolved.

DCO application has been submitted in October 2022.

(e) * Provide details of the outstanding consents to be obtained and the likely timescales for their determination or issue.

DCO

Consent obtained

(e) You must provide the following details for each type of consent granted:

- type of consent
- relevant consent reference number

You must also submit copies of the consents (or extracts) that are relevant to the proposed activity and this licence application, if applicable.

(h) For all consents that have been granted, have all conditions or reserved matters relating to wildlife species and habitat issues (which are intended to be and are capable of being discharged before development begins) been discharged?

Type yes or no

If 'no', answer question (i). If 'yes', please skip to question (j).

(i) Give details of any conditions that are still to be discharged and explain why they have not been discharged.

Commitments that affect the protected species

(j) Is the site subject to any commitment that affects the protected species named in this application?

For example, a Section 106 Agreement (Town and Country Planning act 1990) or other commitments made at a Public Inquiry or in an Environmental Statement.

Type yes or no

If 'yes', answer the following questions. If 'no', go to question (k)

Has the commitment been met? Please also explain what has been done.

What work is outstanding and when will it be completed?

(k) Is the site subject to any such commitment that affects other protected species?

For example, a Section 106 Agreement (Town and Country Planning act 1990) or other commitments made at a Public Inquiry or in an Environmental Statement).

Type yes or no

If 'yes', answer the following questions. If 'no', move on to the 'Consenting authority' section.

Has this commitment been met? Please also explain what has been done.

What work is outstanding and when will it be completed?

Consenting authority

Provide the details of the local planning authority or authorities that have granted consent for the proposed project and the subject of this licence application, including contact details for the responsible officer.

If consent is granted by another body (for example, the Secretary of State, Natural England, Environment Agency, utilities consent, highways consent), provide details for it, as appropriate.

*Consenting authority

Secretary of State

*Title

For example, Mr, Mrs, Mx or Other (specify)

*First name

*Last name

*Telephone number

*Email address

*Address (including the postcode)

Reasoned statement and supporting documents

A reasoned statement and supporting documents are required to support this application.

A [reasoned statement template and further guidance](#) are available on GOV.UK.

Have you read and understood the reasoned statement template and guidance?

Type yes or no

Have you attached a reasoned statement with this application?

Type yes or no

Section 12: Method statement

A method statement must be provided to support this application, using the [A05a method statement template](#).

The method statement is normally prepared by a consultant ecologist or another suitably qualified person with specific and site related knowledge.

Note: for new applications, where practical, you will need to provide a map or plan of a suitable scale showing where the activities will be undertaken, attach this to your application.

Have you attached a map or plan with this application?

Type yes or no

Section 13: Licence charges

You are exempt from paying any licence fees if the proposed work you are applying to carry out is either:

- a single householder home improvement project (such as an extension, garage, car port, wall or fence) for which you have either:
 - received planning consent through a householder planning application
 - do not need planning consent (permitted development)
- for the conservation of an historic building – the primary purpose of the project must be the conservation works. The building or structure must be either a:
 - scheduled monument
 - listed building
 - registered place of worship
 - farm building in a stewardship agreement

Invoice details

Complete this section if your licence application is not exempt from charges.

- You will need to pay before you start your project.
- If this section is not completed, the form will be returned to you. Assessment of the licence application will not start until invoice details are provided.
- If you make a request to change invoice details after an invoice has been issued, you will be charged an administration fee of £101. This includes if there are missing purchase order numbers.

Company name

Contact name

Address (including postcode)

Telephone number

Email address for invoices

Purchase order number (if applicable)

Section 14: Supplementary information

Provide us with any additional information you may have to support your application.

Section 15: Convictions

Have you or any person listed in the application been convicted of any wildlife-related or animal welfare offence?

Type yes or no

If 'yes', provide details of the convictions: (including dates)

The offences we are referring to relate to persons convicted on or after 1 January 2010 of an offence under the Wildlife and Countryside Act 1981, the Conservation (Natural Habitats &c.) Regulations 1994, the Conservation of Habitats and Species Regulations 2017, the Protection of Badgers Act 1992, the Deer Act 1991, the Hunting Act 2004, the Wild Mammals (Protection) Act 1996, the Animal Welfare Act 2006 and the Protection of Animals Act 1911 (all as amended).

You do not have to declare conviction if the person concerned is a rehabilitated person for the purposes of the Rehabilitation of Offenders Act.

Section 16: Applicant's declaration

The applicant must sign this declaration.

I confirm that:

- I have read and understood the Natural England [Wildlife Licensing privacy notice](#)
- where required, I undertake to obtain permission from landowners or occupiers of land to exercise any licence resulting from this application, and to allow any employee or representative of Natural England to monitor or inspect the work described in this application
- I have read and understood the guidance provided in the application form and the [wildlife licensing guidance](#) on GOV.UK
- the particulars given are correct to the best of my knowledge and belief, and I apply for a licence in accordance with the information I have provided
- that there is no satisfactory alternative to meet the need or resolve the problem detailed in this application

Name

Gareth Protheroe

Applicant's signature

Date

22/11/2022

Section 17: Ecologist's declaration

The named ecologist for this application must sign this declaration.

I confirm that:

- I have read and understood the Natural England [Wildlife Licensing privacy notice](#)
- that I have visited the sites
- designed and contributed to this licence application
- there is no satisfactory alternative to meet the need or resolve the problem detailed in this application
- I am satisfied that the proposal will result in no adverse impact on the species concerned
- the particulars given are correct to the best of my knowledge and belief, and the applicant may apply for a licence in accordance with information I have provided
- I have documentary evidence that I am authorised to act of the applicant, which I will supply to Natural England on request

Name

Nick Clark

Ecologist's signature

Date

22/11/2022

Privacy notice

How we use your personal information is set out in the [Natural England Wildlife Licensing privacy notice on GOV.UK](#).

Important advice

If your application is made under the Wildlife and Countryside Act 1981 (as amended) or the Conservation of Habitats and Species Regulations 2017, any person who, in order to obtain a licence, knowingly or recklessly makes a statement or representation or furnishes a document or information which is false in a material particular, shall be guilty of an offence and may be liable to criminal prosecution.

Any person found guilty of such an offence is liable, on summary conviction, to imprisonment for a term not exceeding 6 months or to a fine not exceeding level 5 on the standard scale, or to both. Regarding other wildlife legislation, we will look to provisions in the Fraud Act 2006 (as amended) in respect of applicants making any false representations.

Natural England or the Secretary of State can modify or revoke at any time any licence that is issued, but this will not be done unless there is good reason for doing so. Any licence that is issued is likely to be revoked immediately if it is discovered that false information has been provided that resulted in the issue of a licence.

Application notes

Applicant

The applicant is the person submitting the application (usually the landowner or occupier) who, if the licence was granted, would become the licensee. The applicant may appoint agents to produce the application and act on their behalf. A person with specific skills and knowledge of the species concerned, such as a consultant ecologist, must be appointed to assist in the preparation and the delivery of the proposals that ensure the species protection requirements can be met.

Licensee

The licensee named on the licence is responsible for ensuring that all activities carried out on site in relation to the licence comply with the terms and conditions of the licence. However, all persons authorised to act under the licence must comply with the licence and its conditions. This means that all authorised persons have a responsibility for ensuring that the licence terms and conditions, including any annex special conditions, are understood and complied with. Failure to do so could lead to prosecution.

Named ecologist

The 'named ecologist' is a professional ecological consultant who has satisfied Natural England that they have the relevant skills, knowledge and experience of the species concerned and is responsible for undertaking and/or overseeing the work undertaken in respect of the licensed species. The named ecologist has a responsibility for ensuring that the licence is complied with.

They are responsible for advising the licensee on the suitability and competence of any accredited agents or assistants employed on site to undertake the required duties. This may include the direct supervision of assistants where appropriate. More information about the [experience required to become a named ecologist](#) can be found on GOV.UK.



European Protected Species Mitigation Licensing - Reasoned Statement for the purpose of Imperative Reasons of Overriding Public Interest

The information provided in this form will be used by Natural England to determine whether the proposed activity affecting the European Protected Species meets the requirements of Regulation 53(2)(e) and 53(9)(a) within The Conservation of Habitats and Species Regulations 2010 (as amended). These are known as the ‘**purpose**’ and ‘**no satisfactory alternatives**’ tests.

This form, for the purpose of Imperative Reasons of Overriding Public Interest, only needs to be completed if your application proposal is **not** covered by one the scenarios and categories listed [on GOV.UK](http://GOV.UK).

Important Note: Detailed information on the proposal is required to demonstrate that it will meet the tests set out under the Regulations. If you encounter difficulty answering the questions or providing the evidence required, it may suggest that your proposal is insufficiently advanced to satisfy the licensing tests. In that case, you should consider delaying your application until this information is available.

Please read the following and complete:

- **Section A: Purpose test**
“Imperative reasons of overriding public interest” (IROPI) including those of a social or economic nature and beneficial consequences of primary importance for the environment”
- **Section B: No Satisfactory Alternative test**

The tests are applied proportionately, so the strength of the evidence required to meet each will need to be sufficient to justify the impact upon the protected species (see guidance for further information). Where the supporting evidence upon which your reasoning is based consists of lengthy documents, please do not submit these in their entirety as this will delay your application if we need to go through them to find the relevant extracts. You need to provide clear, concise information for us to be able to meet the licensing tests. Please note that your application is likely to be rejected in cases where the supporting evidence has not been clearly referenced.

Section A: Purpose Test

A1 Please select against all of the following below which apply to your proposal. You are asked to indicate against those that apply whether the projected benefits are primary or secondary or not applicable to your proposal.

Please note: A primary benefit is considered to be the key social, economic or environmental benefit brought about from the proposal. A secondary benefit is considered to be an additional benefit, but not the main reason for the proposal. There may be more than one secondary benefit but supporting evidence should be provided in Section A2 where applicable, for each benefit selected.

Does your proposal:			
Provide housing in an area where shortfalls have been clearly identified?	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
Create, repair or enhance essential infrastructure at a local, regional or national level?	<input checked="" type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input type="checkbox"/> N/A
Provide care facilities or another essential public service in an area where it is known to be required?	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
Address another clearly identified social, religious or cultural need?	<input type="checkbox"/> Primary benefit	<input checked="" type="checkbox"/> Secondary benefit	<input type="checkbox"/> N/A
Create long term employment opportunities in an area of high unemployment?	<input type="checkbox"/> Primary benefit	<input checked="" type="checkbox"/> Secondary benefit	<input type="checkbox"/> N/A
Deliver other economic benefits or otherwise contribute in some way to the wider economy?	<input checked="" type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input type="checkbox"/> N/A
Contribute to addressing problems associated with climate change or promote sustainable energy use	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
Conserve a place of environmental interest?	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
Provide alternative sources of energy?	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
Deliver other benefits from those specified above?	<input type="checkbox"/> Primary benefit	<input type="checkbox"/> Secondary benefit	<input checked="" type="checkbox"/> N/A
If 'Other benefits' is selected, please provide details here:			

A2 In relation to the primary and secondary benefits identified in A1, to help demonstrate the need for the proposal, please provide the evidence and details for all the benefits ticked above.

Important note: Reference the supporting evidence upon which your reasoning is based and include the relevant extracts (please do not send in documents with no indication where the evidence being referred to is). This evidence must link back to the tick boxes selected above. Failure to do so will lead to us having to come back to you for further information.

Supporting evidence can usefully include some or more of the following: Local planning policies and plans, planning permission, policy documents, specialist reports, feasibility studies, extracts from relevant legislation, photographs, media articles or related correspondence. Where applicable, please ensure that planning officer or committee reports and design and access statements are included as supporting evidence.

A2 (a) (i) Please provide full details of the proposal in the box below.

The Lower Thames Crossing (the 'Project') would provide a connection between the A2 and M2 in Kent, east of Gravesend, crossing under the the River Thames through two bored tunnels, before joining the M25 south of junction 29. The Lower Thames Crossing is a Nationally Significant Infrastructure Project (NSIP) within Section 14(1)(h) and 22(1)(a) of the Planning Act 2008.

The A122 Road would be approximately 23km long, 4.25 km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13 and junction 29 of the M25. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.

The Project would be three lanes in both directions except for; link roads, stretches of carriageways through junctions, and the southbound carriageway from the M25 to the junction with the A13/A1089, which would have two lanes.

The Project would include adjustment to a number of side roads to accommodate the A122 road and to connect with the Project road at the A13 and A2 junctions. There would also be adjustments to a number of public rights of way, used by walkers, cyclists and horse riders. Construction of the Project would also require the diversion of a number of utilities, including gas pipelines, overhead and underground electricity cables, as well as water supplies and telecommunications assets.

A full description of the Project is set out in Environmental Statement (Chapter 2 - Project Description) (Application Document 6.1), specifically section 2.4 (Description of the Project) and section 2.8 (Operations, maintenance and management), submitted as part of the application for a development consent order.

A2 (a) (ii) Explain why your proposal is considered to be imperative (essential).

For example, if your development proposal is for a housing development reference the local housing need as set out in the area plan and explain how your proposal contributes to meeting this need or how the requirement for the proposed new public service, care facility or infrastructure project was identified.



The main drivers behind the need case are to reduce existing congestion at the Dartford Crossing and improve the resilience of the Thames Crossing and the major road network. The need case is set out in full within the Need for the Project, notably section 3 (Policy context) (Application Document 7.1) submitted as part of the application for development consent.

Government policy for Transport NSIPs is set out in the National Policy Statement for National Networks (NPSNN).

Paragraph 2.2 of the NPSNN recognises that there is a critical need to improve the national networks to address road congestion in order, '... to provide safe, expeditious and resilient networks that better support social and economic activity; and to provide a transport network that is capable of stimulating and supporting economic growth'.

This is supported by paragraph 2.22 of the NPSNN which states that without improving the road network, including its performance, it will be difficult to support further economic development, and this will impede economic growth and reduce people's quality of life. The Government has therefore concluded that, at a strategic level, there is a compelling need for the development of the national road network.

Paragraph 2.27 of the NPSNN goes on to state that, in some cases to meet the needs of traffic, it will not be sufficient to simply expand capacity on the existing network. In those circumstances new road alignment and corresponding links, including those alignments which cross a river or estuary, may be needed to support increased capacity and connectivity.

Please provide details of supporting evidence.

Provide clear referencing such as page numbers and paragraphs of specific documents so these can easily be cross-referenced. To help with our assessment, please only provide the relevant extracts that help to demonstrate the reasoning given above rather than including lengthy documents in their entirety. Please do not provide website links to separate documentation, unless you identify where exactly in the linked document or web page the evidence referred to is located (our preference is for you to extract the evidence and copy it below, referencing where it has come from).

A full description of the Project is set out in the Environmental Statement (Chapter 2 - Project Description. Application Document 6.1), specifically section 2.4 (Description of the Project) and section 2.8 (Operations, maintenance and management), submitted as part of the application for a development consent order. The need case is set out in full in the Need for the Project (Application Document 7.1).

Please confirm that relevant extract/s from supporting evidence to verify the above have been included

Yes No

A2 (b) Explain why the benefits of your proposal override any harm to the protected species.

The benefit/s arising from the proposal must outweigh the harm (or risk of harm) to the protected species. Generally this means long-term public benefits rather than short term benefits (ie creation of permanent employment opportunities rather than temporary employment or creation of infrastructure that helps to provide long-term solutions to clearly identified national problems associated with energy demands).

The benefits of the Project address the long-standing transport problems at Dartford Crossing which constrain the economy and impose negative issues on nearby communities. National policy recognises the contribution the Project would make to the national and regional economy, notably around the Government's levelling up proposals.

High level traffic demand for crossing the River Thames east of London significantly outstrips the available road space supply, with growth in this demand progressively making this situation worse. This results in traffic congestion and poor journey time reliability, ranking this part of the Strategic Road Network as being in the top 1% of worst performing sections for reliability. Such congestion, delay and poor journey time reliability are identified as being a major impediment to economic growth in the South East of England and the rest of the country.

The Project will increase the supply of available road space by over 80%, and provide an alternative route to the Dartford Crossing. This would reduce congestion and journey time, and improve reliability, increasing the growth potential for local economies both sides of the River Thames, and benefiting the flow of goods and services using the South East ports. Local communities would see reduced congestion in the local area, as well as reductions in noise and air pollution.

Further details on the need case for the Project are given in Need for the Project (Application Document 7.1).

The potential adverse effects on terrestrial biodiversity associated with the construction and operation of the Project are set out in Chapter 8: Terrestrial Biodiversity of the Environmental Statement (Application Document 6.1), notably section 8.4 (Baseline), section 8.5 (Project Design and Mitigation), and section 8.6 (Assessment of Likely Significant Effects), submitted as part of the application for a development consent order. There are no potential significant residual effects predicted to occur to any protected species, although significant adverse effects are predicted for some assemblages of terrestrial invertebrates, as well as a number of statutory and non-statutory designated sites.

The Planning Statement (Application Document 7.2), provides a Project-wide assessment of effects on protected species in a national policy context, and demonstrate that the benefits of the proposed development outweigh any harm or risk to protected species. Biodiversity impacts are detailed within section 6 (National Policy - Project-wide Assessment), notably paragraphs 6.5.45 to 6.5.93. Paragraphs 6.5.68 to 6.5.76 deal specifically with protected species.

Please provide details of supporting evidence as explained in A2 above.

Please refer to the following documents:

Environmental Statement. Chapter 2 - Project Description. (Application Document 6.1). Notably section 2.4 (Description of the Project) and section 2.8 (Operations, maintenance and management).
Environmental Statement. Chapter 8 - Terrestrial Biodiversity. (Application Document 6.1). Notably section 8.4 (Baseline), section 8.5 (Project Design and Mitigation), and section 8.6 (Assessment of Likely Significant Effects).
Need for the Project. (Application Document 7.1). Notably section 3 (Policy Context).

Planning Statement (Application Document 7.2). Notably section 6 (National Policy - Project-wide Assessment)

Please confirm that relevant extract/s from supporting evidence to verify the above have been included

Yes No

A3 There must be a Public Interest. You need to demonstrate that your proposal will deliver a public benefit rather than a solely private interest.

Note: Planning consent (or its equivalent) is considered evidence of public interest so please ensure to reference here but only include details in the application form.

A3 (a) Indicate the scale of these benefits:

Local Regional National

A3 (b) Where possible, explain the scale of the benefits that will be achieved from your proposal, in quantifiable terms, as indicated above.

For example, this could be the number of new houses provided in proportion to the identified need at a local and regional scale; the number of long term employment opportunities that will be created at a local level; the level of reduced Co2 emissions at an 'X' level.

The Project will deliver benefits locally, regionally and nationally, across transport, community and environment, and economic sectors. Transport benefits would see increased road capacity and resilience through the creation of an alternative river crossing to the Dartford Crossing. There would also be reduced congestion, reduced journey times, improved journey reliability and safety benefits. From a community and environment perspective, local communities would experience improved connectivity to the wider road network and greater ease to cross the River Thames. Environmentally, the Project would see a net increase in receptors predicted to experience better air quality, and would create a positive legacy of green infrastructure through the creation of recreational sites such as Chalk Park and Tilbury Fields. The Project would also see direct and indirect provision of local jobs and opportunity for upskilling the local workforce. Economic benefits would aid growth potential north and south of the River Thames through the creation of a single market, no longer fragmented by the river, which would enhance the labour market, competition and efficiencies, driving up productivity.

The detail of these benefits is set out in the Need for the Project (Application Document 7.1), section 5 (Project Benefits) submitted as part of the application for a development consent order.

A3 (c) Please provide details of supporting evidence to verify the above as explained in A2 above

Need for the Project (Application Document 7.1). Notably section 5 (Project Benefits).

Please confirm that relevant extract/s from supporting evidence to verify the above have been included

Yes No

SECTION B: No Satisfactory Alternative Test

Please explain why there is no satisfactory alternative to your proposal.

A “satisfactory alternative” is a different way of achieving the objective of the activity (ie meeting your need) which has a *less negative impact on the protected species*. If there is a less damaging satisfactory alternative available that is feasible, then legally, a licence cannot be granted.

You are expected to have considered all reasonable alternative solutions when developing your proposal(s) and to have suitable grounds (and evidence) for discounting each against the proposed solution to meet the need. There are technical and non-technical elements to consider for this test and this part of your application will consider the non-technical elements – focussing on delivering the need. Alternatives can include different locations, routes, designs and timings. The Method Statement focusses on the technical elements of this test – ie reducing the impact on the species (see ‘Important Advice’ below).

Important Advice: Please note that alternative mitigation (including timing of licensable works) and compensation solutions are considered as part of the Favourable Conservation Status test and should be included in the relevant species Method Statement submitted with your application and not here.

B1 (a) Firstly, please explain why the current situation (ie the status quo) isn’t acceptable or feasible.

The Need for the Project Document (Application Document 7.1), section 4 (Need Case: Issues and Opportunities) identifies the need for the Project and explains why the status quo is not acceptable or feasible. Currently demand outstrips road space supply, with no major increase in capacity achieved since the opening of the Dartford Crossing in 1991, despite increasing demand. This problem is exacerbated by the configuration of the road network at the Dartford Crossing and its approaches, particularly when compared to modern standards (e.g. high constraints within specific tunnel lanes leading the traffic weaving; the need to prevent traffic queuing within tunnels leading to increased congestion at tunnel entrances; drivers using local roads to avoid congestion on M25 and then rejoining the M25 closer to the crossing location). Congestion on M25 and local roads leads to increased and unreliable journey times.

There is a lack of alternative crossing routes east of London, those being limited to the Woolwich Ferry, 10 miles upstream of the Dartford Crossing, and the Blackwall Tunnel, 15 miles upstream. Limitations for some vehicles using these crossing points mean some vehicles are forced to follow the M25 west around London, significantly increasing their journey time.

B1 (b) Details of supporting evidence.

Provide clear referencing such as page numbers and paragraphs of specific documents so these can easily be cross-referenced. To help with our assessment, please only provide the relevant extracts that help to demonstrate the reasoning given above rather than including lengthy documents in their entirety. Please do not provide website links to separate documentation, unless you identify where exactly in the linked document or web page the evidence referred to is located (our preference is for you to extract the evidence and copy it below, referencing where it has come from).

See Need for the Project (Application Document 7.1). In particular, please refer to section 4 (Need Case: Issues and Opportunities) which details why the current situation at Dartford Crossing isn't acceptable or feasible.



B1 (c) Confirm relevant extract(s) from supporting evidence is included to verify the above.

Yes No

Please use the tables below to describe each alternative considered.

Please use a separate line for each and tick the relevant reason(s) why it was dismissed. It is important to explain why each alternative was judged to be unsatisfactory or unfeasible to meet the need for the proposal put forward in your application and to provide concise supporting evidence as appropriate (*Please insert additional rows as required*).

B2 (a) Set out <u>what</u> alternative locations and/or routes were considered and indicate how and why they were not acceptable.	Not applicable to situation	Won't deliver need	Not feasible	Greater impact on species
Location or route 1:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If you have ticked 'Not applicable to situation', please explain why here, otherwise please complete this table as appropriate:				
Describe the location or route considered	Additional capacity at the existing Dartford Crossing			
Clearly set out how and why the alternative location/route was discounted.	Option need not meet traffic-related objectives as it did not provide an alternative route, performed poor in relation to safety, noise and air quality impacts, and had drawbacks from a deliverability perspective.			
Location or route 2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the location or route considered	Swanscombe peninsula link to the A1089			
Clearly set out how and why the alternative location/route was discounted.	Option would have a significant adverse impact on committed development within the area			
Location or route 3:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the location or route considered	M2 link to the A130 via Cliffe/Pitsea			
Clearly set out how and why the alternative location/route was discounted.	Failure to meet the objective of relieving congestion on the Dartford Crossing			
Location or route 4:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the location or route considered	M2 link to the A130 via Canvey Island			
Clearly set out how and why the alternative location/route was discounted.	Failure to meet the objective of relieving congestion on the Dartford Crossing			

**Please note: you can add more rows to the table: Right click in the bottom row > Choose Insert > Insert rows below.*

B2 (b) Details of supporting evidence.

Provide clear referencing such as page numbers and paragraphs of specific documents so these can easily be cross-referenced. To help with our assessment, please only provide the relevant extracts that help to demonstrate the reasoning given above rather than including lengthy documents in their entirety. Please do not provide website links to separate documentation, unless you identify where exactly in the linked document or web page the evidence referred to is located (our preference is for you to extract the evidence and copy it below, referencing where it has come from).

One additional route options were identified which could not be incorporated into table B2:
 Route 5: Isle of Grain link to east of Southend
 Route discounted as wouldn't deliver the need case due to failure to meet the objective of relieving congestion on the Dartford Crossing.

The Planning Statement (Application Document 7.2), section 5 (Project Evolution and Alternatives) submitted in support of the application for a development consent order provides a consideration of all routes reviewed as part of the optioneering process and sets out why each option was assessed. In particular, please refer to section 5.4 (Route Selection) to understand the overview of the alternative options that were reviewed since 2009 (consisting of six potential crossing locations between the Dartford Crossing and the Isle of Grain) through to 2017 when the Secretary of State made the Preferred Route Announcement selecting the current location, as well as the subsequent reappraisal of the Preferred Route Announcement which sought to ensure that the previous work that had been undertaken to identify the preferred route, and to discount other routes, was still valid.

B2 (c) Confirm relevant extract(s) from supporting evidence is included to verify the above. Yes No

B3 (a) Set out <u>which</u> alternative development scales or designs were considered.	Not applicable to situation	Won't deliver need	Not feasible	Greater impact on species
<i>Important note: If new infrastructure is to be created explain why the need cannot be met by expanding existing infrastructure.</i>				
Development scale or Design 1:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If you have ticked 'Not applicable to situation', please explain why here otherwise please complete this table as appropriate:				
Describe the development scale or design considered.	See Route 2 Plate 5.10 - Shortlisted routes. Planning Statement (Application Document 7.2).			
Clearly explain how and why the different development scale or design considered was discounted.	Route 2 would be closer to existing urban areas and would require challenging construction works, leading to the mixing of local and long distance traffic.			
Development scale or Design 2:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the development scale or design considered.	See Route 4 Plate 5.10 - Shortlisted routes. Planning Statement (Application Document 7.2).			

Clearly explain how and why the different development scale or design considered was discounted.	Route 4 had greater impacts on designated sites and was a longer, higher cost option than the Project design			
Development scale or Design 3:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the development scale or design considered.	See Comment below			
Clearly explain how and why the different development scale or design considered was discounted.	See Comment below			
Development scale or Design 4:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the development scale or design considered.	See Comment below			

Clearly explain how and why the different development scale or design considered was discounted.	See Comment below			
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**Please note: you can add more rows to the table: Right click in the bottom row > Choose Insert > Insert rows below.*

B3 (b) Details of supporting evidence.

Provide clear referencing such as page numbers and paragraphs of specific documents so these can easily be cross-referenced. To help with our assessment, please only provide the relevant extracts that help to demonstrate the reasoning given above rather than including lengthy documents in their entirety. Please do not provide website links to separate documentation, unless you identify where exactly in the linked document or web page the evidence referred to is located (our preference is for you to extract the evidence and copy it below, referencing where it has come from).

The Planning Statement (Application Document 7.2), section 5 (Project Evolution and Alternatives) submitted in support of the application for a development consent order provides a consideration of all routes reviewed as part of the optioneering process and sets out why each option was assessed. In particular, please refer to section 5.4 (Route Selection - development of the preferred route. Paragraph 5.4.97 - 5.4.130) to understand the refinement of the route options which led to the Secretary of State's Preferred Route Announcement selecting the current location, as well as the subsequent reappraisal of the Preferred Route Announcement which sought to ensure that the previous work that had been undertaken to identify the preferred route, and to discount other routes, was still valid.

B3 (c) Confirm relevant extract(s) from supporting evidence is included to verify the above. Yes No

B4 (a) Other alternative activities, processes or construction methods considered to reduce the impact upon the species	Not applicable to situation	Won't deliver need	Not feasible	Greater impact on species
<i>Important note – detailed timings of licensable works, alternative mitigation and compensation which will reduce the degree of harm are to be considered within the Method Statement and not here.</i>				

Alternative activity, process or method 1:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If you have ticked 'Not applicable to situation', please explain why here otherwise please complete this table as appropriate:				
Describe the alternative activity, process or method considered.	See comment below			
Clearly explain why this alternative was discounted.	See comment below			
Alternative activity, process or method 2:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the alternative activity, process or method considered.	See comment below			
Clearly explain why this alternative was discounted.	See comment below			
Alternative activity, process or method 3:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the alternative activity, process or method considered.	See comment below			
Clearly explain why this alternative discounted.	See comment below			
Alternative activity, process or methods 4:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the alternative activity, process or method considered.	See comment below			
Clearly explain why this alternative was discounted.	See comment below			

**Please note: you can add more rows to the table: Right click in the bottom row > Choose Insert > Insert rows below.*

B4 (b) Details of supporting evidence.

Provide clear referencing such as page numbers and paragraphs of specific documents so these can easily be cross-referenced. To help with our assessment, please only provide the relevant extracts that help to demonstrate the reasoning given above rather than including lengthy documents in their entirety. Please do not provide website links to separate documentation, unless you identify where exactly in the linked document or web page the evidence referred to is located (our preference is for you to extract the evidence and copy it below, referencing where it has come from).

During the design process undertaken following the Secretary of State's Preferred Route Announcement, a huge number of design decisions were considered across every aspect of the Project's design. These are too numerous to detail in this document but instead are summarised in the Planning Statement (Application Document 7.2), section 5.5 (Design Refinement and Evolution) submitted in support of the application for a development consent order. These include the development of designs for utilities diversions required to facilitate the Project, the location of construction compounds, and junction and road alignments.

B4 (c) Confirm relevant extract(s) from supporting evidence is included to verify the above.

Yes No

Lower Thames Crossing

Natural England Protected Species Mitigation Licence Technical Method Statement Water Vole (Clean version)

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications:
Prescribed Forms and Procedure)
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Lower Thames Crossing

Natural England Protected Species Mitigation Licence Technical Method Statement Water Vole (Clean version)

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1 Background information

1.1 Introduction

- 1.1.1 This Method Statement provides supporting information to Natural England for a protected species mitigation licence application with respect to water vole (*Arvicola amphibius*) which would be affected by National Highways' proposed A122 Lower Thames Crossing project ('the Project').
- 1.1.2 The Project lies within Kent and Essex counties, crossing the river Thames between them. It is proposed to build 23km of new roads connecting the existing road network of the M25, A2 and A13 via a tunnel under the river Thames. The Project objectives are:
- a. To support sustainable local development and regional economic growth in the medium to long term.
 - b. To be affordable to government and users.
 - c. To achieve value for money.
 - d. To minimise adverse impacts on health and the environment.
 - e. To relieve the congested Dartford Crossing and approach roads and improve their performance by providing free-flowing north-south capacity.
 - f. To improve the resilience of the Thames crossings and the major road network; and
 - g. To improve safety.
- 1.1.3 The Project is a Nationally Significant Infrastructure Project (NSIP), for which a Development Consent Order (DCO) Application will be submitted in 2023 under the requirements of the Planning Act 2008. This method statement supports a draft protected species mitigation licence application which will be submitted to Natural England to demonstrate that the Project would deliver a conservation benefit for water vole.
- 1.1.4 The document provides background information about the Project and describes the status of water vole at the site. It also provides details of the measures proposed to mitigate any adverse effects from the construction and/or operation of the Project, as well as measures to provide a conservation benefit for the species. It has been produced following Natural England's *Method Statement In Support of a Water Vole Licence Application* (Natural England, 2014). The information contained within this document will support the granting of any Letter of No Impediment (LONI) from Natural England. The LONI would be submitted to support the application for development consent.

1.2 Land where work is proposed

- 1.2.1 The Project would be undertaken between Ordnance Survey Grid References TQ 56939 92207 in the north, and TQ 76186 60765 in the south. Figure 1 illustrates the Order Limits required to construct and operate The Project, together with the route alignment of the new roads and tunnel. In total, the area of land within the Order Limits amounts to 2152 hectares.

1.3 The developer

- 1.3.1 The application is being made to Natural England by Cascade Joint Venture who will undertake the works on behalf of National Highways.
- a. Contractor (the applicant): Cascade Joint Venture
 - b. Client: National Highways

1.4 Background to the Project

- 1.4.1 The Project would provide a connection between the A2 and M2 in Kent, east of Gravesend, crossing under the River Thames through two bored tunnels before joining the M25 south of junction 29. The Project route is presented in Figure 1.
- 1.4.2 The A122 Lower Thames Crossing would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.
- 1.4.3 Junctions are proposed at the following locations:
- a. New junction with the A2 to the south-east of Gravesend
 - b. Modified junction with the A13/A1089 in Thurrock
 - c. New junction with the M25 between junctions 29 and 30
- 1.4.4 To align with National Policy Statement for National Networks (Department for Transport, 2014) policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.
- 1.4.5 The Project road would be three lanes in both directions, except for:
- a. link roads
 - b. stretches of the carriageway through junctions
 - c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes

- 1.4.6 In common with most A-roads, the A122 Lower Thames Crossing would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 Lower Thames Crossing design outside the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.
- 1.4.7 The A122 Lower Thames Crossing would be classified as an 'all-purpose trunk road' with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.
- 1.4.8 The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas pipelines, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.
- 1.4.9 The Project has been developed to avoid or minimise significant effects on the environment. The measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.
- 1.4.10 The Project would require the permanent loss of 2279m of habitat confirmed as water vole habitat. The Project would also include the temporary loss of another 1306m of habitat confirmed as water vole habitat. This means a total of 3585m of confirmed water vole habitat will be affected.

1.5 Proposed licensable activities

- 1.5.1 Proposed licensable activities that are discussed in this method statement are trapping and translocation, and displacement.
- 1.5.2 The Project agrees to comply with good practice guidance as set out in the *Water Vole Conservation Handbook* (Strachan et al, 2011) and the *Water Vole Mitigation Handbook* (Dean et al, 2016).

1.6 Maps of the Development Site

- 1.6.1 Maps of the development site showing the location of the Project and the location of watercourses and water vole survey results are attached separately. The following drawings are included:
- a. Figure 1: Order Limits Figure, showing the Order Limits in relation to the wider area.
 - b. Figure 2: Water vole survey map, showing location and status of water vole within the Order Limits of The Project.
 - c. Figure 3: Tilbury 2 water vole survey results.
 - d. Figure 4: Water vole impacts and mitigation, showing the impacts of the Project on water vole and the on-site mitigation.
 - e. Figure 5: Detailed water vole results, showing detailed water vole survey results for every watercourse impacted.
 - f. Figure 6: Water vole relocation site.
 - g. Figure 7: Water vole trapping plan.
 - h. Figure 8: Water vole habitat creation.

2 Site information and survey

2.1 Site description

- 2.1.1 The Project stretches across both the north and south bank of the River Thames from the A2/M2 south-east of Gravesend to junction 28 of the M25.
- 2.1.2 To the south of the River Thames the Project stretches from the A2/M2 corridor, south of Thong Village, up to the River Thames immediately east of Gravesend. The habitat in the vicinity of Thong village is mostly arable fields with a single golf course, and large areas of woodland including Claylane Wood, Shorne Country Park and Ashenbank Woods. As the Project moves north towards the River Thames, the road is in a tunnel under the marshes immediately to the north of the A226. These marshes are part of the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI) which stretches from Gravesend east to the Isle of Grain. This habitat contains a large ditch network with areas of grazing marsh, as well as multiple nature reserves including both Shorne Marshes RSPB and Cliffe Pools RSPB reserves.
- 2.1.3 To the north of the River Thames the Project emerges from the tunnel under the river immediately to the east of Tilbury Power Station. The Project then extends northwest to join the A13 south of Baker Street. The habitat immediately adjacent to the River Thames has been historically used as landfill and is characterised by brownfield sites interspersed with watercourses. This habitat is present all along the northern shore of the River Thames, which has historically been an area of large amounts of landfill and landscaping activities. Some of these sites are now nature reserves, both to the east of the Project (Thurrock Thameside Nature Park) and to the west of the Project (Rainham Marshes RSPB). To the east and north of Chadwell St Mary the habitat is almost exclusively arable, with some small pockets of open mosaic grassland and woodland. These areas are mostly dry, with only a limited number of watercourses to the west of Linford.
- 2.1.4 From the A13 the Project moves north-west to join the M25 immediately south of Thames Chase Community Forest. The vast majority of the habitat in this area is arable, with minimal open mosaic habitats and small pockets of woodland. In this area the Project crosses a notable watercourse: the Mardyke. As well as this watercourse, there are a number of drainage ditches which were used to drain the old Orsett Fen and create new arable farmland, which all connect to the Mardyke.
- 2.1.5 From Thames Chase Community Forest the Project extends north with the Order Limits ending south of Junction 28 on the M25. This area consists of mostly landscape planting, with adjacent farmland, woodland and open mosaic habitats. This area has a number of drainage ditches, but these are mostly dry except in times of heavy rainfall.

2.2 Methodology

Desk study

- 2.2.1 A desk study was carried out in 2017 and subsequently updated in 2022, which considered all water vole records from 2007 to present within 2km of the Order Limits. Records were requested from Kent & Medway Biological Records Centre (2022), Essex Wildlife Trust Biological Records Centre (2020), Essex Field Club (2022) and Greenspace Information for Greater London (2022).
- 2.2.2 The locations of statutory designated sites for biodiversity were obtained within 2km and non-statutory designated sites within 500m of the Order Limits. Citations for these sites were reviewed to ascertain whether water vole were included as a reason for designated or noted features.

Field surveys

- 2.2.3 Water vole surveys were carried out following the guidance published in the *Water Vole Mitigation Handbook* (Dean et al, 2016) which recommends the survey extent for different developments. New highways schemes that involve permanent culverting require a study area incorporating the construction footprint of the scheme, plus a buffer of up to 200-500m beyond this, and a desk study of up to 2-5km from the study site. Water vole surveys were therefore planned within suitable waterbodies within and up to 500m from the Order Limits.
- 2.2.4 Suitable waterbodies that could support water vole were identified and the relative suitability of habitat for water vole assessed using the following factors:
- a. Current
 - b. Channel width
 - c. Water depth
 - d. Frequency and height of water level changes (e.g. during flood events)
 - e. Bank profile
 - f. Bank height
 - g. Riparian habitat type
 - h. In-channel vegetation, and % cover
 - i. Terrestrial land use
 - j. Management/disturbance
 - k. Bankside Phase 1 habitat and species
 - l. Signs of key predators (excluding fox and heron, which were assumed to be widespread)

m. Bank substrate

- 2.2.5 The *Water Vole Mitigation Handbook* (Dean et al, 2016) recommends two survey visits are undertaken during the breeding season (April to September) to gain an accurate estimate of the water vole population. This is to account for changes in the habitat suitability for water vole which can influence the apparent distribution and population size. Generally, one visit should take place in spring between April and June with a second visit taking place in late summer/autumn between August and September with surveys being at least two months apart. In the south-east of England the survey season tends to be longer than the national average so surveys can also take place in March and October. This survey methodology was adopted by the Project.
- 2.2.6 All surveys were undertaken by suitably qualified and experienced staff. For a full list of surveyors and their experience please refer to Annex D.
- 2.2.7 A variety of methods were used to survey for water vole:
- a. The preferred technique was to survey the in-channel vegetation and the bank from within the channel. This work was undertaken by two suitably experienced ecologists one wearing waders walking through the channel searching for water vole signs and the second surveying from higher up the bank, wherever it was safe to do so.
 - b. Boat surveys were undertaken in waterbodies that were too deep to safely wade in. These surveys involved a pair of experienced ecologists using an inflatable kayak to survey the bank and any emergent vegetation for signs of water vole. These surveyors were accompanied by two additional surveyors who searched for any water vole features higher up the bank or located away from the water's edge.
 - c. For some waterbodies neither of these survey methodologies were appropriate (e.g. deep water and heavily overgrown waterbodies). In this situation surveys were undertaken from the bank only with any limitations to the surveys being noted.
- 2.2.8 The location and number of the following field signs where present, were recorded using a mobile Geographical Information System (GIS) system:
- a. Single droppings (1-2 droppings)
 - b. Latrines (collection of droppings)
 - c. Feeding remains
 - d. Burrows
 - e. Water vole sightings
- 2.2.9 No detailed examination of any burrows identified during the surveys were carried out using an endoscope to confirm the presence of water vole as this would constitute disturbing water vole and would therefore be a licensable act.

- 2.2.10 The *Water Vole Mitigation Handbook* (Dean et al, 2016) states that aside from sightings the only reliable field sign that can be used on its own to determine presence of water vole is the presence of latrines. Despite this, a combination of other field signs in close proximity can be highly suggestive of water vole presence.
- 2.2.11 Potential water vole footprints were not recorded as recognised field signs due to the similarity to rat footprints and were therefore considered unreliable.
- 2.2.12 No access was granted to survey the waterbodies within the old Tilbury power station site since this was an active construction site at the time of the Project’s baseline surveys. As such, data that were gathered as part of the Tilbury 2 Environmental Statement (ES) and the Tilbury Biomass power station (WYG, 2018) have been used to assess the water vole population within this area. This information dates from 2007, 2008, 2015, 2016 and 2017. This recent water vole survey data for Tilbury 2 is considered robust data for the purposes of this assessment.

2.3 Data analysis

- 2.3.1 Relative water vole population size estimates were calculated using methodology from Dean et al. (2016) shown in Table 2-1 below.

Table 2-1 Relative population density estimates

Relative population density	Approximate number of latrines per 100m of bankside habitat	
	First half of survey season (mid-April to end of June)	Second half of survey season (July to September)
High	10 or more	20 or more
Medium	3-9	6-19
Low	≤ 2 (or none but with other confirmatory field signs)	≤ 5 (or none but with other confirmatory field signs)

- 2.3.2 For the field study section below, and for the subsequent assessment, the highest population estimate from both the surveys was used.
- 2.3.3 Estimated populations sizes have been calculated using two methods found within the *Water Vole Conservation Handbook* (Strachan et al, 2011) both based on the number of latrines recorded. The first method was to calculate the population size based on the predictive formula $y = 1.48 + (0.683x)$ where y is the water vole numbers and x is the number of latrines. The second method used was based on the strong correlation between latrines and number of breeding females; very approximately for every six latrines, there was one female. This method was therefore to simply divide the total number of latrines by six. These two methods were used to provide the population size estimates as found in Table 3-1. All calculations were rounded up to the nearest whole number. Caution should be given to the fact that these are estimates with a large range in values.

2.4 Survey results

Desk study

- 2.4.1 The desk study revealed three sites that are designated for water vole within the study area: Puddle Dock Angling Centre Site of Importance for Nature Conservation (SINC), Fields South of Cranham Marsh SINC and Ingrebourne Valley SINC. All of these sites were immediately adjacent to the Order Limits near the M25.
- 2.4.2 Kent & Medway Biological Records Centre (2022) reported 13 records of water vole within 2km of the Order Limits to the south of the River Thames.
- 2.4.3 Twelve records of water vole were provided by the Essex Wildlife Trust Biological Records Centre (2020) within 2km of the Order Limits to the north of the River Thames.
- 2.4.4 Essex Field Club (2022) returned three records of water vole within 2km of the Order Limits to the north of the River Thames. All records were located outside of the Order Limits, the nearest record located 2.7m from the Order Limits.
- 2.4.5 Greenspace Information for Greater London (2022) returned 74 records of water vole within 2km of the Order Limits to the north of the River Thames. No detailed geographical locations for the records were provided, but the nearest was located within the Order Limits.
- 2.4.6 Water vole surveys carried out to inform the Tilbury 2 Environmental Statement (WYG, 2018) identified a total of 27 waterbodies with water vole present. Eight waterbodies had a peak population estimate of high, seven of medium and 12 of low (see Figure 3).

Field survey results

- 2.4.7 A total of seven waterbodies were found to have high populations of water vole to the south of the River Thames, over a total length of 2.4km. An additional 13 waterbodies were found to have medium water vole populations, over a total length of 4.3km. A total of 26 waterbodies encompassing 8.6km had a low population of water vole. The remaining 17 waterbodies were found to either have no water vole field signs or were dry during every survey undertaken and were therefore considered to be of negligible suitability for water vole. All waterbodies with water vole populations were located either within, or adjacent to, the South Thames Estuary and Marshes SSSI (see Figure 2).
- 2.4.8 To the north of the River Thames a total of six waterbodies encompassing a length of 2.5km had a high water vole population. An additional 21 waterbodies had a medium population across a total length of 12.1km and 31 waterbodies had a low population across a total length of 17km. Fifteen waterbodies had burrows recorded but no confirmed water vole signs. For this assessment these waterbodies have been assessed as having no water vole present as without any other confirmed water vole signs the burrows were considered most likely to be rat burrows. The remaining 84 waterbodies were found to have no water vole field signs or were dry during every survey undertaken and were therefore considered to be of negligible water vole suitability (see Figure 2).

- 2.4.9 Three main areas recorded to the north of the River Thames were the focus of the water vole surveys: the waterbodies adjacent to the Thames estuary; the waterbodies associated with the Mardyke; and the waterbodies within the northern section of the Project adjacent to the M25. Of these areas, all the waterbodies with high or medium populations of water vole were located in the vicinity of the Thames Estuary. The area in the vicinity of the Mardyke had a number of waterbodies with low populations although most had no water vole signs at all. No water voles signs were recorded within the watercourses adjacent to the M25.
- 2.4.10 Two sites had desk study records of water vole, although during the field surveys no water vole field signs were observed. These sites are: Thames Chase Community Forest (water vole last recorded in 2008) and Puddle Dock Angling Centre SINC (water vole listed on the citation, last updated in 2006). As such it is considered that although water vole have historically been present in these sites they no longer are and therefore are not considered further in this licence.
- 2.4.11 Table 2-2 describes the waterbodies with confirmed water vole populations which have been identified within the Order Limits and specifies if the respective watercourse would be affected by the Project. For a full list of water vole survey results please refer to Annex A.

Table 2-2 Waterbodies with confirmed water vole populations within the Order Limits

Waterbody number	Population estimate	Length of waterbody (metres)	Date for first survey	First survey weather conditions	First survey lead surveyor	Date for second survey	Second survey weather conditions	Second survey lead surveyor	Impacted (Yes/no)	Reason for impact
W008	Low	528	12/09/2017	Fine	Mark Lang	06/06/2018	Fine	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W009	Low	2629	10/10/2017	Overcast, windy	Sam Marles	13/09/2018	Overcast, 18 degrees, northerly breeze	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W011	Low	875	13/09/2017	Fine	Mark Lang	30/05/2018	Very overcast, dry, light breeze	Suzanne Jenkins	No	All works would be set back 8m from waterbody.
W013	Low	661	13/09/2017	Fine	Mark Lang	15/05/2018	Clear and sunny	Suzanne Jenkins	No	Adjacent to works involving bat mitigation provision.
W014	Low	1851	13/09/2017	Fine	Mark Lang	17/05/2018	Clear and Sunny	Suzanne Jenkins	Yes	See Table 3-1 Water vole habitat loss and mitigation
W017	Medium	767	07/09/2017	Dry sunny light breeze	Mike Head	03/05/2018	Dry and sunny	Dave Farrow	Yes	All works would be set back 8m from waterbody.
W019	High	940	05/09/2017	Dry overcast, breezy	Danny de la Hey	18/04/2018	Hot, sunny, dry, moderate southerly breeze	Mike Hoit	No	All works would be set back 8m from waterbody.
W020	Medium	957	07/09/2017	Dry, warm, Sunny intervals, light breeze	Mark Lang	09/05/2018	Cloud 1/8, light south westerly, 21 degrees C, dry	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W021	Medium	987	06/09/2017	Dry, Overcast, light breeze	Mike Head	12/06/2018	Dry, 8/8, 14degrees	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W023	Low	159	06/09/2017	Overcast	Danny de la Hey	17/04/2018	Warm, dry, sunny, light breeze	Kora Kunzmann	No	All works would be set back 8m from waterbody.
W024	Medium	1064	06/09/2017	Dry overcast breezy	Mike Head	12/06/2018	Cloudy with light rain	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W025	Low	1157	06/09/2017	Overcast	Danny de la Hey	09/05/2018	6/8. Wind SW2. 20 dc	Dave Andrews	No	Waterbody crossed using existing crossing.
W026	Medium	1406	27/09/2017	Sunny spells	Mike Head	20/06/2018	Warm cloudy	Dave Andrews	No	All works would be set back 8m from waterbody.
W027	Medium	1093	20/06/2018	25 degrees C, dry, light wind, cloud 1/8	Polly Tayler	19/09/2018	Warm, cloudy	Sam Marles	No	All works would be set back 8m from waterbody.
W028	Low	262	06/09/2017	Overcast 7/8	Danny de la Hey	18/06/2018	Sunny	Dave Andrews	No	All works would be set back 8m from waterbody.
W029	Medium	97	07/09/2017	Sunny	Sam Marles	17/06/2018	27 degrees, sunny with light breeze	Polly Tayler	Yes	See Table 3-1 Water vole habitat loss and mitigation
W030	Not surveyed (assumed high)	1006	07/09/2017	Sunny	Sam Marles	18/06/2018	28 degrees, sunny with light breeze	Polly Tayler	Yes	See Table 3-1 Water vole habitat loss and mitigation
W031	High	310	14/09/2017	Fine	Mark Lang	11/04/2018	Cloud 8/8, light air, dry, 10 degrees C	Mike Head	No	All works would be set back 8m from waterbody.
W032	Medium	1702	14/09/2017	Fine	Mark Lang	11/04/2018	Cloud 8/8, 10 degrees C, light air, dry	Mike Head	Yes	See Table 3-1 Water vole habitat loss and mitigation
W033	Low	1267	26/09/2017	Dry overcast warm and humid	Mike Head	09/05/2018	Cloud 1/8, light south westerly, 21 degrees C	Will Trewhella	Yes	See Table 3-1 Water vole habitat loss and mitigation

Waterbody number	Population estimate	Length of waterbody (metres)	Date for first survey	First survey weather conditions	First survey lead surveyor	Date for second survey	Second survey weather conditions	Second survey lead surveyor	Impacted (Yes/no)	Reason for impact
W034	Medium	1744	20/09/2017	Rain	Mark Lang	03/05/2018	Sunny, 15 degrees, cloud 5/8, SW2	Dave Andrews	Yes	See Table 3-1 Water vole habitat loss and mitigation
W036	High	326	06/09/2017	Dry sunny intervals breezy	Mike Head	18/06/2018	Warm sunny	Dave Andrews	No	All works would be set back 8m from waterbody.
W055	Medium	1298	22/08/2017	Warm, dry, overcast with sunny spells	Sam Marles	27/06/2018	Hot dry and sunny no cloud light breeze	Sam Marles	No	See Table 3-1 Water vole habitat loss and mitigation
W056	Low	631	06/09/2017	Overcast	Sam Marles	03/05/2018	Sunny, light breeze, dry, 14 degrees	Mike Head	No	See Table 3-1 Water vole habitat loss and mitigation
W058	Low	383	06/09/2017	Overcast	Sam Marles	01/05/2018	2/8 cloud. Light breeze. Dry. 14 degrees C.	Nick Downs	No	See Table 3-1 Water vole habitat loss and mitigation
W059	High	1454	28/09/2017	Sunny	Mike Head	10/05/2018	Sunny, Hot	Sam Marles	No	See Table 3-1 Water vole habitat loss and mitigation
W060	High	514	28/09/2017	Sunny spells	Mike Head	09/05/2018	Sunny	Sam Marles	No	Culvert under this waterbody used as a soakaway.
W068	Low	451	06/09/2017	Overcast	Sam Marles	02/05/2018	4/8 cloud, light breeze, light rain, 12 degrees	Nick Downs	No	Route alignment in tunnel.
W073	Low	1131	05/09/2017	Overcast	Sam Marles	02/05/2018	4/8 cloud, moderate breeze, 11 degrees C, dry	Nick Downs	No	Route alignment in tunnel.
W074	Low	532	06/09/2017	Overcast	Nick Downs	25/04/2018	Overcast, dry, moderate breeze	Jon Carter	No	Route alignment in tunnel.
W075	Medium	416	06/09/2017	Overcast, windy, SW wind direction	Sam Marles	24/05/2018	Hot, sunny	Sam Marles	No	Route alignment in tunnel.
W076	High	432	06/09/2017	Overcast	Nick Downs	01/05/2018	Cloud 8/8, strong breeze, light rain, approx. 10C	Nick Downs	No	Route alignment in tunnel.
W077	High	667	05/09/2017	Overcast	Sam Marles	01/05/2018	Cloud 0/8, dry, light breeze, 10 degrees C	Nick Downs	No	Route alignment in tunnel.
W097	Low	1137	15/05/2018	Clear sunny	Suzanne Jenkins	04/09/2018	Overcast, light breeze	Dave Andrews	No	Adjacent to works involving bat mitigation provision.
W100	Low	1649	29/08/2018	Raining	Craig Robson	21/10/2019	12C. Cloud 8/8. Raining.	Mike Head	Yes	See Table 3-1 Water vole habitat loss and mitigation
W116	Medium	713	17/05/2018	Cloud 1/8 temp 15 wind ne3	Dave Andrews	30/08/2018	Sunny, warm, clear sky	Craig Robson	No	Access route using existing road network.
W117	Low	574	21/05/2018	Very light rain early afternoon, then clear and sunny	Suzanne Jenkins	30/08/2018	Sunny, warm, clear sky	Craig Robson	No	Access route using existing road network.
W118	Medium	711	16/05/2018	Temp 16, light wind, cloudy, dry	Emma Davis	18/09/2018	Overcast, wind westerly, 19 degrees	Sam Marles	No	Access route using existing road network.
W120	Medium	1339	21/06/2018	Sunny, light breeze, 30% cloud cover, dry	Craig Robson	18/09/2018	Overcast, wind westerly, 19 degrees	Sam Marles	Yes	See Table 3-1 Water vole habitat loss and mitigation
W121	Low	1304	17/05/2018	Temp 14, light wind, sunny, dry	Polly Tayler	18/09/2018	Overcast, wind westerly, 19 degrees	Kora Kunzmann	Yes	See Table 3-1 Water vole habitat loss and mitigation
W123	Low	1403	15/05/2018	Clear sunny	Emma Davis	18/09/2018	Overcast, wind westerly, 19 degrees	Sam Marles	No	Within water vole habitat creation compensation areas.

Waterbody number	Population estimate	Length of waterbody (metres)	Date for first survey	First survey weather conditions	First survey lead surveyor	Date for second survey	Second survey weather conditions	Second survey lead surveyor	Impacted (Yes/no)	Reason for impact
W132	Low	86	07/06/2018	Fair	Dave Andrews	04/09/2018	Overcast, light breeze	Dave Andrews	No	All works would be set back 8m from waterbody.
W142	Low	364	22/05/2018	10% cloud, moderate breeze	Dave Andrews	30/08/2018	Sunny, warm, clear sky	Craig Robson	Yes	See Table 3-1 Water vole habitat loss and mitigation
W145	High	379	21/06/2018	40% cloud cover, sunny, warm. dry	Polly Tayler	19/09/2018	Warm, cloudy	Sam Marles	No	All works would be set back 8m from waterbody.
W146	Medium	417	23/05/2018	20% cloud, light breeze	Suzanne Jenkins	13/09/2018	Dry and sunny	Mike Head	No	All works would be set back 8m from waterbody.
W147	Low	427	23/05/2018	Overcast 100% cloud. Light breeze.	Suzanne Jenkins	13/09/2018	Dry and sunny	Mike Head	Yes	See Table 3-1 Water vole habitat loss and mitigation
W151	Low	566	30/05/2018	100% cloud. Light breeze	Suzanne Jenkins	04/09/2018	Overcast, light breeze	Dave Andrews	No	All works would be set back 8m from waterbody.
W153	Low	1690	12/06/2018	16C, light wind, 90% cloud cover	Charlotte Goodayle	04/09/2018	Overcast, light breeze	Dave Andrews	No	All works would be set back 8m from waterbody.
W155	Low	490	31/05/2018	Overcast, dry	Duncan Smith	26/09/2018	Sunny, calm, dry	Dave Andrews	No	All works would be set back 8m from waterbody.
W196	Low	1048	07/06/2018	Fine	Dave Andrews	04/09/2018	Overcast, light breeze	Dave Andrews	No	Adjacent to works involving bat mitigation provision.
W207	Low	395	06/09/2017	Overcast, windy	Nick Downs	02/05/2018	Cloud 8/8 light rain, strong breeze, 10 degrees	Sam Marles	No	Route alignment in tunnel.
W214	Low	303	29/08/2018	Raining, light breeze, 19 degrees.	Mike Head	03/09/2019	Sunny spells, westerly breeze, 21 degrees	Mike Hoit	No	All works would be set back 8m from waterbody.
W220	Low	83	21/05/2018	Very light rain early afternoon, then clear and sunny	Craig Robson	13/09/2018	Dry and sunny	Mike Head	No	All works would be set back 8m from waterbody.
W224	Low	570	23/05/2019	Cloud, 2/8, wind 0, 17 degrees	Kora Kunzmann	28/08/2019	Dry, sunny, hot, 1/8 cloud, no breeze, 28 degrees	Sam Marles	No	All works would be set back 8m from waterbody.
W226	Low	927	23/05/2019	Cloud 2/8, wind 0, 20 degrees	Kora Kunzmann	28/08/2019	Sunny, hot, clear, 24 degrees	Sam Marles	No	All works would be set back 8m from waterbody.
W237	Low	417	19/06/2019	18 degrees, moderate breeze, 8/8 cloud, dry	Mike Head	03/09/2019	Sunny spells, westerly wind, 21 degrees	Mike Hoit	No	See Table 3-1 Water vole habitat loss and mitigation
W239	Low	1151	19/06/2019	18 degrees, moderate breeze, overcast, dry	Mike Head	04/09/2019	Sunny spells, westerly wind, 22 degrees	Mike Hoit	No	Waterbody used as a soakaway for treated water.
W240	Low	1237	23/05/2019	Cloud, 2/8, wind 0, 17 degrees	Sam Marles	05/09/2019	Clear, 16 degrees, NW wind, dry	Mike Hoit	No	All works would be set back 8m from waterbody.
T1	Low	597	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.						Yes	See Table 3-1 Water vole habitat loss and mitigation
T2	Low	277	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.						No	All works would be set back 8m from waterbody.
T3	Low	217	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.						Yes	See Table 3-1 Water vole habitat loss and mitigation
T4	High	511	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.						Yes	See Table 3-1 Water vole habitat loss and mitigation

Waterbody number	Population estimate	Length of waterbody (metres)	Date for first survey	First survey weather conditions	First survey lead surveyor	Date for second survey	Second survey weather conditions	Second survey lead surveyor	Impacted (Yes/no)	Reason for impact		
Tilbury2 water vole mitigation area	N/a	2319	During discussions with Tilbury2 they have informed the Project that there is a water vole mitigation area which falls within the Order Limits. No water vole population data is available. This area falls between T1, T2 and T3 (see Figure 4 Sheet 2)								No	All works would be set back 8m from waterbody.

3 Impact assessment

3.1 Introduction

- 3.1.1 This section describes the potential impacts of the Project on water vole which would include: habitat loss; habitat fragmentation; incidental mortality; changes in water quality and level; and noise and visual disturbance.
- 3.1.2 As part of the Project design there would be embedded mitigation measures and/or industry standard protection procedures. These are described further in Section 4.

3.2 Habitat loss

- 3.2.1 There would be a loss of both potential water vole habitat and confirmed water vole habitat. Both temporarily during construction and permanently from the operation of the Project.
- 3.2.2 Table 3-1 shows the habitat loss for waterbodies with confirmed water vole populations which are due to be lost to the construction footprint. This is an approximate estimate which would be refined as construction plans are further developed and after further pre-construction water vole survey work is undertaken (see Figure 2). Table 3-1 also shows the key water vole survey results and a brief assessment of the habitat present. For a full assessment of the habitat please refer to Annex B.
- 3.2.3 For photos of the affected waterbodies containing water vole populations please refer to Annex C.

Table 3-1 Water vole habitat loss and mitigation

Waterbody number	Habitat summary	Feeding signs present	Number of latrines (peak count)	Number of burrows	Water vole population estimate (total in watercourse)	Population size estimate	Signs of key predators	Total length of waterbody (metres)	Total length lost as part of the Project (metres)	No. of water vole impacted	Permanent or Temporary	Reason for loss	Trapping or displacement proposed
W008	1.5m wide mostly dry ditch filled with willowherb and nettles. Flat earth banks.	No	0 (only two single droppings located)	0	Low	No estimate		328	71	<1	Permanent	Lost through installation of a culvert	Displacement
W009	Mardyke. Slow flowing 3m wide, 1m deep watercourse with abundant riparian vegetation. Shallow earth banks.	Yes	1	4	Low	1-3		1635	100	<1	Temporary	Temporary loss as part of the construction of the viaduct	Displacement
W014	4m wide mostly dry ditch filled with willowherb and reed canary grass. Steep earth banks.	No	1	0	Low	1-3		1146	100	<1	Temporary	Temporary loss as part of the construction of the viaduct	Displacement
W017	1.5m wide ditch with up to 0.4m of water. Channel is dominated by common reed. Steep earth banks.	Yes	45	14	Medium	5-32		477	<50	1-3	Temporary	Temporary loss through improvement of existing farm track bridge for construction access	Displacement
W020	1.7m wide ditch with up to 0.8m depth of water. Abundant emergent vegetation including foals watercress and water crowfoot. Steep earth banks.	Yes	36	11	Medium	6-26	Brown rat	596	260	3-12	Permanent	Lost through main route alignment	Trapping
W021	2m wide ditch with 0.25m of water. Channel is dominated by common reed. Steep earth banks.	Yes	34	9	Medium	5-32		614	121	1-7	Temporary	Temporary loss as part of the road construction, a watercourse diversion, and the construction of the new box culvert	Trapping
									65 (including 10-20 buffer)	(included in number above)	Permanent	Lost through installation of a culvert	Trapping
									<50	1-3	Temporary	Temporary loss through construction of access track bridge, including a 23m culvert	Displacement

Waterbody number	Habitat summary	Feeding signs present	Number of latrines (peak count)	Number of burrows	Water vole population estimate (total in watercourse)	Population size estimate	Signs of key predators	Total length of waterbody (metres)	Total length lost as part of the Project (metres)	No. of water vole impacted	Permanent or Temporary	Reason for loss	Trapping or displacement proposed
W024	2m wide ditch with 0.2m of water. Channel is dominated by common reed. Steep earth banks.	Yes	47	15	Medium	8-40		662	<50	1-3	Temporary	Temporary loss through construction of access track bridges – only in the event of an emergency	Displacement
									120	2-8	Permanent	Lost through main route alignment	Trapping
W029	4m wide ditch with 1.3m of water. Minimal emergent vegetation (common reed) with large areas of open water. Steep earth banks.	Yes	17	5	Medium	3-14		97	97	3-14	Permanent	Lost through main route alignment	Trapping
W030	2m wide ditch with 3m of water. Channel is dominated by common reed. Steep heavily overgrown earth banks. Not accessible for survey.	n/a	n/a	n/a	Assumed high	25-104 ¹		627	627	25-104 ¹	Permanent	Lost through main route alignment	Trapping
W032	2m wide ditch with up to 1m depth of water. Abundant emergent vegetation including common reed and water crowfoot with some open water. Steep earth banks.	Yes	79	99	Medium	14-56		1069	<50	1-3	Temporary	Temporary loss through construction of access track bridges	Displacement
W033	3m wide ditch with 0.3m depth of water. Channel is dominated by common reed. Shallow earth banks.	Yes	14	9	Medium	3-12		764	<50	<1	Temporary	Temporary loss through construction of access track bridges	Displacement
									<50	<1	Temporary	Temporary loss through construction of access track bridges	Displacement
W034	2m wide ditch with 0.2m depth of water. Channel is dominated by common reed. Steep earth banks.	Yes	40	9	Medium	7-29		1064	<50	1-2	Temporary	Temporary loss through construction of access track bridges	Displacement
									<50	1-2	Temporary	Temporary loss through construction of access track bridges	Displacement

¹ W030 was not surveyed due to health and safety concerns of surveying this watercourse. This figure is based on the average population per 100m of all of the other watercourses within the survey area with high populations.

Waterbody number	Habitat summary	Feeding signs present	Number of latrines (peak count)	Number of burrows	Water vole population estimate (total in watercourse)	Population size estimate	Signs of key predators	Total length of waterbody (metres)	Total length lost as part of the Project (metres)	No. of water vole impacted	Permanent or Temporary	Reason for loss	Trapping or displacement proposed
W055	4m wide ditch with 1m depth of water. Channel is dominated by bulrush and common reed. Steep earth banks.	Yes	62	27	Medium	10-43		703	<50	1-3	Temporary	Temporary loss through construction of tunnel boring shaft	Displacement
W056	5m wide ditch with 1m depth of water. Channel is dominated by common reed. Steep earth banks.	Yes	2	0	Low	1-3		394	<50	<1	Temporary	Temporary loss through construction of tunnel boring compound	Displacement
W058	1m wide ditch with 0.3m depth of water. Channel is dominated by common reed. Steep earth banks.	Yes	2	4	Low	1-3		239	<50	<1	Temporary	Temporary loss through construction of tunnel boring compound	Displacement
W059	5m wide canal with 1m depth of water. Common reed along both banks.	Yes	81	0	High	10-79		908	<50	1-5	Temporary	Temporary loss through construction of tunnel boring shaft	Displacement
W100	30m by 250m lake. Large areas of open water with some common reed and bulrush. Flat earth banks.	Yes	3	0	Low	1-4	Mink (<i>Neovison vison</i>) scats	1039	1039	<1	Permanent	Lost through main route alignment	Trapping
W120	3m wide ditch with 1m depth of water. Emergent vegetation is dominated by common reed with some open water. Steep earth banks.	Yes	56	10	Medium	13-51		827	<50	1-3	Temporary	Temporary loss through construction of access track bridges – only in the event of an emergency	Displacement
W121	1m wide ditch with 0.3m depth of water. Channel is dominated by common reed. Steep earth banks.	Yes	18	3	Low	3-14		836	<50	<1	Temporary	Temporary loss through construction of access track bridges – only in the event of an emergency	Displacement
W142	A 0.3m wide ditch which is dry in places. Channel is dominated by common reed. Steep earth banks.	Yes	0 (only feeding signs found)	0	Low	No estimate		364	<50	<1	Temporary	Temporary loss through construction of access track bridges	Displacement
W147	1m wide ditch with 0.5m depth of water. Channel is dominated by	Yes	2	0	Low	1-3		427	<50	<1	Temporary	Temporary loss through utility diversions	Displacement

Waterbody number	Habitat summary	Feeding signs present	Number of latrines (peak count)	Number of burrows	Water vole population estimate (total in watercourse)	Population size estimate	Signs of key predators	Total length of waterbody (metres)	Total length lost as part of the Project (metres)	No. of water vole impacted	Permanent or Temporary	Reason for loss	Trapping or displacement proposed
	common reed. Steep earth banks.												
W237	1m wide ditch with 0.4m depth of water. Emergent vegetation is dominated by common reed. Steep earth banks.	Yes	0 (only feeding signs found)	0	Low	No estimate		417	<50	<1	Temporary	Temporary loss through improvement of existing culvert and installation of drainage sluice.	Displacement
T1	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.				Low	No estimate		597	<50	Likely <1	Temporary	Temporary loss through utility diversion.	Displacement
									<50	Likely <1	Temporary	Temporary loss through construction of conveyor route.	Displacement
T3	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.				Low	No estimate		217	<50	Likely <1	Temporary	Temporary loss through construction of conveyor route.	Displacement
T4	All data taken from previous surveys undertaken for Tilbury2 in 2016 and 2017. No further details are available.				High	No estimate		511	<50	Likely 2-8 (estimated from other watercourses with high water vole populations)	Temporary	Temporary loss through construction of conveyor route.	Displacement
Total length of habitat loss									3585m				

3.3 Habitat fragmentation

- 3.3.1 The construction of the northern tunnel portal and the route alignment traveling north to the Tilbury loop railway would involve the culverting of Tilbury Main (waterbody W021). This would result in habitat fragmentation during construction. Preventing dispersal of water vole to both the east and west of the Project. Once constructed the culvert would be 46m in length with the existing banks replaced by a concrete box structure (see Figure 4).
- 3.3.2 To ensure a sustainable meta-population a minimum of 100 animals is needed during the peak breeding season for a population to be considered viable (Dean et al, 2016). The population to the east and the west of the Project in the vicinity of W021 (Tilbury Main) are both considered to be sustainable populations. There are a large number of occupied waterbodies (see Figure 2) and the population connects to the wider landscape along the River Thames estuary.
- 3.3.3 Watercourse W008 would have a 71m culvert installed. However, it is not considered this would lead to habitat fragmentation as this waterbody is minor and not considered a commuting/dispersing route for water vole. Additionally, this watercourse connects into the Mardyke (W009 - the major watercourse in this location) both to the north via W154 (only seasonally wet) and to the south of this culvert via W201 (see Figure 4). The connection of W008 to W009 will be strengthened by planting vegetation in waterbodies W154 and W201 (for example planting phragmites). In addition, the landscape in this area has been designed to include wet grassland, which will be suitable for foraging water voles.
- 3.3.4 The construction of the main route and the removal of waterbody W100 and the associated ditch would mean that water vole present within waterbody W143 would become isolated from the main population. Waterbody W143 was found to have a low water vole population with only confirmed feeding signs found on the first survey and possible feeding signs found on the second surveys (see Figure 2).

3.4 Incidental mortality

- 3.4.1 There is the potential for incidental injury or mortality to water vole from construction plant carrying out vegetation and ground clearance works, installation of security fencing, ditch realignment, and site establishment phases of construction. Water vole would be particularly susceptible when they are occupying their burrows.

3.5 Water quality

- 3.5.1 Water vole are known to survive in watercourses with very poor water quality although, pollution can indirectly effect water vole by degrading suitable habitat. Pollution events during construction have the potential to reduce water quality and degrade suitable habitat for water vole however, the Principal Contractor would employ best practice pollution prevention controls to manage this risk throughout construction.
- 3.5.2 During the operational phase of the Project the drainage design would manage both water quantity and quality through a series of balancing ponds and

interceptors. Mitigating both flood events and pollutants entering the watercourses.

3.6 Water level change

- 3.6.1 Notable changes in water levels have the potential to reduce habitat suitability for water vole either through drying out or from flooding burrows. Rendering these burrows as uninhabitable.
- 3.6.2 Detailed hydrological modelling work has been carried out and it is suggested that no significant changes in water levels would occur within suitable water vole habitats. As such no impacts from changes in water levels are predicted (please refer to Chapter 14 of the ES for more details).

3.7 Noise and visual disturbance

- 3.7.1 The construction and the operation of the road would lead to an increase in both the visual and noise disturbance. However, the *Water Vole Mitigation Handbook* (Dean et al, 2016) states that noise and visual disturbance are unlikely to have a significant effect on water vole and only operations with the potential to disturb water vole to the point where it abandons its burrow should be considered as an impact.

3.8 Summary

- 3.8.1 Given that changes in water quality and water levels would be addressed through the Project design it is not considered that this is a potential pathway to an adverse effect on water vole. The potential sources of adverse effects on the extant water vole population are therefore:
- a. Habitat loss
 - b. Habitat fragmentation
 - c. Incidental mortality
 - d. Noise and visual disturbance

4 Mitigation strategy

4.1 General approach to mitigation

- 4.1.1 The following measures would be employed to avoid and minimise adverse effects on the water vole population from the construction and operation of the Project:
- a. Where feasible works would be sited to avoid impacts on water vole. Any works occurring in the vicinity of retained watercourses with known water vole populations would be sited no closer than 8m from the tops of the banks. These watercourses would be fenced off to ensure no vehicles or workers are closer than 8m to prevent possible disturbance. This distance is considered appropriate to avoid noise and visual disturbance to the resident population. No water vole fencing is proposed to be installed around these retained watercourses. This is because water vole burrows and therefore water vole are likely only found up to 3-5m of the watercourses (Dean et al, 2016). Any habitat outside of these areas would be unsuitable for foraging or dispersing water vole. To ensure no vehicles or people access the 8m buffer area anti-vehicle/personnel fencing would be erected (of a type such as Heras fencing).
 - b. Displacement techniques and monitoring requirements are proposed where there is a working area with a maximum length of 50m (for watercourses this equates to 50m on each bank). Displacement is also considered in areas where low population of water vole are present following consultation with Natural England. However, should displacement be unsuccessful (e.g. due to programme, season or signs continuously being recorded following vegetation clearance) trapping would be undertaken. For full details of the displacement procedure please refer to the *Water Vole Mitigation Handbook* (Dean et al, 2016).
 - c. Any works that are being undertaken on lengths of banks longer than 50m would involve trapping out water vole from the waterbodies. Timings would be from 1 March to 15 April inclusive (with a possibility of trapping starting mid-Feb if the weather is suitable) supplemented with trapping from 15 September to 31 October inclusive, if required. Animals would be released into suitable habitat either as part of onsite mitigation or as off-site compensation (see Section 6.2. Trapping and relocation).
 - d. As soon as water vole have been removed from the affected waterbodies their habitat would be rendered unsuitable for recolonisation.
 - e. The W021 (Tilbury Main) crossing would be a culvert of sufficient dimensions to ensure connectivity with the wider water vole population. This

culvert would also include a mammal ledge to ensure access is maintained even during flood conditions.

- f. Pre-, during, and post-construction monitoring of water vole populations would occur.

4.1.2 For the full timetable for the schedule of the mitigation works, see Section 7.

4.2 Mitigation strategy

4.2.1 The mitigation strategy below would mitigate against the impact pathways listed in Section 3 above.

Pre-construction surveys and licensing

4.2.2 Prior to any water vole mitigation, a pre-construction survey to support the final Natural England protected species mitigation licence application would be conducted during the survey season (March to October) prior to works occurring. A minimum of two visits spread across the two halves of the survey season (mid-April to end of July, and Aug – Oct) where practicable would be conducted and all survey work would be in line with Dean et al. (2016).

4.2.3 Following the completion of the pre-construction survey a Natural England protected species mitigation licence application would be submitted.

Displacement

4.2.4 For any lengths of works undertaken in waterbodies that are less than 50m displacement would be undertaken. For waterbodies that have low populations displacement over longer lengths are also recommended provided there is sufficient suitable adjacent habitat (pers. comm. Natural England). For a full list of these waterbodies please refer to Table 3-1.

4.2.5 This would involve the strimming down of vegetation to create sub-optimal water vole habitat intending to cause any water vole to actively move into adjacent suitable habitat. Surveys of cleared areas would be undertaken immediately prior to construction works taking place. If animals are still present then trapping and translocation would occur as detailed below. Displacement works would be undertaken preferentially during the period 15 February to 15 April inclusive (Dean et al, 2016). If these timings are not feasible then displacement would be considered between 15 September and 31 October (pers. comm. Natural England).

4.2.6 Buffer zones of 5-10m would be used either side of where displacement is necessary to ensure water vole are not found in areas where construction works are located (Arnott, 2001).

4.2.7 Water drawdown would also be used to aid displacement where this is feasible as this has been found to be more effective than simply strimming vegetation down (Baker et al, 2019). Water drawdown would be achieved by installing earth bunds either side of the end of the working area with a pump installed to pump out the water from this section of watercourse.

4.2.8 In total it is estimated that between 25 and 47 water vole would be impacted by displacement across the whole Project.

4.2.9 Table 4-1 describes the watercourses where displacement is proposed. For the suitable alternative watercourses only watercourses that have the potential to contain water vole or already have water vole populations are considered. Dry or otherwise unsuitable watercourses are not included. In addition, any watercourses that are likely to be heavily impacted by the construction works (i.e. waterbodies that are being removed or where trapping is required) are also not considered as suitable alternative habitat.

Table 4-1 Water vole displacement areas

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
W008	71 (with an additional 10-20m buffer zone)	328	5 (W007, W009, W152, W153, W201)	Low	This watercourse contains a low population of water voles (no water vole latrines were found). The area around this watercourse contains a number of alternative suitable watercourses, particularly W009 (the Mardyke). W009 is deemed to be of high value habitat for water vole, with a low population of water vole being present. It is likely that the population present on W008 has dispersed from W009. As such displacement is considered appropriate for this area.
W009	100 (with an additional 10-20m buffer zone)	1635	17 (W007, W008, W012, W133, W152, W153, W154, W155, W156, W157, W158, W159, W190, W161, W163, W201, W202, W226, W240)	Low	This watercourse is large and connects into a large number of alternative suitable watercourses. W009 has a low population of water vole (only a single latrine was recorded), but the habitat has been assessed as optimal for water vole. Only a small area would be lost to temporary construction works. As such displacement of the water voles from this short stretch is considered appropriate for this area. Water drawdown would not be used at this location due to the flowing nature of the watercourse.
W014	100 (with an additional 10-20m buffer zone)	1146	6 (W011, W012, W013, W097, W131, W240)	Low	This watercourse has a low population (only a single latrine was recorded). The area around this watercourse contains a number of alternative suitable

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
					watercourses, particularly W009 (the Mardyke). W009 is deemed to be of high value habitat for water vole and has a low population of water vole. It is likely that the population present on W014 has dispersed from W009. As such displacement is considered appropriate for this area.
W017	50 (including 10-20m buffer zone)	477	12 (W016, W018, W019, W020, W021, W023, W024, W031, W032, W034, W144, W220)	Medium	The habitat loss on this watercourse is a small area of the total length (approx. 10%). The surrounding area has high suitability for water vole, as evidenced by ditches within 500m having either medium or high water vole populations. As such there is suitable alternative habitat and displacement is considered appropriate for this area.
W021	<100 (two separate 50m sections) (including 10-20m buffer zone for each section)	614	9 (W022, W023, W024, W025, W026, W031, W032, W034, W102)	Medium	The area around this watercourse has high suitability for water vole, as evidenced by eight of the nine suitable alternative watercourses within 500m having water vole populations. As such there is suitable alternative habitat and displacement is considered appropriate for this area.
W024	<50 (including 10-20m buffer zone)	662	7 (W022, W023, W025, W026, W027, W028, W102)	Medium	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this watercourse has high suitability for water vole, as evidenced by six of the seven suitable alternative watercourses within 500m having water vole populations. As such there is suitable alternative habitat and displacement is considered appropriate for this area.
W032	<100 (two separate 50m sections)	1069	11 (W017, W019, W031, W033, W034, W144, W146,	Medium	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
	(including 10-20m buffer zone for each section)		W147, W220 and 2 unnamed waterbodies surveyed as par to the Tilbury 2 development)		watercourse has high suitability for water vole, with four watercourses having high populations, three having medium and three having low, with just a single waterbody with no water voles within 500m of W032. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W033	<50 (including 10-20m buffer zone)	764	15 (W019, W031, W032, W034, W035, W036, W145, W146, W147 and 6 unnamed waterbodies surveyed as par to the Tilbury 2 development)	Medium	The habitat loss on this watercourse covers a small area of the total length (less than 10%). The area around this watercourse has high suitability, with seven watercourses having high populations, four having medium and three having low, with just a single waterbody with no water voles within 500m of W033. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W034	<100 (two separate 50m sections) (including 10-20m buffer zone for each section)	1064	8 (W031, W032, W033, W035, W036, W145 and 2 unnamed waterbodies surveyed as par to the Tilbury 2 development)	Medium	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this watercourse has high suitability for water vole, with all waterbodies having either high, medium or low populations within 500m of W034. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
W055	<50 (including 10-20m buffer zone)	703	49	Medium	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this watercourse has high suitability for water vole, with five waterbodies having a high population, 13 medium and 23 having low populations within 500m of W055. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W056/W058	<100 (including 10-20m buffer zone)	633	50	Low	The habitat loss on this watercourse (both of these watercourses are connected) is a small area of the total length (less than 16%). The area around this watercourse has high suitability for water vole, with six waterbodies having a high population, 13 medium and 23 having low populations within 500m of W056/W058. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W059	<50 (including 10-20m buffer zone)	908	57	High	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this watercourse has high suitability for water vole, with seven waterbodies having a high population, 13 medium and 27 having low populations within 500m of W059. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W120	<50 (including 10-20m buffer zone)	827	7 (W022, W118, W119, W121, W122, W123, W206)	Medium	The habitat loss on this watercourse is a small area of the total length (less than 10%). The area around this

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
					watercourse has high suitability, with one watercourse having a high population, two having medium and two having low, with two waterbodies with no water voles within 500m of W120. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W121	<50 (including 10-20m buffer zone)	836	6 (W118, W119, W120, W122, W123, W206)	Low	The habitat loss on this watercourse covers a small area of the total length (less than 10%). The area around this watercourse has high suitability, with one watercourse having a high population, two having medium and two having low. Two waterbodies within 500m of W121 have no water voles. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W142	<50 (including 10-20m buffer zone)	364	8 (W019, W098, W114, W115, W116, W117, W144, W147)	Low	The habitat loss on this watercourse covers a small area of the total length (less than 15%). The area around this watercourse has high suitability, with two watercourses having a high population, two having medium and two having low. Two waterbodies within 500m of W142 have no water voles. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W147	<50 (including 10-20m buffer zone)	427	19 (W019, W032, W033, W098 W114, W115, W116, W117, W146, W142, and 9 unnamed watercourses within Tilbury2	Low	The habitat loss on this watercourse covers a small area of the total length (less than 15%). The area around this watercourse has high suitability, with five watercourses having a high population, five having medium, and nine having , and additionally the Tilbury2 water

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
			(including the Tilbury2 water vole mitigation area)		vole mitigation area. One waterbody within 500m of W147 have no water voles. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
W237	<50 (including 10-20m buffer zone)	417	16 (W055, W056, W057, W059, W060, W061, W062, W063, W065, W066, W067, W068, W214, W218, W238, W239)		The habitat loss on this watercourse covers a small area of the total length (less than 15%). The area around this watercourse has high suitability for water vole, with two watercourses having a high population, three having medium and eight having low. Three waterbodies within 500m of W237 have no water voles. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.
T1	<100 (including 10-20m buffer zone)	597	23 (W145, W146, W147 and 20 unnamed within Tilbury2 (including the Tilbury2 water vole mitigation area)	Low	Although there are two <50m displacement areas on this water course, they are at either end of the watercourse and are spaced 500m from each other. The area around this watercourse has high suitability, with six watercourses having a high population, three having medium and nine having low, and additionally the Tilbury2 water vole mitigation area. Four waterbodies within 500m of T1 have no water voles. The abundance of alternative habitats within the location of this waterbody, the distance between the two displacement areas and the low water vole population means displacement is considered appropriate.
T3	<50 (including 10-20m buffer zone)	217	24 (W033 W145, W146, W147 and 20 unnamed within Tilbury2	Low	This watercourse contains a low population of water voles. The area around this watercourse has high suitability, with six watercourses having a high

Waterbody number	Length of affected area (metres)	Total length of water body (metres)	Number of suitable alternative waterbodies within 500m	Water vole population estimate	Description
			(including the Tilbury2 water vole mitigation area)		population, three having medium and nine having low, and additionally the Tilbury2 water vole mitigation area. Four waterbodies within 500m of T3 have no water voles. As such displacement is considered appropriate for this area.
T4	<50 (including 10-20m buffer zone)	511	23 (W019, W020, W021, W031, W032, W033, W034, W146, W147 and 14 unnamed within Tilbury2 (including the Tilbury2 water vole mitigation area)	High	The habitat loss on this watercourse covers a small area of the total length (less than 10%). The area around this watercourse has high suitability, with five watercourses having a high population, five having medium and seven having low, and additionally the Tilbury2 water vole mitigation area. Five waterbodies within 500m of W147 have no water voles. The abundance of alternative habitats within the location of this waterbody means displacement is considered appropriate.

Trapping and relocation

Capture

- 4.2.10 The trapping and translocation of water vole from watercourses identified in Table 3-1 would take place between 1 March and 15 April inclusive (optimal period for trapping, with a possibility of trapping starting in mid-Feb if the weather is suitable) with an earlier than recommended start date due to the site's location in the south-east of England (pers. comm. Natural England). In the autumn trapping would begin from 15 September aiming to finish on/before 31 October.
- 4.2.11 Water vole captured during the spring (1 March to 15 April inclusive, with the possibility of starting in mid-Feb) and housed off-site until 15th April – mid May before being released, unless there is particularly extreme bad weather during this time, when release may be pushed back to late May or early June. This release would occur at the completion of trapping, when all animals have been caught, to allow a release of animals en masse and increase the chances of a successful release. This would also allow the release to occur when vegetation cover as a foraging and shelter resource would be well established and the risk of flash flooding minimal. Wildwood has been contacted to provide this off-site

housing of trapped animals and have agreed in principle, although other organisations with the capabilities to house water voles are listed in Annex H.

- 4.2.12 Should trapping during the autumn period (15 September to 31 October inclusive) be required, any water vole captured to be held in captivity to carry out the health screening for as short a period as possible and released into the receptor area within the same autumn trapping period.
- 4.2.13 Traps would be placed at a density of at least 1 per 10m of bank (see Figure 7 for indicative trap locations) and where necessary, on floating Celotex platforms. Traps would be checked at least twice a day with an early morning check and a late afternoon/evening check (before dusk). The type of trap used would not have a spring-loaded mechanism as these have been found to cause injury. For more details on the type of trap that would be used see the *Water Vole Mitigation Handbook* (Dean et al, 2016). For further examples see the Wildcare website (Wildcare, 2020).
- 4.2.14 Vegetation clearance would not take place within 5m of any traps or within 5m of the toe of the bank prior to the completion of the trapping effort as this is considered to hinder trapping.
- 4.2.15 To avoid ‘drawing in’ water vole at the periphery of trapping locations from areas outside the red line boundary it may be necessary to use water vole exclusion fencing across the watercourse with a return either side to deflect water vole back up the respective ditches, and/or ‘box fencing’ sections of the watercourses. For a full detailed fencing design including illustrations taken from the *Water Vole Mitigation Handbook* (Dean et al, 2016) see Annex F.
- 4.2.16 Trapping would be considered complete once there has been a period of five days or more (when temperatures have not dropped below 0°C overnight) with no further captures and no new field signs. Once complete a destructive search of the area would be undertaken (see Annex G for detail).
- 4.2.17 Health and safety requirements would ensure there is safe access for surveying (and subsequent capture) to the ditch banks. All field staff would also be made aware that water vole can carry leptospirosis. They will be familiar with its symptoms, pathways for transmission to humans and the precautions necessary when handling water vole to minimise the risk of infection.
- 4.2.18 It is estimated that between 34 and 145 water voles would be trapped as part of the Project.
- 4.2.19 A detailed trapping protocol (from Dean et al, 2016) is given in Annex E.
- 4.2.20 To ensure biosecurity during the trapping process all traps would only be used in one area. If traps are moved between areas then they would be disinfected before being placed in any new areas. All equipment used during trapping including traps would be disinfected when moving between areas.

Habitat removal and destructive searches

- 4.2.21 After trapping out water vole from the watercourses identified in Table 3-1 the habitat would then be made unsuitable for water vole to prevent re-colonisation. This would be completed immediately after trapping was concluded.
- 4.2.22 Making the habitat unsuitable would involve an initial destructive search of burrows (using hand-tools) followed by clearing ditches, removing vegetation,

and scraping banks. Soil would be removed to 30-40cm in depth to create, as far as possible, a trapezoidal cross-section with no burrowing materials.

4.2.23 Detailed protocols for destructive searches and techniques to render habitat unsuitable for water vole are provided in Annex G.

4.2.24 Key site-specific issues relating to vegetation clearance include:

- a. Reptiles also use the bankside habitat. It is recommended that reptile captures stop approximately one month before hibernation is expected to commence (mid-September). Reptiles may be hibernating below ground during the period November to March.
- b. Vegetation would be cut to ground level and removed before the end of February to prevent use by nesting birds.

Water vole in captivity

4.2.25 Water voles will only be kept in captivity until they have been health screened and as described in 4.2.11 and 4.2.12. Animals will then be released according to the soft release protocol as described below.

4.2.26 A list of facilities capable of holding water vole in captivity is given in Annex H. Guidelines on keeping water vole in captivity are provided in Dean et al. (2016). Should captured water vole need to be taken into captivity they would be transported to a central care facility in their traps or appropriate holding cages.

Release of water vole into receptor area

4.2.27 Trapped animals would be released into their receptor site using a soft-release technique (see Annex I). The exact design of the soft release pen would be chosen by the specialist contractor carrying out the water vole translocation however, it would follow the specifications set out in Appendix 4 of the *Water vole Mitigation Handbook* (Dean et al, 2016). Prior to any release of water voles, they will be subjected to a health screen in accordance with the *Water vole Mitigation Handbook* (Dean et al, 2016), the details of which can be found in Appendix K.

Receptor sites and habitat creation

4.2.28 The Lower Thames Crossing project is working with Essex Wildlife Trust (EWT) to support the Waterlife Recovery East (WRE) project. The objective of which is to eradicate American mink on a regional basis. Freeing up large areas of river catchment which provide suitable water vole habitat but with no existing water vole population. This would facilitate range expansion and population resilience in line with the Government's 25-year environment plan and the nature recovery networks it looks to develop. Providing significant conservation benefit for the species. This approach has previously been used for DP World, a site to the east of the Project, which released translocated animals to the River Colne.

4.2.29 For the DP world project, animals were reintroduced along several stretches of the River Colne which totalled approx. 13km between 2010 and 2012. Along with this reintroduction mink were continually trapped and removed from this section of river and in 2017 a survey found that over 30km of the river now had water vole presence. This included water vole being sighted in the centre of

Chelmsford for the first time in a century. Prior to the translocation no water vole were located anywhere along the freshwater sections of the river.

- 4.2.30 The catchment areas where mink have been eradicated can be used as receptor sites for translocation of water vole. The rivers Colne and Blackwater are the two key sites which would be suitable receptors as part of WRE project (see Figure 6), supporting water vole range expansion and continued mink control across this region (see Annex J).
- 4.2.31 The translocation/re-introduction of water voles will involve moving animals into their natural range having only disappeared in the recent past. Water voles were once a common part of the ecology of rivers, streams and ditches throughout lowland East Anglia and as with many rodents, can form a significant proportion of the diet of predatory species that also occupy the catchment. As such they are completely compatible with the ecosystem of a river system such as the Pant/Blackwater. The main factor influencing this disappearance is understood to be the presence of predatory mink rather than a substantive deterioration in habitat quality or quantity. Mink control will be in place to remove this threat as an expansion of the ongoing mink eradication activities in the Eastern Region by Waterlife Recovery East of which Essex Wildlife Trust is a Steering Group member.
- 4.2.32 The habitat along the Pant/Blackwater is of generally high quality and consists of many kilometres of suitable bankside habitat. Translocation sites will be selected that are in unoccupied parts of the catchment that, where possible, have the potential to integrate with extant fragmented colonies of water vole as recolonisation occurs. This will strengthen the overall meta-population structure. It is anticipated that approx. 2.3km of habitat will be lost where water voles will need to be translocated. To ensure that there is sufficient habitat for any translocated water voles, over double this length, or approx. 9km of receptor habitat, has been identified along the Pant/Blackwater.
- 4.2.33 A walkover survey of this receptor site was carried out in August 2022 which found 80% of the site as suitable for water vole release, with the other 20% shaded and therefore offering insufficient emergent vegetation for water voles. The banks are steeply earthen, so are optimal for water vole burrowing. Over the course of this survey, no water vole field signs were recorded in any of the receptor areas. eDNA has been collected from these areas, with the results showing no water voles were located along any of these areas. Landowner support for both mink control and the reintroduction of water voles is high, with many landowners remembering when water vole were present in these rivers during the 1980s and early 1990s.
- 4.2.34 Surveys undertaken in July 2023 by Darren Tansley, chair of UK water vole steering group recorded dense riparian vegetation that provided suitable cover and foraging opportunities for water vole. Although vegetation growth each year is heavily influenced by weather conditions, it is considered that these sites offer high quality habitat which will support animals translocated into them during the spring release window. This view is endorsed by Darren Tansley (pers comm).
- 4.2.35 It is extremely unlikely that the return of water voles to this riparian habitat would cause undesirable effects. Water voles are not predators nor do they engender strong opposition from influential portions of the community, such as

freshwater fishery managers, as can be the case with species such as otter. Protected species can require suitable mitigation when undertaking routine maintenance of the habitats in which they live (e.g. ditch clearance on arable land) but water voles are rarely problematic as long as methods of operation are agreed prior to work commencing.

- 4.2.36 Surveys of habitat suitability will be carried out the year before translocation, in April and May, 2 – 4 times a month, to monitor and photograph the vegetation growth at the proposed receptor site. This will inform the decision as to whether the receptor sites are suitable for water vole release. If the habitat is not sufficiently established until May/June each year, then an alternative site on the Mardyke as described below will be used.
- 4.2.37 In addition to the Pant/Blackwater site, there is the potential to release trapped animals into watercourses joining the habitat creation area along the Mardyke. This would increase the population in this location and, once the newly created habitat establishes, this would facilitate colonisation of the area by water voles. This is subject to enough water voles being caught to translocate to the receptor sites along the Pant/Blackwater.
- 4.2.38 The minimum number of water voles for a viable release is estimated at 30-50, as per the *Water Vole Mitigation Handbook* (Dean et al, 2016), however following consultation with the EWT, a minimum of 40 individuals would be considered for relocation. The majority of the population is expected to be native lowland animals displaced by the works footprint of the Project. However, should the number of animals captured not meet the level required for a viable release, the Mardyke (W009) area will be used as an alternative release site.
- 4.2.39 The River Pant/Blackwater release site is a total approximate length of 9.2km, located from villages of Wethersfield upstream (survey start TL7030130988) and Bocking Churchstreet downstream (survey end TL7476526076). None of the site is designated as a SSSI. The distance from the capture site to the receptor site is approximately 36km. The landowners within this area are listed below.
- i. Wildfell Centre for Environmental Recovery (Grays Farm) – Chris Bawtree
 - ii. Russell's Farm – David Thompson
 - iii. Boydell's Farm – Kiley Threadgold
 - iv. Wethersfield Mill – Steven Loakes
 - v. Valley Farm – Alan MacKenzie
 - vi. Shalford Hall – Robert and Peter Stephenson
 - vii. Iron Bridge Farm – Tom Price
 - viii. Lone's Hole – Malcolm Wheatley
 - ix. Codham Hall – Denis Tabor

x. Bovingdon Hall – Jo and Emma Gray

4.2.40 The nearest water vole population was located within an Essex Beaver Project enclosure at Spains Hall, Finchingfield (TL67959 33092). This site is 2.5km upstream from the River Pant and 5.5km from the upstream extent of the walkover survey. In 2019 eDNA metabarcoding water samples identified water vole eDNA although there have been no sightings on site. In addition, Little Sampford Hall (TL6509934277) is 9.5km from the upstream extent of the walkover survey. In February 2022 during ongoing mink trapping on site a water vole was caught and released. This was the first record of water vole in the 21st century on this site. It is anticipated that this release will connect into these populations, particularly with the lack of mink on these rivers following the eradication.

Habitat connectivity

- 4.2.41 The Tilbury Main watercourse (W021) would be culverted for a length of 46m in a box culvert with a width of 2.8m and a height of 4m. This would be installed in the North Portal area where the road immediately exits the tunnel. The culvert would maintain hydrological connectivity across the road alignment, its design incorporating a mammal ledge which would be positioned above peak flood levels to ensure dry passage. The mammal ledge would be sited at least 150mm above the highest water level (1% probability flood level, inclusive of climate change), and allow 600mm headroom from the top of the mammal ledge to the soffit of the culvert based on the requirements in the Design Manual for Roads and Bridges (DMRB) (Highways England, 2020). Following DMRB guidance, the ledge would be at least 500mm wide and would be accessible from bank ramps.
- 4.2.42 There is limited evidence regarding the maximum length of culvert used by water vole before they present a significant barrier to movement. The *Water Vole Conservation Handbook* (Strachan et al, 2011) states that ‘culverting does not seem to provide a major problem to water vole movement or fragmentation’, although it also states that ‘length may present a problem to water voles daily movement and dispersal’.
- 4.2.43 It is therefore acknowledged that whilst the provision of a large box culvert and mammal ledge within W021 (Tilbury Main) watercourse may prevent complete severance of habitat connectivity across the new road alignment it does not fully mitigate for habitat fragmentation.
- 4.2.44 Waterbody W008 would have a 71m box culvert with a height of 1.65m and a width of 1m. Due to the size of this culvert a mammal ledge has been deemed unsuitable. This watercourse would therefore be considered unsuitable for commuting and dispersing water vole. This is not considered to lead to a fragmentation effect as this watercourse is connected with others in this area and is of low importance for commuting water vole. This is not anticipated to affect the local water vole population.

Predator control

4.2.45 To enhance the watercourses around the Mardyke (W009) and the new habitat creation areas, predator control would be carried out on W009 and W014. This would take the form of both a monitoring and trapping programme for mink in

this area. Control of mink in this location would help the water vole population increase from the low population that is present. It is known that there are water vole populations both upstream and downstream of these mink control locations and with the availability of suitable habitat it is thought that mink predation is the limiting factor for the population of water voles in this area.

4.3 Net Conservation Gain

- 4.3.1 Research has shown that water vole live in meta-populations within a core area which sustains a wider population and from which range expansion can occur into suitable connecting habitat (Macpherson and Bright, 2011).
- 4.3.2 The Waterlife Recovery East project is designed to achieve the re-colonisation of core areas which previously contained water vole but due to over predation by mink, along with other factors, have now been lost. The Project is making a contribution to the Waterlife Recovery East to a total of £221,558 for mink control programmes. The introduction of translocated animals and the interaction with water vole already present in other core areas would support the overall population in this area and increase the likelihood of range expansion within Essex. In addition to this, the creation of new watercourse habitat within the Order Limits of the Project would ensure no net loss of habitat for the extant population of water vole.
- 4.3.3 Although the Tilbury Main culvert length is considered to be too long to fully mitigate potential fragmentation effects from the Project. Its design does allow for safe passage across the route alignment and therefore should provide sufficient genetic mixing between the meta-populations on the west and east side to avoid genetic isolation. There is also sufficient retained habitat on the west and east side of the alignment, along with the additional wetland habitat creation as described in Section 5.1.9 on the east side of the Tilbury Main culvert, to allow for sustainable meta-populations to exist (see Section 3.3),.

4.4 Criteria for success

- 4.4.1 Success would be determined by the following criteria:
- a. Successful capture, translocation and displacement of water vole from the construction footprint, delivering a water vole-free construction footprint in line with the timings required for the construction programme.
 - b. Successful establishment of water vole within receptor sites following translocation.
 - c. No incidental mortality to water vole during construction.
 - d. Rapid establishment of suitable habitat for water vole at the on-site the habitat creation areas.
 - e. Monitoring water vole movements to show successful dispersal along the Tilbury Main (using the Tilbury Main culvert).
- 4.4.2 The licence holder would have responsibility for the implementation of this mitigation strategy. As well as ensuring the criteria for success are met and if

monitoring shows long-term impacts on the water vole, responsibility for assessing why this is occurring and implementing appropriate additional actions to rectify this.

4.5 Risks to implementation

- 4.5.1 Water vole populations are known to fluctuate depending on a number of factors that are difficult to predict. As such, it is possible that more water vole than predicted would need to be captured and translocated from the construction footprint. Given the scale of the Waterlife Recovery East project and the on-site habitat creation areas it is considered that the receptor sites would provide sufficient buffer to accommodate any increase in water vole numbers being translocated.
- 4.5.2 Licences to capture and translocate water vole are only issued for work in the spring and autumn windows (1 March to 15 April (with the possibility of starting mid-Feb if the weather is suitable) and 15 September to 31 October respectively). Any slippage in granting the DCO or in the construction programme would need to accommodate the trapping and translocation periods set out within this document. Additional management of cleared areas may be required to prevent re-colonisation.
- 4.5.3 Trapping water vole involves working in areas that are difficult to access, and health and safety issues would need to be addressed due to the presence of deep water. To avoid any problems arising a rigorous approach to health and safety regulations and an appropriate Risk Assessment and Method Statement (RAMS) would address these issues.

5 Compensation

5.1 Habitat creation

- 5.1.1 In addition to the offsite translocation as discussed in Section 4.2 there would also be a number of mitigation areas within the Project's Order Limits where wetland habitats would be created to offset the loss of the habitat listed in Table 3-1. These habitats would be designed to ensure they are suitable for water vole including:
- Sloped earthen banks to allow burrowing.
 - Suitable water levels to maintain some open water.
 - Planting with bankside and emergent vegetation to ensure quick growth of vegetation.
- 5.1.2 Habitat creation will take place as soon as reasonably practicable within the construction timetable to allow for the establishment period of the habitats created. This is secured in the Design Principles (Application Document 7.5) Clause no. LSP.23: *"Where reasonably practicable, planting shall be undertaken early in the construction programme to maximise the maturity of the planting scheme at road opening."*
- 5.1.3 North of the river, to compensate for the loss of the 2980m of confirmed water vole habitat an area of habitat will be created within the Order Limits. This habitat will be created in the vicinity of the Mardyke (W009) where there is already a low population of water vole. This habitat creation will include creating two ditch networks either side of the Project to the east of the Mardyke (W009) totalling approximately 2800m in length. Additionally, seven ponds/small lakes with another approx.1000m of bankside habitat will be created.
- 5.1.4 The watercourses that would be designed within this area are yet to be finalised however, indicative features are highlighted below:
- 3-6m optimal, but a minimum of 2-4m wide.
 - 1-1.5m deep.
 - 200m-250m in length.
 - 0.5-1m emergent vegetation planting width, 2-4m bankside planting.
- 5.1.5 The ponds/small lakes will be designed to be shallow in places to allow for the establishment of reedbeds with some areas of deep water to ensure that there are open water areas. There will be areas of steep bank to allow for burrowing and also shallower banks to allow for the establishment of bankside and emergent vegetation.
- 5.1.6 Plants would include a range of native species to ensure a mix of habitats. These would include tussock forming species such as greater tussock sedge (*Carex paniculata*), common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*) and other species of value for water vole.

- 5.1.7 Water voles are present within adjacent watercourses and it is anticipated that natural colonisation of the new habitats would occur once the habitats are sufficiently established, within 12-18 months. Within 100m of this area there are four watercourses, two of which have low populations and two have no water voles present. Within this habitat creation area, no translocation of water voles would occur. This area would be left for water voles to naturally colonise once habitat has sufficiently established. In order for this to occur the new ditch network will run parallel within 10m of watercourses with existing water vole populations.
- 5.1.8 In order to increase the chances of this habitat becoming colonised with water voles, the area will be subject to predator control as detailed in Section 4.2. This predator control would allow water voles to spread from the known populations to the south and north of the site and increase the water vole population within the vicinity of the habitat creation.
- 5.1.9 An area to the east of Coalhouse Fort will have an area of wetland habitat creation as part of the mitigation strategy for wetland birds using the River Thames. This wetland habitat will consist of 6.5km of ditches and areas of wetland scrapes and wet meadows. This area is not being designed for water voles and is considered sub-optimal as it is likely that this area will contain brackish water due to areas where the sea wall has been breached, and with the installation of a new sluice gate to regulate the water. Water voles using brackish water are known in this area, particularly from the moat at Coalhouse Fort, so it is likely that some of these animals will naturally colonise these wetland areas.
- 5.1.10 South of the river, there will be an area of habitat creation following the closure of the construction compound immediately to the north of the Thames and Medway canal (W059). This area will be recreated as a wetland habitat, with the creation of an approx. 500m long ditch, with approximately 15 other ponds and areas of standing water. All of these watercourses will be designed to be appropriate habitat for water voles as described above. This habitat creation area is surrounded by watercourses, with ten watercourses with water voles present found within 100m.
- 5.1.11 In addition to the creation of these habitats above a further 4.3km of watercourse diversions will be constructed to offset the loss of a number of watercourses during construction. These are not considered water vole habitat creation as the watercourses created are located in areas where water voles do not currently occupy and are not suitable for water voles (dry field ditches etc). In addition, these watercourses will not be designed for water vole suitability. Although it is thought that over time these water courses will become more suitable for water voles with natural vegetation establishment and could become suitable in the possible event that water voles were to recolonise these areas. The predator control measures as listed above would make natural recolonisation more likely as mink presence is thought to be a limiting factor for the population of water voles in large areas within the Order Limits.
- 5.1.12 Habitat lost as part of the temporary impacts will be reinstated to the condition it was prior to the commencement of the works. This is secured in Article 35 of the draft DCO whereby – before giving up possession of land of which temporary possession has been taken under this article, the undertaker must

remove all temporary works and restore the land to the reasonable satisfaction of the owners of the land. In addition, this is secured as a REAC commitment – land temporarily required would be reinstated to its former condition and composition upon completion, as far as reasonably practical, unless otherwise specified in the Environmental Masterplan, under terms of Article 35 of the draft DCO (as stated above) which sets out temporary possession powers. In practical terms, this will involve replanting a number of areas of watercourse to aid the natural reestablishment of the habitat that was present before the temporary construction impacts.

6 Monitoring and management

6.1 Monitoring

- 6.1.1 A regular monitoring programme both during and after construction would be required to:
- a. Assess the effectiveness of the mitigation.
 - b. Provide early warning of any changes in the population so that appropriate action can be taken.
- 6.1.2 This would occur both at the construction site and at the receptor sites.
- 6.1.3 Surveys monitoring water vole signs would provide information on:
- a. The establishment and success of the translocated population.
 - b. Colonisation of the created water vole habitats.
 - c. The use of the Tilbury Main culvert.
- 6.1.4 These monitoring surveys would be carried out during the breeding season (March to October) and at a time of year when field sign survey results can be compared with pre-construction survey data. Monitoring would take place in years one, three and five after the completion of the Project.
- 6.1.5 Monitoring of the Tilbury Main culvert will be used to assess whether the culvert is being used as a commuting route by water voles. The length of the culvert (46m) is thought to provide a barrier to dispersal and commuting and it is not known if this length of culvert could cause a permanent barrier within the population. Monitoring will take the form of both traditional field surveys, identifying field signs within adjacent habitat, and the use of camera traps to identify if animals are moving through the culvert. This data will be used to help assess the effectiveness of long oversized mammal culverts by water voles and whether they act as a barrier to water vole movement.
- 6.1.6 National Highways would retain the responsibility for maintaining the measures proposed to mitigate adverse effects from the Project on water vole and provide conservation benefit to the species as set out in this document.

7 Timetable

7.1 Water vole mitigation construction and operation works

7.1.1 Table 7-1 below shows the proposed construction and operation timescales in relation to water vole mitigation.

Table 7-1 Construction and operational timescales in relation to water vole mitigation

Phase	Generic action	Specific action for water vole mitigation	Timing
Pre-DCO granted	Activities proposed prior to a DCO being granted, to expedite the delivery of the works.	Pre-construction surveys to validate findings submitted as part of the DCO.	2023-24
		Support for the Waterlife Recovery East project and ongoing works associated with mink eradication along the rivers Colne and/or Pant/Blackwater. The Project is working with Essex Wildlife Trust to confirm details.	2023 onwards
Main construction	Establishment of the site and preparations for the main earthworks, focussing on securing and clearing the site and provision of early access routes and compounds. This includes the removal and diversion of some watercourses. Utilities would be diverted in advance of the construction of the Project. Main works including construction of the road, tunnelling of both the tunnels, and constructing the necessary structures for the route alignment (culverts, viaduct etc).	Mink eradication programme along the Mardyke	2024 – post construction
		Protected species mitigation licence submission.	2024
		Trapping of water vole from the affected watercourses.	1 March to 15 April 2025 (with a possibility of mid-Feb start). 15 September to 31 October 2025 if required.
		Release of water vole into receptor sites	15 April – 15 May to maximise chances of successful release.
		Displacement of water vole from watercourses being bridged for temporary access tracks.	15 February – 15 April 2025
		Removal of watercourses/making affected watercourse unsuitable. This includes maintaining unsuitable status where watercourses are not removed immediately after trapping/displacement.	2025-2026
		On-going monitoring programme.	2026-2032 to ensure adequate time to monitor Tilbury Main culvert

Phase	Generic action	Specific action for water vole mitigation	Timing
		Creation of on-site habitats.	2025-2026 (As soon as reasonably practicable).
Operational phase	On-going monitoring programme.		5yrs post construction

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Glossary

Term	Abbreviation
BIAZA	British and Irish Association of Zoos and Aquariums
bTB	Bovine Tuberculosis
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
GIS	Geographical Information System
GPS	Global Positioning System
LONI	Letter of No Impediment
NSIP	Nationally Significant Infrastructure Project
RAMS	Risk Assessment and Method Statement
SINC	Site of Importance for Nature Conservation
SNCO	Statutory Nature Conservation Organisation
SSSI	Site of Special Scientific Interest
WRE	Waterlife Recovery East

Annex A Water vole survey results

A.1.1 Table A.1 and Table A.2 below show the results of the water vole surveys within the study area.

Table A.1 Summary of water vole results for waterbodies south of the River Thames

Waterbody number	Peak population count	Length of waterbody (metres)
W037	Low	269
W038	Medium	363
W039	Low	377
W040	Medium	725
W041	n/a	69
W042	n/a	42
W043	Low	144
W044	Medium	100
W045	n/a	54
W046	Low	135
W047	Medium	90
W048	Medium	349
W049	High	86
W050	Low	27
W051	Low	89
W052	Low	52
W053	Medium	360
W054	Medium	254
W055	Medium	703
W056	Low	394
W057	Medium	168
W058	Low	239
W059	High	908
W060	High	316
W061	Low	1015
W062	Low	155
W063	Low	306
W064	High	283
W065	Medium	484

Waterbody number	Peak population count	Length of waterbody (metres)
W066	n/a	216
W067	n/a	55
W068	Low	270
W069	n/a	43
W070	n/a	254
W071	n/a	46
W072	High	114
W073	Low	695
W074	Low	344
W075	Medium	261
W076	High	268
W077	High	416
W078	Medium	305
W079	Low	423
W080	Low	613
W081	n/a	40
W082	Low	388
W083	Low	304
W084	Low	130
W085	n/a	41
W086	Low	525
W087	n/a	387
W088	n/a	25
W089	n/a	280
W203	n/a	619
W204	n/a	185
W205	n/a	357
W207	Low	251
W214	Low	192
W216	Medium	110
W218	n/a	127
W237	Low	102
W238	Low	447
W239	Low	714

Table A.2 Summary of water vole results for waterbodies north of the River Thames

Waterbody number	Peak population count	Length of waterbody (metres)
W001	n/a	83
W002	n/a	79
W003	n/a	443
W004	Dry	364
W005	n/a	236
W006	n/a	398
W007	n/a	462
W008	Low	328
W009	Low	1635
W010	n/a	713
W011	Low	544
W012	n/a	1051
W013	Low	425
W014	Low	1146
W015	n/a	491
W016	n/a	678
W017	Medium	477
W018	n/a	488
W019	High	572
W020	Medium	596
W021	Medium	491
W022	Medium	609
W023	Low	98
W024	Medium	662
W025	Low	720
W026	Medium	858
W027	Medium	670
W028	Low	163
W029	Medium	90
W030	Not surveyed	627
W031	High	193
W032	Medium	1069
W033	Low	764
W034	Medium	1064

Waterbody number	Peak population count	Length of waterbody (metres)
W035	Medium	264
W036	High	233
W090	Not surveyed	214
W091	n/a	326
W092	Dry	626
W093	n/a	535
W094	n/a	366
W095	n/a	440
W096	n/a	695
W097	Low	708
W098	n/a	359
W099	Dry	374
W100	Low	1039
W101	n/a	480
W102	n/a	730
W103	n/a	461
W104	n/a	298
W105	Not surveyed	333
W106	Not surveyed	536
W107	n/a	874
W108	n/a	556
W109	n/a	1947
W110	n/a	609
W111	n/a	334
W112	Medium	821
W113	Dry	197
W114	High	906
W115	Medium	753
W116	Medium	445
W117	Low	344
W118	Medium	446
W119	n/a	442
W120	Medium	827
W121	Low	836
W122	n/a	761

Waterbody number	Peak population count	Length of waterbody (metres)
W123	Low	876
W124	Medium	368
W125	Medium	154
W126	Low	350
W127	Medium	917
W128	Not surveyed	174
W129	Not surveyed	216
W130	Not surveyed	234
W131	n/a	312
W132	Low	52
W133	n/a	150
W134	n/a	1241
W135	n/a	329
W136	n/a	2093
W137	n/a	1272
W138	n/a	222
W139	n/a	282
W140	n/a	920
W141	Medium	221
W142	Low	364
W143	Low	325
W144	n/a	419
W145	High	234
W146	Medium	260
W147	Low	427
W148	Dry	1607
W149	Dry	82
W150	Dry	171
W151	Low	328
W152	n/a	360
W153	Low	1032
W154	Dry	340
W155	Low	304
W156	n/a	252
W157	n/a	580

Waterbody number	Peak population count	Length of waterbody (metres)
W158	n/a	197
W159	n/a	606
W160	Dry	55
W161	Low	54
W162	n/a	292
W163	n/a	165
W164	n/a	588
W165	n/a	1397
W166	n/a	139
W167	n/a	613
W168	Dry	100
W169	Not surveyed	770
W170	Dry	305
W171	n/a	378
W172	n/a	343
W173	n/a	81
W174	n/a	145
W175	n/a	40
W176	n/a	360
W177	n/a	291
W178	n/a	219
W179	n/a	221
W180	n/a	182
W181	n/a	43
W182	n/a	344
W183	Not surveyed	160
W184	Not surveyed	150
W185	Not surveyed	309
W186	n/a	416
W187	n/a	222
W188	n/a	196
W189	n/a	69
W190	n/a	110
W191	Dry	76
W192	n/a	120

Waterbody number	Peak population count	Length of waterbody (metres)
W193	Dry	169
W194	n/a	151
W195	n/a	157
W196	Low	654
W197	n/a	1051
W198	Dry	210
W199	n/a	350
W200	Dry	943
W201	n/a	299
W202	n/a	286
W206	High	357
W208	n/a	907
W209	n/a	132
W210	n/a	115
W211	Low	214
W212	n/a	262
W213	Not surveyed	1110
W215	Dry	197
W217	Not surveyed	413
W219	Low	130
W220	Low	49
W221	Low	1373
W222	Not surveyed	542
W223	Not surveyed	418
W224	Low	374
W225	n/a	334
W226	Low	560
W227	n/a	646
W228	n/a	457
W229	Dry	286
W230	Not surveyed	542
W231	Not surveyed	256
W232	Not surveyed	426
W233	Not surveyed	169
W234	Not surveyed	533

Waterbody number	Peak population count	Length of waterbody (metres)
W235	Not surveyed	993
W236	Not surveyed	778
W240	Low	770
W241	n/a	262
T1	Low	597
T2	Low	277
T3	Low	217
T4	Hight	511
Tilbury2 mitigation area	Unknown	2319

Annex B Water vole habitat suitability results

B.1.1 For a full description of the habitat suitability surveys of waterbodies for water vole see the tables below.

Table B.1 Summary of water vole habitat suitability surveys for waterbodies south of the River Thames

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otters	Suitable for water vole	Signs and species of key predator	Bank substrate
W037	Static	4	1.5	Often	Shallow < 45°	1	Yes	Ditch	10%	Sea club rush, common reed	Pasture	Major - lots of poaching	Improved grassland, tall ruderal	Common reed, grass, sedge sp.	Yes	Yes		Earth
W038	Static	2	0.5		Shallow < 45°	0.7	Yes	Ditch	20%	Sea club rush	Grazing marsh	Minimal - some poaching	Grassland	Sea club rush, grass	Yes	Yes		Earth
W039	Static	15	0.5	None	Shallow < 45°	0.4	Yes	Pond	20%	Sedge sp., duckweed	Grazing marsh	Moderate - poaching	Grassland	Sea club rush, common reed	Yes	Yes		Earth
W040	Static	2	0.6		Steep > 45°	0.5	Yes	Ditch	95%	Sedge sp., common reed, sea club rush	Grazing marsh	Minimal - some poaching	Grassland	Sea club rush, common reed	Yes	Yes		Earth
W041	Static	5	0.2	None	Steep > 45°	0.5	Yes	Pond	50%	Sedge sp.	Grazing marsh	None	Semi-improved, marshy grassland	Grass, sea club rush	No	Yes		Earth
W042	Static	5	0.2	None	Steep > 45°	0.5	Yes	Pond	100%	Duckweed	Grazing marsh	None	Semi-improved, marshy grassland	Grass, sea club rush	No	Yes		Earth
W043	Static	8	0.3		Shallow < 45°	0.3	Yes	Pond	50%	Sea club rush	Grazing marsh	Minimal - some poaching	Semi-improved, marshy grassland	Grass, sea club rush	Yes	Yes		Earth
W044	Static	10	0.3		Shallow < 45°	0.3	Yes	Pond	60%	Sea club rush	Grazing marsh	Minimal - some poaching	Semi-improved, marshy grassland	Grass, sea club rush	Yes	Yes		Earth
W045	Static	4	0.2	None	Shallow < 45°	0.4	Yes	Pond	60%	Sea club rush	Grazing marsh	Minimal - some poaching	Semi-improved, marshy grassland	Grass, sea club rush	No	Yes		Earth
W046	Static	25	0.5	Frequently affected by precipitation events	Flat < 10°	0.2	Yes	Pond	5%	Water milfoil sp., ivy-leaved duckweed	Grazing marsh	Moderate - poaching	Semi-improved, marshy grassland	Common club-rush, common reed	Yes	Yes		Earth
W047	Static	3	1	Unknown	Shallow < 45°	0.8	Yes	Ditch	5%	Water milfoil sp.	Pasture	Major - lots of poaching	Semi-improved, marshy grassland	Sedge sp.	Yes	Yes		Earth
W048	Static	50	1.5	Frequent fluctuations caused by minor precipitation events	Flat < 10°	0	Yes	Gravel pit	5%	Common reed	Reedbed	None	Reed	Common reed	Yes	Yes	Mink scat and water vole remains	Earth
W049	Static	15	1	Frequent affected by minor precipitation event	Flat < 10°	0.2	Yes	Pond	5%	Common reed	Reedbed	None	Reed	Common reed	Yes	Yes		Earth
W050	Static	1.5	0.3		Flat < 10°	0	No	Ditch	10%	Common reed	Reedbed	None	Reed	Common reed	No	Yes		Earth
W051	Static	1	0.5		Steep > 45°	3.5	Yes	Ditch	80%	Common reed	Reedbed	None	Reed	Common reed	No	Yes		Earth
W052	Static	0.5	0.05	None	Steep > 45°	1.7	Yes	Ditch	99%	Common reed	Reedbed	None	Reed	Common reed	No	Yes		Earth
W053	Static	4	1.2		Shallow < 45°	0.7	Yes	Ditch	70%	Bulrush, pondweed	Grazing marsh	None	Semi-improved, marshy grassland	Grass, sedge sp.	Yes	Yes		Earth
W054	Static	4	1.8	Unknown	Shallow < 45°	1	Yes	Ditch	10%	Common reed	Track	None	Tall ruderal	Common reed, grass	Yes	Yes		Earth
W055	Slow	4	1		Steep > 45°	1.5	Yes	Ditch	70%	Bulrush, common reed	Firing range	Minimal - rifle range, recreation	Tall ruderal, reed	Dock, thistle, nettle, reed	Yes	Yes		Earth
W056	Static	5	1		Steep > 45°	1.5	Yes	Ditch	15%	Common reed	Railway, track	Moderate - occasional dredging	Swamp, semi-improved grassland, scrub	Common reed, nettle, bramble, blackthorn, hawthorn	Yes	Yes		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otters	Suitable for water vole	Signs and species of key predator	Bank substrate
W057	Static	4	0.8	Often, 50cm, tidal	Steep > 45°	1	Yes	Ditch	20%	Common reed	Footpath	Minimal - rifle range, recreation	Tall ruderal, some scrub	Common reed, grasses, hawthorn, rose	Yes	Yes		Earth
W058	Static	1	0.3	None	Steep > 45°	3	Yes	Ditch	100%	Common reed	Track	None	Tall ruderal	Common reed, nettle	No	Yes		Earth
W059	Static	5	1	0.5m seasonally	Steep > 45°	1.5	Yes	Canal	10%	Common reed	Railway, track	Moderate - occasional dredging, vegetation clearance	Swamp	Common reed	Yes	Yes		Earth
W060	Static	10	2		Shallow < 45°	1.5	Yes	Canal	10%	Common reed	Railway, track	Moderate - reed cutting, some canal restoration	Reed, scattered scrub	Common reed, elder, hawthorn	Yes	Yes		Earth, stone
W061	Static	2	0.8		Shallow < 45°	1.5	Yes	Ditch	100%	Lesser duckweed, common reed, bulrush	Pasture, arable	None	Poor semi improved, scrub	Fleabane, thistles, sedges, rushes, hawthorn, bramble	No	Yes		Earth
W062	Static	2	0.4	None	Steep > 45°	3	Yes	Ditch	20%	Common reed	Arable	None	Reed bed, scrub	Common reed	No	Yes		Earth
W063	Sluggish	2	1		Steep > 45°	2	Yes	Ditch	80%	Common reed, bulrush	Arable	Minimal - some vegetation trimming	Arable	Common reed, bulrush, bramble, rose, hawthorn, sea club-rush	No	Yes		Earth
W064	Static	5	1	Unknown	Steep > 45°	2	Yes	Ditch	20%	Common reed, bulrush	Arable	None	Reed	Common reed	Yes	Yes		Earth
W065	Static	4	1.4		Steep > 45°	1.5	Yes	Ditch	90%	Pondweed, common reed	Pasture	Major - lots of poaching	Improved grassland, hedge	Grass, thistle, nettle, hawthorn, bramble, rose	Yes	Yes		Earth
W066	Static	1	0.2	Some dry areas	Steep > 45°	1.3	Yes	Ditch	90%	Sedge	Pasture	Major - lots of poaching	Improved grassland	Grass	No	Yes		Earth
W067	Static	4	0.3	None	Flat < 10°	0.2	No	Pond	50%	Sedge	Pasture	Moderate - poaching, some sedge cutting	Improved grassland	Grass	No	Yes		Earth
W068	Static	3	0.5	None	Steep > 45°	1.2	Yes	Ditch	100%	Sedge, New Zealand stonecrop, algae	Pasture	Moderate - some poaching	Improved grassland	Grass	No	Yes		Earth
W069	Static	1.5	0.2	None	Flat < 10°	0.3	No	Pond	50%	Sedge	Pasture	Moderate - poaching	Poor semi-improved grassland	Grass, some common reed	No	Yes		Earth
W070	Static	2	0.3	None	Shallow < 45°	1	Yes	Ditch	100%	Sedges, crassula	Pasture	Moderate - some poaching	Poor semi-improved grassland	Cocksfoot grass, dock, rush, thistle, creeping bent	No	Yes		Earth
W071	Static	1	0.2	None	Flat < 10°	0.5	No	Pond	50%	Sedge, common reed	Pasture	Moderate - poaching	Poor semi-improved grassland	Common reed, rye grass	No	Yes		Earth
W072	Static	2	0.4	None	Steep > 45°	2	Yes	Ditch	50%	Common reed	Pasture	Moderate - some poaching	Improved grass	Common reed, sedge, grass	Yes	Yes		Earth
W073	Static	3	1	None	Shallow < 45°	1.5	Yes	Ditch	70%	Sedges, common reed, water milfoil, common duckweed, ivy leaved duckweed, crassula	Pasture	Moderate - poaching	Poor semi improved, scrub	Common reed, cocksfoot, rushes, thistles, hawthorn, rose	Yes	Yes	Heron, fox	Earth
W074	Static	2.5	1	Seasonal	Steep > 45°	1	Yes	Ditch	15%	Sea club-rush	Pasture	Moderate - poaching	Swamp	Sea club-rush	Yes	Yes		Earth
W075	Static	2	1	No change	Steep > 45°	1	Yes	Ditch	70%	Water milfoil, common duckweed, ivy-leaved duckweed	Pasture	Minimal - some poaching	Poor semi improved	Sedge sp., rush sp., fool's watercress, thistle sp.	No	Yes		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otters	Suitable for water vole	Signs and species of key predator	Bank substrate
W076	Static	3	1.2		Steep > 45°	1	Yes	Ditch	90%	Duckweed	Pasture	Moderate - some poaching, some reed cutting	Poor semi improved	Sedge sp., grass, common reed	Yes	Yes		Earth
W077	Static	2	1		Steep > 45°	0.7	Yes	Ditch	50%	Common reed, sedge	Hay meadow	Minimal - some reed cutting, some poaching	Semi-improved grassland	Sedge sp., grass, common reed	Yes	Yes		Earth
W078	Static	2.5	1.2	None	Steep > 45°	1	Yes	Ditch	100%	Water milfoil, common duckweed, ivy leaved duckweed	Pasture	Moderate - poaching	Poor semi-improved	Cocksfoot, dock, rush sp., sedge sp.	No	Yes		Earth
W079	Static	1.5	1		Steep > 45°	1	Yes	Ditch	90%	Water milfoil, ivy leaved crowfoot	Pasture	Major - dredging, cattle poaching	Poor semi-improved	Annual sea-blite, common reed, soft rush, thistle, dock, dogstail	Yes	Yes		Earth
W080	Static	2	1		Steep > 45°	1.5	Yes	Ditch	10%	Watermilfoil. Ivy-leaved duckweed	Pasture	Major - collapsed banks from poaching	Poor semi-improved	Reflexed saltmarsh-grass, sea club-rush, lesser water parsnip, fool's watercress	Yes	Yes	Mink scat	Earth
W081	Static	2	0.05	None	Shallow < 45°	1	Yes	Pond	5%	Duckweed	Pasture	None	Poor semi-improved grassland	Floating sweat-grass, celery-leaved water crows-foot, sedges, rushes	No	No		Earth
W082	Static	2.5	0.75	Seasonal	Steep > 45°	0.5	Yes	Ditch	100%	Azolla abundant, marginal sea club-rush	Pasture	Moderate - poaching	Swamp	Sea club-rush	Yes	Yes		Earth
W083	Static	2	0.2	None	Shallow < 45°	1	Yes	Ditch	90%	Water milfoil, common duckweed, ivy-leaved duckweed, fool's watercress	Pasture	None	Poor semi-improved grassland	Water plantain, creeping bent, water forget-me-not, sedges and rushes	No	Yes		Earth
W084	Static	1	0.1	None	Shallow < 45°	1	Yes	Ditch	100%	Floating sweat-grass	Pasture	None	Poor semi-improved grassland	Ragwort, soft rush, dock, thistle, creeping buttercup, creeping bent	No	Yes		Earth
W085	Static	4	0.5	None	Shallow < 45°	0.2	No	Pond	100%	Water milfoil, common duckweed, ivy-leaved duckweed	Pasture	None	Poor semi-improved grassland	Sedges, rushes, water plantain	No	Yes		Earth
W086	Static	1	0.1		Shallow < 45°	2	Yes	Ditch	50%	Duckweed	Pasture	Moderate - poaching	Tall ruderal, scrub	Bramble, nettle, willowherb, dock	No	No		Earth
W087	Static	20	0.45		Shallow < 45°	1	No	Lake	50%	Bulrush, flag iris, reed sp., water Lilly sp.	Pasture	Minimal - some recreation	Tall ruderals, scrub	Bulrush, bramble, ruderal herbs	Yes	No		Stones, gravel
W088	Static	10	0.2	None	Shallow < 45°	1.5	Yes	Pond	40%	Algae	Hay meadow	None	Semi improved grassland, scrub	Grass, dock, hawthorn	No	Yes		Earth
W089	Static	0.5	0.5	Infrequent	Steep > 45°	1.5	Yes	Ditch	90%	Burr reed, bulrushes, iris	Pasture	Minimal - some recreation, some litter	Pasture	Willow, bramble	No	No		Earth
W203	Static	85	5	None	Shallow < 45°	1	Yes	Lake	5%	Common reed	Fishing lake, gardens, woodland	Moderate - fishing	Broadleaved woodland, amenity grassland	Oak, sweet chestnut, alder	Yes	Yes		Earth
W204	Static	25	2.5	Unknown	Steep > 45°	0.5	Yes	Lake	25%	Common reed	Public recreation	Moderate - fishing	Trees, bare ground, swamp	Common reed, oak, sweet chestnut	Yes	Yes		Earth, gravel
W205	Static	25	2.5	Unknown	Vertical/Undercut	0.5	Yes	Lake	20%	Common reed	Public recreation	Moderate - fishing	Semi-improved grassland, swamp	Common reed	Yes	Yes		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otters	Suitable for water vole	Signs and species of key predator	Bank substrate
W207	Static	3	1.3	None	Shallow < 45°	1	Yes	Ditch	100%	Hornwort, lesser duckweed, ivy-leaved duckweed, water milfoil	Pasture	Moderate - poaching	Poor semi-improved grassland	Sedges, rushes, dock, common reed, cock's foot, creeping bent, red fescue, crassula	Yes	Yes		Earth
W214	Static	2.5	0.2	Regular changes. Tidally influences	Steep > 45°	3.5	Yes	Ditch	50%	Common reed, sea club rush	Compound, rough grassland	Minimal - some poaching	Semi-improved grassland, swamp	Common reed, sea club rush, sea couch, false oat grass, cocksfoot	Yes	Yes		Earth
W216	Slow	5	1.5		Steep > 45°	1	Yes	Ditch	5%	Common reed	Firing range, footpath	None	Grassland, reed	Grass, common reed	Yes	Yes		Earth
W218	Static	2	0	Unknown	Steep > 45°	2.5	Yes	Ditch	100%	Common reed	Track, canal	Minimal - infrequently dredged	Swamp	Common reed	Yes	Yes		Earth
W237	Sluggish	1	0.4	Often tidal	Steep > 45°	3	Yes	Ditch	20%	Common reed	Industrial	Moderate - rifle range, some vegetation clearance	Tall ruderals, scrub, trees	Bramble, hawthorn, elm, nettle	Yes	Yes		Earth
W238	Static	2	0.2	Seasonal	Steep > 45°	0.5	Yes	Ditch	75%	Sea club rush, bulrush	Grazing marsh	Moderate - some dredging, poaching	Swamp	Sea club rush, water plantain, marsh foxtail, common spike rush	Yes	Yes		Earth, clay
W239	Static	2.5	0.5	Seasonal	Steep > 45°	2	Yes	Ditch	50%	Common reed, bulrush, sea club rush, water starwort	Arable, building plot, grazing marsh	Moderate - some vegetation clearance, little poaching	Scrub, swamp, tall ruderal	Bristly oxtongue, hawthorn, sea club rush	Yes	Yes		Earth

Table B.2 Summary of water vole habitat suitability surveys for waterbodies north of the River Thames

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W001	Static	3	1.5		Shallow < 45°	1.5	Yes	Ditch	100%	Duckweed, nettle	Arable	None	Hedge, amenity grassland	Nettle, bramble, willowherb, bindweed, hops, elder, willow	No	No		Earth
W002	Sluggish	3	0.3	None	Shallow < 45°	2	Yes	Ditch	0%	Nettle	Arable	None	Scrub, tall ruderal, line of trees	Hawthorn, elder, nettle, hops, bramble, oak	No	No		Earth
W003	Static	1	0.1	Frequent	Shallow < 45°	1	Yes	Ditch	20%	Rosebay willowherb, bramble	Arable	Moderate - some reprofiling	Arable, hedgerow	Rosebay willowherb, grass, nettle, hawthorn	No	Yes		Earth
W004	Static	6	0.1	Occasionally in heavy rain	Steep > 45°	2.5	Yes	Ditch	100%	Common reed	Arable, landfill	Minimal - possibly infrequently dredged	Tall ruderal, scrub	Yorkshire fog, nettle, creeping thistle, bramble	No	Yes		Clay loam
W005	Static	1.5	0.3	Low frequency and not significant	Steep > 45°	1.25	Yes	Ditch	5%	Common reed, bulrush	Landfill, rough grassland	None	Rough grassland, scrub	False oat grass, Yorkshire fog, creeping thistle, bramble, hawthorn, blackthorn	No	Yes		Clay loam
W006	Sluggish	1.5	0.2	Infrequent and not significant	Steep > 45°	1	Yes	Ditch	40%	Bulrush, fool's watercress, common reed, water forget-me-not	Arable, woodland, landfill	None	Dense scrub	False oat, bramble, hawthorn	No	No		Clay loam

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W007	Static	1.5	0	Infrequent	Steep > 45°	1.5	Yes	Ditch	100%	Rosebay willowherb, nettle, bulrush	Arable	None	Scrub, grass	Grass, nettle, willowherb, hawthorn	No	Yes		Earth
W008	Static	1.5	0	Infrequent	Flat < 10°	0.4	Yes	Ditch	100%	Willowherb, grass, nettle	Arable	None	Grass, arable	Grass, nettles	No	Yes		Earth
W009	Sluggish	3	1		Shallow < 45°	2	Yes	Stream	100%	Sedge, common reed, fools water cress, bur, nettle	Arable	Minimal - some recreation	Scrub, tall ruderal	Nettles, hawthorn	Yes	Yes		Earth
W010	Static	3	0.2		Shallow < 45°	1	Yes	Ditch	100%	Fools water cress, bur reed, nettle	Arable	None	Scrub, tall ruderal	Hawthorn, nettle	No	Yes		Earth
W011	Static	3	0.1		Steep > 45°	1.5	Yes	Ditch	100%	Common reed	Arable	None	Grass, tall ruderal	Common hogweed, nettle, thistle sp., common reed	No	Yes		Earth
W012	Static	3	0.1	Infrequent	Steep > 45°	2	Yes	Ditch	80%	Common reed, water parsnip, water plantain	Arable	None	Tall ruderal	Common reed, grass	No	Yes		Earth
W013	Sluggish	2	0.1	Infrequent	Shallow < 45°	1	Yes	Ditch	80%	Reed canary grass, nettle	Arable	None	Hedgerow, tall ruderal	Grasses, elder, hawthorn, cow parsley	No	Yes	Rat	Earth
W014	Static	4	0	Infrequent	Steep > 45°	2	Yes	Ditch	100%	Reed canary grass, willowherb	Arable	None	Tall ruderal, scrub, hedgerow	Willow, nettles, burdock	No	Yes		Earth
W015	Static	1.5	0.4	None	Steep > 45°	1.5	Yes	Ditch	90%	Fool's watercress	Arable	None	Arable	Nettle	No	No		Earth
W016	Static	20	3	Abstraction	Steep > 45°	3	Yes	Reservoir	0%	Water starwort, water moss	Arable, woodland	Moderate - water abstraction, fishing	Scrub, reed	Bramble, common reed	Yes	No	Dead mink	Earth
W017	Static	1.5	0.4		Steep > 45°	2.5	Yes	Ditch	90%	Common reed	Arable	Moderate - dredging	Common reed	Common reed	Yes	Yes		Earth
W018	Static	2	0		Shallow < 45°	1	Yes	Ditch	60%	Common reed	Arable	None	Scrub	Nettles, bramble, oak, hawthorn	No	No	Adder	Earth
W019	Static	1	0.3	Water level affected by run of from agricultural land	Steep > 45°	1.5	Yes	Ditch	60%	Common reed	Arable	Moderate - some reprofiling	Reed, grassland	Common reed, grass	Yes	Yes		Earth
W020	Static	1.7	0.8	None	Steep > 45°	1.5	Yes	Ditch	40%	Common reed, ivy leaved and celery leaved water crow-foot, fool's watercress	Arable	None	Arable, scattered scrub, semi improved grassland	Common reed, hawthorn, bramble, nettle, thistles	Yes	Yes	Brown Rat	Earth
W021	Static	2	0.25	Often	Steep > 45°	1.5	Yes	Ditch	100%	Common reed	Soil stripping	None	Tall ruderal, scattered scrub	Thistle, grass, hawthorn	Yes	Yes		Earth
W022	Sluggish	6	2	Tidal	Steep > 45°	3	Yes	Ditch	10%	Small cord grass, common reed	Waste land	Moderate - recently dredged	Tall ruderal and scrub	Nettle, elm	Yes	Yes		Earth
W023	Static	1.5	0.4		Steep > 45°	1	Yes	Ditch	75%	Common reed	Arable	None	Scrub	Rose, bramble	No	Yes		Earth
W024	Static	1.5	0.2	Unknown	Steep > 45°	2	Yes	Ditch	95%	Common reed	Arable	None	Common reed, swamp, scrub	Common reed, hawthorn	Yes	Yes		Earth
W025	Static	2.5	0.1		Shallow < 45°	1.5	Yes	Ditch	100%	Bramble	Arable	None	Scrub	Blackthorn, hawthorn, rose	No	No		Earth
W026	Sluggish	3	2		Steep > 45°	2	Yes	Ditch	50%	Common reed	Waste land	None	Scrub and rough grassland	Common reed, bramble	Yes	Yes		Earth
W027	Static	2	0.1	Often	Steep > 45°	4	Yes	Ditch	100%	Common reed	Soil stripping	None	Scrub, tall ruderal	Grass, elder	No	Yes		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W028	Static	2	0.7	Seasonal	Steep > 45°	1.5	Yes	Ditch	60%	Common reed	Pasture	Moderate - some reprofiling, heavy machinery	Improved grassland	Common reed, false oat grass	Yes	Yes		Earth
W029	Static	4	1.3	None	Steep > 45°	3	Yes	Ditch	10%	Common reed	Compound, track	None	Concrete, tall ruderal	Common reed, hawthorn, elder	Yes	Yes		Earth/rock
W030	Static	1.5	3		Steep > 45°	2.5	Yes	Ditch	100%	Common reed	Waste land	None	Scrub, reed, tall ruderal	Common reed, hawthorn, elder, nettles	Yes	Yes		Earth
W031	Static	2	1		Shallow < 45°	1.5	Yes	Ditch	80%	Common reed	Arable	None	Reed	Common reed, grass	Yes	Yes		Earth
W032	Static	2	1		Steep > 45°	1.5	Yes	Ditch	60%	Reed, grass, common water crowfoot	Arable	Moderate - recently dredged	Grass, tall ruderal, some scattered scrub	Grass, nettle, bramble, hawthorn	Yes	Yes		Earth
W033	Static	3	0.3	Often	Shallow < 45°	1.2	Yes	Ditch	100%	Common reed	Arable	None	Tall ruderal	Common reed, thistle, nettle	Yes	Yes		Earth
W034	Static	2	0.2		Steep > 45°	2	Yes	Ditch	100%	Common reed	Arable	None	Tall ruderal	Sow thistle, rape, nettles, ragwort	No	Yes		Earth
W035	Static	4	1.5	None	Steep > 45°	3	Yes	Ditch	20%	Common reed, sedge sp.	Waste land	None	Tall ruderal, scrub	Bramble, teasel, nettle, hawthorn	Yes	Yes		Stone, earth
W036	Sluggish	7	1.5	Tidal	Steep > 45°	0.3	Yes	Ditch	10%	Sea club rush	Waste land	None	Semi-improved grassland, scrub	Sea couch, bramble	Yes	Yes		Earth
W090	No access																	
W091	Sluggish	0.3	0.1	None	Steep > 45°	0.6	Yes	Ditch	100%	Fools parsley, water plantain, New Zealand pigmyweed	Golf course	Major - mown and reprofiled	Amenity grassland, hedgerow	Grass sp., cow parsley, nettle, garlic mustard, hawthorn hedge	No	No		Earth
W092	Slow	0.8	0.2		Shallow < 45°	0.5	Yes	Ditch	100%	Grass	Golf course, community woodland	Moderate - some mowing	Dense hedgerow	Hawthorn, blackthorn, elder	No	No		Earth
W093	Slow	0.5	0.01	None	Shallow < 45°	1	Yes	Stream	10%	None	Woodland, scrub	Minimal - some recreation	Scrub, scattered trees	Hawthorn, blackthorn, elder	No	Yes		Earth
W094	Sluggish	2	0.3	Regularly may dry out	Steep > 45°	0.5	Yes	Ditch	0%	Hawthorn	Fishing lake	None	Dense scrub	Hawthorn, blackthorn	Yes	No		Earth
W095	Static	230	4		Flat < 10°	0.5	No	Lake	90%	Bulrush	Fishing lake	Moderate - boats, lots of fishing	Scrub, trees	Hawthorn, elder, bramble	Yes	No		Gravel
W096	Static	0	3		Shallow < 45°	4	Yes	Lake	0%	None	Fishing lake	Moderate - fishing	Wood, grass	Grass, oak, ash	Yes	Yes		Gravel and clay
W097	Static	100	5		Shallow < 45°	4	Yes	Reservoir	5%	Water crowfoot	Arable	Minimal - reservoir maintenance	Grass, rough grassland	Grass	Yes	Yes		Earth
W098	Static	2.5	0	None	Steep > 45°	2.5	Yes	Ditch	50%	Common reed	Arable	None	Reed	Common reed	No	Yes		Earth
W099	Static	3	0		Steep > 45°	2	No	Ditch	100%	Nettle, cow parsley	Arable	None	Scrub, tall ruderals	Nettle, bramble, oak, cow parsley	No	No		Earth
W100	Static	30	0.75	None	Flat < 10°	0.5	No	Lake	20%	Bulrush, common reed	Arable	None	Reed, tall ruderals	Bulrush, common reed, willowherb	Yes	Yes	Mink scats	Earth
W101	Static	2	0.05		Steep > 45°	2	Yes	Ditch	100%	Nettle, hawthorn, elder	Arable	None	Scrub, tall ruderals	Nettle, elder, hops, hazel, willowherb	No	Yes		Earth
W102	Static	2.5	0.2		Steep > 45°	1.5	Yes	Ditch	90%	Bramble, grass	Pasture	None	Rough grassland, scrub	Bramble, grasses, nettle, hemlock	No	Yes		Earth
W103	Static	2.5	0.3	None	Steep > 45°	1	Yes	Ditch	5%	Common reed	Grazing marsh	Major - dredged, flailed, polluted, lots of litter, road	Semi-improved grassland	Common reed, grass	Yes	Yes		Earth
W104	Static	4	3		Vertical/Undercut	5	No	Canal	0%	None	Track	Major - heavily maintained	Concrete wall	N/a	Yes	No		Concrete
W105	No access																	
W106	No access																	

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W107	Static	4	0.5		Steep > 45°	1	Yes	Ditch	60%	Water crow-foot	Grazing marsh	Moderate - poaching, litter, adjacent to road	Semi-improved grassland	Grass	Yes	Yes	Mink footprints	Earth
W108	Static	3	0.4	None	Shallow < 45°	0.5	Yes	Ditch	0%	None	Grazing marsh	Moderate - poaching, litter	Semi-improved grassland	Grass	Yes	Yes		Earth, gravel
W109	Static	35	1		Steep > 45°	1	No	Lake	0%	None	Grazing marsh, public recreation	Moderate - poaching, litter, recreation	Improved grassland	Grass	Yes	No		Wood
W110	Sluggish	1.5	0.3		Steep > 45°	0.5	No	Ditch	10%	Water crow-foot	Grazing marsh	Moderate - poaching, litter	Semi-improved grassland	Grass, hawthorn	Yes	No		Wood
W111	Static	1.5	0.3	None	Steep > 45°	1	Yes	Ditch	95%	Grass, common reed	Pasture	Major - pollution runoff	Scrub, semi-improved grassland	Grass, common reed, bramble, hawthorn, rose	No	No		Earth, stone
W112	Sluggish	4	1.2		Shallow < 45°	1	Yes	Ditch	90%	Duckweed, common reed	Arable, pasture, road	Moderate - adjacent to road, some litter	Reed, grass	Common reed, grass	Yes	Yes		Earth
W113	Static	1	0		Steep > 45°	1.5	Yes	Ditch	80%	Nettle, grasses, common reed	Road, pasture	Moderate - lots of rubbish, adjacent to road	Scrub, tall ruderals, poor semi improved grassland	Common reed, grasses, nettles, bindweed, hawthorn	No	No		Earth
W114	Static	3	0.7		Steep > 45°	2.5	Yes	Ditch	75%	Common reed, chara sp., fennel pondweed, common reed	Road, arable	Moderate - some dredging, vegetation management	Swamp	Common reed	Yes	Yes		Earth
W115	Static	2.5	0.3	None	Steep > 45°	2	Yes	Ditch	90%	Common reed, bulrush	Arable	Minimal - some dredging	Reed, tall ruderals	Common reed, grass, nettle, thistle	No	Yes		Earth
W116	Static	2	0		Steep > 45°	3	Yes	Ditch	80%	Common reed	Arable	None	Reed, tall ruderals	Common reed, dock, bindweed	No	Yes		Earth
W117	Static	2	0	None	Steep > 45°	2	Yes	Ditch	50%	Common reed	Pasture	Moderate - some dredging, poaching	Reed, arable	Common reed, grass	No	Yes		Earth
W118	Static	1.5	0.3	None	Steep > 45°	2.5	Yes	Ditch	80%	Common reed	Arable, track	None	Reed, tall ruderal	Reed, nettle, hawthorn	Yes	Yes		Earth
W119	Static	1.5	0.15	Rain dependant, unknown.	Steep > 45°	2	Yes	Ditch	5%	Woody nightshade	Rough grassland, arable	None	Ruderal, scattered scrub, scattered trees	Nettle, white poplar, hawthorn	Yes	Yes		Earth
W120	Static	3	1		Steep > 45°	2	Yes	Ditch	50%	Common reed	Pasture	None	Grass, scrub	Bramble, hogweed, grass, common reed	Yes	Yes		Earth
W121	Static	1	0.3		Steep > 45°	1.5	Yes	Ditch	90%	Common reed	Arable	None	Grassland	Grasses	No	Yes		Earth
W122	Slow	1	0.5		Steep > 45°	2	Yes	Ditch	3%	Common reed	Arable	Moderate - recently dredged	Arable	Grasses	No	Yes		Clay
W123	Static	2	0.5	Infrequent, with some dry areas	Shallow < 45°	1.5	Yes	Ditch	10%	Common reed	Arable, public recreation	None	Hedgerow, scrub	Hawthorn, bramble	No	Yes		Earth
W124	Slow	4	1		Steep > 45°	0.5	Yes	Ditch	40%	None	Public recreation	Major - heavily managed, lots of recreation	Grassland	Grass, sedge sp.	Yes	Yes		Earth
W125	Slow	4	1		Steep > 45°	0.5	Yes	Ditch	5%	None	Public recreation	Heavily managed, lots of human activity	Grassland	Grass	Yes	Yes		Earth
W126	Sluggish	50	1		Steep > 45°	0.5	Yes	Reservoir	5%	None	Public recreation	Major - heavily managed, lots of recreation	Amenity grass, rough grassland	Grass	Yes	Yes		Earth
W127	Sluggish	50	2		Steep > 45°	0.5	Yes	Reservoir	5%	None	Public recreation	Major - heavily managed, lots of recreation	Grassland, concrete	Grass	Yes	Yes		Earth, wood, concrete
W128											No access							

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W129	No access																	
W130	No access																	
W131	Static	2	0.3		Steep > 45°	4	Yes	Ditch	100%	Nettle, bindweed	Arable	None	Tall ruderals, scrub	Hawthorn, nettle, bindweed, cow parsley, elder	No	No		Earth
W132	Static	1.5	0		Steep > 45°	1.5	Yes	Ditch	100%	Nettle, grass	Arable	Minimal - some vegetation trimming	Tall ruderal, grass	Nettle, grass, bramble	No	No		Earth
W133	Static	2	0		Steep > 45°	3	Yes	Ditch	5%	Grass	Arable	None	Scrub, grass	Hawthorn, blackthorn, grass	Yes	Yes		Earth
W134	Static	15	1	None	Vertical/Undercut	0.5	Yes	Lake	5%	Rushes, sedges	Fishing lake	Moderate - lots of fishing	Semi-improved grassland, trees, scrub	Grass, oak, hawthorn	Yes	Yes		Earth
W135	Static	15	1	None	Vertical/Undercut	0.5	Yes	Lake	5%	Rushes, sedges	Fishing lake	Moderate - fishing lake	Semi-improved grassland, trees, scrub	Hawthorn, hazel, grass	Yes	Yes		Earth
W136	Slow	1	0.4		Steep > 45°	2	Yes	Stream	5%	None	Arable, woodland, compound	None	Woodland, dense scrub, tall ruderals	Nettles, ivy, bramble, oak, ash, elder, hawthorn	No	Yes		Earth, some shingle, concrete section
W137	Slow	0.75	0.15		Steep > 45°	2	Yes	Stream	0%	Sedge sp.	Arable, woodland	Minimal - some recreation	Woodland, tall ruderal, hedgerows	Nettle, cow parsley, garlic mustard, ivy, oak, ash, bramble, hawthorn	Yes	Yes		Earth, shingle base
W138	Sluggish	0.5	0.2	Some areas holding less than 1cm of water	Vertical/Undercut	3	Yes	Stream	0%	None	Woodland, arable, motorway	Moderate - large amounts of litter	Woodland	Bramble, tree saplings, beech, hawthorn, oak	No	Yes		Earth, shingle base
W139	Sluggish	0.3	0.01	Some sections dry	Steep > 45°	1.5	Yes	Ditch	0%	Grass, hawthorn	Arable	Minimal - some mowing	Hedgerow, scattered trees	Bramble, nettle, willow sp., rose, hawthorn, ash, oak, cow parsley	No	No		Earth
W140	Slow	0.2	0.01	None	Steep > 45°	1.75	Yes	Ditch	0%	Grass, willowherb	Arable	Minimal - some mowing	Tall ruderal, scattered trees	Nettle, cow parsley, bramble, great hairy willowherb, red campion, ash	No	No		Earth
W141	Static	4	1.5	None	Steep > 45°	3	Yes	Ditch	10%	Common reed	Power station	None	Tall ruderal, scattered scrub	Common reed, bramble	Yes	Yes		Earth
W142	Static	1.5	0	None	Steep > 45°	1.5	Yes	Ditch	95%	Common reed	Pasture	Moderate - road, lots of litter	Reed	Common reed	No	Yes		Earth
W143	Static	20	1.5	Unknown	Shallow < 45°	1	Yes	Lake	20%	Bulrush, common reed	Scrub, quarry	None	Dense scrub	Bramble, creeping thistle, aspen, dogwood, grey willow	Yes	Yes		Earth
W144	Static	2	0	None	Steep > 45°	2	Yes	Ditch	50%	Common reed, grass, thistle	Arable	Minimal - some litter	Tall ruderals, scrub	Thistle, common reed, grass, hawthorn, blackthorn	No	Yes	Fox	Earth
W145	Static	4	1.5		Steep > 45°	2	Yes	Ditch	20%	Common reed, Sedge	Track	Moderate - heavy vehicles	Grass, reed	Common reed, grass, sedge sp.	Yes	Yes	Fox footprints	Earth
W146	Static	1	0		Steep > 45°	1.5	Yes	Ditch	95%	Common reed	Arable	None	Semi-improved grassland	Grass sp., nettle	No	Yes		Earth
W147	Static	1	0.5		Steep > 45°	2	Yes	Ditch	100%	Common reed	Arable	None	Semi-improved grassland	Grass sp., thistle sp., hawthorn	No	Yes		Earth
W148	Static	2	0	None	Steep > 45°	1.5	Yes	Ditch	100%	Common reed, bramble	Arable	Minimal - railway	Scrub, railway line	Hawthorn, bramble, nettle	No	Yes		Earth, stone
W149	Sluggish	0.5	0		Steep > 45°	1.5	Yes	Ditch	70%	Nettle, ash	Arable	None	Tall ruderal, scrub	Nettles, ash, hawthorn, spear thistle, dock	No	No		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W150	Static	2.5	0	0	Shallow < 45°	2	Yes	Ditch	0%	Nettle, common reed	Arable	Minimal - some vegetation trimming	Tall ruderal, scrub	Nettles, common reed, hawthorn, bramble	No	No		Earth
W151	Static	3	0.1		Steep > 45°	2	Yes	Ditch	0%	None	Arable	Moderate - recently dredged	Reed, tall ruderals	Common reed, nettles	No	No		Earth
W152	Sluggish	0.5	0.1	Water levels likely to fluctuate with seasonal rainfall	Steep > 45°	1.6	Yes	Ditch	90%	Grass	Arable	None	Grass, tall ruderals, scrub	Nettles, grasses, umbellifers, bramble	No	Yes	Fox cub seen	Earth
W153	Sluggish	0.5	0.05	50% dry	Steep > 45°	1.2	Yes	Ditch	80%	Common reed, nettles, umbellifers, grasses	Arable	None	Tall ruderal, scrub	Grasses, nettles, occasional bramble, willow	No	Yes		Earth
W154	Static	2	0		Steep > 45°	1.5	Yes	Ditch	100%	Grass	Arable	None	Grass	Grass, dock	No	No		Earth
W155	Static	2	0		Steep > 45°	1.5	Yes	Ditch	100%	Grass, nettle, bulrush	Arable	None	Grass, tall ruderals	Reedmace, willowherb, grass sp.	No	No		Earth
W156	Static	1	0		Steep > 45°	1.5	Yes	Ditch	100%	Nettle, grass	Arable	None	Grass, trees	Nettles, field maple, willow	No	No	Fox	Earth
W157	Slow	1	0.1		Steep > 45°	1.5	Yes	Ditch	99%	Foos watercress, willowherb	Arable	Minimal - occasional trimming	Broadleaved plantation, tall ruderal	Common nettle, willowherb, bramble, cow parsley	No	Yes		Earth
W158	Static	1.5	0.05		Steep > 45°	1	Yes	Ditch	100%	Bulrush, grass	Arable	None	Grass, arable, scrub	Oak, hawthorn, common reed, blackthorn, bramble	No	No		Earth
W159	Static	2	0		Steep > 45°	1.5	Yes	Ditch	100%	Bulrush, willowherb, grass	Arable	None	Grass, scrub, tall ruderals, trees	Hawthorn, common reed, reedmace, bramble, willowherb, oak, blackthorn	No	No		Earth
W160	Static	2	0		Steep > 45°	2	Yes	Ditch	10%	Nettle	Arable	None	Scrub	Nettle, hawthorn	No	No		Earth
W161	Static	1.5	0.05		Steep > 45°	1.5	Yes	Ditch	100%	Grass, common reed	Arable	None	Grass, tall ruderal	Grass sp., nettle, common reed	No	Yes		Earth
W162	Static	1.6	0		Steep > 45°	1.6	Yes	Ditch	40%	Grass, nettle	Arable	Moderate - vegetation clearance	Scrub, bramble, grassland	Grass, nettle, elm	No	No		Earth
W163	Static	1.6	0		Steep > 45°	1.6	Yes	Ditch	40%	Grass, nettle	Arable	Moderate - vegetation clearance	Scrub, bramble, grassland	Grass, nettle, elm, hawthorn	No	No		Earth
W164	Static	2	0.3		Steep > 45°	1.5	Yes	Ditch	90%	Great willowherb	Arable	None	Tall ruderals	Nettles, cow parsley, coarse grasses, cleavers	No	Yes		Earth
W165	Fast	2.5	0.1		Steep > 45°	1	Yes	Stream	60%	None	Landfill, arable	Moderate - landfill site	Scrub	Hawthorn, nettles, willowherb, bramble, elder	No	Yes		Earth
W166	Static	25	2		Shallow < 45°	0.5	Yes	Pond	100%	Duckweed	Woodland, public recreation	Minimal - some recreation	Wood, scrub	Willow, hawthorn, nettle, bramble, willowherb	Yes	Yes		Earth
W167	Static	50	3		Steep > 45°	2	Yes	Lake	100%	Common reed, duckweed, water lily	Arable	Minimal - some recreation	Wood, reed, scrub	Willow, hawthorn, common reed, bramble, oak	Yes	Yes		Earth
W168	Static	2	0		Steep > 45°	2	Yes	Ditch	100%	Willowherb, bramble, nettle	Arable	Minimal - some pipe maintenance	Tall ruderal, scrub	Nettle, bramble, willowherb, thistle sp.	No	No		Concrete along M25, earth
W169												No access						
W170	Static	1	0		Steep > 45°	1.5	Yes	Ditch	10%	Common reed	Arable	Moderate - some mowing	Hedgerow, grassland	Hawthorn, elder, grass, nettle, willowherb	No	No		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W171	Static	20	3	None likely, fishing lake	Vertical/Undercut	0.75	Yes	Pond	1%	Redshank	Fishing lake, arable	Moderate - fishing lake	Scrub, improved grassland	Bramble, willow, oak, grass	Yes	Yes	Mink anecdotal report	Earth with fishing platforms
W172	Static	30	1	None	Steep > 45°	0.75	Yes	Lake	3%	Water lily, pondweed	Gardens, pasture	Moderate - recreation	Scattered scrub, trees	Willow, poplar, oak	Yes	Yes		Earth
W173	Static	20	2	Unlikely	Vertical/Undercut	0.5	Yes	Pond	25%	Water lily, gypsywort	Gardens, arable	Moderate - adjacent to road, recreation	Scrub, herbs, improved grassland	Bramble, common nettle	Yes	Yes		Earth
W174	Static	0.5	0.15	Likely to be frequently dry	Shallow < 45°	1	Yes	Ditch	5%	Nettle	Gardens, road	Moderate - vegetation clearance	Bare soil, conifers	Conifers, bramble, hawthorn, ivy	No	No		Earth
W175	Static	1	0.1	Unknown	Steep > 45°	2	Yes	Ditch	30%	Nettle	Arable, gardens	Major - mown and reprofiled	Tall ruderal	Nettle	Yes	Yes	Mink scat	Earth
W176	Static	2	0		Shallow < 45°	1	Yes	Ditch	20%	Nettle	Arable	Moderate - some reprofiling	Woodland, grass	Oak, bramble, nettle, grass	No	No		Earth
W177	Static	30	0.25		Vertical/Undercut	0.4	Yes	Pond	0%	None	Golf course	Major - regularly mowed	Amenity grass	Grass, wooden supports	Yes	No		Earth, wooden sleepers
W178	Static	30	0.3		Vertical/Undercut	0.4	Yes	Pond	15%	Common reed	Golf course	Major - regularly mowed	Amenity grass	Grass, wooden supports	Yes	No		Earth, wooden sleepers
W179	Static	25	0.25		Vertical/Undercut	0.4	Yes	Pond	10%	Common reed	Golf course	Major - regularly mowed	Amenity grass	Grass, wooden supports	Yes	No		Earth
W180	Static	20	0.3		Vertical/Undercut	0.4	Yes	Pond	0%	None	Golf course	Major - regularly mowed	Amenity grass	Grass, wooden supports	Yes	No		Earth
W181	Static	8	0.25		Flat < 10°	0.5	No	Pond	60%	Pondweed	Golf course	Major - regularly mowed	Amenity grass	Grass, wooden supports	No	No		Earth
W182	Static	30	0.25		Vertical/Undercut	0.4	Yes	Pond	15%	Curled pondweed, bulrush	Golf course	Major - regularly mowed	Amenity grass	Grass, willow	Yes	No		Earth, wooden sleepers, stone
W183	No access																	
W184	No access																	
W185	No access																	
W186	Static	20	1	None	Vertical/Undercut	0.5	Yes	Lake	5%	Rushes, sedges	Fishing lake	Moderate - fishing lake	Semi-improved grassland, fen, trees, scrub	Common reed, willow, grass, sedges	Yes	Yes		Earth
W187	Static	25	0.02	None	Shallow < 45°	0.5	Yes	Pond	95%	Common reed, bulrush	Pasture, rough grassland	Moderate - poaching	Semi-improved grassland	Grass sp., thistle sp., rush	Yes	Yes		Earth
W188	Sluggish	6	1.5	None	Shallow < 45°	1.5	Yes	Pond	1%	Flag iris	Gardens	Moderate - regularly managed	Amenity, residential garden	Grass, acer, horse chestnut	Yes	Yes		Earth
W189	Static	3	1	None	Shallow < 45°	1.5	Yes	Pond	1%	Flag iris	Gardens	Moderate - regularly managed	Amenity, residential garden	Grass, acer, horse chestnut	Yes	Yes		Earth
W190	Static	3	0.5		Shallow < 45°	1.5	Yes	Pond	1%	Flag iris	Gardens	Moderate - regularly managed	Amenity, residential garden	Grass, acer, horse chestnut	Yes	Yes		Earth
W191	Static	20	0.4	None	Shallow < 45°	1.5	Yes	Pond	100%	Common reed, sedge	Arable	Moderate - adjacent to motorway	Tall ruderal	Cow parsley, hogweed, thistle, goats rue, willowherb, speedwell	No	No		Earth
W192	Static	20	2		Shallow < 45°	0.75	No	Pond	0%	None	Woodland, compound	Moderate - heavy vehicle disturbance	Grass, plastic lining	Grass sp.	No	No		Earth, but plastic lined
W193	Static	25	0	None	Steep > 45°	2	No	Pond	100%	Bulrush, common reed, willow	Arable	Moderate - adjacent to motorway	Tall ruderal	Horsetail, teasel, dock, grasses	No	No		Earth

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate	
W194	Static	40	0.25		Vertical/Undercut	0.4	Yes	Pond	0%	None	Golf course	Major - regularly mowed	Amenity grass	Grass	Yes	No		Earth	
W195	Sluggish	1	0.15	Water level appears to have been approx. 20cm higher recently	Steep > 45°	1.2	Yes	Ditch	20%	Water plantain, fool's watercress, common reed	Golf course	Major - regularly mowed	Amenity grassland	Grass	No	Yes		Earth	
W196	Static	2	0		Steep > 45°	1.5	Yes	Ditch	100%	Common reed, bramble, nettle	Arable	None	Dense scrub, tall ruderal	Hawthorn, elm, willowherb, nettle, bramble	No	No		Earth	
W197	Sluggish	1.2	0.3	Increased with rainfall	Steep > 45°	2	Yes	Ditch	50%	Foos watercress, floating sweet grass, common reed, great willow herb, wolf cress	Arable	Moderate - vegetation clearance	Ruderal, scattered scrub	Common nettle, great willow herb, hawthorn, elm, blackthorn	Yes	Yes		Earth, clay loam	
W198	Static	2	0		Steep > 45°	1.6	Yes	Ditch	100%	Grass, common reed	Arable	Minimal - farm track, recreation	Grass, tall ruderal	Grass, burdock	No	No		Earth	
W199	Sluggish	2	0.1	Only likely in periods of prolonged heavy rain	Shallow < 45°	1.5	Yes	Stream	1%	Watercress, bulrush	Arable, landfill	None	Scrub	Bramble, nettle, ivy, hawthorn	No	Yes		Clay loam	
W200	Static	1	0	No significant change in level. May increase in periods of heavy rain	Steep > 45°	0.75	Yes	Ditch	60%	Bramble, bulrush, hawthorn	Arable, landfill	None	Scrub	Bramble, hawthorn	No	No		Clay loam	
W201	Sluggish	0.5	0.05		Steep > 45°	2	Yes	Ditch	100%	Nettle, grass	Arable	None	Hedgerow, rough grassland	Bramble, willowherb, hawthorn, oak	No	Yes		Earth	
W202	Sluggish	1	0.1	Infrequent	Steep > 45°	2	Yes	Ditch	20%	Nettle, bramble, common reed	Arable	None	Dense scrub	Hawthorn, nettle, bramble	No	Yes		Earth	
W206	Static	2	0.5	Likely to fluctuate regularly	Steep > 45°	3	Yes	Ditch	70%	Common reed	Rough grassland	Moderate - some reprofiling	Tall ruderals, semi-improved grassland	Common nettle, false oat grass	Yes	Yes		Earth	
W208	Slow	0.8	0.2	Water level appears to have been around 30cm higher recently	Shallow < 45°	1	Yes	Stream	10%	Bulrush, pondweed, water starwort	Golf course, community woodland	Major - regularly mowed	Amenity grassland, dense scrub, scattered trees	Nettles, brambles. abundant grass sp. cow parsley, mostly hawthorn, blackthorn, elder	Yes	Yes		Earth	
W209	Slow	1.5	0.75		Shallow < 45°	1	Yes	Pond	10%	Duckweed, water lily	Woodland, rough grassland	Minimal - some recreation	Scrub	Willow sp., hawthorn, alder	Yes	Yes		Earth	
W210	Static	20	0	Low frequency and not significant in height	Shallow < 45°	1.75	Yes	Pond	100%	Common reed, bulrush	Arable, landfill	None	Scrub, trees	Bramble, field maple, oak, hawthorn	No	Yes		Clay loam	
W211	Sluggish	1	0.4		Steep > 45°	1	Yes	Ditch	90%	Grass	Public recreation	Major - heavily managed, lots of recreation	Grassland, hard standing	Grass, thistle sp.	No	Yes		Earth	
W212	Static	0.7	0.05		Steep > 45°	1	Yes	Ditch	60%	Bulrush, grass	Fishing lake	Moderate - fishing lake	Semi-improved grassland, scrub	Grass, bramble, hawthorn	No	Yes		Earth	
W213	No access																		
W215	Static	2	0.1	None	Steep > 45°	1.5	Yes	Ditch	20%	Grass	Arable	Moderate - vegetation clearance	Grassland, scrub, scattered trees	Grass, nettle, bramble, oak	No	No		Earth	
W217	No access																		
W219	Static	5	0		Shallow < 45°	1	Yes	Ditch	100%	Common reed	Public recreation	None	Scrub	Bramble, hawthorn	No	Yes		Earth	

Waterbody number	Current	Width	Depth	Level changes	Bank profile	Bank height	Suitable for burrowing	Riparian habitat	Percentage of in channel vegetation	In channel vegetation	Land use	Management and disturbance	Bankside Phase 1 habitat type	Bankside vegetation	Suitable for otter	Suitable for water vole	Signs and species of key predator	Bank substrate
W220	Static	12	0.1		Steep > 45°	2	Yes	Pond	90%	Bulrush, sedge sp.	Farmyard	None	Dense scrub	Bramble	No	No		Earth
W222	No access																	
W223	No access																	
W224	Static	50	2	None	Shallow < 45°	2	Yes	Pond	0%	None	Golf course	Moderate - recreation	Reed	Common reed	Yes	Yes		Clay
W225	Static	1.5	0.2	None	Steep > 45°	1.5	Yes	Ditch	95%	Nettle, thistles	Arable	None	Tall ruderal, grass	Thistle sp., grass, nettle	No	No		Clay
W226	Fast	3	0.5	None	Steep > 45°	4	Yes	Stream	80%	Sedge sp.	Arable	None	Tall ruderal	Cow parsley, hogweed, nettle	Yes	Yes		Clay
W227	Static	30	0.5	Rare	Shallow < 45°	0.5	Yes	Lake	5%	Typha sp., common reed	Moat	None	Scrub, tall ruderal	Greater willowherb, bramble, bittersweet, nettle, creeping thistle	Yes	Yes	Cats	Earth
W228	Static	1	0.2	None	Steep > 45°	3	Yes	Ditch	100%	Nettle, greater willowherb, grass sp.,	Arable, pasture, track	None	Tall ruderal, semi-improved grassland	Creeping cinquefoil, brome sp., ribwort plantain, nettle, bristly ox tongue, greater willowherb	No	Yes		Stone, earth
W229	Static	2	0	None	Steep > 45°	2	Yes	Ditch	0%	None	Woodland, pasture	None	Woodland	Oak, beech, ash	No	No		Earth
W230	No access																	
W231	No access																	
W232	No access																	
W233	No access																	
W234	No access																	
W235	No access																	
W236	No access																	
W240	Static	5	2		Shallow < 45°	1.5	Yes	Dyke	60%	Common reed, bulrush, duckweed	Arable	Minimal - some recreation	Tall ruderals, scrub, woodland	Reed, teasel, nettle, hawthorn	Yes	Yes		Earth
W241	Static	7	1	With rainfall	Steep > 45°	5	Yes	Lake	15%	Bulrush, willows, gipsywort	Arable	None	Dense scrub, semi improved grassland, scattered trees	Bramble, willow, ash, nettle, gipsywort	Yes	Yes		Earth, sand, gravel
W242	Not surveyed																	
W243	Not surveyed																	
T1	Unknown – all data based on Tilbury2 data with no HSA available																	
T2	Unknown – all data based on Tilbury2 data with no HSA available																	
T3	Unknown – all data based on Tilbury2 data with no HSA available																	
T4	Unknown – all data based on Tilbury2 data with no HSA available																	
Tilbury2 mitigation area	Unknown – all data based on Tilbury2 data with no HSA available																	

Annex C Water vole waterbody photos

C.1.1 Table C.1 below shows the photos of the waterbodies containing water vole where habitat loss is anticipated.

Table C.1 Photos of confirmed water vole waterbodies

Waterbody number	Population estimate	Photos
W008	Low	
W009	Low	
W014	Low	

Waterbody number	Population estimate	Photos
W017	Medium	
W020	Medium	
W021	Medium	
W024	Medium	

Waterbody number	Population estimate	Photos
W030	Assumed high	
W032	Medium	
W033	Low	
W034	Medium	

Waterbody number	Population estimate	Photos
W055	Medium	
W056	Low	
W058	Low	

Waterbody number	Population estimate	Photos
W059	High	
W097	Medium	
W100	Low	
W120	Medium	

Waterbody number	Population estimate	Photos
W121	Low	
W143	Low	
W147	Low	

Waterbody number	Population estimate	Photos
W237	Low	
T1	Low	No photo available
T2	Low	No photo available
T3	Low	No photo available
T4	High	No photo available
Tilbury2 mitigation area	Unknown	No photo available

Annex D Water vole surveyors

D.1.1 The table below outlines the water vole surveyors and their experience.

Table D.1 Water vole surveyors experience

Water vole surveyor	Company	Experience
Charlotte Goodayle	Jacobs	Over 5 years' experience as a consultant ecologist. Has carried out water vole surveys across the South East of England.
Craig Robson	Arcadis	Over 30 years' experience as an ecologist. Has carried out numerous water vole surveys across East Anglia.
Danny de la Hey	Arcadis	Over 15 years' experience as a consultant ecologist. Has carried out water vole surveys across the UK.
Dave Andrews	Arcadis	Over 15 years' experience as an ecologist. Has carried out water vole surveys across a number of projects over southern England.
Dave Farrow	Arcadis	Over 30 years' experience as an ecologist. Has carried out numerous water vole surveys across East Anglia.
Duncan Smith	Jacobs	Over 20 years' experience as an ecologist. Has carried out water vole surveys across England and Wales.
Emma Davis	Arcadis	Over 5 years' experience as a consultant ecologist. Has carried out water vole surveys across England and Wales.
Jon Carter	Arcadis	Over 4 years' experience as a consultant ecologist. Has carried out water vole surveys across southern England.
Kora Kunzmann	Arcadis	Over 4 years' experience as a consultant ecologist. Has carried out water vole surveys across southern England.
Mark Lang	Arcadis	Over 20 years' experience as an ecologist. Has carried out water vole surveys across the UK.
Mike Head	Arcadis	Over 20 years' experience as a consultant ecologist. Has carried out water vole surveys across the UK.
Mike Hoit	Arcadis	Over 15 years' experience as an ecologist. Has carried out water vole surveys across a number of projects over southern England.
Nick Downs	Arcadis	Over 20 years' experience as a consultant ecologist. Has carried out water vole surveys across the UK.

Water vole surveyor	Company	Experience
Polly Tayler	Arcadis	Over 10 years' experience as an ecologist. Has carried out water vole surveys across England and Wales.
Sam Marles	Arcadis	Over 10 years' experience as an ecologist. Has carried out water vole surveys across England and Wales.
Suzanne Jenkins	Jacobs	Over 5 years' experience as a consultant ecologist. Has carried out water vole surveys across England.

Annex E Trapping protocol

- E.1.1 The following is from Dean et al. 2016.
- E.1.2 Trapping of water vole can only be undertaken by a person licensed to do so by the relevant Statutory Nature Conservation Organisation (SNCO) (Natural England in England) and would only be carried out by those with sufficient experience to ensure the welfare of the animals.
- E.1.3 Before any water vole trapping begins, the site must be checked and verified clear of the presence of mink. If mink is present, then they must be eliminated before water vole trapping begins wherever practical (failure to do so can result in mink killing captured water vole).

Time of year/weather conditions

- E.1.4 Trapping of water vole should only be undertaken at an appropriate time of year (1st March – 15th April, 15th September – 31st October). Trapping would also not be undertaken during the following conditions:
- Cold conditions – night-time temperatures below freezing (0°C).
 - Hot conditions – daytime temperatures above 20°C.
 - High rainfall/flooding – where water-level rises could be sufficient to flood the traps (the use of floating platforms may allow trapping to continue during minor water level fluctuations but not during major flooding events which would capsize the rafts).
- E.1.5 The weather forecast should be monitored daily during a trapping exercise and the traps would be securely closed or removed if adverse weather conditions arise or are forecast.

Traps

- E.1.6 An ideal metal trap type for capturing water vole is constructed from 1cm x 1cm weld mesh with an aluminium or wooden shelter at one end. Its basic dimensions are 50cm long x 15cm wide x 15cm high. The aluminium shelter sits over the far end of the trap and is 215mm in length. The traps have a mechanism allowing a very light treadle weight and have a simple locking bar fitting in their doors which activates on closure. These traps are light and easy to handle.

- E.1.7 Other trap types which have been used for water vole include folding metal traps, such as those produced by Sherman. These are relatively small in size, and therefore have limited space for bedding and bait which means that the mechanisms can become fouled and need to be checked regularly; they should only be used by those with considerable experience.
- E.1.8 Traps would be thoroughly cleaned, disinfected, rinsed in clean water and dried after use and between trapping sites. In areas with bovine tuberculosis (bTB) care needs to be taken to ensure that the agent is effective against mycobacteria (eg Trigene© is an effective agent whereas Virkon is not).
- E.1.9 Trapping terrestrial water vole is difficult and specialist advice and expertise is required.
- E.1.10 If trapping is undertaken during inclement weather conditions then wooden covers over the nesting areas of the trap help to insulate the bedding area. These can be additionally insulated with a covering of 'bubble-wrap' if poor weather conditions persist.
- E.1.11 Traps must be checked prior to use to ensure that they are in complete working order. Any traps which break or malfunction would be immediately replaced. Each trapping team would have enough traps to allow for a replaceable reserve.

Locating and securing traps

- E.1.12 Traps should be placed at a density of at least one per 10m of bank and should be located parallel to the bank edge and immediately adjacent to latrine sites, or in areas where runs are obvious. The ground beneath the trap should be flattened as far as feasible without damaging the bank to allow the trap to sit securely but ideally placed on a slight incline with the nest chamber highest to prevent submersion in the event of minor fluctuations in water level. All traps should be secured with pegs to prevent them being dislodged.
- E.1.13 Traps must not be set in precarious positions where the movement of captured animals could lead them to fall into water, or in situations where human interference is likely to occur. Where it is necessary to trap water vole in locations used by the public, they should be set in locations that are difficult to reach and be covered with vegetation.

- E.1.14 Traps can also be set on floating platforms (such as mink rafts or purpose-built structures). This approach is particularly helpful in capturing animals from wetland habitat where there is no bank; where the bank is too steep to allow traps to be set safely; where most of the latrines are located some distance from the bank on floating vegetation; or where water levels are likely to fluctuate, such as downstream of an outfall or in an artificially or tidally impounded reach. Floating platforms are also useful where the disturbance of traps by dogs or foxes is likely. They must be sufficiently buoyant and stable to ensure that they can support a water vole's weight (or that of any non-target species) and therefore must be of higher specification than those simply used for undertaking surveys. The traps must be secured to the platform to ensure that they do not roll into the water and the platforms must be secured using canes or similar to prevent them floating away. They also need to be tethered in a way which allows them to rise and fall with changes in water level and they should not be used in situations where there is significant water wash from boat traffic, which could cause them to capsize.
- E.1.15 Each trap must be uniquely numbered with indelible pen and either clearly marked using flags (where interference by the public is unlikely) or their locations mapped accurately to ensure they can be relocated. All trap locations should also be recorded using a hand-held Global Positioning System (GPS).

Provisioning traps

- E.1.16 Traps must be provisioned with dry straw bedding and half a fresh, sweet apple. Additional food can also be provided (eg pieces of carrot). These materials must be checked daily and changed at least every second day.

Checking traps

- E.1.17 Traps should be checked at least twice daily:
- a. Early morning check, between 6am and 10am, with all traps checked by 10am.
 - b. Late afternoon/evening check, before dusk.
- E.1.18 During warm weather conditions a third check in the middle of the day should be undertaken.

Handling captured animals

- E.1.19 Handling of water vole can only be undertaken by individuals holding an SNCO licence or their accredited agents. Captured water vole would be examined upon release from the trap to determine their sex and approximate size (animals can also be weighed when necessary but this procedure can be stressful for the animals so should be avoided if not necessary). They should

then be placed in a suitable container for transportation to the off-site holding facility, such as a standard rodent laboratory cage.

- E.1.20 When water vole are captured, traps should be replaced on the same spot. It is likely that more than one animal would be present. Particular care should be taken to ensure that more than a single trap is placed side by side at any location where very small juveniles (30–50g in weight) have been captured. The chance of catching other sibling litter mates at the same point is high. These can be placed in holding cages together if they are captured at the same location but should not be mixed with any other adults.
- E.1.21 All field staff should be aware that water vole can carry leptospirosis and be familiar with its symptoms, pathways for transmission to humans and the precautions necessary when handling water vole to minimise the risk of infection.

Completion of trapping

- E.1.22 Trapping would be considered to be complete once there has been a period of five days or more, when overnight temperatures are above freezing with no captured animals and there are no new field signs within the capture site. Once completed, a destructive search of the area should be undertaken (see Annex G). Any animals found during the destructive search should be captured with nets or by hand and transported as described above.
- E.1.23 For large trapping exercises it may be appropriate to consider completing trapping in some parts of the site before others to prevent the chances of animals recolonising the cleared areas.

Annex F Fencing Design

F.1.1 Below are the indicative fencing designs for the water vole exclusion fencing as described in the *Water Vole Mitigation Handbook* (Dean et al, 2016).

Plate F.1 Water vole fencing cross section

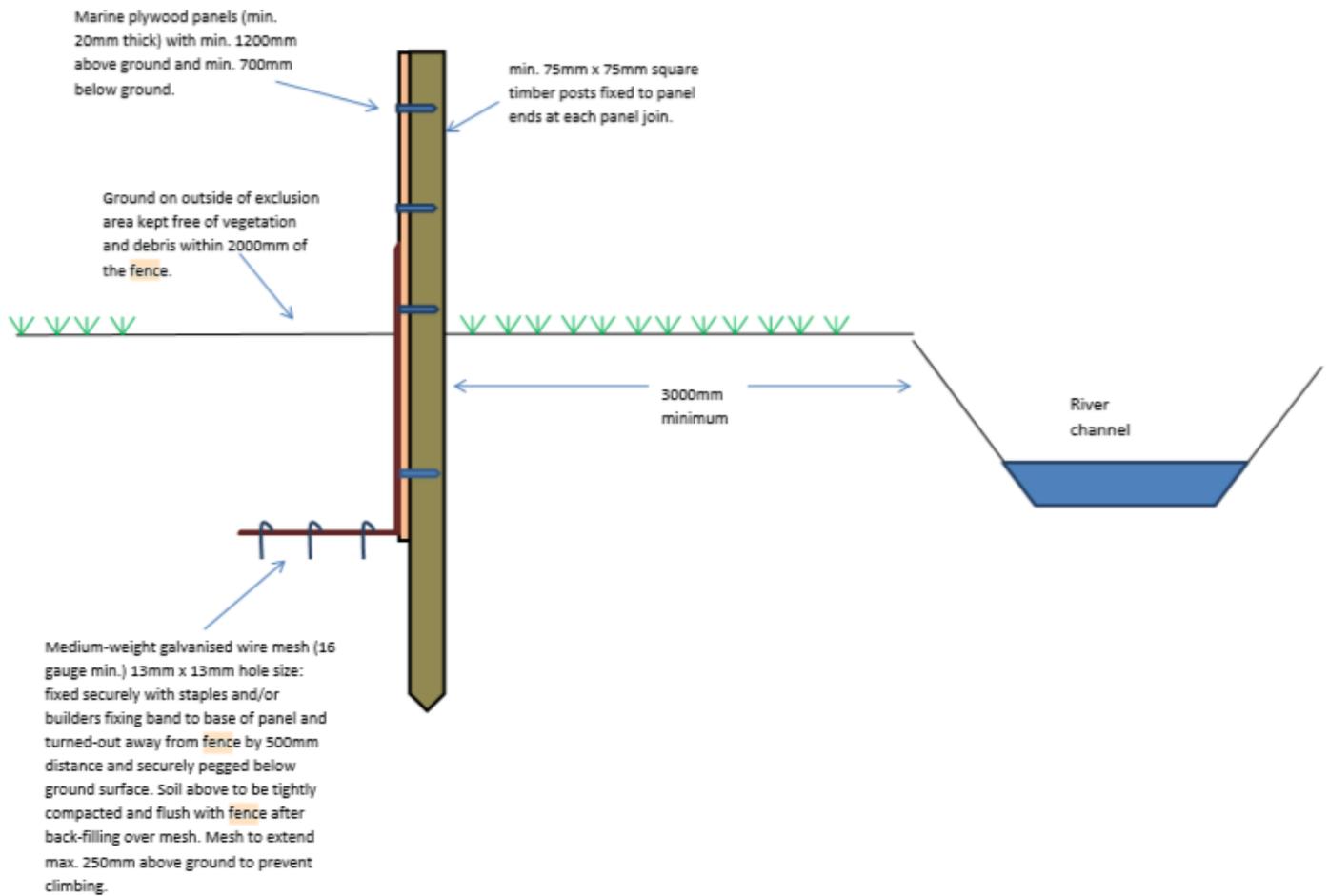
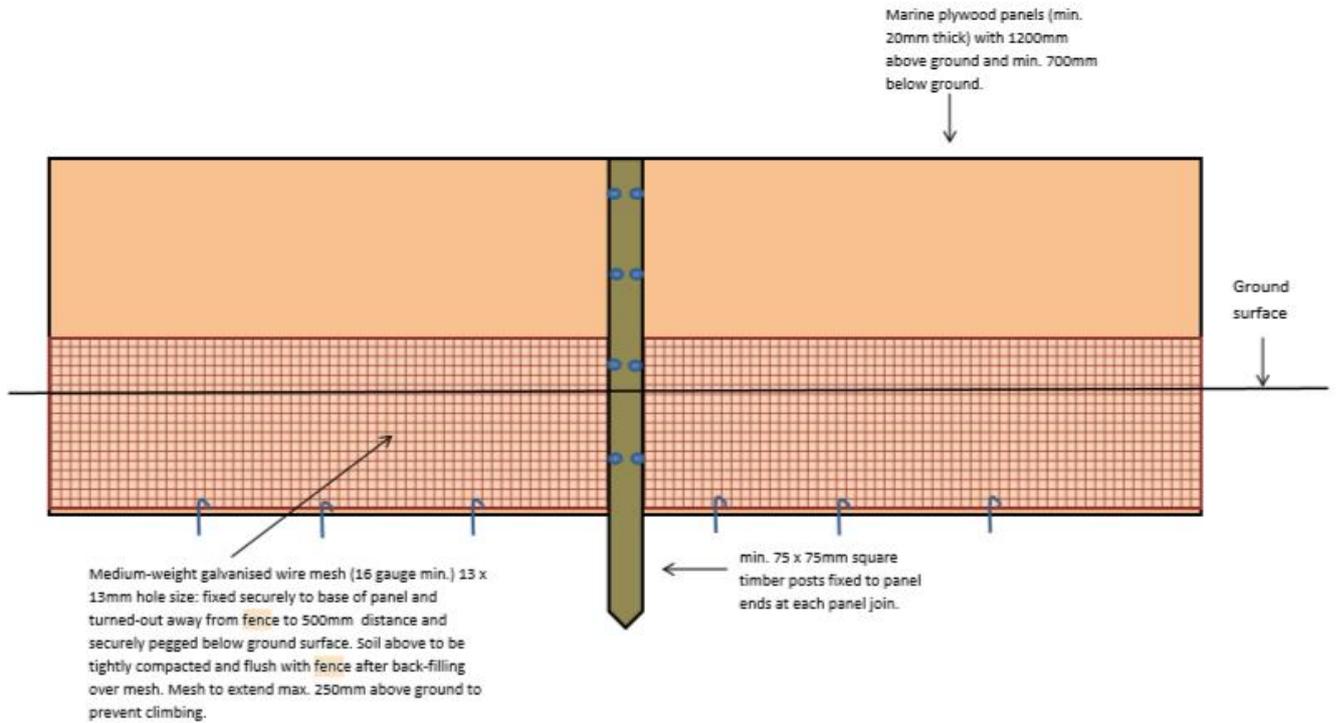


Plate F.2 Water vole fencing (front on view)



Annex G Destructive search protocols

G.1.1 The following steps are taken from Dean et al. (2016). Note, this refers to displacement processes but is equally applicable for a site once trapping has removed water vole.

Table G.1 Water vole displacement steps

Step	Action
1	Before vegetation removal, identify and mark the position of all burrows in the working area so that these can be located later to ensure that they are not blocked. Confirm the absence of other constraints to the works, such as nesting birds.
2	Remove vegetation on the bank face within the area subject to development works, plus at least an additional 3m either side of the working area, and on the bank top (i.e. at least 3m back from the bank). This would be achieved using a strimmer until only bare earth remains. If feasible, also cut the emergent aquatic vegetation located along the water margin to below water level.
3	Rake off and remove any arisings from the cleared area.
4	Check that burrow entrances have not become blocked and remove any latrines or feeding remains.
5	If feasible and environmentally acceptable, combine with de-watering of the affected section of watercourse.
6	Leave the strimmed area intact for five days to allow animals time to relocate.
7	Re-survey the site for fresh evidence of water vole. If there is no evidence that water vole are still present, undertake a destructive search of the burrows (under the supervision of a suitably experienced ecologist) as follows.
a	Excavate burrows to ensure that no animals are present. Hand tools would preferably be used, and excavation would extend as far as feasible, bearing in mind practical health and safety constraints.
b	Using an excavator with a toothed bucket, rake through the turf and topsoil on the bank face and top, on the side that the excavator is positioned. Then with a second or third sweep of the bucket, remove the turf and topsoil to a depth beyond which any burrows would be present.
c	Remove in-channel vegetation within 50cm of the toe of the bank to prevent regrowth.
d	Smooth the surface of the bank using an excavator with a ditching bucket (or the back of the toothed bucket). Ensure that any lumps of topsoil that might provide a refuge for water vole are removed.
e	Repeat the process for the opposite bank (if necessary).
8	Ensure that water vole do not return prior to the development works commencing by: Undertaking the works within five days of completing the destructive search; or In-filling the channel immediately following the destructive search; or Maintaining the works area as bare ground until the works have taken place. This is likely to require a repeat scraping/smoothing of the banks; or Covering the ground with a suitable matting to ensure that vegetative regeneration cannot occur; or Installing suitable water vole resistant fencing to prevent water vole returning.

Annex H Sites with facilities to hold water vole in captivity

- H.1.1 The following organisations are believed to have the facilities to hold water vole in captivity (should this be required if the weather turns cold (night-time temperature below freezing (0°C)) during an autumn trapping programme):
- c. Wildwood Ecology: BIAZA registered
 - a. Chester Zoo: British and Irish Association of Zoos and Aquariums (British and Irish Association of Zoos and Aquariums (BIAZA) registered.
 - b. Derek Gow Consultancy.
 - c. M&H Ecology.
- H.1.2 All facilities and care regimes for water vole must be fully compliant with the legislative requirements present in the Welfare of Animals Act (2006). Ideally animals would be held by organisations registered with the BIAZA or in similar facilities (such as those organisations listed above) which can maintain a consistently high standard of captive care and maintenance.
- H.1.3 All operatives handling water vole must be suitably experienced and use appropriate equipment.

Annex I Soft release protocol

I.1.1 The following is taken from Dean et al. (2016).

Introduction

I.1.2 Water vole that are relocated by trapping should be released into their receptor site using a soft-release technique. Although there is a lack of evidence of the additional benefits of soft-release versus hard-release (or indeed of the potential benefits of a longer-term soft-release than that described below) it is the professional opinion of the authors that the use of soft-release pens is likely to increase the number of animals surviving at release sites by providing animals with time to adjust to their new location. There are two basic methodologies for this process:

- a. The creation of pens with no base that are sunk into the ground to a depth of at least 25cm adjacent to the water's edge. These can be complete (fold-up) units or constructed from separate materials.
- b. Complete cages positioned in the riparian vegetation next to the water's edge from which animals cannot escape until a front section (with 6cm diameter holes in either side of a predator-proof baffle) is fitted.

I.1.3 Although both systems can work well each has its advantages and disadvantages discussed in the following sections.

Pens with no base

I.1.4 Using this release technique the water voles burrow out of the holding pen. Studies of radio-collared individuals (P. Franklin, personal communication) demonstrated that they would remain under these structures in the burrow systems they have established for many days before moving out into the wider environment. Once in position these cages are difficult to move and if water levels fluctuate they can rapidly be submerged. In addition, if they are not designed as complete units and their construction materials leave gaps in the overall structure then the voles can readily escape before they have settled. Under certain ground conditions, such as stony soils, they can be hard to reliably install. They need to be covered at least partially from the weather and securing predator-proof lids can be difficult.

- I.1.5 A successfully used design is constructed from aluminium which folds down for transport and has a hinged lid for feeding access. It is completely weather-proof with a floor area of approximately 45cm x 45cm and a maximum height of 25cm. Once dug in these pens are fitted with a cardboard sheet (5mm thick) in their base through which the water vole have to gnaw through to access the soil beneath. The top lid functions as an access door for feeding and maintenance. These cages needed to be well shaded to avoid them heating up excessively so they would be located to avoid direct or dappled sunlight.

Complete cages

- I.1.6 Using this technique water vole are completely contained. Although they cannot establish burrow systems they would rapidly come and go from both their own and adjacent cages once the fronts are folded under the main cage and a baffle (to deter large predator access) is placed in position. These types of release cages are easier to install in some cases (such as stony soils) and are easier to move if this is needed during the release. The water vole are released from this structure by folding the front section under the main cage and then fitting a baffle with 6cm diameter holes at either side.
- I.1.7 These cages can also be used as an on-site holding facility in situations where the release of water vole needs to be delayed such as to allow vegetation within the receptor site to become better established. In such cases the cages must have a covered section on their top back and sides to prevent the bedding getting damp. This can be achieved by partially covering the cage with a tarpaulin. The pens must be positioned in an entirely secure location where they cannot be removed or interfered with in any way by predators or people. Their position in a receptor habitat must be well above the level of any potential rises in water level.

Release

- I.1.8 If groups of siblings are being released together up to seven individuals can be released using either technique. Family groups of a mother and young can also be released together. In other circumstances, water vole should be released as individuals rather than in groups. Individuals of the same sex should be separated by a minimum of 40m intervals along the waterway (two pens; one containing a male and one a female per 40m length). The pens should be sited as close to the water as feasible in (or near) tall vegetation. Release pens should be situated away from public access. If this is impossible then a security fence may be required to prevent interference.

Provisioning

- I.1.9 Release pens must be checked daily during the relocation operation to ensure that the animals have enough food. They should be supplied with a straw-bale-section (one-sixth of a bale) to provide cover and bedding. In the experience of the authors each water vole should be provided with quarter of a sweet apple, half a carrot and cut external vegetation daily; and the animals should be supported with food for eight days in the dug-in cage system before these are removed leaving the old bedding in place. In the complete cage system they should be supported with food for five days, released on the sixth day and then fed for another three days. Once again, all the old bedding from these pens should be left in situ on the bank. In situations where water vole are to be held in complete cages for longer than six days, as an on-site holding facility (see above), they should also be provided daily with a small bowl of dry alfalfa-rich rabbit feed and drinking water (clip-on water bottles should be attached to the side of the cage). Shallow metal trays 60cm long x 30cm wide x 10cm deep can also be provided as swimming trays. The cages should need to be checked daily to ensure that they are intact and food and water must be replenished daily.

Annex J EWT's reintroduction plan

J.1.1 Below is the statement from EWT outlining their water vole proposals.

Lower Thames Crossing water vole mitigation

Background

Within Essex the LTC will contribute to a loss of connectivity and habitat in a core area of the current water vole range in the county and has the potential to impact both locally and at a county level on the long-term survival of this species. **Water voles are extinct across most of Essex** and in the 2006 survey of the county were only present in **17% of their historic locations** (Dobson & Tansley, 2014). The majority of the population now lives in the coastal fringe and is therefore disproportionately impacted by development pressures along the Thames marshes, and sea level rise.

“ Water voles are extinct across most of Essex, present in just 17% of their historic range. The majority of the population now lives in the coastal fringe so is disproportionately impacted by development pressures. ”

Nationally, Nature Recovery Networks are at the core of what The Wildlife Trusts wish to see from the new Environmental Bill, and were referred to in the draft legislation prior to the December general election. Essex Wildlife Trust is also embarking on an ambitious new Strategic Plan for 2020-2025. One of the over-arching themes crossing all aspects of our work will be **Connectivity**. River catchments are a key component of this work and provide thriving networks for species such as fish, otter and water vole.

The LTC coincides with the development of the Waterlife Recovery East (WRE) project. This pilot mink eradication scheme could have National consequences for water vole conservation but requires large scale funding to achieve. Essex forms a significant part of the 60km buffer zone for the pilot, which aims to eradicate mink in much of Norfolk and Suffolk to protect vulnerable water voles and other native species. Mink will be entirely removed from a core zone spanning 5500 km², with an outer zone acting as a similar sized buffer but in range of potential mink incursion. Steering Group and project members include:

- County Wildlife Trusts (Essex; Suffolk; Cambs, Beds and Northants; Herts and Middlesex, Lincs)
- RSPB
- The Norfolk Rivers Trust
- Norfolk County Council
- Norfolk Mink Project
- The Mid Level Commissioners (Cambs Fens Internal Drainage Board)
- BASC
- Countryside Restoration Trust
- Angling Trust
- Environment Agency
- Anglian Water
- Cambridge University (DNA analysis)
- Water Management Consortium and Doncaster East Internal Drainage Board



Restoring Connectivity in Essex – Colne and Blackwater Catchments

Mink and water voles

Within the zone allocated to Essex to buffer the WRE pilot and expand water vole range, the Rivers Colne and Blackwater/Pant form the main boundary. The Colne has been the subject of funded mink control (2009-2014) but now relies on volunteers, and mink sightings have increased. The Blackwater has only had light coverage by volunteers and there are only a few scattered records of water vole. Contacts within both catchments have been established and there are suitable areas of habitat for water vole reintroduction to take place if mink are tackled in the catchments, preferably as part of the WRE project.

eDNA Study

Both catchments are currently the focus of a pilot project to track mammal species using environmental DNA water sampling – a new technique not attempted at this scale before. Salford University and Essex Wildlife Trust are attempting to develop a technique that can be cost effective at a landscape scale and will allow the presence of mink and water voles to be detected even in the absence of field evidence.

Funding a project in Essex

There will be significant costs to setting up a project in Essex as part of the WRE and some of these could form the basis for freeing up significant habitat to receive water voles from the LTC.

To resource the mink control effectively would require a full-time member of staff, hosted by EWT, and the casual employment of 'on call' trappers or ecological consultants to monitor the messages sent from the Smart Traps. This work would be much less intensive than the original River Colne Project where trappers had to visit every trap every day. With smart traps they would only need attention when triggered. A project minimum of 5 years would be required to deliver the eradication of mink although the project may continue after this initial period if future funding becomes available.

By integrating with a Regional Scale mink eradication pilot, previously unviable habitat can be released for water vole translocation from the LTC. The potential risk is that the overall scheme fails to attract the level of funding required to roll it out regionally, however the existing work of the Eastern Region Mink Control Group over the past 20 years, has kept mink numbers down and does secure some protection from the Suffolk border even should the WRE project fail to materialise during the life of the LTC project.

Map 1 WRE Project area initial proposal
Green: eradication pilot
Orange 30km inner buffer – eradication
Red 60km full buffer, eradication but mink incursions likely



Project options

The key factors to consider are:

- The LTC will disproportionately impact water vole populations in Essex by removing habitat in some of the last remaining 17% of the county that contains water voles.
- In addition the finished road will compromise connectivity in a core area of habitat for the species, limiting future prospects for a Nature Recovery Network along the Thames. Note:- This is also a corridor being newly colonised by otters utilising the coast and estuaries to disperse.
- Essex Wildlife Trust have successfully delivered a catchment scale water vole reintroduction in partnership with the DP World container port development on the Thames. We have a proven track record of working strategically with partners at this scale.

To address the main issues within the footprint of the works area is extremely problematic, however by working with the strategic plan for water voles in Essex and the Eastern Region, water vole habitat along the upper reaches of the River Colne and Blackwater catchments could increase connectivity and the distribution of this species, compensating for losses in the south of the county.

Neither of the proposals listed overleaf include the costs of site clearance of water voles by trapping prior to translocation. This would need to be handled by a competent consultant with the facility to handle water vole quarantine and medical checks. It should be noted that this work would be required regardless of whether a site-based, or the more strategic approach outlined above, were employed.

Darren Tansley
River Catchment Coordinator – Essex Wildlife Trust

Reference

Dobson, J. & Tansley, D. (2014) *Mammals of Essex*. Essex Field Club, London



Annex K Health Screening

K.1.2 The following health screening plan is taken from the *Water Vole Mitigation Handbook* (Dean et al, 2016).

Basic Health Screening

K.1.3 If an individual water vole is in obvious poor condition, then veterinary advice should be sought and translocation of that individual should be halted. Symptoms that trigger concern include the animal exhibiting diarrhoea, being underweight, having an open wound, dental issues (e.g. an obvious abscess or over grown teeth), significant fur loss or skin infection, noticeable harsh breathing, discharge, a heavy ectoparasitic load or tumours.

K.1.4 If more than 10% of animals die whilst being trapped or held in captivity, then every effort should be made to preserve cadavers and veterinary advice should be sought.

Translocation distances

K.1.5 Water voles being translocated short distances within the same catchment would not normally be required to be health screened but should be held for release as cohesive populations at the same time. However, if significant numbers display symptoms of concern (see above) or die, then veterinary advice, together with detailed examination of the cadavers, blood, and faeces would be advised before any release. Blood sampling will only be undertaken in extreme circumstances following the sampling methodology as described below, but will not be part of the standard health screening.

K.1.6 Water voles caught within areas known to have bovine tuberculosis (bTB) in badgers and cattle must not be translocated to other bovine TB-free regions of the UK. However, such individuals can be translocated to other bovine TB-positive regions with the consent of Statutory Nature Conservation Organisations (SNCO).

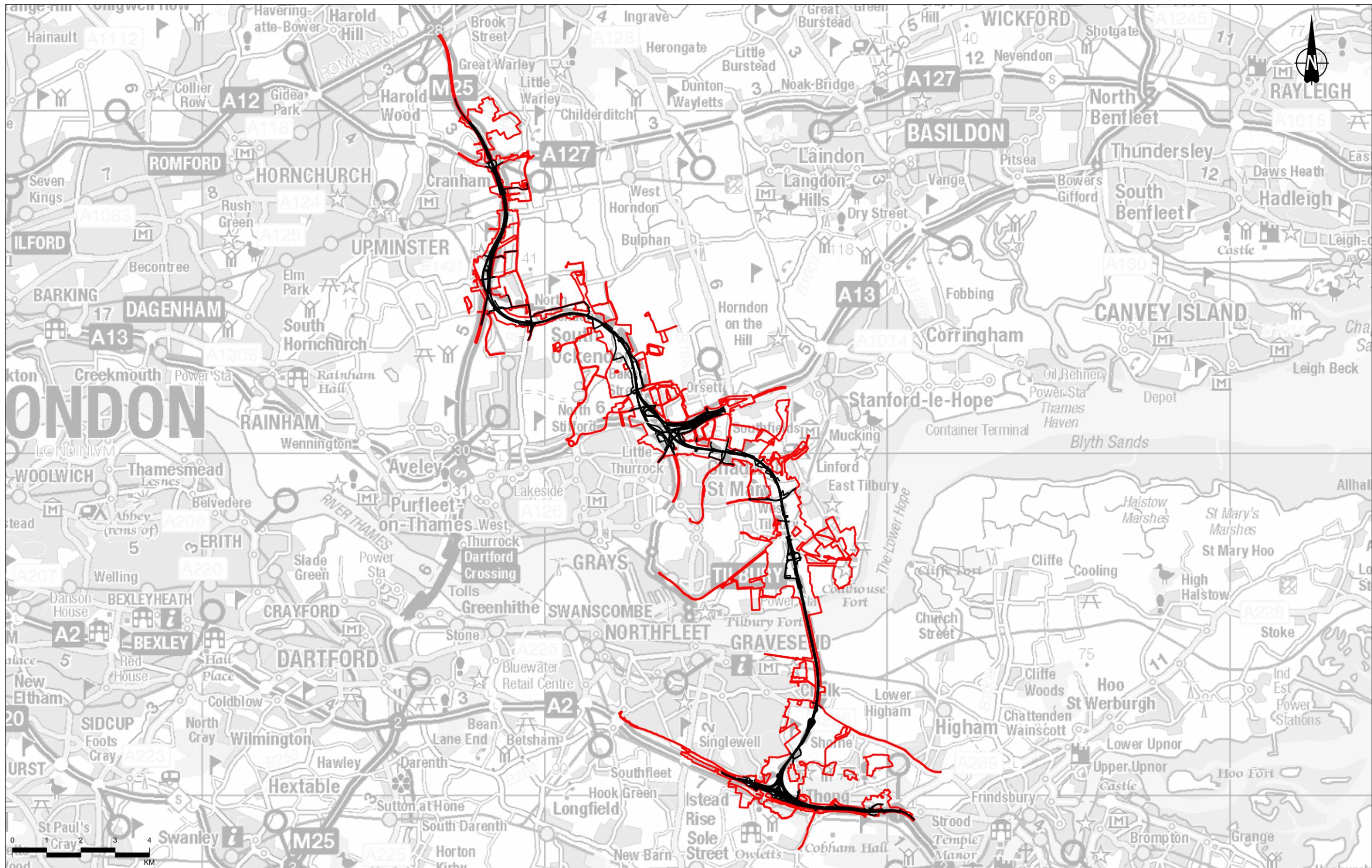
K.1.7 Where water vole populations are being translocated to other catchments or receptor sites outside the catchment, or are being re-introduced from captive bred populations the option of submitting a proportion of the population to fuller health screening should be considered. In the event that any significant conditions such as hantavirus or tularemia are identified in these populations the licensing SNCO's must be informed immediately and specialist advice must be sought regarding the most appropriate course of action.

K.1.8 Information on the baseline prevalence of a range of parasites and pathogens in water vole populations, against which screening results can be contextualised is available (Gelling et al, 2012, 2015).

- K.1.9 No movement of Scottish animals to England or vice versa for release should be attempted, without evidence that the animals being moved are of the same genetic origin as in the release location, through genotyping. Movement of intermediate populations with range overlap zones such as North Wales, Cumbria or Northumberland should be agreed in advance with the relevant SNCOs, and may also require genotyping.

General sampling

- K.1.10 Faeces can be stored for microbiology and parasitology. Faeces from each individual should ideally be stored separately, though combined samples from groups of animals can also be usefully examined to assess the presence or absence of a disease within a group. Any stored faeces should be labelled with the date of collection, collection point and the contact details of the individual responsible for collection.
- K.1.11 Any blood sampling for screening should only be taken by a qualified veterinary surgeon (only permissible if the sampling is to inform directly the care of individual animals. Note that for parasites and pathogens where the diagnostic test takes longer than the anticipated period of captivity, then blood sampling for disease screening would need to be conducted under a Home Office Licence.
- K.1.12 If disease is suspected within any group then cadavers can be frozen for screening. Advice should be sought from a pathologist or veterinary surgeon before freezing as some tests require fresh rather than frozen tissue. It is essential to avoid putrefaction of the sample, and therefore cadavers must be kept chilled.
- K.1.13 In the event of conditions of significant disease being identified in this species the SNCOs, via the mammal society (www.mammal.org.uk) will provide an update to this handbook.



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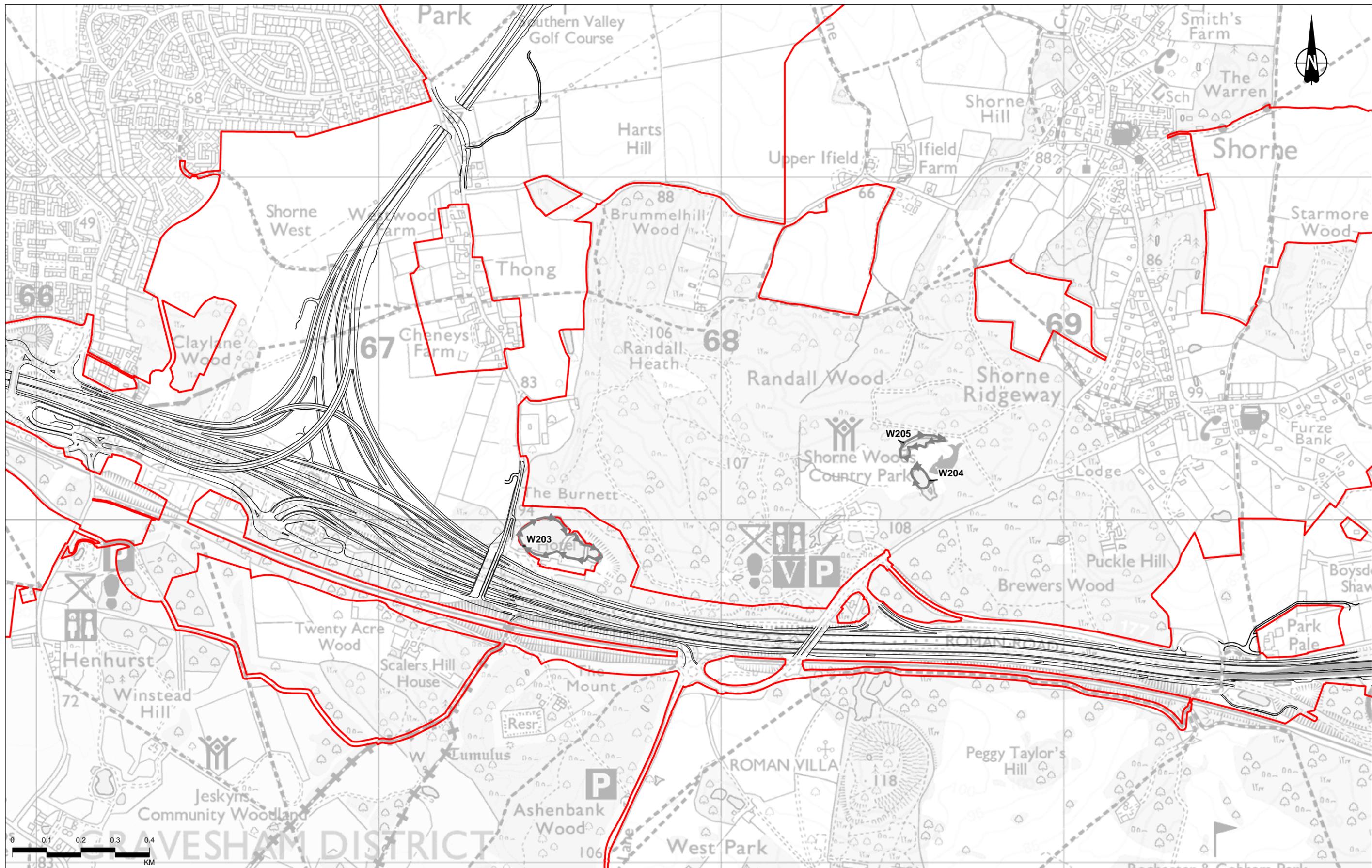
Legend
 Order Limits
 Route alignment



Client

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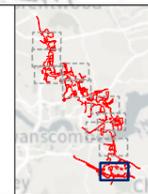


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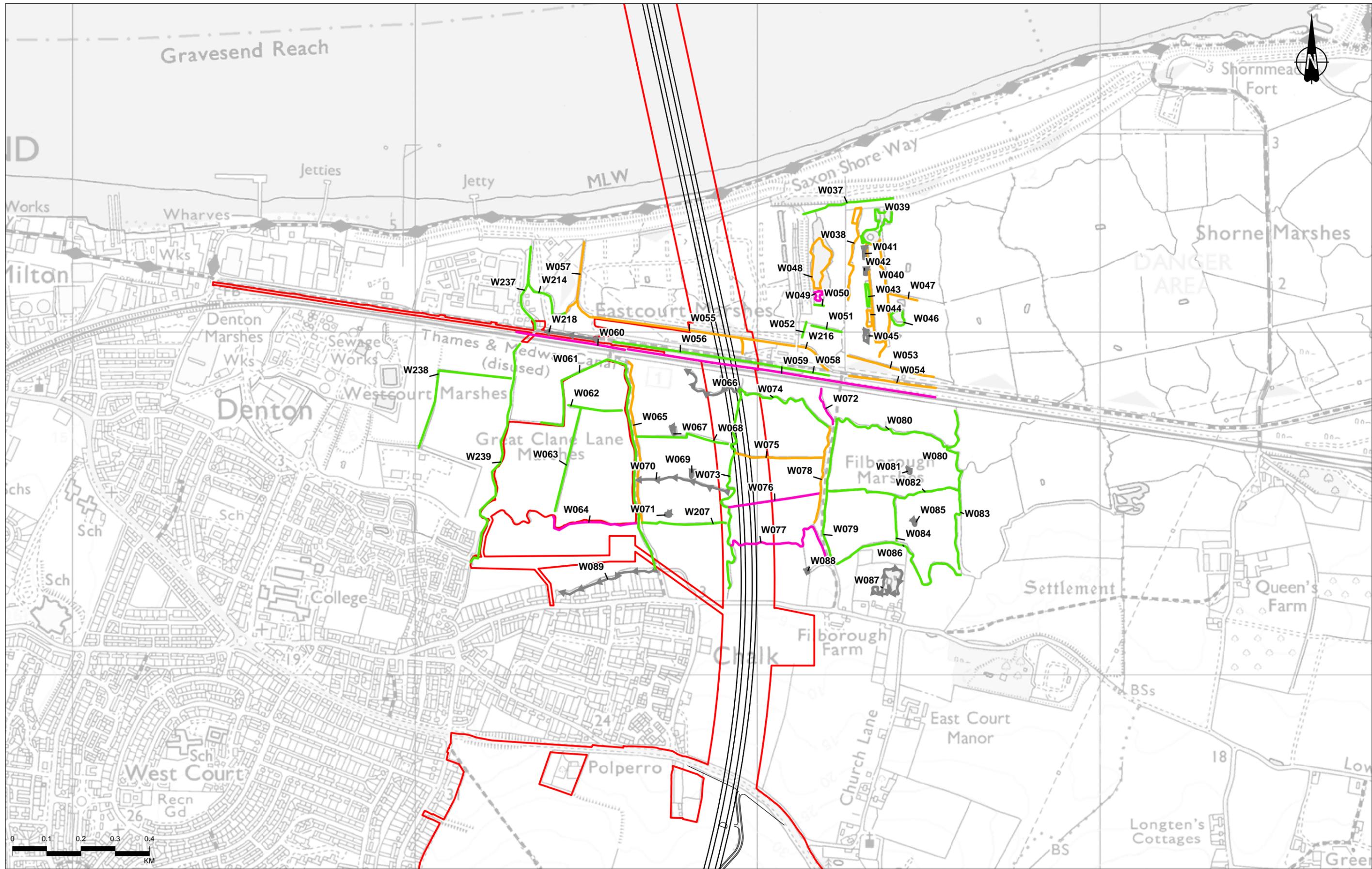
- Order Limits
- Route alignment
- No water vole signs found



Client
national highways

Project
LOWER THAMES CROSSING

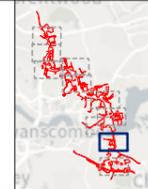
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Drawing Title	Figure 2 - Water Vole Survey Results				
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- Legend**
- Order Limits
 - Route alignment
 - High population
 - Medium population
 - Low population
 - No water vole signs found

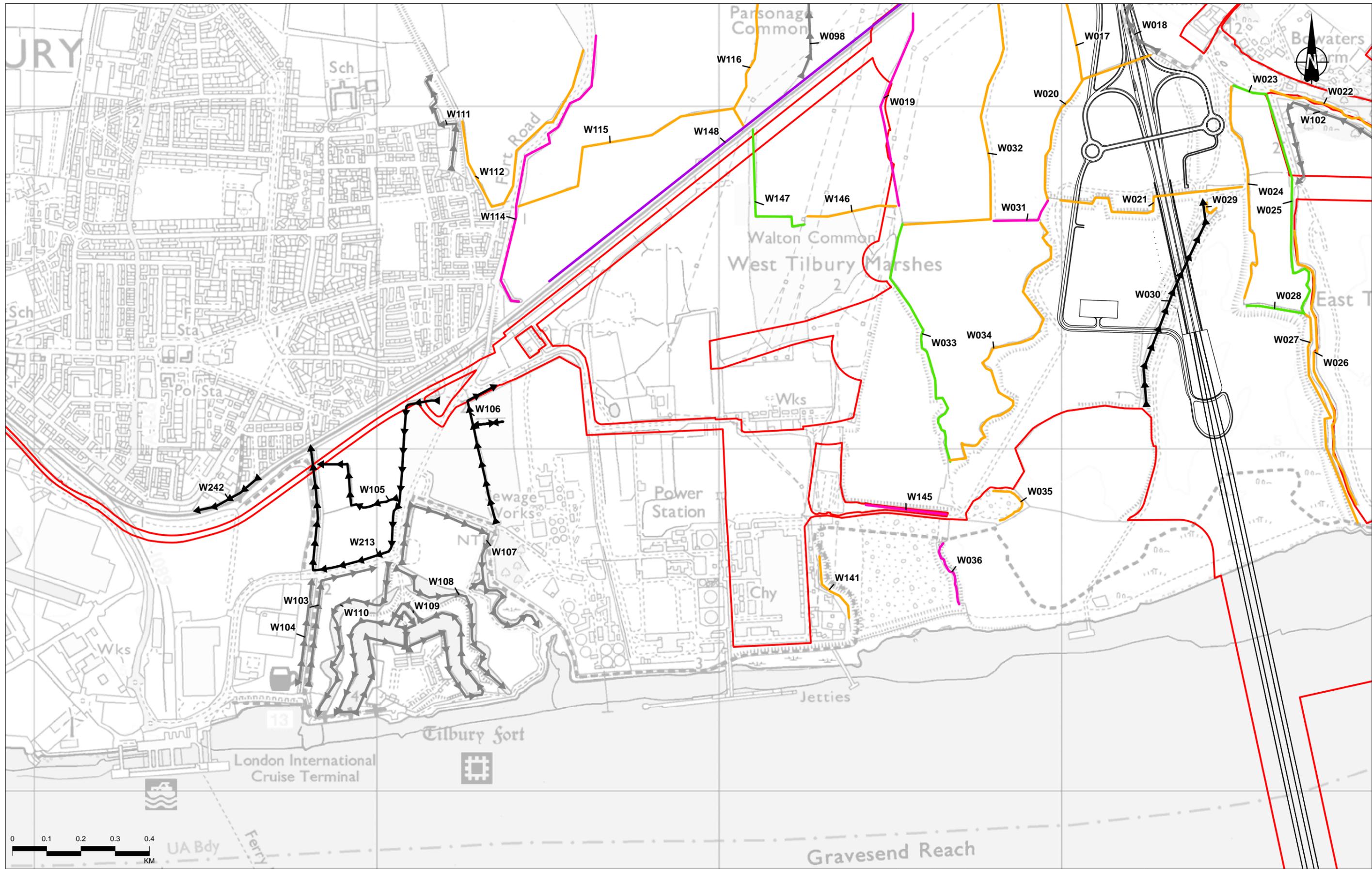


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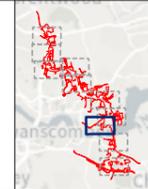
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- Legend**
- ▬ Order Limits
 - ▬ Route alignment
 - ▬ High population
 - ▬ Medium population
 - ▬ Low population
 - ▬ Dry waterbody
 - ▬ No water vole signs found
 - ▬ Not surveyed

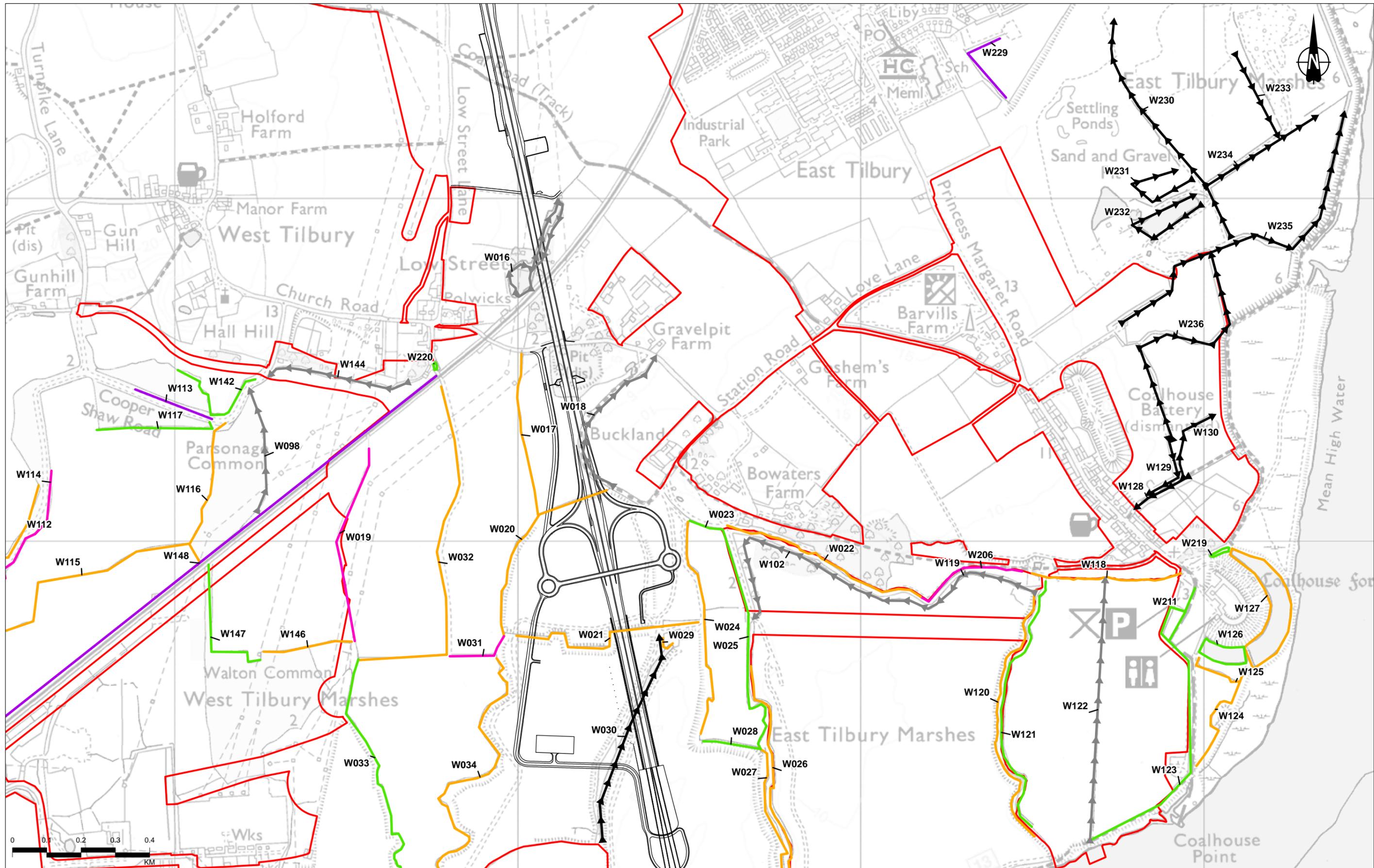


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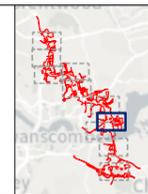
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- Legend**
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 - ▬ Route alignment
 - ▬ High population
 - ▬ Medium population
 - ▬ Low population
 - ▬ Dry waterbody
 - ▬ No water vole signs found
 - ▬ Not surveyed

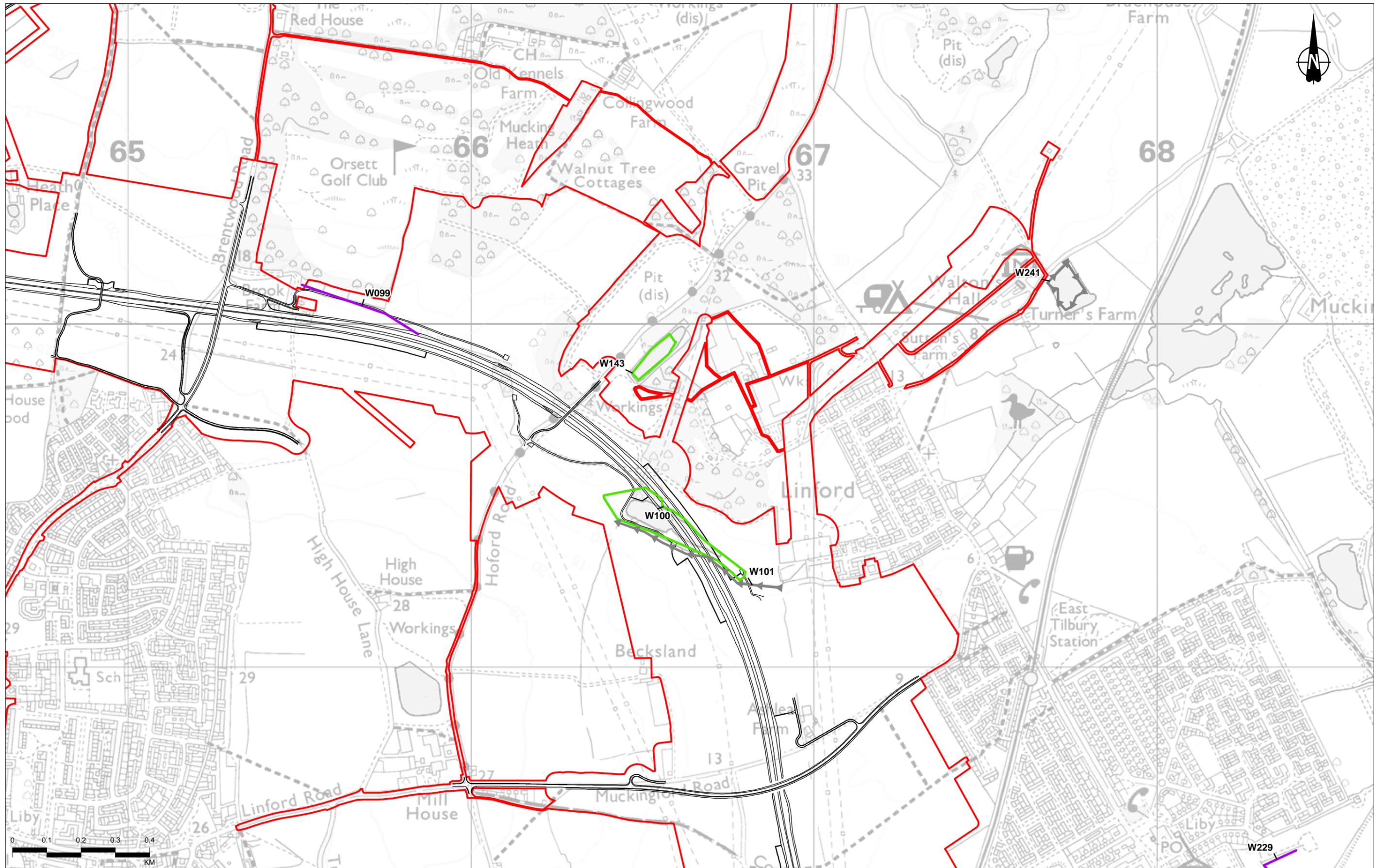


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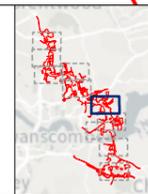
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P02	S8	13/10/2022	DCO Application	LK	SM	BF

- Legend**
- Order Limits
 - Route alignment
 - Low population
 - Dry waterbody
 - No water vole signs found
 - Not surveyed



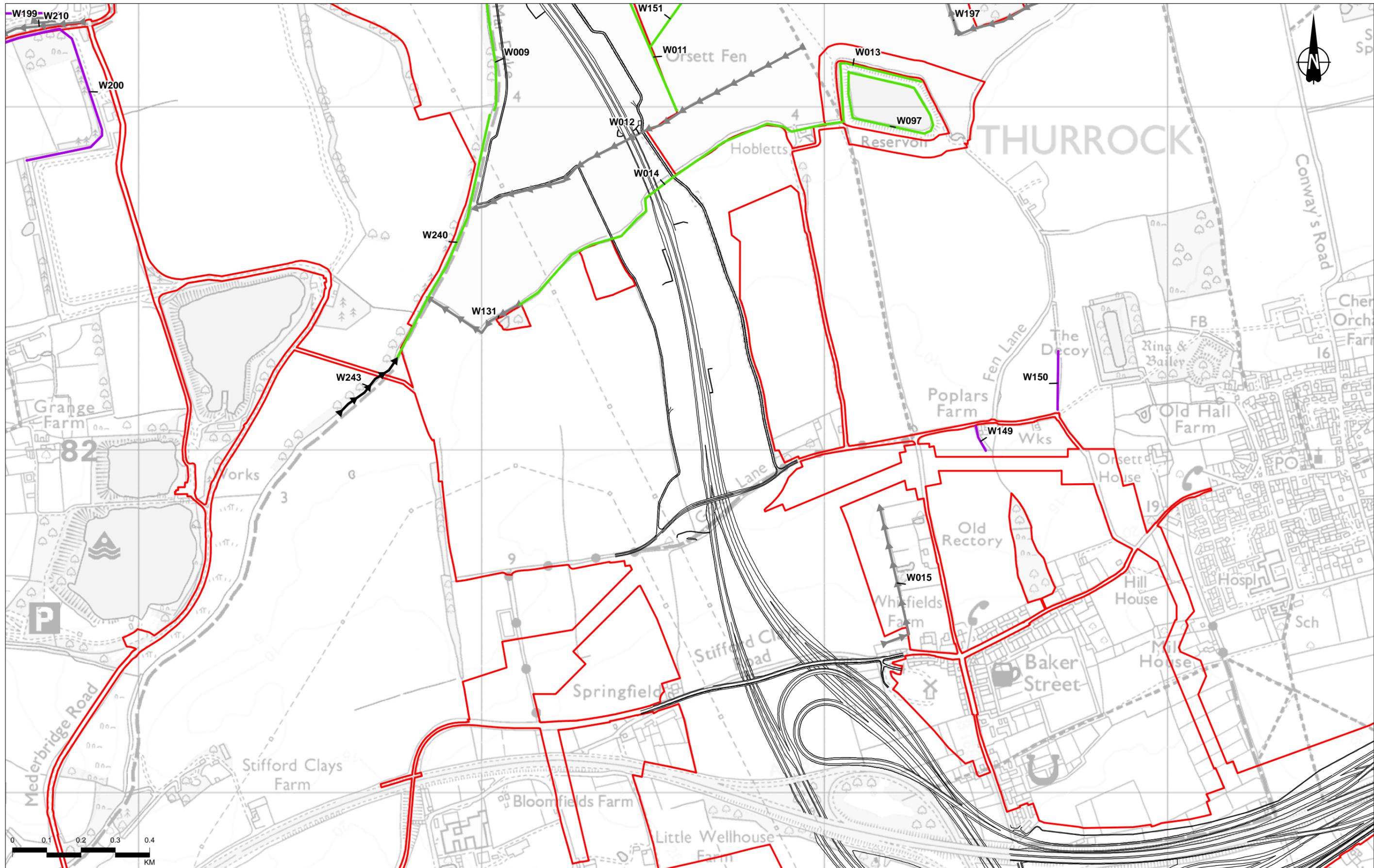
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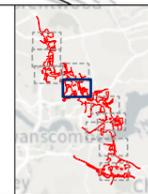
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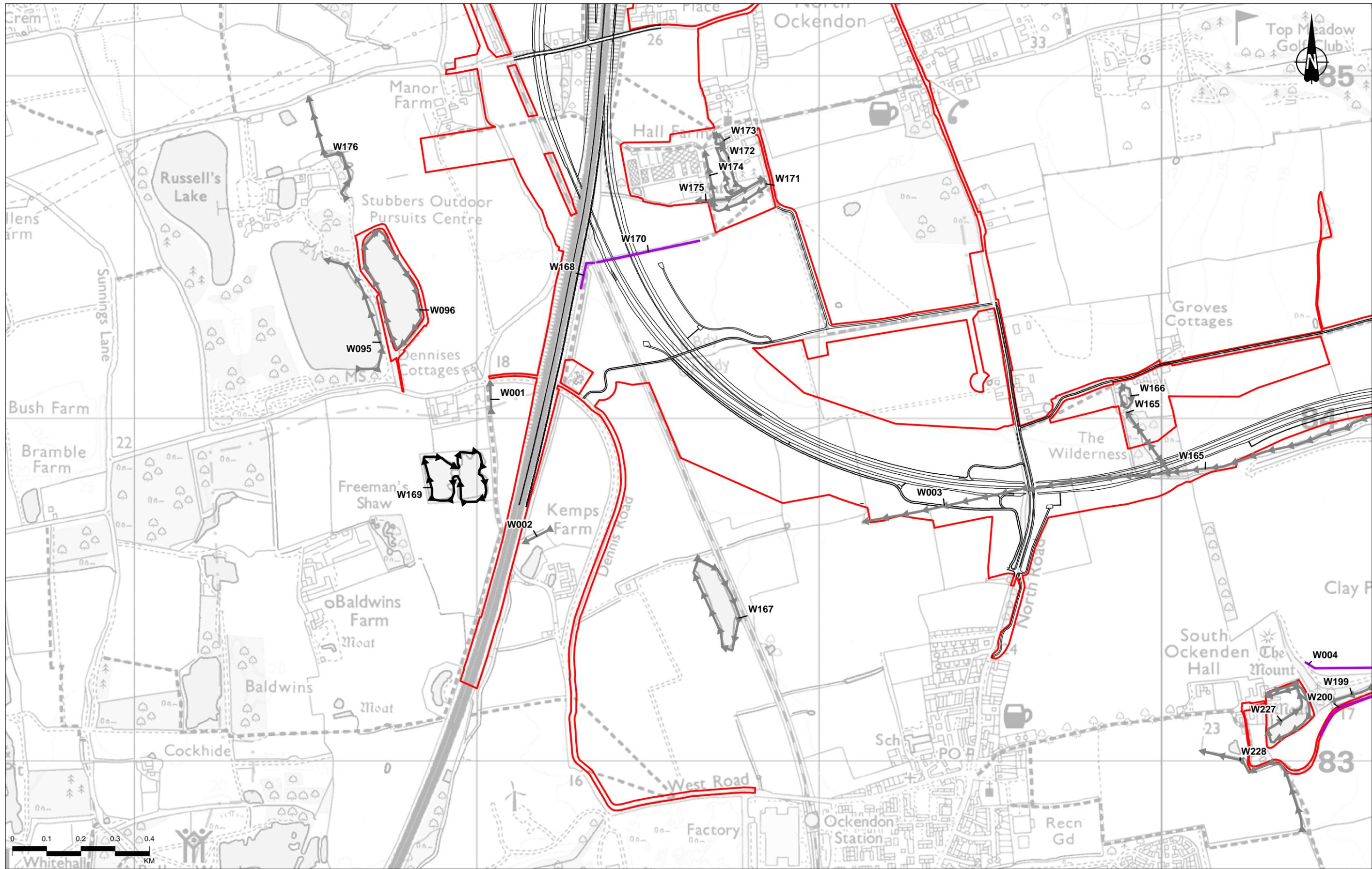
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 - Route alignment
 - Low population
 - Dry waterbody
 - No water vole signs found
 - Not surveyed



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national highways

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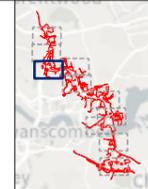
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 - Route alignment
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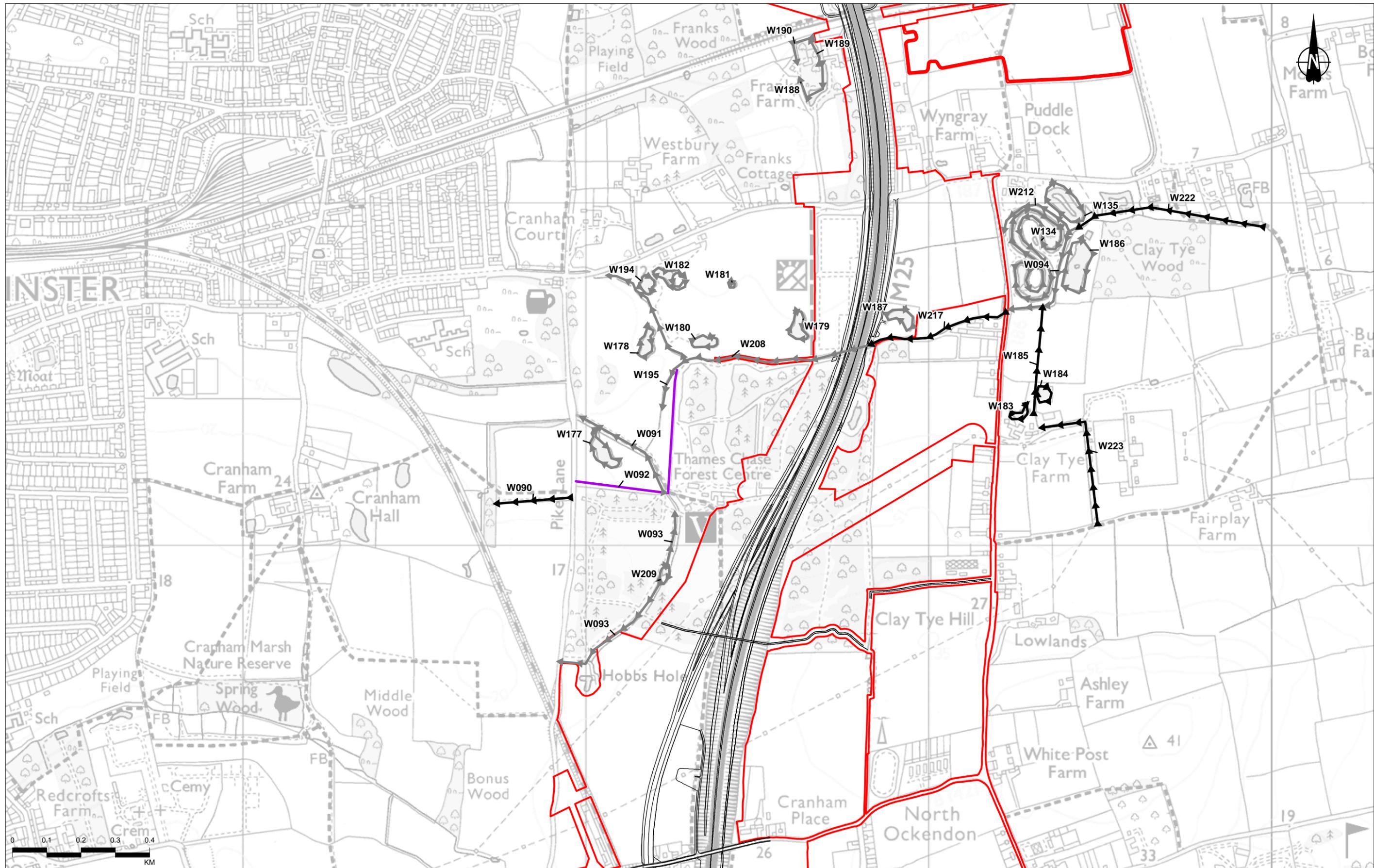
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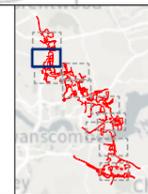
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- Legend**
- Order Limits
 - Route alignment
 - Dry waterbody
 - No water vole signs found
 - Not surveyed

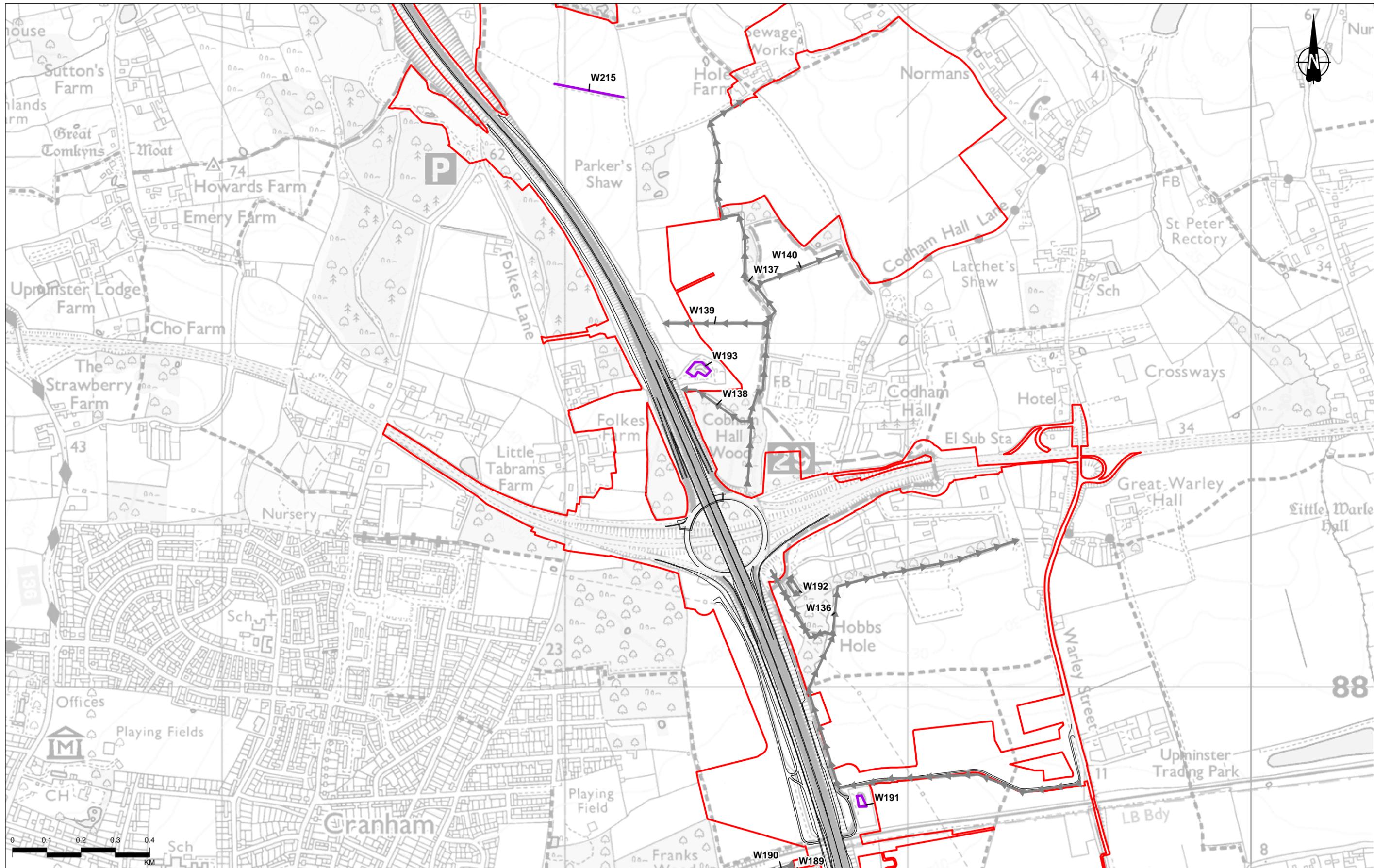


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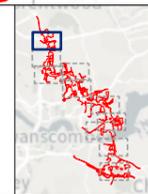
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 - Route alignment
 - Dry waterbody
 - No water vole signs found

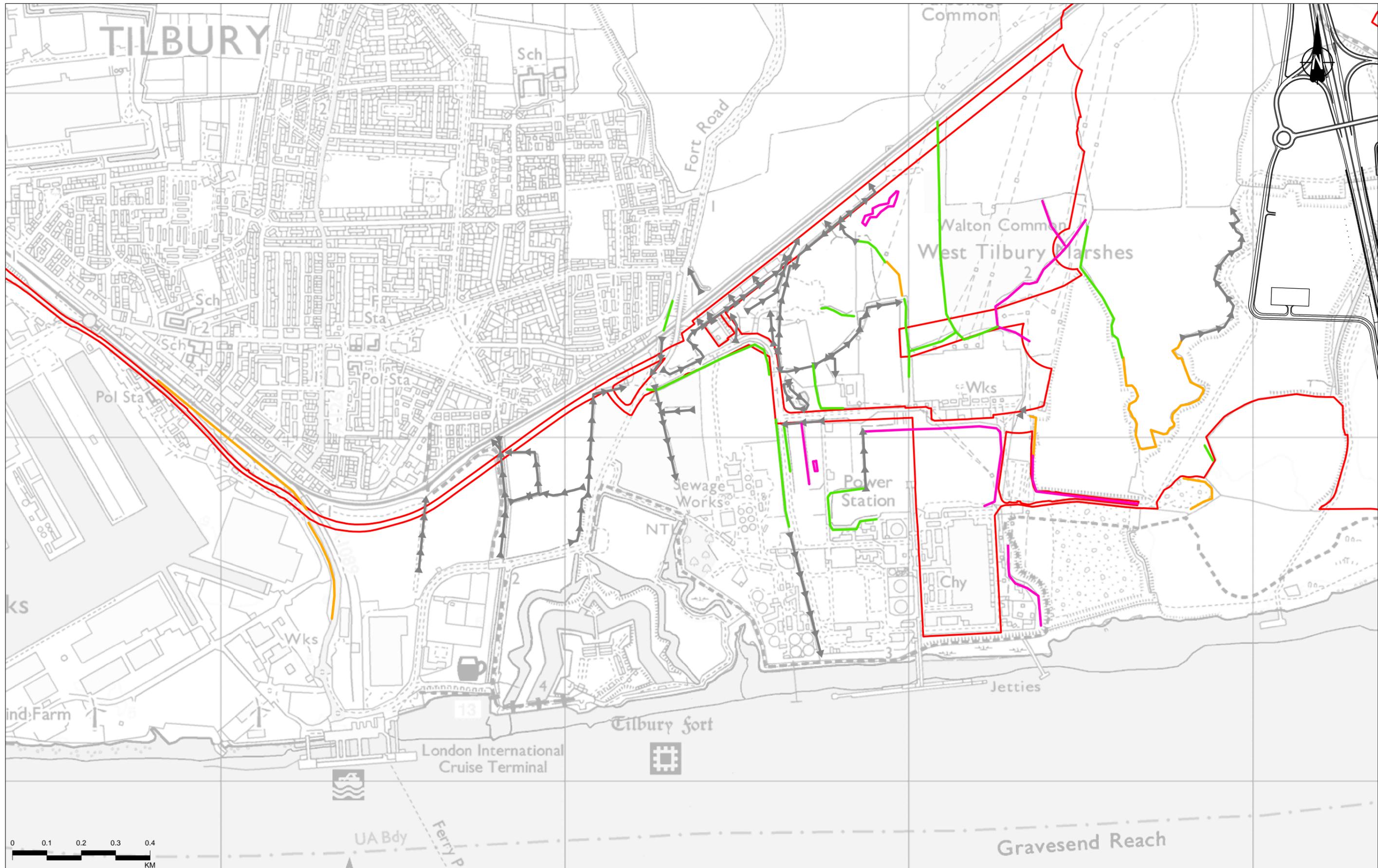


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Legend

- Order Limits
- Route alignment
- High population
- Medium population
- Low population
- No water vole signs found

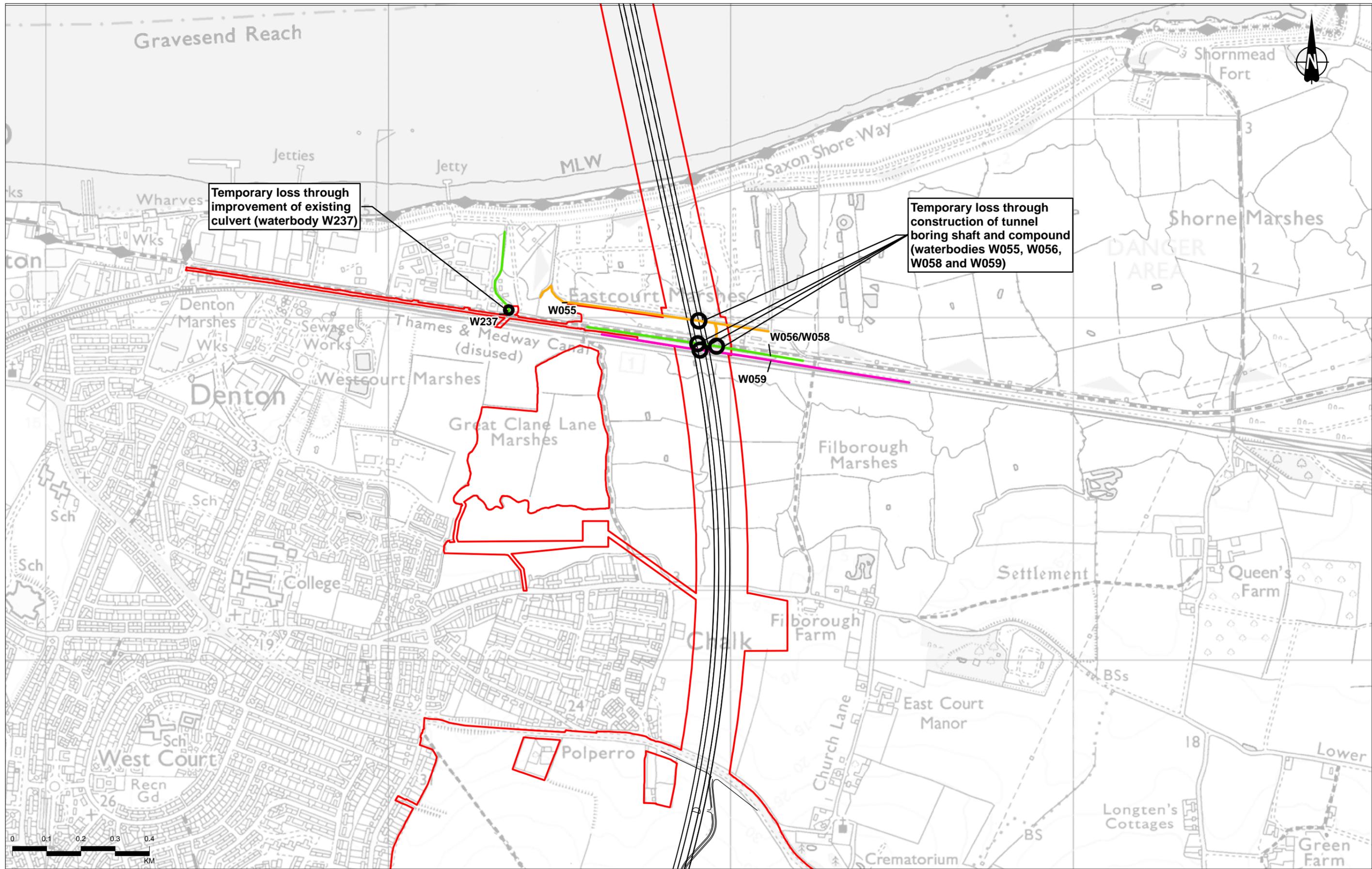


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Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:10,000		
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Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-30087				

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Temporary loss through improvement of existing culvert (waterbody W237)

Temporary loss through construction of tunnel boring shaft and compound (waterbodies W055, W056, W058 and W059)

Legend

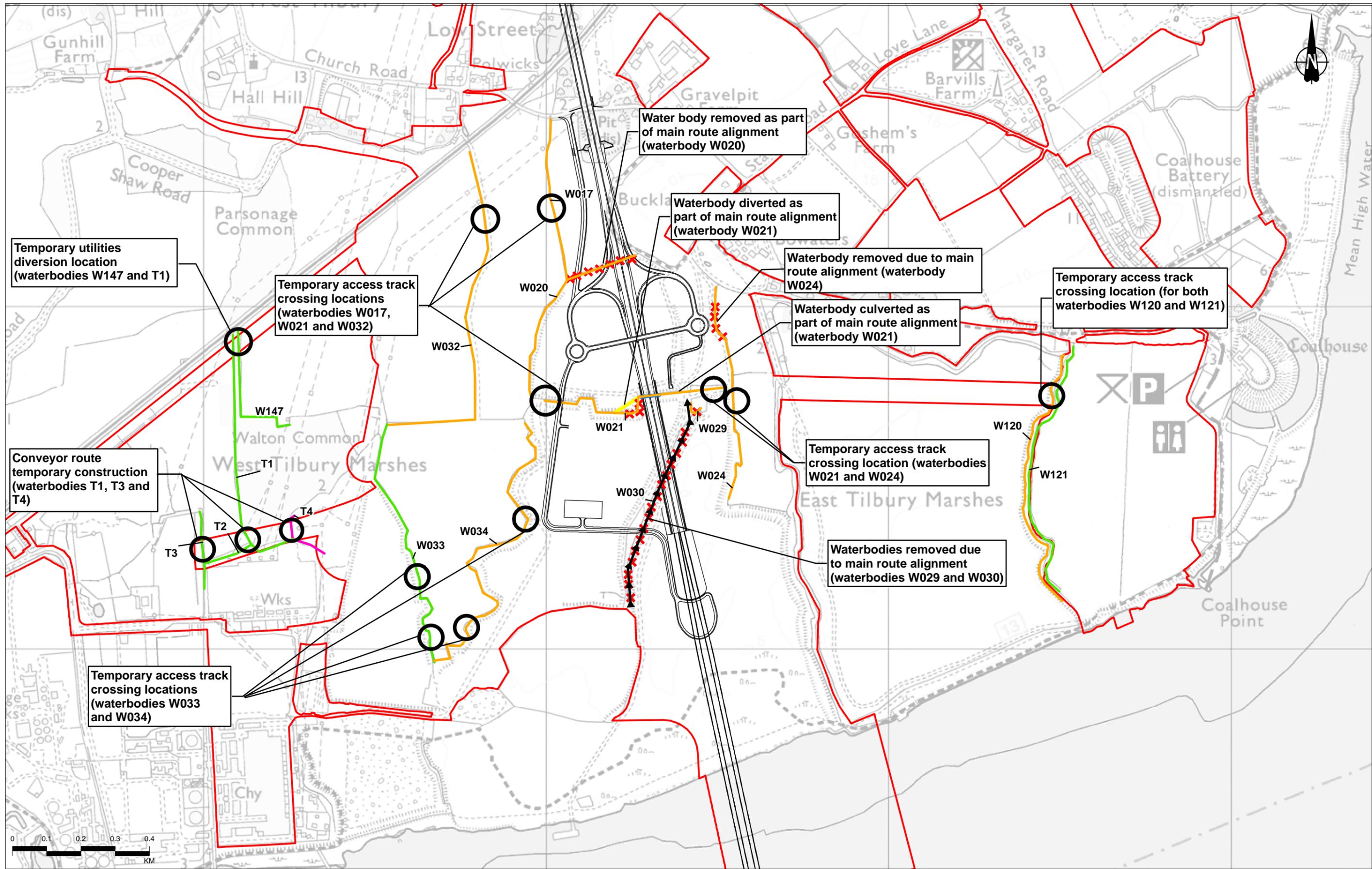
- Order Limits
- Route alignment
- Water vole temporary access track
- crossing location
- Water vole population
- High population
- Medium population
- Low population
- Dry waterbody
- No water vole signs found
- Not surveyed



LOWER THAMES CROSSING

Status	DCO APPLICATION		Original Size	Revision
Application Document Number	TR010032/APP/6.2		A3	P03
Drawing Title	Figure 4 - Water Vole Impacts and Mitigation		Scale	1:10,000
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60019		Page 1 of 4	

P03	S9	04/05/2023	Natural England comments	CD	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprvd



Temporary utilities diversion location (waterbodies W147 and T1)

Temporary access track crossing locations (waterbodies W017, W021 and W032)

Water body removed as part of main route alignment (waterbody W020)

Waterbody diverted as part of main route alignment (waterbody W021)

Waterbody removed due to main route alignment (waterbody W024)

Waterbody culverted as part of main route alignment (waterbody W021)

Temporary access track crossing location (for both waterbodies W120 and W121)

Conveyor route temporary construction (waterbodies T1, T3 and T4)

Temporary access track crossing location (waterbodies W021 and W024)

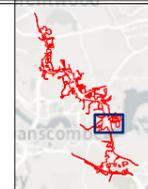
Waterbodies removed due to main route alignment (waterbodies W029 and W030)

Temporary access track crossing locations (waterbodies W033 and W034)

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Legend	
	Order Limits
	Route alignment
	Water Vole Waterbody Removed
	Culvert location
	Water body diversion
	Water vole temporary access track crossing location
Water vole population	
	High population
	Medium population
	Low population
	Dry waterbody
	No water vole signs found
	Not surveyed

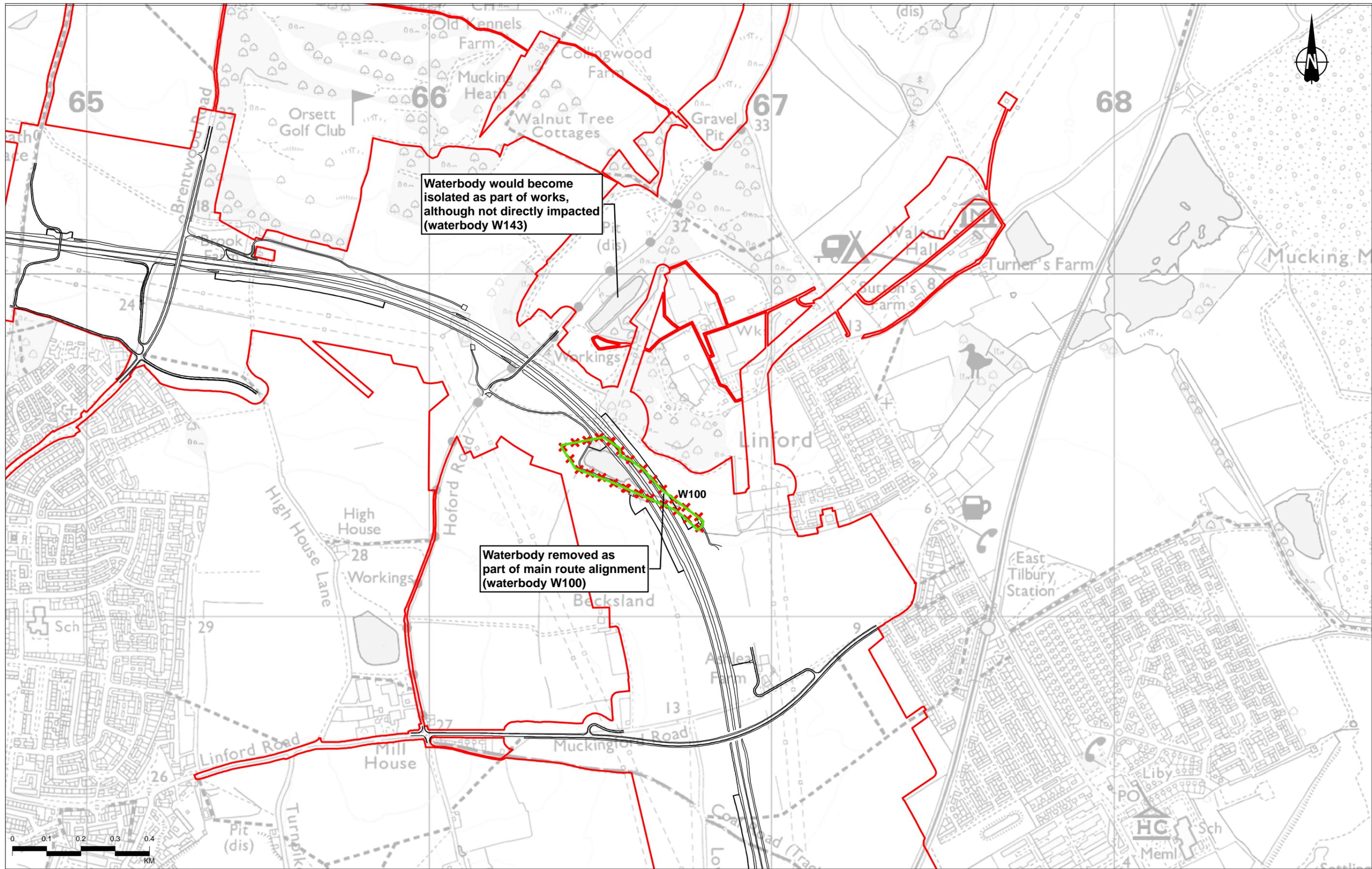


Client: national highways

Project: LOWER THAMES CROSSING

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Application Document Number	TR010032/APP/6.2	Scale	1:10,000		
Drawing Title	Figure 4 - Water Vole Impacts and Mitigation				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60019				

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Waterbody would become isolated as part of works, although not directly impacted (waterbody W143)

Waterbody removed as part of main route alignment (waterbody W100)

Legend		Water vole population		Dry waterbody	
	Order Limits		High population		Dry waterbody
	Route alignment		Medium population		No water vole signs found
	Water Vole Waterbody Removed		Low population		Not surveyed
	Water vole temporary access track crossing location				

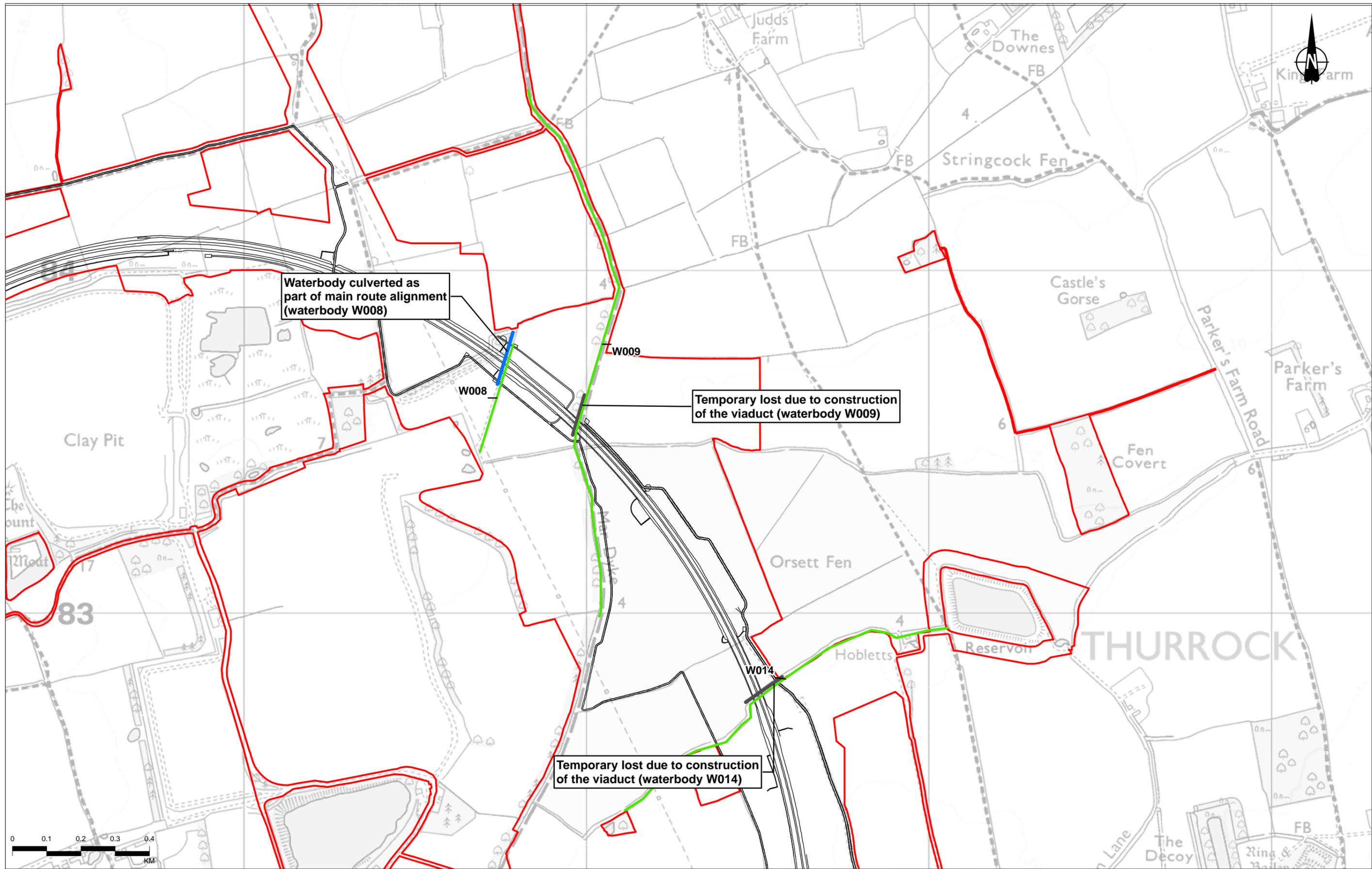


Client
 national highways
 Project
LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P03
Application Document Number	TR010032/APP/6.2	Scale	1:10,000		
Drawing Title	Figure 4 - Water Vole Impacts and Mitigation				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60020				

Page 3 of 4

P03	S9	04/05/2023	Natural England comments	CD	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprvd

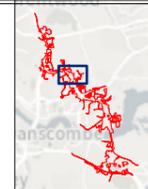


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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd
P03	S9	04/05/2023	Natural England comments	CD	SM	BF

Legend

- Order Limits
- Route alignment
- Culvert location
- Temporary habitat loss due to construction
- Water vole temporary access track crossing location
- Water vole population**
- High population
- Medium population
- Low population
- Dry waterbody
- No water vole signs found
- Not surveyed

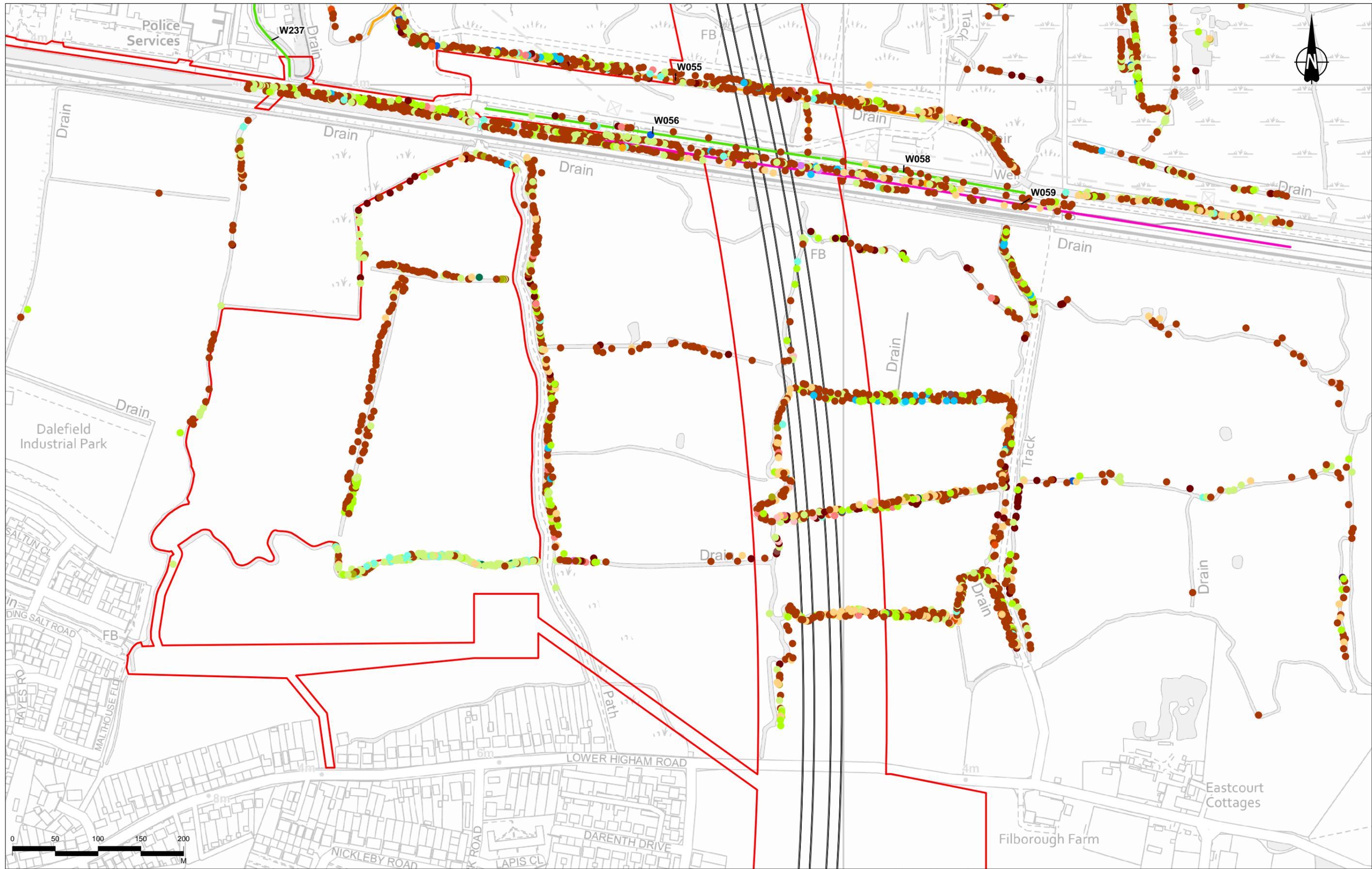


Client: **national highways**

Project: **LOWER THAMES CROSSING**

Status	DCO APPLICATION	Original Size	A3	Revision	P03
Application Document Number	TR010032/APP/6.2	Scale	1:10,000		
Drawing Title	Figure 4 - Water Vole Impacts and Mitigation				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				

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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd

Legend

- Order Limits (Red outline)
- Route alignment (Grey line)
- Water vole population**
 - High population (Thick pink line)
 - Medium population (Medium orange line)
 - Low population (Thin green line)

Water vole field sign

- Burrow (Brown dot)
- Burrow, feeding sign (Pink dot)
- Burrow, latrine (Light pink dot)
- Burrow, single dropping (Dark brown dot)
- Feeding sign (Orange dot)

- Feeding sign, burrow (Orange dot)
- Feeding sign, feeding sign (Light orange dot)
- Feeding sign, latrine (Yellow dot)
- Feeding sign, single dropping (Light green dot)
- Latrine (Light green dot)

- Latrine, feeding sign (Light green dot)
- Latrine, latrine (Dark green dot)
- Latrine, single dropping (Teal dot)
- Single dropping (Cyan dot)
- Single dropping, feeding sign (Blue dot)

- Single dropping, latrine (Dark blue dot)
- Water vole sighted (Blue dot)
- Water vole sighted, feeding sign (Purple dot)
- Water vole sighted, latrine (Magenta dot)



Client: **national highways**

Project: **LOWER THAMES CROSSING**

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
Page 1 of 9					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				

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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd
P02	S8	14/10/2022	DCO Application	LK	SM	BF

Legend

Order Limits
Route alignment

Water vole population

- High population
- Medium population
- Low population

Water vole field sign

- Burrow
- Burrow, feeding sign
- Burrow, latrine
- Feeding sign
- Feeding sign, burrow

- Feeding sign, feeding sign
- Feeding sign, latrine
- Feeding sign, single dropping
- Latrine
- Latrine, burrow

- Latrine, feeding sign
- Latrine, latrine
- Single dropping
- Single dropping, feeding sign
- Single dropping, latrine

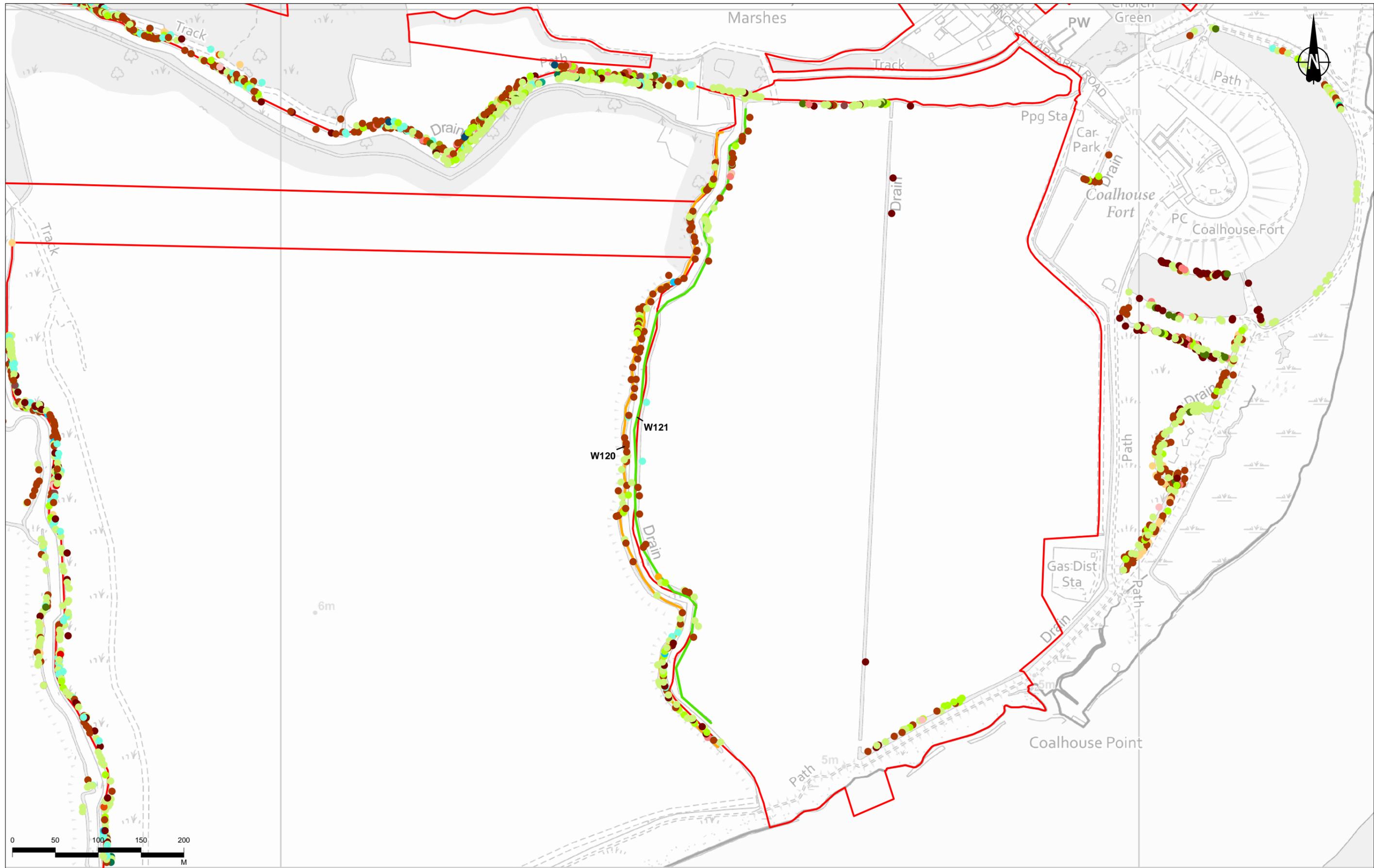
- Water vole sighted
- Water vole sighted, feeding sign
- Water vole sighted, latrine



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Project
LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
	Page 2 of 9				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				



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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd

Legend	
 Order Limits	
Water vole population	
 Medium population	
 Low population	
Water vole field sign	
● Burrow	● Burrow, single dropping
● Burrow, burrow	● Feeding sign
● Burrow, feeding sign	● Feeding sign, burrow
● Burrow, latrine	● Feeding sign, feeding sign
	● Feeding sign, latrine
● Latrine	● Feeding sign, single dropping
● Latrine, water vole sighted	● Latrine, burrow
● Single dropping	● Latrine, feeding sign
● Single dropping, feeding sign	● Latrine, latrine
● Single dropping, latrine	



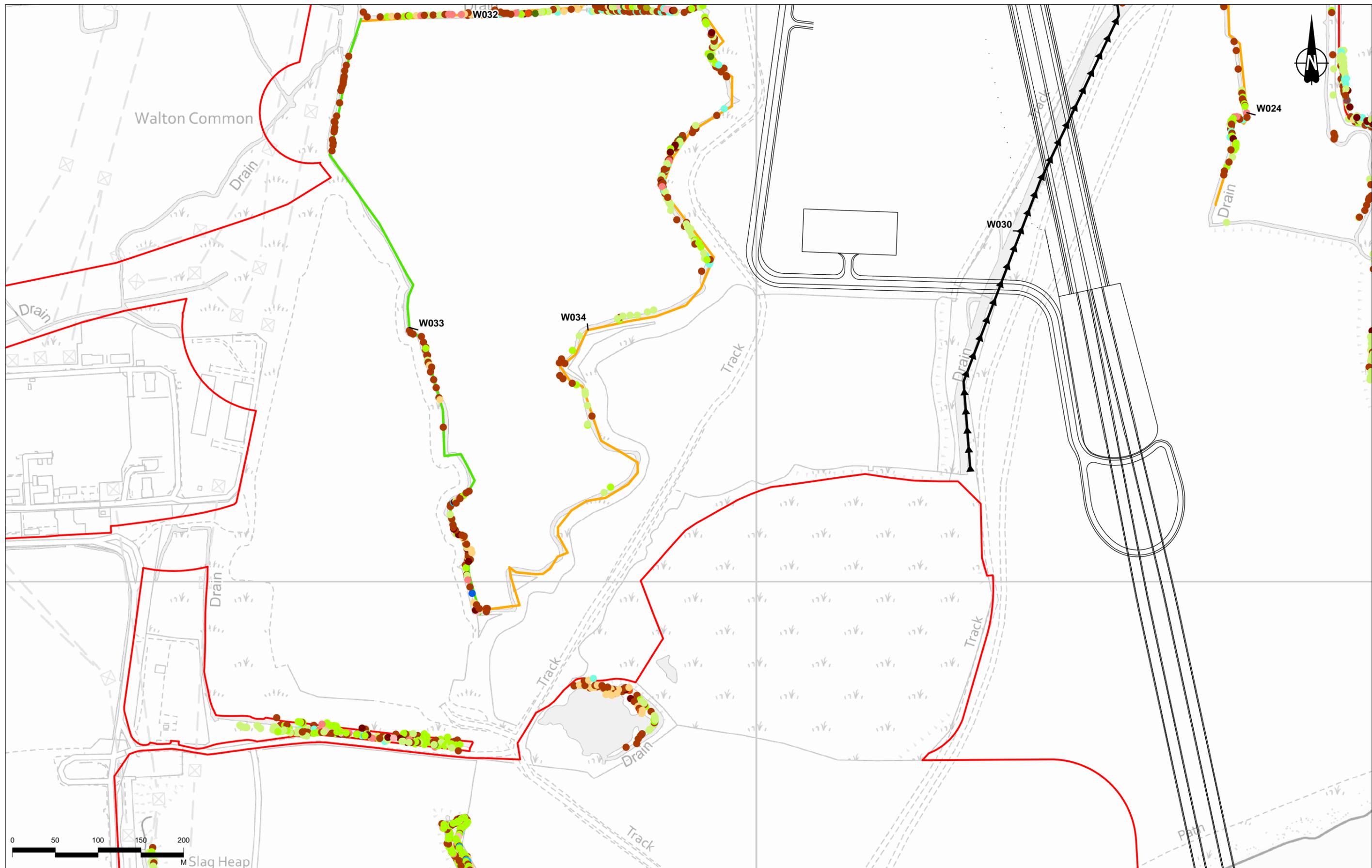
Client

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Project
LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
Page 3 of 9					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				

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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprvd

Order Limits	Not surveyed	Burrow, latrine	Feeding sign, single dropping	Latrine, single dropping
Route alignment	Water vole field sign	Burrow, single dropping	Latrine	Single dropping, feeding sign
Water vole population	Burrow	Feeding sign	Latrine, burrow	Water vole sighted
Medium population	Burrow, burrow	Feeding sign, burrow	Latrine, feeding sign	
Low population	Burrow, feeding sign	Feeding sign, latrine	Latrine, latrine	



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Project
LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
	Page 4 of 9				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60021				

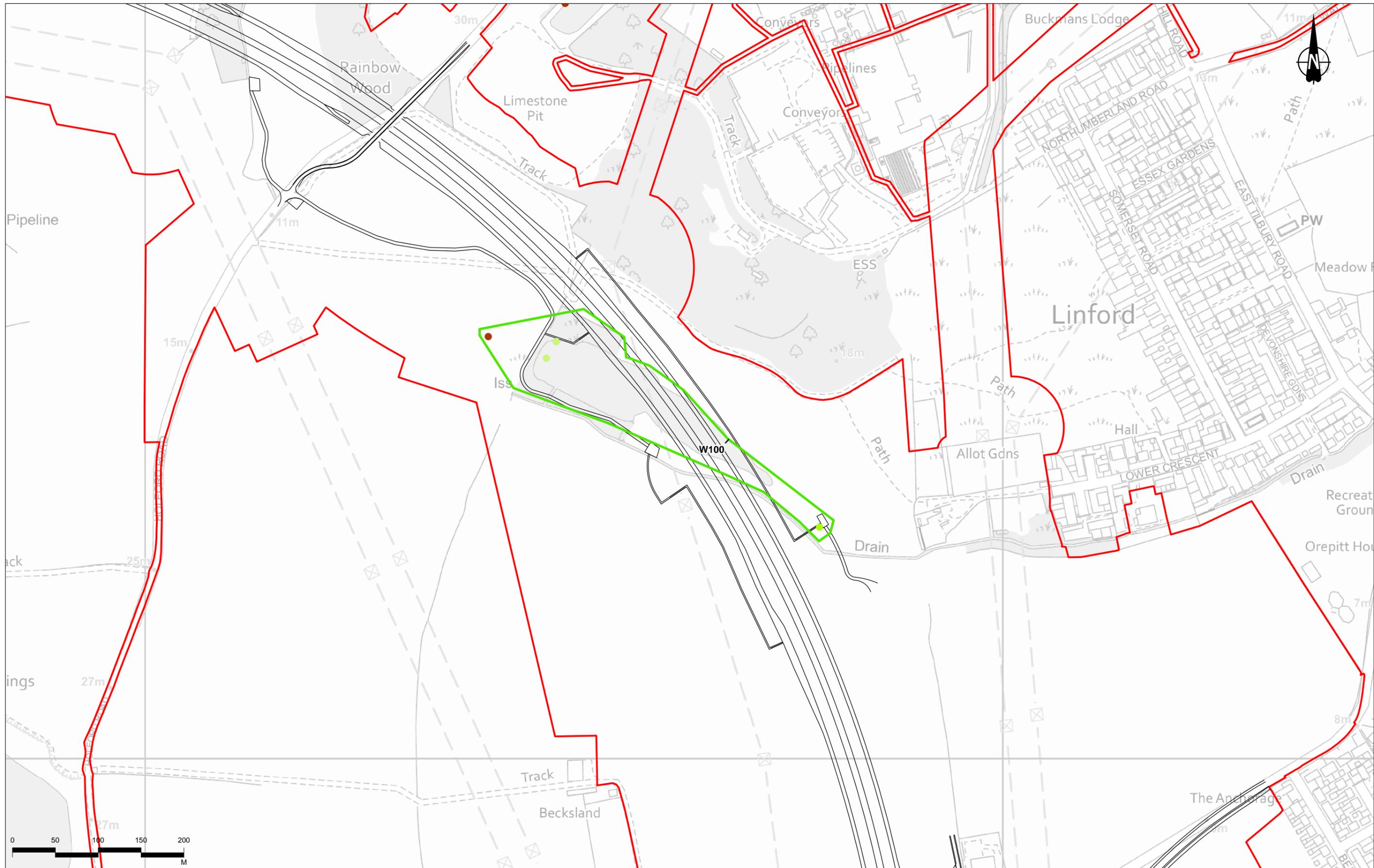
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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd

Legend Order Limits Route alignment Water vole population Medium population Low population	Not surveyed Water vole field sign Burrow Burrow, burrow Burrow, feeding sign Burrow, latrine Burrow, single dropping Feeding sign Feeding sign, burrow Feeding sign, feeding sign Feeding sign, latrine Feeding sign, single dropping Latrine Latrine, burrow Latrine, feeding sign Latrine, single dropping Single dropping Single dropping, feeding sign Water vole sighted		Client 	Status DCO APPLICATION	Original Size A3	Revision P02
			Project LOWER THAMES CROSSING	Application Document Number TR010032/APP/6.2	Scale 1:4,000	
Drawing Title Figure 5 - Detailed Water Vole Results			Page 5 of 9			
Drawing Number HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021						

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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd
P02	S8	14/10/2022	DCO Application	LK	SM	BF

- Legend**
- ▭ Order Limits
 - Route alignment
 - Water vole population**
 - Low population
 - Water vole field sign**
 - Feeding sign
 - Latrine
 - Latrine, feeding sign

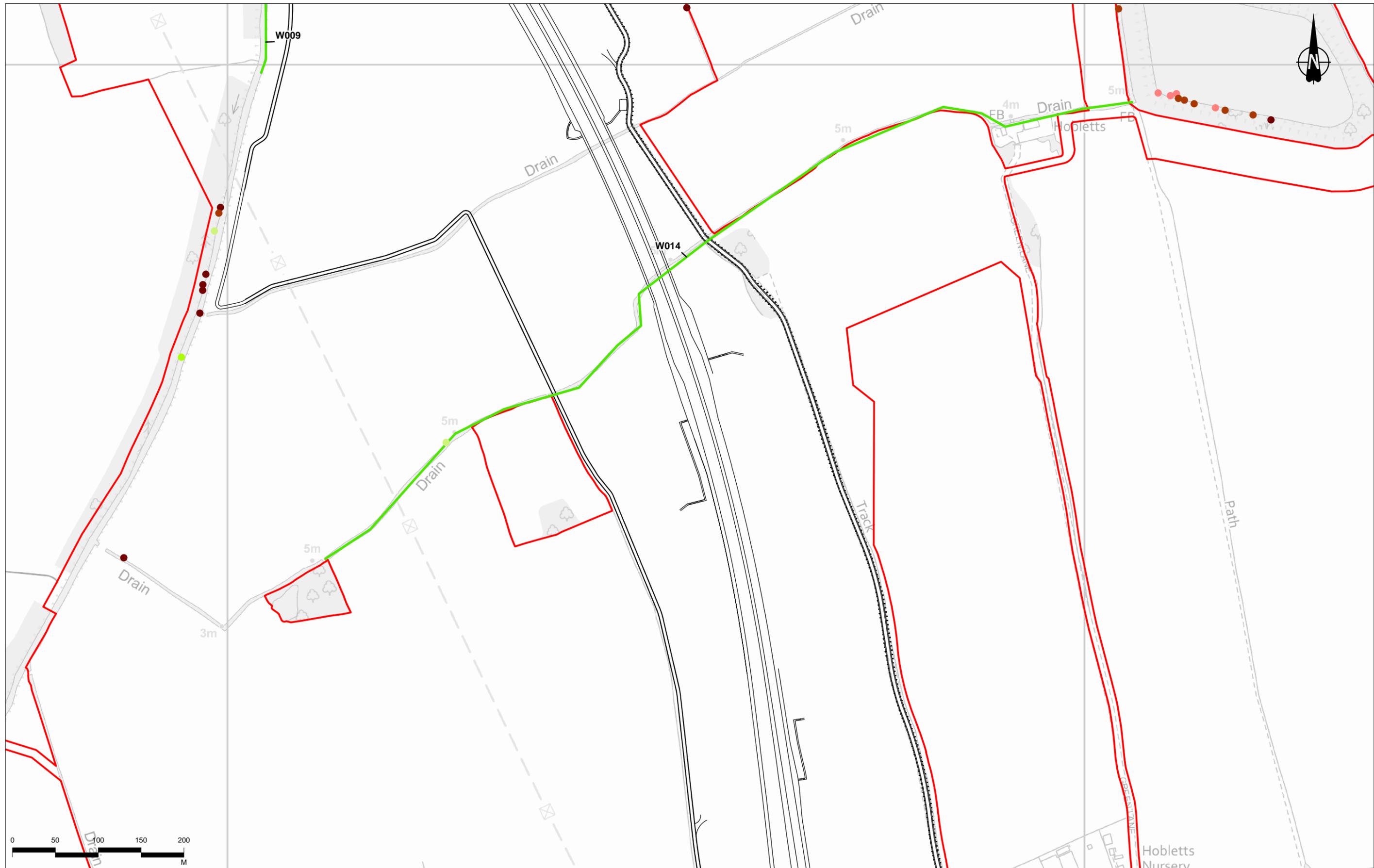


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LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
	Page 6 of 9				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				

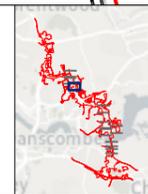
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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Appr'd

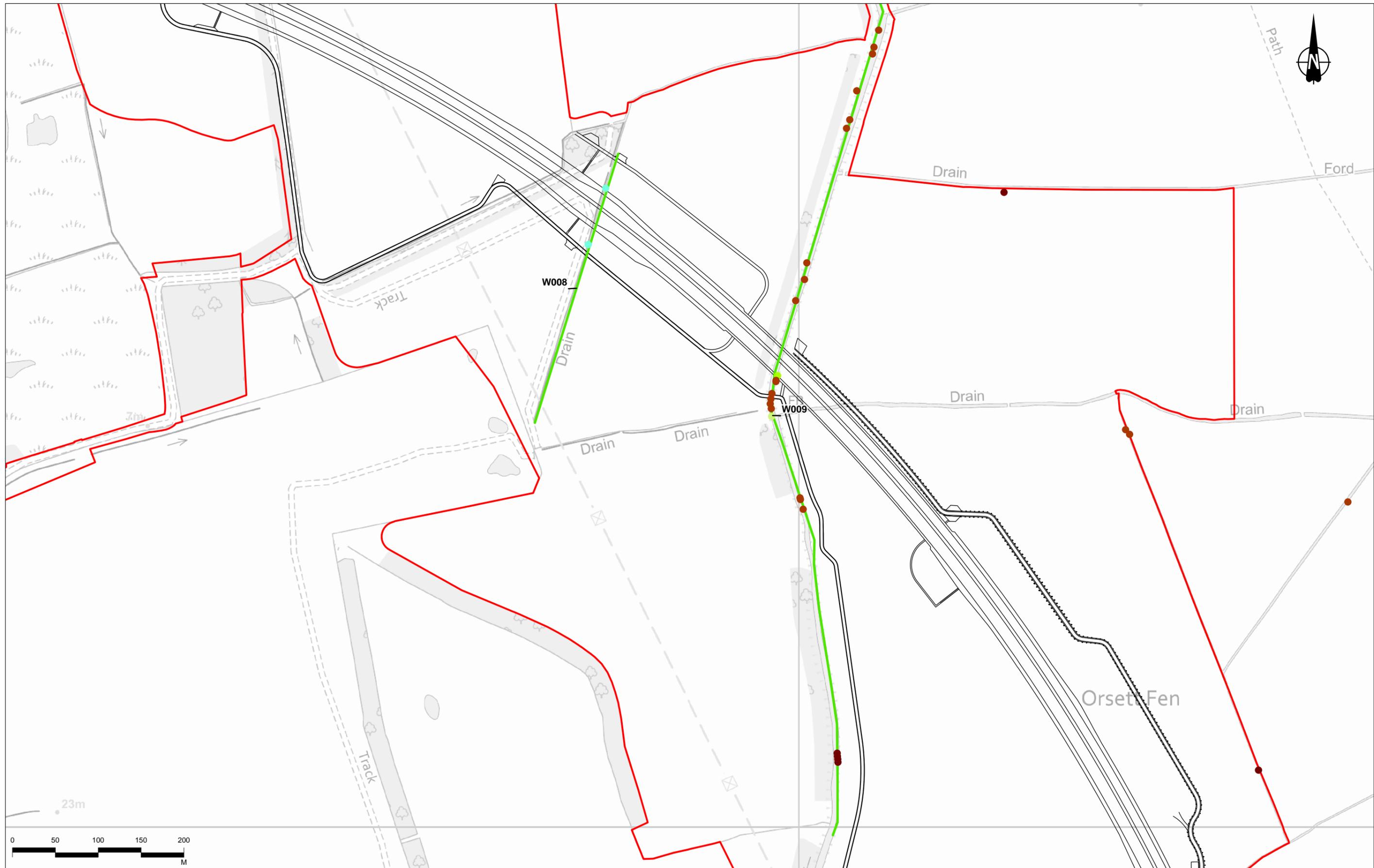
- Legend**
- Order Limits
 - Route alignment
 - Water vole population**
 - Low population
- Water vole field sign**
- Burrow
 - Burrow, feeding sign
 - Feeding sign
 - Latrine
 - Latrine, feeding sign



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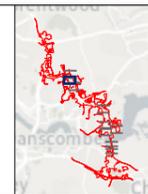
Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
Page 7 of 9					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60021				



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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd
P02	S8	14/10/2022	DCO Application	LK	SM	BF

Legend		
	Order Limits	
	Route alignment	
	Water vole population	
	Low population	
●	Water vole field sign	
●	Burrow	
●	Feeding sign	
●	Latrine	
●	Latrine, feeding sign	
●	Single dropping	



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Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
	Page 8 of 9				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE00000000-DR-LE-60021				

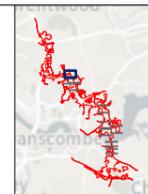
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P02	S8	14/10/2022	DCO Application	LK	SM	BF
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Apprv'd

- Legend**
- Order Limits
 - Route alignment
 - Water vole population
 - Low population
- Water vole field sign**
- Burrow
 - Feeding sign
 - Single dropping

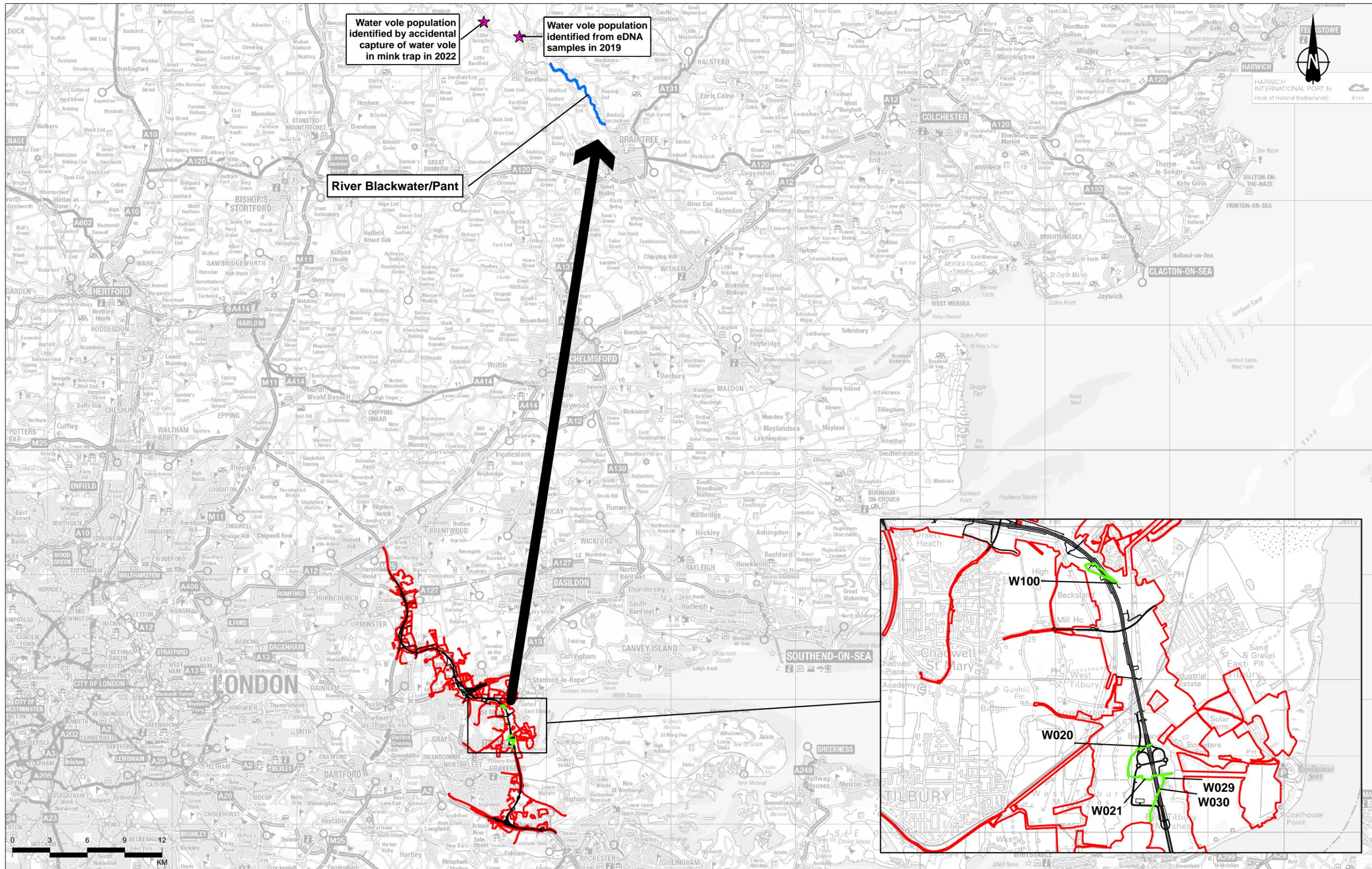


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LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:4,000		
Drawing Title	Figure 5 - Detailed Water Vole Results				
Page 9 of 9					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60021				

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P03	S9	03/05/2023	Natural England comments	CD	SM	BF

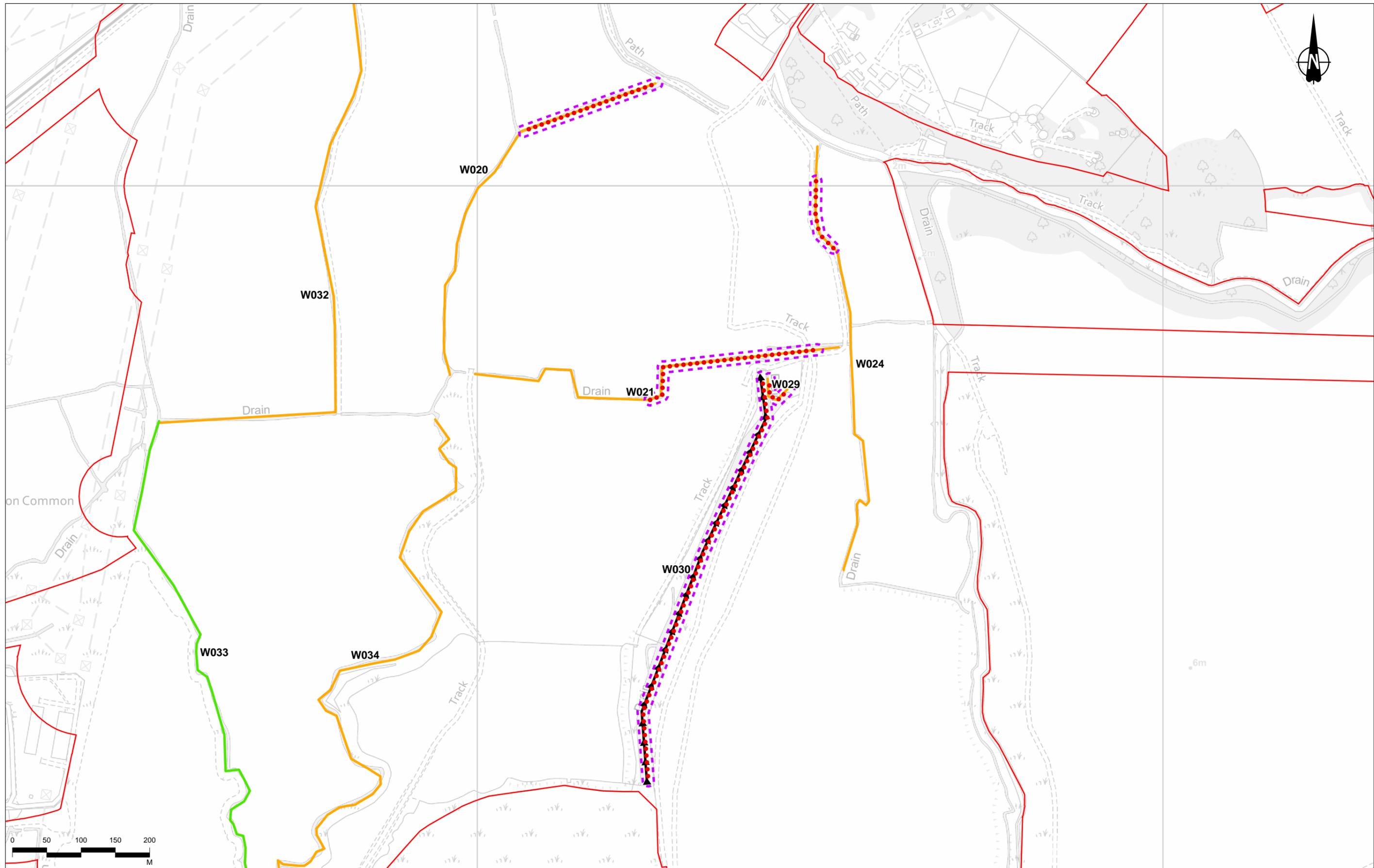
- Legend**
- Order Limits
 - Route alignment
 - Receptor Sites
 - Translocation sites
 - ★ Known Water Vole Populations
 - ↗ Direct of translocation



Client
national highways

Project
LOWER THAMES CROSSING

Status	DCO APPLICATION	Original Size	A3	Revision	P03
Application Document Number	TR010032/APP/6.2	Scale	1:275,000		
Drawing Title	Figure 6 - Vole Receptor Sites				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60039				



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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Appr'd
P03	S9	03/05/2023	Natural England comments	CD	SM	BF

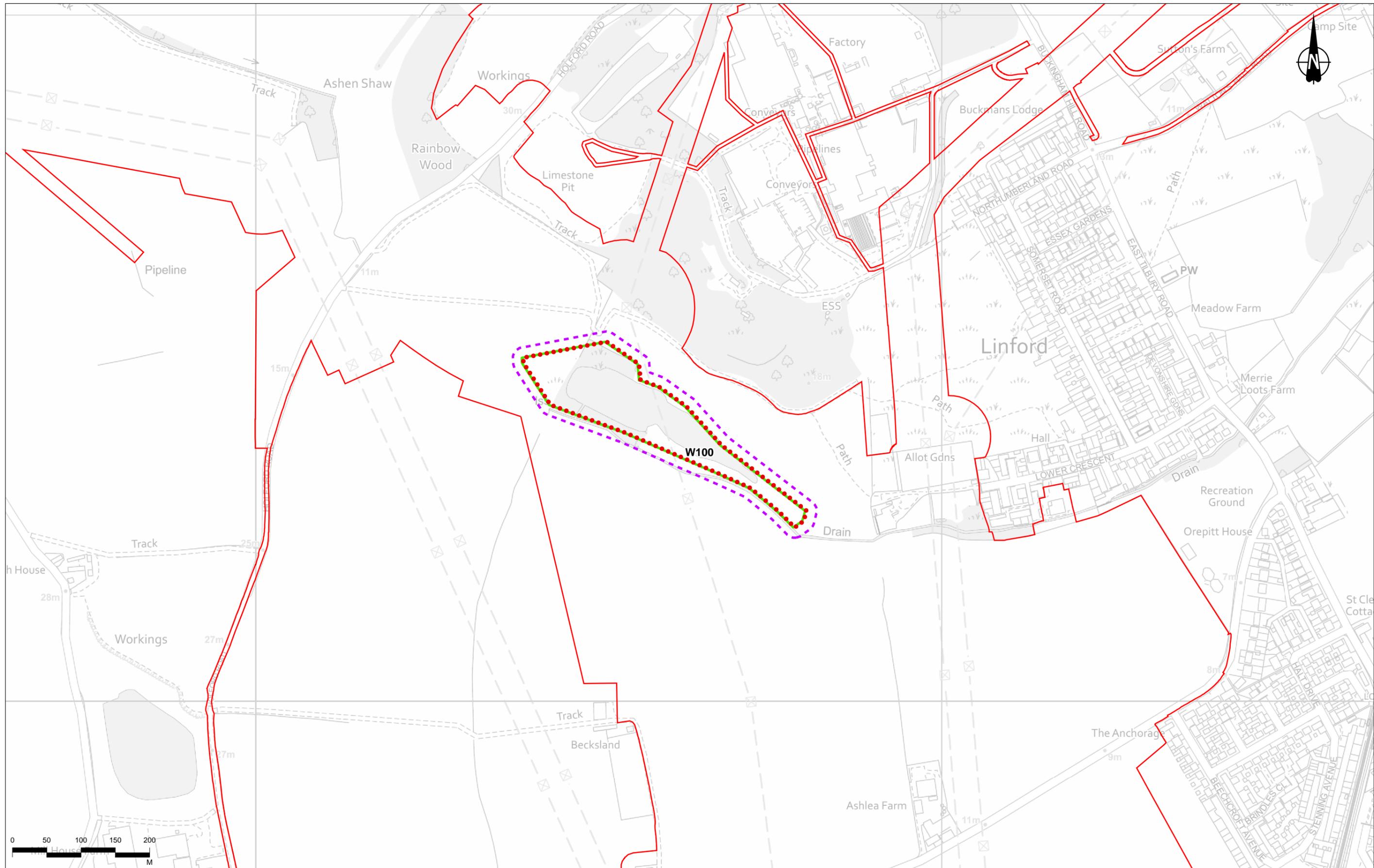
Legend	
	Order Limits
	Water vole trap location
	Water vole exclusion fencing
Water Vole Population	
	Medium population
	Low population
	Not surveyed



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Status	DCO APPLICATION	Original Size	A3	Revision	P03
Application Document Number	TR010032/APP/6.2	Scale	1:5,000		
Drawing Title	Figure 7 - Water Vole Trapping Plan				
Page 1 of 2					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60110				



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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Appr'd
P03	S9	03/05/2023	Natural England comments	CD	SM	BF

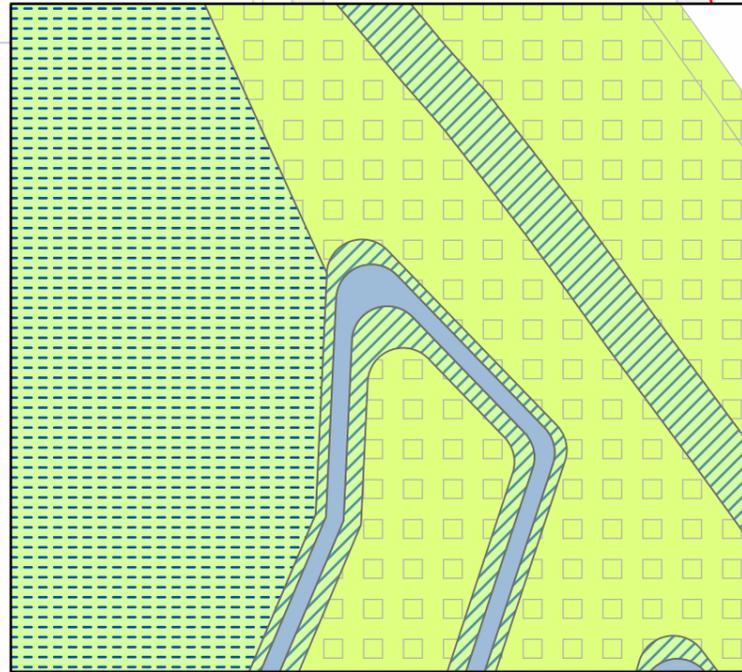
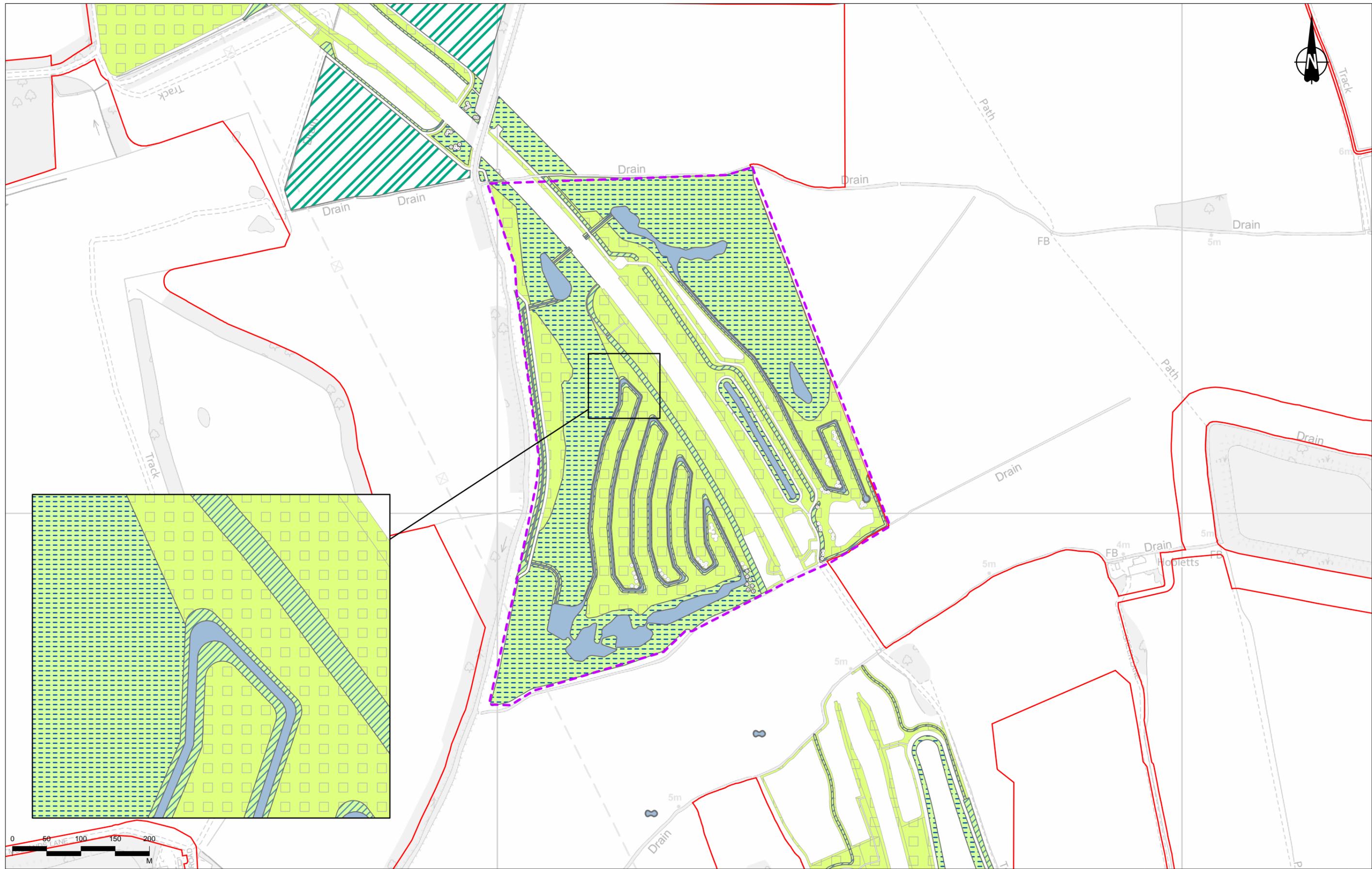
- Legend**
- Order Limits
 - Water vole trap location
 - Water vole exclusion fencing
 - Water Vole Population**
 - Low population



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Project
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Status	DCO APPLICATION	Original Size	A3	Revision	P03
Application Document Number	TR010032/APP/6.2	Scale	1:5,000		
Drawing Title	Figure 7 - Water Vole Trapping Plan				
Page 2 of 2					
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60110				

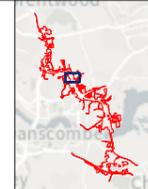


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Rev	Status	Rev. Date	Purpose of revision	Drawn	Chkd	Appr'd
P02	S8	17/10/2022	DCO Application	LK	SM	BF

Legend

Order Limits	Wet grassland
Water vole exclusion fencing	Wetland/fenland creation
Species rich grassland	Ecology pond
Bankside/emergent vegetation	



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Status	DCO APPLICATION	Original Size	A3	Revision	P02
Application Document Number	TR010032/APP/6.2	Scale	1:5,000		
Drawing Title	Figure 8 - Water Vole Habitat Creation				
Drawing Number	HE540039-CJV-EBD-SZP_EGNE0000000-DR-LE-60111				

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