

Great North Road Solar and Biodiversity Park

Environmental Statement

Volume 4 – Technical Appendices

Technical Appendix – Otter, Water Vole and White-clawed Crayfish Baseline

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A8.8.1 INTRODUCTION

A8.8.1.1 INTRODUCTION

- This Technical Appendix (TA) presents the methods and results of baseline studies for otter *Lutra lutra*, water vole *Arvicola amphibius* and white-clawed crayfish *Austropotamobius pallipes* in relation to the Great North Road Solar and Biodiversity Park (the Development).
- The scope of the study has been determined through a combination of a Preliminary Ecological Appraisal (PEA), comprising a desk study and site walkover, and professional judgement with reference to prevailing good practice.
- This TA includes no valuation or assessment of potential effects. These aspects are presented in Chapter 8: Ecology and Biodiversity [EN010162/APP/6.2.8] of the Environmental Information (ES).
- 4 This TA is supported by the following appendices:
 - Appendix A Figures.

A8.8.1.2 LEGISLATION AND POLICY

A8.8.1.2.1 Legislation

- Otter and white-clawed crayfish are strictly legally protected by the Conservation of Habitats and Species Regulations 2017¹ under which it is an offence to intentionally or recklessly: kill, injure, disturb or capture otters and white-clawed crayfish; and damage or destroy their breeding sites and resting places, even if they are not present.
- Otter, water vole and white-clawed crayfish are also legally protected under the Wildlife and Countryside Act 1981² under which it is an offence to intentionally capture, injure or kill otter, water vole and white-clawed crayfish; and intentionally or recklessly damage, destroy or obstruct their breeding or resting places.

A8.8.1.2.2 Conservation Status

Otter, water vole and white-clawed crayfish are species of Principal Importance in England under Section 41 of the Natural Environment and Communities Act 2006³, and Species of Conservation Concern under the Nottinghamshire Local Biodiversity Action Plan⁴.

A8.8.1.3 AIMS AND OBJECTIVES

The aim of the study was to provide a robust baseline against which the effects of the Development could be assessed. A combination of desk study

¹ Available at: https://www.legislation.gov.uk/uksi/2017/1012/contents/made [accessed 02/05/2024]

² Available at: https://www.legislation.gov.uk/ukpga/1981/69/contents [accessed 02/05/2024]

³ Available at: https://www.legislation.gov.uk/ukpga/2006/16/contents [Accessed 21/05/2024]

⁴ Nottinghamshire Biodiversity Action Group (2020). Nottinghamshire Biodiversity Action Plan. Available at: https://nottsbag.org.uk/lbap/lbap-introduction-and-sections-1-to-6/ [Accessed 21/05/2024]



and field surveys have been undertaken to meet this aim by addressing the following objectives:

- Determine the suitability of habitats to support otter, water vole and white-clawed crayfish; and
- Establish the presence or likely absence of above species in suitable habitats.

A8.8.1.4 STUDY AREA

The Study Area for surveys included all land within the Order Limits and, where accessible, up to 100 m outside the Order Limits (Figure A8.8.1).

A8.8.2 METHODS

A8.8.2.1 DESK STUDY

- A desk study was undertaken to assess the characteristics of the landscape and to obtain pre-existing ecological data and information relevant to the assessment. The desk study included the following elements:
 - An assessment of aerial imagery and Ordnance Survey mapping;
 - A search of the MAGIC⁵ website for European Protected Species (EPS) licences within 2 km of the Order Limits; and
 - Nottinghamshire Biological and Geological Records Centre (NBGRC) records of otter, water vole and white-clawed crayfish within 2 km of the Order Limits (January 2024).

A8.8.2.2 SURVEY

- A walkover survey of the Study Area was conducted to assess the suitability of watercourses to support otter, water vole and white-clawed crayfish. Detailed, species-specific surveys were then conducted for suitable watercourses.
- 23 Surveys were undertaken on the following dates:
 - January 2022;
 - March–October 2022;
 - May–September 2023; and
 - June 2024.

A8.8.2.2.1 Otter and Water Vole

Suitable watercourses for otter contain good quality, clean water with an abundant, varied supply of food and plenty of bank-side vegetation offering secluded sites for holts⁶. Optimal habitat for water vole is watercourses that are less than 3m wide and around 1m deep, water should be slow flowing and rarely fluctuate. Riverbanks should be steep with continuous riparian vegetation and limited shading⁷

⁵ Available at: Magic Map Application [accessed on 06/05/2025]

⁶ Chanin P (2003). Monitoring the Otter *Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough

⁷ Dean M (2021). Water Vole Field Signs and Habitat Assessment: A Practical Guide To Water Vole Surveys, Pelagic Publishing, Exeter



- Watercourses identified as suitable for otter and water vole were subject to detailed surveys, which included a thorough search of watercourses and riparian habitats for field signs of the species. Watercourses or sections of watercourses were classified as "Present" where definitive field signs were identified, "Absent" where no field signs were identified, or "Potential" where field signs were inconclusive or where no signs were observed but the watercourse or section of watercourse had high suitability for the species. Where watercourses were inaccessible due to access restrictions they are marked as "No Access", or "Survey Constrained" where overgrown vegetation constrained survey effort and data were insufficient to determine otter or water vole presence.
- Good practice survey methods⁸ for water vole suggests two survey visits, one in mid-April to June and one in July to September. Due to the large scale of the Order Limits and the relatively limited and localised potential for direct effects to watercourses, many of which will not be accurately identified until the detailed design is confirmed post-consent, only one survey visit, rather than the recommended two, to each watercourse was conducted. This approach provided excellent spatial coverage and suitable information to inform the Development design and an assessment of potential effects.

2.2.1.1 Otter Field Signs

- Prints: Tracks can be found in sand and mud alongside rivers and streams. They are five-toed, but often only four toes appear in the print. The large, round prints (5–7 cm in width, 6–9 cm in length) are often pushed deep into the clay providing clear ID field signs.
- Toilet or latrine sites: Often found on high points along the banks of streams, bays or along crossover trails between water bodies. The vegetation is usually flattened out, and the area may contain numerous piles of otter scat, often comprised of fish scales or crayfish parts.
- Spraints: Often found on rocks or logs close to water and contain mainly fish shells, bones, shells of crustaceans, feathers or fur. Highly variable in size and colour ranges from greenish to black-grey. Spraints have a sweet smell of jasmine tea or laurel flowers.
- Scats: Irregular, sometimes short, rounded segments, sometimes flattened masses, containing fish bones, scales, or crayfish parts. When fresh, often greenish and slimy. Scats are most often found on banks of streams or ponds, on logs, or on rocks in water.
- 34 Feeding signs: Often include remains of opened shells or crayfish parts.
- Slides: Found in mud or ice/snow. Riverbank slides are 200 cm wide or wider with heavy use. Often on flat ground, sometimes pitted with blurred prints where otter has given itself a push for momentum.
- Holts, dens and resting places: Large burrows, often on river banks and leading to a cavity under the roots of a bankside tree. Can include grass or

⁸ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.



heather bedding. The likelihood of a potential holt being associated with otter and in active use was determined from the field signs around it.

2.2.1.2 Water Vole Field Signs

- Burrows and lawns: Entrances of 4–8 cm in diameter are located just above the water level on steep banks, some below water level and others within vegetation up to 3 m from the water's edge. Lawns are often found around burrow entrances and comprise of vegetation that has been grazed short.
- Nests: Comprising a ball like structure of shredded material, often woven into the base of reeds in areas where a high water table is present.
- Faeces and latrines: Faeces are 8–12 mm long and 4–5 mm wide, cylindrical with blunt ends and symmetrical, variable in colour and often show concentric rings of fine plant material if dry and broken open. Faeces are usually found at discrete latrine sites near the nest/burrows and where water voles leave or enter water. Latrines are established and maintained from February to November and often have a flattened mass of old droppings topped with fresh ones.
- Feeding stations: Often a neat pile of chewed lengths 10 cm long showing the marks of two large incisors with a distinctive 45° cut angle on the ends.
- Vegetation runs: Often found within 2 m of the water's edge and can be seen as low tunnels pushed through the vegetation with a width of 5–9 cm.
- Prints: Typically, at water's edge and leading into vegetation cover, prints have four toes in a star arrangement from the fore foot and five toes of the hind foot with the outer ones splayed.

A8.8.2.2.2 White-clawed Crayfish

- Suitable watercourses for white-clawed crayfish are often mineral-rich with shallow waters containing stones and overhanging vegetation to provide protection from predators⁹.
- Watercourses suitable for white-clawed crayfish were assessed for presence or likely absence of white-clawed crayfish using eDNA sampling following good practice methods¹⁰. Samples were tested in an accredited laboratory for white-clawed crayfish eDNA by SureScreen Scientifics and on the basis of the results white-clawed crayfish was determined to be "Present" or "Absent" from watercourses or sections of watercourses. Where watercourses were inaccessible due to access restrictions they are marked as "No Access", or "Survey Constrained" where overgrown vegetation constrained survey effort.

A8.8.3 RESULTS

A8.8.3.1 DESK STUDY

The desk study returned no recent (2012 onwards) records of otter in the Study Area, but there were 21 records within 2 km, concentrating around the

⁹ Holdich, D. (2003). Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. English Nature, Peterborough.

¹⁰ Available at: https://www.surescreenscientifics.com/wp-content/uploads/2022/03/Detailed-Filtration-Guide-Mk5-Complete.pdf [accessed 02/05/2024]



River Trent and Car Dyke. Records included tracks, spraints and feeding signs, and an adult caught on a camera trap in 2019 in a drain near the River Trent.

- The desk study returned no records of water vole within the Study Area, however five records were identified within 2 km, consisting of sightings in 2016, 2022 and 2023 alongside the River Trent and near Egmanton, to the north of the Order Limits.
- No records of white-clawed crayfish were returned.

A8.8.3.2 SURVEY

- Initial habitat assessments identified 76 watercourses or sections of watercourse suitable for otter, water vole and/or white-clawed crayfish (Figure A8.8.1).and these were subjected to more detailed surveys, as described below
- Watercourses identified as unsuitable for otter, water vole and white-clawed crayfish were mainly dry throughout much of the year, had poor water quality, had unsuitable substrate (for white-clawed crayfish), or were subject to high levels of disturbance from human activities or cattle poaching.

A8.8.3.2.1 Otter

- Evidence of otter was widely distributed but scarce and included prints, spraints, slides and feeding signs. No potential holts were identified during the survey; however, in some places this may be due to overgrown vegetation limiting the visibility of these signs. Evidence was recorded in nine watercourses and potentially present in 22 others (Table A8.8.1 and Figure A8.8.1). Ten watercourses were inaccessible due to access restrictions, and survey effort was constrained along an additional 12 due to overgrown vegetation.
- Otter activity was recorded along Moorhouse Beck in the north of the Study Area (29-w1, 151-w1 and 199-w1), with fresh spraints and feeding remains present along the banks and under a bridge between field parcels 72 and 525. No conclusive otter signs were identified along its tributaries (5-w1, 5-w2, 28-w1, 29-w2, 72-w1, 82-w2 and 475-w1), however they were marked as having potential due to their suitable habitat and connectivity to Moorhouse Beck.
- Otter presence was confirmed along The Beck (218-w2, 207-w1 and 207-w2) near Maplebeck.
- Otter presence was confirmed on Pingley Dyke (in the south of the Study Area), and connecting watercourses were marked as having potential despite access restrictions preventing surveys.



Table A8.8.1: Otter Survey Results

Watercourse ID	Otter Status	Notes
5-w1	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
5-w2	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
8-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
8-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
8-w3	Survey Constrained	Survey constrained due to overgrown vegetation.
21-w1	Potential	No field signs identified; habitat identified as suitable during walkover survey.
22-w1	Absent	No field signs identified.
22-w2	Absent	No field signs identified.
22-w3	Absent	No field signs identified.
22-w4	Absent	No field signs identified.
28-w1	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
29-w1	Present	Moorhouse Beck main channel, field signs identified.
29-w2	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
58-w2	Potential	Partially outside order limits.
72-w1	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
77-w1	Absent	No field signs identified.
82-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
82-w2	Potential	Survey constrained due to overgrown vegetation, however, connects to Moorhouse Beck with confirmed otter presence.
93-w1	Potential	Good habitat suitability with potential field signs identified, in close proximity to Moorhouse Beck with confirmed otter presence.



Watercourse ID	Otter Status	Notes
101-w1	Absent	No field signs identified.
101-w2	Absent	No field signs identified.
105-w1	Absent	No field signs identified.
115-w1	Absent	No field signs identified.
115-w2	Absent	No field signs identified.
130-w1	Potential	No field signs identified; habitat identified as suitable during walkover survey.
130-w2	Present	Spraint.
131-w1	Absent	No field signs identified.
140-w1	Absent	No field signs identified.
144-w1	Absent	No field signs identified.
144-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
151-w1	Present	Feeding signs, potential footprints leading to a disused burrow.
154-w1	Potential	No field signs identified; habitat identified as suitable.
172-w1	Absent	No field signs identified.
195-w1	Potential	Potential assumed. Restricted access.
195-w2	Potential	Potential assumed. Restricted access.
197-w1	Absent	No field signs identified.
199-w1	Present	Northern section of Moorhouse Beck main channel. No field signs identified in this section, however otter presence confirmed downstream (29-w1).
207-w1	Present	Field signs identified.
207-w2	Present	Field signs identified.
210-w1	Present	Pingley Dyke main channel. Opened mollusc shell and prints under bridge and along river.
213-w1	Potential	Partially within order limits. Near 58-w2
218-w1	Potential	Survey constrained due to overgrown vegetation, however, connects to the Beck with confirmed otter presence.
218-w2	Present	The Beck main channel. Prints and spraints identified.
230-w1	Absent	No field signs identified.



Watercourse ID	Otter Status	Notes
230-w2	Absent	No field signs identified.
236-w1	Present	Pingley Dyke main channel. Dry prints and slides identified.
236-w2	Potential	No access, however, connects to Pingley Dyke with confirmed otter presence.
236-w3	Potential	No access, however, connects to Pingley Dyke with confirmed otter presence.
236-w4	Potential	No access, however, connects to Pingley Dyke with confirmed otter presence.
241-w1	Absent	No field signs identified.
243-w1	Potential	Dry and overgrown watercourse
244-w1	Absent	No field signs identified.
260-w1	Absent	No field signs identified.
274-w1	Potential	Tributary of 385-W1.
279-w1	Potential	Potential slide.
279-w2	Potential	Very overgrown slide with no conclusive otter signs.
295-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
295-w2	Potential	No field signs identified; habitat identified as suitable during walkover survey.
385-w1	Potential	Habitat identified as suitable during walkover survey; access restricted during otter survey due to overgrown vegetation.
442-w1	Potential	Suitable habitat, access limited.
442-w2	Absent	No field signs identified.
442-w3	Absent	No field signs identified.
475-w1	Potential	No field signs identified, however habitat suitable and connects to Moorhouse Beck with confirmed otter presence.
492-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
492-w2	Survey Constrained	Survey constrained due to hedgerow.
492-w3	Survey Constrained	Survey constrained due to hedgerow.
492-w4	Survey Constrained	Survey constrained due to hedgerow.



Watercourse ID	Otter Status	Notes
494-w1	Survey Constrained	Survey constrained due to overgrown vegetation and hedgerow.
504-w1	Survey Constrained	Survey constrained due to hedgerow.
513-w1	Potential	No access, however, connects to Pingley Dyke with confirmed otter presence.
515-w1	Absent	No field signs identified.
521-w1	Potential	Tributary of 279-W1.
524-w1	Potential	No access, assumed potential.
550-w1	Potential	No access, however, connects to Pingley Dyke with confirmed otter presence.

A8.8.3.2.2 Water Vole

- Evidence of water vole was widely distributed, and included mainly prints and burrows. Conclusive evidence (e.g., droppings) was very limited. Overall, evidence was present in 14 watercourses and potentially present in 19 others (Table A8.8.2 and Figure A8.8.2). Where access was restricted the habitat and surrounding area was assessed to determine likely presence of water vole and survey effort was constrained along an additional 17 due to overgrown vegetation.
- Moorhouse Beck and some of its tributaries had good habitat suitability for water vole, however no field signs were observed.
- Water vole was present in The Beck, a watercourse to the east (442-w1 and 105-w1), and The Wink (244-w1). To the south, water vole field signs were identified along Pingley Dyke, with connecting watercourses marked as having potential due to their habitat suitability. Water vole field signs were widely distributed in the east of the Study Area and are considered present in multiple watercourses.

Table A8.8.2: Water Vole Survey Results

No.	Watercourse ID	Water Vole Status	Notes
1	5-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
2	5-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
3	8-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
4	8-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
5	8-w3	Survey Constrained	Survey constrained due to overgrown vegetation.



No.	Watercourse ID	Water Vole Status	Notes
6	21-w1	Potential	No field signs identified however continuous to 243-w1 and 279-w2 with confirmed water vole presence.
7	22-w1	Absent	No field signs identified.
8	22-w2	Absent	No field signs identified.
9	22-w3	Present	Field signs identified.
10	22-w4	Present	Field signs identified.
11	28-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
12	29-w1	Potential	Good habitat suitability but no field signs identified.
13	29-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
15	58-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
16	72-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
17	77-w1	Absent	No field signs identified.
18	82-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
19	82-w2	Absent	No field signs identified.
21	93-w1	Absent	No field signs identified.
22	101-w1	Absent	No field signs identified.
23	101-w2	Absent	No field signs identified.
24	105-w1	Present	Field signs identified.
25	115-w1	Absent	No field signs identified.
26	115-w2	Absent	No field signs identified.
27	130-w1	Potential	Assumed. Suitable habitat.
28	130-w2	Absent	No field signs identified.
29	131-w1	Present	Field signs identified.
30	140-w1	Absent	No field signs identified.
31	144-w1	Absent	No field signs identified.
32	144-w2	Survey Constrained	Survey constrained due to overgrown vegetation.
33	151-w1	Potential	Good habitat suitability but no field signs identified.



No.	Watercourse ID	Water Vole Status	Notes
34	154-w1	Potential	Good habitat suitability but no field signs identified.
35	172-w1	Absent	No field signs identified.
36	195-w1	Potential	Potential assumed. Access restricted.
37	195-w2	Potential	Potential assumed. Access restricted.
38	197-w1	Potential	Potential field signs identified.
39	199-w1	Potential	Good habitat suitability but no field signs identified.
40	207-w1	Potential	Potential field signs identified.
41	207-w2	Potential	Potential field signs identified.
42	210-w1	Present	Burrows, potential prints and feeding signs.
43	213-w1	Potential	Partially within order limits.
44	218-w1	Potential	Survey constrained due to overgrown vegetation, however, connects to The Beck with confirmed water vole presence.
45	218-w2	Present	Prints.
46	230-w1	Potential	Potential field signs identified.
47	230-w2	Present	Dry old burrow, feeding signs and tracks.
48	236-w1	Present	Field signs identified e.g. small burrows.
49	236-w2	Potential	No access, however, connects to Pingley Dyke with confirmed water vole presence.
50	236-w3	Potential	No access, however, connects to Pingley Dyke with confirmed water vole presence.
51	236-w4	Potential	No access, however, connects to Pingley Dyke with confirmed water vole presence.
52	241-w1	Absent	No field signs identified.
53	243-w1	Present	Prints.
54	244-w1	Present	Field signs identified.
55	260-w1	Absent	No field signs identified.
56	274-w1	Present	Field signs identified.
57	279-w1	Potential	Potential field signs identified, connects to 243-w1 and 279-w2 with confirmed water vole presence.
58	279-w2	Present	Burrows in dry part of watercourse.
59	295-w1	Survey Constrained	Survey constrained due to overgrown vegetation.



No.	Watercourse ID	Water Vole Status	Notes
60	295-w2	Potential	Inconclusive field signs identified.
61	385-w1	Present	Field signs identified.
62	442-w1	Present	Field signs identified.
63	442-w2	Absent	No field signs identified.
64	442-w3	Absent	No field signs identified.
65	475-w1	Potential	Good habitat suitability but no field signs identified.
66	492-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
67	492-w2	Survey Constrained	Survey constrained due to hedgerow.
68	492-w3	Survey Constrained	Survey constrained due to hedgerow.
69	492-w4	Survey Constrained	Survey constrained due to hedgerow.
70	494-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
71	504-w1	Survey Constrained	Survey constrained due to overgrown vegetation.
72	513-w1	Potential	No access, however, connects to Pingley Dyke with confirmed water vole presence.
73	515-w1	Absent	No field signs identified.
74	521-w1	Potential	No access however connects to 243-w1 and 279-w2 with confirmed water vole presence.
75	524-w1	Potential	Suitable habitat, restricted access.
76	550-w1	Potential	No access, however, connects to Pingley Dyke with confirmed water vole presence.

A8.8.3.2.3 White-clawed Crayfish

Nine watercourses provided suitable habitat for white-clawed crayfish but all tested negative for eDNA (Table A8.8.3 and Figure A8.8.3). A crayfish was observed in 2022 in watercourse 210-w1 but was not identified to species. The subsequent negative eDNA result suggests that the observation was probably of the invasive signal crayfish *Pacifastacus leniusculus*. White-clawed crayfish is absent from the Study Area.



Table A8.8.3: White-clawed Crayfish Survey Results

No.	Watercourse Reference	White-clawed Crayfish eDNA result
17	77-w1	Negative.
25	115-w1	Negative (single eDNA test point).
26	115-w2	
33	151-w1	Negative.
38	197-w1	Negative.
42	210-w1	Negative (single eDNA test point).
48	236-w1	
54	244-w1	Negative.
60	295-w2	Negative.

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APPENDIX A - FIGURES





