WATER VOLE AND OTTER SURVEY REPORT

Oxford Flood Alleviation Scheme

Prepared for

Environment Agency

December 2016

Burderop Park
Swindon, SN4 0QD
UK

Document History

Reference Number: IMSE500177-HGL-06-ZZ-RE-I-000173

Client Name: Environment Agency

This document has been issued and amended as follows:

Version	Date	Description	Created By	Verified By	Approved By
1	28.10.16	1st Draft for comment	Emily Hewitt Matt Palmer Amanda Baker	Sarah Toogood	Phil Marsh
2	14.12.16	Final	Amanda Baker	Peter Sketch	Phil Marsh

Contents

Introduction

1.1 Background

CH2M has been commissioned by the Environment Agency to undertake a survey for water vole *(Arvicola amphibius)* and otter *(Lutra lutra)* to inform details of the proposed Oxford FAS route as part of Oxford Flood Alleviation Scheme (FAS).

The Oxford FAS is critical in reducing the long-term risk of flooding to residential and commercial properties in the floodplain. The principal component of the FAS is improvements to approximately 7km of the proposed route so as not to accelerate the speed at which the floodplain can drain. This may also be augmented by improvements to approximately 1km of other channels.

The need for a water vole and otter survey was recommended within the Ecological Appraisal (CH2M, 2015) and the Ecological Appraisal Summer 2016 (CH2M, 2016), which identified the need for species specific ecological surveys.

An otter and water vole survey was conducted across an area overlapping the Oxford FAS site boundary in June 2014 by URS Consultants working on behalf of Network Rail. Evidence to suggest the presence of both otter and water vole was recorded along the Hinksey Stream during that survey.

1.2 Objectives

1.2.1 Water vole

The objectives of the water vole desk study and activity survey were:

- To determine presence or likely absence of water vole within the river channels, streams and ditches within the site boundary, including the banks and marginal habitat of each;
- To identify the location and activity levels of any burrows and areas used for foraging within the site;
- To determine how the site is being used i.e. burrow construction, foraging locations and consequently the value of the area to water vole;
- Where the presence of water vole is confirmed, to make a preliminary assessment of potential impacts and recommendations for avoidance of impacts through design; and
- Where impacts cannot be avoided, to recommend the level of appropriate mitigation measures to remove or reduce potential impacts and assess the requirement for a licence from Natural England.

  Note – The Environment Agency holds an organisational licence suitable for use in many cases where disturbance (only) to water voles is necessary.

1.2.2 Otter

Otter are known to inhabit the river Thames (also known as the river Isis) through Oxford and connecting watercourses, therefore the aim of the survey was:

- To assess wider habitat suitability (within a 200m buffer zone around the project site boundary encompassing current scheme design);
- To determine the locations of any holts or resting places and gather evidence, by recording field signs (prints, spraints, feeding remains);

- To determine which areas are most heavily used, and therefore the most important to otter, as well as assess the value to otter of the site as a whole. Where the presence of otters is confirmed, a preliminary assessment of potential impacts will be undertaken, with recommendations as to how these impacts may be avoided or minimised and the likely need for a Natural England otter disturbance or licence.

Where appropriate this report also aims to identify opportunities to enhance the study area for otter.

Ecology of Water Vole and Otter

2.1 Water Vole

The water vole is the largest British vole, with males weighing on average 246-386g and females slightly less at 225-310g. Their body length is around 20cm plus a tail length of 13cm. Young are born between April and September, with a short gestation period of 20-22 days. Breeding nests are usually underground within burrows and consist of finely shredded grass or reeds.

Water voles can have up to three or four litters of young per year. Young water voles are weaned at two weeks and are actively scent marking at three weeks. Water voles scent mark by scratching the scent glands on their flanks using their hind feet, at latrines and during aggressive or defensive social interaction or sexual encounters.

The water vole is a species that is well adapted to riparian habitats in the UK and its characteristic burrows can be found in the banks of rivers, streams, canals, dykes, lakes and ponds throughout Britain. The species has a preference for slow flowing or still waters. Steep banks are also a key habitat feature, allowing the construction of burrows at different levels above the water. This is particularly important where water courses are prone to rising and falling water levels.

Water voles have suffered a serious decline in recent years and this is considered to be due to a reduction in available riparian habitat with good emergent vegetation, fragmentation following urbanisation and hard engineering of water courses and predation from American mink *(Neovison vison)*, an invasive non-native species.

2.2 Otter

Otters are found throughout Britain in aquatic and marine habitats including rivers, small streams, ditches, ponds, lakes, marshes, reed beds, estuaries and coastal waters, with an abundant, varied supply of food, plenty of bankside vegetation and clean water. They are also now found in urban areas.

Otters are extremely territorial and solitary animals. Active largely at dusk and night they usually rest in holts in or near to riverbanks, often within a tree root system, a hole in a bank or under a pile of rocks, caves, or manmade such as drains. Otters will also rest above ground in vegetation, creating flattened areas (couches). The diet of otters is mainly fish but also crustaceans, frogs, voles and aquatic birds and they often travel over large tracts of territory. A dog (male) otter may cover around 18kms of river habitat, marking their range by depositing spraint (faeces) in prominent places.

Otters breed just once every two years with cubs dependent on their mother for a year. In England, breeding can occur throughout the year, typically with one to three cubs to a litter. Breeding areas are often traditional sites that otters will return to year after year.

Otters are vulnerable to disturbance. Particular activities that may pose significant potential harm include road schemes near or crossing watercourses; maintenance of water bodies and associated

features e.g. bridges and culverts; impacts on banks and adjacent habitats e.g. vegetation removal, tree management, increased access for people and dogs; and pollution to watercourses.

Legislation & Policy

3.1 Water Vole

3.1.1 National Legislation

In England and Wales water voles are listed on Schedule 5 of the Wildlife and Countryside Act 1981, receiving full protection since 2008. The Wildlife and Countryside Act 1981, together with amending legislation, lists the following offences:

- Intentionally killing, taking or injuring a water vole (Section 9(1));
- Possessing or controlling any live or dead water vole, or any part or derivative (Section 9(2));
- Intentionally or recklessly damaging or destroying a water vole's place of shelter or protection (Section 9(4)(a));
- Intentionally or recklessly disturbing a water vole whilst it is occupying a structure or place which it uses for shelter or protection (Section 9(4)(b));
- Intentionally or recklessly obstructing access to a water vole's place of shelter or protection (Section 9(4)(c));
- Selling, offering for sale, or possessing or transporting for the purposes of sale, any live or dead water vole, or any part or derivative, or advertising any of these for buying or selling (Section 9(5)).

It is generally agreed that a place of shelter or protection used by water voles includes a network of active burrows and/or any nests that have been constructed within the burrow system or above ground amongst dense vegetation.

The trapping and displacement of water voles needs to be carried out under a licence issued by the relevant statutory nature conservation authority (Natural England in this instance). In England and Wales there is no provision for licensing development or other construction activities under the Wildlife and Countryside Act. Such works should therefore be carried out under a conservation licence, which requires the applicant to demonstrate a conservation benefit for water voles. The conservation benefit can be achieved by delivering a net gain in the amount of habitat available to the water vole population, or by improving the quality of the habitat.

It may also be possible to deliver a conservation benefit by significantly improving the linkages between water vole colonies.

Operations aimed at displacing water voles from a development footprint (in England and Wales) have previously been routinely undertaken without a licence, with developers relying on the 'incidental result' defence. Natural England and Natural Resources Wales have reviewed their position on this and now take the view that displacement activities are not covered by the 'incidental result' defence, and therefore should be licensed.

In England, displacement operations can be carried out under a Class Licence by a registered person (as of January 2016), provided that they conform to the licence conditions which include:

- Only to be used for displacement over a continuous length of bank not exceeding 50m (for watercourses this equates to 50m on each bank);
- Only to be used during the period 15th February to 15th April inclusive (ahead of the main breeding season); and

- The project must have planning consent (for schemes requiring such consent).

An annual report of actions must be provided to Natural England.

Displacement operations which do not conform to the conditions set out in the Class Licence may still be permissible in certain circumstances, such as where weather conditions do not allow for displacement during the period specified above. Displacement in such circumstances will need to be carried out under a site-specific licence. In both England and Wales a licence to displace water voles, whether site-specific or a class licence, will be issued for the purpose of conservation and the project will therefore need to deliver a conservation benefit for water voles.

3.1.2 Environment Agency Organisational Water Vole Licence

The Environment Agency holds an organisation licence for the disturbance of water voles in their burrows and damage to water vole burrows by 'displacement'.

The conditions of the Environment Agency's Organisational Licence include:

- There is suitable adjacent habitat to displace and support water voles;
- The habitat they currently occupy is made unsuitable with the use of a grass cut and scrape during Feb 15th – Apr 15th or Sept 15th – Oct 31st (before or following the main breeding season).

The first window is preferred as the number of individuals will be lower, with potentially more available unoccupied habitat for displaced voles, minimizing conflict with other individuals.

- Vegetation re-growth must be maintained below 100mm (either by cut or scrape)
- A check for fresh field signs is made from 7 days after displacement methods have been used and there is no evidence of recent use then a destructive search can be carried out at the earliest convenience and where appropriate.
- If fresh signs are found after 7 days, then a further check will be required until there are no fresh signs in the working area.
- If fresh signs are still being found (i.e. displacement does not seem to work as a method) then trapping may be required under a site specific licence issued by Natural England.
- If displacement is used outside the above windows then the Environment Agency's Organisational Licence cannot be relied upon and a site specific licence will be required which may take up to 6 weeks to be assessed, and may not be approved during the main breeding season.
- If a site licence cannot be agreed in time because the works are classed as an emergency and there is a risk to damage to people and property, then a licence is not required. However, works would need to "proceed with reasonable measures" following good practice wherever possible and recording why the works need to be done outside the recommended period. Natural England must be informed as soon as possible.

Post- construction monitoring is required for up to 3yrs following displacement or until water voles are confirmed present

3.2 Otter

Otters are protected under Schedule 5 of the Wildlife and Countryside Act (1981) as amended, and The Countryside and Rights of Way Act (CRoW Act, 2000), and are listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2010. The otter is listed on Appendix 1 of CITES, Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive; under this legislation, otters and their places of shelter are protected and it is an offence to:

- Intentionally kill, injure or take an otter;
- Keep, transport, sell or exchange any live or dead otter or any part of an otter;
- Intentionally or recklessly disturb an otter in its place of shelter; and
- Intentionally or recklessly damage, destroy or obstruct access to a place of shelter.

The otter is a Priority Species in the UK Biodiversity Action Plan, with actions targeted at its conservation at both a local and national level. The otter is also a Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities Act 2006. Many typical otter habitats (for example, wet woodlands, reed beds and ponds) are also classed as Habitats of Principal Importance.

Study Methodology

4.1 Desk Study

A desk study was carried out as part of the Ecological Appraisal (CH2M, 2015), in which records of protected species, including water vole and otter, were provided by Thames Valley Environmental Records Centre (TVERC) in 2015. These records, along with Multi-Agency Geographic Information for the Countryside website (MAGIC), were consulted to locate water courses and habitats that may be suitable for water vole burrows and otter holts within and adjacent to the proposed scheme.

4.2 Field Survey

Approximately 36.3km of watercourse was identified within the proposed scheme study area during the desk-top review. Initially, survey methodology was based on a coverage of 50m of every 250m of water course, which equates to 145 'sites' (lengths of watercourse) requiring survey. However, a full walkover was carried out as described below, and all reasonably accessible habitat was assessed and presented in the target notes and plans (Appendix A and Appendix B).

The water vole and otter survey was undertaken by two experienced ecologists in the week commencing 25th July over a period of two days, then continued on the 24th and 25th of August and the 22nd and 23rd of September 2016 during suitable weather conditions. The initial visits provided an opportunity to ground truth and rule out sites that were considered unlikely to support an otter holt and water voles at that time (i.e. very over grown, fenced, dry channels holding no water). Thigh waders (worn with life jackets) and a ranging pole were used to access riverbanks and shallow water where safe to do so.

As some watercourses could not be safely and adequately surveyed by viewing from the bank and wading in shallow water, a canoe was used on the 22nd and 23rd of September. Any evidence or potential signs of water vole and otter were photographed and/or a description provided as target notes, as documented in Appendix A.

The extent of the surveyed water courses is shown on Maps 1-8 (Appendix B). The maps are presented as follows:

- TN – Target Note, wading survey
- CS – Target Note, canoe survey
- Red Line Boundary: Study area
- Red hatched areas: Limited access using waders
- Blue hatched areas: Inaccessible
- Green hatched areas: Survey by canoe; and

- Solid Blue line: watercourses within the study area.

Field signs for both otter and water vole including prints (both species), otter spraints, water vole droppings/latrines, feeding remains (both species), water vole burrows and likely or potential otter holts and resting places were visually and manually searched for. Where possible, during the surveys on foot, the water line was viewed from the opposite bank to locate potential water vole burrows without needing to enter the water.

An assessment of the potential for otter holts along the banks of all surveyed watercourses was also undertaken and included a buffer zone of up to 200m from the watercourse, where suitable habitats were identified. This was based on current scheme design.

During the canoe survey, sections of water course previously identified as having potential to support otter or water vole were manually and visually searched for the field signs and described previously.

In some cases, incidental sightings or evidence of additional protected species were noted. These and are included within this report.

In the two locations where the watercourse was inaccessible (both using waders and in a canoe, up and downstream of Botley Bridge, Map 1 of 8), consideration is given to the habitats present and the likelihood (risk) that water vole or otters may be present.

Results

5.1 Desk Study

5.1.1 Water Vole

The TVERC record search returned records from 2009 and 2015 indicating that water voles had been present in the majority of the watercourses and streams within the larger study area.

A MAGIC search did not return any records of past EPS licences for water vole within the wider Oxford area.

Water vole activity was confirmed during a survey of Hinksey Stream south of the A423 and just to the north of the confluence with Weirs Mill Stream (URS, 2014). No other confirmed signs of recent water vole activity was recorded during this survey in 2014 (on behalf of Network Rail) although potential water vole burrows were recorded close to the rail depot within the study area. In addition, evidence of recent presence of American mink, an invasive species and a notorious predator of water vole, was recorded, which suggests why no conclusive evidence of water vole has been found during this survey (CH2M, 2016).

5.1.2 Otter

The TVERC record search returned records for otter in the wider Oxford area within the river Thames and its tributaries. The nearest record for otter was on the Bulstake Stream, approximately 1.4km upstream from where the Bulstake enters the study area.

A MAGIC search did not return any records of past EPS licences for otter within the wider Oxford area.

There have been records of casual sightings from members of the Oxford project team (specifically at Willow Walk). The URS field survey (July 2014) suggests that otter regularly use both the Hinksey Stream and Weirs Mill Stream which are located in close proximity to the Didcot to Oxford line near Hinksey.

5.2 Field Survey

Target Note descriptions are provided in Appendix A, with supporting plans in Appendix B.

Water course	Target notes	Water Vole habitat and field signs	Otter habitat and field signs
Seacourt Stream (or Wytham Stream)	CS12 CS13 TN1 TN2 TN3 TN4 TN5 TN12 TN13 TN14 TN15	The Seacourt stream is slow flowing, silty bottomed and approximately 0.3-1m in depth along the upstream half surveyed length. This upstream section is mostly devoid of trees and heavily colonised by reed and sedge beds that span the entire channel for extended lengths. The abundant in-stream and stream-bank vegetation and steep earth banks would provide ample feeding and burrowing opportunities for any water vole present. **Note**. The majority of the upstream surveyed length of the Seacourt stream could not safely be manually searched by accessing from the bank, wading, or canoe so it is possible that field signs may have been missed but the lack of water vole evidence along manually searchable sections was consistent with the Oxford FAS survey area as a whole. No conclusive evidence of water vole was encountered. The downstream section ran through a wooded area on the streams approach to Botley Bridge. Due to the tree cover shading out riverbank and macrophytic vegetation combined with the shallower depth of water, this section has much lower suitability for water vole. No evidence was encountered in the downstream section. Downstream of Botley bridge vertical earth banks are shaded by trees but do provide burrowing opportunities. No evidence was found to confirm the presence of water vole along this reach.	The Seacourt stream and associated riparian habitat provides commuting and foraging habitat for otters. The wooded section north of Botley Bridge receives relatively little disturbance and could provide refugia for otters. Despite a thorough search of the banks of the stream no evidence of otter was encountered. Downstream of Botley bridge the banks of the river continue to be heavily shaded by trees, with commercial/retail properties and public open space adjacent. Access into the channel was possible during the wading survey, and exposed roots and overhanging trees provide some opportunities for refuge, but no confirmed evidence to suggest these areas are currently used by otter An otter spraint was recorded further downstream in the more rural extent (TN14) and prior to the survey there was a sighting here of an otter travelling north at approximately sunset, confirming their presence in this area.
Hinksey Stream	TN25 TN26 TN27	The banks of the Hinksey stream are dominated by overhanging willow and alder trees. These trees shade out much of the riverbank below resulting in relatively little foraging habitat suitable for water vole. Some sections of the Hinksey stream	The river corridor of the Hinksey stream is largely naturalised with riparian trees and woodland along much of its length and receives little in the way of human disturbance except for the passing of trains along the nearby railway. These factors make the Hinksey stream highly suitable

	TN39 TN40 TN41 TN42 CS1 CS2 CS3 CS4 CS5 CS6 CS7 CS8 CS9 CS10 CS11	devoid of trees did have high suitability for water voles however. Flooded deep ditches connected to the Hinksey stream along its East bank (target note CS3) also had high suitability for water voles especially due to their more sheltered nature compared with the main Hinksey Stream. These sections were manually searched from the bank or from the canoe. Some burrows were encountered (see. target note CS6 and CS0). Some of these were of the size typically created by bank vole *(Myodes glareolus)* whilst some were larger-approaching the typical size for water vole, although a lack of any supporting evidence (droppings, prints, feeding signs) for water vole suggests that these were created by rat *(Rattus norvegicus).* However, there were no spoil heaps or worn bare earth runs between burrow entrances, which are more indicative of rat.	for use as a main commuting and foraging route for otters. The woodland and fallen trees also provide potential refugia. Despite being named the Hinksey stream, it is in fact a medium sized river in profile and therefore can be expected to support a fish population providing ample feeding opportunities for any otters using the reach. During the wading survey, feeding remains were recorded (TN25) considered to be that of otter. Further possible evidence of otter was a single print encountered on a patch of exposed earth on the east bank (target note CS5). Due to the poor condition of the single print, it is possible however that it was made by a domestic dog exiting the river, considering also that the adjoining field to the river in this location is a nature reserve that allows public access. As otters are known to be present in the wider area it is considered highly likely that otter are using the Hinksey stream on a regular basis.
Bulstake Stream	TN06 TN07 TN08 TN09 TN10 TN16 TN17 TN18 TN19 TN20 TN21 TN22 TN23 TN24 CS14 CS15	One section of the Bulstake stream had to be accessed by the canoe survey. This section was heavily shaded, limiting marginal vegetation. This confers low suitability for water vole but the banks did contain numerous small burrows (target note CS15), most likely created by bank vole, although most of these were in a state of collapse due to the soft consistency of the mud. A single mink trap (not set) was noted on the canoed section of the Bulstake suggesting that mink *(Neovison vison)*, a non-native invasive and voracious predator of water vole are present in the area. No evidence of water vole was encountered during the wading or canoe survey.	The well vegetated river corridor provides a suitable commuting route for otter with no significant obstructions along the surveyed length of the Bulstake stream. The riparian woodland habitat offered numerous opportunities for laying up and suitable holt features were noted (TN19 and TN22) However, no physical evidence of otter was encountered during the wading or canoe survey.
Hogacre Ditch	N/A	Hogacre ditch is shallow but appears likely to dry out occasionally. It is overgrown along much of its length. It generally has low suitability for water vole.	The ditch is likely to be used as a commuting route by otter as it provides a connection between the larger Hinksey and Bulstake streams.

Hinksey Hill Stream and Ditch	TN33	The stream and dry ditch running down from Hinksey Hill farm were surveyed on foot. Both were heavily shaded by trees. The stream to the west (target note TN33, top photo) was shallow, rocky and fast flowing and therefore unlikely to be suitable for water vole whereas the ditch to the east (target note WS33, bottom photograph) was completely dry and therefore not suitable. Both the stream and ditch are isolated ecologically from hydrologically connected drainage/water courses by culverts passing underneath the Oxford Southern Bypass road. No evidence of water vole was encountered.	The western dry ditch is unlikely to be used for foraging by otter and did not offer any holt building opportunities. The western stream is small (in terms of water flow) and isolated and also provides little in the way of feeding opportunities. However, the ditch is likely to provide some refuge for otter within their home range and a route to other foraging locations. No evidence of otter was encountered.
South Hinksey - North Drains	TN31 TN32 TN34	Very shallow depth of water or ditches with dense tree and shrub cover, barbed wire fence preventing access (TN31). Both watercourses are isolated from downstream habitat by culverts underneath the southern bypass road. No field signs of water vole were encountered.	The drains have a very low flow, if at all, with relatively limited opportunities for foraging. The vegetation cover along the drains did not provide habitat suitable to create an otter holt. No evidence of otter was encountered.
Devils Backbone	TN29 TN30 TN45	Watercourse generally very shallow with a lack of flow, overgrown and shaded by bramble. Steep vertical banks with no marginal berm and a lack of marginal vegetation. Footprints evident in mud/silt but no burrows, inconclusive. Some sections unsafe to access on foot or via canoe.	Due to the low flows and shallow watercourse, Devils Backbone is likely to be only used for commuting otter. A mammal 'hollow' in vegetation was recorded (TN46) but barbed wire along banks limited to access to investigate further. No conclusive evidence of otter encountered.
South Hinksey - South Drains	TN35 TN44 TN46	Watercourse generally very shallow with a lack of flow, overgrown and shaded by bramble. No evidence of water vole recorded.	Due to the low flows and shallow watercourse, South Hinksey – South Drain is likely to be only used for commuting otter. No conclusive evidence of otter encountered.
Eastwyke Ditch	TN28	This small channel provides good habitat for water vole with a reed fringe providing cover and foraging habitat, with a decent depth of water. However, no evidence recorded.	No evidence of otter recorded.
Abingdon Road Drains	TN36 TN37 TN38	Predominantly dry ditches, boundaries of grazed horse fields (badger sett recorded). Although close to the main river, lack of water and dense shade makes Abingdon	Otters may seek refuge in open areas beneath the mature willow trees in the field boundaries which connect to the river's edge. No evidence of activity was recorded.

		Drains generally unsuitable for water vole.	

Results Summary Table

Feature	Target Note Reference	Further Action (refer Section 6.1)
OTTER		
Potential Otter Holt	TN19, TN22	Pre-construction survey at least 6-8wks in advance of works to allow preparation of a mitigation strategy and any compensation measures. To include any new areas (i.e. access routes, site compounds) which may not have been included during this survey as the scheme design has progressed.
Potential Otter Resting Areas/Lying-Up Sites	TN3, TN7, TN8, TN10, TN15, TN20, TN23, TN25, TN27 and TN40	
Confirmed otter activity (i.e. sighting, spraint, foot print, feeding remains)	TN14, TN16, TN25, Tn42 and CS5	
WATER VOLE		
Potential water vole burrow		Pre-construction surveys at least 6-8wks in advance of works. Field checks to be carried out where existing banks are likely to be damaged as part of the scheme. This is required to inform an understanding of dispersal and any need to trap and translocate to an appropriate pre-selected receptor site (under an appropriate licence from Natural England). Final checks 4wks pre-construction.
Potential signs of activity		
Confirmed water vole activity (i.e. latrine, footprints, feeding remains)		

Conclusions and Recommendations

6.1 Water Vole

Although several potential burrows were recorded in 2014 by URS Ecologists, the only firm evidence of water vole activity reported for that survey were two latrines encountered on the Hinksey stream, south of the A423. Crayfish were reported during the survey and these are also known to create burrows in river banks.

CH2M ecologists (three separate experienced individuals and additional assistants) surveyed a substantial total length of water course over a total of six days in 2016. If water vole were still present in sufficient population densities to sustain a population, it is likely that reliable evidence would be encountered. Due to the lack of conclusive findings (i.e. feeding stations, footprints and latrines) it can be concluded that water vole are currently unlikely to be present within the scheme area, unless in isolated patches and very low numbers.

This possible recent local population decline may be explained by the presence of American mink as suggested by the mink trap seen on the Bulstake stream although no direct evidence of mink was encountered.

Where any in-channel works or works within 5m of a riverbank may be required, pre-construction surveys should be conducted in that particular location and the ecologist responsible should be made aware of the possible (although unlikely) presence of water voles.

Preconstruction surveys should be undertaken at least 6-8wks in advance of works to allow sufficient time for the Environment Agency's organisational water vole licence to be employed in order to temporarily displace any water voles from newly discovered burrows.

Alternatively, relocation by trapping, which is the capture of water voles from a development site and their release into a suitable receptor site away from the works may need to be considered. Where the presence of water voles has been confirmed and where works cannot be avoided that would impact upon their presence, water voles will be trapped from the working area and moved to an appropriate receptor site under licence from Natural England.

Any riverbank habitat with the potential to support water voles that is lost due to the permanent works should be replaced with new like-for-like habitat elsewhere within the scheme, if possible. This should be integrated within the design process.

Further checks should be carried out 4wks prior to works starting. If water voles are confirmed present, construction activities will be restricted to periods of time when they will have the least impact upon the water vole population present. For example, some watercourses/waterbodies may always dry out in late summer, with the water voles moving into other habitat when this occurs.

Conversely, the habitat at the periphery of a water vole population may not be occupied by water voles in spring, when populations are at their lowest.

Standard good working practices will always be employed to avoid damage to the banks of watercourses or associated wetland habitat during construction, except where directly affected by the works, or pollution events.

Mitigation should be considered further during the Environmental Impact Assessment process and measures will be recorded in the resulting Environmental Statement and the Environmental Action Plan (EAP) written for the schemes construction.

In working areas of the site where no new evidence of water vole has been recorded during the pre-construction surveys, it is recommended that these areas are made unsuitable for water vole, by frequent strimming and removal of vegetation at the earliest opportunity, subject to nesting birds and any other ecological restrictions.

6.2 Otter

The surveyed area has considerable well connected watercourses, most of which are well vegetated or adjacent to pockets of woodland. In summary there is ample suitable habitat for at least a small population of otters to be present within the proposed working area. The presence of otters, already known from previous site visits by the project team, was confirmed during the initial walkover/wading survey, on which spraints and feeding remains were encountered.

The detailed design should seek to avoid the potential otter holts identified during this survey (TN19 and TN22), however, pre-construction surveys will confirm if these are active and the appropriate mitigation required going forward. The overall design of the scheme should also aim to retain and where possible enhance connectivity of watercourses with respect to otters, and designers should seek assistance from suitably qualified ecologists where there are doubts as to the best way in which to do this.

A pre-construction survey 6-8wks in advance of mobilisation of works on site should aim to identify and confirm any ***active*** holts that may exist but have not been recorded during this survey. Sufficient time will then be available in which to prepare a mitigation strategy and apply for a license from Natural England if necessary.

Otters should be assumed to be present in all watercourses and riparian habitat in the scheme area and night-time working near watercourses should not be undertaken except where completely essential.

Mitigation should be considered further during the Environmental Impact Assessment process and measures will be recorded in the resulting Environmental Statement and the Environmental Action Plan (EAP) written for the schemes construction.

6.3 Further Mitigation for Water Vole and Otter

As part of the mitigation strategy and any licence commitments for the proposed scheme, further measures may be required to benefit water voles and otter potentially affected by the works. Such measures which will be incorporated into the scheme design to offset any remaining negative impacts on these species. Depending on the detailed design, which is still to be undertaken, potential measures could include:

- Remove selected artificial revetments along the water courses to encourage a more marginal berm to establish more suitable habitat for water voles and otter;
- If any bank side reinforcements are required as part of the scheme *block stone* revetments are preferable over gabion baskets, allowing water voles to access the earth bank through gaps in the stone. Geotextile should not be used with the block stone as this prevents/reduces vole access;
- Consider the management of water levels and the impact this has on the network of ditches used as foraging and commuting habitat for otter;
- Consider whether any bridges or culverts under roads and railways require otter ledges to allow safe passage.
- Provision of 'safe' channels/water bodies to act as a dispersal function following the construction of the flood defence scheme;
- Follow best practice for preventing pollution incidents. The Environment Agency's former PPG5 'Pollution Prevention Guidelines for Works in, near or over watercourses' or similar would be appropriate. Site compounds, site plant, materials and fuel should be stored away from water bodies;
- Recommended 2-3m buffer where bankside work is not proposed but plant access is required;
- Consider improving the habitat for water voles and otter through scrub removal and management of ditches and drains to facilitate connectivity with the wider environment encourage flow/permanent water.

6.4 Conclusion

Otters are present in low numbers within and adjacent to the study area boundary. Water voles are considered likely to be present in very low numbers only, or absent along many of the water courses surveyed. The proposed flood alleviation scheme has the potential to kill or injure otters and water voles and damage, disturb and fragment their habitat and places of shelter. Provided the works are undertaken in accordance with the recommendations of this survey report current indications are that a significant adverse impact to these species can be avoided.

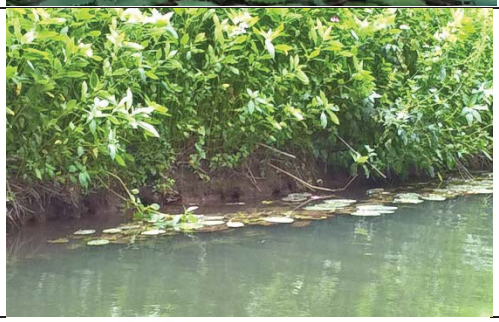
SECTION 7

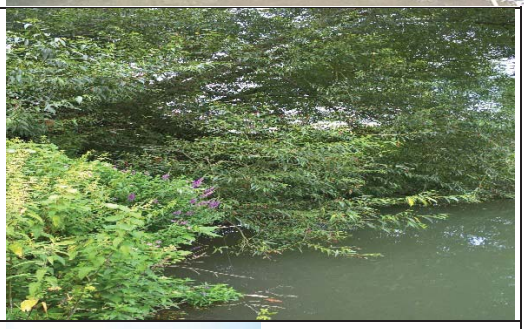
References

- Thames Valley Environmental Records Centre (TVERC)
- The Multi Agency Geographic Information Service (MAGIC), www.magic.gov.uk
- URS (2014), Hinksey Flood Alleviation Scheme Otter and Water Vole Survey

Appendix A – Target Notes

Oxford Flood Alleviation Scheme: Otter and Water Vole Survey target notes

Target note ref.	Map no ref.	Description	Photo (where available)
Walkover/ wading survey notes			
TN1	1	Dense reed fringe that could provide cover for foraging and commuting otter and water vole.	
TN2	1/2	Small burrows on right bank near foot-bridge.	
TN3	1/2	Potential resting areas, but no confirmed lying-up sites.	
TN4	1/2	Burrows in soft, vertical earth banks (left bank only).	
TN5	1	Potential bat roost in mature willow tree.	

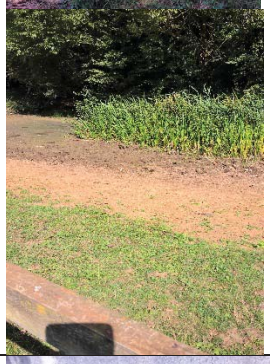
TN6	1	Burrows in soft earth banks.	
TN7	2	Extensive row of small, earth burrows, considered likely to be rat and potential otter resting/lying-up area; overhang and hollow in bank near to water's edge.	
TN8	2/3	2x mature willows overhanging water course; exposed tree roots may provide shelter/rest area for otter.	
TN9	2/3	Earth bank excavated for archaeological investigations; post-wire fence and dense hedgerow opposite. Freshwater mussel noted.	 
TN10	2	2x mature trees, felled, with root balls exposed, potential resting/lying up area.	

TN11	2	Very small burrows at foot-bridge abutment, left and right bank. Footprints nearby inconclusive.	
TN12	1/2	Extensive network of small burrows with over-hanging trees, very shaded.	-
TN13	2	Extensive network of small burrows with over-hanging trees, very shaded.	
TN14	2	Small burrows, close to water's edge, left bank, <10m from foot-bridge and spraint downstream.	
TN15	2/3	Hollow area under willow tree, smoothed earth in front. Potential otter lying up/rest area.	
TN16	2/3	Otter spraint and feeding remains.	
TN17	2/3	Dense vegetation along water's edge providing cover, but no field signs recorded.	-

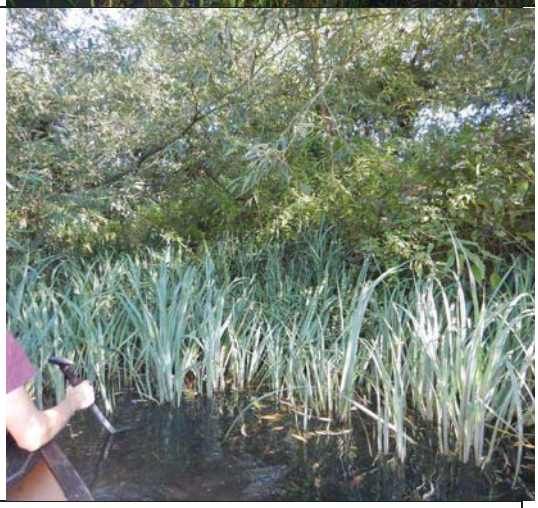
TN18	2/3	Restricted access (barbed wire fencing & vertical drop).	
TN19		Potential otter holt.	No photograph available. Area of exposed tree roots/over-hanging vegetation.
TN20	3	Mature and overhanging trees provide cover for resting/lying-up.	
TN21	2/3	Nesting bird (wildfowl) and burrows along right-bank (inconclusive). **NOTE**: Homeless people living under bridge nearby.	
TN22		Burrows along left bank	-
TN23	2/3	Over-hanging mature willow tree provides potential lying up site/rest area for otter.	
TN24	3	Small burrows along top of both banks, no other supporting evidence.	-

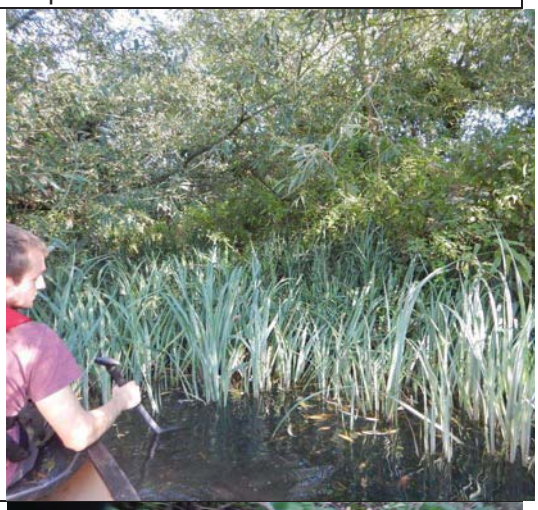
TN25	2	Site of 2x potential holts/resting areas (left and right bank, including up-rooted tree), evidence of feeding (mussel, fish, crustacean.	 
TN26	2/4	Dead mammal (inconclusive) and small, mammal footprints in silt.	
TN27	3/4	Potential lie-up, right bank, near bridge, upstream.	-
TN28	3/5	Small channel at this location with high potential to support water voles but no evidence recorded. Dense vegetation along water's edge (Himalayan balsam, nettle and reeds).	
TN29	4/5/7	Footprints evident in mud/silt but no burrows, inconclusive, very overgrown and shaded, shallow water.	-
TN30	4/5/7	Water not visible, very overgrown, unsafe to access on foot or via boat/kayak.	

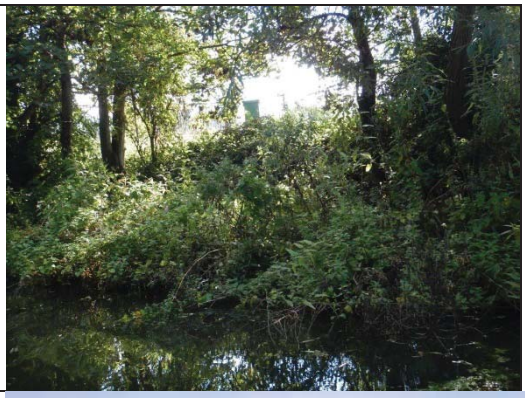
TN31	4/5	Potential water vole habitat but limited connectivity with ditches holding water, double-row barbed wire fencing, lack of flowing water.	
TN32	4/5	Very shallow depth of water in ditch, dense tree and shrub cover, barbed wire fence preventing access. Grazed sheep fields either side.	-
TN33	4	North west water course (first image) is a fast flowing rocky stream on a moderate gradient and heavily shaded by trees. The south east watercourse (second image) is a dry ditch running down a moderate gradient. Both watercourses are isolated from downstream habitat by culverts underneath the southern bypass road. No field signs were encountered.	 
TN34	4/5	Dry ditch.	
TN35	4/7	Dry ditch.	-
TN36	5/6	Dry ditch.	-

TN37	5/6	Embankment/bund, with trees, no ditch. Badger sett recorded.	
TN38	5/6	Dry ditch, overgrown, 2x mature willow trees recorded with potential to support bats. Dry pond (seasonal) subject to poaching by horses/livestock.	 
TN39	7/8	No evidence of water vole recorded during on-foot survey between Cold Harbour Camping Site and Abingdon Road/Red Bridge. Canoe survey- Solid concrete under bridge with no water vole habitat potential. No evidence of otter or water vole under bridge or along adjacent river banks.	 

			
TN40	5/7	Potential otter holt/resting area near bridge, upstream, including rocky outcrop with hollow.	
TN41	5/6/7	Small burrows considered to be that of rat.	-
TN42	5/6/7/8	Otter spraint near weir.	-
TN43	7/8	Stand of Japanese knotweed.	-
TN44	5/7	Very shallow, shaded and over-grown.	-
TN45	4/7	Steep vertical banks with no marginal berm, lack of marginal vegetation with dense shade and limited flow.	-
TN46	5/6/7	Very dense stands of bramble adjacent to shaded water course, mammal 'hollow' in vegetation. Barbed wire along banks limiting access. Crayfish observed in-channel, preferable water vole habitat with varying steepness of earth banks and reed fringes. Burrows in banks inconclusive. Pooled areas have low to moderate potential to support water voles but no evidence recorded.	 
Canoe survey target notes.			
CS1	7/8	Culvert.	No photo availiable

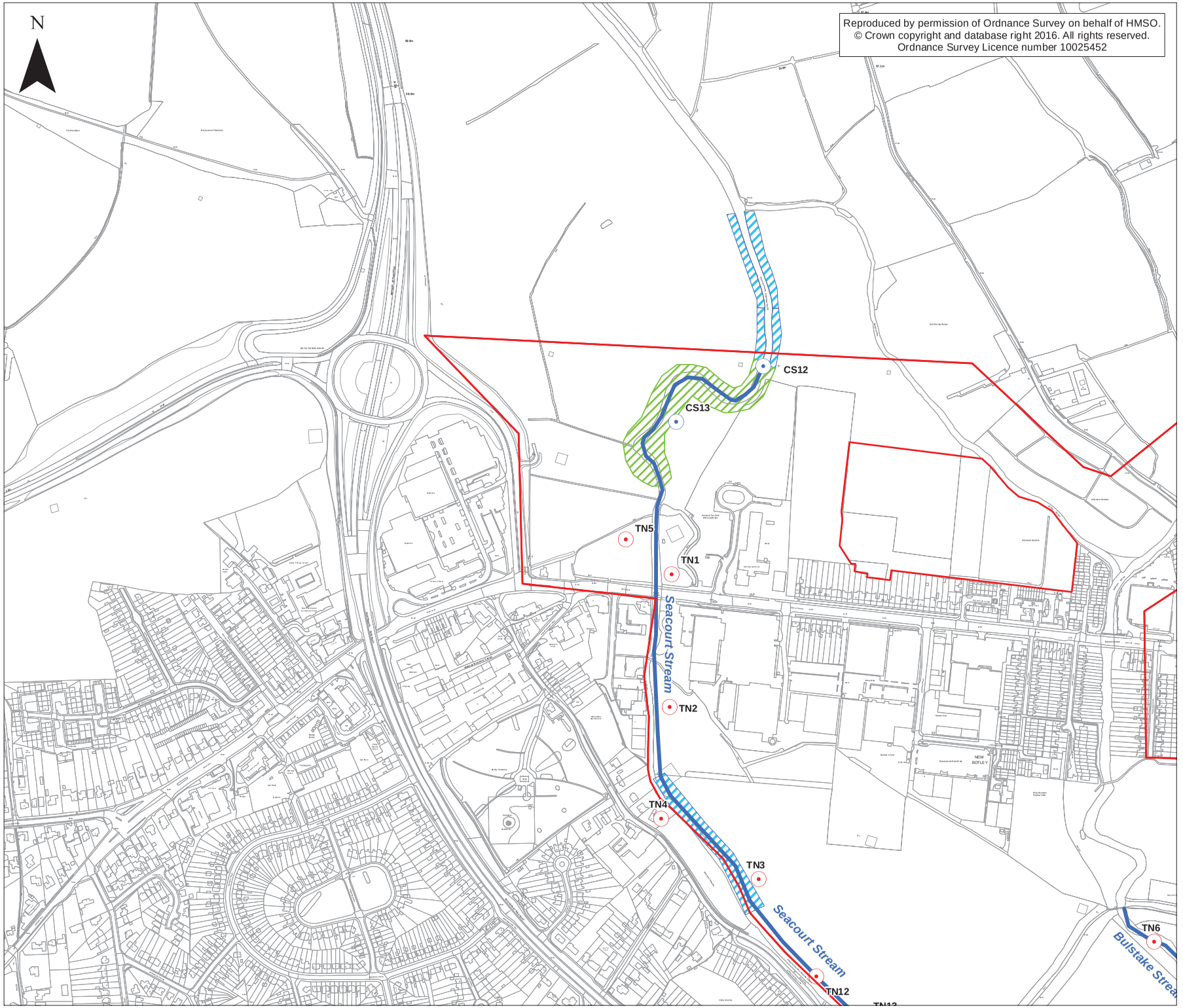
CS2	7/8	Dry drains.	
CS3	7/8	Year-round wet ditches.	
CS4	7/8	Reed/tall sedge bed.	
CS5	7/8	Point of entry with canoe, also possible otter print.	

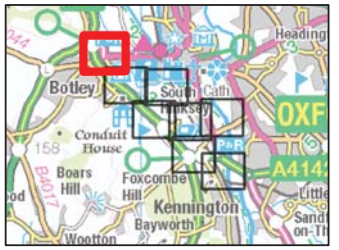
			
CS6	7/8	Probable rat burrow.	
CS7	7/8	Dry ditch.	No photo
CS8	7/8	Reed/sedge bed.	
CS9	7/8	A number of small burrows like the one shown, probably bank vole.	

CS10 and CS 11	8	River banks along Hinksey stream mostly over-shaded by trees with some small openings.	
CS12	1	Seacourt Stream (or Wytham Stream) – much of which unsurveyable by wading or canoe due to steep banks, deep silty water and very dense reed vegetation.	
CS13	1	Mud banks with recent waterfowl prints evident but no evidence of any small mammal prints.	
CS14	1	Mink trap (not set) – suggestive of mink.	

CS15	3	Burrows, likely created by bank vole, many partially collapsed however.	

Appendix B – Survey Area Mapping





Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

Environment Agency

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

ch2m.

Project :
Oxford Flood Alleviation Scheme

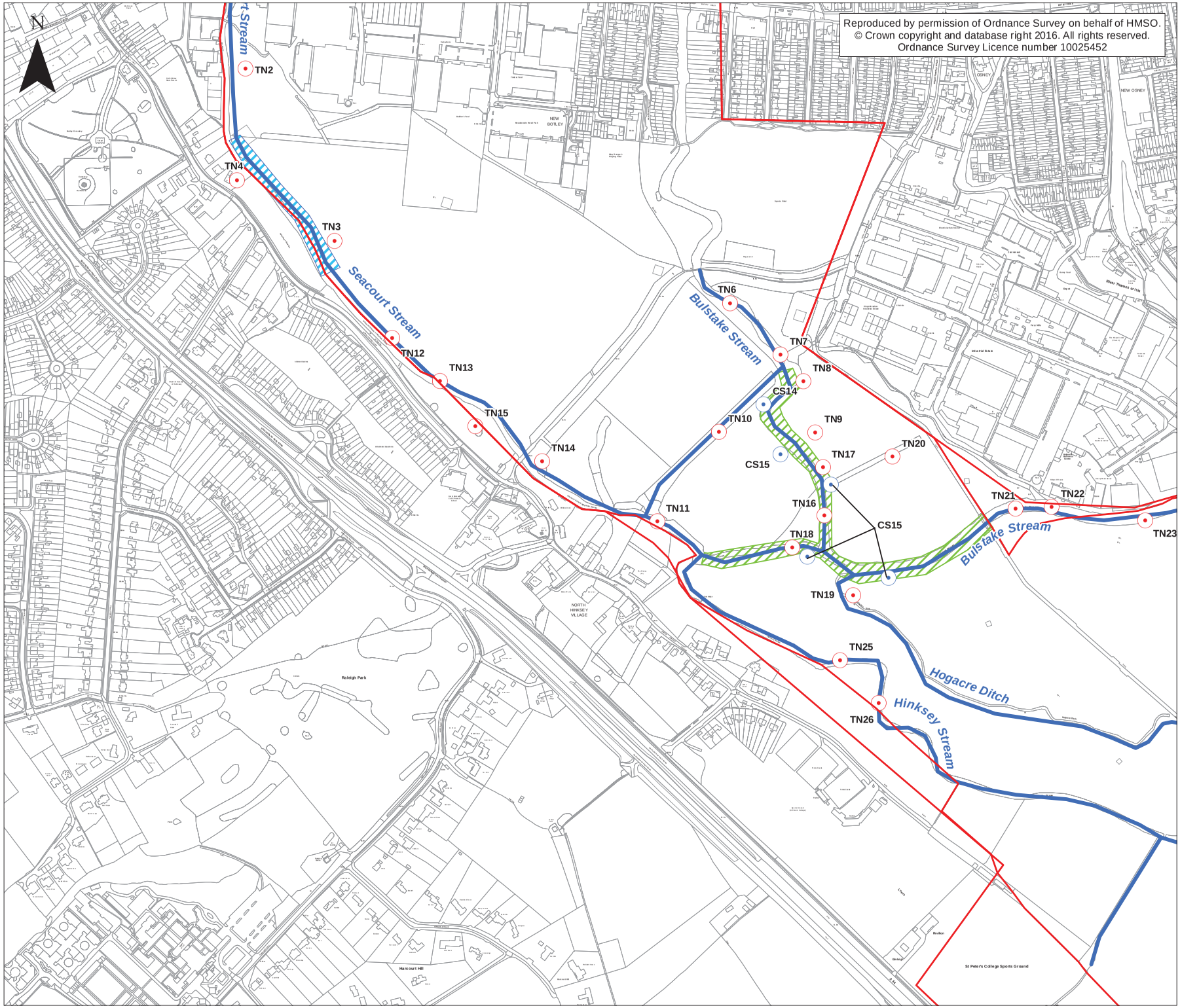
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 1 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_Water\Vole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

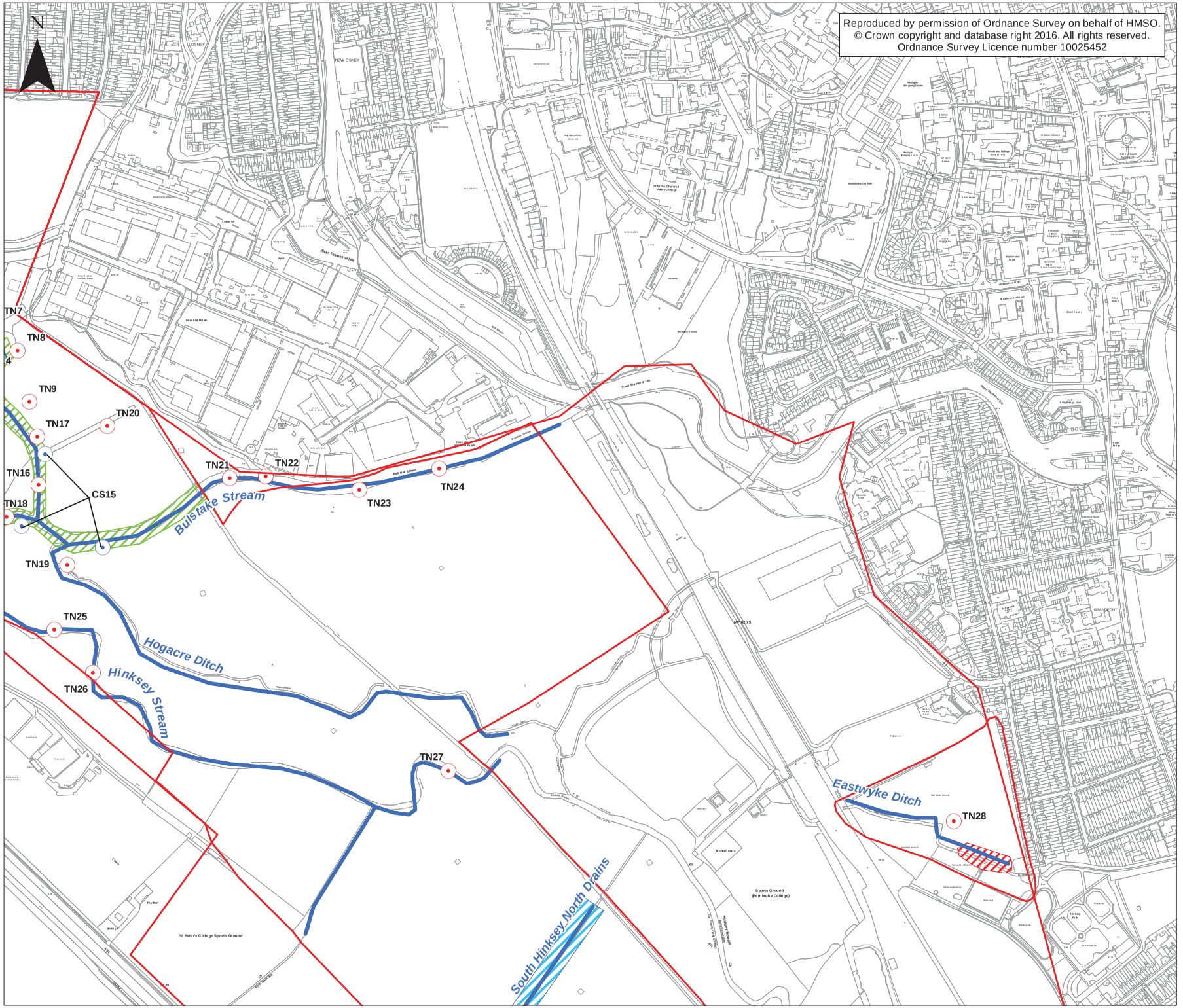
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 2 of 8
Revision -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_Water\Vole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

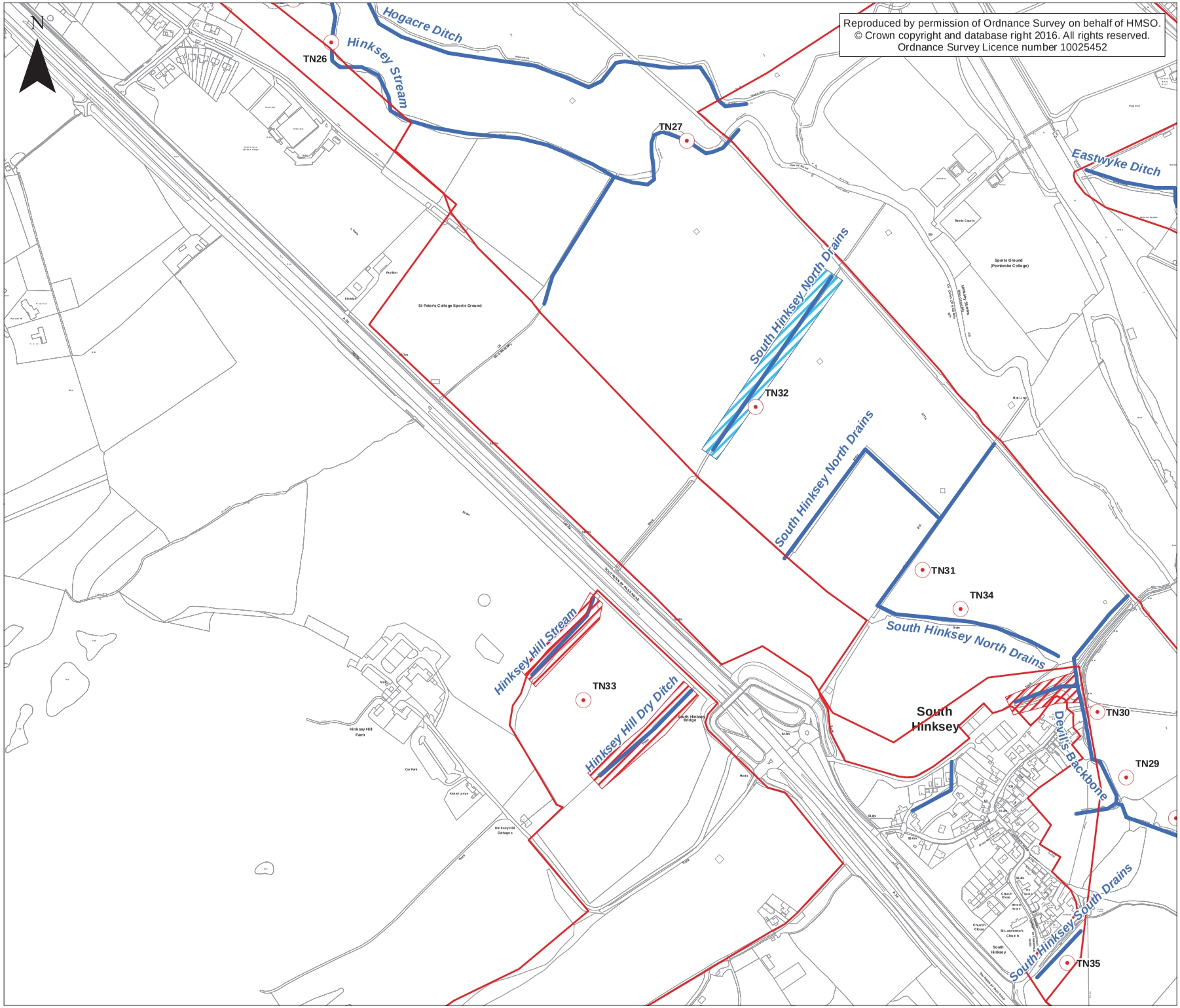
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 3 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_WaterVole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

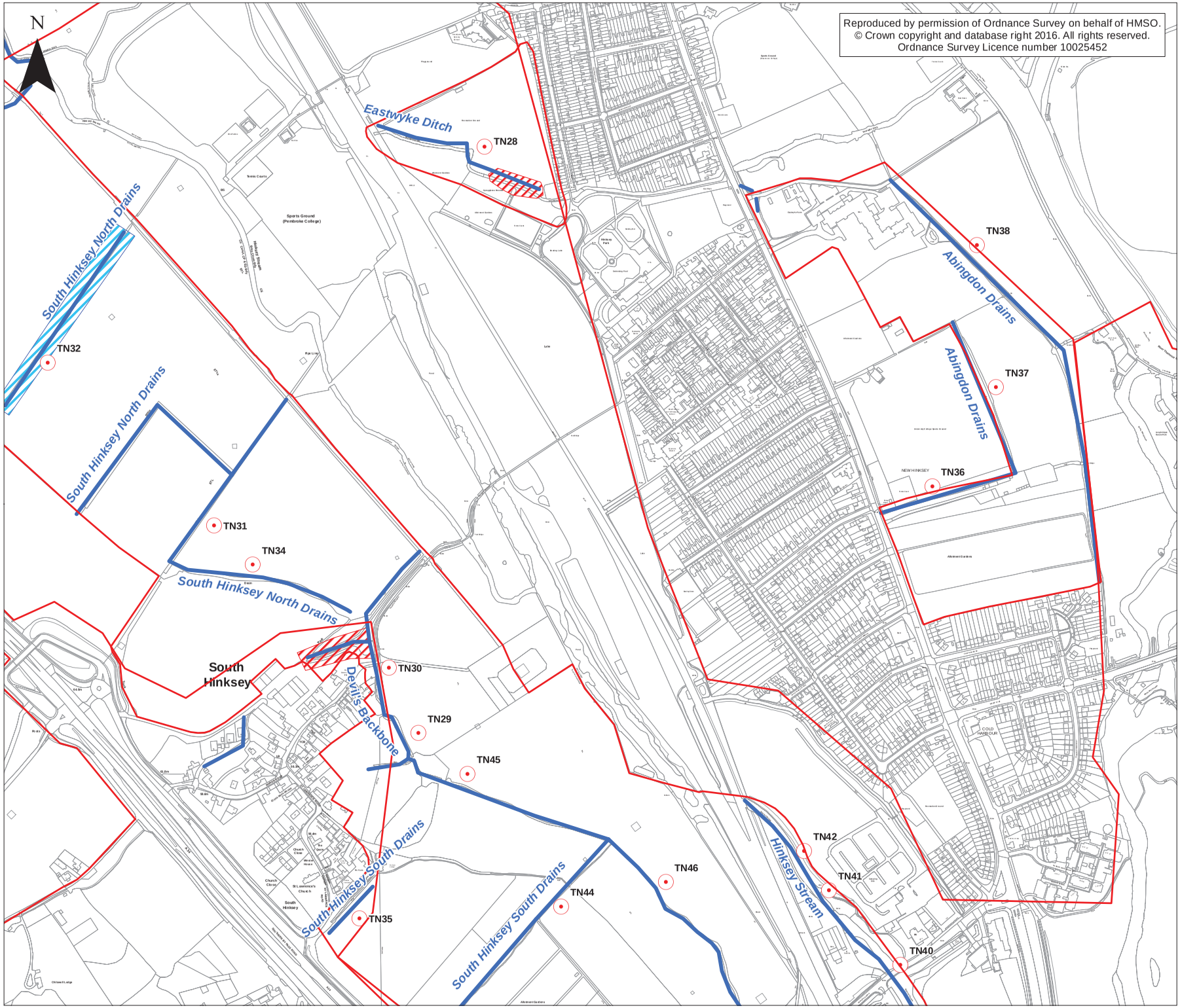
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 4 of 8
Revision -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_WaterVole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

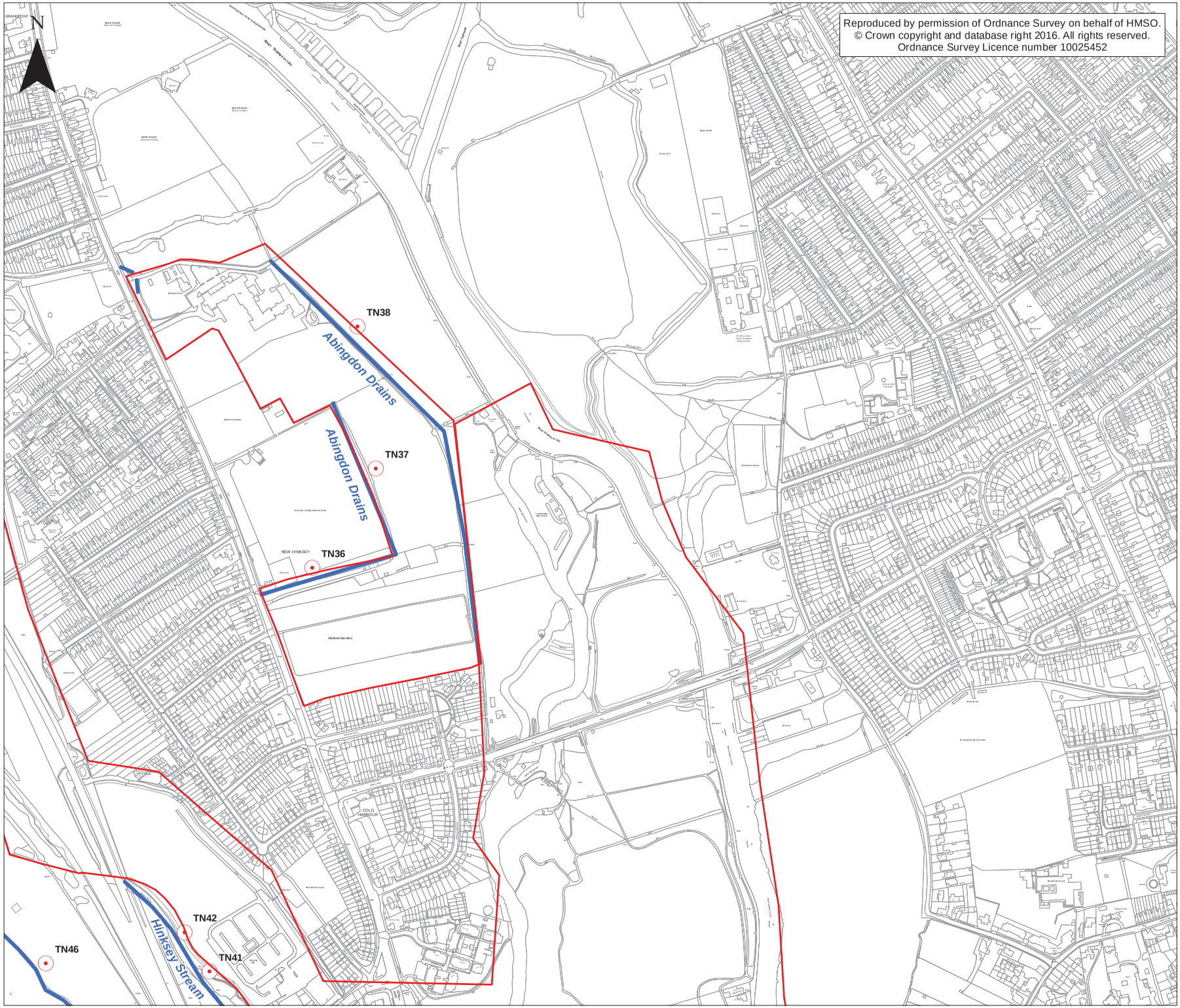
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 5 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_WaterVole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

Environment Agency

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

ch2m.

Project :
Oxford Flood Alleviation Scheme

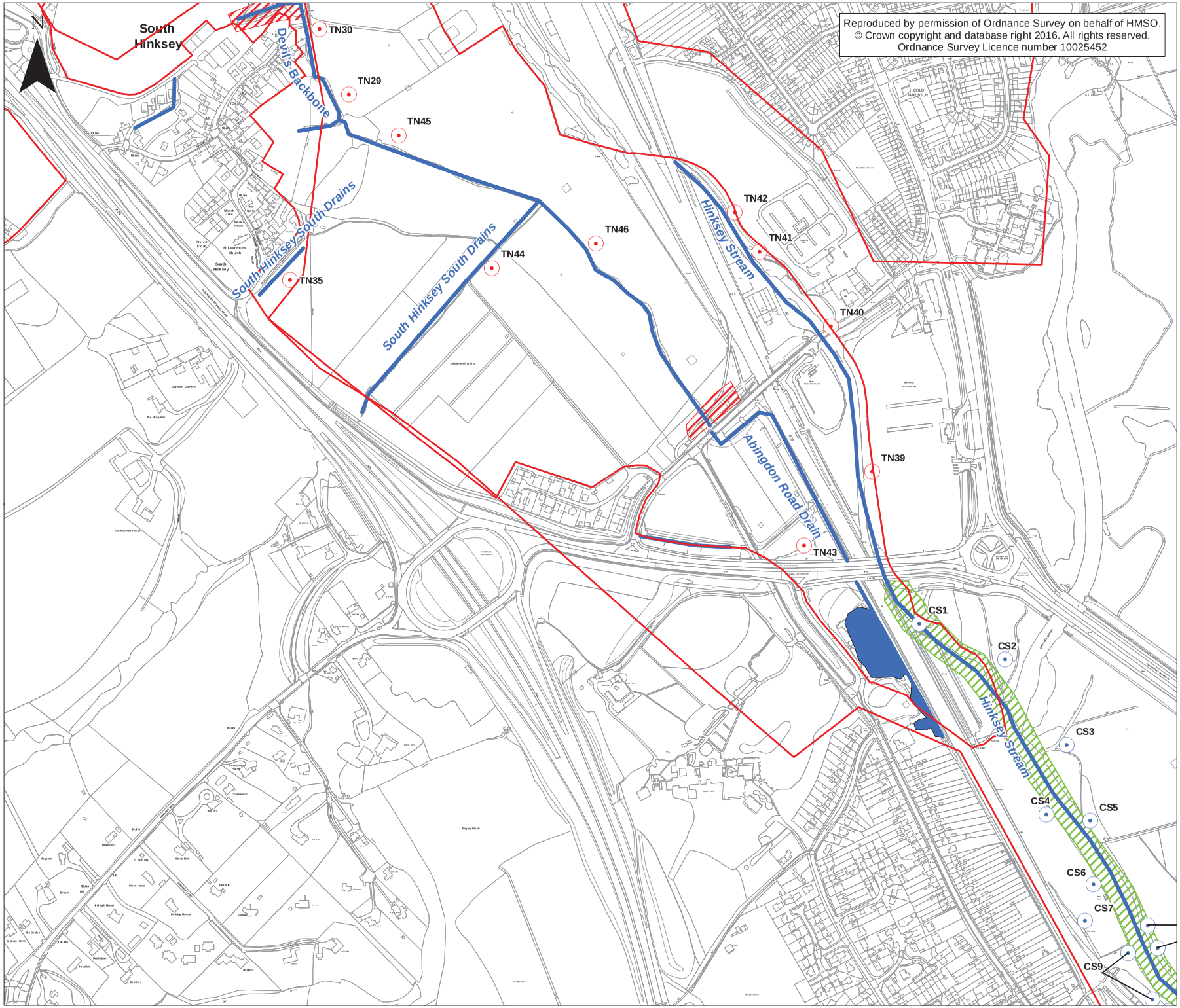
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 6 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_Water\Vole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

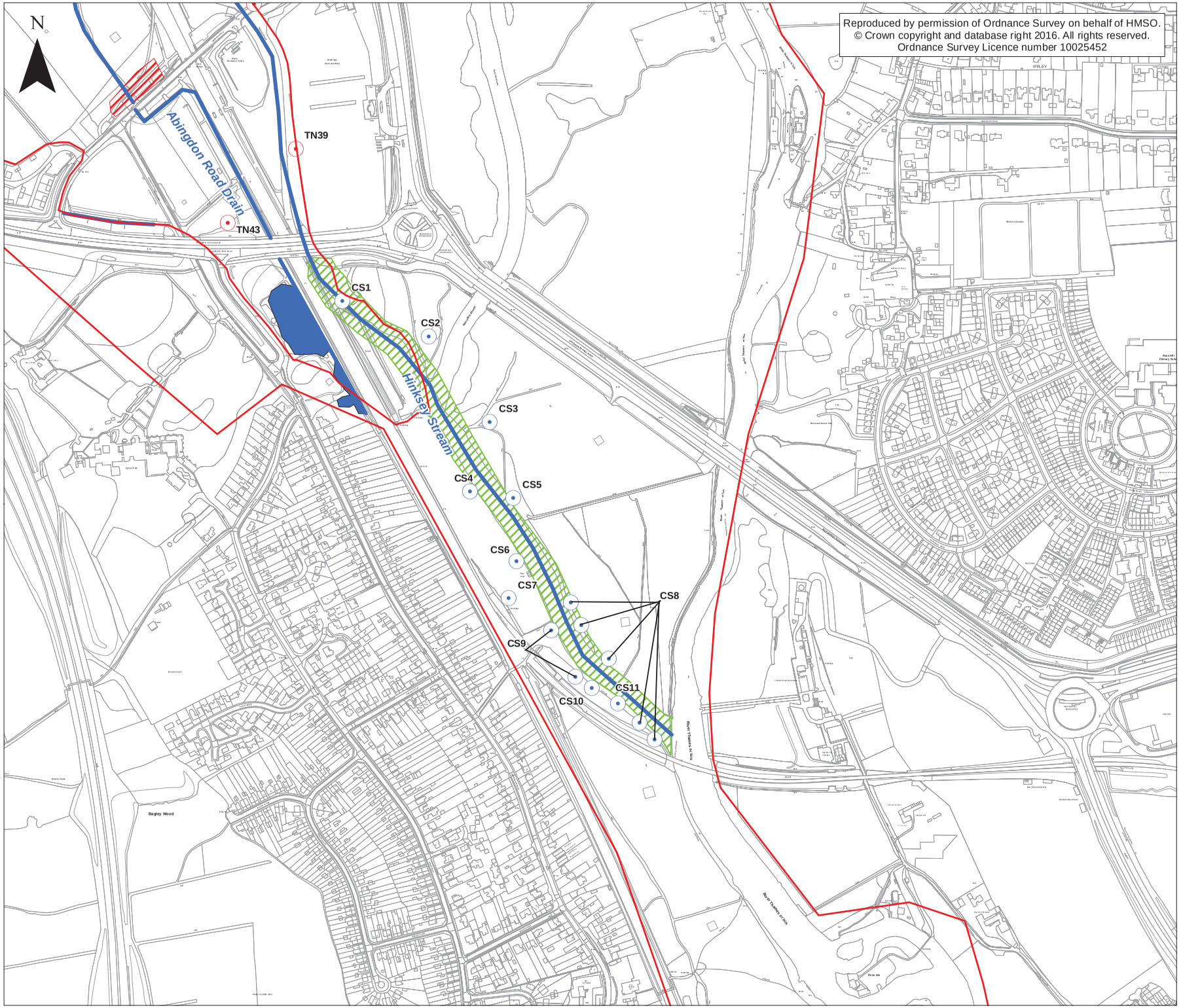
Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 7 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_Water\Vole_Survey_v1.mxd



Legend

- Survey Boundary
- Target Note, Canoe Survey
- Target Note, Wading Survey
- Inaccessible by Any Means
- Limited Access Using Waders
- Survey by Canoe
- Watercourses in Study Area

0 125 250
Metres

Rev	By	Chkd	Apprvd	Date	Description

Client
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
RG1 8DQ

CH2M HILL
Burderop Park, Swindon, SN4 0QD
Tel: +44 (0)1793 812479 Fax: +44 (0)1793 812089
www.ch2m.com

Project :
Oxford Flood Alleviation Scheme

Drawing :
Otter and Water Vole Survey

Drawn By :	Martin Costello	Date: 28/10/2016
Checked By :	Amanda Baker	Date: 28/10/2016
Approved By :	Emily Hewitt	Date: 28/10/2016

Drawing No. : Map 8 of 8
Revision : -

Drawing Scale : 1:5,000

Document Path: \\swin-fs-05\water\whitec\Oxford FAS\Environment\GIS\MXDs\Otter_and_Water_Vole_Survey\Oxford_FAS_Otter_Water Vole_Survey_v1.mxd