M42 Junction 6 Development Consent Order

Scheme Number TR010027

8.55 Soil Survey Report

Planning Act 2008

Rule 8 (1)(k)

The Infrastructure Planning (Examination Procedure) Rules 2010

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M42, J6:SOIL SUITABILITY ASSESSMENT FOR ANCIENT WOODLAND & GRASSLAND TRANSLOCATION

Report 1581/2

23rd August, 2019

Land Research ASSOCIATES
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M42, J6: SOILS SUITABILITY ASSESSMENT FOR ANCIENT WOODLAND & GRASSLAND TRANSLOCATION

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Report 1581/2
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1.0 Introduction

1.1 This report provides information on the soilresources of ancient woodlandand grasslandhabitat areas and of proposed receptor sites.

SITE ENVIRONMENT

1.2 The survey area comprises land at two donor sites (Aspbury's Copse and Bickenhill) and potentialtwo receptor sites (existing arable fields).

1.3 Aspbury's Copse lies to the south of Solihull Road and is bissected by the M42. This woodland is proposed to be translocated onto an arable field immediately to the south. This land is bordered by the M42 in the west and adjoining agricultural land on all other sides.

1.4 Species-rich meadow grassland forming part of Castle Hill Farm Meadows Local Wildlife Site is bordered to the east by Catherine De Barnes Lane, a sports club to the south and other sides by adjoining grassland. The receptor site is an arable field on restored landfill. It lies adjacent to Bickenhill SSSI and is bordered on all other sides by adjoining agricultural land.

1.5 A second area of species-rich grassland at Bickenhill was identified, although following a site visit the area was found to be unmanaged and invaded by denseimpenetrable nettles and brambles. As the undesirable weed burden of these soils makes them unsuitable for translocation, no further investigation of this land was undertaken.

SOIL SURVEY

1.6 The site was visited in July 2019. A detailed soil survey was carried out across the sites, at a density of four observations per hectare (see Maps 1 and 2 in an appendix to this report). Soils were investigated to a maximum depth of 1.2 m, via a combination of auger borings and hand dug pits.

1.7 During the survey land 'units' were identifiedaccording to changes in soil type and management, in order to target sampling for analysis (see below).

NUTRIENT SAMPLING

1.8 Representative topsoil (0-15 cm) and subsoil (30-45 cm) samples were collected for each identified soil type within each donor/receptor site. They were bulked from a minimum of five sample points across each sample area. A total of nineteen samples (nine topsoil and ten subsoil) were submitted for nutrient analyses to a UKAS accredited laboratory.

2.0 Soils

ASPBURY'S COPSE

2.1 Soils at the receptor and donor site were found to have similar characteristics: they typically comprise heavy textured (clay loam) topsoilat 250-300 mm thickness over dense poorly structured clay subsoil. In some locations within the donor site, a thin permeable upper subsoil was found to overlie the clay. Soils at both sites are poorly-draining(Wetness Class IV).

2.2 A typical profile is described below from a pit at observation L6 within the receptor site (Map 1).

0-31cm	Dark reddish brown (5YR 3/3) heavy clay loam; slightly stony (small and medium rounded pebbles); moderately developed medium subangular blocky structure; friable; smooth clear boundary to:
31-100cm+	Red (2.5YR 4/6) clay with large distinct grey (5YR 5/1) mottles; very slightly stony (small hard stones and pebbles); weakly developed very coarse prismatic structure; firm.

2.3 A small area in the north-east of Aspbury's Copse (Donor Site 1 of Map 1) was found to have sandy clay loam lower subsoils. This is due to the land in this area being formed over interbedded sandstone, siltstone and mudstone (Arden Sandstone Formation).

2.4 A profile from the donor site with sandy clay loam lower subsoils is described below from a pit at A1 (Map 1).

0-22 cm	Dark greyish brown (10YR 4/2) heavy clay loam; very slightly stony (small subangular hard stones); well developed medium subangular blocky structure; smooth clear boundary to:
22-45 cm	Grey (10YR 6/1) clay with common diffuse light grey (10YR 7/1) and yellowish reddish yellow (7.5YR 6/8) mottles; (moderately developed coarse subangular blocky structure;
45-100+	Red (2.5YR 4/8) sandy clay loam; with large distinct grey (10YR 6/1) mottles; weakly developed medium to coarse platy structure; firm.

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2.5 Soils within the receptor site and donor site vary significantly in texture and drainage properties.

2.6 The donor site has topsoils of sandy loam texture that are friable and easily handled by machinery, they occur to an average depth of 250 mm. The subsoils within this area are friable and well draining, of sandy loam texture. The land is freely draining (Wetness Class I).

0-27cm	Dark brown (7.5YR 3/2) medium sandy loam; slightly stony (10% small and medium quartz pebbles); moderately developed fine subangular blocky structure; friable; smooth gradual boundary to:

27-60 cm	Reddish brown (5YR 4/4) medium sandy loam; slightly stony; moderately developed fine subangular blocky structure; very friable; smooth gradual boundary to:
60-79 cm	Light greyish brown (10YR 6/2) loamy medium sand with common distinct yellowish brown (10YR 5/8) mottles; weakly developed fine subangular blocky structure; friable; smooth diffuse boundary to:
79-100 cm+	Reddish brown (5YR 4/4) sandy clay loam with common fine distinct reddish grey (5YR 5/2) and red (2.5YR 4/6) mottles; weakly developed coarse-very coarse subangular blocky structure; friable.

2.7 In contrast, land at the receptor site is imperfectly draining (Wetness Class III). The land is made up of heavy textured topsoils, to a depth of 250 mm, over dense poorly structured reddish clay.

2.8 An example profileof the heavy soils on the receptor site is described below from a pit at observation M4 (Map 2).

0-25cm	Very dark greyish brown (10YR 3/2) heavy clay loam; slightly stony (small pebbles and medium and coarse brick fragments); moderately developed very coarse subangular blocky structure; firm; smooth clear boundary to:
25-50 cm	Brown (7.5YR 5/3) heavy clay loam; very slightly stony (small stones and medium pebbles); weakly developed very coarse subangular blocky structure; firm; smooth gradual boundary to:
50-80 cm+	Reddish brown (5YR 4/4) clay; very slightly stony (small stones and pebbles); weakly developed very coarse angular blocky structure to massive; very firm; plastic and dense.

3.0 Laboratory analysis

3.1 Analytical results are summarised below, full laboratory certificates are provided in an appendix to this report.

ASPBURY'S COPSE

3.2 The topsoil of the woodland donor sites are slightly acidic. Donor Site 1 has low nutrient topsoils while Donor Site 2 is moderately fertile (see Map 3). The subsoils are low in available nutrients with neutral pH.

3.3 The receptor site has neutral topsoils that are high in nutrients, as would be expected on intensively managed arable land. The subsoils have low available phosphate.

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3.4 Despite the physical differences between the donor and receptor sites, the soils chemical characteristics are broadly similar. Both sites have low nutrient, neutral topsoils and subsoils (phosphate index 0).

Table 1: Soil analytical results

	Sample area ID (see Map 2)	Topsoil					Subsoil				
		Soil texture	pH	MAFF nutrient index			Soil texture	pH	MAFF nutrient index		
				P	K	Mg			P	K	Mg
Aspbury's Copse	Donor Site 1	Heavy clay loam	5.3	0	2-	6	Clay	6.6	0	2-	9
	Donor Site 1 (subsoil 2)	-	-	-	-	-	Sandy clay loam	8.0	0	1	9
	Donor Site 2	Heavy clay loam	5.7	2	2-	6	Clay	5.7	0	2-	8
	Receptor Site	Heavy clay loam	6.3	4	2-	6	Clay	7.0	0	1	7
Bickenhil	Donor Site	Sandy loam	6.0	0	1	4	Loamy sand	6.6	0	0	4
	Receptor Site	Heavy clay loam	6.7	0	2-	6	Clay/sandy clay	7.2	0	2-	7

4.0 Soil suitability and resources

4.1 The soils resources of each site are described below and a map showing their distribution provided in an appendix to this report (Maps 3 and 4).

ASPBURY'S COPSE

4.2 The soils within the woodland (donor sites) and the arable field (receptor site) have similar physical properties, but differ in nutrient content due to the intensive management of the agricultural land.The stripping of high nutrient topsoils within the receptor site prior to woodland translocation will minimise the presence of competitive weed species. The subsoils of the donor site are clayey and poorly-structured, this will need to be accounted for in management of the translocation. The soils are moderately-well suited to the translocation of the woodland.

Donor Site 1 Topsoil (TS1)

4.3 These soils are low in available nutrients andwell structured with a moderately high clay content (heavy clay loam texture). They should be relatively easy to handle although their high clay content means they are susceptible to compaction damage when wet. They should be stripped to a thickness of 250 mm.

Estimated maximum yield: 2,500 m^3

Donor Site 2 Topsoil

4.4 The moderately high nutrient content of topsoils in Donor Site 2 (see Map 3) mean these soils have a reduced suitability for translocation as they are likely to rapidly turn to bramble/nettle scrub once canopy cover is removed. They also lie at a thickness of 250 mm.

Estimated maximum yield: 3,750 m^3

Donor Site Subsoil (SS1)

4.5 The subsoils of the woodland are generally dense clays with permeable upper subsoils in patches,although these are too unpredictable to strip separately. It is not advised to use these soils in the translocation as their poor structure will further deteriorate upon excavation. Where excavated for construction, SS1 would be suitable for use in landforming and embankment cores. They occur below the topsoil at a thickness of over 700 mm.

Receptor Site Topsoil (TS2)

4.6 The topsoil of the receptor site is moderately well structured with a relatively high clay content. They are high in nutrients and would be suitable for reuse in landscaping (e.g. amenity grassland or spread on neighbouring agricultural land). These soils should be stripped to a thickness of 300 mm.

Estimated maximum yield: 6,600 m^3

Receptor Site Subsoil (SS2)

4.7 The subsoils of the receptor site are dense poorly-draining clays. They are highly susceptible to compaction damage, especially if trafficked when wet. These occur at a thickness of greater 700 mm+.

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4.8 The restored arable land is well suited as a receptor site for the MG5 grassland. The low fertility soils will support species diversity,althoughthe imperfectly draining subsoils may encourage wetness tolerant species without drainage management. The receptor site also has a relatively high pernicious weed burden which will need managing prior to translocation.

Donor Site Topsoil (TS3)

4.9 The topsoils of the grassland donor site are light textured sandy loams. They are low in nutrient and fairly resistant to structural damage. They should be stripped to a thickness of 250 mm (turf and topsoil inclusive).

Estimated maximum yield: 6,600 m^3

Donor Site Subsoil (SS3)

4.10 The subsoils of the donor site are sandy loams. These soils are low in clay content and easy to handle with machinery although prone to wind-blown erosion. They underlie the topsoil at a thickness of over 750 mm.

Receptor Site Topsoils (TS4)

4.11 The topsoils of the receptor site are low nutrient heavy clay loams. They lie at an average thickness of 250 mm.

Estimated maximum yield: 5,500 m^3

Receptor Site Subsoils (SS4)

4.12 The subsoils are poorly structured and high in clay content comprising sandy clays and clays. They are susceptible to compaction damage from trafficking

during the translocation.They underlie the topsoil at a thickness of greater than 750 mm.

5.0 Soil management

ASPBURY'S COPSE

Stage 1 – Topsoil Strip Receptor Site

5.1 The arable landis moderately well suited for the translocation of the woodland. The topsoils (TS2) should be stripped to 300 mm thickness and stockpiled prior to future use elsewhere. They should be stripped in drier parts of the year using the excavator and dumper method described by Sheet 1 in the MAFF Good Practice Guide for Handling Soils[1]. Soils should not be stripped during or just after heavy rainfall to protect soil resources. Soils should not be moved in a plastic state, this can be judged by the ability of soil to be rolled into a 3 mm thick thread (if it rolls into a thread it is too wet to handle).

Stage 2 – Cultivate Receptor Site

5.2 The subsoils of the donor site (SS2) are weakly structured with poor drainage. They are highly susceptible to compaction damage and so trafficking should be kept to a minimum. The subsoil of the receptor site should be cultivated to alleviate any compaction damage suffered during topsoil stripping. This will ensure tree roots can penetrate the soil profile to full depth.

Stage 3 – Topsoil Strip Donor Site

5.3 TS1 from woodland Donor Site 1 should be stripped to 250 mm depth, with care taken to avoid incorporation of the underlying clayey subsoils (SS1). Typical protocol is to lay soil profiles intact. This method aims to preserve soil microbial-plant relationships.However, due to the poorly structured clay subsoil of the receptor site and high clay content of TS1, the risk of compaction damage is excessive. Compaction of the soil resources will adversely affect soil microbes and macrofauna, lead to sealing of the subsoil causing impermeability and surface waterlogging, and cause restricted rooting depth. Therefore, it is recommended that TS1 be laid at the receptor site using the loose-tipping technique (Sheet 4 MAFF Good Practice Guide), which avoids traffic on the restored surfaces and minimises compaction risk.

Stage 4 – Translocation

5.4 Translocation of the woodland should take place during trees dormant periods of autumn/winter taking care to avoid handling when soils are plastic (see para

[1]MAFF Good Practice Guide for Handling Soils, (www.defra.gov.uk/farm/environment/land-use/soilguid/)

5.1). Coppice stooles, saplings and deadwood should also be retained from the donor site and translocated. As the subsoils of the receptor site are dense, the planting of heavier standards should take place in tree pits back filled with suitable permeable material.

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5.5 The donor site has low nutrient coarse loamy topsoils that are an excellent resource for translocation of MG5 grassland. The topsoils are relatively resistant to structural damage although handling should be avoided during and just after heavy rainfall.

5.6 From the investigation, it has been found that the receptor site also has suitable soil properties for the creation of neutral meadow following a change in land management (i.e. spraying off and removal of pernicious weeds, reseeding with desired sward mix).

5.7 Given that soils within both the sites are capable of supporting habitat of high ecological value, it may be advisable that the more effective use of the donor site topsoil (TS3) is in wildflower verges elsewhere within the site and the receptor site managed into species rich meadow (given the drainage the natural grassland ecology is likely to be that of a moist neutral site).

5.8 If this is not a viable alternative, the receptor site should be cleared of weeds. Topsoil TS3 should be stripped from the donor site at 250 mm thickness, then cultivated into the receptor site. Care should be taken to avoid excessive trafficking of the receptor site as the heavy soils are susceptible to compaction damage which would worsen the already imperfect drainage of the site.

6.0 Summary and conclusions

6.1 The soils at receptor sites for Aspbury's Copse and Bickenhill have suitable properties to facilitate successful translocation of the desired habitats. The translocation of ancient woodland will involve the removal of receptor site topsoil and replacement with that from the donor site. Care should be taken to avoid excessive trafficking of the clay receptor site subsoils.

6.2 The low nutrient soils of the donor site and receptor site are suitable for the translocation of MG5 grassland at Bickenhill. The receptor site was under a high density of pernicious weeds at the time of survey which will need spraying off prior to any habitat creation/translocation. The receptor site can then either be reseeded with suitable wildflower mix or the donor site topsoil imported. The topsoil of the donor site is an excellent resource which could be used in species rich grassland creation elsewhere within the site if not translocated to the donor site.

APPENDIX

DETAILS OF SURVEY OBSERVATIONS
MAPS
AND LABORATORY ANALYSIS

Land at M42, J6: Soil resources survey – Details of observations at each sampling point

Site		Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness
		No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class
Aspbury's Copse	Receptor Site	L1	0-30	HCL	<5	30-80+	Cr	xx				1	IV
		L2	0-29	HCL	<5	29-100+	C	xxx				0	IV
		L3	0-29	HCL	<5	29-100+	Cr	xxx				0	IV
		L4	0-31	HCL	<5	31-45	Cr	xxx	45-52 52-100+	SCL Cr	xxx xxx	0	IV
		L5	0-26	HCL	<5	26-100+	Cr	xxx				0	IV
		L6	0-28	HCL	<5	28-80+	Cr	xxx				1	IV
		L7	0-27	HCL	<5	27-80+	Cr	xxx				1	IV
		L8	0-26	HCL	<5	26-70	HCL	xxx	70-100+	Cr	xxx	1	IV
		L9	0-29	HCL	<5	29-80+	C	xxx				0	IV
		L10	0-28	HCL	<5	28-90+	Cr	xxx				0	IV
	Dponor Site	L11	0-20	HCL	<5	20-45	Cr	xxx	45+	Roots		3	II/III
		L12	0-20	HCL	<5	20-40	C	xxx	40-100+	C	xxx	1	IV
		L13	0-25	HCL	<5	25-55	HCL	xxx	55-100+	C	xxx	0	IV/III
		A1	0-25	HCL	<5	25-48	C	xxx	48-62 62-80+	ZC SCLr	xxx xx	2	IV
		A2	0-21	HCL	0	21-57	Cr	xxx	57-86+	HZCLr	xxx	4	IV
		A3	0-43	HZCL	0	43-80+	SC	xx				1	IV
		A4	0-29	MCL	<5	29-69	C	xxx	68-100+	Cr	xxx	2	IV
		A5	0-27	HZCL	<5	27-58	C	xxx	58-92+	SCLr	xx	3	IV
		A6	0-16	MZCL	<5	16-47	SCL	xxx	47-90+	C	xxx	5	III
		A7	0-30	HCL	<5	30-100+	C	xxx				3	IV
Bicken Hill	Receptor Site	M1	0-26	HCL	<5	26-80+	C	o				2	IV
		M2	0-23	C	0	23-51	C	xxx	51-80+	C	xxx	3	IV
		M3	0-25	SCL	<5	25-51	SC	xx	51-80+	SC	xxx	2	III
		M4	0-25	HCL	<5	25-50	HCL	xx	50-80+	Cr	o	2	III
		M5	0-32	HCL	<5	32-80+	Cr	o				4	III
		M6	0-20	HCL	<5	20-43	HCL	xx	43-80+	Cr	xxx	3	III
		M7	0-23	HCL	<5	23-65+	HCL	xx	65+	Stopped on stone		1	II/III
		M8	0-25	HCL	<5	25-80+	HCLr	o				4	IV
	Donor Site	M9	0-24	SCL	<5	24-54	SCLr	x	54-92 92-100+	SZLr SCL	x xx(x)	0	II
		M10	0-27	MSL	5-10	27-60	MSL	o	60-79 79-100+	LMS SCL	x xxx	0	I
		M11	0-27	MSL	5-10	27-100+	LMS	xx				0	I
		M12	0-23	MSL	5-10	23-40+	MSL	o	40+	Too stony		0	I

Key to table

Mottle intensity:

o	unmottled
x	few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
xx	common to many ochreous mottles and/or dull structure faces
xxx	common to many greyish or pale mottles (gleyed horizon)
xxxx	dominantly grey, often with some ochreous mottles (gleyed horizon)

a depth underlined (e.g. <u>50</u>) indicates the top of a slowly permeable layer
(a wavy underline indicates the top of a layer borderline to slowly permeable)

Texture:

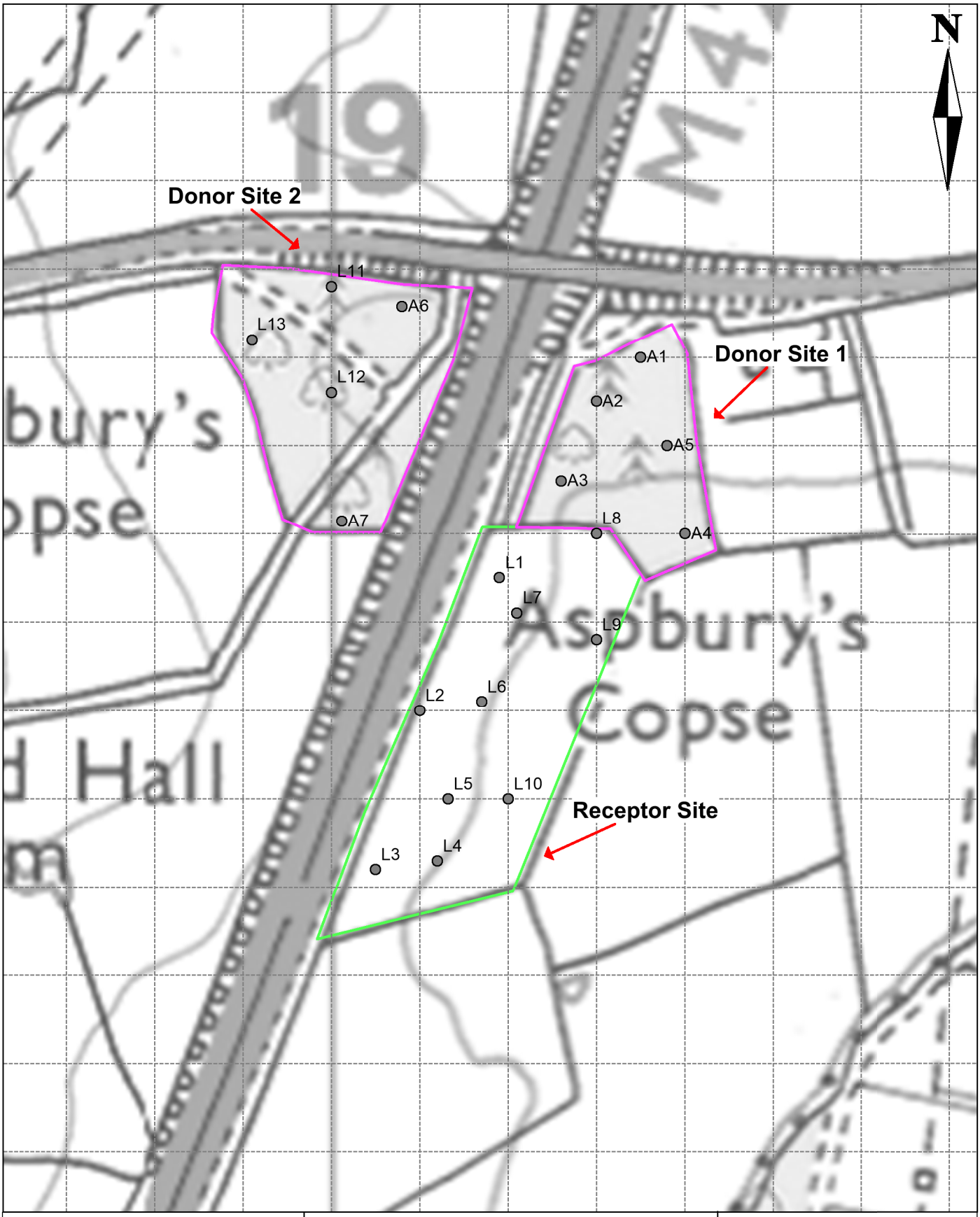
C - clay
ZC - silty clay
SC - sandy clay
CL - clay loam (H-heavy, M-medium)
ZCL - silty clay loam (H-heavy, M-medium)
SCL - sandy clay loam
SZL - sandy silt loam (F-fine, M-medium,C-coarse)
SL - sandy loam (F-fine, M-medium, C-coarse)
LS - loamy sand (F-fine, M-medium, C-coarse)
S - sand (F-fine, M-medium, C-coarse)
P - peat (H-humified, SF-semi-fibrous, F-fibrous)
LP - loamy peat; PL - peaty loam
R - bedrock

Limitations:

W - wetness/workability
D - droughtiness
De - depth
St – stoniness
Sl – slope
F - flooding
T – topography/microrelief

Texture suffixes & prefixes:

ca – calcareous: x-extremely, v-very, sl-slightly
(ca) marginally calcareous
mn - ferrimanganiferous concentrations
gn – greenish, yb – yellowish brown, rb – reddish brown
r – reddish; (v)st – (very) stony; sdst–sandstone;lst - limestone
dist - disturbed soil layer; mdst - mudstone



Client: AECOM

Project: Woodland Translocation (Aspbury's Copse - M42, J6)

Map title: Map 1 Survey observations

KEY

- Survey observation
- Soil/land grade description pit
- Survey area (Donor Site)
- Survey area (Receptor Site)

1581/1

Scale: 1:3,000 at A4

Date: 07/08/2019

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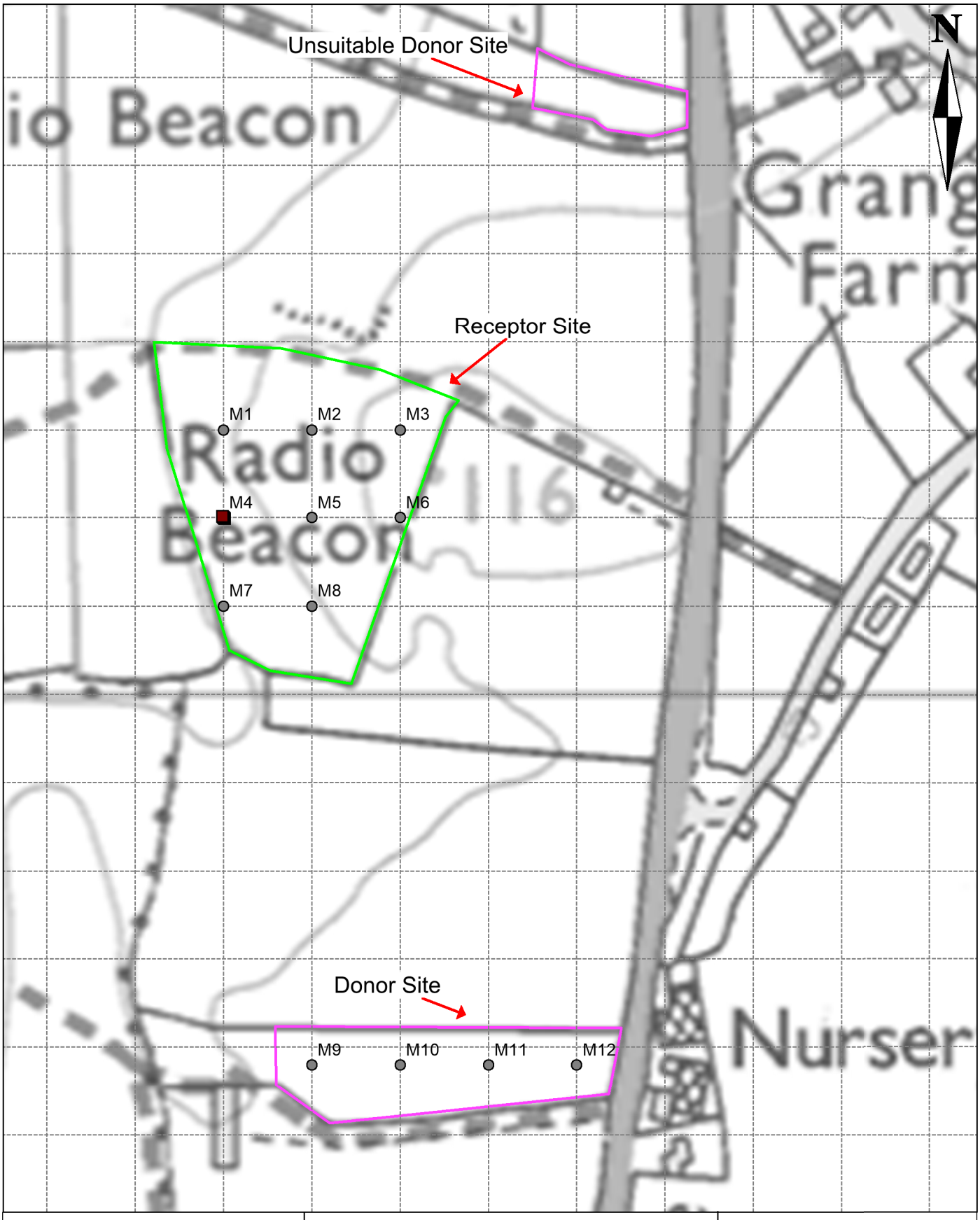

Client:

AECOM

Project:

Grassland Translocation
(Bickenhill - M42, J6)

Map title:

Map 2
Survey observations

KEY

- Survey observation
- Soil/land grade description pit
- Survey area (Donor Site)
- Survey area (Receptor Site)

1581/1

Scale: 1:3,000 at A4

Date: 07/08/2019

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Project:
Woodland Translocation
(Aspbury Copse - M42, J6)

Map title:
Map 3
Soil resources

KEY

- Low nutrient Donor Site 1 topsoil (TS1)
- High nutrient Donor Site 2 topsoil
- High nutrient Receptor Site topsoil (TS2)
- Survey area (Donor Site)
- Survey area (Receptor Site)

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Scale: 1:3,000 at A4

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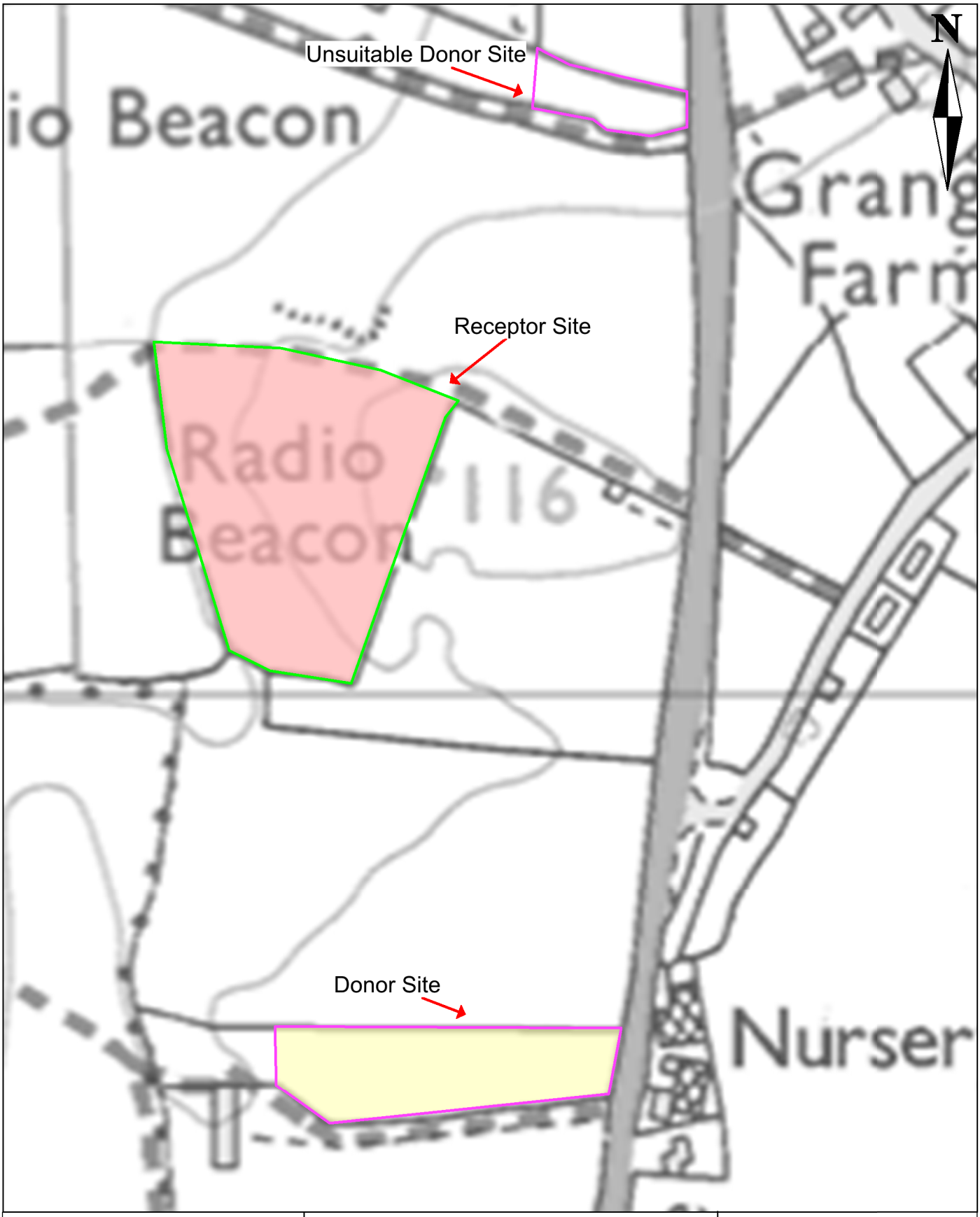

Client:
AECOM

Project:
Grassland Translocation
(Bickenhill - M42, J6)

Map title:
Map 4
Soil resources

KEY

- Low nutrient Donor Site topsoil (TS3) (sandy loam)
- Low nutrient Receptor Site topsoil (TS4) (heavy clay loams)
- Survey area (Donor Site)
- Survey area (Receptor Site)

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Scale: 1:3,000 at A4

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