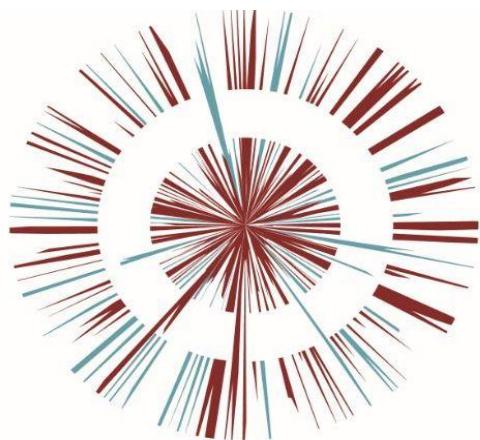




OMEGA ZONE 8, ST HELENS

Omega St Helens Ltd / T. J. Morris Limited



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READING
AGRICULTURAL
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Omega St Helens Ltd / T.J. Morris Ltd

Agricultural Land Classification and Soil Resources

at

Omega Zone 8, St Helens

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Omega St Helens Ltd / T.J. Morris Ltd (the Applicant) to investigate the Agricultural Land Classification (ALC) and soil resources of land to the north-west of Warrington, south of the M62. The survey was undertaken in October 2019 during a prolonged period of high rainfall, meaning the site was waterlogged to the surface making it difficult to accurately assess soil textures and depth to soil boundaries.
- 1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land (1988)¹, and summarised in Natural England's Technical Information Note 049².
- 1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.
- 1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use, and Grade 5 is very poor quality land, with severe limitations due to adverse soil, relief, climate or a combination of these. Grade 3 land is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Land which is classified as Grades 1, 2 and 3a in the ALC system is defined as best and most versatile agricultural land.
- 1.5 As explained in Natural England's TIN049, the whole of England and Wales was mapped from reconnaissance field surveys in the late 1960s and early 1970s to provide general strategic guidance on agricultural land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile (1:63,360). The Provisional ALC map shows the site as very good quality Grade 2. However, TIN049 explains that:

"These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their

¹ **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* MAFF Publications.

² **Natural England (2012).** *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land,* Second Edition.

preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended ..."

- 1.6 TIN049 goes on to explain that a definitive ALC grading should be obtained by undertaking a detailed survey according to the published guidelines, at an observation density of one boring per hectare. This survey follows the detailed methodology set out in the MAFF guidelines.

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The surveyed area extends to approximately 73ha to the north-west of Warrington. The site is bounded to the north by the M62 and to the east by the Omega Business Park. Other agricultural land and three pockets of woodland (Booth's Wood, Duck Wood and Finch's Plantation) are to the south of the site. The site is drained by a series of drainage ditches and ponds running along field boundaries which drain water eastward to Whittle Brook.
- 2.2 The site has a very gentle upward slope from east to west. Altitudes are around 25m to 30m above Ordnance Datum (AOD).

Agro-climatic conditions

- 2.3 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 25m AOD, and are given in Table 1. The site is warm and wet with moderate to moderately large moisture deficits. The number of Field Capacity Days (FCD) is large and is considered to be unfavourable for providing opportunities for agricultural field work.

Table 1: Local agro-climatic conditions

Parameter	Value
Average Annual Rainfall	836mm
Accumulated Temperatures >0°C	1427 day°
Field Capacity Days	198 days
Average Moisture Deficit, wheat	86mm
Average Moisture Deficit, potatoes	74mm

Soil parent material and soil type

- 2.4 The principal underlying geology mapped by the British Geological Survey³ across the site is the Chester Formation, characterised by pebbly sandstone deposits. Superficial deposits of glacial Till overlie the bedrock and consist of poorly sorted clay, sand, gravel and boulders.
- 2.5 The Soil Survey of England and Wales soil association mapping⁴ (1:250,000 scale) shows the Salop association soils across the entire site. These soils are developed primarily in reddish drift and are characterised by profiles with clay loam topsoils. Profiles are often waterlogged resulting from the presence of a slowly permeable subsoil and slow surface runoff. Profiles are commonly assessed as Wetness Class (WC) IV or III with improved drainage⁵.

3 Agricultural land quality

Soil survey methods

- 3.1 In total, 72 soil profiles were examined across the site using an Edelman (Dutch) auger at an observation density of one per hectare, in accordance with the recommendations set out in Natural England's TIN049². The locations of observations are indicated on Figure 14.1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;
 - significant stoniness;
 - colour (including localised mottling);
 - consistency;
 - structural condition;
 - free carbonate; and
 - depth.

³ British Geological Survey (2019). *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ Soil Survey of England and Wales (1984). *Soils of Northern England* (1:250,000), Sheet 1

⁵ Jarvis et al (1984). *Soils and Their Use in Northern England*. Soil Survey of England and Wales Bulletin 14, Harpenden.

- 3.2 Four topsoil samples were submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.
- 3.3 Soil WC was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of FCD at the location.
- 3.4 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

Agricultural land classification and site limitations

- 3.5 Assessment of land quality has been carried out according to the revised ALC guidelines (1988)¹. Soil profiles have been described according to Hodgson (1997)⁶ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 Agricultural land quality at the site is limited by soil wetness and workability, mostly to Subgrade 3b with smaller areas of Subgrade 3a and Grade 4. Two profiles (54 and 64) are assessed as Grade 2 quality but could not be accurately mapped in isolation so have been incorporated with the surrounding grades.
- 3.7 Soil profiles of Subgrade 3a quality include sandy clay loam, medium clay loam or medium silty clay loam topsoil of 30 to 40cm depth. The colour is black or very dark greyish brown (10YR3/2, 10YR3/1, 10YR4/2, 10YR2/1, 7.5YR3/2 or 7.5YR3/1 in the Munsell colour charts⁷). The topsoil is non-calcareous and generally free of stones.
- 3.8 There are two upper subsoil variants, both of which are permeable. The main upper subsoil comprises medium loamy textures, predominantly sandy clay loam or medium sandy loam, which is black to dark greyish brown (including 10YR2/1, 4/2, 7.5YR3/2). The second upper subsoil type is generally heavier, of clay or sandy clay, although some sandy loams are also

⁶ **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁷ **Munsell Color (2009).** *Munsell Soil Color Book*, Grand Rapids, MI, USA

included in this variant. This upper subsoil type is commonly greyish brown or brown (10YR5/2 or 5/3) and distinctly mottled and is considered to be gleyed.

- 3.9 Lower subsoil in both variants is clay. The colour is variable, from greyish brown to reddish brown. Distinct or prominent mottles are common and the structure is poor, such that the lower subsoil is gleyed and slowly permeable. Profiles are of WC III which, when combined with medium topsoil textures results in a wetness and workability limitation to Subgrade 3a.
- 3.10 Profiles of Subgrade 3b include a sandy clay loam or medium clay loam topsoil which is black, very dark greyish brown or dark grey (10YR2/1, 10YR3/2 or 10YR4/1). Predominantly in the central north of the site, the soil profiles are mottled from the surface, which suggests severe waterlogging. The topsoil is of 34cm average depth, is stoneless and non-calcareous.
- 3.11 Most of the upper subsoil is clay, although sandy clay loam is common and there are instances of clay loam and sandy loam. The colour is dark and greyish, including but not limited to 10YR3/1, 4/2 and 5/1.
- 3.12 Lower subsoil consists of clay which is brown or reddish brown (7.5YR4/3, 7.5YR5/3, 5YR4/2 or 5YR4/3) and distinctly or prominently mottled. The lower subsoil is gleyed and the profiles become slowly permeable within 54cm of the soil surface. Profiles are of WC IV and are limited by wetness and workability to Subgrade 3b.
- 3.13 Profiles of Grade 4 are located to the north of the site adjacent to the motorway, which could be an indication that these profiles were disturbed when the motorway was built. Profiles were very wet throughout at the time of survey. The topsoil is of heavy clay loam or sandy clay loam and is black or very dark greyish brown (10YR2/1 or 10YR3/2). Upper subsoil consists of clay or occasionally sandy clay which is typically greyish brown or brown (2.5Y5/2 or 10YR5/3) and distinctly or prominently mottled. Lower subsoil consists of clay which reddish brown or brown (5YR4/3, 7.5YR4/3 or 10YR4/3). The clay is poorly structured and slowly permeable. Profiles are of WC IV, which when combined with heavy topsoils results in a wetness and workability limitation to Grade 4.
- 3.14 The areas of each ALC grade are given in Table 2 and are mapped in Figure 14.2.

Table 2: Agricultural land classification

Grade	Description	Area (ha)	%
3a	Good quality	17.5	23
3b	Moderate quality	47.2	63
4	Poor quality	4.8	6
Non-Agricultural		5.7	8
Total		75.2	100

Appendix 1: Laboratory Data

Determinand	Site 13	Site 48	Site 58	Site 69	Units
Sand 2.00-0.063 mm	52	58	59	53	% w/w
Silt 0.063-0.002 mm	26	23	22	26	% w/w
Clay <0.002 mm	22	19	19	21	% w/w
Organic Matter	3.5	6.5	2.8	2.8	% w/w
Texture	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	

Determinand	Site 13	Site 48	Site 58	Site 69	Units
Soil pH	6.4	5.2	6.7	6.6	
Phosphorus (P)	30.0	14.2	19.8	6.0	Mg/l (av)
Potassium (K)	55.2	106	182	89.4	Mg/l (av)
Magnesium (Mg)	72.2	69.5	41.9	43.8	Mg/l (av)

Determinand	Site 13	Site 48	Site 58	Site 69	Units
Phosphorus (P)	3	1	2	0	ADAS Index
Potassium (K)	0	1	2+	1	ADAS Index
Magnesium (Mg)	2	2	1	1	ADAS Index

Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness / workability limitations are determined according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types		
%	TA v	Eav
hard	1	0.5

Climate Data		
MDwheat	86	
MDpotato	74	
FCD	198	

Wetness Class Guidelines		II	III	IV	V
SPL within 80cm, gleying within 40cm			>54cm	<54cm	
SPL within 80cm, gleying at 40-70cm		>72cm	<72cm		
No SPL but gleying within 40cm		coarse subsoil	/	other cases	//

Maximum depth of auger penetration is underlined

Site No.		Depth (cm)	Texture	CaCO ₃	Colour	Mottle colour	Abundance	stone % hard	stone %	Structure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade	Final grade	Limiting factor(s)
1	T	0 30	hCL	n	10YR2/1						54	54	n	/V	4	4	WE	
		30 50	SC	n	10YR5/2	och	cmd				30	30	y	n				
		50 120	C	n	5YR4/3	och	cmd			poor	49	26	y	y				
										Total	133	110						
										MD	47	36						
										Droughtiness grade(DR)	1	1						
2	T	0 35	SCL	n	10YR2/1						60	60	n	/V	4	4	WE	
		35 45	SC	n	10YR5/3	och	cmd				15	15	y	n				
		45 120	C	n	7.5YR4/3	och	cmd			poor	56	33	y	y				
										Total	130	107						
										MD	44	33						
										Droughtiness grade(DR)	1	1						
3	T	0 30	SCL	n	10YR3/2						51	51	n	/I	3a	3a	WE	
		30 40	mCL	n	10YR3/2						16	16						
		40 60	SL	n	7.5YR5/3	och	cmd				26	30	y	n				
		60 120	C	n	7.5YR4/3	och	mmd			poor	42	13	y	y				
										Total	135	110						
										MD	49	36						
										Droughtiness grade(DR)	1	1						
4		0 30	hCL	n	10YR4/2						48	48	n	/V	4	4	WE	
		30 50	C	n	10YR3/2	och	mmd				32	32	y	n				
		50 120	C	n	5YR4/3	och	cmd			poor	49	26	y	y				
										Total	129	106						

								MD	43	32						
								Droughtiness grade(DR)	1	1						
5	T	0	40	mZCL	n	10YR2/1			76	76	n	n	III	3a	3a	WE
		40	65	C	n	10YR5/2	och	mmd	28	40	y	n				
		65	120	C	n	7.5YR4/3	och	mmd	poor	39	7	y	y			
								Total	142	123						
								MD	56	49						
								Droughtiness grade(DR)	1	1						
6	T	0	35	mZCL	n	10YR2/1			67	67	n	n	IV	3b	3b	WE
		35	50	SL	n	10YR5/1	och	fmd	23	23	n	n				
		50	120	C	n	7.5YR4/3	och	mmd	poor	49	26	y	y			
								Total	138	115						
								MD	52	41						
								Droughtiness grade(DR)	1	1						
7	T	0	40	mZCL	n	10YR2/1	och	mmd	76	76	y	n	II	3a	3a	WE
		40	<u>80</u>	SC	n	10YR5/3	och	cmp	45	45	y	n				
		80	120	C	n	10YR5/3	och	cmp	poor	28	0	y	y			
								Total	149	121						
								MD	63	47						
								Droughtiness grade(DR)	1	1						
8	T	0	40	mZCL	n	10YR2/1			76	76	n	n	III	3a	3a	WE
		40	60	SL	n	10YR5/3	och	cmd	26	30	y	n				
		60	120	C	n	5YR4/3	red	mmd	poor	42	13	y	y			
								Total	144	119						
								MD	58	45						
								Droughtiness grade(DR)	1	1						
9		0	20	hCL	n	10YR3/2	och	mmd	32	32	n	n	IV	4	4	We
		20	120	C	n	10YR5/3	och	mmd	poor	88	65	y	y			
								Total	120	97						
								MD	34	23						
								Droughtiness grade(DR)	1	1						
10		0	40	SCL	n	10YR3/2	och	cmd	60	60	y	n	IV	3b	3b	We
		40	120	C	n	5YR4/3	och	cmd	poor	62	39	y	y			
								Total	122	99						
								MD	36	25						
								Droughtiness grade(DR)	1	1						
11		0	25	SCL	n	10YR3/2	och	cmd	38	38	y	n	IV	3b	3b	We
		25	40	SC	n	10YR5/1	och	mmd	23	23	y	n				

		40	120	C	n	7.5YR4/3	och	cmd	poor	62	39	y	y			
									Total	122	99					
									MD	36	25					
									DR	1	1					
12		0	40	hCL	n	10YR4/2	och	mmd	poor	64	64	y	n	/V	4	4 WE
		40	120	C	n	7.5YR4/3	och	ccp	poor	62	39	y	y			
									Total	126	103					
									MD	40	29					
									DR	1	1					
13	T	0	40	SCL	n	10YR2/1	och	mmd	poor	68	68	y	n	/V	3b	3b WE
		40	70	SC	n	10YR5/2	och	mmd	poor	29	39	y	y			
		70	120	SCL	n	7.5YR4/3	och	mmd	poor	50	0	y	n			
									Total	147	107					
									MD	61	33					
									DR	1	1					
14	T	0	30	mZCL	n	10YR2/1			poor	57	57	n	n	/II	3a	3a WE
		30	45	SL	n	10YR2/1	och	fmd	poor	23	23	n	n			
		40	70	SC	n	10YR5/3	och	cmd	poor	35	45	y	n			
		70	120	C	n	7.5YR4/3	och	cmd	poor	35	0	y	y			
									Total	150	125					
									MD	64	51					
									DR	1	1					
15	T	0	40	mCL	n	10YR2/1			poor	72	72	n	n	/V	3b	3b WE
		40	50	C	n	7.5YR5/3	och	cmp	poor	16	16	y	n			
		50	120	C	n	7.5YR5/3	och	cmp	poor	49	26	y	y			
									Total	137	114					
									MD	51	40					
									DR	1	1					
16	T	0	40	mCL	n	10YR2/1			poor	72	72	n	n	/V	3b	3b WE
		40	50	SC	n	10YR5/2	och	mmd	poor	15	15	y	n			
		50	120	C	n	5YR4/3	och	cmd	poor	49	26	y	y			
									Total	136	113					
									MD	50	39					
									DR	1	1					
17		0	30	SCL	n	10YR3/2	och	fmd	poor	45	45	n	n	/V	3b	3b WE
		30	120	C	n	7.5YR4/3	och	cmd	poor	75	52	y	y			
									Total	120	97					
									MD	34	23					V wet, too wet to clearly see mottles in TS- assume due to SS structure

										Droughtiness grade(DR)		1	1						
18	0	30	SCL	n	10YR3/2	och	mmd			poor	45	45	y	n	/V	3b	3b	We	
	30	120	SC	n	7.5YR4/3	och	cmp			82	52	y	y						
										Total	127	97							
										MD	41	23							
										Droughtiness grade(DR)		1	1						
19	0	30	mCL	n	10YR3/2	och	mmd				48	48	y	n	/V	3b	3b	We	
	30	40	SC	n	10YR5/3	och	mmd				15	15	y	n					
	40	120	C	n	7.5YR4/3	och	cmd			poor	62	39	y	y					
										Total	125	102							
										MD	39	28							
										Droughtiness grade(DR)		1	1						
20	0	25	mCL	n	10YR3/2	och	mmd				40	40	y	n	/V	3b	3b	We	
	25	120	C	n	10YR5/3	och	cmd			poor	82	59	y	y					
										Total	122	99							
										MD	36	25							
										Droughtiness grade(DR)		1	1						
21	0	30	SCL	n	10YR3/2						45	45	n	n	/V	3b	3b	WE	
	30	40	SCL	n	10YR3/2	och	mmd				15	15	y	n					
	40	120	C	n	7.5YR4/3	och	ccp			poor	62	39	y	y					
										Total	122	99							
										MD	36	25							
										Droughtiness grade(DR)		1	1						
22	T	0	40	SCL	n	10YR2/1					68	68	n	n	/V	3b	3b	WE	
		40	45	SL	n	10YR5/2	och	mmd			8	8	y	n					
		45	120	C	n	5YR4/3	och	cmp			poor	56	33	y	y				
										Total	131	108							
										MD	45	34							
										Droughtiness grade(DR)		1	1						
23	T	0	45	mCL	n	10YR2/1					81	81	n	n	/I	3a	3a	WE	
		45	60	SCL	n	10YR5/3	och	mmd			18	23	y	n					
		60	120	C	n	5YR4/3	och	mmd			poor	42	13	y	y				
										Total	140	117							
										MD	54	43							
										Droughtiness grade(DR)		1	1						
24	T	0	40	mCL	n	10YR2/1	och	mmd			72	72	y	n	/V	3b	3b	WE	
		40	50	C	n	10YR5/1	och	mmd			16	16	y	n					

	50	120	C	n	7.5YR4/3	och	cmp	poor	49	26	y	y					
								Total	137	114							
								MD	51	40							
								Droughtiness grade(DR)	1	1							
25	0	30	SCL	n	10YR3/2	och	fmd		45	45	n	n	I/V	3b	3b	WE	
	30	50	C	n	7.5YR4/2	och	cmp		32	32	y	n					
	50	120	C	n	5YR4/3	och	cmp	poor	49	26	y	y					
								Total	126	103							
								MD	40	29							
								Droughtiness grade(DR)	1	1							
26	0	30	SCL	n	10YR3/2	och	fmd		45	45	n	n	I/V	3b	3b	WE	
	30	50	C	n	7.5YR4/2	och	cmp		32	32	y	n					
	50	120	C	n	5YR4/3	och	cmp	poor	49	26	y	y					
								Total	126	103							
								MD	40	29							
								Droughtiness grade(DR)	1	1							
27	0	30	hCL	n	10YR3/2	och	mmd		48	48	y	n	I/V	4	4	WE	
	30	60	C	n	2.5Y4/3	och	cmp	poor	33	39	y	y					
	60	120	C	n	10YR4/3	och	cmd	poor	42	13	y	y					
								Total	123	100							
								MD	37	26							
								Droughtiness grade(DR)	1	1							
28	T	0	30	mCL	n	10YR3/2			54	54	n	n	I/V	3b	3b	WE	
		30	38	mCL	n	10YR3/3	Och	com.		13	13	n	n				
		38	<u>90</u>	C	n	7.5YR5/3	Och	com.	poor	44	42	y	y				
		90	120	C	n	7.5YR5/3			poor	21	0	y	y				
								Total	131	108							
								MD	45	34							
								Droughtiness grade (DR)	1	1							
29	T	0	30	mCL	n	10YR3/3			54	54	n	n	I/V	3b	3b	WE	
		30	38	mCL	n	10YR3/3	Och	com		13	13	n	n				
		38	<u>50</u>	C	n	7.5YR5/3	Och,gre y	com	poor	16	16	y	y				
		50	120	C	n	7.5YR5/3			poor	49	26	y	y				
								Total	131	108							
								MD	45	34							
								Droughtiness grade(DR)	1	1							

depression? Old hedge line wet. Near pond
Soil saturated at 50cm

30	T	0	38	SCL	n	10YR3/2				65	65	n	n	/V	3b	3b	WE
	38	43	SCL	n	10YR3/2	Och		few		8	8	n	n				
43	<u>100</u>	C	n	7.5YR5/3	Och,gre	y	com		poor	44	35	y	y				
10									poor	14	0	y	y				
0	120	C	n	7.5YR5/3					Total	130	107						
									MD	44	33						
									Droughtiness grade(DR)	1	1						
31	T	0	38	mCL	n	10YR4/1				68	68	n	n	/V	3b	3b	WE
	38	50	SCL	n	10YR5/1	Och		com		18	18	y	n				
50	<u>70</u>	C	n	7.5YR5/3	Och,gre	y	com		poor	14	26	y	y				
70	120	C	n	7.5YR5/3					poor	35	0	y	y				
									Total	135	112						
									MD	49	38						
									Droughtiness grade(DR)	1	1						
32	T	0	33	mCL	n	10YR3/3			3			n	n	/V	3b	3b	WE
	33	38	SCL	n	10YR3/3	Och		few		58	58	n	n				
38	70	C	n	7.5YR5/3	Och,gre	y	com		poor	8	8	n	n				
70	<u>100</u>	C	n	5YR4/3	Mn	com			poor	30	42	y	y				
10									poor	21	0	y	y				
0	120	C	n	5YR4/3					Total	130	107						
									MD	44	33						
									Droughtiness grade(DR)	1	1						
33	T	0	30	hCL	n	7.5YR3/2				54	54	n	n	/V	3b	3b	WE
	30	45	hCL	n	7.5YR3/2	Och		few		24	24	n	n				
45	<u>90</u>	C	n	5YR4/2	Och,Mn	com			poor	35	33	y	y				
90	120	C	n	5YR4/2					poor	21	0	y	y				
									Total	134	111						
									MD	48	37						
									Droughtiness grade(DR)	1	1						
34	T	0	35	mCL	n	10YR3/2				63	63	n	n	/V	3b	3b	WE
	35	38	hCL	n	10YR3/2	Och		few		5	5	n	n				
38	45	C	n	10YR5/1	Och	com			poor	9	9	y	y				

												Droughtiness grade(DR)	1	1					
39	T	0	20	mCL	n	10YR4/1						36	36	n	n	/V	3b	3b	WE
		20	38	hCL	n	10YR4/1	Och	com				poor	22	22	y	n			
		38	<u>40</u>	SCL	n	7.5YR4/1	Och	com				poor	3	3	y	n			
		40	120	C	n	7.5YR4/1						poor	62	39	y	y			
												Total	122	99					
												MD	36	25					
												Droughtiness grade(DR)	1	1					
40	T	0	39	mSL	n	10YR3/1						66	66	n	n	/II	3a	3a	WE
		39	43	SCL	n	10YR3/1						6	6	n	n				
		43	50	mS	n	7.5YR5/2	Och	com				5	5	y	n				
		50	<u>100</u>	C	n	5YR4/2	Och, Mn	com				poor	35	26	y	y			
		10	0	120	C	n	5YR4/2					poor	14	0	y	y			
												Total	126	103					
												MD	40	29					
												Droughtiness grade(DR)	1	1					
41	T	0	35	SCL	n	10YR3/1						60	60	n	n	/II	3a	3a	WE
		35	40	SCL	n	10YR3/1						8	8	n	n				
		40	<u>55</u>	mSL	n	7.5YR4/2	Och	com				21	23	y	n				
		55	120	C	n	5YR4/2			10			poor	41	18	y	y			
												Total	129	107					
												MD	43	33					
												Droughtiness grade(DR)	1	1					
42	T	0	30	SCL	n	10YR4/1						51	51	n	n	/V	3b	3b	WE
		30	40	SCL	n	10YR4/1	Och	com				15	15	y	n				
		40	<u>50</u>	SCL	n	10YR4/1	Och	com				15	15	y	n				
		50	120	C	n	5YR4/2			10			poor	44	24	y	y			
												Total	125	105					
												MD	39	31					
												Droughtiness grade(DR)	1	1					
43	T	0	30	mCL	n	10YR3/1						54	54	n	n	/V	3b	3b	WE
		30	90	C	n	10YR5/2	Och	com				poor	54	52	y	y			
		90	<u>100</u>	C	n	5YR4/2	Och	com				poor	7	0	y	y			

water at 30cm augered to 40cm
stubble

d to a stone layer (?) 55cm
stubble marginal WC

d to a stone layer (?) 50cm
stubble Small gravel type stones at 55cm C??

		10 0	120	C	n	5YR4/2		poor	21	0	y	y					
								Total	136	106			wet at 40cm in hole				
								MD	50	32							
							Droughtiness grade(DR)		1	1							
44	T	0	30	mCL	n	10YR3/1			54	54	n	n	/V	3b	3b	WE	
		30	39	mCL	n	10YR3/1			14	14	n	n					
		39	80	C	n	7.5YR5/3	Och	com			poor	35	40	y	y		
		80	<u>110</u>	C	n	5YR4/3	Och, Mn	com			poor	21	0	y	y		
		11									poor	7	0	y	y		
		0	120	C	n	5YR4/3					Total	132	109				
											MD	46	35				
							Droughtiness grade(DR)		1	1							
45	T	0	20	mCL	n	10YR2/1			36	36	n	n	/I	3a	3a	WE	
		20	40	mCL	n	10YR2/1	och	mmd				32	32	y	n		
		40	60	SC	n	7.5YR5/3	och	cmd				25	30	y	n		
		60	120	C	n	5YR4/3	grey	cmd			poor	42	13	y	y		
											Total	135	111				
											MD	49	37				
							Droughtiness grade(DR)		1	1							
46	T	0	38	SCL	n	10YR3/1			65	65	n	n	/V	3b	3b	WE	
		38	40	SCL	n	10YR5/2	Och	com				3	3	y	n		
		40	<u>50</u>	SCL	n	10YR5/2	Och	com				15	15	y	n		
		50	120	C	n	5YR4/3	Och, Mn	com	10		poor	44	24	y	y		
											Total	127	106			stone at 50cm	
											MD	41	32			stubble	
							Droughtiness grade(DR)		1	1							
47	T	0	39	mCL	n	10YR4/1			70	70	n	n	/V	3b	3b	WE	
		39	<u>50</u>	C	n	7.5YR5/3	Och	com			poor	14	14	y	y		
		50	120	C	n	7.5YR5/3					poor	49	26	y	y		
											Total	134	111			wet at 30cm	
											MD	48	37			stubble	
							Droughtiness grade(DR)		1	1							
48	T	0	30	SCL	n	7.5YR3/1			51	51	n	n	/V	3b	3b	WE	
		30	40	mSL	n	5YR3/1			15	15	n	n					

40 10 0	<u>100</u> 120	C C	n n	5YR4/2 5YR4/2	Och com		poor poor Total MD	48 14 128 42	39 0 105 31	y y y	y			
							Droughtiness grade(DR)	1	1					
49	T	0 35 43 70 120	35 SCL C 5YR5/3 C	mCL n n 5YR3/2 n	10YR3/2 10YR5/1 5YR5/3 5YR5/3	Och com Mn com		63 12 23 35 Total MD	63 12 35 0 133 47	n n y y 110 36		3b	WE	
							Droughtiness grade(DR)	1	1					
50	T	0 40 40 120	40 C	hCL n	10YR2/1 2.5Y5/2	och och	mmd mmd		72 62 Total MD	72 39 134 48	y y y 37		4	WE
							Droughtiness grade(DR)	1	1					
51	T	0 35 80 120	35 C C	mCL n n	10YR4/4 7.5YR5/3 7.5YR5/3	Och com			63 41 28 Total MD	63 46 0 132 46	n y y y 109 35		3b	WE
							Droughtiness grade(DR)	1	1					
52	T	0 39 39 50 120	39 C	mCL n	10YR4/1 7.5YR5/2 7.5YR5/2	Och com			70 14 49 Total MD	70 14 26 134 48	n y y y 111 37		3b	WE
							Droughtiness grade(DR)	1	1					
53	T	0 36 36 45 80	36 C	mSL mS n	10YR3/2 10YR5/1 5YR4/2 5YR4/2	Och com Mn com			61 6 28 poor poor	61 6 33 y 28 0	n y y y y y		3b	WE

54	T	0	35	mSL	n	7.5YR3/2		Och	com	Total	123	100	mangolds				
										MD	37	26					
										Droughtiness grade(DR)	1	1					
35		35	55	SCL	n	7.5YR4/2				60	60	n	n	II	2	2	WE
55		55	60	LmS	n	7.5YR5/1	Och	com		28	30	y	n				
60		60	90	mS	n	7.5YR5/1				3	5	y	n				
90		90	120	mS	n	7.5YR5/1				15	7	n	n				
										15	0	n	n				
										Total	120	101	mangolds no SPL WCI/II				
										MD	34	27	soil saturated at 90cm				
										Droughtiness grade(DR)	1	1					
55	T	0	30	SCL	n	10YR3/2				51	51	n	n	IV	3b	3b	WE
30		30	45	SCL	n	10YR3/2	Och	few		23	23	n	n				
45		45	50	SCL	n	10YR5/1	Och	com		8	8	y	n				
50		50	100	C	n	7.5YR5/2	Och, Mn	com	poor	35	26	y	y				
10		10	0	120	C	n	7.5YR5/2		poor	14	0	y	y				
									Total	130	107	grass					
									MD	44	33						
									Droughtiness grade(DR)	1	1						
56	T	0	20	mSL	n	7.5YR3/1				34	34	n	n	III	3a	3a	WE
20		20	40	mSL	n	7.5YR3/3	Och	few		30	30	n	n				
40		40	58	LmS	n	7.5YR2.5/				14	16	n	n				
58		58	100	C	n	5YR5/4	Och	com	poor	29	16	y	y				
10		10	0	120	C	n	5YR5/4		poor	14	0	y	y				
									Total	121	96	grass					
									MD	35	22						
									Droughtiness grade(DR)	1	1						
57	T	0	38	mCL	n	10YR4/1				68	68	n	n	IV	3b	3b	WE
38		38	40	C	n	10YR5/2	Och	few		3	3	n	n				
40		40	80	C	n	5YR5/3	Och,Mn	com	poor	34	39	y	y				
80		80	120	C	n	5YR5/3			poor	28	0	y	y				
									Total	134	111	cereal stubble					
									MD	48	37						
									Droughtiness grade(DR)	1	1						

												Droughtiness grade(DR)	1	1						
58	T	0	35	SCL	n	7.5YR4/1						poor	60	60	n	n	/V	3b	3b	WE
35		<u>100</u>	C	n	7.5YR4/4	Och	com					poor	55	46	n	y				
10												poor	14	0	y	y				
0		120	C	n	7.5YR4/4							Total	128	105		cereal stubble				
												MD	42	31						
												Droughtiness grade(DR)	1	1						
59	T	0	38	mCL	n	10YR4/1						poor	68	68	n	n	/V	3b	3b	WE
38		<u>100</u>	C	n	5YR5/2	Och,Mn	com					poor	51	42	y	y				
10												poor	14	0	y	y				
0		120	C	n	5YR5/2							Total	133	110		cereal stubble				
												MD	47	36						
												Droughtiness grade(DR)	1	1						
60	T	0	33	mCL	n	10YR3/1						poor	59	59	n	n	/V	3b	3b	WE
33		<u>70</u>	C	n	5YR4/2	Och,Mn	com					poor	36	48	y	y				
70		120	C	n	5YR4/2			10				poor	32	0	y	y				
												Total	127	108		stone at 70cm				
												MD	41	34						
												Droughtiness grade(DR)	1	1						
61	T	0	30	SCL	n	7.5YR3/2						poor	51	51	n	n	/I	3a	3a	WE
33		40	SCL	n	7.5YR3/2							poor	11	11	n	n				
40		58	mSL	n	7.5YR2.5/ 2							poor	24	27	n	n				
58		<u>70</u>	C	n	7.5YR5/3	Och	few					poor	8	16	n	y				
70		120	C	n	7.5YR5/3							poor	35	0	y	y				
												Total	129	104		grass hole wet at 60cm augered to 70cm				
												MD	43	30						
												Droughtiness grade(DR)	1	1						
62	T	0	20	SCL	n	10YR4/2						poor	34	34	n	n	/I	3a	3a	WE
20		40	SCL	n	10YR4/2							poor	30	30	n	n				
40		<u>60</u>	mS	n	7.5YR5/1	Och	many					poor	12	14	y	n				
60		120	C	n	7.5YR5/1							poor	42	13	y	y				
												Total	118	91		grass augered to 60cm stone/drain water in hole at 60cm near pond				

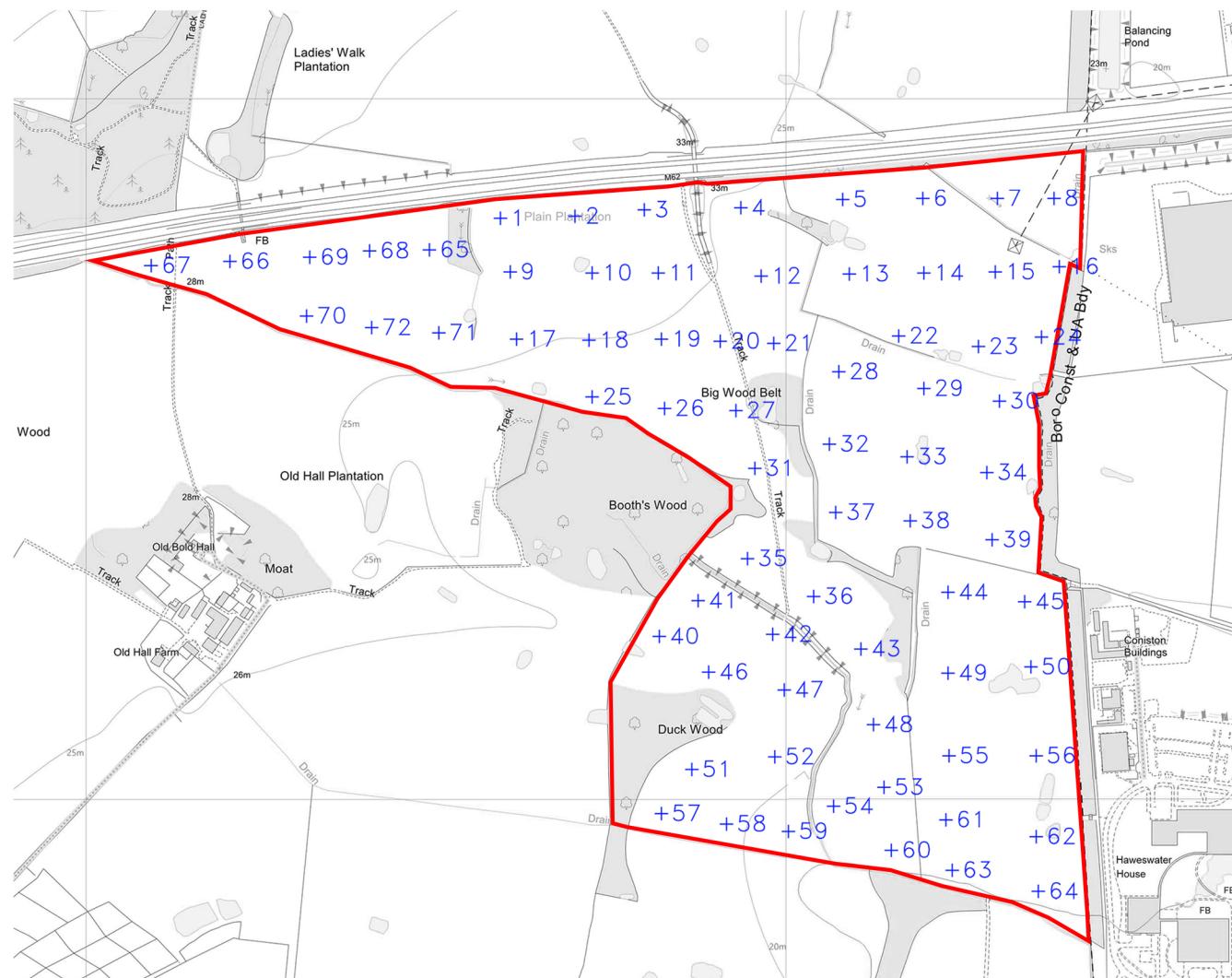
									MD	32	17							
								Droughtiness grade(DR)		1	1							
63	T	0	35	SCL	n	7.5YR3/2				60	60	n	n	III	3a	3a	WE	
		35	39	SCL	n	7.5YR3/2				6	6	n	n					
		39	45	SCL	n	5YR4/1	Och	few		9	9	n	n					
		45	80	C	n	5YR4/4	Och	few		poor	28	n	y					
		80	120	C	n	5YR4/4				poor	28	0	y	y				
									Total	130	107							
									MD	44	33							
								Droughtiness grade(DR)		1	1							
64	T	0	20	SCL	n	7.5YR3/2				34	34	n	n	I	2	2	WE	
		20	45	SCL	n	7.5YR3/2				38	38	n	n					
		45	65	mSL	n	5YR4/1	Och	few		24	30	n	n					
		65	80	LmS	n	5YR4/4	Och	few		9	5	n	n					
		80	120	C	n	5YR4/4				poor	28	0	y	y				
									Total	132	106							
									MD	46	32							
								Droughtiness grade(DR)		1	1							
65	T	0	30	SCL	n	10YR2/1	och	fmd		51	51	n	I	V	3b	3b	WE	
		30	50	SL	n	10YR5/2	och	cmd		30	30	y	n					
		50	120	C	n	5YR4/3	och	cmp		poor	49	26	y	y				
									Total	130	107							
									MD	44	33							
								Droughtiness grade(DR)		1	1							
66	T	0	30	hCL	n	2.5Y3/2	och	mmd		54	54	y	n	I	V	4	4	WE
		30	45	C	n	2.5Y5/2	och	cmp		24	24	y	n					
		45	120	C	n	5YR4/3	och	cmp		poor	56	33	y	y				
									Total	134	111							
									MD	48	37							
								Droughtiness grade(DR)		1	1							
67	0	30	SCL	n	10YR2/1					45	45	n	n	I	V	3b	3b	WE
	30	45	LmS	n	10YR2/1	och	mmd			14	14	y	n					
	45	120	C	n	5YR4/3	och	cmp			poor	56	33	y	y				
									Total	114	91							
									MD	28	17							
								Droughtiness grade(DR)		2	1							

68	T	0	20	SCL	n	10YR2/1				51	51	n	n	III	3a	3a	WE
	20	50	C	n	10YR5/3	och	cmd			30	30	y	n				
	50	60	C	n	7.5YR4/3	och	cmd			49	26	y	n				
	60	120	C	n	5YR4/3	och	cmp	poor		49	26	y	y				
								Total		130	107						
								MD		44	33						
								Droughtiness grade(DR)		1	1						
69	T	0	30	SCL	n	2.5Y3/2	och	mmd		54	54	y	n	IV	3b	3b	WE
	30	65	C	n	2.5Y5/2	och	cmd		poor	37	46	y	y				
	65	80	SL	n	10YR5/3	och	cmd			17	8	y	n				
	80	120	C	n	10YR4/3	och	cmd	poor		28	0	y	y				
								Total		135	107						
								MD		49	33						
								Droughtiness grade(DR)		1	1						
70	0	30	SCL	n	10YR2/1	och	mmd			45	45	y	n	IV	3b	3b	WE
	30	50	SC	n	10YR5/2	och	cmp			30	30	y	n				
	50	120	C	n	5YR4/3	och	cmp	poor		49	26	y	y				
								Total		124	101						
								MD		38	27						
								Droughtiness grade(DR)		1	1						
71	0	30	SCL	n	10YR3/2					45	45	n	n	III	3a	3a	WE
	30	70	SL	n	2.5Y5/3	och	mmd			52	60	y	n				
	70	120	C	n	2.5Y5/1	och	mmd	poor		35	0	y	y				
								Total		132	105						
								MD		46	31						
								Droughtiness grade(DR)		1	1						
72	0	40	SCL	n	10YR2/1					60	60	n	n	III	3a	3a	WE
	40	<u>55</u>	SC	n	10YR5/2	och	cmd			20	23	y	n				
	55	70	C	n	5YR4/3	och	cmp			12	24	y	n				
	70	120	C	n	5YR4/3	och	cmp	poor		35	0	y	y				
								Total		127	107						
								MD		41	33						
								Droughtiness grade(DR)		1	1						

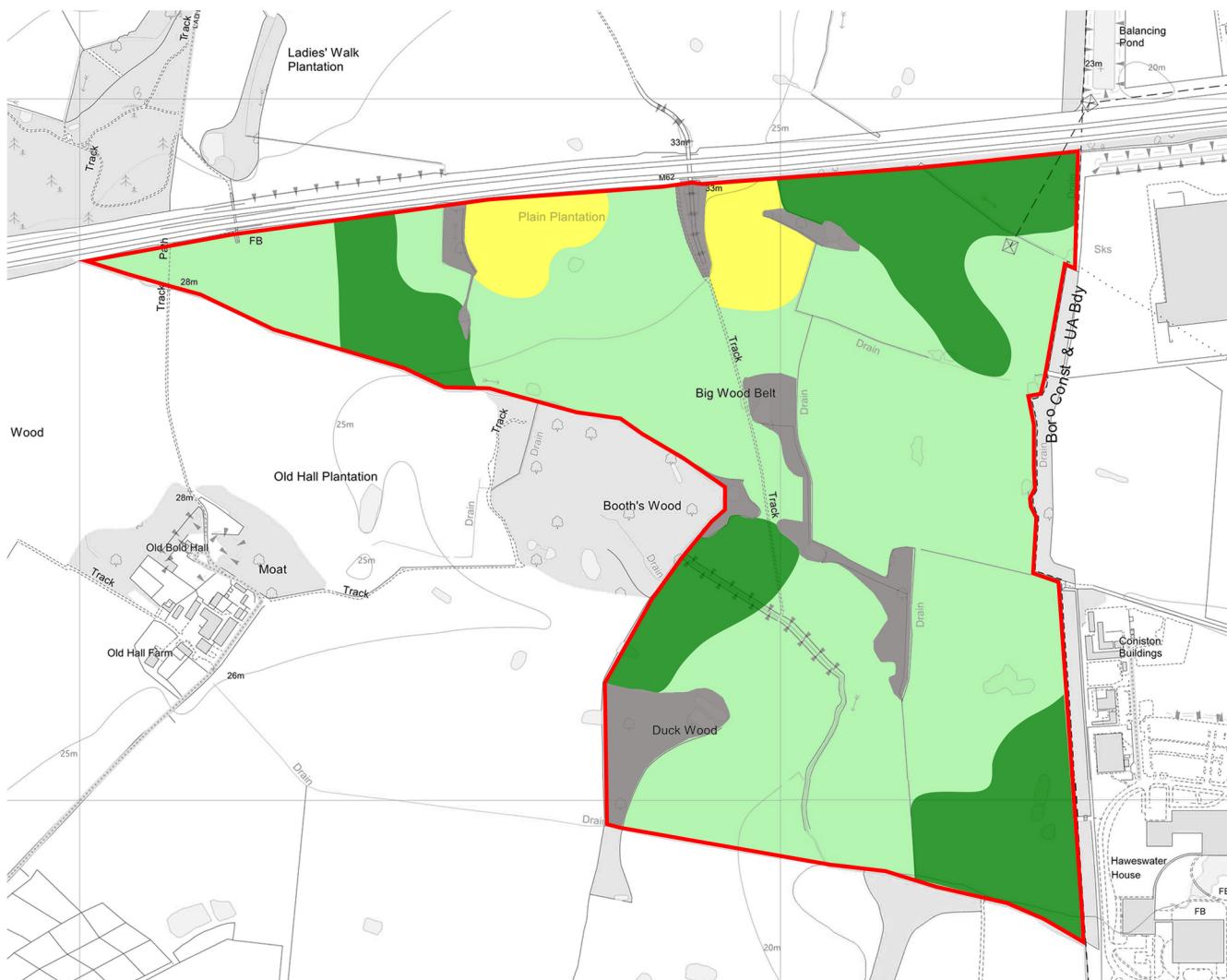
Observation Key:

Survey area

+1 Observations



Rev.	Comment	Date
Drawing title		
FIGURE 14.1		
Contract		
OMEGA ZONE 8, ST HELENS, OMEGA ST HELENS LTD/ T.J. MORRIS LTD		
Reading Agricultural Consultants Ltd Gate House Beechwood Court Long Toll Woodcote RG8 0RR 01491 684233		
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Ref.	Rev.	
RAC/8487/1		
Drawn by	Checked by	
AGM	AIF	
Scales	Date	
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Rev.	Comment	Date
Drawing title		
FIGURE 14.2		
Contract		
OMEGA ZONE 8, ST HELENS, OMEGA ST HELENS LTD/ T.J. MORRIS LTD		
Reading Agricultural Consultants Ltd Gate House Beechwood Court Long Toll Woodcote RG8 0RR 01491 684233		
www.readingagricultural.co.uk 		
Ref.	Rev.	
RAC/8487/2		
Drawn by	Checked by	
AGM	AIF	
Scales	Date	
1:10,000@A4	12/2019	