GAS MONITORING RESULTS

Contract No: 722048
Contract Name: GROVEFIELD WAY, CHELTENHAM

Contract Engineer: MB
Date: 08/09/08

Weather Conditions: BRIGHT, CLOUDY
Atmospheric Wind Conditions: Light
ALM Pressure: Falling

Equipment used: GFM 400

Data Collected By: IAN WARNE

Input checked by: M. Baker 11/09/08.

Ground Conditions (eg dry, flooded, frost, snow etc): WET

Location	Flow (l/hr) (peak and residual) [ ] = time period	Atmospheric Pressure (mb)	BH Pressure (mb)	Time		% by volume in air			LEL (%)	(ppm)			Depth range to water (m bgl) (for a period of time (specify) following tap removal)	Well depth (mbgl) Current and [as installed]	Top of Response zone (m bgl)	Notes (eg, samples taken, dual installation, odours, sheens, broken headworks).
				hours mins	secs	Methane	Carbon Dioxide	Oxygen		H2S	CO	PID				
BH1	0.1	1006	1006		0 (initial)	<0.1	<0.1	20.8					2.63	5.95		
	0.1	1006	1006		15	<0.1	1.0	18.6								
					30	<0.1	0.7	19.0								
					60	<0.1	0.3	20.2								
					90	<0.1	0.3	20.3								
					120	<0.1	0.3	20.3								
					180	-	-	-								
					240	-	-	-								
BH2	-3.7 (Approx 3 secs) 0.1	1007	1003		0 (initial)	<0.1	<0.1	20.8					0.23	6.01		
		1007	1007		15	<0.1	1.6	17.5								
					30	<0.1	1.4	16.0								
					60	<0.1	0.9	17.4								
					90	<0.1	0.7	19.3								
					120	<0.1	0.5	20.0								
					180	<0.1	0.4	20.4								
					240	<0.1	0.4	20.4								
BH4	-4.5 (Approx 5 secs) 0.1	1006	997		0 (initial)	<0.1	<0.1	20.8					0.24	6.11		
		1006	1006		15	<0.1	0.2	19.1								
					30	<0.1	0.2	18.9								
					60	<0.1	0.1	20.0								
					90	<0.1	0.1	20.4								
					120	<0.1	<0.1	20.6								
					180	-	-	-								
					240	-	-	-								
BH5	0.1	1006	1006		0 (initial)	<0.1	<0.1	20.8					0.25	6.06		Water came up tube.
	0.1	1006	1006		15	<0.1	1.2	20.7								
					25	<0.1	1.2	20.4								
					60	-	-	-								
					90	-	-	-								
					120	-	-	-								
					180	-	-	-								
					240	-	-	-								

STRUCTURAL SOILS LTD

GAS MONITORING RESULTS

Contract No: 722048
Contract Name: GROVEFIELD WAY, CHELTENHAM

Contract Engineer: MB
Date: 08/09/08

Weather Conditions: BRIGHT, CLOUDY Atmospheric Wind Conditions: Light ALM Pressure: Falling				Equipment used: GFM 400						Data Collected By: IAN WARNE				Input checked by: MZ. M. Baker 11/09/08		
Ground Conditions (eg dry, flooded, frost, snow etc): WET																
Location	Flow (l/hr) (peak and residual) [ ] = time period	Atmospheric Pressure (mb)	BH Pressure (mb)	Time		% by volume in air			LEL (%)	(ppm)			Depth range to water (m bgl) (for a period of time (specify) following tap removal)	Well depth (mbgl) Current and [as installed]	Top of Response zone (m bgl)	Notes (eg, samples taken, dual installation, odours, sheens, broken headworks).
				hours mins	secs	Methane	Carbon Dioxide	Oxygen		H2S	CO	PID				
BH7	>-28.0 (Approx 17 secs) 0.1	1006	-3000		0 (initial)	<0.1	<0.1	20.8					0.94	4.13		
		1006	1006		15	<0.1	0.3	19.7								
					30	<0.1	0.3	19.1								
					60	<0.1	0.3	18.9								
					90	<0.1	0.2	19.6								
					120	<0.1	0.2	19.9								
					180	<0.1	0.2	20.0								
					240	-	-	-								
BH8	>-28.0 (Approx 6 secs) 0.1	1006	-3000		0 (initial)	<0.1	<0.1	20.8					0.43	4.72		
		1006	1006		15	<0.1	0.3	20.1								
					30	<0.1	0.3	19.6								
					60	<0.1	0.3	19.7								
					90	<0.1	0.3	19.8								
					120	-	-	-								
					180	-	-	-								
					240	-	-	-								

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IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	Constant	Falling	1007	1006	GFM430 + Weather: Sunny + Ground: Dry + Wind: Light
Round 2	Constant	Constant	1023	1023	GA2000 SN-GA07762 + Ground: Dry + Wind: Light + Air Temp: 25DegC
Round 3	Constant	Falling	1026	1025	GFM430 + Weather: Fine + Ground: Dry + Wind: Light
Round 4	Falling	Constant	1010	1010	GFM430 + Weather: Fine + Ground: Dry + Wind: Light

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH1	1	50	1	6.00	---	3.00 to 6.00	03/06/2014 17:00:00	1006	1006	$0.0_{(I)}$	-	-	-	-	-	
BH1	1	50	1		---	3.00 to 6.00	30 secs	1006	1006	$0.0_{(SS)}$	-	-	-	-	-	
BH1	1	50	1	6.00	---	3.00 to 6.00	03/06/2014 17:01:00	-	-	-	-	0.4	0.0	20.7	0.0	
BH1	1	50	1		---	3.00 to 6.00	15 secs	-	-	-	-	0.3	0.0	20.8	0.0	
BH1	1	50	1		---	3.00 to 6.00	30 secs	-	-	-	-	0.2	0.0	20.8	0.0	
BH1	1	50	1		---	3.00 to 6.00	60 secs	-	-	-	-	0.1	0.0	20.9	0.0	
BH1	1	50	1		---	3.00 to 6.00	90 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	1		---	3.00 to 6.00	120 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	1		---	3.00 to 6.00	180 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	1		---	3.00 to 6.00	240 secs	-	-	-	-	0.0	0.0	21.0	0.0	
BH1	1	50	1		---	3.00 to 6.00	300 secs	-	-	-	-	0.0	0.0	21.0	0.0	
BH1	1	50	1		---	3.00 to 6.00	360 secs	-	-	-	-	0.0	0.0	21.0	0.0	
BH1	1	50	1		---	3.00 to 6.00	420 secs	-	-	-	-	0.0	0.0	21.0	0.0	
BH1	1	50	1		5.93	3.00 to 6.00	480 secs	-	-	-	1.21	-	-	-	-	
BH1	1	50	2	6.00	---	3.00 to 6.00	13/06/2014 13:06:00	1023	1023	$0.0_{(I)}$	-	-	-	-	-	
BH1	1	50	2		---	3.00 to 6.00	30 secs	1023	1023	$0.0_{(SS)}$	-	-	-	-	-	
BH1	1	50	2	6.00	---	3.00 to 6.00	13/06/2014 13:07:00	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	2		---	3.00 to 6.00	15 secs	-	-	-	-	0.0	0.0	20.8	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/14		**08/07/14**	**729381**

Contract: **Grovefield Way, Cheltenham**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH1	1	50	2		---	3.00 to 6.00	30 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	2		---	3.00 to 6.00	60 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		---	3.00 to 6.00	90 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		---	3.00 to 6.00	120 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		---	3.00 to 6.00	180 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		---	3.00 to 6.00	240 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		---	3.00 to 6.00	300 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	2		5.92	3.00 to 6.00	360 secs	-	-	-	1.21	-	-	-	-	
BH1	1	50	3	6.00	---	3.00 to 6.00	17/06/2014 12:20:00	1025	1025	$0.0_{(I)}$	-	-	-	-	-	
BH1	1	50	3		---	3.00 to 6.00	30 secs	1025	1025	$0.0_{(SS)}$	-	-	-	-	-	
BH1	1	50	3	6.00	---	3.00 to 6.00	17/06/2014 12:21:00	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	3		---	3.00 to 6.00	15 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	30 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	3		---	3.00 to 6.00	60 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	90 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	120 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	180 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	240 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	300 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	360 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		---	3.00 to 6.00	420 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	3		5.92	3.00 to 6.00	480 secs	-	-	-	1.25	-	-	-	-	
BH1	1	50	4	6.00	---	3.00 to 6.00	26/06/2014 15:45:00	-	1010	$0.1_{(I)}$	-	-	-	-	-	
BH1	1	50	4		---	3.00 to 6.00	25 secs	-	1010	$0.0_{(SS)}$	-	-	-	-	-	
BH1	1	50	4	6.00	---	3.00 to 6.00	26/06/2014 15:46:00	-	-	-	-	0.0	0.0	20.9	0.0	

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	08/07/14		**08/07/14**	**729381**

Contract: **Grovefield Way, Cheltenham**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH1	1	50	4		---	3.00 to 6.00	15 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	4		---	3.00 to 6.00	30 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	4		---	3.00 to 6.00	60 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	4		---	3.00 to 6.00	90 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH1	1	50	4		---	3.00 to 6.00	120 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	4		---	3.00 to 6.00	180 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	4		---	3.00 to 6.00	240 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH1	1	50	4		---	3.00 to 6.00	300 secs	-	-	-	-	0.0	0.0	21.0	0.0	
BH1	1	50	4		---	3.00 to 6.00	360 secs	-	-	-	-	0.0	0.0	21.1	0.0	
BH1	1	50	4		---	3.00 to 6.00	420 secs	-	-	-	-	0.0	0.0	21.1	0.0	
BH1	1	50	4		5.93	3.00 to 6.00	660 secs	-	-	-	1.26	-	-	-	-	
BH4	1	50	1	6.00	---	1.00 to 6.00	03/06/2014 15:05:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	
BH4	1	50	1		---	1.00 to 6.00	30 secs	1007	1007	$0.0_{(SS)}$	-	-	-	-	-	
BH4	1	50	1	6.00	---	1.00 to 6.00	03/06/2014 15:06:00	-	-	-	-	0.0	0.0	20.9	0.0	
BH4	1	50	1		---	1.00 to 6.00	15 secs	-	-	-	-	0.2	0.0	20.7	0.0	
BH4	1	50	1		---	1.00 to 6.00	30 secs	-	-	-	-	0.3	0.0	20.6	0.0	
BH4	1	50	1		---	1.00 to 6.00	60 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	1		---	1.00 to 6.00	90 secs	-	-	-	-	-	-	-	-	
	Remarks: Test abandoned water extracting up pipe.															
BH4	1	50	1		6.05	1.00 to 6.00	120 secs	-	-	-	0.24	-	-	-	-	
BH4	1	50	2	6.00	---	1.00 to 6.00	13/06/2014 11:42:00	1023	1023	$0.0_{(I)}$	-	-	-	-	-	
BH4	1	50	2		---	1.00 to 6.00	30 secs	1023	1023	$0.0_{(SS)}$	-	-	-	-	-	
BH4	1	50	2	6.00	---	1.00 to 6.00	13/06/2014 11:43:00	-	-	-	-	0.1	0.0	20.6	0.0	
BH4	1	50	2		---	1.00 to 6.00	15 secs	-	-	-	-	0.3	0.0	20.1	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH4	1	50	2		---	1.00 to 6.00	30 secs	-	-	-	-	0.3	0.0	20.1	0.0	
BH4	1	50	2		---	1.00 to 6.00	60 secs	-	-	-	-	0.2	0.0	20.2	0.0	
BH4	1	50	2		---	1.00 to 6.00	90 secs	-	-	-	-	0.2	0.0	20.2	0.0	
BH4	1	50	2		---	1.00 to 6.00	120 secs	-	-	-	-	0.2	0.0	20.3	0.0	
BH4	1	50	2		---	1.00 to 6.00	180 secs	-	-	-	-	0.1	0.0	20.3	0.0	
BH4	1	50	2		---	1.00 to 6.00	240 secs	-	-	-	-	0.1	0.0	20.3	0.0	
BH4	1	50	2		---	1.00 to 6.00	300 secs	-	-	-	-	0.1	0.0	20.3	0.0	
BH4	1	50	2		6.07	1.00 to 6.00	360 secs	-	-	-	0.64	-	-	-	-	
BH4	1	50	3	6.00	---	1.00 to 6.00	17/06/2014 11:50:00	1025	1025	$0.1_{(I)}$	-	-	-	-	-	
BH4	1	50	3		---	1.00 to 6.00	30 secs	1025	1025	$0.0_{(SS)}$	-	-	-	-	-	
BH4	1	50	3	6.00	---	1.00 to 6.00	17/06/2014 11:51:00	-	-	-	-	0.3	0.0	20.8	0.0	
BH4	1	50	3		---	1.00 to 6.00	15 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	30 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	60 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	90 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	120 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	180 secs	-	-	-	-	0.4	0.0	20.7	0.0	
BH4	1	50	3		---	1.00 to 6.00	240 secs	-	-	-	-	0.4	0.0	20.5	0.0	
BH4	1	50	3		---	1.00 to 6.00	300 secs	-	-	-	-	0.2	0.0	20.8	0.0	
BH4	1	50	3		---	1.00 to 6.00	360 secs	-	-	-	-	0.2	0.0	20.8	0.0	
BH4	1	50	3		---	1.00 to 6.00	420 secs	-	-	-	-	0.1	0.0	20.9	0.0	
BH4	1	50	3		6.06	1.00 to 6.00	480 secs	-	-	-	0.72	-	-	-	-	
BH4	1	50	4	6.00	---	1.00 to 6.00	26/06/2014 15:15:00	-	1010	$-0.1_{(I)}$	-	-	-	-	-	
BH4	1	50	4		---	1.00 to 6.00	4 secs	-	1010	$0.0_{(SS)}$	-	-	-	-	-	
BH4	1	50	4	6.00	---	1.00 to 6.00	26/06/2014 15:16:00	-	-	-	-	0.2	0.0	20.8	0.0	

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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH4	1	50	4		---	1.00 to 6.00	15 secs	-	-	-	-	0.3	0.0	20.7	0.0	
BH4	1	50	4		---	1.00 to 6.00	30 secs	-	-	-	-	0.4	0.0	20.5	0.0	
BH4	1	50	4		---	1.00 to 6.00	60 secs	-	-	-	-	0.6	0.0	20.4	0.0	
BH4	1	50	4		---	1.00 to 6.00	90 secs	-	-	-	-	0.4	0.0	20.6	0.0	
BH4	1	50	4		---	1.00 to 6.00	120 secs	-	-	-	-	0.2	0.0	20.7	0.0	
BH4	1	50	4		---	1.00 to 6.00	180 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	4		---	1.00 to 6.00	240 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	4		---	1.00 to 6.00	300 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	4		---	1.00 to 6.00	360 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	4		---	1.00 to 6.00	420 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH4	1	50	4		6.08	1.00 to 6.00	660 secs	-	-	-	0.89	-	-	-	-	
BH5	1	50	2	6.00	---	2.50 to 6.00	13/06/2014 12:20:00	1023	1023	$0.1_{(I)}$	-	-	-	-	-	
BH5	1	50	2		---	2.50 to 6.00	30 secs	1023	1023	$0.0_{(SS)}$	-	-	-	-	-	
BH5	1	50	2	6.00	---	2.50 to 6.00	13/06/2014 12:21:00	-	-	-	-	0.0	0.0	20.5	0.0	
BH5	1	50	2		---	2.50 to 6.00	15 secs	-	-	-	-	0.9	0.0	18.8	0.0	
BH5	1	50	2		---	2.50 to 6.00	30 secs	-	-	-	-	0.8	0.0	18.7	0.0	
BH5	1	50	2		---	2.50 to 6.00	60 secs	-	-	-	-	0.7	0.0	18.9	0.0	
BH5	1	50	2		---	2.50 to 6.00	90 secs	-	-	-	-	0.6	0.0	19.2	0.0	
BH5	1	50	2		---	2.50 to 6.00	120 secs	-	-	-	-	0.5	0.0	19.4	0.0	
BH5	1	50	2		---	2.50 to 6.00	180 secs	-	-	-	-	0.4	0.0	19.5	0.0	
BH5	1	50	2		---	2.50 to 6.00	240 secs	-	-	-	-	0.3	0.0	19.7	0.0	
BH5	1	50	2		---	2.50 to 6.00	300 secs	-	-	-	-	0.3	0.0	19.7	0.0	
BH5	1	50	2		---	2.50 to 6.00	360 secs	-	-	-	-	0.3	0.0	19.8	0.0	
BH5	1	50	2		6.00	2.50 to 6.00	420 secs	-	-	-	0.69	-	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH5	1	50	3	6.00	---	2.50 to 6.00	17/06/2014 11:00:00	1026	1026	$0.0_{(I)}$	-	-	-	-	-	
BH5	1	50	3		---	2.50 to 6.00	30 secs	1026	1026	$0.0_{(SS)}$	-	-	-	-	-	
BH5	1	50	3	6.00	---	2.50 to 6.00	17/06/2014 11:01:00	-	-	-	-	0.0	0.0	20.9	0.0	
BH5	1	50	3		---	2.50 to 6.00	15 secs	-	-	-	-	1.6	0.0	20.4	0.0	
BH5	1	50	3		---	2.50 to 6.00	30 secs	-	-	-	-	1.7	0.0	18.8	0.0	
BH5	1	50	3		---	2.50 to 6.00	60 secs	-	-	-	-	1.0	0.0	19.5	0.0	
BH5	1	50	3		---	2.50 to 6.00	90 secs	-	-	-	-	0.9	0.0	19.6	0.0	
BH5	1	50	3		---	2.50 to 6.00	120 secs	-	-	-	-	0.8	0.0	19.7	0.0	
BH5	1	50	3		---	2.50 to 6.00	180 secs	-	-	-	-	0.6	0.0	20.1	0.0	
BH5	1	50	3		---	2.50 to 6.00	240 secs	-	-	-	-	0.4	0.0	20.4	0.0	
BH5	1	50	3		---	2.50 to 6.00	300 secs	-	-	-	-	0.4	0.0	20.4	0.0	
BH5	1	50	3		---	2.50 to 6.00	360 secs	-	-	-	-	0.4	0.0	20.4	0.0	
BH5	1	50	3		---	2.50 to 6.00	420 secs	-	-	-	-	0.3	0.0	20.5	0.0	
BH5	1	50	3		6.02	2.50 to 6.00	480 secs	-	-	-	0.77	-	-	-	-	
BH5	1	50	4	6.00	---	2.50 to 6.00	26/06/2014 14:40:00	1010	1010	$0.0_{(I)}$	-	-	-	-	-	
BH5	1	50	4		---	2.50 to 6.00	60 secs	1010	1010	$0.0_{(SS)}$	-	-	-	-	-	
BH5	1	50	4	6.00	---	2.50 to 6.00	26/06/2014 14:42:00	-	-	-	-	0.0	0.0	20.8	0.0	
BH5	1	50	4		---	2.50 to 6.00	15 secs	-	-	-	-	0.1	0.0	20.7	0.0	
BH5	1	50	4		---	2.50 to 6.00	30 secs	-	-	-	-	0.1	0.0	20.6	0.0	
BH5	1	50	4		---	2.50 to 6.00	60 secs	-	-	-	-	0.3	0.0	20.5	0.0	
BH5	1	50	4		---	2.50 to 6.00	90 secs	-	-	-	-	0.6	0.0	20.5	0.0	
BH5	1	50	4		---	2.50 to 6.00	120 secs	-	-	-	-	0.9	0.0	20.3	0.0	
BH5	1	50	4		---	2.50 to 6.00	180 secs	-	-	-	-	0.8	0.0	20.3	0.0	
BH5	1	50	4		---	2.50 to 6.00	240 secs	-	-	-	-	0.5	0.0	20.5	0.0	
BH5	1	50	4		---	2.50 to 6.00	300 secs	-	-	-	-	0.4	0.0	20.6	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH5	1	50	4		---	2.50 to 6.00	360 secs	-	-	-	-	0.3	0.0	20.7	0.0	
BH5	1	50	4		---	2.50 to 6.00	420 secs	-	-	-	-	0.2	0.0	20.8	0.0	
BH5	1	50	4		6.02	2.50 to 6.00	660 secs	-	-	-	0.86	-	-	-	-	
BH7	1	50	1	5.00	---	2.00 to 5.00	03/06/2014 16:00:00	1007	1007	$0.0_{(I)}$	-	-	-	-	-	
BH7	1	50	1		---	2.00 to 5.00	30 secs	1007	1007	$0.0_{(SS)}$	-	-	-	-	-	
BH7	1	50	1	5.00	---	2.00 to 5.00	03/06/2014 16:01:00	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	15 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH7	1	50	1		---	2.00 to 5.00	30 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH7	1	50	1		---	2.00 to 5.00	60 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	90 secs	-	-	-	-	0.0	0.0	20.8	0.0	
BH7	1	50	1		---	2.00 to 5.00	120 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	180 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	240 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	300 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	360 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		---	2.00 to 5.00	420 secs	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	1		3.99	2.00 to 5.00	480 secs	-	-	-	0.94	-	-	-	-	
BH7	1	50	2	5.00	---	2.00 to 5.00	13/06/2014 12:41:00	1023	1023	$0.0_{(I)}$	-	-	-	-	-	
BH7	1	50	2		---	2.00 to 5.00	30 secs	1023	1023	$0.0_{(SS)}$	-	-	-	-	-	
BH7	1	50	2	5.00	---	2.00 to 5.00	13/06/2014 12:42:00	-	-	-	-	0.0	0.0	20.7	0.0	
BH7	1	50	2		---	2.00 to 5.00	15 secs	-	-	-	-	1.6	0.0	17.7	0.0	
BH7	1	50	2		---	2.00 to 5.00	30 secs	-	-	-	-	1.4	0.0	18.0	0.0	
BH7	1	50	2		---	2.00 to 5.00	60 secs	-	-	-	-	0.8	0.0	19.5	0.0	
BH7	1	50	2		---	2.00 to 5.00	90 secs	-	-	-	-	0.5	0.0	19.9	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH7	1	50	2		---	2.00 to 5.00	120 secs	-	-	-	-	0.4	0.0	20.3	0.0	
BH7	1	50	2		---	2.00 to 5.00	180 secs	-	-	-	-	0.2	0.0	20.7	0.0	
BH7	1	50	2		---	2.00 to 5.00	240 secs	-	-	-	-	0.2	0.0	20.8	0.0	
BH7	1	50	2		---	2.00 to 5.00	300 secs	-	-	-	-	0.1	0.0	20.9	0.0	
BH7	1	50	2		---	2.00 to 5.00	360 secs	-	-	-	-	0.1	0.0	20.9	0.0	
BH7	1	50	2		---	2.00 to 5.00	420 secs	-	-	-	-	0.1	0.0	20.9	0.0	
BH7	1	50	2		3.96	2.00 to 5.00	480 secs	-	-	-	1.55	-	-	-	-	
BH7	1	50	3	5.00	---	2.00 to 5.00	17/06/2014 11:30:00	1026	1026	$0.0_{(I)}$	-	-	-	-	-	
BH7	1	50	3		---	2.00 to 5.00	30 secs	1026	1026	$0.0_{(SS)}$	-	-	-	-	-	
BH7	1	50	3	5.00	---	2.00 to 5.00	17/06/2014 11:31:00	-	-	-	-	-	-	-	-	
BH7	1	50	3		---	2.00 to 5.00	15 secs	-	-	-	-	1.7	0.0	19.6	0.0	
BH7	1	50	3		---	2.00 to 5.00	30 secs	-	-	-	-	1.4	0.0	18.7	0.0	
BH7	1	50	3		---	2.00 to 5.00	60 secs	-	-	-	-	0.5	0.0	20.2	0.0	
BH7	1	50	3		---	2.00 to 5.00	90 secs	-	-	-	-	0.4	0.0	20.3	0.0	
BH7	1	50	3		---	2.00 to 5.00	120 secs	-	-	-	-	0.3	0.0	20.4	0.0	
BH7	1	50	3		---	2.00 to 5.00	180 secs	-	-	-	-	0.3	0.0	20.6	0.0	
BH7	1	50	3		---	2.00 to 5.00	240 secs	-	-	-	-	0.2	0.0	20.6	0.0	
BH7	1	50	3		---	2.00 to 5.00	300 secs	-	-	-	-	0.1	0.0	20.7	0.0	
BH7	1	50	3		---	2.00 to 5.00	360 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH7	1	50	3		---	2.00 to 5.00	420 secs	-	-	-	-	0.1	0.0	20.8	0.0	
BH7	1	50	3		3.97	2.00 to 5.00	480 secs	-	-	-	1.66	-	-	-	-	
BH7	1	50	3	5.00	---	2.00 to 5.00	18/06/2014 11:39:00	-	-	-	-	0.0	0.0	20.9	0.0	
BH7	1	50	4	5.00	---	2.00 to 5.00	26/06/2014 14:50:00	-	1010	$0.0_{(I)}$	-	-	-	-	-	
BH7	1	50	4		---	2.00 to 5.00	60 secs	-	1010	$0.0_{(SS)}$	-	-	-	-	-	
BH7	1	50	4	5.00	---	2.00 to 5.00	26/06/2014 14:52:00	-	-	-	-	0.0	0.0	20.8	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	
BH7	1	50	4		---	2.00 to 5.00	15 secs	-	-	-	-	1.9	0.0	20.1	0.0	
BH7	1	50	4		---	2.00 to 5.00	30 secs	-	-	-	-	2.0	0.0	19.5	0.0	
BH7	1	50	4		---	2.00 to 5.00	60 secs	-	-	-	-	1.8	0.0	19.6	0.0	
BH7	1	50	4		---	2.00 to 5.00	90 secs	-	-	-	-	1.6	1.0	19.7	0.0	
BH7	1	50	4		---	2.00 to 5.00	120 secs	-	-	-	-	1.3	0.0	19.8	0.0	
BH7	1	50	4		---	2.00 to 5.00	180 secs	-	-	-	-	1.2	0.0	19.9	0.0	
BH7	1	50	4		---	2.00 to 5.00	240 secs	-	-	-	-	0.9	0.0	20.2	0.0	
BH7	1	50	4		---	2.00 to 5.00	300 secs	-	-	-	-	0.9	0.0	20.4	0.0	
BH7	1	50	4		---	2.00 to 5.00	360 secs	-	-	-	-	0.6	0.0	20.5	0.0	
BH7	1	50	4		---	2.00 to 5.00	420 secs	-	-	-	-	0.2	0.0	20.7	0.0	
BH7	1	50	4		3.99	2.00 to 5.00	660 secs	-	-	-	1.65	-	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/14		**08/07/14**	**729381**

Contract: **Grovefield Way, Cheltenham**

Revised Wilson and Card Classification Ground Gas Risk Assessment

Job No.:	728391
Client:	Harris Cars plc
Site:	Cheltenham

For low-rise residential developments without a clear ventilated sub-floor void, flats and commercial / industrial sites

Characteristic Situation	Risk		GSV
1	Very Low		0.07
2	Low		0.7
3	Moderate		3.5
4	Moderate to High		15
5	High		70
6	Very High		>70

***From CIRIA Report 659 (2006) "Assessing Risks Posed By Hazardous Ground Gases To Buildings", Wilson* et al.**

BH NO.	DATE	CH4 I %v/v		CO2 SS %v/v	Flow I l/hr	Flow SS l/hr	Baro mbar		GSV CH4	GSV CO2	CS No.	Water depth m	Remarks
BH1	21/08/2008	<0.1		2.0	**0.1**	**0.1**	1005-8	rising	**0.00**	**0.00**	**CS1**	dry	
	26/08/2008	0.1		1.7	**0.0**	**0.0**	1015-16	rising	**0.00**	**0.00**	**CS1**	5.76	
	02/09/2008	<0.1		2.0	**0.0**	**0.0**	993	falling	**0.00**	**0.00**	**CS1**	5.64	
	08/09/2008	<0.1		0.3	**0.1**	**0.1**	1006-7	falling	**0.00**	**0.00**	**CS1**	2.63	
	03/06/2014	<0.1		0.4	**0.0**	**0.0**	1007-6	falling	**0.00**	**0.00**	**CS1**	1.21	
	13/06/2014	<0.1		<0.1	**0.0**	**0.0**	1023	constant	**0.00**	**0.00**	**CS1**	1.21	
	17/06/2014	<0.1		<0.1	**0.0**	**0.0**	1026-5	falling	**0.00**	**0.00**	**CS1**	1.25	
	26/06/2014	<0.1		<0.1	**0.1**	**0.0**	1010	constant	**0.00**	**0.00**	**CS1**	1.26	
BH2	21/08/2008	<0.1		2.0	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	dry	
	26/08/2008	0.1		0.5	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	dry	
	02/09/2008	<0.1		2.3	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	4.18	
	08/09/2008	<0.1		0.4	**3.7**	**0.1**			**0.00**	**0.00**	**CS1**	**0.23**	Initial flow negative, lasted for 3 sec
	03/06/2014												
	13/06/2014												
	17/06/2014												
	26/06/2014												
BH4	21/08/2008	<0.1		2.1	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	dry	
	26/08/2008	0.3		1.9	**0.1**	**0.0**			**0.00**	**0.00**	**CS1**	dry	
	02/09/2008	<0.1		2.5	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	5.49	
	08/09/2008	<0.1		<0.1	**4.5**	**0.1**			**0.00**	**0.00**	**CS1**	**0.24**	Initial flow negative, lasted for 5 sec
	03/06/2014	<0.1		0.3	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	**0.24**	Test abandoned: water coming up pipe
	13/06/2014	<0.1		0.3	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	0.64	
	17/06/2014	<0.1		0.4	**0.1**	**0.0**			**0.00**	**0.00**	**CS1**	0.72	
	26/06/2014	<0.1		0.6	**0.1**	**0.0**			**0.00**	**0.00**	**CS1**	0.89	
BH5	21/08/2008	<0.1		2.3	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	5.75	
	26/08/2008	0.1		0.6	**0.1**	**0.0**			**0.00**	**0.00**	**CS1**	5.56	
	02/09/2008	<0.1		3.4	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	4.67	
	08/09/2008	<0.1		1.2	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	**0.25**	
	03/06/2014												BH not located on this date
	13/06/2014	<0.1		0.9	**0.1**	**0.0**			**0.00**	**0.00**		0.69	
	17/06/2014	<0.1		1.7	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	0.77	
	26/06/2014	<0.1		0.9	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	0.86	
BH7	21/08/2008	<0.1		1.7	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	2.89	
	26/08/2008	28.5		1.3	**0.9**	**0.0**			**0.26**	**0.00**	**CS2**	3.08	
	02/09/2008	<0.1		2.0	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	2.72	

Characteristic Situation	Risk		GSV
1	Very Low		0.07
2	Low		0.7
3	Moderate		3.5
4	Moderate to High		15
5	High		70
6	Very High		>70

From CIRIA Report 659 (2006) "Assessing Risks Posed By Hazardous Ground Gases To Buildings", Wilson **et al.**

BH NO.	DATE	CH4 I %v/v		CO2 SS %v/v	Flow I l/hr	Flow SS l/hr	Baro mbar		GSV CH4	GSV CO2	CS No.	Water depth m	Remarks
	08/09/2008	<0.1		0.2	**28.0**	**0.1**			**0.00**	**0.00**	**CS1**	**0.94**	Initial flow negative and over- range, lasted for 17sec Suction in BH
	03/06/2014	<0.1		<0.1	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	0.94	
	13/06/2014	<0.1		1.6	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	1.55	
	17/06/2014	<0.1		1.7	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	1.66	
	26/06/2014	<0.1		2.0	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	1.65	
BH8	21/08/2008	<0.1		2.1	**0.1**	**0.1**			**0.00**	**0.00**	**CS1**	2.55	
	26/08/2008	0.1		0.6	**0.0**	**0.0**			**0.00**	**0.00**	**CS1**	2.49	
	02/09/2008	<0.1		0.6	**21.3**	**0.0**			**0.00**	**0.00**	**CS1**	**0.19**	
	08/09/2008	<0.1		0.3	**28.0**	**0.1**			**0.00**	**0.00**	**CS1**	**0.43**	Initial flow negative and over- range, lasted for 6sec Suction in BH
	03/06/2014								**0.00**	**0.00**			
	13/06/2014								**0.00**	**0.00**			
	17/06/2014								**0.00**	**0.00**	**CS1**		
	26/06/2014								**0.00**	**0.00**	**CS1**		

WORST-CASE VALUES PER BOREHOLE

		Maximum CH4		Maximum CO2	Max Flow	Max Flow	Not Applicable		Maximum GSVs		CS No		
BH1		0.1		2.0	0.1	0.1			**0.00**	**0.00**	**CS1**		
BH2		0.1		2.3	3.7	0.1			**0.00**	**0.00**	**CS1**		
BH4		0.3		2.5	4.5	0.1			**0.01**	**0.00**	**CS1**		
BH5		0.1		3.4	0.1	0.1			**0.00**	**0.00**	**CS1**		
BH7		28.5		2.0	0.9	0.1			**0.26**	**0.00**	**CS2**	Over-range flows discounted since they are likely to have been due to water level change in the standpipes	
BH8		0.1		2.1	21.3	0.1			**0.02**	**0.00**	**CS1**		

Generic assessment criteria for human health: commercial scenario

The human health generic assessment criteria (GAC) have been developed during a period of regulatory review and updating of the Contaminated Land Exposure Assessment (CLEA) project. Therefore, the Environment Agency (EA) is in the process of publishing updated reports relating to the CLEA project and the GAC presented in this document may change to reflect these updates. This issue was prepared following the publication of soil guideline value (SGV) reports and associated publications[(1)] for mercury, selenium, benzene, toluene, ethylbenzene and xylene in March 2009, arsenic and nickel in May 2009, cadmium and phenol in June 2009, dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs) in September 2009. It was also produced following publication of GAC by LQM[(6)]. Where available, the published soil guideline values (SGV)[(1)] were used as the GAC. The GAC for lead is discussed separately below owing to it not being derived using the same approach as other compounds.

Lead GAC derivation

The Environment Agency SGV and Tox reports for lead were withdrawn in 2009. In addition, the provisional tolerable weekly intake data published in the Netherlands was also withdrawn in 2010 owing to concerns that it was not suitably protective of human health. The withdrawn SGV was based on a target blood lead concentration 10 μg/dl. In the absence of current guidelines, many consultants have continued to use the withdrawn SGV. However, as this is not considered sufficiently protective of human health RSK has revised its GAC for lead and is currently undertaking a review of recent toxicological developments that will be used to refine this GAC further in the coming months.

Variable	Description of variable	Units	Value in SGV10	Revised value for RSK GAC
T	Health criteria value – reduced owing to concern that 10ug/dl may not be suitably protective of human health	ug/dl	10	5
G	Geometric standard deviation for B typically in range of 1.8 to 2.1	-	2.0	1.8
B	Geometric mean of blood lead concentration in adult women. The value used in SGV10 was based on UK data from 1995 from women in an urban area aged 16–44. Data in the US has shown decreases from between 1.7 and 2.2 to 1ug/dl between the late 1980s/early 1990s and late 1990s/early 2000s for adult females between 17 and 45 years old. Lead concentrations in blood are likely to be decreasing in the UK owing to a ban on lead in internal paint, a ban on lead in fuel and replacement of lead pipes for water supply	ug/dl	2.3	1.0
n	Selected on the basis of the degree of protection needed for a population at risk at the target concentration (T); the default value is 95%	-	1.645	1.645
$AT_{S, D}$	Averaging time assuming exposure over working lifetime. The value has been revised to reflect 49 years in accordance with CLEA commercial scenario outlined in SR3	days	15695	17885
BKSF	Biokinetic slope factor	ug/dl per ug/day	0.4	0.4
IR_S	Soil ingestion rate (including soil-derived indoor dust). This value has been revised to reflect the CLEA commercial scenario outlined in SR3	g/day	0.040	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	-	0.12	0.12
$EF_{S, D}$	Exposure frequency – based on CLEA commercial conceptual model	days/yr	230	230
ED	Exposure duration. This value has been revised to reflect CLEA commercial conceptual model outlined in SR3	years	43	49

The methodology utilised for the adult receptor is the Adult Lead Methodology used in the USA, which is a similar equation to that used in production of the UK SGV outlined in R&D publication SGV10. Parameters within the equation are presented below and have been updated to reflect:

- a revised and more health protective target blood level
- more recent US data pertaining to the geometric blood lead concentration, which indicates decreasing concentrations from 1988 to 2004
- more recent US data regarding the geometric standard deviation (the measure of inter-individual variability in blood lead concentrations within the adult population).

Although the update is based on US data, RSK considers that background blood levels in the UK will also be decreasing owing to lead pipes being replaced, lead no longer being used in fuel and lead paints being banned from internal use. Furthermore, RSK has run the equation with varying inputs to ascertain its sensitivity to certain parameters. Using the parameters outlined above RSK obtains a GAC of **600mg/kg** for an adult in a commercial setting. A similar value is obtained if all input parameters remain equal to those used in production of the former SGV but the soil ingestion rate is increased to reflect 50mg/day reported for the commercial scenario in SR3.

GAC derivation for other metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated for compounds where SGV have not been published using CLEA v1.06 and the supporting UK guidance[1–6]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect the UK guidance[2–5]. The SAC and GrAC collectively are termed GAC.

Pathway selection

In accordance with EA Science Report SC050221/SR3[3] the commercial scenario considers risks to a female worker who works from the age of 16 to 65 years. It should be noted that this end use is not suitable for a workplace nursery but also may be appropriate for a sport centre or shopping centre where children are present. In accordance with Box 3.5, SR3[3] the pathways considered for production of the SAC in the commercial scenario are:

- direct soil and dust ingestion
- dermal contact with soil both indoor and outdoors
- indoor air inhalation from soil and vapour and outdoor inhalation of soil and vapour.

Figure 1 is a conceptual model illustrating these linkages.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by workers while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air.

Within RBCA, the solubility limit of the determinant restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the model output cells are flagged red where the soil saturation limit has been exceeded.

An assumption used in the CLEA model is that of simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[4]. The upper boundaries of this partitioning are represented by the aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous-based or the vapour-based saturation limits. Where model output cells are flagged red the soil or vapour saturation limit has been exceeded and further consideration of the SAC to be used within the assessment is required. One approach that could be adopted is to use the 'modelled' solubility saturation limit or vapour saturation limit of the compound as the SAC. However, as stated within the CLEA handbook[4] this is likely to be impractical in many cases because of the very low solubility/vapour saturation limits and, in any case, is highly conservative. Unless free-phase product is present, concentrations of the chemical are unlikely to be present at sufficient concentration to result in an exceedance of the health criteria value (HCV).

RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH[6] whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets. Therefore, when using the SAC to screen laboratory analysis the assessor should take note if a given SAC has a corresponding solubility saturation or vapour saturation limit (in brackets), and subsequently incorporate this information within the screening analytical discussion. If further assessment is required following this process then an additional approach can be utilised as detailed within Section 4.12 of the CLEA model handbook[4] which explains how to calculate an effective assessment criterion manually.

Input selection

Chemical data was obtained from EA Report SC050021/SR7[5] and the health criteria values (HCV) from the UK TOX[1] reports where available. For SAC for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH), toxicological and specific chemical parameters were obtained from the LQM/CIEH report[6]. Similarly, toxicological and specific chemical parameters for the volatile organic compound 1,2,4-trimethylbenzene were obtained from EIC/AGS/CL:AIRE[7].

For TPH, aromatic hydrocarbons C_5–C_8 were not modelled since benzene and toluene are being modelled separately. The aromatic C_8-C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. As ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for this band have been taken from styrene.

Owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate methyl tertiary butyl ether (MTBE). No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the US EPA as in the RBCA model. RBCA

uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of:

- an adult weighing 70kg and breathing 14.8m^3 air per day in accordance with the UK TOX reports[2] and SR3[3]
- the 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[2] where MDI data is not currently available but background exposure is considered important in the overall exposure.

Physical parameters

For the commercial end use, the CLEA default pre-1970s three-storey office building was used. SR3 notes this commercial building type to be the most conservative in terms of protection from vapour intrusion. The building parameters are outlined in Table 3.

The parameters for a sandy loam soil type were used in line with SR3[3]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this parameter, RSK has produced an additional set of SAC for an SOM of 1% and 2.5%.

For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater.

GAC

The SAC were produced using the input parameters in Tables 1, 2 and 3 and the GrAC using the input parameters in Table 4. The final selected GAC are presented by pathway in Table 5 with the combined GAC in Table 6.

Figure 1: Conceptual model for CLEA commercial scenario

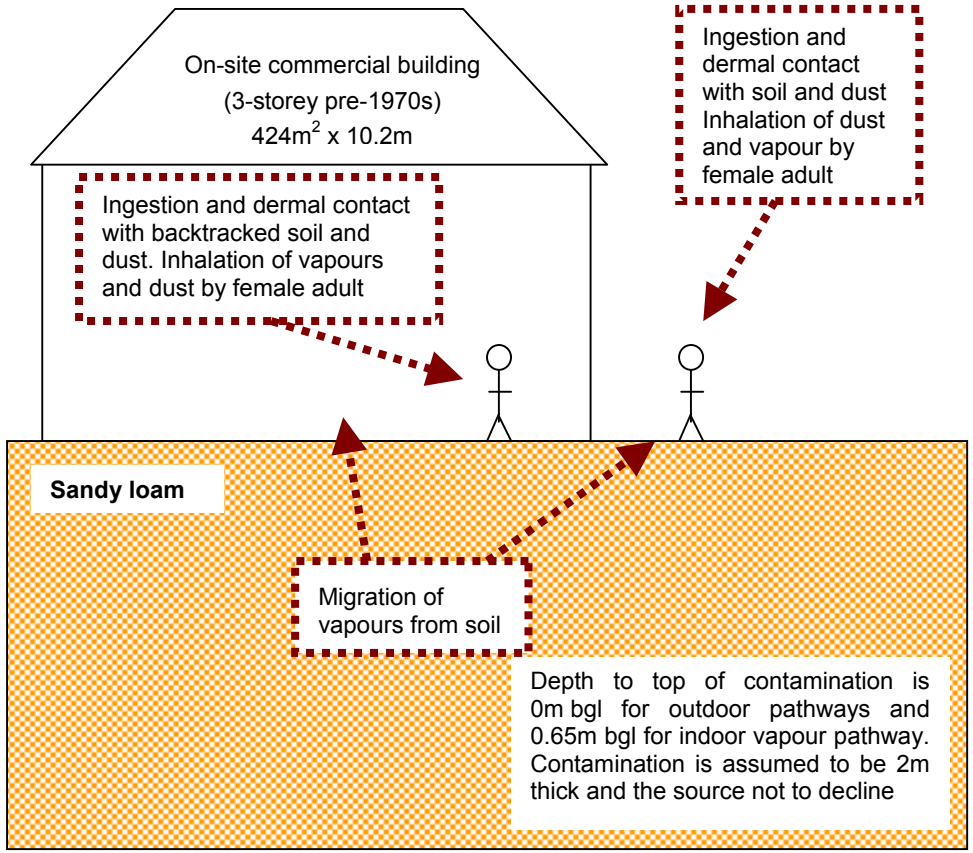


Table 1: Exposure assessment parameters for commercial scenario – inputs for CLEA model

Parameter	Value	Justification
Land use	Commercial	Chosen land use
Receptor	Female worker	Taken as female adult exposed over 49 years from age 16 to 65 years, Box 3.5, SR3[3]
Building	Office (pre-1970)	Key generic assumption given in Box 3.5, SR3[3]. Pre-1970s three-storey office building chosen as it is the most conservative in terms of protection from vapour intrusion (Section 3.4.6, SR3[3])
Soil type	Sandy loam	Most common UK soil type (Section 4.3.1, Table 4.4, SR3[3]). Table 4 presents soil-specific inputs
Start age class (AC)	17	AC corresponding to key generic assumption that the critical receptor is a working female adult exposed over a 49-year period from age 16 to 65 years. Assumption given in Box 3.5, SR3[3]. Data specific to AC exposure is presented in Table 2 and receptor specific in Table 3
End AC	17	
SOM (%)	6	Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[8]
	1	To provide SAC for sites where SOM < 6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Commercial – receptor inputs for CLEA model

Parameter	Unit	Value	Justification
Exposure frequency (EF) (soil and dust ingestion)	day yr^{-1}	230	From Table 3.9, SR3[3]. The working week is assumed 45 hours including a 1-hour lunch break each day. Indoor and outdoor exposure are weighted by the frequency of time spent indoors and outdoors (8.3 hours a day and 0.7 hours a day respectively)
EF (dermal contact with dust. indoor)	day yr^{-1}	230	
EF (dermal contact with soil, outdoor)	day yr^{-1}	170	
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	230	
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	170	
Occupancy period (indoor)	hr day^{-1}	8.3	Box 3.6, SR3[3]. Weighted average based on a nine-hour day including one-hour lunch being spent outside 75% of the year
Occupancy period (outdoor)	hr day^{-1}	0.7	
Soil to skin adherence factor (indoor and outdoor)	mg cm^{-2} day^{-1}	0.14	Table 8.1, SR3[3] for age class 17
Soil and dust ingestion rate	g day^{-1}	0.05	Table 6.2, SR3[3] for age class 17
Body weight	kg	70	Table 4.6, SR3[3] for female AC 17
Body height	m	1.6	Table 4.6, SR3[3] for female AC 17
Inhalation rate	m^3 day^{-1}	14.8	Table 4.14, SR3[3] for female AC 17
Max. exposed skin fraction (indoor and outdoors)	m^2 m^{-2}	0.08	Based on adult female assuming face and hands are exposed. Table 4.7, SR3[3]

Table 3: Commercial – soil, air and building inputs for CLEA model

Parameter	Unit	Value	Justification
Soil properties for sandy loam			
Porosity, total	$cm^3\ cm^{-3}$	0.53	Default soil type is sandy loam, Section 4.3.1, SR3[3]. Parameters for sandy loam from Table 4.4, SR3[3]
Porosity, air filled	$cm^3\ cm^{-3}$	0.20	
Porosity, water filled	$cm^3\ cm^{-3}$	0.33	
Residual soil water content	$cm^3\ cm^{-3}$	0.12	
Saturated hydraulic conductivity	$cm\ s^{-1}$	0.00356	
van Genuchten shape parameter (*m*)	-	0.3201	
Bulk density	$g\ cm^{-3}$	1.21	
Threshold value of wind speed at 10m	$m\ s^{-1}$	7.20	Default value taken from Section 9.2.2, SR3[3]
Empirical function (F_x) for dust model	-	1.22	Value taken from Section 9.2.2, SR3[3]
Ambient soil temperature	K	283	Annual average soil temperature of UK surface soils. Section 4.3.1, SR3[3]
Air dispersion model			
Mean annual wind speed (10m)	$m\ s^{-1}$	5.0	Default value taken from Section 9.2.2, SR3[3]
Air dispersion factor at height of 1.6m	$g\ m^{-2}\ s^{-1}$ per $kg\ m^{-3}$	120	From Table 9.1, SR3. Values for a 2ha site, appropriate to a commercial land use in Newcastle (most representative city for UK, section 9.2.1,SR3[3])
Fraction of site with hard or vegetative cover	$m^2\ m^{-2}$	0.8	Section 3.4.6 and 9.2.2, SR3[3] for average office such as that used in the commercial scenario
Building properties for office (pre-1970) with ground-bearing floor slab			
Building footprint	m^2	424	From Table 3.10, SR3[3]
Living space air exchange rate	hr^{-1}	1.0	
Living space height (above ground)	m	9.6	
Living space height (below ground)	m	0.0	Assumed no basement.
Pressure difference (soil to enclosed space)	Pa	4.4	From Table 3.10, SR3[3]
Foundation thickness	m	0.15	

Parameter	Unit	Value	Justification
Floor crack area	m^2	0.165	
Dust loading factor	$\mu g\ m^{-3}$	100	Default value for a commercial site taken from Section 9.3, SR3[3]
Vapour model			
Default soil gas ingress rate	$cm^3\ s^{-1}$	150	Section 10.3, report SC050021/SR3[3]
Depth to top of source (beneath building for indoor exposure)	cm	50	Section 3.4.6, SR3[3] states source is 50cm below building or 65cm below ground surface
Depth to top of source (outdoors)	cm	0	Section 10.2, SR3[3] assumes impact from 0-1m for outdoor inhalation pathway
Thickness of contaminant layer	cm	200	Model default for indoor air, Section 4.9, SR4[4]
Time average period for surface emissions	years	49	Working lifetime from 16–65 years. Key generic assumption given in Box 3.5, SR3[3]
User-defined effective air permeability	cm^2	3.05E-08	Calculated for sandy loam using equations in Appendix 1, SR3[3]

Figure 2: GrAC conceptual model for RBCA commercial scenario

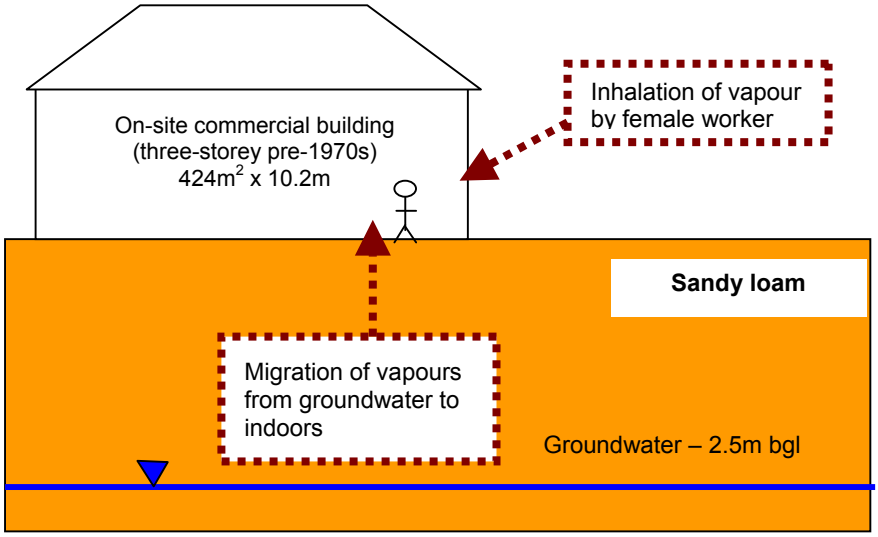


Table 4: Commercial – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	49	From Box 3.5, SR3[3]
Receptor weight	kg	70	Female adult, Table 4.6, SR3[3]
Exposure duration	Years	49	From Box 3.5, SR3[3]
Exposure frequency	Days/yr	86.25	Weighted using occupancy period of 9 hours per day for 230 days of the year ((9hours x 230 days)/24 hours)
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3[3]
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3[3]
Capillary zone	m	0.1	Professional judgement

Parameter	Unit	Value	Justification
thickness			
Building			
Building volume/area ratio	m	9.6	Table 3.10, SR3[3]
Foundation area	m^2	424	Table 3.10, SR3[3]
Foundation perimeter	m	82.40	Based on square root of building area being 20.59m
Building air exchange rate	d^{-1}	24	Table 3.10, SR3[3]
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	Table 3.10, SR3[3]
Foundation crack fraction	-	3.89E-04	Calculated from floor crack area of 0.165m^2 and building footprint of 424m^2 in Table 4.21, SR3[3]
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	4.4	From Table 3.10, SR3[3]

References

1. Environment Agency (2009), 'Science Report SC050021/benzene SGV, toluene SGV, ethylbenzene SGV, xylene SGV, mercury SGV, selenium SGV, nickel SGV, arsenic SGV, cadmium SGV, phenol SGV, dioxins, furans and dioxin like PCBs SGVs', 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', March 2009, May 2009 and September 2009.

2. Environment Agency (2009), *Human health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2*, January (Bristol: Environment Agency).

3. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

4. Environment Agency (2009), Contaminated Land Exposure Assessment (CLEA) software, version 1.06.

5. Environment Agency (2008), *Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* (Bristol: Environment Agency).

6. Chartered Institute for Environmental Health and Land Quality Management (2009), 'The LQM/CIEH Generic Assessment Criteria for Human Health', second edition.

7. CL:AIRE (2009), *Soil Generic Assessment Criteria for Human Health Risk Assessment* (London: CL:AIRE).

8. Changes made to the CLEA framework documents after the three-month evaluation period in 2008, released January 2009 by the Environment Agency.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 5

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(b)(c)	-	6.35E+02	6.95E+02	-	NR	6.35E+02	6.95E+02	-	NR	6.35E+02	6.95E+02	-	NR
Cadmium	(b)	-	3.99E+02	3.87E+02	2.30E+02	NR	3.99E+02	3.87E+02	2.30E+02	NR	3.99E+02	3.87E+02	2.30E+02	NR
Chromium (III) - oxide		-	3.31E+05	3.34E+04	3.04E+04	NR	3.31E+05	3.34E+04	3.04E+04	NR	3.31E+05	3.34E+04	3.04E+04	NR
Chromium (VI) - hexavalent		-	2.01E+03	3.48E+01	3.42E+01	NR	2.01E+03	3.48E+01	3.42E+01	NR	2.01E+03	3.48E+01	3.42E+01	NR
Copper		-	1.78E+05	9.60E+04	7.17E+04	NR	1.78E+05	9.60E+04	7.17E+04	NR	1.78E+05	9.60E+04	7.17E+04	NR
Lead	(a)	-	6.00E+02	-	-	NR	6.00E+02	-	-		6.00E+02	-	-	NR
Elemental mercury (Hg^0)	(b)(d)	5.60E-02	-	1.84E+01	-	4.31E+00	-	4.57E+01	-	1.07E+01	-	1.09E+02	-	2.58E+01
Inorganic mercury (Hg^{2+})	(b)	-	4.41E+03	2.09E+04	3.64E+03	NR	4.41E+03	2.09E+04	3.64E+03		4.41E+03	2.09E+04	3.64E+03	NR
Methyl mercury (Hg^{4+})	(b)	1.00E+02	4.25E+02	2.73E+03	3.68E+02	7.33E+01	4.25E+02	4.97E+03	3.91E+02	1.42E+02	4.25E+02	9.41E+03	4.07E+02	3.04E+02
Nickel	(b)	-	2.22E+04	1.79E+03	-	NR	2.22E+04	1.79E+03	-	NR	2.22E+04	1.79E+03	-	NR
Selenium	(b)(c)	-	1.30E+04	-	-	NR	1.30E+04	-	-	NR	1.30E+04	-	-	NR
Zinc	(c)	-	6.67E+05	2.09E+08	-	NR	6.67E+05	2.09E+08	-	NR	6.67E+05	2.09E+08	-	NR
Cyanide		-	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR
Volatile organic compounds														
Benzene	(b)	1.40E+02	5.53E+02	2.96E+01	2.81E+01	1.22E+03	5.53E+02	5.51E+01	5.01E+01	2.26E+03	5.53E+02	1.14E+02	9.47E+01	4.71E+03
Toluene	(b)	5.90E+02	4.25E+05	6.85E+04	5.90E+04	8.69E+02	4.25E+05	1.51E+05	1.11E+05	1.92E+03	4.25E+05	3.42E+05	1.89E+05	4.36E+03
Ethylbenzene	(b)	1.80E+02	1.91E+05	1.84E+04	1.68E+04	5.18E+02	1.91E+05	4.31E+04	3.51E+04	1.22E+03	1.91E+05	1.00E+05	6.57E+04	2.84E+03
Xylene - m	(b)	2.00E+02	3.43E+05	6.59E+03	6.46E+03	6.25E+02	3.43E+05	1.55E+04	1.48E+04	1.47E+03	3.43E+05	3.61E+04	3.27E+04	3.46E+03
Xylene - o	(b)	1.70E+02	3.43E+05	7.08E+03	6.94E+03	4.78E+02	3.43E+05	1.65E+04	1.58E+04	1.12E+03	3.43E+05	3.84E+04	3.46E+04	2.62E+03
Xylene - p	(b)	2.00E+02	3.43E+05	6.34E+03	6.22E+03	5.76E+02	3.43E+05	1.48E+04	1.42E+04	1.35E+03	3.43E+05	3.45E+04	3.14E+04	3.17E+03
Total xylene	(b)	2.00E+02	3.43E+05	6.59E+03	6.46E+03	6.25E+02	3.43E+05	1.55E+04	1.48E+04	1.47E+03	3.43E+05	3.61E+04	3.27E+04	3.46E+03
Methyl tertiary butyl ether (MTBE)		4.80E+04	9.53E+03	2.09E+04	8.21E+03	1.66E+04	9.53E+03	2.72E+04	8.55E+03	2.16E+04	9.53E+03	4.18E+04	8.93E+03	3.34E+04
Trichloroethene		3.60E+01	9.92E+03	1.19E+01	1.19E+01	1.54E+03	9.92E+03	2.49E+01	2.49E+01	3.22E+03	9.92E+03	5.54E+01	5.50E+01	7.14E+03
Tetrachloroethene		2.30E+02	2.65E+04	1.31E+02	1.31E+02	4.24E+02	2.65E+04	2.94E+02	2.91E+02	9.51E+02	2.65E+04	6.75E+02	6.58E+02	2.18E+03
1,1,1-Trichloroethane		1.30E+03	1.14E+06	7.01E+02	7.00E+02	1.43E+03	1.14E+06	1.43E+03	1.43E+03	2.92E+03	1.14E+06	3.14E+03	3.13E+03	6.39E+03
1,1,1,2 Tetrachloroethane		1.10E+03	1.10E+04	1.16E+02	1.15E+02	2.60E+03	1.10E+04	2.68E+02	2.62E+02	6.02E+03	1.10E+04	6.24E+02	5.91E+02	1.40E+04
1,1,2,2 Tetrachloroethane		1.10E+03	1.10E+04	2.98E+02	2.90E+02	2.67E+03	1.10E+04	6.10E+02	5.78E+02	5.46E+03	1.10E+04	1.34E+03	1.19E+03	1.20E+04
Carbon Tetrachloride (tetrachloromethane)		5.70E+00	2.70E+03	3.04E+00	3.04E+00	1.52E+03	2.70E+03	6.67E+00	6.65E+00	3.32E+03	2.70E+03	1.51E+01	1.50E+01	7.54E+03
1,2-Dichloroethane		6.10E+00	2.29E+02	7.14E-01	7.12E-01	3.41E+03	2.29E+02	1.03E+00	1.03E+00	4.91E+03	2.29E+02	1.77E+00	1.75E+00	8.43E+03
Vinyl Chloride (chloroethene)		4.10E-01	2.67E+01	6.31E-02	6.30E-02	1.36E+03	2.67E+01	8.16E-02	8.14E-02	1.76E+03	2.67E+01	1.25E-01	1.24E-01	2.69E+03
1,2,4-Trimethylbenzene		5.70E+01	-	4.17E+01	-	5.57E+02	-	9.89E+01	-	1.36E+03	-	2.19E+02	-	3.25E+03
1,3,5-Trimethylbenzene		3.80E+01	2.19E+04	4.71E+01	4.71E+01	9.47E+01	2.19E+04	1.12E+02	1.12E+02	2.26E+02	2.19E+04	2.63E+02	2.63E+02	5.33E+02
Semi-volatile organic compounds														
Acenaphthene		3.20E+00	1.10E+05	3.75E+05	8.49E+04	5.70E+01	1.10E+05	8.95E+05	9.77E+04	1.41E+02	1.10E+05	2.00E+06	1.04E+05	3.36E+02
Acenaphthylene		1.61E+01	1.10E+05	3.64E+05	8.43E+04	8.61E+01	1.10E+05	8.68E+05	9.74E+04	2.12E+02	1.10E+05	1.94E+06	1.04E+05	5.06E+02
Anthracene		2.10E-02	5.49E+05	1.19E+07	5.25E+05	1.17E+00	5.49E+05	2.49E+07	5.37E+05	2.91E+00	5.49E+05	4.38E+07	5.42E+05	6.96E+00
Benzo(a)anthracene		3.80E-03	2.52E+02	1.39E+02	8.95E+01	1.71E+00	2.52E+02	1.52E+02	9.48E+01	4.28E+00	2.52E+02	1.59E+02	9.74E+01	1.03E+01
Benzo(b)fluoranthene		2.00E-03	2.60E+02	1.63E+02	1.00E+02	1.22E+00	2.60E+02	1.67E+02	1.02E+02	3.04E+00	2.60E+02	1.69E+02	1.03E+02	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	1.66E+03	1.08E+03	6.54E+02	1.54E-02	1.66E+03	1.09E+03	6.59E+02	3.85E-02	1.66E+03	1.10E+03	6.61E+02	9.23E-02
Benzo(k)fluoranthene		8.00E-04	3.66E+02	2.31E+02	1.41E+02	6.87E-01	3.66E+02	2.35E+02	1.43E+02	1.72E+00	3.66E+02	2.38E+02	1.44E+02	4.12E+00
Chrysene		2.00E-03	3.66E+02	2.20E+02	1.37E+02	4.40E-01	3.66E+02	2.29E+02	1.41E+02	1.10E+00	3.66E+02	2.34E+02	1.43E+02	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	3.29E+01	2.80E+01	1.27E+01	3.93E-03	3.29E+01	2.12E+01	1.29E+01	9.82E-03	3.29E+01	2.15E+01	1.30E+01	2.36E-02
Fluoranthene		2.30E-01	2.29E+04	2.01E+06	2.26E+04	1.89E+01	2.29E+04	2.89E+06	2.27E+04	4.73E+01	2.29E+04	3.52E+06	2.27E+04	1.13E+02
Fluorene		1.90E+00	7.31E+04	4.82E+05	6.35E+04	3.09E+01	7.31E+04	1.12E+06	6.87E+04	7.65E+01	7.31E+04	2.38E+06	7.10E+04	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	1.57E+02	9.71E+01	6.00E+01	6.13E-02	1.57E+02	9.98E+01	6.11E+01	1.53E-01	1.57E+02	1.01E+02	6.17E+01	3.68E-01
Phenanthrene		5.30E-01	2.28E+04	5.67E+05	2.19E+04	3.60E+01	2.28E+04	1.16E+06	2.24E+04	8.96E+01	2.28E+04	1.98E+06	2.26E+04	2.14E+02
Pyrene		1.30E-01	5.49E+04	4.74E+06	5.42E+04	2.20E+00	5.49E+04	6.86E+06	5.44E+04	5.49E+00	5.49E+04	8.39E+06	5.45E+04	1.32E+01
Benzo(a)pyrene		3.80E-03	3.66E+01	2.30E+01	1.41E+01	9.11E-01	3.66E+01	2.35E+01	1.43E+01	2.28E+00	3.66E+01	2.38E+01	1.44E+01	5.46E+00
Naphthalene		1.90E+01	3.64E+04	2.05E+02	2.04E+02	7.64E+01	3.64E+04	4.90E+02	4.83E+02	1.83E+02	3.64E+04	1.15E+03	1.12E+03	4.32E+02
Phenol	(b)(e)	-	1.54E+06	3.16E+04	3.10E+04	4.16E+04	1.00E+06	3.57E+04	3.49E+04	8.15E+04	1.54E+06	3.85E+04	3.76E+04	1.74E+05
Total petroleum hydrocarbons														
Aliphatic hydrocarbons EC_5–EC_6		3.60E+01	4.77E+06	3.38E+03	3.39E+03	3.04E+02	4.77E+06	6.21E+03	6.21E+03	5.58E+02	4.77E+06	1.28E+04	1.28E+04	1.15E+03
Aliphatic hydrocarbons >EC_6–EC_8		5.40E+00	4.77E+06	8.26E+03	8.25E+03	1.44E+02	4.77E+06	1.84E+04	1.84E+04	3.22E+02	4.77E+06	4.21E+04	4.20E+04	7.36E+02
Aliphatic hydrocarbons >EC_8–EC_{10}		4.30E-01	9.53E+04	2.14E+03	2.13E+03	7.77E+01	9.53E+04	5.21E+03	5.14E+03	1.90E+02	9.53E+04	1.24E+04	1.19E+04	4.51E+02
Aliphatic hydrocarbons >EC_{10}–EC_{12}		3.40E-02	9.53E+04	1.06E+04	1.03E+04	4.75E+01	9.53E+04	2.62E+04	2.42E+04	1.18E+02	9.53E+04	6.25E+04	4.93E+04	2.83E+02

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 5

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Aliphatic hydrocarbons >EC_{12}–EC_{16}		7.60E-04	9.53E+04	8.75E+04	6.08E+04	2.37E+01	9.53E+04	2.16E+05	8.26E+04	5.91E+01	9.53E+04	5.10E+05	9.50E+04	1.42E+02
Aliphatic hydrocarbons >EC_{16}–EC_{35}	(c)	-	1.59E+06	-	-	8.48E+00	1.76E+06	-	-	2.12E+01	1.83E+06	-	-	5.09E+01
Aliphatic hydrocarbons >EC_{35}–EC_{44}	(c)	-	1.59E+06	-	-	8.48E+00	1.76E+06	-	-	2.12E+01	1.83E+06	-	-	5.09E+01
Aromatic hydrocarbons >EC_{8}–EC_{9} (styrene)		6.50E+01	1.14E+05	3.00E+04	2.77E+04	6.20E+02	1.14E+05	7.30E+04	5.81E+04	1.52E+03	1.14E+05	1.73E+05	9.00E+04	3.61E+03
Aromatic hydrocarbons >EC_{9}–EC_{10}		6.50E+01	3.81E+04	3.76E+03	3.67E+03	6.13E+02	3.81E+04	9.16E+03	8.56E+03	1.50E+03	3.81E+04	2.17E+04	1.78E+04	3.58E+03
Aromatic hydrocarbons >EC_{10}–EC_{12}		2.50E+01	3.81E+04	2.03E+04	1.69E+04	3.64E+02	3.81E+04	4.97E+04	2.85E+04	8.99E+02	3.81E+04	1.17E+05	3.45E+04	2.15E+03
Aromatic hydrocarbons >EC_{12}–EC_{16}	(c)	5.80E+00	3.81E+04	2.15E+05	3.63E+04	1.69E+02	3.81E+04	5.05E+05	3.74E+04	4.19E+02	3.81E+04	1.09E+06	3.78E+04	1.00E+03
Aromatic hydrocarbons >EC_{16}–EC_{21}	(c)	-	2.82E+04	-	-	5.37E+01	2.83E+04	-	-	1.34E+02	2.84E+04	-	-	3.21E+02
Aromatic hydrocarbons >EC_{21}–EC_{35}	(c)	-	2.84E+04	-	-	4.83E+00	2.84E+04	-	-	1.21E+01	2.84E+04	-	-	2.90E+01
Aromatic hydrocarbons >EC_{35}–EC_{44}	(c)	-	2.84E+04	-	-	4.83E+00	2.84E+04	-	-	1.21E+01	2.84E+04	-	-	2.90E+01

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

NR - the compound is not volatile and therefore a soil saturation limit not calculated within CLEA

EC - equivalent carbon. GrAC - groundwater screening value. SAC - soil screening value.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded. The SAC has been set as the model calculated SAC with the saturation limits shown in brackets.

Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cellls have also been hatched red and the GrAC set at the solubility limit.

The SAC for organic compounds are dependent upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58; 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3

(a) RSK Lead GAC obtained following sensitivity analysis of blood lead concentrations.

(b) GAC taken from the Environment Agency SGV reports published 2009.

(c) SAC for selenium, aliphatic and aromatic hydrocarbons >EC16 does not include inhalation pathway owing to absence of toxicity data. SAC for arsenic is only based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The same approach has been adopted for zinc.

(d) SAC for elemental mercury, chromium VI and nickel is based on the inhalation pathway only owing to an absence of toxicity for elemental mercury, in accordance with the SGV report for nickel and LQM report for chromium VI.

(e) The GAC for phenol is based on a threshold which is protective of acute direct skin contact with phenol (the figure in brackets is based on health effects following long-term exposure and is provided for illustration only).

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 6
Selected human health generic assessment criteria for commercial scenario

Compound	GrAC for groundwater (mg/l)	SAC for soil SOM 1% (mg/kg)	SAC for soil SOM 2.5% (mg/kg)	SAC for soil SOM 6% (mg/kg)
Metals				
Arsenic	-	640	640	640
Cadmium	-	230	230	230
Chromium (III) - oxide	-	30,000	30,000	30,000
Chromium (VI) - hexavalent	-	35	35	35
Copper	-	72,000	72,000	72,000
Lead	-	600	600	600
Elemental mercury (Hg^0)	0.056	18 (4.3)	46 (11)	110 (26)
Inorganic mercury (Hg^{2+})	-	3,600	3,600	3,600
Methyl mercury (Hg^{4+})	100	370 (73)	391	410
Nickel	-	1,800	1,800	1,800
Selenium	-	13,000	13,000	13,000
Zinc	-	670,000	670,000	670,000
Cyanide	-	1,800	1,800	1,800
Volatile organic compounds				
Benzene	140	28	50	95
Toluene	590	59,000 (870)	110,000 (1,900)	189,000 (4,400)
Ethylbenzene	180	17,000 (520)	35,000 (1,200)	65,700 (2,800)
Xylene - m	200	6,500 (620)	15,000 (1,500)	32,700 (3,500)
Xylene - o	170	6,900 (480)	16,000 (1,100)	34,600 (2,600)
Xylene - p	200	6,200 (580)	14,000 (1,400)	31,400 (3,200)
Total xylene	200	6,500 (630)	15,000 (1,500)	32,700 (3,500)
Methyl tertiary butyl ether (MTBE)	48,000	8,200	8,600	8,900
Trichloroethene	36	12	25	55
Tetrachloroethene	230	130	1,400	660
1,1,1-Trichloroethane	1,300	700	1,400	3,100
1,1,1,2 Tetrachloroethane	1,100	120	260	590
1,1,2,2 Tetrachloroethane	1,100	290	580	1,200
Carbon tetrachloride (tetrachloromethane)	5.7	3.0	6.7	15
1,2-Dichloroethane	6.1	0.71	1.0	1.8
Vinyl chloride (chloroethene)	0.41	0.063	0.08	0.12
1,2,4-Trimethylbenzene	57	42	99	220
1,3,5-Trimethylbenzene	38	47	110	260
Semi-volatile organic compounds				
Acenaphthene	3.2	85,000 (57)	98,000 (141)	100,000
Acenaphthylene	16	84,000 (86)	97,000 (212)	100,000
Anthracene	0.021	530,000	540,000	540,000
Benzo(a)anthracene	0.0038	90	95	97
Benzo(b)fluoranthene	0.0020	100	100	100
Benzo(g,h,i)perylene	0.00026	650	660	660
Benzo(k)fluoranthene	0.00080	140	140	140
Chrysene	0.0020	140	140	140
Dibenzo(a,h)anthracene	0.00060	13	13	13
Fluoranthene	0.23	23,000	23,000	23,000
Fluorene	1.9	64,000 (31)	69,000	71,000
Indeno(1,2,3-cd)pyrene	0.00020	60	61	62
Phenanthrene	0.53	22,000	22,000	23,000
Pyrene	0.13	54,000	54,000	55,000
Benzo(a)pyrene	0.0038	14	14	14
Naphthalene	19	200 (76)	480 (183)	1100 (432)
Phenol	-	3,200 * (31,000)	3,200* (35,000)	3,200 * (38,000)
Total petroleum hydrocarbons				
Aliphatic hydrocarbons EC_5–EC_6	36	3,400 (304)	6,200 (558)	13,000 (1,150)
Aliphatic hydrocarbons >EC_6–EC_8	5.4	8,300 (144)	18,000 (322)	42,000 (736)
Aliphatic hydrocarbons >EC_8–EC_{10}	0.43	2,100 (78)	5,100 (190)	12,000 (451)
Aliphatic hydrocarbons >EC_{10}–EC_{12}	0.034	10,000 (48)	24,000 (118)	49,000 (283)
Aliphatic hydrocarbons >EC_{12}–EC_{16}	0.00076	61,000 (24)	83,000 (59)	91,000 (142)
Aliphatic hydrocarbons >EC_{16}–EC_{35}	-	1,000,000**	1,000,000**	1,000,000**
Aliphatic hydrocarbons >EC_{35}–EC_{44}	-	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC_8–EC_9 (styrene)	65	28,000 (620)	58,000 (1,500)	90,000 (3,600)
Aromatic hydrocarbons >EC_9–EC_{10}	65	3,700 (610)	8,600 (1,500)	18,000 (3,600)
Aromatic hydrocarbons >EC_{10}–EC_{12}	25	17,000 (364)	29,000 (899)	35,000 (2,150)
Aromatic hydrocarbons >EC_{12}–EC_{16}	5.8	36,000 (169)	37,000	38,000
Aromatic hydrocarbons >EC_{16}–EC_{21}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{21}–EC_{35}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{35}–EC_{44}	-	28,000	28,000	28,000

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

** Denotes SAC calculated exceeds 100% contaminant. Hence 100% taken as SAC.

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

* The GAC for phenol is based on a threshold which is protective of direct skin contact with phenol (the figure in brackets is based on health effects following long-term exposure and is provided for illustration only).

The SAC for organic compounds are dependent on soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58; 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

The SAC has been set as the model calculated SAC with the saturation limit shown in brackets. For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC are highly conservative as concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.

APPENDIX M
GENERIC ASSESSMENT CRITERIA FOR CONTROLLED WATERS

The water environment in England and Wales is protected under a number of regulatory regimes, many regulated by the Environment Agency. The Environment Agency is consulted where there may be a risk that pollution of 'controlled waters' may occur or may have occurred in the past. Controlled waters are coastal waters, inland freshwaters and groundwaters. The EU Water Framework Directive (WFD) (2000/60/EC) is implemented via various regulations and guidance, covering aspects of groundwater, surface water and drinking water supply policy. The regulations mainly apply to England and Wales, therefore if you are working on a site in Scotland or Northern Ireland, please review the equivalent legislation and guidance provided by the Scottish Environmental Protection Agency (SEPA) or the Northern Ireland Environment Agency (NIEA).

The main objectives of the protection and remediation of groundwater under threat from land contamination are set out in the Environment Agency's Groundwater Protection: Principles and Practice (GP3) series of documents(1). When assessing risks to groundwater the following need to be taken into consideration:

- Where pollutants have not yet entered groundwater, all necessary and reasonable measures must be taken to:
    - *Prevent the input of hazardous substances into groundwater (see description of hazardous substances below)*
    - *Limit the entry of other (non-hazardous) pollutants into groundwater so as to avoid pollution, and to avoid deterioration of the status of groundwater bodies or sustained, upward trends in pollutant concentration*
- Where hazardous substances or non-hazardous pollutants have already entered groundwater, the priority is to:
    - *Minimise further entry of hazardous substances and non-hazardous pollutants into groundwater*
    - *Take necessary and reasonable measures to limit the pollution of groundwater or impact on the status of the groundwater body from the future expansion of a contaminant 'plume', if necessary by actively reducing its extent.*

Definitions

Hazardous Substances are defined in the Water Framework Directive 2000/60/EC as 'substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern. All List 1 substances under the old Groundwater Directive (80/68/EEC) are hazardous substances, all radioactive substances are hazardous substances.

Non-hazardous Substances are defined as 'substances capable of causing pollution that have not been classified as hazardous substances'. The non-hazardous list of pollutants does not simply replace the old WFD List II but includes a wider range.

For the current list of classified substances please visit the UKTAG website www.wfduk.org./jagdag/

When assessing the risks to surface waters, various standards apply, including Environmental Quality Standards which are protective of the water ecology[14].

The Water Supply (Water Quality) Regulations[2,3] are the primary source for assessing water bodies which may be used for public water supplies. There are also Private Water Supply Regulations which may be applicable in some cases.

This appendix presents the generic assessment criteria (GAC) that RSK considers are suitable for assessing risks to controlled waters.

The RSK GAC for controlled waters are presented in Table 1. In line with the Environment Agency's (2006b) Remedial Targets Methodology, the GAC for controlled waters are termed 'target concentrations'.

The target concentration can be derived by several means with consideration to:

- whether the substance is classified as hazardous or non-hazardous by the EU under the Water Framework Directive (2000/60/EC) and Groundwater Daughter Directive (2006/118/EC) implemented though the Environmental Permitting Regulations 2010
- background concentrations in the aquifer
- published guidance such as Environmental Quality Standards that are protective of ecology or The Water Supply (Water Quality) Regulations 2010 that are protective of drinking water
- Minimum Reporting Values (or method detection limits if MRV are not provided).

Table 1: Target concentrations for Controlled Waters

Analytes in bold are hazardous, *analytes in italics are non hazardous*, analytes in plain text are unclassified; according to JAGDAG Determination List June 2010

Target Concentrations shaded in GREEN are Statutory Values ORANGE are Non-Statutory Values

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Metals				
Arsenic	-	0.01[2]	0.05[13a]	0.025[13a]
Cadmium	0.0001[4]	0.005[2]	≤0.00008, 0.00008, 0.00009, 0.00015, 0.00025 [13b]	0.0002[13c]
Chromium (total)	-	0.05[2]	Use values for chromium III and VI	
Chromium (III)	-	Use value for total chromium	0.0047 [13a]	0.032[13c]
Chromium (VI)			0.0034 [13a]	0.0006[13a]
Copper	-	2.0[2]	0.001, 0.006, 0.01, 0.028[13e]	0.005[13a]
Lead	-	0.025 (before 25/12/2013), 0.01 (after 25/12/2013)[2]	0.0072[13c]	0.0072[13c]
Mercury	0.00001[4]	0.001[2]	0.00005[13c]	0.00005[13c]

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Nickel	-	0.02[2]	0.02[13c]	0.02[13c]
Selenium	-	0.01[2]	-	-
Zinc	-	5[3]	0.008, 0.05, 0.075, 0.125 [13e]	0.04[13a]
Chlorinated solvents				
Trichloroethene	0.0001[4]	0.01[2]	0.01[13c]	0.01[13c]
Tetrachloroethene	0.0001[4]	0.01[2]	0.01[13c]	0.01[13c]
1,1,1-Trichloroethane	0.0001[4]	-	0.1[13c]	0.1[13c]
1,1,2-Trichloroethane	0.0001[4]	-	0.4[13c]	0.3[13c]
Carbon tetrachloride (Tetrachloromethane)	0.0001[4]	0.003[2]	0.012[13c]	0.012[13c]
1,2-Dichloroethane	0.001[4]	0.003[2]	0.01[13c]	0.01[13c]
Vinyl chloride (Chloroethene)	-	0.0005[2]	-	-
Trihalomethanes	-	0.1[2, 5]	-	-
Chloroform (Trichloromethane) (one of the trihalomethanes included above)	0.0001[4]	0.1[2, 5]	0.0025[13c]	0.0025[13c]
Polycyclic aromatic hydrocarbons				
Acenaphthene	-	-	0.0058[10]	
Acenaphthylene	-	-	0.0058[10]	
Anthracene	-	-	0.0001[13c]	0.0001[13c]

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Benzo(a)anthracene	-	-	0.000018[10]	
Benzo(b)fluoranthene	-	0.0001[2]	0.00003[13f]	0.00003[13f]
Benzo(k)fluoranthene	-			
Benzo(g,h,i)perylene	-		0.000002[13g]	0.000002[13g]
Indeno(1,2,3-cd)pyrene	-			
Chrysene	-	-	0.00001[10]	
Dibenzo(a,h)anthracene	-	-	0.00001[10]	
Fluoranthene	-	-	0.0001[13c]	0.0001[13c]
Fluorene	-	-	0.0021[10]	
Phenanthrene	-	-	0.003[10]	
Pyrene	-	-	0.00004[10]	
Benzo(a)pyrene	-	0.00001[2]	0.00005[13c]	0.00005[13c]
Naphthalene	-	-	0.0024[13c]	0.0012[13c]
Petroleum hydrocarbons				
Total petroleum hydrocarbons	-	0.01[3]	0.01[3, 11]	
Benzene	0.001[4]	0.001[2]	0.01[13c]	0.008[13c
Toluene	0.004[4]	0.7[9]	0.05[13a]	0.04[13a]
Ethylbenzene	-	0.3[9]	0.02[12]	0.02[12]
Xylene	0.003[4]	0.5[9]	0.03[13c]	0.03[13c]

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Methyl tertiary butyl ether	-	0.015[7]		
Pesticides and herbicides				
Aldrin	0.000003[4]	0.00003[2]	0.00001[13d]	0.000005[13d]
Dieldrin	0.003[4]	0.00003[2]		
Endrin	0.000003[4]	0.0006[9]		
Isodrin	0.000003[4]	-		
Heptachlor	-	0.00003[2]		
Heptachlor epoxide	-	0.00003[2]		
Other pesticides	-	0.0001[2]		
Total pesticides	-	0.0005[2]		
Total DDT	0.000004[4]	0.001[9]	0.000025[13c]	0.000025[13c]
Azinphos – methyl	0.000001[4]	-	0.00001[1]	
Cyfluthrin	0.0001[4]	-	0.000001[14]	
Demeton	0.00005[4]	-	0.0005[14	
Dichlorvos	-	-	0.000001[13c]	0.00004[13c]
Dimethoate	0.00001[4]	-	0.00048[13a]	0.00048[13a]
Endosulphan	0.000005[4]	-	0.000005[13c]	0.0000005[13c]
Fenitrothion	0.000001[4]	-	0.00001[13c]	0.00001[13c]
Flucofuron	0.0001[4]	-	0.001[14]	

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Malathion	0.000001[4]	-	0.00001[13c]	0.00002[13c]
Mevinphos	0.000005[4]	-	0.00002[14]	-
Omethoate	0.0001[4]	-	0.00001[14]	
PCSDs (cyfluthrin, sulcofuron, flucofuron and **permethrin**)	-	-	0.00005[15]	
Permethrin	0.000001[4]	-	0.00001[13a]	0.00001[13]
Sulcofuron	0.0001[4]	-	0.025[8,14]	
Triazaphos	0.0001[4]	-	0.000005[8]	
Atrazine	0.00003[4]	-	0.0006[13c]	0.0006[13c]
Simazine	0.00003[4]	-	0.001[13c]	0.001[13c]
Bentazone	0.1[4]	-	0.5[13c]	0.5[13a]
Linuron	0.0001[4]	-	0.0005[13a]	0.0005[13a]
Mecoprop	0.00004[4]	-	0.018[13a]	0.018[13a]
Trifluralin	0.00001[4]	-	0.00003[13c]	0.00003[13c]
Miscellaneous				
Cyanide (Hydrogen cyanide)	-	0.05[2]	0.001[13a]	0.001[13a]
Phenol	0.0005[4]	-	0.0077[13a]	0.0077[13a]
Sodium	-	200[2]	-	
Chloride	-	250[2]	250[6,14]	-

Determinant	Target concentrations (mg/l)			
	Minimum Reporting Value	UK Drinking Water Standard or Best Equivalent	Environmental Quality Standard or Best Equivalent	
			Freshwater	Transitional (estuaries) and Coastal Waters
Ammonium (as NH_4^+)	-	0.5[2]	0.3[13a]	
Ammonia (NH_3)	-	-	0.025[15]	0.021[13a]
Sulphate	-	250[2]	400[6,14]	-
Iron	-	0.20[2]	1[13a]	1[13a]
Manganese	-	0.05[2]	0.03[6,14]	No EQS required [12]
Aluminium	-	0.2[2]	-	
Nitrate (as NO_3)	-	50[2]	-	
Nitrite (as NO_2)	-	0.1[2]	0.01[15]	-

Analytes in bold are hazardous, *analytes in italics are non hazardous*, analytes in plain text are unclassified;
according to JAGDAG Determination List June 2010

Notes:

1. Environment Agency. Groundwater Protection: Principles and Policy (GP3). Part 1 – 4. Part 4 and 5 under consultation.
2. Statutory Instrument 2000 No. 3184. The Water Supply (Water Quality) Regulations 2000, as amended by SI 2001/2885, SI 2002/2469, SI 2005/2035, SI 2007/2734 and SI 2010/991 (applying from April 20 2010)
3. Statutory Instrument 1989 No. 1147. The Water Supply (Water Quality) Regulations 1989, as amended.
4. Minimum reporting values listed in Annex (j) of Horizontal Guidance Note H1 (H1 Environmental Risk Assessment Framework, Environment Agency, April 2010 v2.0). Note target concentration for xylenes is 0.003mg/l each for o-xylene and m/p xylene.
5. Statutory Instrument 2000 No. 3184. The Water Supply (Water Quality) Regulations 2000 – sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane.
6. Proposed list of EQS for implementation of the Dangerous Substances Directive (76/464.EEC).
7. Environment Agency MTBE guidance, 2006.
8. Freshwater Environmental Quality Standards: The Water Framework Directive 200/60/EC.
9. WHO (2004) guidelines for drinking-water quality.
10. WRc plc (2002), R&D Technical Report P45. Where predicted no-effect concentration is below the laboratory method detection limit (LMDL) for chrysene, dibenzo(a,h)anthracene and fluoranthene, the target concentration has been set at the LMDL of 0.00001mg/l.
11. Please note this is a very conservative value. If necessary please refer to EA, 2009. *Petroleum hydrocarbons in Groundwater Supplementary Guidance for Hydrogeological Risk Assessment, which* provides advice on risk rankings of TPH CWG fractions. It may be possible to eliminate low risk fractions and/or those not detected above LMDL from concern.
12. Environment Agency Chemical Standards Database (May 2011). http://evidence.environment-agency.gov.uk/ChemicalStandards/home.aspx
13. The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010.
    - 13a. Annual mean concentration (mg/l) for 'Good' standard.
    - 13b. Applies to hardness ranges of <40mg/l $CaCO_3$, 40–<50mg/l $CaCO_3$, 50–<100mg/l $CaCO_3$, 100–<200mg/l $CaCO_3$ and >/=200mg/l $CaCO_3$. The target concentrations included in Table 1 are listed in order of increasing calcium carbonate concentrations.
    - 13c Annual Average EQS (surface waters).
    - 13d. Sum of aldrin, dieldrin, endrin and isodrin.
    - 13e. Applies to hardness ranges of 0–50mg/l $CaCO_3$, 50–100mg/l $CaCO_3$, 100–250mg/l $CaCO_3$ and >250mg/l $CaCO_3$. The target concentrations included in Table 1 are listed in order of increasing calcium carbonate concentrations; applies to annual mean concentration (mg/l) of $CaCO_3$. Applies to annual mean concentration of metal (mg/l) for 'Good' standard.

13f. Sum of benzo(b)fluoranthene and benzo(k)fluoranthene.

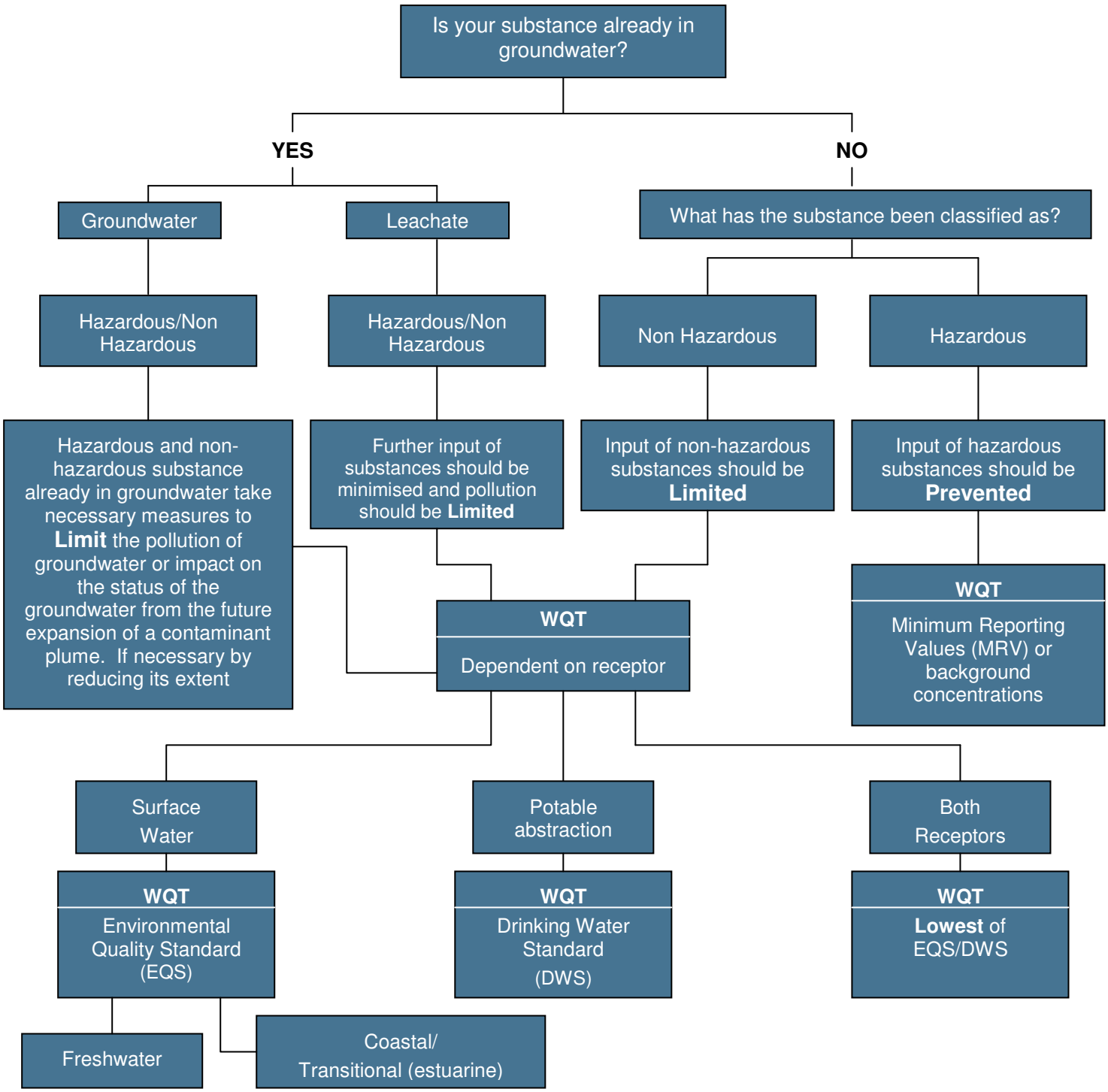
13g. Sum of benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene.

14. Council Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community (Dangerous Substances Directive) - List II Substances. Council Directive 76/464/EEC and Surface Waters (Dangerous Substances) (Classification) Regulations 1998

15. Council Directive on the Quality of Fresh Waters Needing Protection or Improvement in Order to Support Fish Life (Freshwater Fish Directive). Surface Waters (Fishlife) (Classification) Regulations 1997.

Note: '-' A target concentration is not available.

FLOW CHART TO ASSIST WITH SELECTION OF TARGET CONCENTRATIONS



WQT = Water Quality Target

When leachate is being assessed the 'compliance point' is the groundwater body. Therefore dilution within the groundwater body may be applied with caution before comparing with the WQT.

When directly assessing a receptor, e.g., a river, the appropriate WQT should be selected.

APPENDIX E

(i) Environmental Data Sheets

(ii) Historical Mapping

GroundSure Environmental Data Report

Address: Grovefield Way, CHELTENHAM, GL51 6RF

Date: Jul 22, 2008

GroundSure Reference: HMD-24-174362

Your Reference: 722048/MB

Client: Structural Soils

Brought to you by GroundSure

Aerial Photograph of Study Site

NW ▲ N NE

◄W E►

SW ▼ S SE

Site Name: Grovefield Way, CHELTENHAM, GL51 6RF
Grid Reference: 390648,221452

Overview of Findings

For further details on each dataset, please refer to each individual section in the main Report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary					
1. Authorisations, Incidents and Registers	on-site	0-50	51-250	251-500	501-1000	1000-1500
1.1 Industrial Sites Holding Licenses and/or Authorisations						
Records of IPC Authorisations	0	0	0	0	0	-
Records of IPPC Authorisations	0	0	0	0	0	-
Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0	-	-
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0	-	-
Records of List 1 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of List 2 Dangerous Substances Inventory sites	0	0	0	5	-	-
Records of LAPPC (LAPC) Authorisations	0	0	0	0	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0	-	-
Records of Licensed Discharge Consents	0	0	0	3	-	-
1.2 Records of COMAH and NIHHS sites	0	0	0	0	-	-
1.3 Environment Agency Recorded Pollution Incidents						
National Incidents Recording System, List 2	0	0	0	-	-	-
National Incidents Recording System, List 1	0	0	0	-	-	-
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0	0	0	-	-
2. Landfill and Other Waste Sites	on-site	0-50	51-250	251-500	501-1000	1000-1500
2.1 Landfill Sites						
Environment Agency Registered landfill Sites	0	0	0	0	0	0
Landfill Data – Operational Landfill Sites	0	0	0	0	0	0
Environment Agency Historic Landfill Sites	0	1	0	0	0	1
Landfill Data – Non-Operational Landfill Sites	0	0	1	0	0	1
BGS/DoE Landfill Site Survey	0	0	0	0	0	0
GroundSure Local Authority Landfill Sites Data	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						
Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	1	-	-
Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	1	-	-
Environment Agency (REGIS) Waste Sites	0	0	1	2	3	0
3. Current Land Uses	on-site	0-50	51-250	251-500	501-1000	1000-1500
3.1 Current Industrial Sites Data	0	0	2	29	-	-
3.2 Records of Petrol and Fuel Sites	0	0	0	0	-	-
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0	-	-

4. Geology

	Description
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site? *	None
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None
4.3 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section. Source: Scale: 1:50,000 BGS Sheet 216	

* This includes an automatically generated 50m buffer zone around the site.

5. Hydrogeology and Hydrology

	on-site	0-50	51-250	251-500	501-1000	1001-2000*
5.1 Environment Agency Groundwater Vulnerability and Soil Classification						
Minor Aquifer (within 200m)	No	No	No	-	-	-
Major Aquifer (within 200m)	No	No	No	-	-	-
Soil Classification (within 200m)	No	No	No	-	-	-
5.2 Groundwater Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.3 Surface Water Abstraction Licences (within 1000m of the study site).	0	0	0	0	1	-
5.4 Source Protection Zones						
Source Protection Zones within 500m of the study site.	0	0	0	0	-	-
5.5 Potable Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.6 River Quality						
Is there any Environment Agency information on river quality within 500m of the study site?	No	No	No	No	-	-
5.7 Main Rivers						
Main Rivers within 500m of the study site.	0	0	0	0	-	-

6. Flooding

6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	No
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	No
6.3 Are there any Areas benefiting from Flood Defences within 250m of the study site?	No
6.4 Are there any Areas used for Flood Storage within 250m of the study site?	No
6.5 What is the maximum BGS groundwater flooding susceptibility within 50m of the study site?	Not Applicable
6.6 What is the BGS confidence rating for the groundwater flooding susceptibility areas?	Not Applicable

7. Ecological Designated Sites	on-site	0-50	51-250	251-500	501-1000	1001-1500
7.1 Records of Sites of Special Scientific Interest (SSSI):	0	0	0	0	1	-
7.2 Records of National Nature Reserves (NNR) :	0	0	0	0	0	-
7.3 Records of Local Nature Reserves (LNR):	0	0	0	0	0	-
7.4 Records of Special Areas of Conservation (SAC):	0	0	0	0	0	-
7.5 Records of Special Protection Areas (SPA):	0	0	0	0	0	-
7.6 Records of Ramsar sites:	0	0	0	0	0	-
7.7 Records of World Heritage Sites:	0	0	0	0	0	-

8. Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Low

9. Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Negligible

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Authorisations, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by the Environment Agency, and sites determined as Contaminated Land. This search is conducted using radii up to 1000m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on artificial and superficial deposits and bedrock beneath the study site. These searches are conducted onsite and includes a 50m buffer zone.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on groundwater vulnerability, soil leaching potential, abstraction licenses, Source Protection Zones (SPZ) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Ecological Designated Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR) and World Heritage Sites. These searches are conducted using radii of up to 1000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These searches are conducted using radii of up to 75m.

9. Mining

Provides information on areas of coal and shallow mining. These searches are conducted using radii of up to 150m.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (01273 819700) for further information and guidance.

Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Authorisations, Incidents and Registers Map

NW ▲ N NE

◄W

E►

SW S ▼ SE

Incidents and Registers Legend

- Site Outline
- Search Buffers (m) — 250 — 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- IPPC & IPC Authorisations
- LAPPC Authorisations
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land

1. Authorisations, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

Records of Part A Licences (IPC Processes) within 1000m of the study site: **0**

Database searched and no data found.

Records of Part A Licences (IPPC Processes) within 1000m of the study site: **0**

Database searched and no data found.

Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site: **0**

Database searched and no data found.

Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site: **0**

Database searched and no data found.

Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site: **0**

Database searched and no data found.

Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site: **5**

The following List 2 Dangerous Substance Inventory Site records are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
1A	270.0	SE	391050,221350	Name: Lucas Aerospace, Arle Court, Cheltenham Sample Site Name: No Site Sample Site Number: No site	Receiving Water: - Discharge Type: -
2A	270.0	SE	391050,221350	Name: Lucas Aerospace, Arle Court, Cheltenham Sample Site Name: No Site Sample Site Number: No site	Receiving Water: - Discharge Type: Trd
3A	270.0	SE	391050,221350	Name: Lucas Aerospace, Arle Court, Cheltenham Sample Site Name: No Site Sample Site Number: No site	Receiving Water: - Discharge Type: -
4A	270.0	SE	391050,221350	Name: Lucas Aerospace, Arle Court, Cheltenham Sample Site Name: No Site Sample Site Number: No site	Receiving Water: - Discharge Type: 04311905
5A	270.0	SE	391050,221350	Name: Lucas Aerospace, Arle Court, Cheltenham Sample Site Name: No Site Sample Site Number: No site	Receiving Water: - Discharge Type: Trd

Records of LAPPC (LAPC) Authorisations within 500m of the study site: **0**

Database searched and no data found.

Records of Category 3 or 4 Radioactive Substance Licences within 500m of the study site: **0**

Database searched and no data found.

Records of Licenced Discharge Consents within 500m of the study site: **3**

The following Licenced Discharge Consents records are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
6A	270.0	SE	391050,221350	Address: Woodward Aircraft Controls, Arle Court, Cheltenham, Gloucestershire Effluent Type: Trade Discharges - Cooling Water Permit Number: S/20/25107/T Permit Version: 2	Receiving Water: Arle Court Brook Status: New Consent (wra 91, S88 & Sched 10 As Amended By Env Act 1995) Issue date: 23-12-1996 Effective Date: 29-9-2003 Revocation Date: -
7A	270.0	SE	391050,221350	Address: Woodward Aircraft Controls, Arle Court, Cheltenham, Gloucestershire Effluent Type: Trade Discharges - Cooling Water Permit Number: S/20/25107/T Permit Version: 2	Receiving Water: Arle Court Brook Status: New Consent (wra 91, S88 & Sched 10 As Amended By Env Act 1995) Issue date: 23-12-1996 Effective Date: 29-9-2003 Revocation Date: -
8	367.0	E	391140,221300	Address: Delphi Diesel Systems Limited, Hatherley Lane, Cheltenham, Gloucestershire Effluent Type: Trade Discharges - Site Drainage Permit Number: S/20/25631/T Permit Version: 1	Receiving Water: Arle Court Brook Status: New Consent (wra 91, S88 & Sched 10 As Amended By Env Act 1995) Issue date: 25-7-2000 Effective Date: 25-7-2000 Revocation Date: -

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: **0**

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

Records of National Incidents Recording System, List 2 within 250m of the study site: **0**

Database searched and no data found.

Records of National Incidents Recording System, List 1 within 250m of the study site: **0**

Database searched and no data found.

1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990[1]

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? **0**

Database searched and no data found.

[1]Further information on sites that have been determined under the Contaminated Land Regime is maintained by Local Authorities under Section 78R of the Environmental Protection Act 1990. Information should be available on both sites currently determined as Contaminated Land and Special Sites.

2. Landfill and Other Waste Sites Map

NW ▲ N NE

◄W E►

SW ▼ S SE

Landfill & Other Waste Sites Legend

2. Landfill and Other Waste Sites

2.1 Landfill Sites[1]

Records from Environment Agency landfill data within 1000m of the study site: **0**

Database searched and no data found.

Records of operational landfill sites sourced from Landmark within 1500m of the study site: **0**

Database searched and no data found.

Records of Environment Agency historic landfill sites within 1500m of the study site: **2**

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
5	5.0	NE	390900,221500	Site Address: Land off Hatherley Lane, Hatherley Waste Licence: Yes Site Reference: 150/408 Waste Type: No data Regis Reference: -	Data Type: Polygon Licence Issue: 21-Apr-1994 Licence Surrendered: 06-Oct-1994 Licence Hold Address: - Operator: -
Not shown	1198.0	NW	389800,222500	Site Address: Swanbrook Grill, Swanbrook Grill, Cheltenham Road, Valley Farm, Staverton, Near Cheltenham, Gloucestershire Waste Licence: Yes Site Reference: 20/267, 897 226, 1600/0267 Waste Type: Inert, Industrial, Commercial Regis Reference: -	Data Type: Polygon Licence Issue: 08-Feb-1980 Licence Surrendered: 31-Dec-1993 Licence Hold Address: Cafe, Swanbrook Grill, Gloucester Road, Staverton Operator: -

Records of non-operational landfill sites sourced from Landmark within 1500m of the study site: **2**

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
1	221.0	NE	391000,221700	Site Address: Hatherley Lane, Arle Court Roundabout, CHELTENHAM, Gloucestershire, Landfill Licence: 160AHAAL Agency Reference: Waste Type: Inert Waste Description: Inert Landfill Known Restrictions: No known restriction on source of waste	Record Date: 01-May-1994 Transfer Date: Modification Date: Status: Licence lapsed/cancelled/defunct/not applicable/surrendered Category: LANDFILL Regulator: EA - Midlands Region - Lower Severn Area (Tewkesbury) Size: Very Small (←10,000 tonnes/year)

[1]This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited®. Data supplied by Landmark Information Group Limited® and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

Not shown	1341.0	NW	389700,222600	Site Address: Swanbrook Grill, Gloucester Road, Staverton, CHELTENHAM, Gloucestershire, Landfill Licence: 160AATAL Agency Reference: Waste Type: Inert Waste Description: Inert Landfill Known Restrictions: No known restriction on source of waste	Record Date: 01-Feb-1980 Transfer Date: Modification Date: Status: Licence lapsed/cancelled/defunct/not applicable/surrendered Category: LANDFILL Regulator: EA - Midlands Region - Lower Severn Area (Tewkesbury) Size: Undefined

Records of BGS/DoEnon-operational landfill sites within 1500m of the study site: 0

Database searched and no data found.

Records of Local Authority landfill sites within 1500m of the study site: 0

Database searched and no data found.

2.2 Other Waste Sites[1]

Records of operational waste treatment, transfer or disposal sites within 500m of the study site: 1

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
3A	350.0	N	390595,221885	Site Address: Cotswold View, Golden Valley, Gloucester Road, CHELTENHAM, Gloucestershire, GL51 0SS Landfill Licence: B21AATAL EA Reference: EAWML48061 Waste Type: Non-Hazardous Rating: Non-Hazardous Scrapyard Known Restrictions: No known restriction on source of waste	Record Date: 01-Mar-1997 Transfer Date: Modification Date: 01-Mar-1999 Status: Operational as far as is known Category: SCRAPYARD Regulator: EA - Midlands Region - Lower Severn Area (Tewkesbury) Size: Very Small (←10,000 tonnes/year)

Records of non-operational waste treatment, transfer or disposal sites within 500m of the study site: 1

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
4A	354.0	N	221887,221887	Site Address: Cotswold View, Golden Valley, Gloucester Road, CHELTENHAM, Gloucestershire, GL51 0SS Landfill Licence: 160ADEAL EA Reference: - Waste Type: Non-Hazardous Waste Description: - Known Restrictions: No known restriction on source of waste	Record Date:01-Dec-1991 Transfer Date: Modification Date: 01-Apr-1995 Status: Record superseded Category: SCRAPYARD Regulator: EA - Midlands Region - Lower Severn Area (Tewkesbury) Size: Very Small (←10,000 tonnes/year)

Records of Environment Agency (REGIS) waste sites within 1500m of the study site: 6

[1]This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited®. Data supplied by Landmark Information Group Limited® and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
7	198.0	NE	390886,221757	Site Address: Shurdington, Gloucestershire, - Type: Landfills taking non-biodegradeable wastes (not construction) Size: ← 25000 tonnes Regis Licence Number: CAP001 Operator: Capaldi Plant Hire Limited Surrendered Date: Waste Management licence No: 48027 Annual Tonnage: 5501	Issue Date: 16/08/1993 Expiry Date: Effective Date: Status: Closure Modified: Site Name: Brook Villa Farm Cancelled Date: Correspondence Address: Pillar House, 113/115, Bath Road, Cheltenham, Gloucestershire, GL53 7LS
8B	441.0	N	390627,221993	Site Address: Golden Valley, Gloucester Road, Cheltenham, Gloucestershire, GL50 0SS Type: Metal recycling sites (vehicle dismantlers) Size: ← 25000 tonnes Regis Licence Number: BUC001 Operator: Buckland Henry Raymond Surrendered Date: - Waste Management licence No: 48061 Annual Tonnage: No Data	Issue Date: 03/12/1991 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Cotswold View Cancelled Date: - Correspondence Address: Oak Priors, Gloucester Road, Staverton, Cheltenham, Gloucestershire, GL50 0SS
9B	441.0	N	390627,221993	Site Address: Golden Valley, Gloucester Road, Staverton, Cheltenham, Gloucestershire, GL51 0SS Type: Metal recycling sites (vehicle dismantlers) Size: ← 25000 tonnes Regis Licence Number: BUC001 Operator: Buckland Henry Raymond Surrendered Date: Waste Management licence No: 48061 Annual Tonnage: 4999	Issue Date: 03/12/1991 Expiry Date: Effective Date: Status: Issued Modified: Site Name: Cotswold View Cancelled Date: Correspondence Address: Oak Priors, Gloucester Road, Staverton, Cheltenham, Gloucestershire, GL51 0SS
10C	578.0	W	389840,221348	Site Address: Bamfurlong Depot, Golden Valley Interchange, Cheltenham, Gloucestershire, GL51 6SU Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: RIN002 Operator: Ringway Infrastructure Services Limited Surrendered Date: - Waste Management licence No: 48057 Annual Tonnage: 312	Issue Date: 22/03/1995 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Bamfurlong Depot Cancelled Date: - Correspondence Address: Ringway Gloucester Depot, Shepherd Road, Cole Avenue, Gloucester, GL2 5HA
11C	578.0	W	389840,221348	Site Address: Bamfurlong Depot, Golden Valley Interchange, Cheltenham, Gloucestershire, GL51 6SU Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: RIN002 Operator: Ringway Infrastructure Services Ltd Surrendered Date: Waste Management licence No: 48057 Annual Tonnage: 312	Issue Date: 22/03/1995 Expiry Date: Effective Date: Status: Issued Modified: Site Name: Bamfurlong Depot Cancelled Date: Correspondence Address: Highways House, 225, London Road, Worcester, WR5 2BE
12C	578.0	W	389840,221348	Site Address: Golden Valley Interchange, Cheltenham, Gloucestershire, GL51 6SU Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: RIN002 Operator: Ringway Highway Services Ltd Surrendered Date: - Waste Management licence No: 48057 Annual Tonnage: 312	Issue Date: 22/03/1995 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Bamfurlong Depot Cancelled Date: - Correspondence Address: Shepherd Road, Cole Avenue, Gloucester, GL2 5HA

3. Current Land Use Map

NW ▲ N NE

◄W E►

SW ▼ S SE

Current Land Use Legend

Site Outline

250 500 Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Underground High Pressure Oil & Fuel Pipelines

3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 500m of the study site: **31**

The following records are represented as points on the Current Land Uses map.

ID	Distance	Direction	Company	Address	Activity	Category
1	78.0	SE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
2	238.0	NE	Depot	-	Container and Storage	Transport, Storage And Delivery
3	254.0	SE	Tanks	-	Tanks (Generic)	Industrial Features
4	263.0	SW	D W Taylor	Branch Cottage, Branch Road, The Reddings, Cheltenham, GL51 6RH	Vehicle Repair and Servicing	Repair And Servicing
5	274.0	SE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
6	282.0	N	Scrap Yard	-	Scrap Metal Merchants	Recycling Services
7	282.0	NE	Depot	-	Container and Storage	Transport, Storage And Delivery
8A	303.0	NE	Easy Mix Ltd	Golden Valley, Gloucester Rd, Cheltenham, Gloucestershire, GL51 0TT	Concrete Products	Industrial Products
9A	304.0	NE	Keltruck Ltd	Golden Valley, Gloucester Road, Cheltenham, GL51 0TT	New Vehicles	Motoring
10	323.0	E	The Nuffield Hospital Cheltenham	Hatherley Lane, Cheltenham, GL51 6SY	Hospitals	Health Practitioners And Establishments
11	328.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
12C	338.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
13B	342.0	N	Frost Engineering	Gloucester Road, Staverton, Cheltenham, GL51 0SS	Precision Engineers	Engineering Services
14	347.0	S	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
15B	354.0	N	Harry Buckland	Cotswold View, Gloucester Road, Staverton, Cheltenham, GL51 0SS	Vehicle Breakers	Recycling Services
16D	357.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
17	357.0	SE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
18	360.0	E	Works	-	Unspecified Works Or Factories	Industrial Features
19C	366.0	E	Chimney	-	Chimneys	Industrial Features
20	368.0	NW	B J M Refrigeration	23 Valley Mobile Home Park, Bamfurlong Lane, Cheltenham, GL51 6SL	Domestic Appliances	Consumer Products
21	369.0	SE	Tank	-	Tanks (Generic)	Industrial Features
22D	371.0	SE	Tank	-	Tanks (Generic)	Industrial Features
23	384.0	SE	Bulldog Protection Systems	Little Elms, The Reddings, Cheltenham, GL51 6RY	Electronic Equipment	Industrial Products
24	387.0	E	Tanks	-	Tanks (Generic)	Industrial Features
25E	390.0	E	Chimney	-	Chimneys	Industrial Features
26	394.0	SE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
27E	397.0	E	Tanks	-	Tanks (Generic)	Industrial Features
28	423.0	SE	A Piece of Cake	4, Leyson Road, The Reddings, Cheltenham, GL51 6RU	Baking and Confectionery	Foodstuffs

29	429.0	N	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
30	475.0	NE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
31	493.0	E	A P M Fire Protection	59, Unwin Road, Cheltenham, GL51 6TN	Electronic Equipment	Industrial Products

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: **0**

Database searched and no data found.

3.3 Underground High Pressure Oil and Gas Pipelines

Records of underground pipelines within 500m of the study site: **0**

Database searched and no data found.

4. Geology

4.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.2 Superficial Ground and Drift Geology

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

Distance (m)	Direction	LEX Code	Description	Rock Type
0.0	On Site	CHAM-MDST	Charmouth Mudstone Formation	Mudstone

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

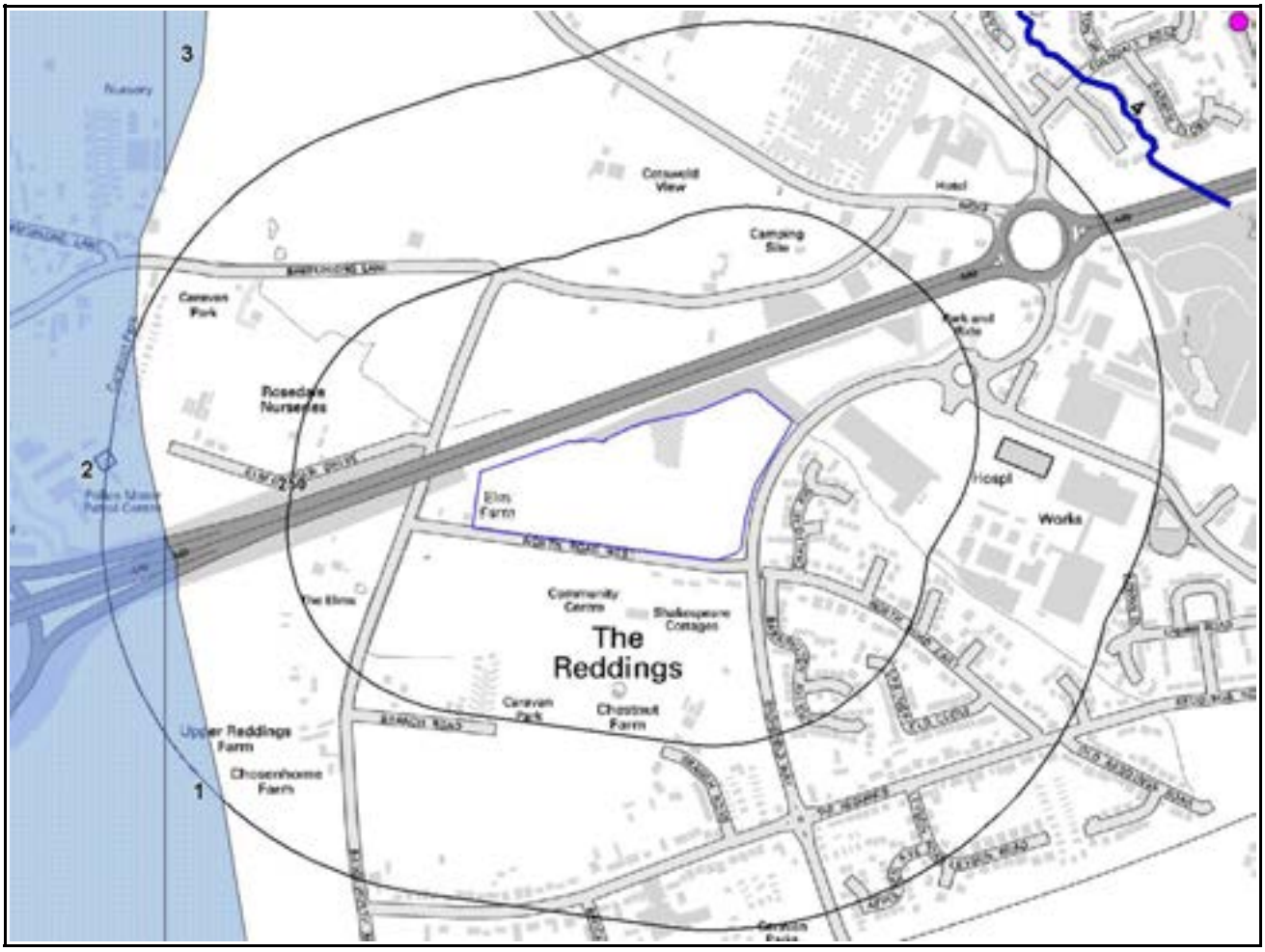
For more detailed geological and ground stability data please refer to the "GroundSure Geology and Ground Stability Report". Available from our website.

5. Hydrogeology and Hydrology: - Aquifer and Abstraction Licence Map

NW ▲ N NE

◄W E►

SW ▼ S SE



Hydrogeology and Hydrology Legend

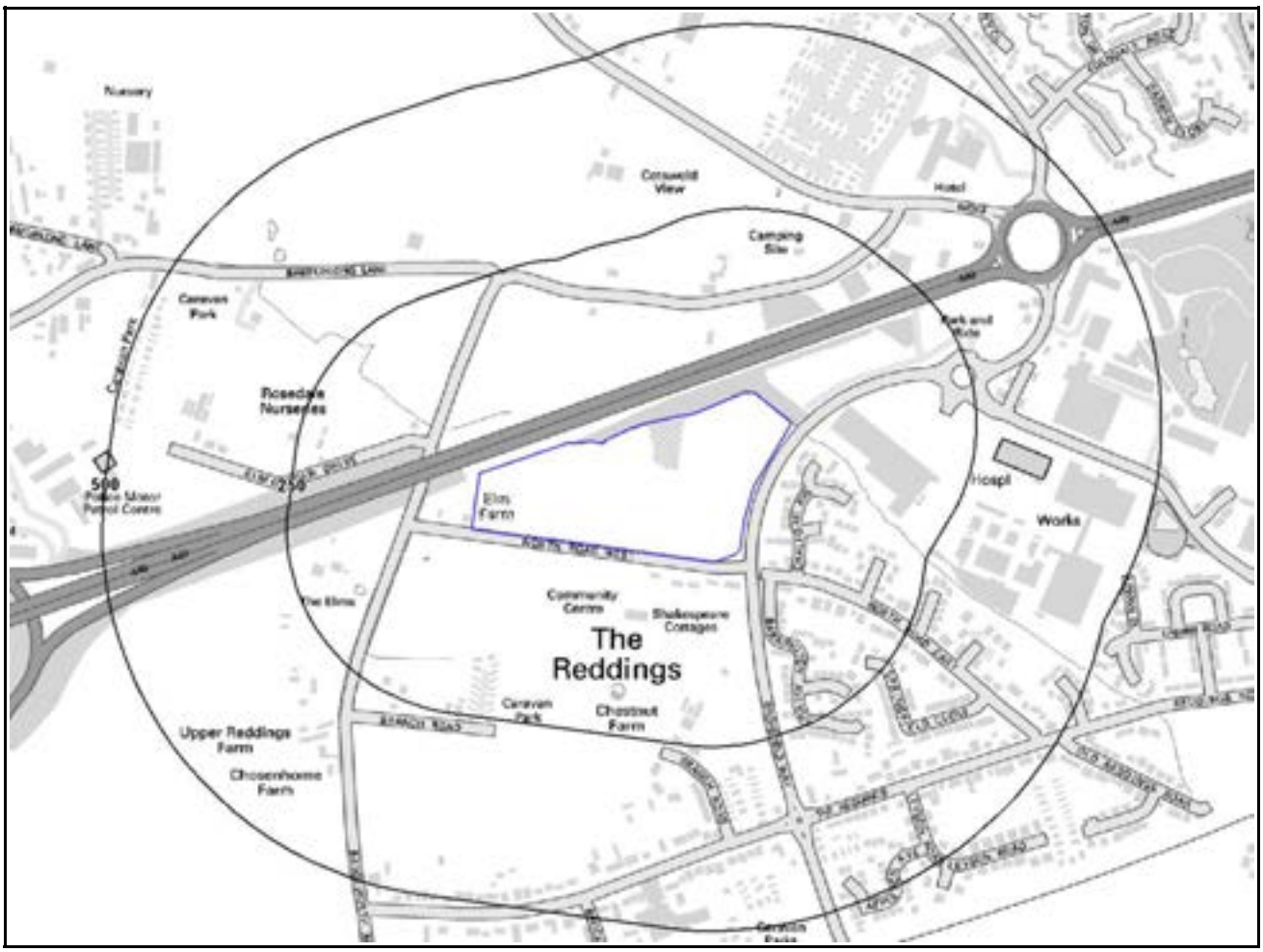
- Site Outline
- Search Buffers (m) 250 500
- Minor Aquifer - Low Leaching Potential
- Minor Aquifer - Intermediate Leaching Potential
- Minor Aquifer - High Leaching Potential
- Major Aquifer - Low Leaching Potential
- Major Aquifer - Intermediate Leaching Potential
- Major Aquifer - High Leaching Potential
- Main River
- Groundwater Abstraction Licence
- Surface Water Abstraction Licence

5b. Hydrogeology and Hydrology: - SPZ and Potable Water Abstraction Map

NW ▲ N NE

◄W E►

SW ▼ S SE



Hydrogeology and Hydrology Legend

If you would like any further assistance regarding this report then please contact
GroundSure on (T) 01273 819700, [F] 01273 377902, email: info@groundsure.com

5. Hydrogeology and Hydrology

5.1 Groundwater Vulnerability and Soil Classification

Records of aquifer and soil classification within 200m of the study site: **No**

Database searched and no data found.

5.2 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.3 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 1000m of the study site? **Yes**

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer and Abstraction Licence Map:

ID	Distance	Direction	NGR	Details	
5	809.0	NE	391450,222080	Licence No: 18/54/20/0411 Details: Dust suppression Direct Source: Surface Water Midlands Region Point: Trib Of Hatherley Brook At Gloucester Road, Cheltenham Data Type: Point	Application No: A/54/20/496 Original Start Date: 1/11/2000 Expiry Date: 31/1/2005 Issue No: 1 Version Start Date: 1/11/2000 Version End Date: -

5.4 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? **No**

Database searched and no data found.

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.6 River Quality

Is there any Environment Agency information on river quality within 500m of the study site? **No**

Database searched and no data found.

5.7 Main Rivers

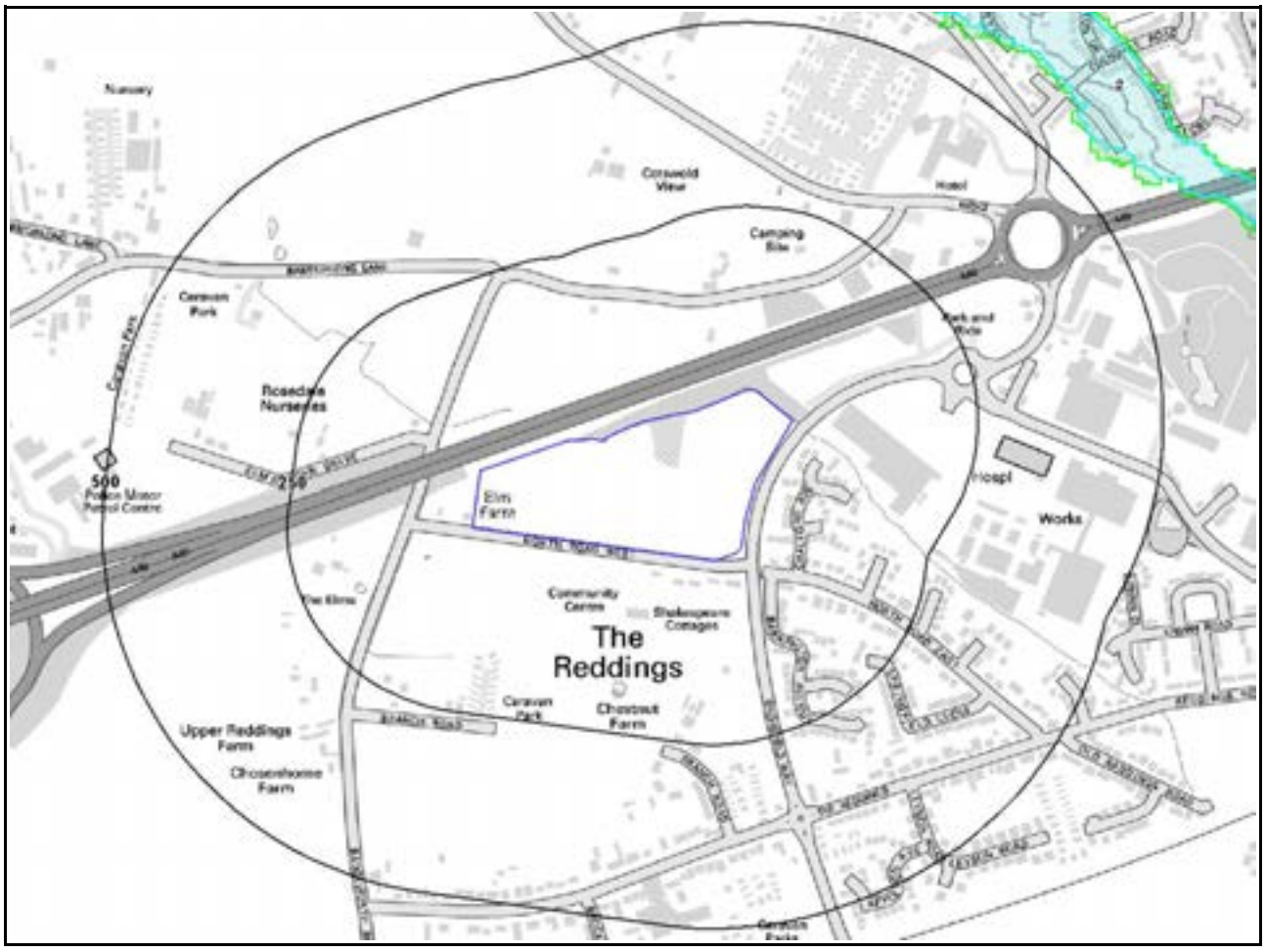
Are there any Main Rivers within 500m of the study site? **No**

Database searched and no data found.

If you would like any further assistance regarding this report then please contact
GroundSure on (T) 01273 819700, [F] 01273 377902, email: info@groundsure.com

6. Surface Water Flood Map

N



S

Flood Legend

Site Outline

Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Storage Area

Area Benefiting from Flood Defences

Flood Defences

6. Flooding

6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

Database searched and no data found.

6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.
Database searched and no data found.

6.3 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.4 Areas used for Storage Areas

Are there any areas used for Flood Storage within 250m of the study site? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.5. Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the centre of the study site? **No**

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? **Not Applicable**

What is the British Geological Survey confidence rating in this result? **Not Applicable**

Notes:

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a fivefold scale - Low, Moderately Low, Moderate, Moderately High and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7. Ecological Designated Sites Map

N

S

Ecological Designated Sites Legend

Site Outline
Search Buffers (m)
SAC
SPA
SSSI
Ramsar
NNR
LNR
World Heritage Sites

7. Ecological Designated Sites

Presence of sites of ecological value within 1000m of the study site? **Yes**

Records of Sites of Special Scientific Interest (SSSI) within 1000m of the study site: **1**

The following Sites of Special Scientific Interest (SSSI) records provided by English Nature/Countryside Council for Wales are represented as polygons on the Ecological Designated Sites Map:

ID	Distance	Direction	SSSI Name	Data Source
Not shown	684.0	S	Badgeworth	Natural England

Records of National Nature Reserves (NNR) within 1000m of the study site: **0**

Database searched and no data found.

Records of Special Areas of Conservation (SAC) within 1000m of the study site: **0**

Database searched and no data found.

Records of Special Protection Areas (SPA) within 1000m of the study site: **0**

Database searched and no data found.

Records of Ramsar sites within 1000m of the study site: **0**

Database searched and no data found.

Records of Local Nature Reserves (LNR) within 1000m of the study site: **0**

Database searched and no data found.

Records of World Heritage Sites within1000m of the study site: **0**

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information, please obtain a GroundSure Geology and Ground Stability Report. Available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site?	**Low**

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site?	**Low**

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site?	**Null - Negligible**

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site?	**Negligible**

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site?	**Null - Negligible**

8.1.6 Running Sand

What is the maximum Running Sand* hazard rating identified on the study site?	**Negligible**

9.Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site? **No**

Database searched and no data found.

9.2 Shallow Mining

What is the hazard of subsidence relating to shallow mining onsite? (this includes a 150m buffer) **Negligible**

10.Contacts

GroundSure Helpline
Telephone: 01273 819700
info @ groundsure.com

British Geological Survey (England & Wales)
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3136. www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

Environment Agency
Lower Severn
Riversmeet House - Newtown Industrial Estate, Northway Lane,
Tewkesbury, Gloucestershire, GL20 8JQ Tel: (01684) 850 951
Midlands Region Tel: (0121) 711 2324

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848. DX 716176 Mansfield 5
www.coal-authority.co.uk
Coal mining reports and related enquiries

Ordnance Survey
Romsey Road
Southampton SO16 4GU
Tel: 08456 050505

Local Authority
Cheltenham Borough Council Tel: 01242 262626

Get Mapping PLC
Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements
This product includes map data licensed from Landmark Information Group Limited®.

GroundSure Geology & Ground Stability Report

Address: Grovefield Way, CHELTENHAM, GL51 6RF

Date: Jul 22, 2008

GroundSure Reference: HMD-24-174363

Your Reference: 722048/MB

Brought to you by GroundSure

If you would like any further assistance regarding this report then please contact
GroundSure on (T) 01273 819700, [F] 01273 377902, email: info@groundsure.com

Aerial Photograph of Study Site

NW N NE

◄W E►

SW S SE

Site Name: Grovefield Way, CHELTENHAM, GL51 6RF
Grid Reference: 390648,221452

Overview of Findings

The GroundSure Geology and Ground Stability Report provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database and GroundSure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary
1. Geology	Description
1.1 Artificial Ground,	
1.1.1 Is there any Artificial Ground /Made Ground present beneath the study site? *	No
1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology & Landslips	
1.2.1 Is there any Superficial Ground /Drift Geology present beneath the study site? *	No
1.2.2 Are there any records relating to permeability of superficial geology within the study site* boundary?	No
1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
1.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No
1.3 Bedrock, Solid Geology & Faults	
1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
1.3.2 Are there any records relating to permeability of bedrock within the study site* boundary?	Yes
1.3.3 Are there any records of faults within 500m of the study site boundary?	No
1.3.4 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a radon Affected Area, as less than 1% of properties are above the Action Level
1.3.5 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Resea rch Establishment?	No radon protective measures are necessary

*** This includes an automatically generated 50m buffer zone around the site**

Source:Scale 1:50,000 BGS Sheet No:216

2. Ground Workings	on-site	0-50	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	0	-	-
2.2 Historical Underground Workings Features from Small Scale Mapping	0	0	0	0	0
2.3 Current Ground Workings	0	0	0	0	0

3. Mining, Extraction & Natural Cavities	on-site	0-50	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	0
3.2 Coal Mining	0	0	0	0	0
3.3 Shallow Mining*	1	-	-	-	-
3.4 Non – Coal Mining Cavities	0	0	0	0	0
3.5 Natural Cavities	0	0	0	0	0
3.6 Brine Extraction	0	0	0	0	0
3.7 Gypsum Extraction	0	0	0	0	0
3.8 Tin Mining	0	0	0	0	0
3.9 Clay Mining	0	0	0	0	0

*This includes an automatically generated 150m buffer zone around the site

4. Natural Ground Subsidence	on-site*	0-50	51-250	251-500	501-1000
4.1 Shrink-Swell Clay	Low	-	-	-	-
4.2 Landslides	Low	-	-	-	-
4.3 Ground Dissolution of Soluble Rocks	Negligible	-	-	-	-
4.4 Compressible Deposits	Negligible	-	-	-	-
4.5 Collapsible Deposits	Negligible	-	-	-	-
4.6 Running Sand	Negligible	-	-	-	-

* This includes an automatically generated 50m buffer zone around the site

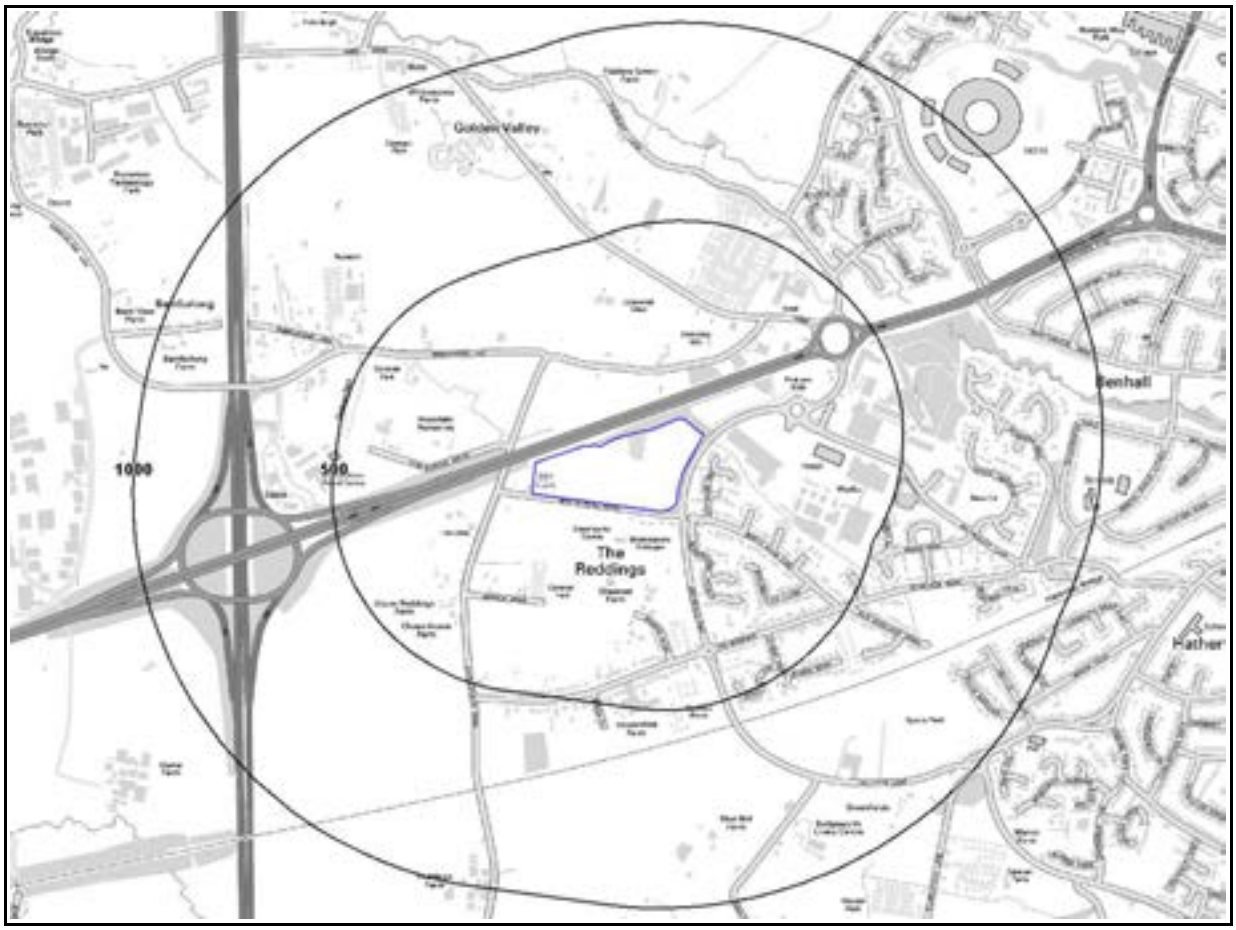
5. Borehole Records	on-site	0-50	51-250	251-500	501-1000
5.1 BGS Recorded Boreholes	1	0	0	-	-

1.1 Artificial Ground Map

NW ▲ N NE

◄W E►

SW ▼ S SE



Artificial Ground Legend

Site Outline

Search Buffers (m)

Made Ground (undivided)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

Reclaimed Ground

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:216

1.1.1 Artificial/Made Ground

Are there any records of Artificial/Made Ground within 500m of the study site boundary: **No**

Database searched and no data found.

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site* boundary: **No**

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site.

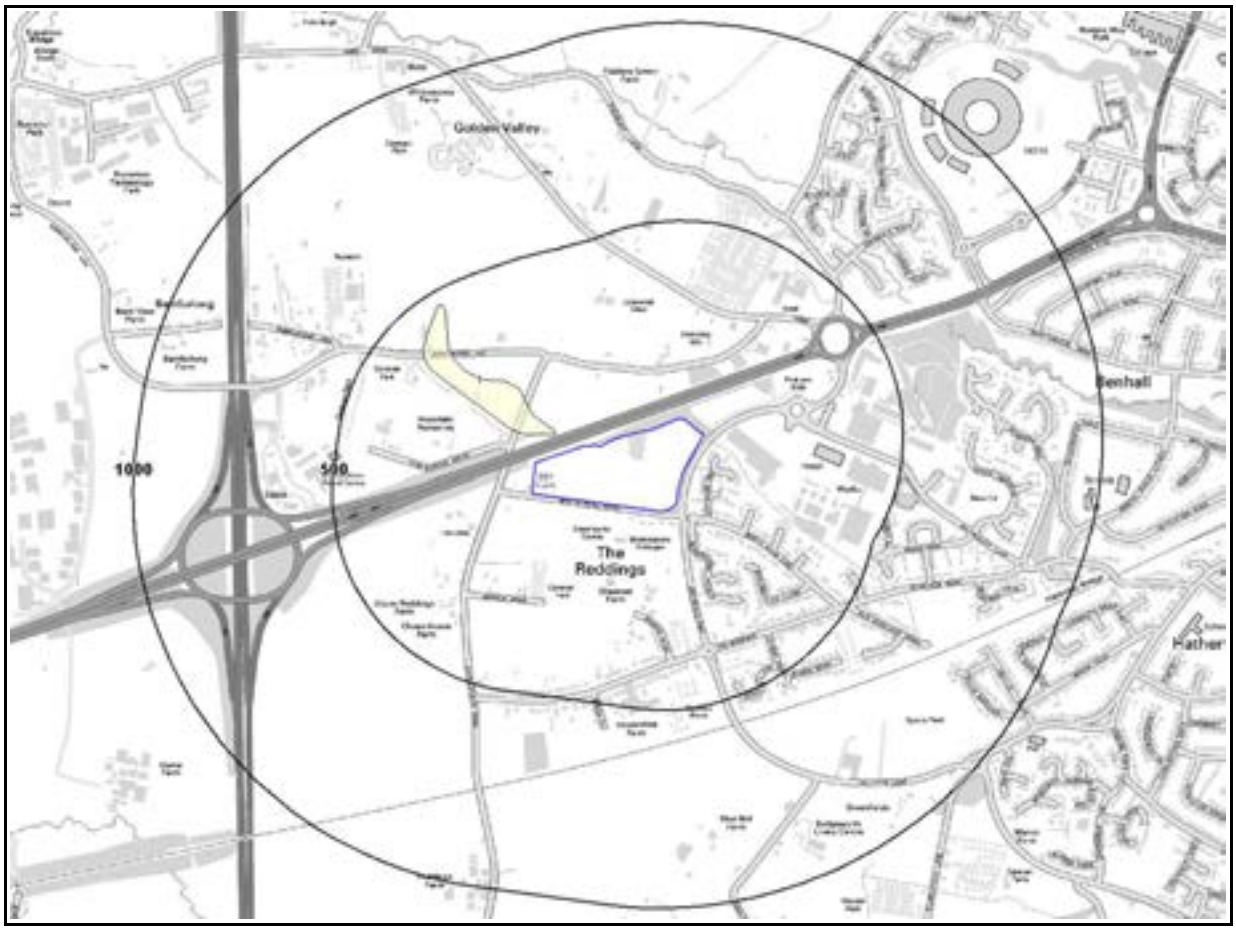
If you would like any further assistance regarding this report then please contact
GroundSure on (T) 01273 819700, [F] 01273 377902, email: info@groundsure.com

1.2 Superficial Deposits and Landslips Map

NW ▲ N NE

◄W E►

SW ▼ S SE



Superficial and Landslips Legend

Site Outline

Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

Are there any records of Superficial Deposits/Drift Geology within 500m of the study site boundary: **Yes**

ID	Distance (m)	Direction	Lex Code	Description	Rock Description
1	52.0	N	ALV-CSSG	Alluvium	Clay, Silt, Sand and Gravel

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site* boundary: **No**

Database searched and no data found.

1.2.3 Landslip

Database searched and no data found.

Are there any records of Landslip within 500m of the study site boundary? **No**

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.
This Geology shows the main components as discreet layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

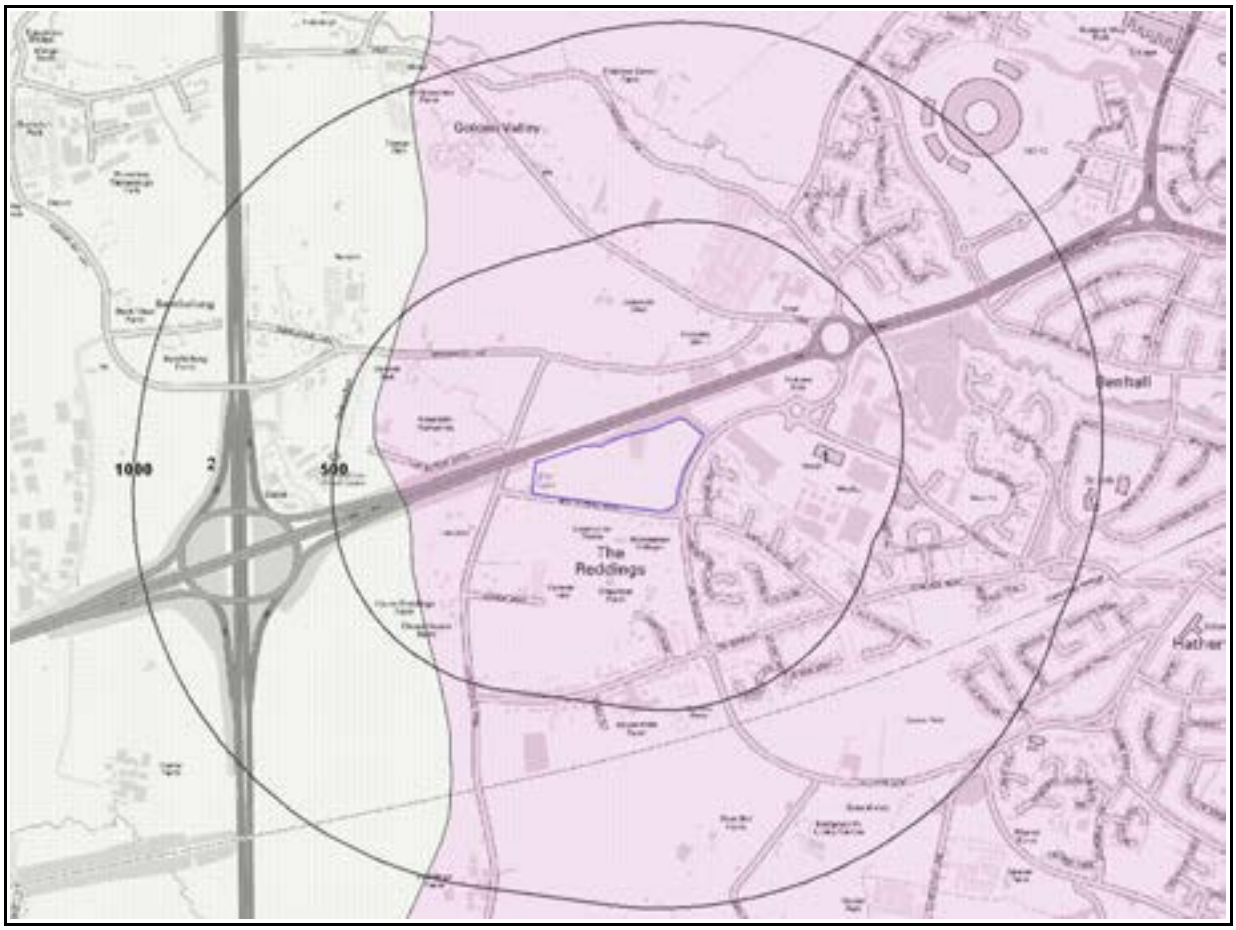
Are there any records relating to permeability of landslips within the study site* boundary: **No**

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site.

1.3 Bedrock and Faults Map

NW ▲ N NE



◄W E►

SW ▼ S SE

Bedrock & Faults Deposits Legend

Site Outline

Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:216

1.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	CHAM-MDST	Charmouth Mudstone Formation - Mudstone	Pliensbachian / Sinemurian
2	313.0	W	RLS-MDLM	Rugby Limestone Member - Mudstone and Limestone, Interbedded	Sinemurian / Hettangian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary: **Yes**

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Low	Low

1.3.3 Faults

Database searched and no data found.

Are there any records of Faults within 500m of the study site boundary? **No**

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discreet layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3.4 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is not in a radon Affected Area, as less than 1% of properties are above the Action Level

1.3.5 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary

* This includes an automatically generated 50m buffer zone around the site.

2. Ground Workings Map

NW ▲ N NE

◄W E►

SW ▼ S SE

Ground Workings Legend

Enabled by Ordnance Survey

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2. Ground Workings

2.1 Historical Surface Ground Working Features derived from the Historical Mapping

This dataset is based on GroundSure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? **No**

Database searched and no data found.

2.2 Historical Underground Workings Features derived from the Historical Mapping

This data is derived from the GroundSure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? **No**

Database searched and no data found.

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? **No**

Database searched and no data found.

3. Mining, Extraction & Natural Cavities Map

NW ▲ N NE

◄W E►

SW S ▼ SE

Mining, Extraction & Natural Cavities Legend

Enabled by Ordnance Survey

Site Outline

Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities

3. Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from GroundSure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.3 Shallow Mining

This dataset refers to the (largely very old) extraction of mineral deposits by means of near surface underground workings.

What is the maximum hazard rating of subsidence relating to shallow mining within the study site* boundary? **Negligible**

*This includes an automatically generated 150m buffer zone around the study site boundary

The following Shallow Mining information provided by the British Geological Survey is not represented on Mapping:

Distance (m)	Direction	Hazard Rating	Details
0.0	On Site	Negligible	Where negligible potential is indicated, this means that the rocks underlying the area are not likely to have been mined at shallow depth. However, you should still find out whether or not a Coal Authority mining search is required in the area, for example, to check for deeper mining.

3.4 Non – Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.5 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.6 Brine Extraction

This dataset provides information from the Brine compensation board which has been discontinued and is now covered by the Coal Authority.

Are there any Brine Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.7 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.8 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records.

Are there any Tin Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.9 Clay Mining

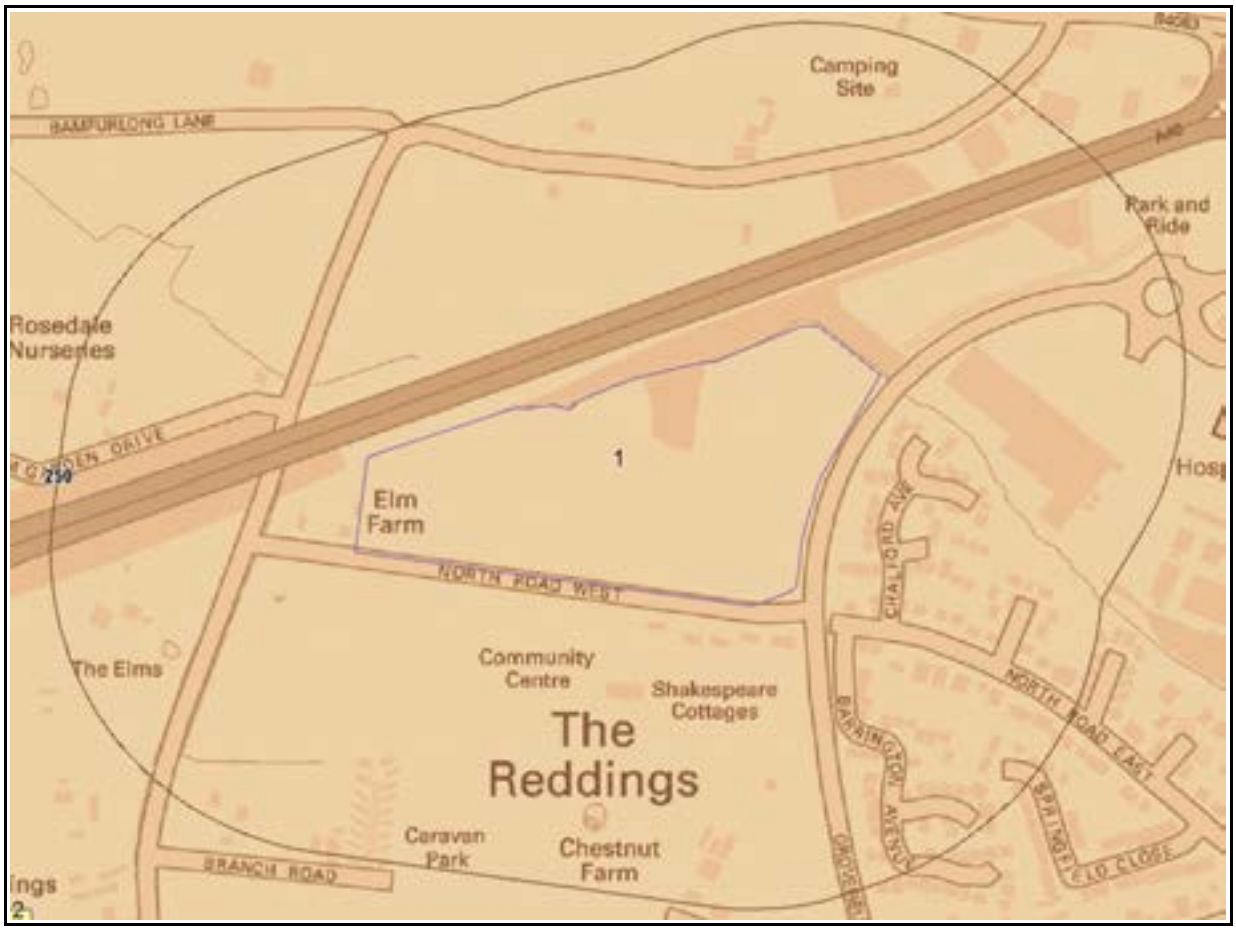
This dataset provides information on Kalin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

4. Natural Ground Subsidence
4.1 Shrink-Swell Clay Map

NW ▲ N NE



◄W E►

SW ▼ S SE

Shrink-Swell Clay Legend

Site Outline

Search Buffers (m)

No Data / Null

Negligible

Very Low

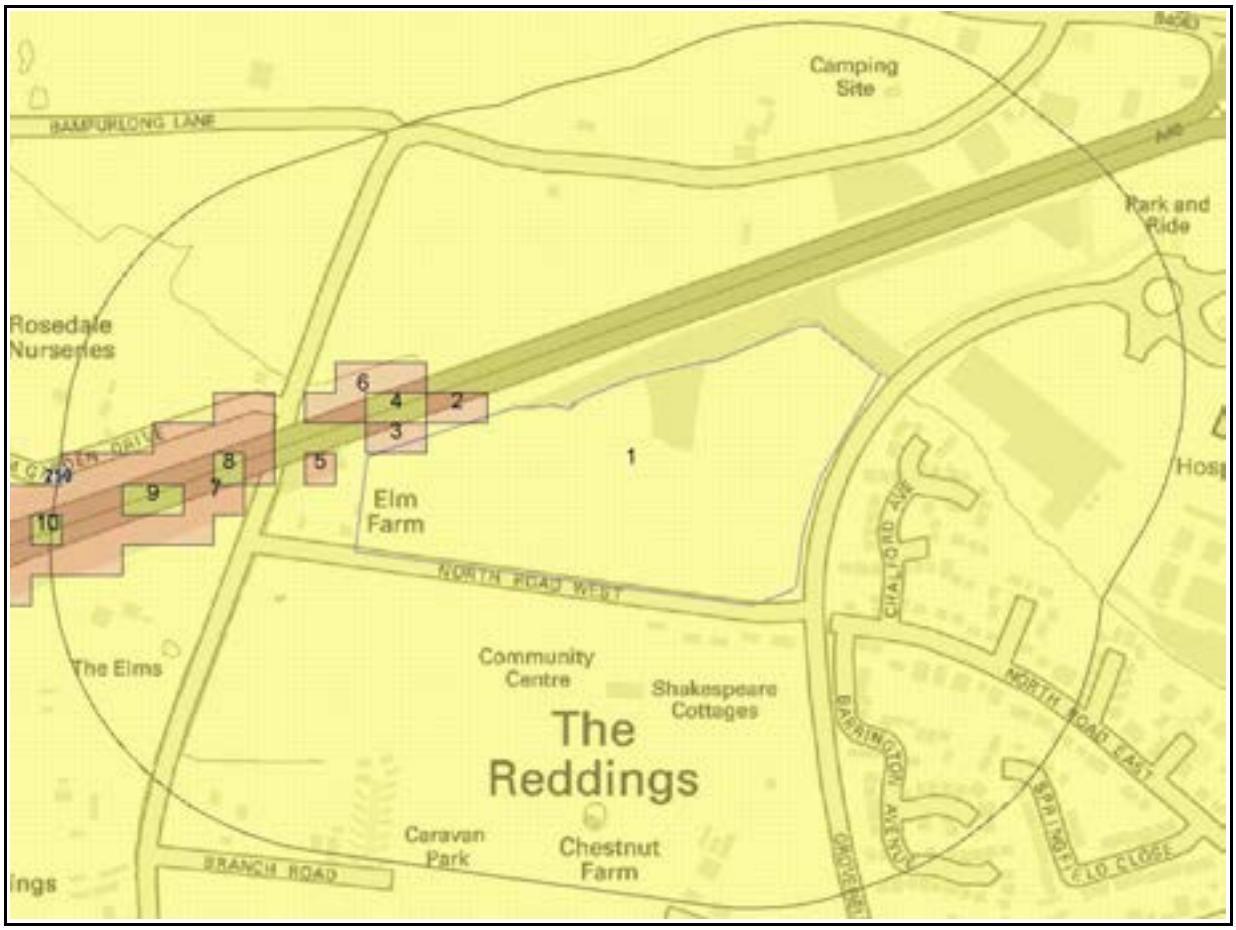
Low

Moderate

High

4.2 Landslides Map

NW N NE



◄W E►

SW S SE

Landslides Legend

Site Outline

Search Buffers (m)

No Data / Null

Negligible

Very Low

Low

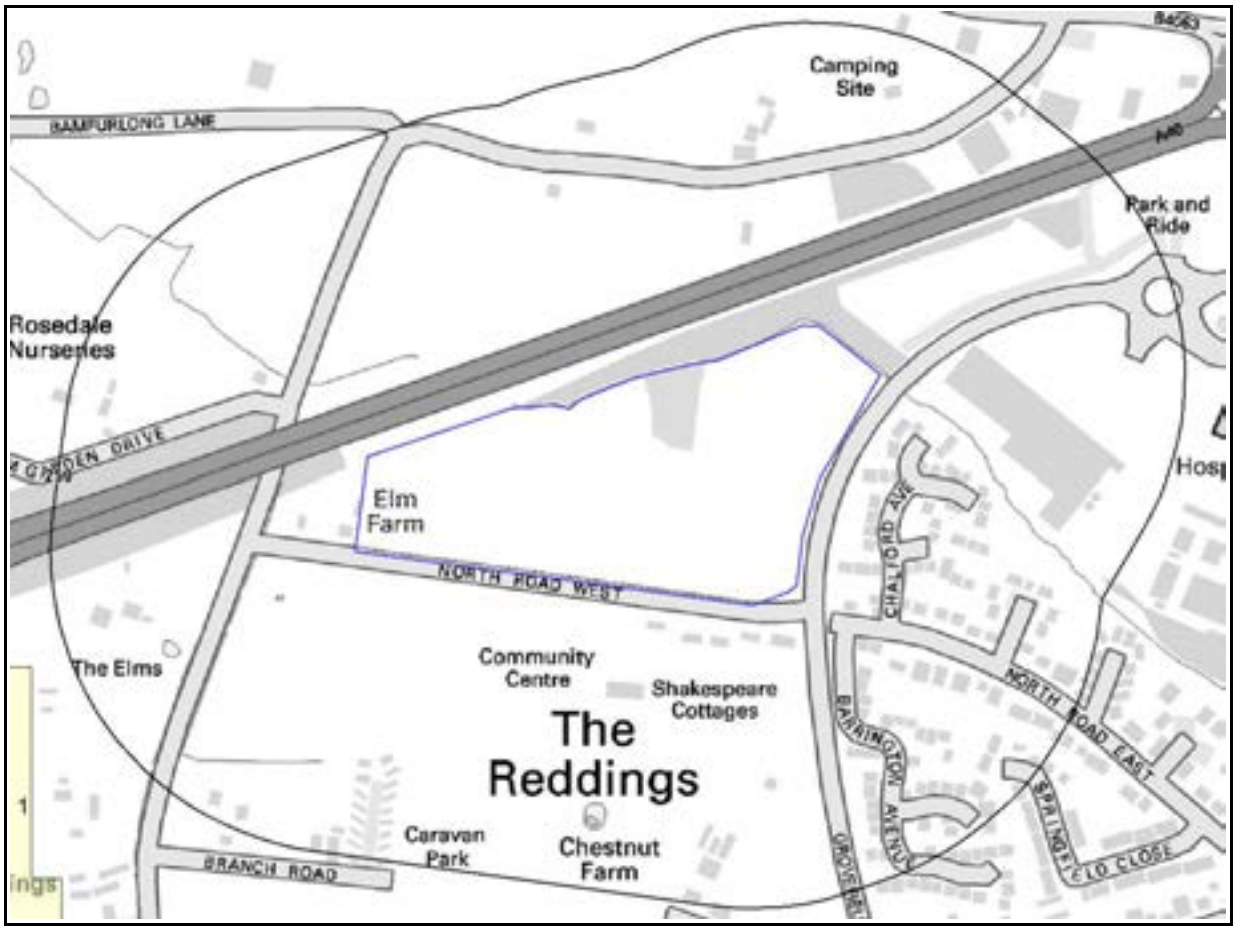
Moderate

High

4.3 Ground Dissolution Soluble Rocks Map

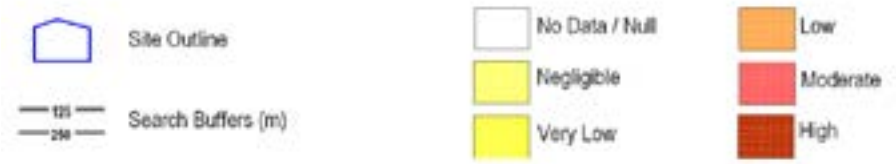
NW ▲ N NE

◄W E►



SW ▼ S SE

Ground Dissolution Soluble Rocks Legend

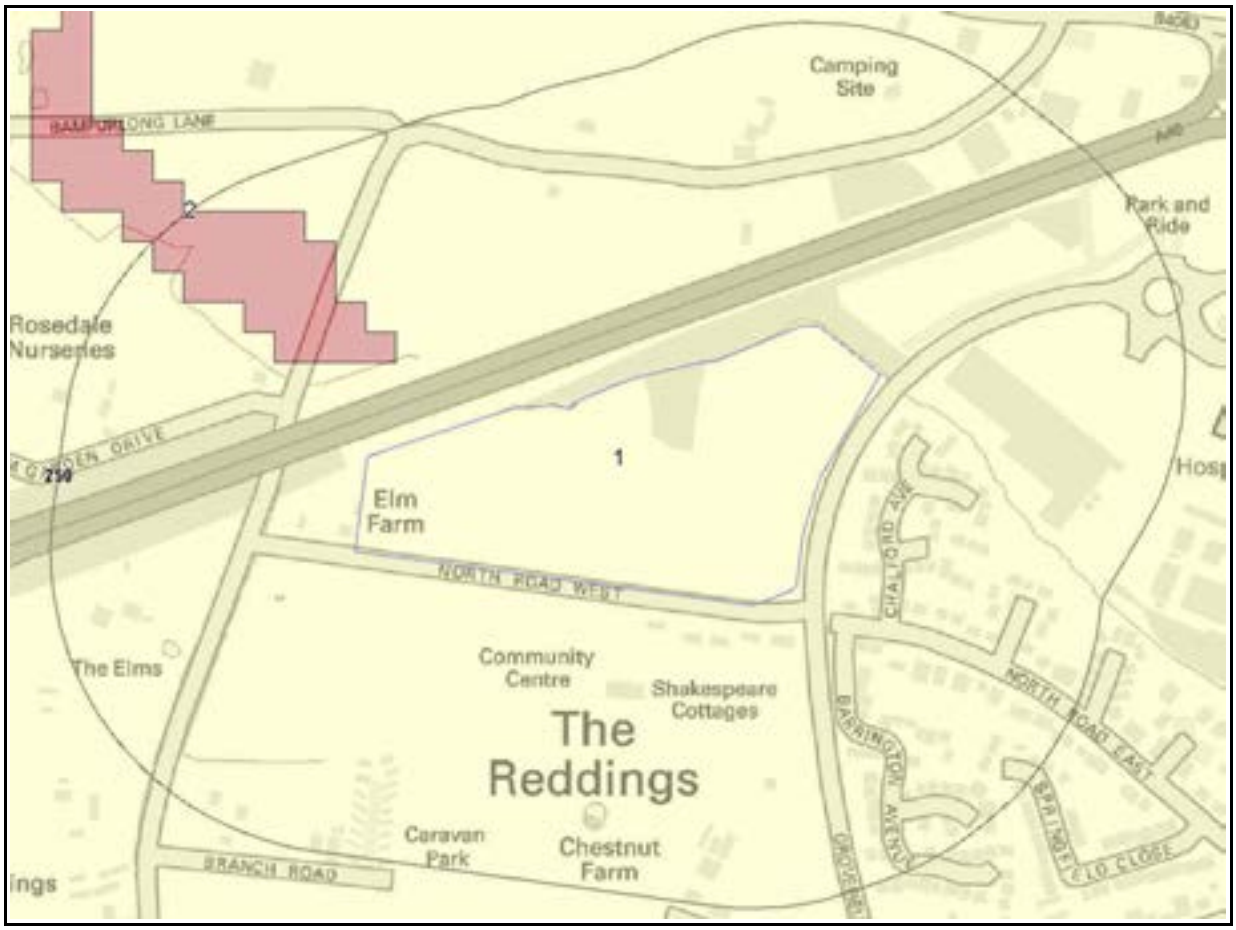


4.4 Compressible Deposits Map

NW ▲ N NE

◄W E►

SW ▼ S SE



Compressible Deposits Legend

Site Outline

Search Buffers (m)

No Data / Null

Negligible

Very Low

Low

Moderate

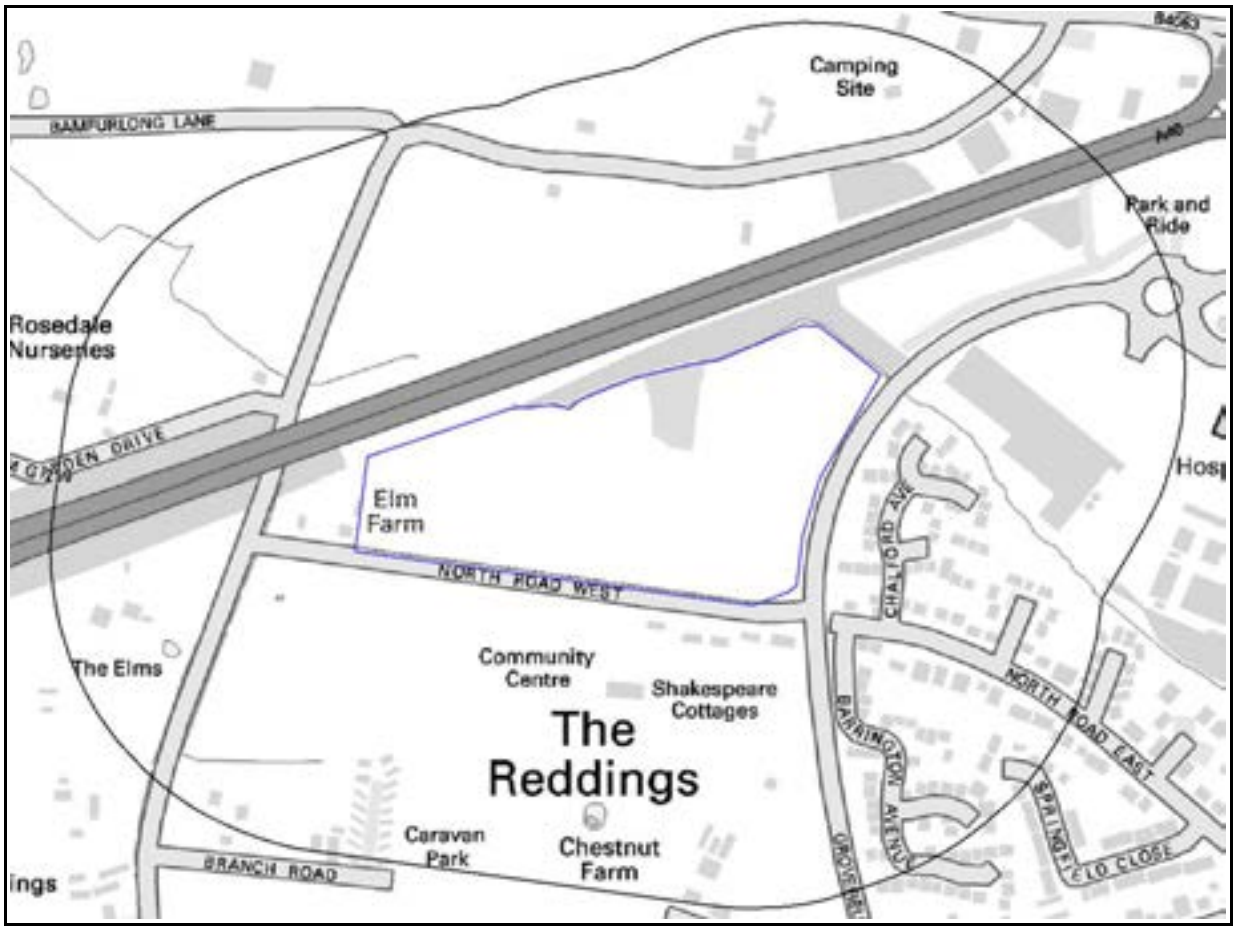
High

4.5 Collapsible Deposits Map

NW N NE

◄W E►

SW S SE



Collapsible Deposits Legend

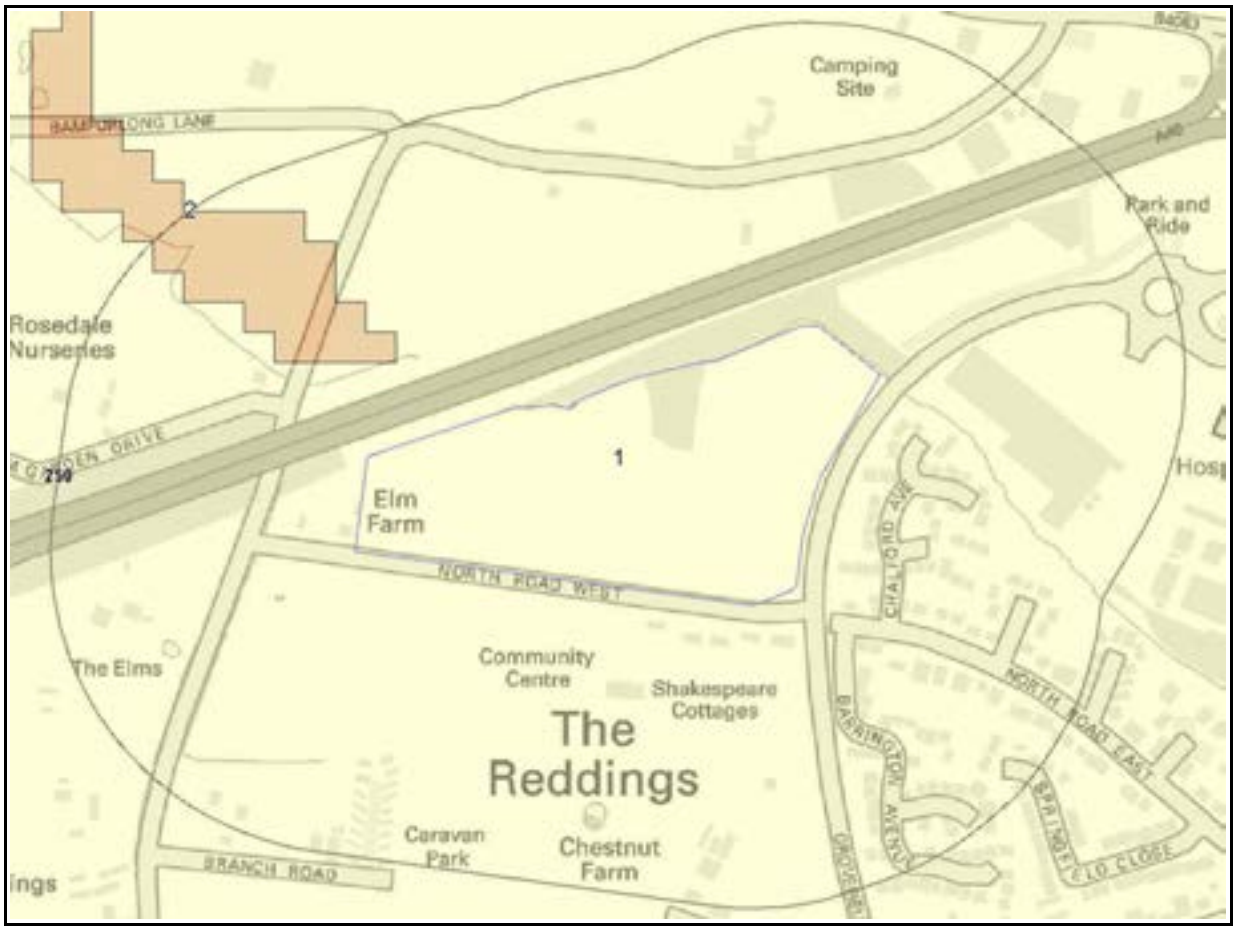
Site Outline

Search Buffers (m)

No Data / Null

Significant

4.6 Running Sand Map



Running Sand Legend

Enabled by Ordnance Survey

Site Outline

Search Buffers (m)

No Data / Null

Negligible

Very Low

Low

Moderate

High

4. Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS)
The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? **Low**

*This includes an automatically generated 50m buffer zone around the study site boundary.

4.1 Shrink – Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
2	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property – no significant increase in insurance risk due to natural slope instability problems.
3	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property – no significant increase in insurance risk due to natural slope instability problems.
4	11.0	N	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
5	23.0	W	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property – no significant increase in insurance risk due to natural slope instability problems.
6	27.0	N	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property – no significant increase in insurance risk due to natural slope instability problems.

4.3 Ground Dissolution of Soluble Rocks

The following Soluble Rocks information provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0	On site	Null-Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Ground information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

4.5 Collapsible Deposits

The following Collapsible Rocks information is provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0	On site	Null-Negligible	No Indicators for collapsible deposits identified. No Special actions required to avoid problems due to collapsible deposit.

4.6 Running Sands

The following Running Sands information is provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5. Borehole Records Map

NW ▲ N NE

◄W E►

SW ▼ S SE

Borehole Records Legend

Site Outline

Search Buffers (m)

Borehole Locations

5. Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: **1**

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length (m)	Borehole Name
1	0.0	On Site	390470,0221390	SO92SW205	10.0	A40 Improvement 19

Contacts

GroundSure Helpline
Telephone: 01273 819700
info @ groundsure.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143 www.bgs.ac.uk

British Gypsum
British Gypsum Ltd, East Leake, Loughborough, Leicestershire, LE12 6HX
Tel: www.british-gypsum.bpb.com

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848
DX 716176 Mansfield 5 www.coal-authority.co.uk

Ordnance Survey
Romsey Road, Southampton SO16 4GU
Tel: 08456 050505

Getmapping PLC
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Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk

Acknowledgements

Search Code

GroundSure are committed to providing market leading environmental reports. GroundSure has therefore registered with the Property Codes Compliance Board and is committed to comply with all the regulations and obligations contained within the Search Code of Practice.

Important Protection

The Search Code provides protection for homebuyers, sellers, conveyancers and mortgage lenders, who rely on property search reports carried out on residential property within the United Kingdom. It sets out minimum standards which organisations compiling and/or selling search reports have to meet. This information is designed to introduce the Search Code to you.

By giving you this information, GroundSure is confirming that they keep to the principles of the Search Code. This provides important protection for you.

The Code's main commitments

The Search Code's key commitments say that search organisations will:

Provide search reports which include the most up-to-date available information when compiled and an accurate report of the risks associated with the property.

- Deal promptly with queries raised on search reports.
- Handle complaints speedily and fairly.
- At all times maintain adequate and appropriate insurance cover to protect you.
- Act with integrity and ensure that all search services comply with relevant laws, regulations and industry standards.

Keeping to the Search Code
How search organisations keep to the Search Code is monitored independently by the Property Codes Compliance Board. And, complaints under the Code may be referred to the Independent Property Codes Adjudication Scheme. This gives you an extra level of protection as the service can award compensation of up to £5,000 to you if you suffer as a result of GroundSure failing to keep to the Code.

Contact Details
The Property Codes Compliance Board - please contact:

Telephone: 020 7917 1817

Email: info@propertycodes.org.uk

You can also get more information about the Property Codes Compliance Board from our website at: www.propertycodes.org.uk.

Please contact GroundSure on 01273 819500 or email info@groundsure.com if you would like a copy of the full Search Code

GroundSure Limited – Standard Terms and Conditions

1 Definitions

In these conditions unless the context otherwise requires:

"Beneficiary" means the Customer or the client of the Customer for whom the Customer has procured the Services.

"Consultancy Services" mean consultancy services provided by GroundSure including, without limitation, carrying out interpretation of third party and in-house environmental data, provision of environmental consultancy advice, undertaking environmental audits and assessments, site investigation, site monitoring and related items.

"Content" means any data, database or other information contained in a Report or Mapping which is provided to GroundSure by a Data Provider.

"Contract" means the contract between GroundSure and the Customer for the performance of the Services which shall incorporate these conditions, the relevant GroundSure user guide, proposal by GroundSure and the content of any subsequent report, and any agreed amendments in accordance with condition 12.

"Customer" means the party that submits an Order or commissions GroundSure further to a written proposal for environmental consultancy services.

"Data Provider" means any third party providing Content to GroundSure.

"Data Report" means reports comprising factual data with no professional interpretation in respect of the level of likely risk and/or liability available from GroundSure.

"GroundSure" means GroundSure Limited, a company registered in England and Wales under number 03421028 and whose registered office is at Greater London House, Hampstead Road, London NW1 7EJ.

"Intellectual Property" means any patent, copyright, registered design rights, service marks, moral rights, data protection rights, know-how, trade mark or other intellectual property rights.

"Mapping" an historical map or a combination of historical maps of various ages, time periods and scales available from GroundSure;

"Order" means an order form submitted by or for the Beneficiary requiring Services from GroundSure in respect of a specified site.

"Report" means a Risk Screening or Data Report for commercial or residential property available from GroundSure relating to a site identified in the Order prepared in accordance with the specifications set out in the relevant user guide.

"Risk Screening" means one of GroundSure's risk screening reports such as GroundSure Homebuyers; GroundSure Home Environmental GroundSure SiteGuard, GroundSure Screening, GroundSure Review, GroundSure Developer Review, or any other risk screening report available from GroundSure.

"Services" means the provision of any Report, Mapping and Consultancy Services which GroundSure has agreed to carry out for the Customer/Beneficiary on these terms and conditions in respect of a site detailed in the Order.

2Scope of Services

2.1GroundSure agrees to carry out the Services in accordance with the Contract and to the extent set out therein.

2.2GroundSure shall exercise all reasonable skill, care and diligence in the performance of the Services.

2.3The Customer acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in the Contract.

2.4Terms and conditions appearing on a Customer's order form, printed stationery or other communication, including invoices, to GroundSure, its employees, servants, agents or other representatives shall be of no effect and these terms and conditions shall prevail over all others.

2.5In the event that a Customer/Beneficiary opts to take out insurance in conjunction with or as a result of the Services, such insurance shall be subject solely to the terms of any policy issued to it in that respect and GroundSure will have no liability therefore.

3The Customer's obligations

3.1The Customer shall be solely responsible for ensuring that the Report/Mapping ordered is appropriate and suitable for the Beneficiary's needs.

3.2The Customer shall (or shall procure that the Beneficiary shall) supply to GroundSure as soon as practicable and without charge all information necessary and accurate relevant data including any specific and/or unusual environmental information relating to the site known to the Customer/Beneficiary which may pertain to the Services and shall give such assistance as GroundSure shall reasonably require in the performance of the Services (including, without limitation, access to a site, facilities and equipment as agreed in the Contract).

3.3Where Customer/Beneficiary approval or decision is required, such approval or decision shall be given or procured in reasonable time as not to delay or disrupt the performance of any other part of the Services.

3.4The Customer shall not and shall procure that the Beneficiary shall not, save as expressly permitted by these terms and conditions, re-sell, alter, add to, amend or use out of context the content of any Report, Mapping,or in respect of any service or information given by GroundSure. For the avoidance of doubt, the Customer and Beneficiary may make the Report, Mapping or GroundSure's findings available to a third party, but such third party cannot rely on the same unless expressly permitted under condition 4.

3.5The Customer is responsible for maintaining the confidentiality of its user name and password if using GroundSure's internet ordering service and accepts responsibility for all activity that occurs under such account and password.

4Reliance
4.1Upon full payment of all relevant fees and subject to the provisions of these terms and conditions, the Customer and Beneficiary are granted an irrevocable royalty-free licence to use the information contained in the Report, Mapping or in a report prepared by GroundSure in respect of or arising out of the Consultancy Services. The Services may only be used for the benefit of the Customer and those persons listed in conditions 4.2 and 4.3.
4.2 In relation to Data Reports, Mapping and Risk Screening, reliance shall be limited to the Customer, Beneficiary and subsequent first purchaser or first tenant of the site including the professional advisers and lenders of each. For the avoidance of doubt, such persons shall include any entity necessary under the Housing Act 2004 or as legally required because of the Home Information Pack.
4.3 In relation to Consultancy Services, reliance shall be limited to the Customer, Beneficiary and named parties on the GroundSure proposal and subsequent report.
4.4 No party referred to in conditions 4.2 and 4.3 shall assign any rights or obligations under these terms and conditions without the prior written consent of GroundSure. GroundSure reserves the right to charge an assignment fee which will be no higher than 15% of the original fee or £250 whichever is the highest. GroundSure may assign its rights and obligations under these terms.
4.5Save as set out in conditions 4.2 and 4.3, unless otherwise agreed in writing with GroundSure, any other party considering the information within a Report, Mapping or proposal and subsequent report in respect of Consultancy Services, including insurance underwriters, does so at their own risk and GroundSure has no legal obligations to such party unless otherwise agreed in writing.
4.6The Customer shall not and shall procure that any person (including the Beneficiary) who is provided with a copy of any Report shall not: (a) remove, suppress or modify any trade mark, copyright or other proprietary marking from the Report or Mapping; (b) create any product which is derived directly or indirectly from the data contained in the Report or Mapping; (c) combine the Report or Mapping with, or incorporate the Report or Mapping into any other information data or service; or (d) re-format or otherwise change (whether by modification, addition or enhancement) data or images contained in the Report or Mapping save to the extent that the Customer is adding its assessment to the Report or Mapping solely for the purposes of providing its services to the Beneficiary.
4.7Without prejudice to any other right or remedy available to GroundSure including without limitation any claim for infringement of copyright, breach of confidence or contract or otherwise howsoever arising if the Customer or a person to whom a Report or Mapping is provided, breaches any of the provisions of this condition 4, the Customer shall fully and effectually indemnify GroundSure and hold it harmless against any claim by any third party who may claim to have sustained injury loss or damage by reason of their reliance upon any report or document which GroundSure may have prepared for the Customer or upon the contents thereof.
5Fees and Disbursements
5.1GroundSure shall charge the Customer fees at the rate and frequency specified in the Contract together with all proper disbursements made in performing the Services. The Customer shall in addition pay all value added tax or other tax payable on such fees and disbursements in the country concerned in relation to the provision of the Services.
5.2Unless GroundSure requires prepayment, the Customer shall promptly pay all fees disbursements and other monies due to GroundSure in full without deduction, counterclaim or set off together with such Value Added Tax or equivalent local tax as may be required within 30 days from the date of GroundSure's invoice. GroundSure reserves the right to charge interest which shall accrue on a daily basis from the date of invoice until the date of payment (whether before or after judgment) at the rate of two per cent per month.
5.3In the event that the Customer disputes the amount payable in respect of GroundSure's invoice it shall notify GroundSure no later than 28 days after the date thereof that it is in dispute. In default of such notification the Customer shall be deemed to have agreed the amount thereof which shall thereupon be due and payable. As soon as reasonably practicable following receipt of any disputed invoice, a member of the management team at GroundSure shall contact the Customer and the parties shall use all reasonable endeavours to resolve the dispute.
6 Intellectual Property
6.1Unless expressly agreed in writing to the contrary GroundSure and its Data Providers (where relevant) retain all Intellectual Property rights and proprietary rights in all information, Content and data reproduced in a Report or as part of the Consultancy Services.
6.2Data Providers may enforce any breach of condition 6.1 against the Customer or Beneficiary.
7 Liability
7.1GroundSure shall not be liable to pay compensation to the Customer or any person to whom the Customer provides a copy of the Report, Mapping or results of the Consultancy Services in any circumstances whatsoever unless arising out of a breach on its part of the obligations set out in the Contract.
7.2GroundSure shall not be liable if the Services are used otherwise than as provided or referred to in these conditions
7.3Where any person is engaged whether by the Customer or by GroundSure on the Customer or Beneficiary's behalf in the performance of the Services or any part thereof GroundSure shall not be liable for acts of negligence, default or omission by such person.

7.4GroundSure makes no representation, warranties, express or implied, as to the accuracy, reliability, completeness, validity or fitness for purpose of the Content shall not be liable for any omission, error or inaccuracy in relation thereto.
7.5GroundSure shall not be liable for any inaccurate statement or risk rating in a Report which resulted from a reasonable interpretation of the Content.
7.6GroundSure shall not be liable for any indirect losses, loss of profit nor consequential loss caused by the suspension or reduction of activity on the site.
7.7 Notwithstanding anything to the contrary contained elsewhere in the Contract, and irrespective of whether multiple parties make use of the same Services, the total liability of GroundSure under or in connection with the Contract, whether in contract in tort for breach of statutory duty or otherwise shall not exceed the amount of GroundSure's insurance as provided for below.
7.8GroundSure shall maintain professional indemnity insurance in respect of its liabilities in respect of the Services (provided it is available at reasonable commercial rates) giving cover of not less than £5 million in the aggregate which amount shall first include the whole of any sum payable for death or personal injury. GroundSure shall produce evidence of such insurance if requested by the Customer. A greater level of cover may be available upon request and agreement with the Customer.
7.9The Customer shall be liable to indemnify GroundSure where any loss arises as a result of any breach on the part of the Customer of its obligations under these terms and conditions.
7.10GroundSure's liability under the Contract shall cease upon the expiry of six years from the date when the Customer/Beneficiary became aware that it may have a claim against GroundSure in respect of the Services provided always that there shall be no liability at the expiration of twelve years from the completion of the Contract.
7.11Whilst GroundSure will use all reasonable endeavours to maintain operability of its internet ordering service it will not be liable for any loss or damages caused by a delay or loss of use of such service. The Customer shall use GroundSure's internet ordering service at its own risk. GroundSure shall not be responsible for any damage to a Customer or permitted assignee's computer, software, modem, telephone or other property resulting from the use of GroundSure's internet ordering service.
7.12The Customer accepts, and shall procure that anyone who is provided with a copy of the Report accepts, that it has no claim or recourse to any Data Provider or to GroundSure in respect of the acts or omissions of such Data Providers including Content supplied by them.
7.13Nothing in these terms and conditions shall limit GroundSure's liability for causing death or personal injury through negligence or wilful default.
7.14GroundSure accepts no liability for use of any residential Reports or any data or information contained therein for development or other commercial property purposes in respect of which a commercial Report should have been obtained.
8 Remediation
8.1 For the purpose of this condition 8, 'Claimant' shall mean one of: (a) the Beneficiary, (b) the purchaser of the site from the Beneficiary or (c) the funder of (a) or (b) as applicable.
8.2 This condition 8 shall apply solely to GroundSure Homebuyers and GroundSure Home Environmental with passed rather than failed status.
8.3 GroundSure may, at its sole discretion without any admission of liability, make a contribution to the Claimant towards the costs of any clean up works required to be carried out under a notice served on a Claimant in respect of a site under Part II (A) Environmental protection Act 1990 ("Remediation Notice") on the terms of this condition 8 ("Clean up Award").
8.4 The Clean up Award:

(a) is only available once in respect of a site and to one Claimant only;(b) shall only apply where the site is a single residential dwelling house or a single residential flat within a block of flats. For the avoidance of doubt, a Clean up Award will not be considered in respect of commercial property or to any site being developed or redeveloped whether for residential purposes or otherwise; and (c) shall only apply to contamination or a pollution occurring as at or prior to the date of GroundSure Homebuyers.

8.5 The Clean up Award will not be paid in respect of any of the following, including without limitation:

(a) asbestos; (b) radioactive contamination arising directly or indirectly from or in connection with ionising radiations or contamination by radioactivity from any nuclear waste or fuel; from the combustion of nuclear fuel or the radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof; (c) naturally occurring materials or their removal except where such materials are present in excess of their natural concentration; (d) any condition caused by acts of war or an act of terrorism;(e) any condition which is known or ought reasonably to have been known to the Claimant prior to the purchase of GroundSure Homebuyers; (f) non-compliance by the Claimant or any other person with respect to the site with any statute, regulation, byelaws complaint, or notice from any regulatory authority; (g) any property belonging to or in the custody or control of the Claimant which does not form a fixed part of the site or the structure; (h)any losses incurred following a material change in use of, alteration or development of the site; or (i) financial loss in respect of loss of rental, profit, revenue, savings, business or any consequential, indirect or economic loss, damages or expenses, including the cost of temporary accommodation or business interruption.

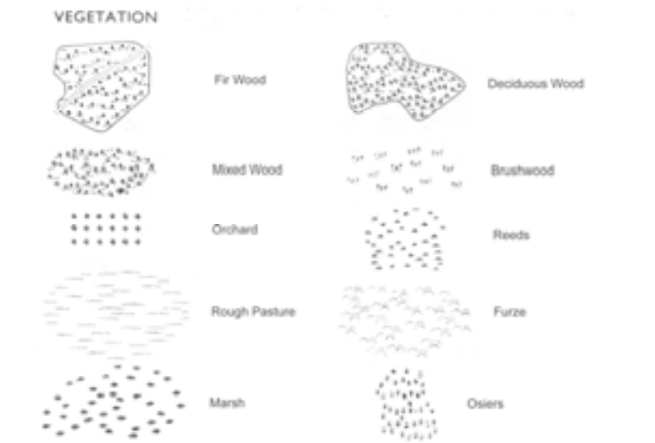
8.6 In the event the Claimant wishes to apply for a Clean up Award, it shall notify GroundSure in writing within 3 months of the date of the Remediation Notice. The Claimant shall comply with all reasonable requirements of GroundSure with regard to the commission and conduct of the clean up works to be carried out under the Remediation Notice. In the event that the Claimant breaches this provision including, without limitation, failing to obtain GroundSure's prior written consent in respect of estimates for such works GroundSure shall not be required to pay a Clean up Award.
8.7 GroundSure shall only pay a Clean up Award where a Remediation Notice is served within 36 months of the date of GroundSure Homebuyers.
8.8 The maximum sum of any Clean up Award shall be £60,000 and shall be paid subject to the Claimant having paid to GroundSure an excess in respect of its claim of £5,000.
8.9 GroundSure reserves the right at any time to withdraw the offer of payment of a Clean up Award.
8.10 The Claimant shall take all reasonable steps to appeal such Remediation Notice and mitigate any costs incurred in connection with the remediation works required under the terms of any Remediation Notice. GroundSure reserves the right to withhold or reduce the amount of its Clean up Award in the event of a breach of this condition or an appeal is still active.
9 GroundSure right to suspend or terminate
9.1In the event that GroundSure reasonably believes that the Customer or Beneficiary as applicable has not provided the information or assistance required to enable the proper performance of the Services, GroundSure shall be entitled on fourteen days written notice to suspend all further performance of the Services until such time as any such deficiency has been made good.
9.2 GroundSure may additionally terminate the Contract immediately on written notice in the event that:

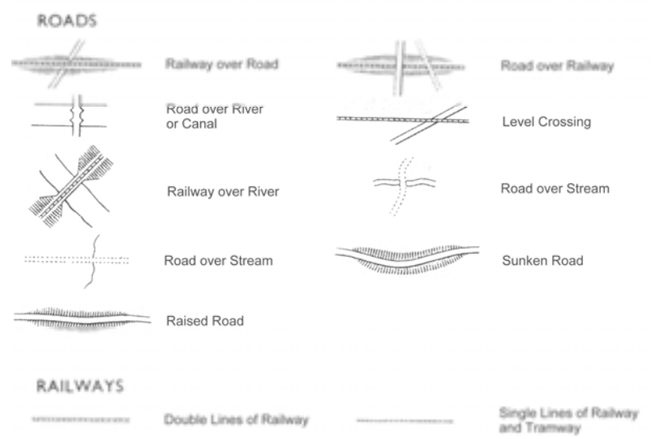
(i)the Customer shall fail to pay any sum due to GroundSure within 28 days of the due date for payment; or (ii) the Customer (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an Administration Order made against it or if a Receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Customer is struck off the Register of Companies or dissolved; or(iii) the Customer being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Customer shall enter into a composition or arrangement with the Customer's creditors or shall suffer distress or execution to be levied on his goods; or (iv) the Customer breaches any material term of the Contract (including, but not limited to, the obligations in condition 4) incapable of remedy then and in any such case GroundSure shall be entitled to a fair and reasonable amount on account of the fees due commensurate with the services performed to the date of such termination and any outstanding expenses or other disbursements that it may have incurred in respect of the Contract including without limitation equipment hire costs for the remainder of any lease, storage costs, transportation costs, labour costs or sub-contractor fees.

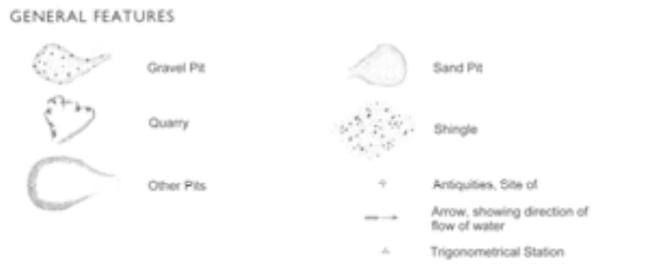
10 Customer's Right to Terminate and Suspend
10.1Subject to condition 11.2, the Customer may at any time after commencement of the Services by notice in writing to GroundSure require GroundSure to terminate or suspend immediately performance of all or any of the Services.
10.2 The Customer waives all and any right of cancellation it may have under the Consumer Protection (Distance Selling) Regulations 2000 (as amended) in respect of the Order of a Report/Mapping.
11 Consequences of Withdrawal, Termination or Suspension
11.1 Upon termination or any suspension of the Services, GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any site with all reasonable speed and shall deliver to the Customer/Beneficiary any property of the Customer/Beneficiary in GroundSure's possession or control.
11.2 The Customer shall pay to GroundSure all and any fees as are due in respect of the Services performed up to or in respect of such termination or suspension.
12General
12.1GroundSure and the Customer agree not to rescind or vary these terms and conditions to Ordnance Survey's or its successor's detriment without obtaining Ordnance Survey's or its successor's prior written consent.
12.2Subject to condition 12.1, GroundSure reserves the right to amend these terms and conditions. No variation to these terms shall be valid unless signed by GroundSure or made in accordance with condition 12.1.
12.3No failure on the part of GroundSure to exercise and no delay in exercising, any right, power or provision under these terms and conditions shall operate as a waiver thereof.
12.4 Save as expressly provided in conditions 6.2 and 12.5, no person other than the Customer, Beneficiary and GroundSure shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of these terms and conditions.
12.5 The Secretary of State for Communities and Local Government acting through Ordnance Survey, may enforce breach of conditions 6.1 or 12.1 of these terms and conditions against the Customer in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.6 GroundSure shall not be liable to the Customer if the provision of the Services is delayed or prevented by any circumstance which is beyond GroundSure's reasonable control including without limitation one or more of the following circumstances:
(i) the Customer or Beneficiary's failure to provide facilities, access or information; (ii)fire, storm, flood, tempest or epidemic; (iii)process shutdown; (iv) Acts of God or the public enemy; (v)riot, civil commotion or war; (vi)strikes, labour disputes or industrial action; (vii) acts or regulations of any governmental or other agency; (viii)suspension or delay of services at public registries by Data Providers; or (ix) changes in law.
12.7Any notice provided for shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.
12.8Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email and on the second working day after the day of posting if sent by first class post.
12.9The Contract constitutes the entire contract between the parties and shall supersede all previous arrangements between the parties.
12.10Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.
12.11 These terms and conditions shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with these terms and conditions shall be subject to the exclusive jurisdiction of the English courts.
12.12These terms and conditions were produced on 28 May 2008.

County Series 1:10,560 scale







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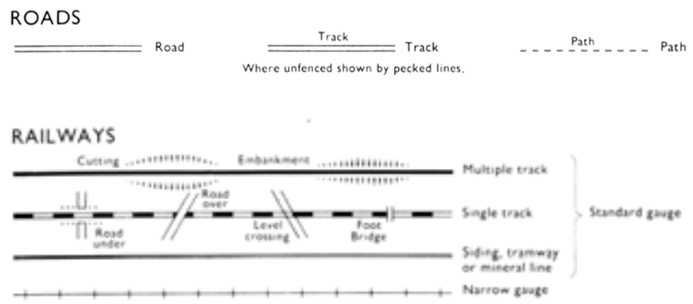

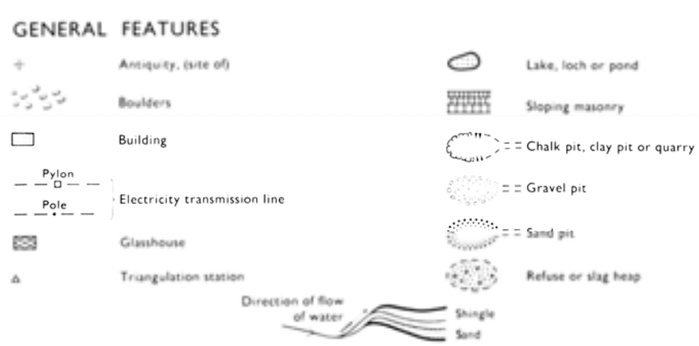

GroundSure

Historical Map Pack Legend

County Series & National Grid

1:10,560 scale & 1:10,000 scale

Information present on these legends is sourced from the same Ordnance Survey mapping as the maps used in this product.

If you have a query regarding any of the maps provided please contact GroundSure's technical helpline. We will endeavour to answer any queries you may have.

Technical Helpline

Tel:01273 819 700
maps&data@groundsure.com
www.groundsure.com

County Series 1:2,500 scale

National Grid 1:2,500 / 1:1,250 scale

GroundSure

Historical Map Pack Legend

County Series

1:1,250 scale

~

County Series & National Grid

1:2,500 scale

Information present on these legends is sourced from the same Ordnance Survey mapping as the maps used in this product.

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www.groundsure.com

GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: MasterMap

Map date: **2007**

Scale: 1:2,500

Printed at: 1:2,500

2007

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Tel: 01273 819500
Email:
maps&data@groundsure.com

Production date:22 July 2008

GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: National Grid

Map date: **1996**

Scale: 1:1,250

Printed at: 1:2,500

Surveyed 1996
Revised 1996
Edition NA
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Levelled NA

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Production date:22 July 2008

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Site Details:

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GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: National Grid

Map date: **1972**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1972
Revised 1972
Edition NA
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Levelled 1968

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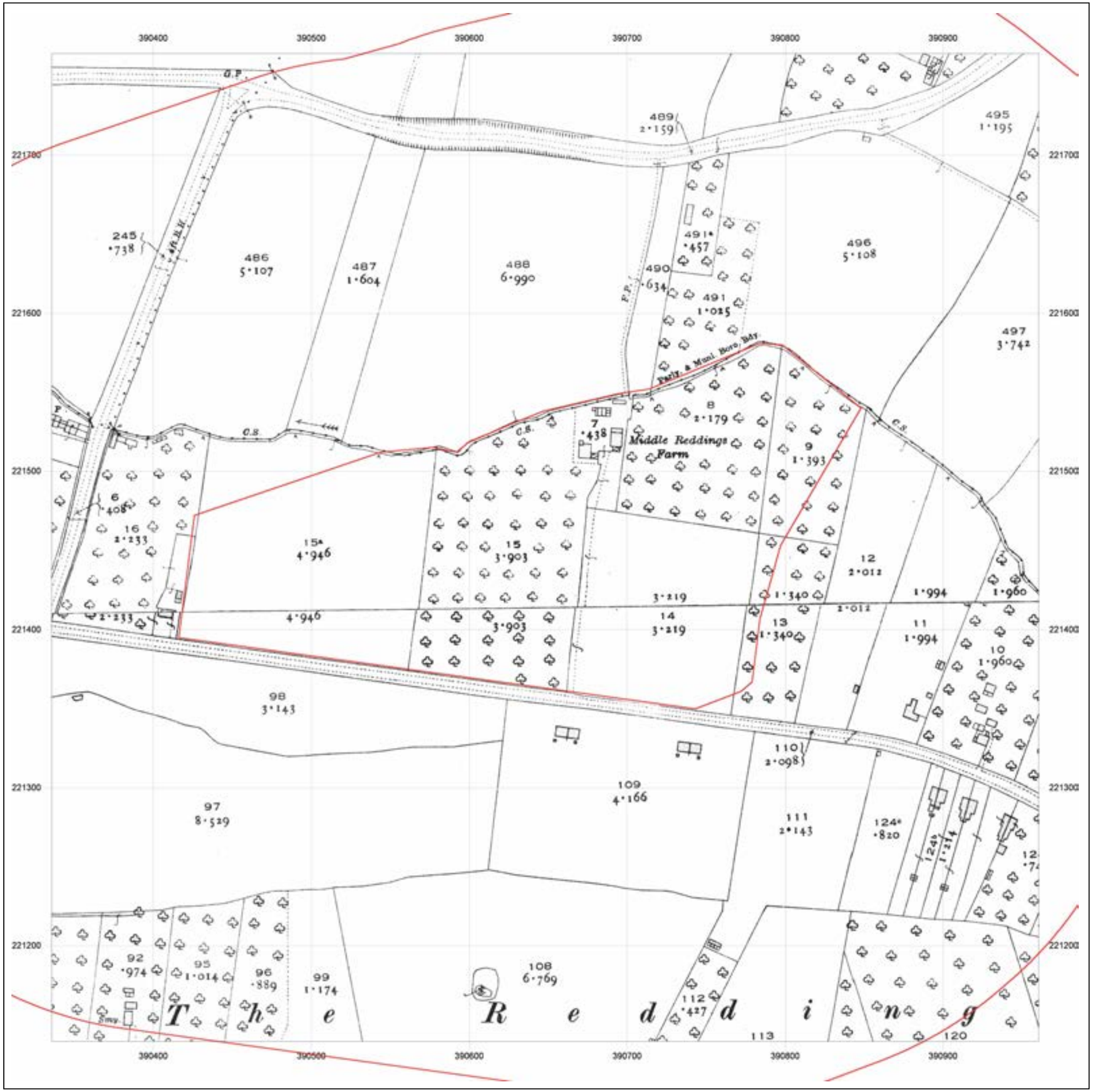


GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

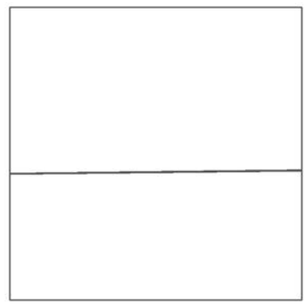
Map Name: County Series

Map date: **1923**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1923
Revised 1923
Edition NA
Copyright NA
Levelled NA



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Revised 1923
Edition NA
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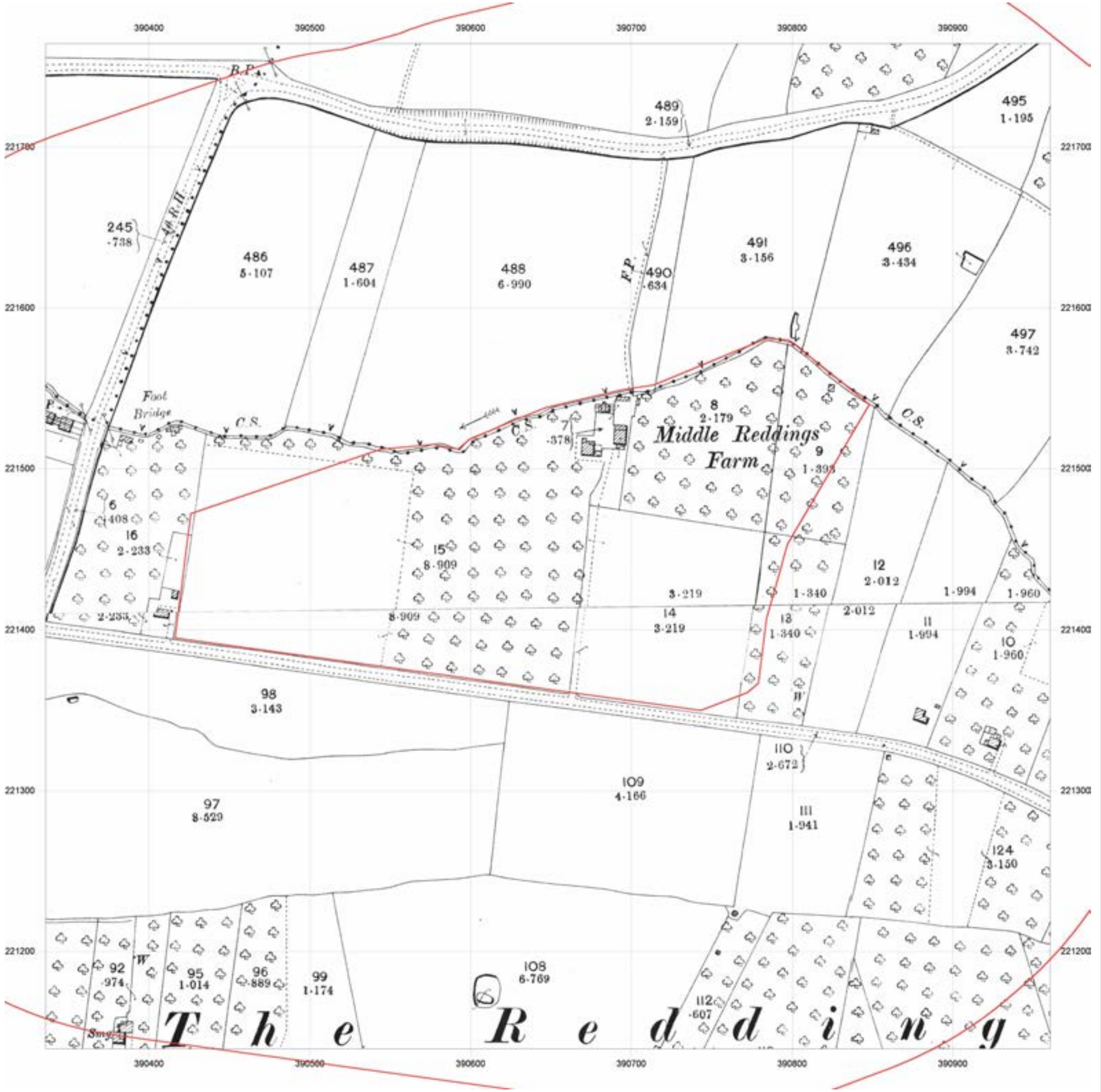

GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1903**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1903
Revised 1903
Edition NA
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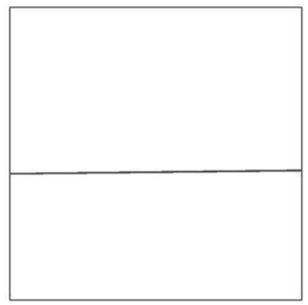

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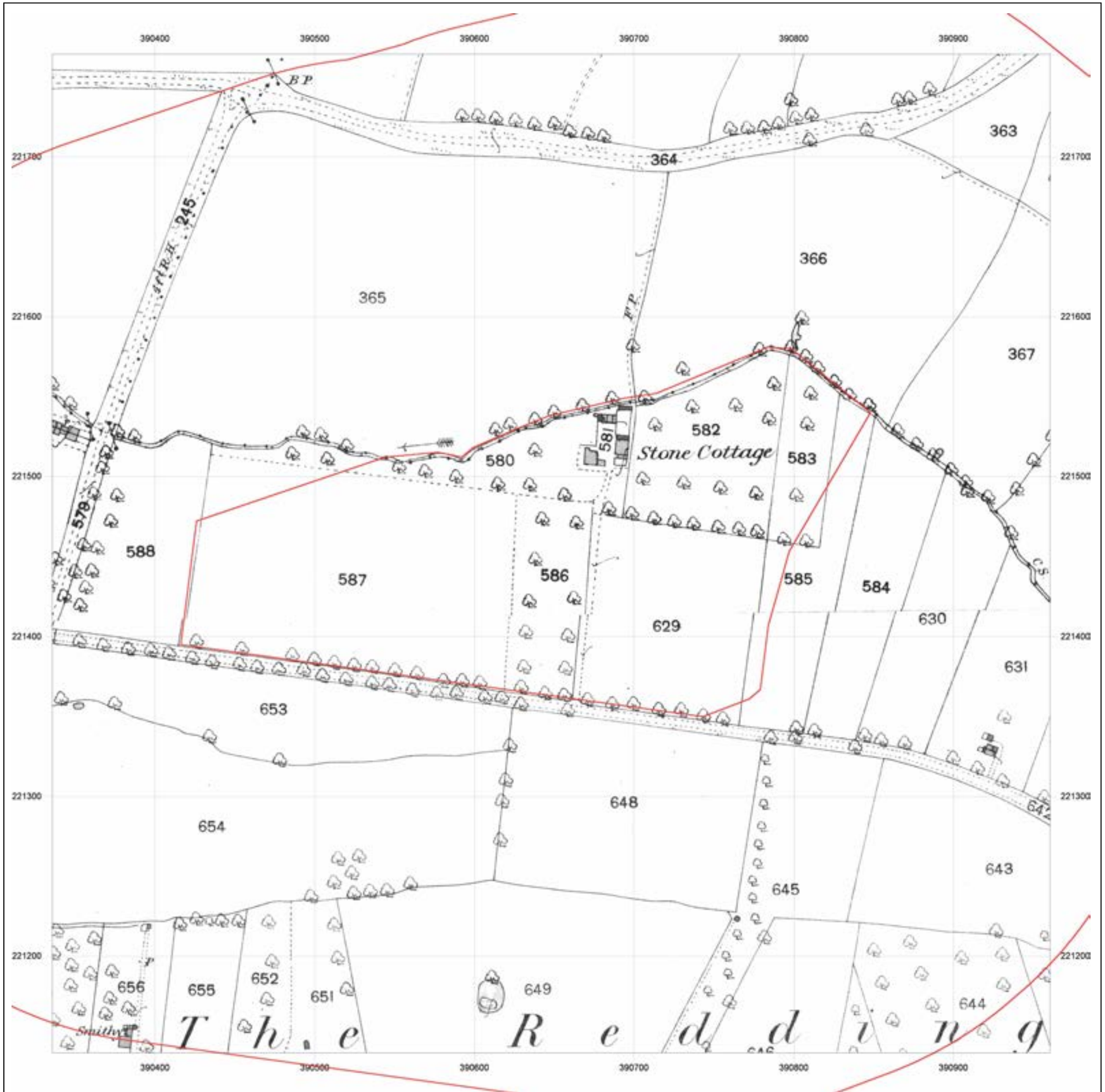

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Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

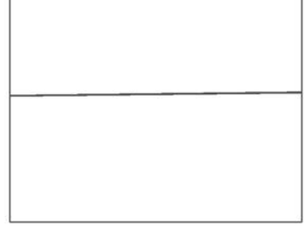
Map Name: County Series

Map date: **1887**

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1887
Revised 1887
Edition NA
Copyright NA
Levelled NA



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Site Details:

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Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: National Grid

Map date: **2005**

Scale: 1:10,000

Printed at: 1:10,000

2005

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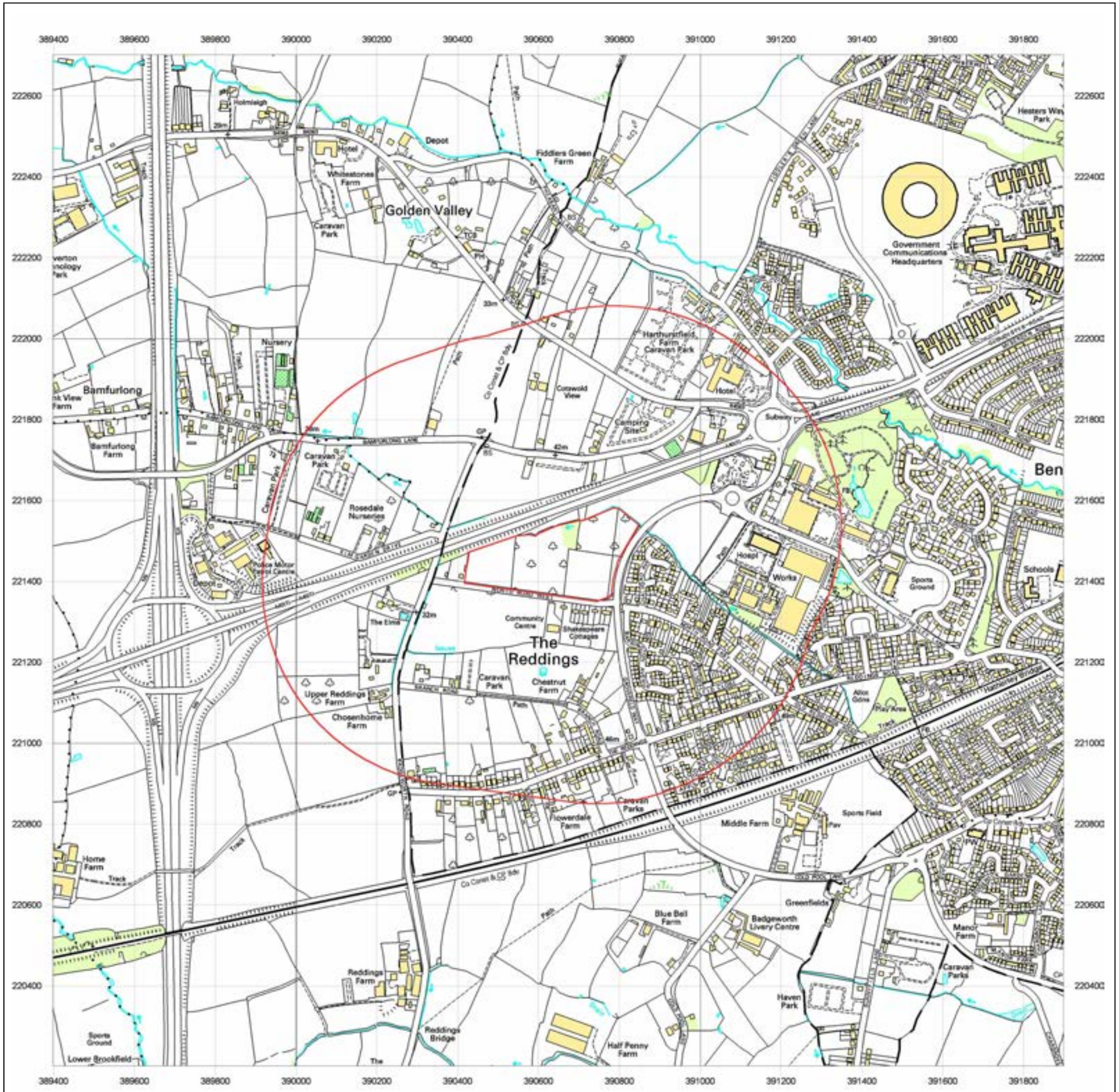

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Site Details:

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GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

2002

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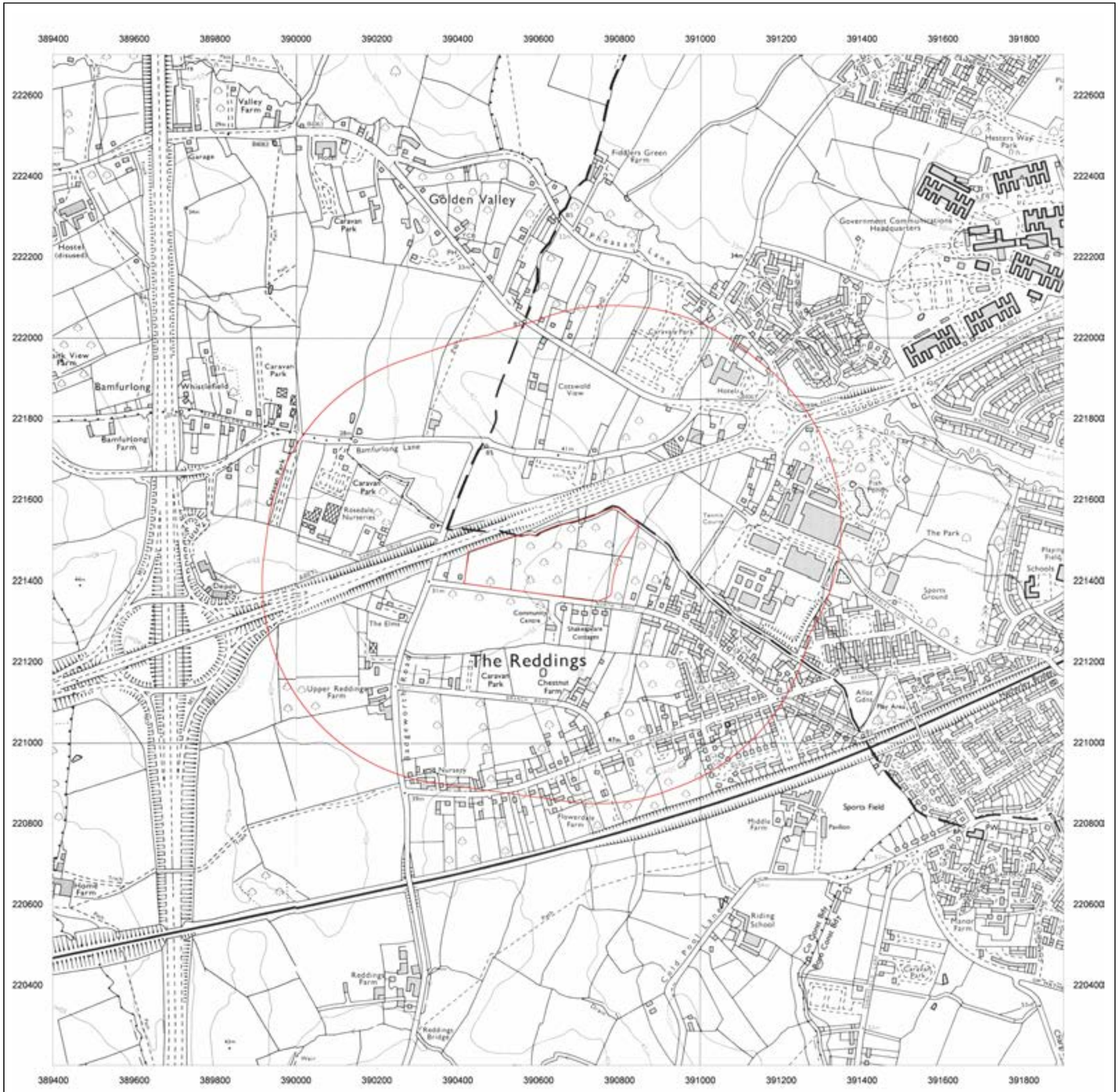
Production date:22 July 2008



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Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: National Grid

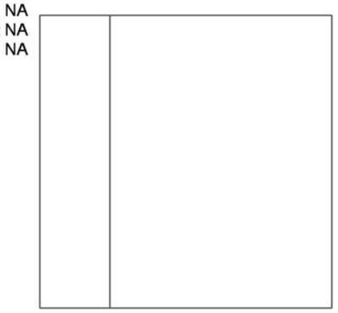
Map date: **1984-1989**

Scale: 1:10,000

Printed at: 1:10,000

Surveyed 1974
Revised 1984
Edition NA
Copyright NA
Levelled NA

Surveyed 1988
Revised 1989
Edition NA
Copyright NA
Levelled NA



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Email:
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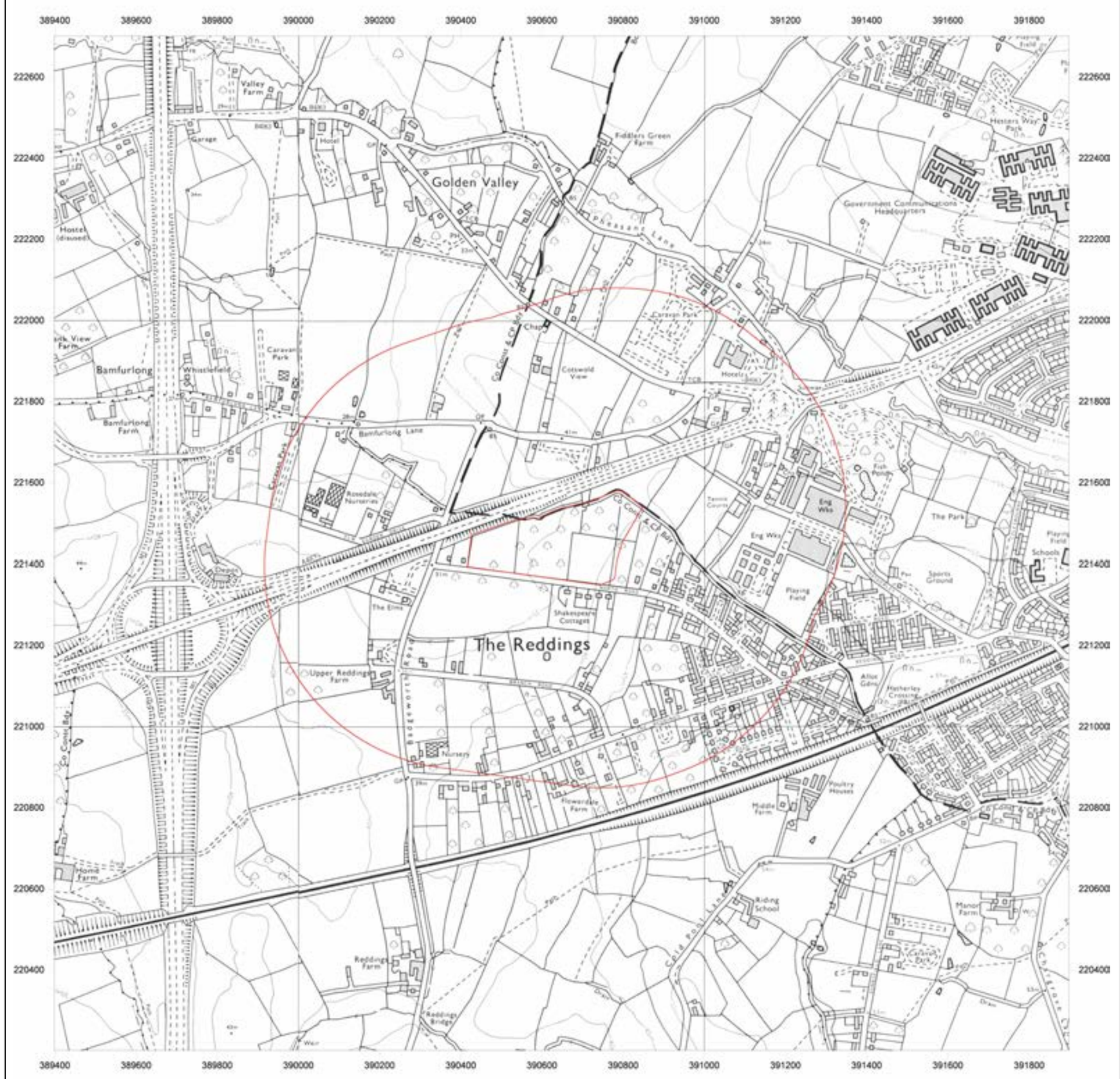
Production date:22 July 2008



GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: National Grid

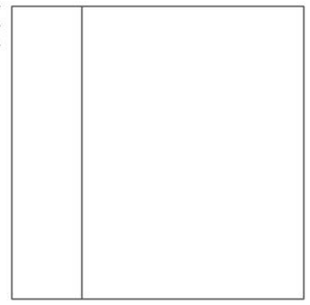
Map date: **1974-1976**

Scale: 1:10,000

Printed at: 1:10,000

Surveyed 1974
Revised 1974
Edition NA
Copyright NA
Levelled NA

Surveyed 1976
Revised 1976
Edition NA
Copyright NA
Levelled NA



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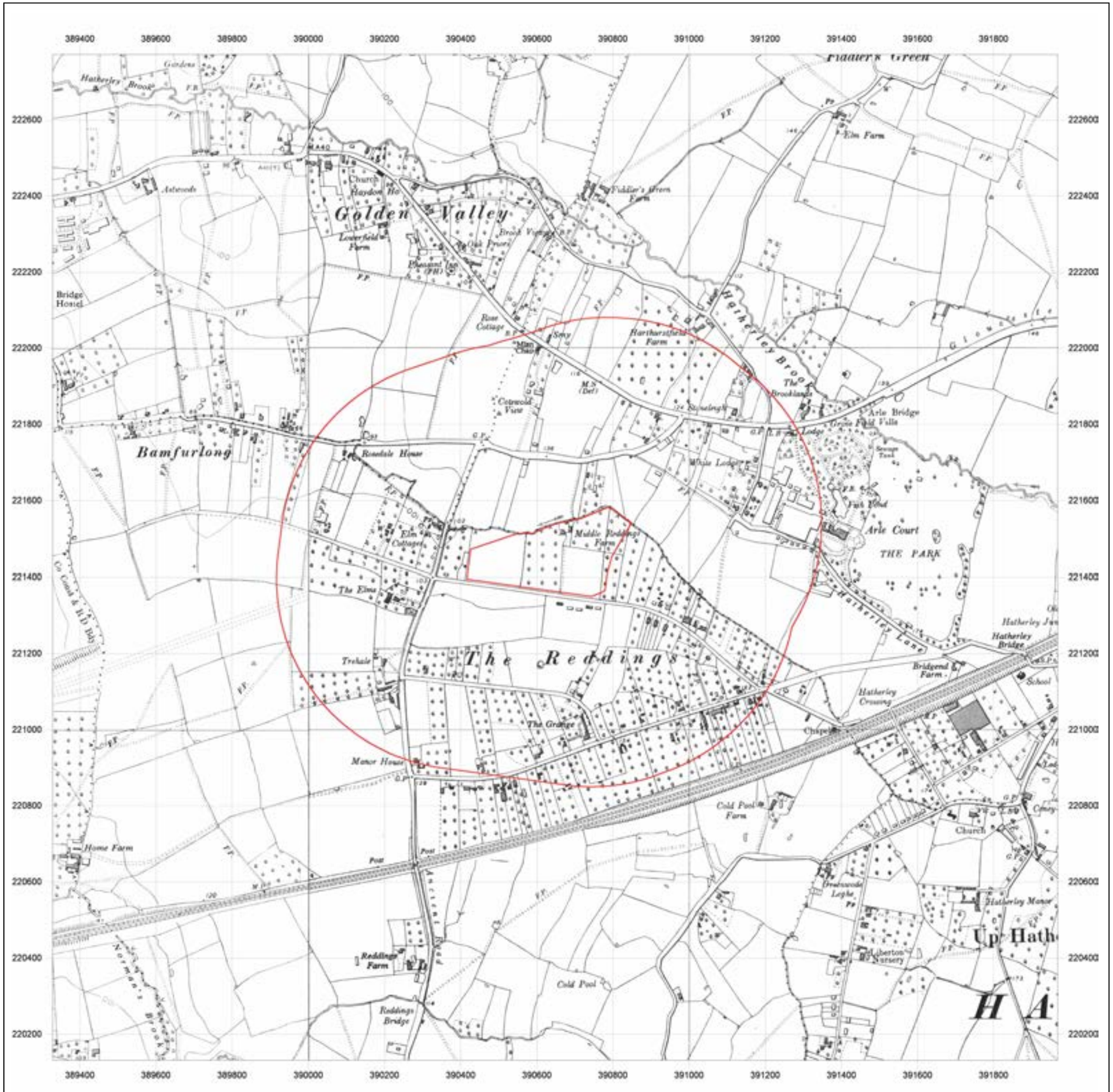
Production date:22 July 2008



GroundSure

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: Provisional

Map date: **1949**

Scale: 1:10,560

Printed at: 1:10,560

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Edition NA
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Edition NA
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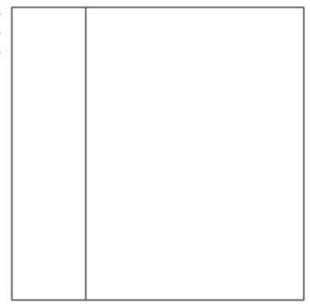

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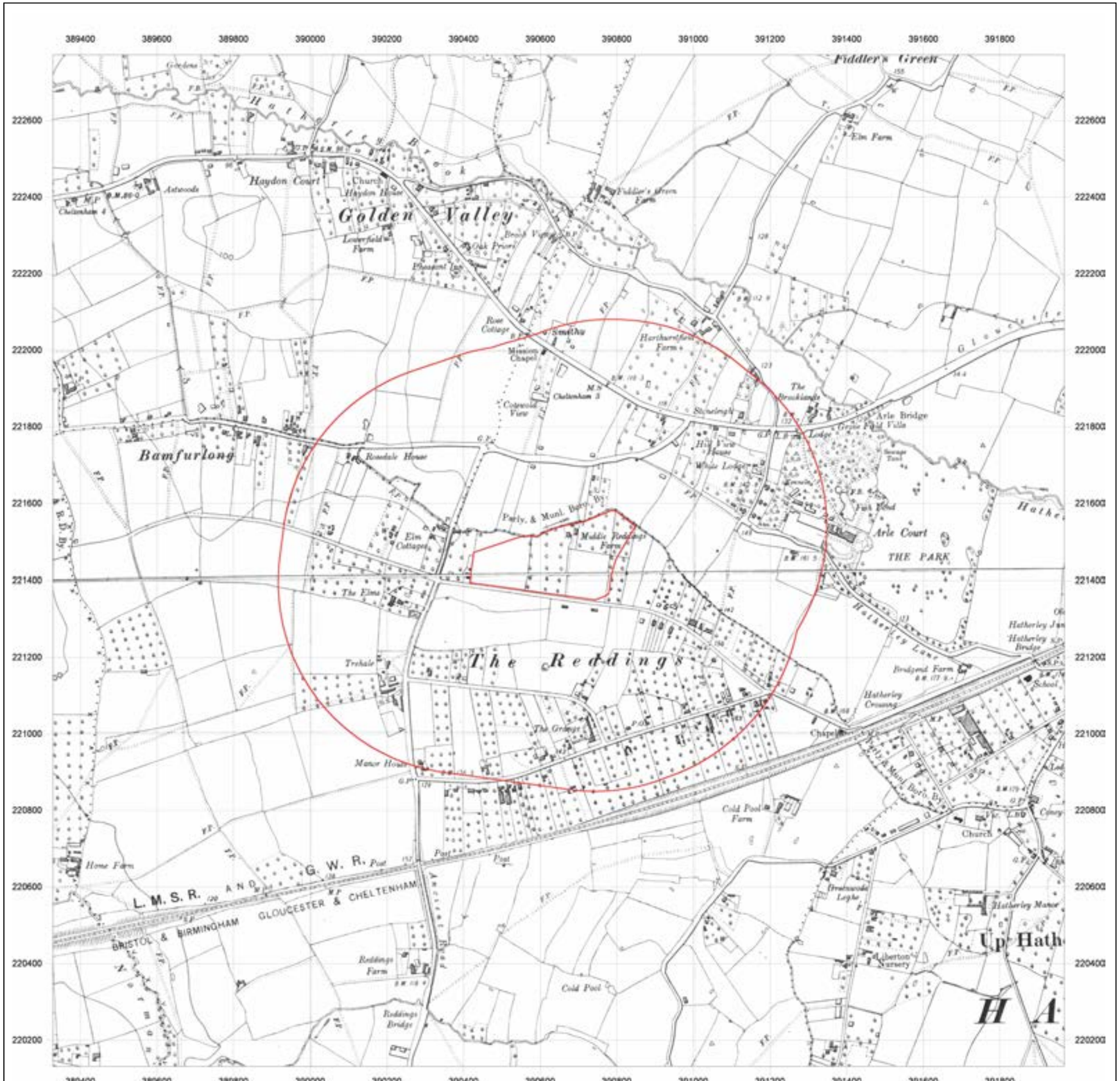

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Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1883
Revised 1938
Edition NA
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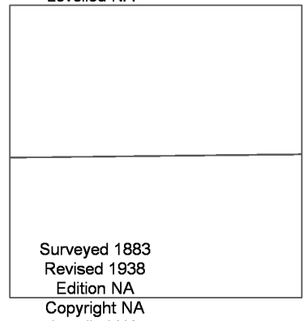

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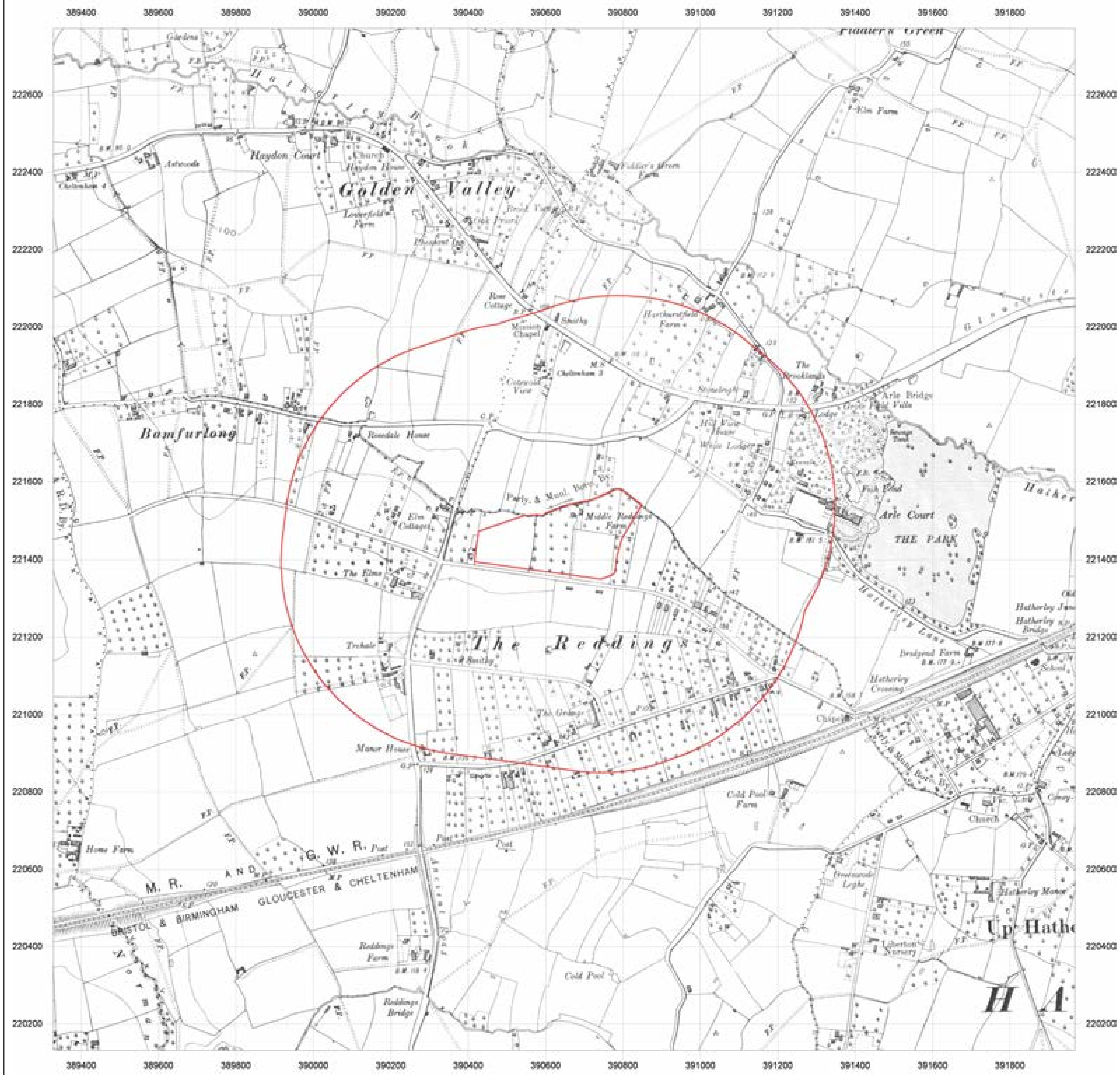

Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1924**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1884
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Edition NA
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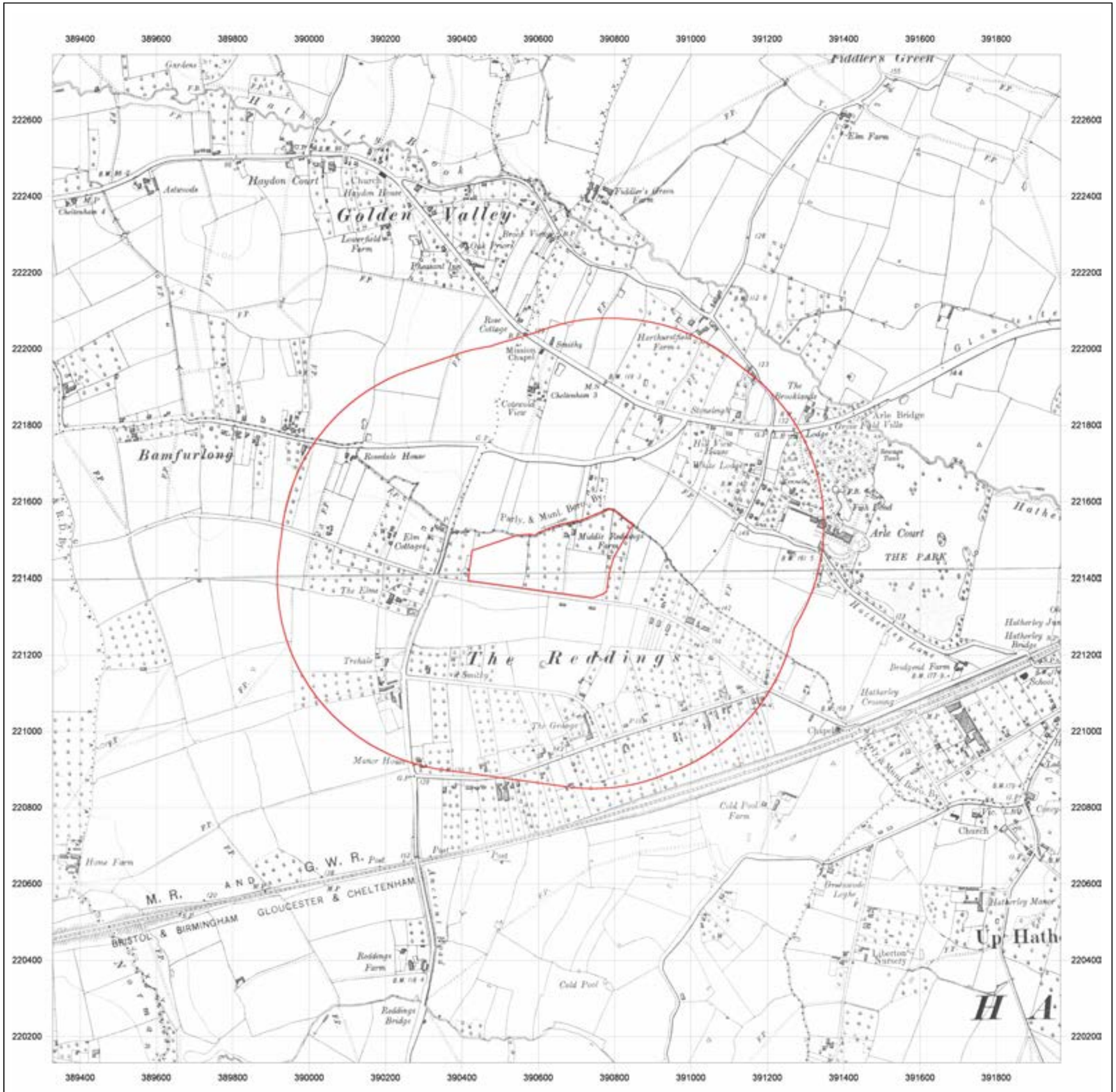

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Site Details:

Grovefield Way, CHELTENHAM,
GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1924**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1883
Revised 1924
Edition 1924
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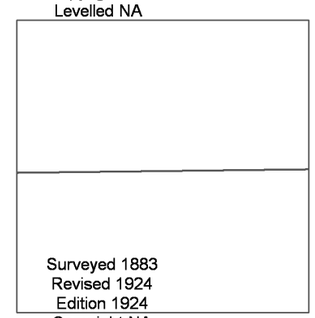

Surveyed 1883
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Edition 1924
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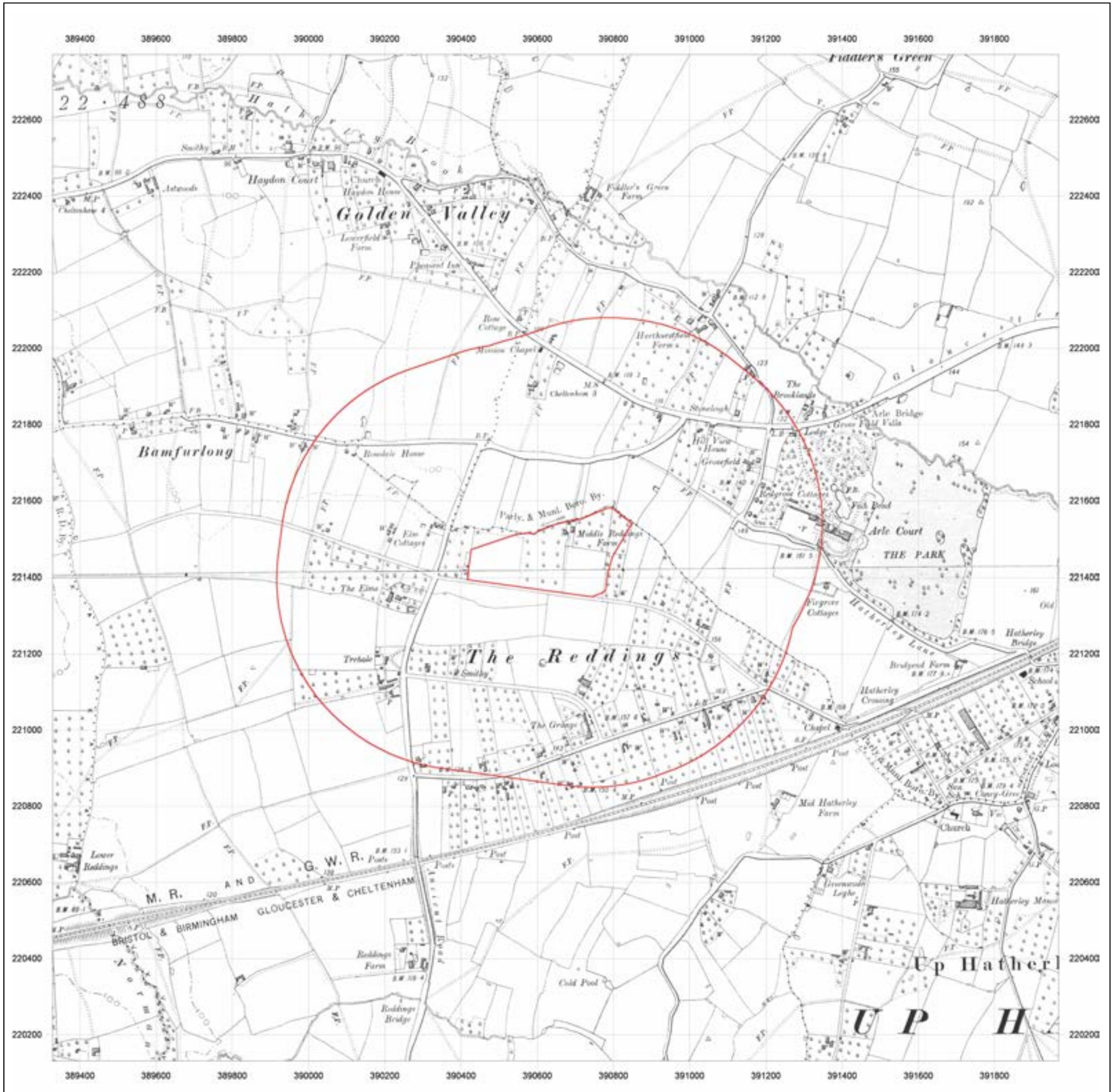

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Site Details:

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GL51 6RF

Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1901**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1883
Revised 1901
Edition NA
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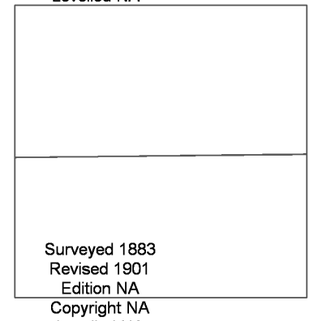

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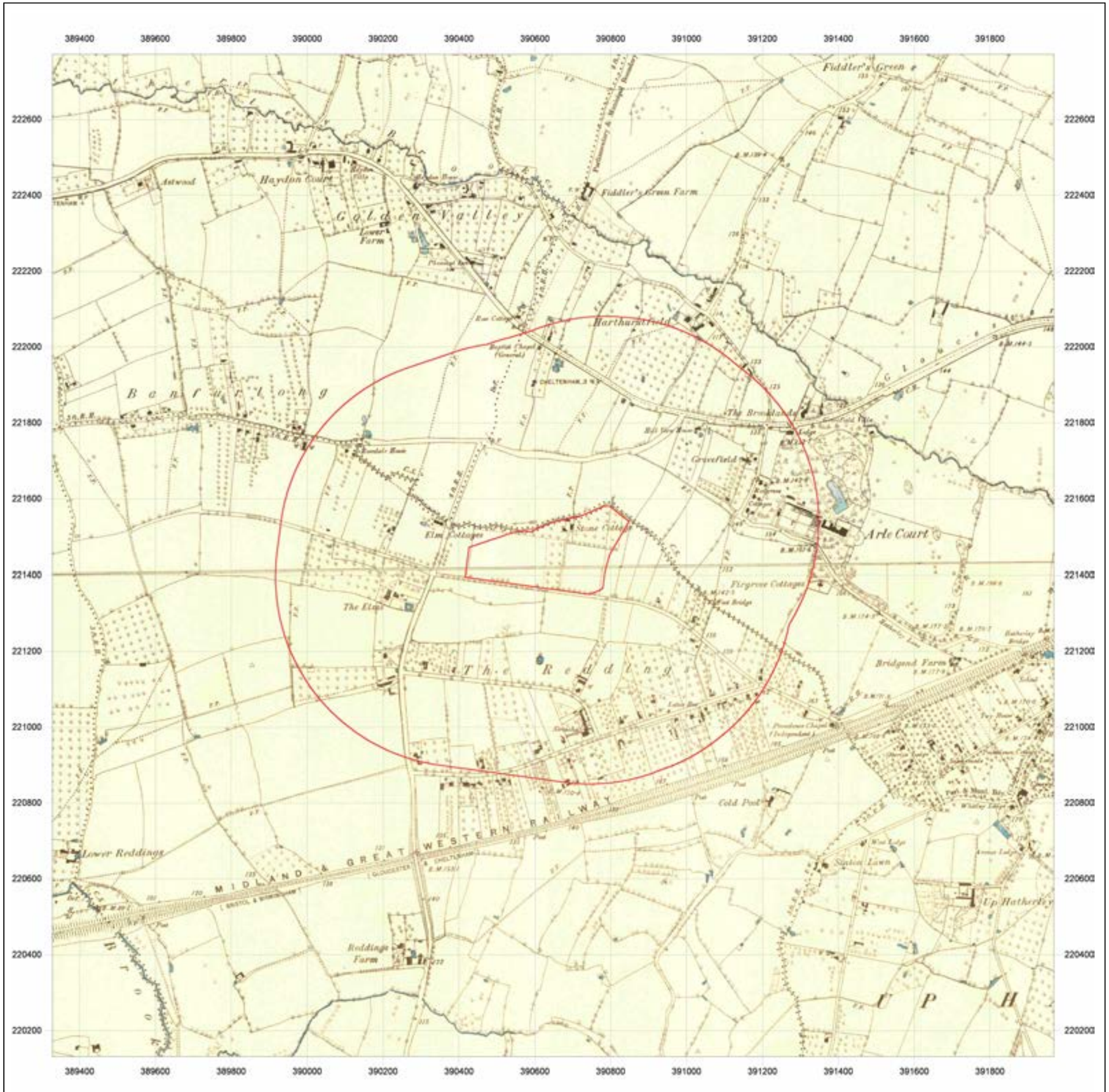

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Client Ref: 722048/MB
Report Ref: HMD-24-174361
Grid Ref: 390648, 221452

Map Name: County Series

Map date: **1884**

Scale: 1:10,560

Printed at: 1:10,560

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