C-FAR - Carbon Footprinting of Archaeological Research: Data collection methodology and Interim Report

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C-FAR

Carbon **F**ootprinting

of

Archaeological **R**esearch

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Introduction

The Carbon Footprinting of Archaeology Research (C-FAR) project originated in 2008 with a small grant from the British Academy to fund the pilot year. The project focused on developing a method of determining the carbon footprint of university-led archaeological training excavations. Underlying the project was the principle that part of developing a sustainable approach to archaeological fieldwork (of any derivation: academic, community or commercial) is establishing a base-line understanding of how our research affects the environment. This targeted project attempted to make a first step in that process. The data collection covered three seasons of a residential UK fieldschool and tested the feasibility of both general and detailed reporting. This report sets out the data collection methodology and the initial outcomes and analysis; further contextualisation and implications of the project will be published elsewhere.

C-FAR was established as a pilot project to investigate how the carbon footprint of archaeological excavation (particularly that associated with university-led research projects) might be established with the intention of investigating how it could then be reduced. An underlying tenet of the project is that the evaluation of the carbon footprint of archaeological research is needed to ensure our discipline develops sustainable and environmentally responsible methodologies and practices. It is only through establishing a base-line understanding of our current footprint that action can be taken to reduce the impact of fieldwork not just in universities, but also in the community and commercial archaeological sectors. The research objectives for the project included: the development of a method or prototype 'carbon calculator' for archaeological excavation focusing on key activities: travel, energy use, materials, food (where applicable) and waste and secondly, the application and testing of this method on various years of the field school. The research questions centred on evaluating whether it was possible to establish a carbon footprinting methodology for archaeological excavation and if so, what the implications of this might be for future projects.

Context

In 1998, the Greenhouse Gas Protocol Initiative was launched by a consortium of businesses, NGOs, governments and other parties; a guideline for corporate accounting of emissions was published in 2001 and updated in 2004 (World Business Council for Sustainable Development and the World Resources Institute 2004 (referenced from here as GHG Protocol 2004)). This reflected a growing political and corporate belief that the measuring, tracking and open reporting of greenhouse gas emissions should be a key responsibility of business. In the UK, the 2009 DEFRA guidelines on accounting for emissions are based on the GHG Protocol (DEFRA 2009, 4). Like all activities, archaeology involves the use of energy and the production directly or indirectly of a range of greenhouse gases. A carbon footprint tends to include both carbon and non-carbon emissions and is expressed as CO_2 equivalents, which represent the

total climate change impact of all the greenhouse gases expressed in terms of the amount of CO_2 that would have same impact (Berners-Lee 2010, 2). The methodologies and available tools to calculate carbon footprints of individual activities or products are numerous and arguments can be made that many of the CO_2 equivalents assigned to these actions and products are largely guess work or based on such an average as to be relatively meaningless in real scenarios. However, even these loose estimates begin the debate and offer insight as to where knowledge of 'real' carbon footprints are lacking. This project sits within a growing and diverse attempt amongst universities and businesses to calculate relevant carbon footprints to develop green policy and procedures and benefits from discussion with the originators of the Carbon Footprint Calculator for Field Work, developed in the Department of Geography and Development Studies at the University of Chester (Ribchester, Alexander and Hunt 2008).

Collection Methodology

The annual fieldschool of a large scale UK research project (hereafter 'the project' or 'the fieldschool') was used to test data collection methodologies and the C-FAR research objectives from 2008-2010. The field season lasted three weeks with the full cohort with a smaller contingent staying on up to another week. The number of participants ranged from 35 – 66, including staff and students. It was a residential fieldschool with all members staying in individual dormitory room accommodation with central dining facilities, one large common room and two kitchenettes. The project generally used minibuses for daily transport to/from site with some participants opting for private transport. Catering was provided by different outlets over the three years: by the accommodation provider and from outside local sources. Similar to other archaeological excavations, the project used a range of equipment requiring electricity including desktop computers, laptops, a printer, several total stations, GPS and digital camera chargers.

Project inventory boundary

The first major issue when beginning to account for emissions is identifying the 'inventory boundary,' or what to 'count.' Accounting and reporting should be complete, consistent, accurate and transparent. However, due to lack of full information or limitations in data collection, it is recognised that there will always be some measure of trade-off between accuracy and completeness and that evaluations may change in scope or method as new information or techniques of accounting become available (GHG Protocol 2004, 7). C-FAR used an operational inventory boundary, which considered both direct (from sources controlled by the project) and some indirect emissions (consequences of the project, but not fully under our control). The organisational boundary was limited to the fieldschool event itself and for this pilot project did not include preparation (such as mechanical excavators to remove topsoil), post-excavation (such as flotation) or analysis (such as radiocarbon dating). The omission of key activities such as these highlight the trade-offs between accuracy, feasibility and completeness that are unfortunately necessary at this stage of developing methodologies.

The DEFRA and GHG Protocols divide emissions into three categories or scopes, which are used in the following account. ***Scope 1*** includes direct emissions; for archaeological fieldwork the most relevant activity in this category relates to fuel use in company or project vehicles (GHG Protocol 2004, 26). ***Scope 2*** defines indirect emissions from purchased energy use. ***Scope 3*** brings together all other indirect sources of emissions. This is a wide ranging category and includes things such as the footprint of goods used or consumed, waste disposal and employee travel (e.g. commuting to work). As many Scope 3 sources are difficult to account for, guidance documents recommend concentrating only on 'significant' sources (DEFRA 2009, 11-12). Table 1 shows a breakdown of activities by Scope accounted for in the C-FAR project.

Scope 1	Project Travel: to/from project, to/from site daily, essential travel such as field trips and shop runs
Scope 2	Electricity for Project: 'daily life' activities in accommodation, project equipment
Scope 3	'Employee' Travel: individuals commuting to project Indirect fieldschool electricity Food: catering provided by project

Table 1: Items included in the project inventory

It was originally hoped to be able to include within Scope 3 those emissions related to the use of excavation-specific materials such as plastic finds bags/sample bags, drafting film and paper for recording sheets. This proved to be extremely difficult to actualise. Materials used can be estimated based on final records (although accuracy for this is more difficult for finds and sample bags), but existing emissions information for bespoke items is not publicly available. Discussions with providers and suppliers did not prove fruitful; current legislation does not require emissions to be calculated, methodologies are still developing and some providers may feel information is too sensitive. It would be a major step forward in reporting accuracy if these specialist items, often designed specifically to not degrade or be recycled, could be assessed and included.

Surveys

Most C-FAR data was collected via voluntary questionnaires, an example of which can be found in Appendix A, distributed to staff and students and collected at the fieldschool orientation meeting each year. The questionnaire was designed to aid the calculation of Scope 1 project travel and Scope 3 individual travel, indirect electricity use and the carbon footprint of feeding fieldschool participants. Although attempts were made to ensure accurate and comprehensive completion of the surveys, some participants were missed and some surveys were either wholly or partly unusable due to missing information. The main reasons completed surveys were unusable or only partly usable were lack of relevant journey information (no mileage calculable), no estimated hours of appliance use provided or no diet information provided. This included two instances of plane journeys in 2008 where origin/destination

was not included; the inclusion of two plane journeys potentially could have impacted the overall indirect travel for that year considerably.

Total fieldschool attendees				Total surveys filled in				
	staff	students	ALL	ALL	Usable transport	Partly usable transport	Usable elect.	Comments
2008	11	27	38	38	37	4	38	
2009	12	36	48	40	39	1	36	1 no electric brought
2010	16	50	66	33	32	1	31	

Table 2: Numbers of participants and C-FAR surveys completed

Emissions Calculation Methodology

Scope 1	World Resources Institute GHG emissions from transport or mobile sources Calculation Tool (World Resources Institute 2008).
Scope 2	Emissions from energy for project accommodation: based on UK average From project equipment: kwH x .5246kgCO2e. Conversion factor from Defra/Carbon Trust figures for grid electricity (Carbon Trust 2011, 3).
Scope 3	'Employee' Travel emissions: as Scope 1 travel Indirect fieldschool electricity: As Scope 2 project electricity calculation Food (catering provided by project): days x kgCO2e/day by diet type.

Table 3: Summary of calculation methods

Travel (Scope 1 and Scope 3)

Scope 1 project travel was accounted for by recording the mileage of minibuses and other project vehicles. Scope 3 project travel was derived from the individual questionnaires. All data was entered into the online Calculation tool for travel emissions from the World Resources Institute. Although many such online free carbon calculators exist for travel emissions, this version proved to be the easiest and most comprehensive to use based on the C-FAR data collected. Detailed collection data can be found in Appendix B. When only part information was provided for car type or engine size in questionnaires, estimates were based on emissions the default of 'petrol, engine size unknown' in the calculation tool. When some qualifier was given (e.g. 'small car') then a default of a small petrol car was used (<1.4 litre petrol engine passenger car). No direct equivalent was available for minibuses, and the default of a small light goods diesel vehicle was used.

Electricity (Scope 2 and Scope 3)

To account for Scope 2, direct project electricity use, two methods were used. All relevant project equipment was itemised and use hours calculated. To establish the average kwH electricity consumption, project equipment was connected to mains for charging and operating (where applicable)

via a standard plug-in electricity cost and usage calculator, which provided the average draw of watts (see Appendix C). This enabled assessment of specialist equipment such as chargers for total stations or GPS units. A similar procedure was done for items associated with indirect project electricity (Scope 3) and where this was not possible, calculations were based on publicly accessible averaged data or from recorded voltage and amps for exemplars of appliances (See Appendix C for details).

Electricity related to the project accommodation, referred to as the 'daily life' of the project, was more difficult to account for as no access could be given to the electricity meter for the dormitory building and usage could not be parsed from the overall usage at the accommodation centre. Thus, to account for basic accommodation electricity (lights, single TV use, heating water, general electricity) an estimate per person per day of KwH was based on the overall UK energy use per household divided by the average population of households in 2009 (See Table 4; Palmer and Cooper 2011). Communal living in a dormitory is less emissions-intensive than the average UK household, so this number is likely an over-estimate (Druckman and Jackson 2008, 9). The inclusion of electrical items used by fieldschool members within Scope 3 may also add an element of double-counting, but given the potential for exponential multiplication of certain items (various chargers, laptops) above and beyond what might be considered as 'normal' for a household, these were included in the overall emissions calculations.

2009 average household energy use	2009 population of average household	Average per person use per year	Average per person per day
18,639 KwH[(1)]	2.34[(2)]	(18,639kwH)/2.34= 7965KwH/pp	7935KwH/365 days= 22KwH/pp/pd

Table 4: Calculating the 'daily life' figure for the fieldschool (Figures from Palmer and Cooper 2011, p.8 (1) and p.68 (2)).

Food (Scope 3)

All participants were asked to describe their diet from four options (see Appendix A). The carbon footprint of dietary choices is increasingly recognised as a significant contributor to an individual's carbon footprint and the footprint includes not only the food itself, but food waste, production and transport of items (Berners-Lee et al 2012, 184). It has been generally recognised that meat and dairy products result in more emissions than vegetables (ibid; 185). The descriptions were based on methodology developed by Ribchester, Alexander and Hunt (2008) for tracking the carbon footprint of geography fieldtrips. Their definitions and carbon estimates are based on those established by Michaelis (2007). The conversion factors used for C-FAR to translate diets into CO_2e derive from research on the GHG emissions of a range of foodstuffs and different diets utilising detailed life cycle analysis (Berners-Lee et

al. 2012). The 'mostly meat' diet was not a scenario modelled by Berners-Lee et al. (2012). To determine an estimate for this description, these 2012 figures were compared against conversion factors defined in 2007 (Michaelis 2007). The estimate is based on a simple extrapolation from the difference between the 2006 and 2012 typical diet emissions where two more kg of CO_2e per day was added.

Diet description	2007	2012
1/3 meat or 'typical' British diet	2000kg/year = 5.4kg/day	7.4kg/day
Mostly meat diet (1/2)	2250kg/year= 6.2kg/day	8.2kg/day estimated
Lacto-ovo vegetarian	1400kg/year= 3.8kg/day	6.1kg/day
Vegan	1000kg/year= 2.7kg/day	5.7kg/day

Table 5: Diet and emissions (Figures based on Michealis 2007 and Berners-Lee et al. 2012).

Summary of Emissions and Conclusion

C-FAR Carbon Footprint - GHG Emissions data for period 2008-2010			
	Metric Tonnes of CO2e		
	2008	2009	2010
Scope 1 (Project Travel)	1.919	1.624	1.352
Scope 2 a) Project 'daily life' b) Project Electricity	 a) 7.952 b) 0.034	 a) 8.656 b) 0.035	 a) 7.860 b) 0.039
Scope 3 a) 'Employee' travel b) Indirect electricity c) Food	 a) 0.906 b) 0.034 c) 4.963	 a) 0.828 b) 0.030 c) 5.459	 a) 5.663 b) 0.055 c) 4.911
Total gross emissions	15.808	16.632	19.880
Per person (surveyed)	0.416	0.416	0.602

Table 6: Summary of calculated emissions

The largest contributor to the GHG emissions of the project is the basic energy required for 'daily life.' Although incurred whilst on the project, these emissions would have occurred anyway and the fieldschool had little control over them. The next largest contributor to emissions is the provision of food. Again, participants would have produced these emissions outside of the fieldschool as they ate their normal diets. However, this is one area where projects such as fieldschools could potentially reduce emissions. The most radical green policy would be to have catering completely vegetarian or even vegan, but this is likely to cause problems. Choices made in planning stages about other aspects of catering can also

contribute to reduced emissions. For example, the fieldschool stopped using one caterer that supplied individual bottled water for each lunch.

The overall emissions per person surveyed remained very consistent for the first two reporting years, but increased by about 40% in 2010 largely due to a jump in Scope 3 travel related to an increased number of international participants that year in the fieldschool. Direct (Scope 1 and 2) emissions relating to the operation of the fieldschool remained relatively consistent. This may suggest that in a well-planned operation, a carbon footprint base year could be calculated for a long-term research project and used to determine strategies and targets for carbon reduction or carbon offsets in future years. Radical green policy might restrict international participants thus avoiding emissions from long-distance flights, but as this is a lucrative income stream for many archaeological projects the environmental costs may not be of primary importance. Clearly, if ethical green policy is to be taken seriously in archaeological research, then it will need to be accounted for at the outset and embedded fully into the project design.

Overall, the experiment in carbon footprinting of archaeological research has shown that the tools exist, if time and resources can be devoted to it, to calculate the basics of a carbon footprint. It is possible to calculate the carbon footprint of research – to a point. The issue of the 'known unknown' footprints of specialist materials means that the most discipline-specific activities cannot yet be counted. Whilst C-FAR originally had hoped that collaborations with industry and providers could develop life cycle analyses for such materials, the current economic and political climate means that green issues are no longer prioritised. The decision to calculate a carbon footprint is not only an exercise in recording, but also manifestly will involve ethical and political decisions about the cost of emissions vs. research objectives and income, the implementation of green policy or green strategies on research/commercial projects and inclusion of carbon offsetting costs in grant applications and project budgeting. C-FAR offers a first step towards this debate within the discipline.

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Appendix A: Example of C-FAR questionnaire

*Survey No.*_____

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C-FAR Individual Questionnaire: 2010

Please take a few minutes to fill out this questionnaire. Your information is anonymous and will be used for research purposes.

.....

1. How many days are you spending on the SERF residential project? _____

2. How did you get to the project? WHERE were the start and end-points of each leg of your journey – use postcode or town? ***(tick all that apply)***

Project Minibus start: _____ end_____

Project Car/vehicle start: _____ end_____

Train start: _____ end_____

Coach/bus start: _____ end_____

Own Car start: _____ end_____

Car-share start: _____ end_____

If you came in your own car or in a car-share, please answer the following:

Engine size:

Fuel Type: **Number of people in car:**

3. How are you planning on getting home/leaving the project? Answer as above.

Project Minibus start: _____ end_____

Project Car/vehicle start: _____ end_____

Train start: _____ end_____

Coach/bus start: _____ end_____

Own Car start: _____ end_____

Car-share start: _____ end_____

4. Please tick all personal electrical appliances you brought with you (this excludes project equipment). In the second column, please estimate how many hours per week you will be using/charging the item.

ITEM	Hours per week used (estimate)
Mobile phone charger	

Laptop	
Music device (radio/CD player)	
iPod/MP3 type music device charger	
Hairdryer	
Electric razor	
Digital camera battery charger	
Fan	
Portable or other DVD player	
Portable or other TV	
Hair straightener or styler	
Other items (please list)	

5. How would you describe your daily diet?

Typical British (c. ⅓ meat based)
Mostly meat! (c. ½ meat based)
Lacto-vegetarian
Vegan
Other _____

.....

That's it! Thank you for your help and for answering these questions. Please remember to use the recycling bins provided for all your cans, bottles and papers over the next few weeks.

Appendix B: Travel

(Extracted from completed WRI Calculation Tool (World Resources Institute 2008)

2008: Scope 1 and Scope 3 Travel

Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Activity Data			GHG Emissions			
					Vehicle Type	Distance Travelled	Unit of Distance	Fossil Fuel CO2 (metric tonnes)	CH4 (kg)	N2O (kg)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
2008 Survey: car 1.8 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	114	Mile	0.039			0.039
2008 Survey: car 1.3 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2008 Survey car 1.2 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2008 Survey: project minibus Fort Transit 14 seater diesel	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	624	Mile	0.273			0.273
2008 Survey: project crewbus Vauxhall Movano 2.2 DtI	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	736	Mile	0.322			0.322
2008 Survey: project minibus Ford Transit minibus	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	785	Mile	0.343			0.343

2008 Survey: project Landrover	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size >2.0 liters	685	Mile	0.284			0.284
2008 Survey: project minibus Fort Transit diesel	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	642	Mile	0.281			0.281
2008 Survey: Ford Focus project car	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	1371	Mile	0.415			0.415
2008 Survey: short haul flight Luton-Glasgow	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Domestic	318	Passenger Mile	0.098			0.098
2008 Survey: train journey Abd-Gla	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	162	Passenger Mile	0.016	3.240E-04	1.620E-04	0.016
2008 Survey: ferry Shet-Abd	UK	Water	Scope 3	Passenger Distance (e.g. Public Transport)	Large RoPax Ferry	210	Passenger Mile	0.039			0.039
2008 Survey: Dennistou-Gla C train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - Average (Light Rail and Tram)	4	Passenger Mile	5.021E-04	1.600E-05	8.000E-06	5.049E-04
2008 Survey: Tube Hillhead-St Enoch	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - Subway	6	Passenger Mile	6.276E-04	2.400E-05	1.200E-05	6.318E-04
2008 Survey: York-Gla train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	508	Passenger Mile	0.049	0.001	5.080E-04	0.049
2008 Survey: small car	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	74	Mile	0.025			0.025

2008 Survey: flight Finland-Gla	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Short Haul - Economy Class	2348	Passenger Mile	0.386			0.386
2008 Survey: 1.3 petrol car share (3)	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	122	Mile	0.036			0.036
2008 Survey: compact petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2008 Survey: 2L diesel	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	30	Mile	0.009			0.009
2008: Survey 1.2 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	30	Mile	0.009			0.009
2008 Survey: 2L petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	74	Mile	0.025			0.025
2008 Survey: 1000cc petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2008 Survey: 660cc tiny car! Petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2008 Survey: Perth-Gla train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - Average (Light Rail and Tram)	65	Passenger Mile	0.008	2.600E-04	1.300E-04	0.008

Summary 2008:

Mode of Transport	Scope	Fossil Fuel Emissions			Biofuel CO2 Emission (metric tonnes)
		Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	
Road	Scope 1	1.919	0	0	0
	Scope 3	0.309	0	0	
Rail	Scope 1	0	0	0	0
	Scope 3	0.074	0.002	8.200E-04	
Water	Scope 1	0	0	0	0
	Scope 3	0.039	0	0	
AirCraft	Scope 1	0	0	0	0
	Scope 3	0.484	0	0	
Total Emission (metric tonnes CO2e)		2.824	0.002	8.200E-04	0
Total GHG Emission (metric tonnes CO2e)		2.824			

2009: Scope 1 and Scope 3 Travel

Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Activity Data			GHG Emissions			
					Vehicle Type	Distance Travelled	Unit of Distance	Fossil Fuel CO2 (metric tonnes)	CH4 (kg)	N2O (kg)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
2009: 1.3 Petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	628	Mile	0.183			0.183
2009: Project minibus (Ford Transit)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	741	Mile	0.324			0.324
2009: Project minibus (Ford Transit)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	1130	Mile	0.494			0.494
2009: Project miniubs (blue Ford Transit)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	386	Mile	0.169			0.169
2009: Project crew bus (VH Movano 2.2)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	650	Mile	0.284			0.284
2009: Project Landrover	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size >2.0 liters	650	Mile	0.270			0.270
2009: Rented minibus Abd-FG return	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	188	Mile	0.082			0.082
2009 Survey: small petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	74	Mile	0.022			0.022
2009 Survey: train	UK	Rail	Scope 3	Passenger Distance	Train - Average (Light Rail and	36	Passenger Mile	0.005	1.440 E-04	7.200E -05	0.005

Alex.-Gla				(e.g. Public Transport)	Tram)						
2009 Survey: small petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	111	Mile	0.032			0.032
2009 Survey: sm petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	68	Mile	0.020			0.020
2009 Survey: city coach	UK	Road	Scope 3	Passenger Distance (e.g. Public Transport)	Bus - Local Bus	10	Passenger Mile	0.002	6.000 E-06	5.000E -06	0.002
2009 Survey: large petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	72	Mile	0.025			0.025
2009 Survey: Micra petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2009 Survey: unspec car	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	15	Mile	0.005			0.005
2009 Survey: train Bar.-Gla	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - Light Rail	150	Passenger Mile	0.024	6.000 E-04	3.000E -04	0.024
2009 Survey: local coach	UK	Road	Scope 3	Passenger Distance (e.g. Public Transport)	Bus - Local Bus	28	Passenger Mile	0.005	1.680 E-05	1.400E -05	0.005
2009 Survey: 1.0 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	58	Mile	0.017			0.017
2009 Survey: 1.8 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	32	Mile	0.011			0.011
2009 Survey: 1.3 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033

				Transport)							
2009 Survey: 2.0L diesel	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	84	Mile	0.025			0.025
2009 Survey: 1.6 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	52	Mile	0.018			0.018
2009 Suvey: small petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	62	Mile	0.018			0.018
2009 Survey: 1.1 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	126	Mile	0.037			0.037
2009 Survey: car unspec	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	114	Mile	0.038			0.038
2009 Survey: 600cc petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	114	Mile	0.033			0.033
2009 Survey: car unspec	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	26	Mile	0.009			0.009
2009 Survey: flight Holland-GLA	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Short Haul - Economy Class	884	Passenger Mile	0.145			0.145
2009 Survey: 2L petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size 1.4 - 2.0 liters	88	Mile	0.030			0.030
2009 Survey: local train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - Light Rail	20	Passenger Mile	0.003	8.000 E-05	4.000E -05	0.003
2009 Survey: Perth-GL train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	65	Passenger Mile	0.006	1.300 E-04	6.500E -05	0.006

2009 Survey: car unspec	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	57	Mile	0.019			0.019
2009 Survey: petrol unspec	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	92	Mile	0.031			0.031

Summary 2009:

Mode of Transport	**Scope**	**Fossil Fuel Emissions**			**Biofuel CO2 Emission** (metric tonnes)
		Fossil Fuel CO2 (metric tonnes)	**CH4** (kilograms)	**N2O** (kilograms)	
Road	Scope 1	1.624	0	0	0
	Scope 3	0.645	2.280E-05	1.900E-05	
Rail	Scope 1	0	0	0	0
	Scope 3	0.037	9.540E-04	4.770E-04	
Water	Scope 1	0	0	0	0
	Scope 3	0	0	0	
AirCraft	Scope 1	0	0	0	0
	Scope 3	0.145	0	0	
Total Emission (metric tonnes CO2e)		2.451	9.768E-04	4.960E-04	0
Total GHG Emission (metric tonnes CO2e)		2.452			

2010: Scope 1 and Scope 3

Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Activity Data			GHG Emissions			
					Vehicle Type	Distance Travelled	Unit of Distance	Fossil Fuel CO2 (metric tonnes)	CH4 (kg)	N2O (kg)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
2010: 1.3 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	630	Mile	0.183			0.183
2010: Project Minibus (Ford Transit)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	505	Mile	0.221			0.221
2010: Project Minibus (Ford Transit)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	505	Mile	0.221			0.221
2010: Project Minibus (blue bus)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	625	Mile	0.273			0.273
2010: Project crewbus (VH Movano 2.2)	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	650	Mile	0.284			0.284
2010: Project landrover	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size >2.0 liters	650	Mile	0.270			0.270
2010: Hire minibus Abd-FG return	UK	Road	Scope 1	Vehicle Distance (e.g. Road Transport)	Light Goods Vehicle (e.g. Van) - Diesel - Engine Size ≤3.5 tonnes	188	Mile	0.082			0.082
2010 Survey: 2L diesel	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	196	Mile	0.059			0.059
2010 Survey: 1.2 petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	54	Mile	0.016			0.016
2010 Survey: car unspec	UK	Road	Scope 3	Vehicle Distance	Passenger Car - Petrol - Engine Size	114	Mile	0.038			0.038

				(e.g. Road Transport)	Unknown						
2010 Survey: Brussels - GLA train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	1382	Passenger Mile	0.134	0.003	0.001	0.134
2010 Survey: car trip in NY USA	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size Unknown	252	Mile	0.084			0.084
2010 Survey: flgith NY to GLA	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Long Haul - Economy Class	6386	Passenger Mile	0.904			0.904
2010 Survey: taxi	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	20	Mile	0.006			0.006
2010 Survey: flight Toronto to CA	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Long Haul - Economy Class	6586	Passenger Mile	0.932			0.932
2010 Survey: 1.3 diesel	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size <1.4 liter	186	Mile	0.045			0.045
2010 Survey: sm petrol	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Petrol - Engine Size <1.4 liter	86	Mile	0.025			0.025
2010 Survey: coach Ed airport-Gla	UK	Road	Scope 3	Passenger Distance (e.g. Public Transport)	Bus - Coach	40	Passenger Mile	0.002	2.400E-05	2.000E-05	0.002
2010 Survey: Tokyo-ABD flight	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Long Haul - Economy Class	11304	Passenger Mile	1.600			1.600
2010 Survey: Hokkaido - ABD flight	UK	Aircraft	Scope 3	Passenger Distance (e.g. Public Transport)	Air - Long Haul - Economy Class	10402	Passenger Mile	1.473			1.473

2010 Survey: train BRM - GLA	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	592	Passenger Mile	0.057	0.001	5.920E-04	0.058
2010 Survey: ABD-GLA coach	UK	Road	Scope 3	Passenger Distance (e.g. Public Transport)	Bus - Coach	147	Passenger Mile	0.007	8.820E-05	7.350E-05	0.007
2010 Survey: Ork-ABD ferry	UK	Water	Scope 3	Passenger Distance (e.g. Public Transport)	Large RoPax Ferry	308	Passenger Mile	0.057			0.057
2010 Survey: Ed - LNDN train	UK	Rail	Scope 3	Passenger Distance (e.g. Public Transport)	Train - National Rail	408	Passenger Mile	0.040	8.160E-04	4.080E-04	0.040
2010 Survey: London taxi	UK	Road	Scope 3	Vehicle Distance (e.g. Road Transport)	Passenger Car - Diesel - Engine Size 1.4 - 2.0 liters	2	Mile	6.054E-04			6.054E-04

Summary 2010:

Mode of Transport	**Scope**	**Fossil Fuel Emissions**			**Biofuel CO2 Emission** (metric tonnes)
		Fossil Fuel CO2 (metric tonnes)	**CH4** (kilograms)	**N2O** (kilograms)	
Road	Scope 1	1.352	0	0	0
	Scope 3	0.466	1.122E-04	9.350E-05	
Rail	Scope 1	0	0	0	0
	Scope 3	0.231	0.005	0.002	
Water	Scope 1	0	0	0	0
	Scope 3	0.057	0	0	
AirCraft	Scope 1	0	0	0	0
	Scope 3	4.909	0	0	
Total Emission (metric tonnes CO2e)		7.015	0.005	0.002	0
Total GHG Emission (metric tonnes CO2e)		7.016			

Appendix C: Electricity

Determination of average energy use

Project Equipment	Watts	Kw	Determined by
Computer (desktop) ON	65	0.065	Monitored by plug in to electricity cost & usage calculator
Computer (desktop) Standby	4.8	0.0048	Monitored by plug in to electricity cost & usage calculator
Monitor (ON)	22.6	0.0226	Monitored by plug in to electricity cost & usage calculator
Monitor (standby)	0.4	0.0004	Monitored by plug in to electricity cost & usage calculator
Laser printer printing	700	0.7	Monitored by plug in to electricity cost & usage calculator
Laser printer resting	8	0.008	Monitored by plug in to electricity cost & usage calculator
Total station chargers	15.7	0.0157	Monitored by plug in to electricity cost & usage calculator
Resistivity meter charging	6.2	0.0062	Monitored by plug in to electricity cost & usage calculator
Digital camera chargers	7.1	0.0071	Monitored by plug in to electricity cost & usage calculator
GPS charger	9.6	0.0096	Monitored by plug in to electricity cost & usage calculator
Laptops (plugged in/charging)	26	.026	Monitored by plug in to electricity cost & usage calculator

Other electrical goods (Scope 3)	Watts	Kw	Determined by
Mobile phone charger	3.7	.0037	Monitored by plug in to electricity cost & usage calculator (smartphone type)
Laptops (plugged in/charging)	26	.026	Monitored by plug in to electricity cost & usage calculator
Radio/CD player	85	.085	From Sierra Pacific and Nevada Power (n.d.) guide
iPod/MP3 type charger	3.7	.0037	Treated like other small portable lithium battery items (e.g. phones)
Hairdryer	1050	1.05	Monitored by plug in to electricity cost & usage calculator travel example
Electric Razor	15	.015	From Sierra Pacific and Nevada Power (n.d.) guide
Digital camera charger	7.1	.0071	Monitored by plug in to electricity cost & usage calculator
Fan (desk/portable)	45	.045	Based on wattage of average 3 speed desk fan (Office Direct website)

Portable or other DVD player	--	--	31.63kg CO2e/year = .004kg CO_2/hour (from Sust-It website)
Portable TV (ex: 10 inch screen handheld)	--	--	7.12kg CO2e/year = .0008kg CO_2/hour (from Sust-It website)
Hair straightener or styler	123	.0123	From Energy Saving Blog (2009)
PDA charger	3.7	.0037	Treated like smartphone charger
Rechargeable battery charger	12	.012	Calculated from battery pack information on Duracell DEF-22 NiMH Multi-battery charger (Input 15 V .8A)
Kettle	2000	2	From Centre for Sustainable Energy (2013)
Nintendo DS charger	3.7	.0037	Treated like other small portable lithium battery items (e.g. phones)
Espresso machine	360	.360	Based on estimate from Wholesale Solar (n.d.)
Electric toothbrush (charger)	1.1	.0011	From Sierra Pacific and Nevada Power (n.d.) guide
Portable speakers	34.5	0.0345	Calculated from information on power cord of basic model: 230Vx.15A=34.5W

Scope 2 Data (Project Electricity Use)

Project 'daily life'	Surveys	22KwH/pp/pd	0.5246kgCO2e/kwH	Total days	Total Kg	metric tonne
2008	38	22	0.5246	689	7951.887	7.952
2009	40	22	0.5246	750	8655.9	8.656
2010	33	22	0.5246	681	7859.557	7.860

Equipment and Indirect Electricity Totals

2008

	KW/hr	kwH x .5246kgCO2e	x .001	CO2e metric tonne
Proj scope 2	65.1256	0.5246	0.001	0.034
Ind scope3	65.16595	0.5246	0.001	0.034

2009

	KW/hr	kwH x .5246kgCO2e	x .001	CO2e metric tonne
Proj scope 2	66.1296	0.5246	0.001	0.035
Ind scope 3	57.8779	0.5246	0.001	0.030

2010

	KW/hr	kwH x .5246kgCO2e	x .001		CO2e metric tonne
Proj scope 2	73.4328	0.5246	0.001		0.039
Ind scope 3	105.26265	0.5246	0.001	+0.156kgCO_2	0.055

Project Equipment Details

2008

Project Equipment (Scope 2)	Number	Hrs/wk	Weeks	Total hours	Watts	Kw	KW/hr	
Computer (desktop) ON	4	42	3	504	65	0.065	32.76	
Computer (desktop) Standby	4	126	3	1512	4.8	0.0048	7.2576	
Monitor (ON)	4	42	3	504	22.6	0.0226	11.3904	
Monitor (standby)	4	126	3	1512	0.4	0.0004	0.6048	
Laser printer printing	1	1	3	3	700	0.7	2.1	
Laser printer resting	1	167	3	501	8	0.008	4.008	
Total station chargers	3	32	3	288	15.7	0.0157	4.5216	
Resistivity meter charging	1	32	1	32	6.2	0.0062	0.1984	
Digital camera chargers	2	32	3	192	7.1	0.0071	1.3632	
GPS charger	1	32	3	96	9.6	0.0096	0.9216	
							65.1256	Total Direct

2009

Project Equipment	Number	Hrs/wk	Weeks	Total hours	Watts	Kw	KW/hr	
Computer (desktop) ON	3	42	3	378	65	0.065	24.57	
Computer (desktop) Standby	3	126	3	1134	4.8	0.0048	5.4432	
Monitor (ON)	3	42	3	378	22.6	0.0226	8.5428	
Monitor (standby)	3	126	3	1134	0.4	0.0004	0.4536	
Laser printer printing	1	1	3	3	700	0.7	2.1	
Laser printer standby	1	167	3	501	8	0.008	4.008	
Total station chargers	5	32	3	480	15.7	0.0157	7.536	

Resistivity meter	0	0	0	0	0	0	0	
Digital camera chargers	4	32	3	384	7.1	0.0071	2.7264	
GPS charger	1	32	3	96	9.6	0.0096	0.9216	
Laptops (on, plugged in/charging)	3	42	3	378	26	0.026	9.828	
							66.1296	Total Direct

2010

Project Equipment	No	Hrs/wk	Weeks	Total hours	Watts	Kw	Kw/hr	
Computer (desktop) ON	4	42	3	504	65	0.065	32.76	
Computer (desktop) Standby	4	126	3	1512	4.8	0.0048	7.2576	
Monitor (ON)	4	42	3	504	22.6	0.0226	11.3904	
Monitor (standby)	4	126	3	1512	0.4	0.0004	0.6048	
Laser printer printing	1	1	3	3	700	0.7	2.1	
Laser printer standby	1	167	3	501	8	0.008	4.008	
Total station chargers	5	32	3	480	15.7	0.0157	7.536	
Resistivity meter	0	0	0	0	0	0	0	
Digital camera chargers	4	32	3	504	7.1	0.0071	3.5784	
GPS charger	1	32	3	96	9.6	0.0096	0.9216	
Laptops	1	42	3	126	26	0.026	3.276	
							73.4328	Total Direct

Scope 3 Indirect Electricity Use (personal item use whilst on fieldschool)

2008

Total: 65.16595kW/hr

Survey No.	37	38	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Total Hours Used over fieldschool																								
Mobile charger	6	15	24	5	18	72	6	126		6	24	42		30	3	12	15	4	48	27	12	3		6
Laptop	18	45						24			84	63	6	30		12		6	90	24	9			9
Radio/CD player																								
Ipod/MP3 type player	6						6	24	84								15		6	10.5				
Hairdryer						9	2			4.5						3	1.5	1		3.75				
Electric razor																								
Digital camera battery charger	1.5	6			2						6			6		3								9
Fan																								
Portable or other DVD player																								

Portable or other TV																								
Hair straightener or styler							6			6	1.5					1.5								
PDA	6																							
Rechargeable battery charger									6															
Kettle																								

Survey No.	23	24	25	26	27	28	29	30	31	32	33	34	35	36		Total hours	Watt	KW	Total KW/hr
Total Hours Used over fieldschool																			
Mobile charger	24		10	6	6	5	150	6		12	7.5	36	4			770.5	3.7	0.0037	2.85085
Laptop		18				10	15		21			7.5				491.5	26	0.026	12.779
Radio/CD player																0	0	0	0
Ipod/MP3 type player			7.5	15	3		15			6						198	3.7	.0037	.7326
Hairdryer	1.5									12			1.5			39.75	1050	1.05	41.7375
Electric razor							3									3	15	0.015	0.045

Digital camera battery charger		3						15			15	1.5				68	7.1	0.0071	0.4828
Fan																0	0	0	0
Portable or other DVD player																0	0	0	0
Portable or other TV																0	0	0	0
Hair straightener or styler										12			1			28	123	0.123	3.444
PDA																6	3.7	0.0037	0.0222
Rechargeable battery charger																6	12	0.012	0.072
Kettle								1.5								1.5	2000	2	3

2009

Total – 57.8779kW/hr

Survey No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Total Hours Used over fieldschool																						
Mobile charger	3	9	9	24	15	10	36	12	9	4	60	36	6	18	9	15	6	7	9	15	12	12
Laptop	15	30	9		30	180			45	6			42			42	15	42				30
Radio/CD				12									18							9		

player																						
Ipod/MP3 type player		30	6				24		18		60	12	6	18	12	3	9			6	12	
Hairdryer		3					6								1.5						12	
Electric razor														3								
Digital camera battery charger		6					24		3	2			6				6			1	12	
Fan																						
Portable or other DVD player																						
Portable or other TV																						
Hair straightener or styler		3																			12	
Portable speakers												18										
Nintendo DS																						

Survey No.	23	24	25	26	27	28	29	30	31	32	33	34	35	36		Total hours	Watt	KW	KW/hr
Total Hours Used over fieldschool																			
Mobile charger	9	0	24.5	3	6	14	36	1.5	9	6	4.5	36	3	6		494.5	3.7	0.0037	1.82965
Laptop	84	10	52.5				30		9	7.5						679	26	0.026	17.654
Radio/CD																39	85	0.085	3.315

player																			
Ipod/MP3 type player				6				3			21	36	6			288	3.7	.0037	1.0656
Hairdryer				3							1.5		1.5	0.75		29.25	1050	1.05	30.7125
Electric razor		2														5	15	0.015	0.075
Digital camera battery charger	3	2	10.5				12	1.5	3		3		1.5	9		105.5	7.1	0.0071	0.74905
Fan																0	0	0	0
Portable or other DVD player																0	0	0	0
Portable or other TV																0	0	0	0
Hair straightener or styler																15	123	0.123	1.845
Portable speakers																18	34.5	0.0345	.621
Nintendo DS												3				3	3.7	0.0037	0.0111

2010

Total 105.2627 KW/hr plus 0.156kgCO_2

Survey No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Total Hours Used over fieldschool																						
Mobile charger	7	30	30	36	6	4	12	9	18	24	45	4.5	36	36	10	6	30	12	6	14	6	18
Laptop	17.5	30			9		21	42		6	120		45		15	3		36	6	10		

Radio/CD player			30																			
Ipod/MP3 type player		24	30	36	6					24			24							6		12
Hairdryer		3.5											30	12						4		
Electric razor																		6				
Digital camera battery charger	3.5	15		24	3	2					15			6			30			26	1.5	9
Fan																						
Portable or other DVD player																						
Portable or other TV																						
Hair straightener or styler		3.5			3						12			18								
Espresso machine																						
Electric toothbrush charger																						

Survey No.	23	24	25	26	27	28	29	30	31		Total hours	Watt	kw	kw/hr
Total Hours Used over fieldschool														
Mobile charger	4	36	12	16	78	84	22.5	1	24		677	3.7	0.0037	2.5049
Laptop	20				60	105	4.5		42		592	26	0.026	15.392

Radio/CD player					42						72	85	0.085	6.12
Ipod/MP3 type player				16	24	42					244	3.7	.0037	.9028
Hairdryer	12	1			6						68.5	1050	1.05	71.925
Electric razor											6	15	0.015	0.09
Digital camera battery charger	8		12	8	12		4.5				179.5	7.1	0.0071	1.27445
Fan					24						24	45	0.045	1.08
Portable or other DVD player					30						30			.004kgCO2/hr x 30hr = .012kg CO_2
Portable or other TV					45						45			.0008kgCO_2/hr X 45 hr = .036kgCO_2
Hair straightener or styler											36.5	123	0.123	4.4895
Espresso machine	4										4	360	0.36	1.44
Electric toothbrush charger	32	8									40	1.1	0.0011	0.044

Appendix D: Food

2008 Diets	No	Cumulative Days	KG CO_2e	Total kg CO_2e	CO_2e metric tonne
Typical British (c. 1/3 meat based)	26	470	7.4	3478	3.478
Mostly meat! (c. 1/2 meat based)	4	75	8.2	615	0.615
Lacto-vegetarian	7	123	6.1	750.3	0.7503
Vegan	1	21	5.7	119.7	0.1197
Other	0	0	n/a		0
	38				**4.963**
2009 Diets	No	Cumulative Days	KG CO_2e	Total kg CO_2e	CO_2e metric tonne
Typical British (c. 1/3 meat based)	24	479	7.4	3544.6	3.5446
Mostly meat! (c. 1/2 meat based)	2	44	8.2	360.8	0.3608
Lacto-vegetarian	12	235	6.1	1433.5	1.4335
Vegan	1	21	5.7	119.7	0.1197
Other	1	0	n/a	n/a	0
	40				**5.4586**
2010 Diets	No	Cumulative Days	KG CO_2e	Total kg CO_2e	CO_2e metric tonne
Typical British (c. 1/3 meat based)	24	484	7.4	3581.6	3.5816
Mostly meat! (c. 1/2 meat based)	3	61	8.2	500.2	0.5002
Lacto-vegetarian	6	136	6.1	829.6	0.8296
Vegan	0	0	5.7	0	0
Other	0	0	n/a	n/a	0
	33				**4.9114**