Waste 4 Fuel
Visual Waste Characterisation Assessment

Environment Agency

14 February 2014

ATKINS

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This document has 38 pages including the cover.

Document history

Job number:			**Document ref:**			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
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Rev 2.0	Final	GW	JF	JE	JAS	14/02/14

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1. Introduction

1.1. Background

Waste 4 Fuel currently operate a Waste Transfer Station (WTS) located at Cornwall Drive, Orpington, BR5 3JB. It is understood that the site operates under Permit number: EAWML/103312 and receives and transfers general skip waste, with a storage capacity of 5,000 tonnes per annum (plus a 10% excess) and an annual throughput of 150,000 tonnes. Following concern over the sites operation and a number of fires the site has been subject to an environmental permit suspension notice and all combustible waste is to be removed by the 1st of May 2014. The site location is shown in Appendix A.

To further understand the volume and type of waste remaining the Environment Agency has appointed Atkins to undertake an assessment of the material currently contained within the site. The goal of the assessment was to:

1. Topographically survey the site to determine volume of waste residing within the limits of the site boundary;

2. Visually characterise the waste to determine approximate composition i.e. volume of plastic, wood, rubble etc; and

3. Undertake ambient air sampling at the site boundary and at residential properties to determine concentrations of an extensive suite of organic compounds associated with the products of combustion and the potential risk to members of the public.

1.2. Purpose of Report

The purpose of this report is to summarise the results of the visual waste characterisation undertaken during the site visit on the 19th December 2013, item 2 of the above. All other aspects of work will be summarised in separate reports.

2. Methodology

Two Atkins site engineers visited the Waste 4 Fuel site on Thursday the 19th of December 2013 for the purpose of undertaking the visual waste characterisation. In order to conduct the visual assessment Atkins engineers proposed to extract a minimum of eight samples from the waste stockpile.

A random sampling approach was adopted throughout the sampling exercise although every effort was made to take samples across the length and breadth of the stockpile to capture older and newer deposits of waste.

Due to access constraints it was not possible to sample waste buried deeper in the stockpile. As a result all samples were taken from the stockpile edge and top which were accessible by the site excavator. As each sample was taken the approximate location was recorded, these are identified on the sample plan included within Appendix B.

Waste 4 Fuel provided Atkins with access to their excavator and driver to assist with obtaining the samples. A sample storage area was defined within the site to conduct the sampling (see Appendix B).

In order to undertake the sampling the following assessment methodology was followed.

- Atkins directed the Waste 4 Fuel site excavator to an approximate and accessible sampling point. The driver was then instructed to take a single bucket load of waste and to deposit the chosen sample at the designated sample storage area. This process was repeated until a select number of samples were taken and which could fit within the sampling space allocated.
- Once deposited to the tipping floor each sample was given a unique sample ID and the length, width and height recorded on the visual sample form (shown in Appendix D) to provide an estimate of volume;
- Each sample was then evenly distributed over the sampling area using a hand shovel so as to ensure materials could be easily viewed and characterised;
- Photographs of every sample were taken to provide a visual record; these images can be seen in Appendix C.
- Both Atkins site engineers then visually estimated the volumetric composition of the waste's main categories and subcategories through the following steps:
    - The presence of each material observed was recorded onto the sample form. The perimeter of the sample was walked around to ensure that the waste was fairly assessed and material categories present were identified.
    - The composition by volume of each major material category was estimated beginning with the category identified to be present in the largest volume. The process was then repeated for the next most common category.
    - Each major material category identified was subsequently broken down into its subcategories. For example the major category Textiles was made of the subcategories Clothing, Carpet, Mattresses and Other. As for the major categories the total of the subcategories were estimated to collectively total 100 percent.
    - All data was subsequently checked and discussed.
- Once characterisation was complete the samples were set aside and new samples taken whereupon the process was repeated until all the samples were assessed. The remainder of the waste was removed following characterisation where it was then deposited back to the main waste stockpile by the excavator.

2.1. Waste Categories

The major waste categories were defined based on the principle components expected within a municipal waste stream i.e. paper, cardboard, plastics, organic, metals etc. Subcategories were defined based on commonly expected materials within each major category. An example sub category of the Paper category for example would be Newspapers, Magazines, and Books etc. Table 1 details the list of wastes which were assessed during the sampling.

Table 1. Material Categories

Major Categories	Subcategories
Paper	
	Newspapers, Magazines, Books etc.
	Paper packaging
	Other papers
Cardboard	
	Corrugated cardboard
	Non-corrugated cardboard
Plastics	
	Rigid Plastic
	Film Plastic
	Plastic Strapping
	Polystyrene Packaging
Organic	
	Food waste
	Green/ garden waste
Wood	
	Furniture
	Pallets, Crates
	Other Untreated Wood
	Other Painted, Stained Wood
Metals	
	Scrap metal
	Food and beverage cans
	Aerosol cans
	Other metals
Glass	
	Bottles & Jars
	Other Glass
Textiles	
	Clothing, Shoes, Bags, Sheets, Curtains etc.
	Carpets
	Mattresses
	Other
Rubber	
	Tyres
	Other Rubber

Major Categories	Subcategories
Aggregate	
	Brick, Rubble, Masonry, Ceramic, Porcelain etc.
	Rock, Gravel
Gypsum	
	Plasterboard
	Other Gypsum
Fines	
	Dirt, Sand, Soil
WEEE	
	White Goods
	Other WEEE
Hazardous	
	Light bulbs
	Batteries
	Gas Canisters
	Solvents, petrol, oil, chemicals etc.
	Other Hazardous

3. Results

3.1. Assessment

On the day of the analysis Atkins engineers characterised a total of ten samples. At certain points of the day sampling was restricted due to the need to wait for the excavator on site to finish clearing waste which was newly delivered.

The results of the assessment are detailed in Table 2 with the minimum, maximum and average values recorded across the range of samples shown in Figure 1 (page 11). The overall average composition by volume determined from the samples assessed is shown in Figure 2. Example images of the samples and components assessed are shown in Figure 3 whilst all the photographs taken are contained in Appendix C.

It was clear from the samples that the waste materials identified were consistent with the information provided to Atkins by Waste 4 Fuel. Namely that the majority of waste appeared to originate from house clearances or building activities. Several of the samples contained 'builders bags' large bulk waste bags for containing assorted, but principally building related wastes. None of the samples assessed were seen to contain organic household food related waste. The highest recorded wastes in the overall average across the samples included 24% of plastics, with frequent plastic sheeting, 14% wood and 16% textiles which included carpets and/ or underlay in almost every sample, a mattress and tent on one occasion, and shed felt on two occasions. Other occasional materials included aggregates such as brick, rubble, masonry or ceramic tiles at 6%, although one instance of 30% was recorded. Rare instances of metals were observed although these were likely to have been limited because of possible extraction by the pre-sort process before the waste was deposited to the stockpile. This was evident by the large quantity of metal which was seen accumulating in one of the pre-sort bunkers.

By far the most common material recorded in all the samples were 'fines'. This category was used to define much of the indistinguishable proportion of waste which comprised of what appeared to be small particles of decomposed waste, potentially comprising of wood and soil like matter, and which was present in many of the samples. It was difficult to assess this waste to determine its constituents. The overall average across the samples was almost 40% making this the largest proportion by volume of all the categories used, with a maximum of 60% recorded in one sample and 8% in the lowest. Many of the samples assessed appeared to be 'older waste' and in an advanced state of decomposition which would account for the higher volume of this material. It is considered likely that much of the stockpile could comprise of this type of material as waste has decomposed and broken up over time.

Looking to the greater stockpile it was observed that much of the material was consistent with what was sampled as can be seen in Appendix C. The surface was covered in loose plastic sheeting, and the stockpile appeared to contain a high volume of plastic and wood. Other materials noted include items of furniture such as sofas and mattresses.

No hazardous waste was observed in the samples assessed. It was however observed during the unloading of an incoming refuse vehicle that a gas canister was found and removed by one of the members of site staff. Whilst likely to be empty this was stored appropriately in a secure cage, a demonstration of good practice management of the incoming waste. Numerous large print cartridges, such as may be used in large office printers, were spread across the lower areas of the site occasionally in high volume. A number of these were cracked and leaking their contents. Such inks have the potential to contain solvents, heavy metals and volatile organic compounds (VOCs) although the quantity of ink did not appear to be significant.

3.2. Limitations

It should be noted that this assessment can provide an indication of the waste composition only, and as determined from the samples which were taken. It is possible that other waste components may exist within the stockpile which were not captured by the samples taken. In order to provide a holistic and more robust view of the stockpile a detailed sampling strategy would be required. This would involve a significantly greater number of samples to achieve statistically suitable levels of accuracy and precision and a thorough analysis of each sample, including measurement of categories according to mass.

Table 2. Sample Results % Volume

Sample No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Average**
Date:	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	
Time:	**9.45**	**10.07**	**10.38**	**11.03**	**13.22**	**13.43**	**14.08**	**14.22**	**14.42**	**15.06**	
Volume (m^3)	**1.20**	**1.80**	**1.20**	**1.70**	**1.60**	**1.30**	**1.60**	**1.00**	**1.70**	**0.90**	**1.40**
MSW Component	**Volume (%)**										
Paper	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.00**	**1.00**	**0.00**	**1.00**	**0.00**	**0.30**
Newspapers, Magazines, Books etc.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper packaging	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other papers	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.30
Cardboard	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**3.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.60**
Corrugated cardboard	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20
Non-corrugated cardboard	0.00	0.00	0.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	0.40
Plastics	**15.00**	**20.00**	**15.00**	**28.00**	**25.00**	**55.00**	**25.00**	**25.00**	**15.00**	**13.00**	**23.60**
Rigid Plastic	5.00	5.00	2.00	9.00	7.00	5.00	7.00	3.00	3.00	3.00	4.90
Film Plastic	9.00	15.00	10.00	18.00	17.00	40.00	17.00	22.00	12.00	10.00	17.00
Plastic Strapping	1.00	0.00	3.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.60
Polystyrene Packaging	0.00	0.00	0.00	0.00	1.00	10.00	0.00	0.00	0.00	0.00	1.10
Organic	**0.00**	**0.00**	**0.00**	**1.00**	**0.00**	**3.00**	**0.00**	**1.00**	**0.00**	**0.00**	**0.50**
Food waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green/ garden waste	0.00	0.00	0.00	1.00	0.00	3.00	0.00	1.00	0.00	0.00	0.50
Wood	**15.00**	**10.00**	**13.00**	**5.00**	**5.00**	**5.00**	**25.00**	**20.00**	**20.00**	**23.00**	**14.10**
Furniture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.30
Pallets, Crates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	0.00	0.00	1.70
Other Untreated Wood	7.50	10.00	13.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	3.55
Other Painted, Stained Wood	7.50	0.00	0.00	5.00	0.00	5.00	25.00	0.00	20.00	23.00	8.55
Metals	**1.00**	**2.00**	**1.00**	**1.00**	**2.00**	**1.00**	**3.00**	**1.00**	**1.00**	**1.00**	**1.40**
Scrap metal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and beverage cans	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.60
Aerosol cans	0.00	2.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.30
Other metals	1.00	0.00	0.00	0.00	1.00	0.00	3.00	0.00	0.00	0.00	0.50
Glass	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.00**	**0.00**	**1.00**	**0.00**	**1.00**	**0.30**
Bottles & Jars	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Glass	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.30
Textiles	**7.00**	**5.00**	**20.00**	**40.00**	**10.00**	**25.00**	**1.00**	**20.00**	**5.00**	**25.00**	**15.80**
Clothing, Shoes, Bags, Sheets, etc.	7.00	2.50	3.00	5.00	2.00	8.00	1.00	3.00	4.00	3.00	3.85
Carpets	0.00	2.50	10.00	15.00	8.00	3.00	0.00	17.00	1.00	15.00	7.15
Mattresses	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
Other	0.00	0.00	7.00	0.00	0.00	14.00	0.00	0.00	0.00	7.00	2.80

Sample No.	1	2	3	4	5	6	7	8	9	10	Average
Date:	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	**19/12/13**	
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Volume (m^3)	**1.20**	**1.80**	**1.20**	**1.70**	**1.60**	**1.30**	**1.60**	**1.00**	**1.70**	**0.90**	**1.40**
MSW Component	**Volume (%)**										
Rubber	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Tyres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Rubber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aggregate	**5.00**	**2.00**	**3.00**	**0.00**	**5.00**	**0.00**	**30.00**	**5.00**	**5.00**	**5.00**	**6.00**
Brick, Rubble, Masonry, Ceramic, etc.	5.00	2.00	3.00	0.00	5.00	0.00	30.00	5.00	5.00	5.00	6.00
Rock, Gravel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gypsum	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.10**
Plasterboard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10
Other Gypsum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fines	**57.00**	**60.00**	**48.00**	**25.00**	**50.00**	**8.00**	**15.00**	**27.00**	**53.00**	**30.00**	**37.30**
Dirt, Sand, Soil	57.00	60.00	48.00	25.00	50.00	8.00	15.00	27.00	53.00	30.00	37.30
WEEE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
White Goods	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other WEEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hazardous	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Light bulbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Batteries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gas Canisters	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solvents, petrol, oil, chemicals etc.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Hazardous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Figure 1. Sample Range % Volume

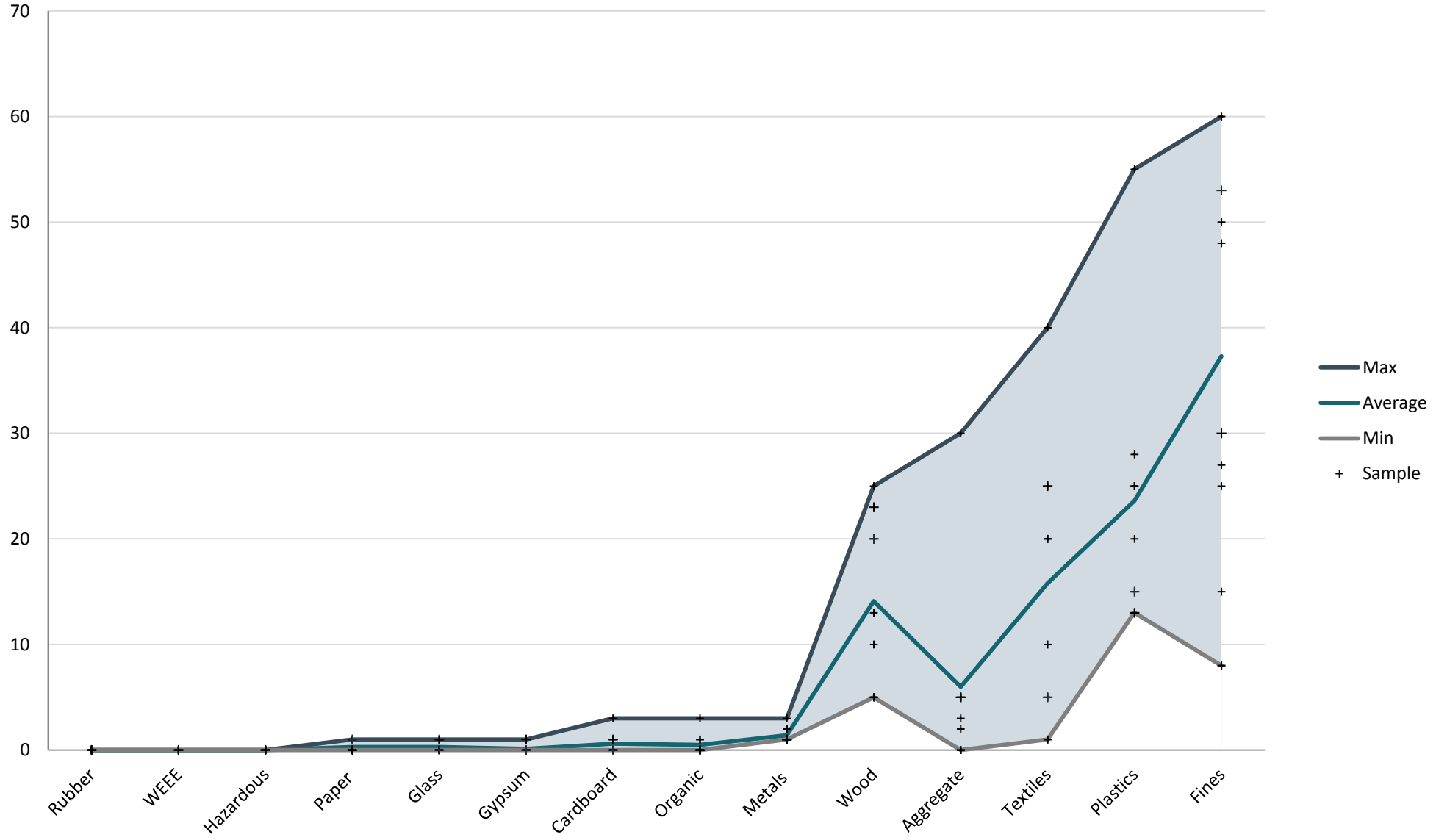


Figure 2. Average % Volume of Waste in Samples Assessed

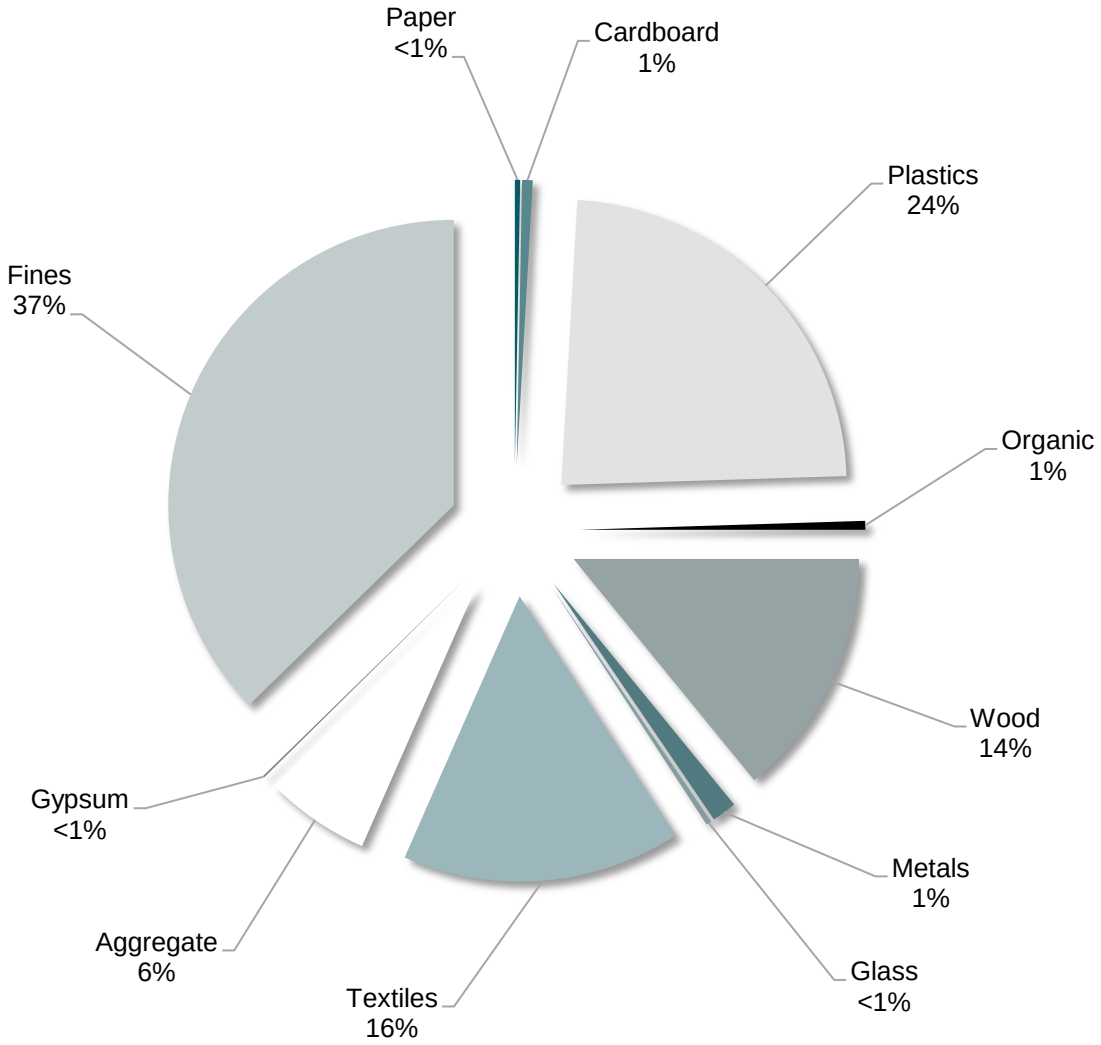


Figure 3. Sample Observations


Sample 4
Carpet
Plastic piping
Plastic Sheeting
Car bumper


Sample 5
Builders bag
Dense plastic
High volume of fines; decomposed materials and woody debris.
Plastic container
Aggregate
Plastic Sheeting


Sample 6
Green waste
Plastic garden fencing
Tent
Bitumen roof felt
Plastic bags/ sheeting
Cardboard
Insulation


Sample 7
Metal
Dense plastic
Wood
Plastic bags/ sheeting
Aggregate


Sample 8
Plastic bags/ sheeting
High volume of fines; decomposed materials and woody debris.
Carpet


Sample 9
Plastic bags/ sheeting
Underlay
Dense plastic
Carpet


Sample 10
Builders bag
Plastic bags/ sheeting
High volume of fines; decomposed materials and woody debris.

4. Conclusion

Table 3 provides the overall average waste composition assessed.

It can be concluded that much of the waste assessed was consistent with the type of material which may arise from house clearance activities or associated building works, as was noted to be the source of much of the waste by Waste 4 Fuel. The vast majority of waste assessed contained high volumes of fines with an average of almost 40%. The fines were composed of smaller particles of waste which appeared to be degraded and of a woody, soil based nature, although much of this material was hard to classify in itself. It could be assumed that a reasonable proportion of the stockpile is comprised of this type of material.

The other dominant categories of waste were plastics; averaging 24%, with a high volume of plastic sheeting type wastes, textiles; averaging 16%, principally carpets, clothing, a mattress and similar materials, and wood at 14%. Infrequent observations of materials such as paper, cardboard, glass and metal were found. The lack of metal is felt to be likely due to the pre-sort and metal removing process used before waste is deposited to the stockpile.

Table 3. Average % Volume of Waste in Samples Assessed

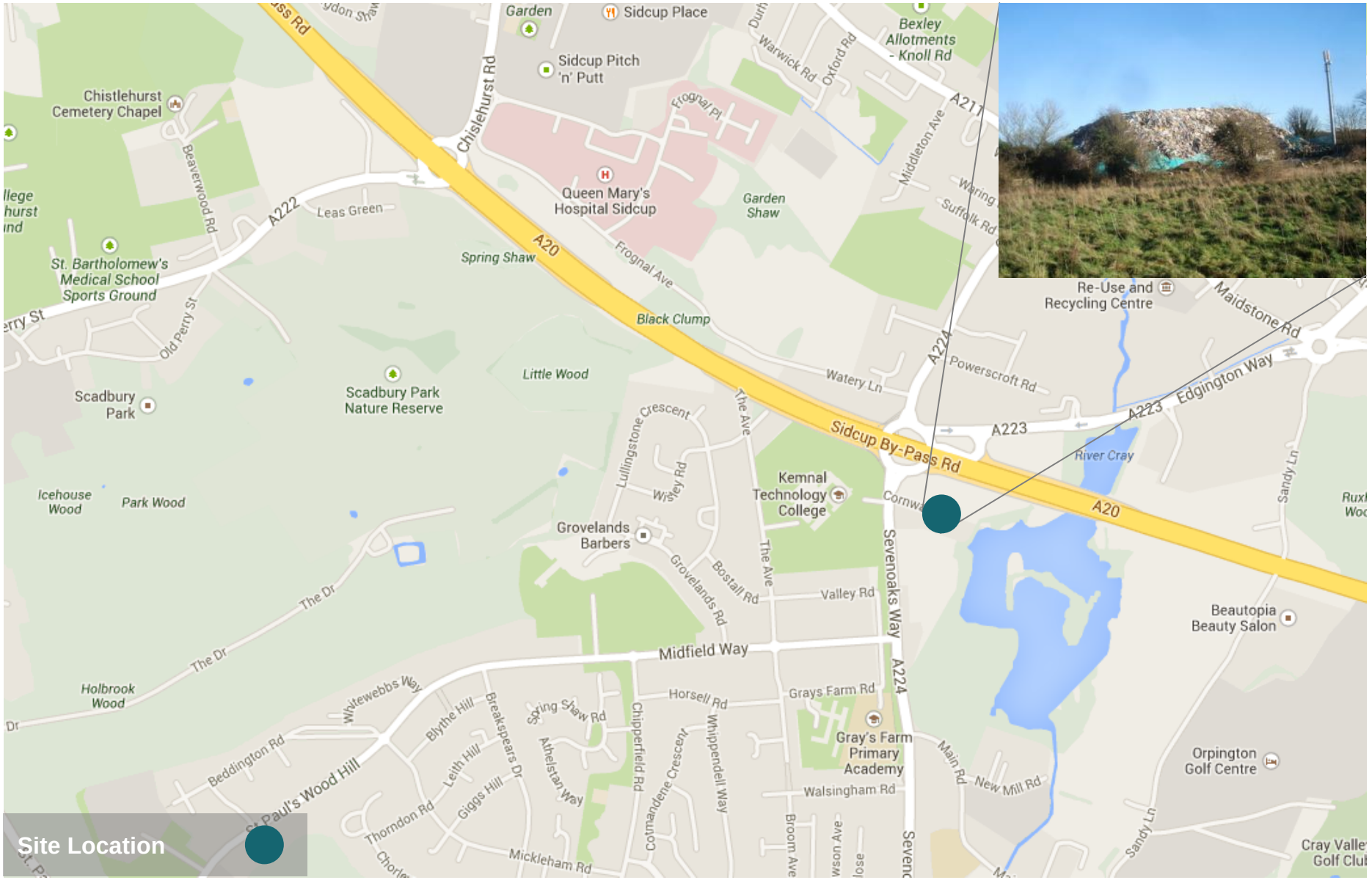
Waste Component	Average	Max	Min
Paper	0.3	1	0
Cardboard	0.6	3	0
Plastics	23.6	55	13
Organic	0.5	3	0
Wood	14.1	25	5
Metals	1.4	3	1
Glass	0.3	1	0
Textiles	15.8	40	1
Rubber	0	0	0
Aggregate	6	30	0
Gypsum	0.1	1	0
Fines	37.3	60	8
WEEE	0	0	0
Hazardous	0	0	0
Total	**100**		

Whilst no hazardous waste was noted within the samples assessed a gas bottle was seen to be removed from an incoming refuse vehicle. Whilst likely to be empty this was stored appropriately in a secure cage, a demonstration of good practice management of the incoming waste. Numerous large print cartridges were spread across the lower areas of the site occasionally leaking their contents; although the quantity of ink did not appear to be significant. Such inks may be solvent based and contain heavy metals and volatile organic compounds (VOCs). It should also be generally noted that the majority of waste was of a combustible nature, as apparent from the recent fires which have occurred within the site.

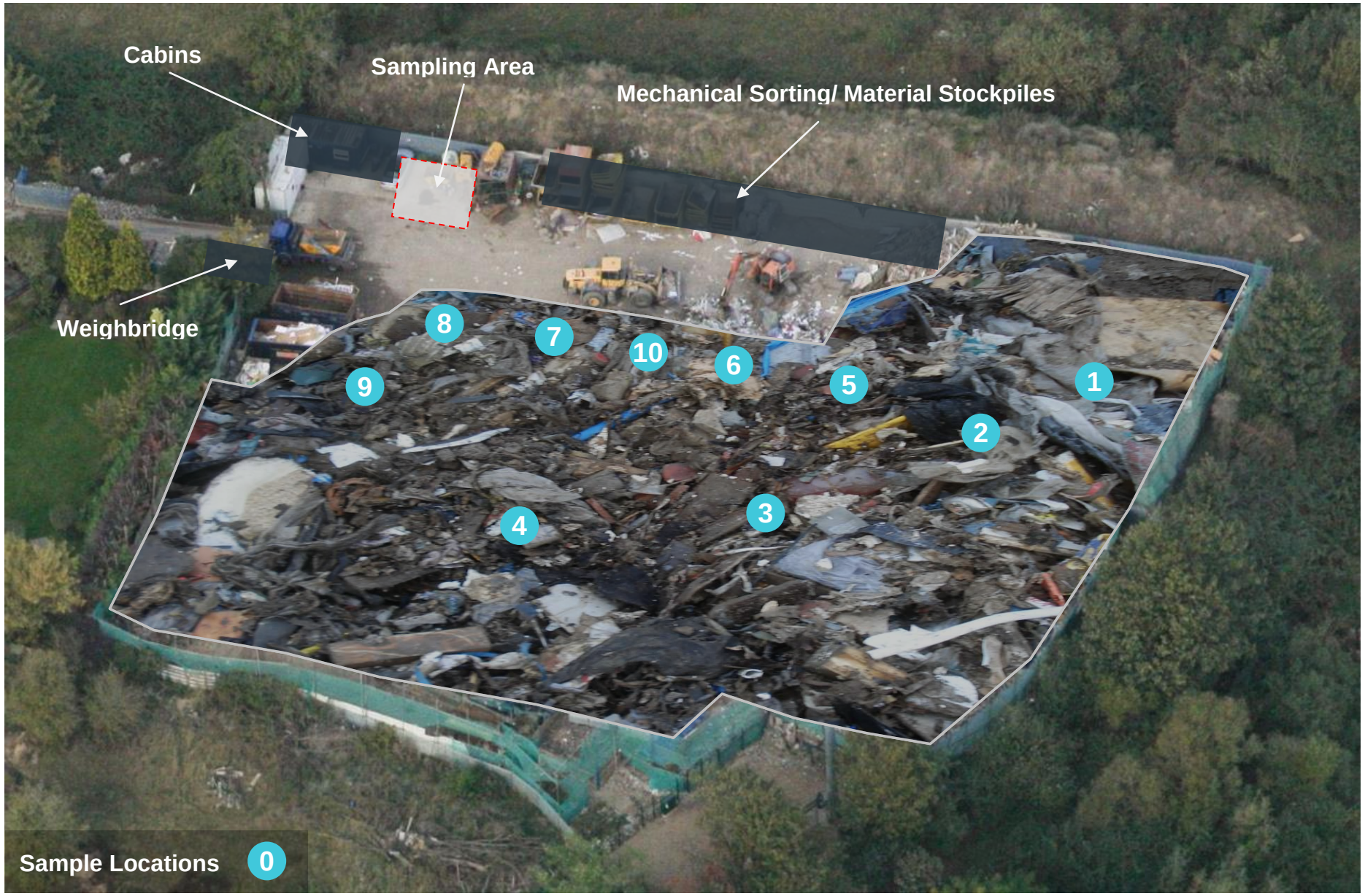
As aforementioned the assessment can provide a guideline of the waste composition only, and as determined from the samples which were taken. In order to provide a holistic and more detailed view of the stockpile, a more robust sampling strategy involving a greater number of samples to achieve statistically suitable levels of accuracy and precision would be required.

Appendices

Appendix A. Site Location


Site Location
Sidcup Place
Garden
Sidcup Pitch 'n' Putt
Bexley Allotments - Knoll Rd
Chistlehurst Cemetery Chapel
Chislehurst Rd
Queen Mary's Hospital Sidcup
Garden Shaw
Spring Shaw
Frognal Ave
Frognal Pl
Warwick Rd
Oxford Rd
Middleton Ave
A211
A222
Leas Green
Beaverwood Rd
St. Bartholomew's Medical School Sports Ground
Old Perry St
A20
Sidcup By-Pass Rd
Black Clump
Little Wood
Scadbury Park
Scadbury Park Nature Reserve
Watery Ln
Re-Use and Recycling Centre
Maidstone Rd
A224
Powerscroft Rd
A223
Edgington Way
River Cray
Kemnal Technology College
Lullingstone Crescent
Wisley Rd
The Ave
Icehouse Wood
Park Wood
Grovelands Barbers
Grovelands Rd
Bostall Rd
Valley Rd
Sevenoaks Way
Sandy Ln
Beautopia Beauty Salon
The Dr
Midfield Way
Holbrook Wood
Whitewebbs Way
Horsell Rd
Grays Farm Rd
Blythe Hill
Breakspears Dr
Spring Shaw Rd
Chipperfield Rd
Whippendell Way
Gray's Farm Primary Academy
Beddington Rd
St Paul's Wood Hill
Leith Hill
Athelstan Way
Walsingham Rd
Main Rd
New Mill Rd
Orpington Golf Centre
Thorndon Rd
Giggs Hill
Mickleham Rd
Broom Ave
Cray Valley Golf Club

Appendix B. Site Plan


Cabins
Sampling Area
Mechanical Sorting/ Material Stockpiles
Weighbridge
8
7
10
6
5
1
9
2
3
4
Sample Locations
0

Appendix C. Photographs

Sample 1




Sample 2




Sample 3

Sample 4




Sample 5




Sample 6

Sample 7




Sample 8




Sample 9




Sample 10




Excavator Sampling

Stockpile

Appendix D. Sampling Form

ATKINS

Sample Details	
Date:	
Time:	
Sample No.	
Your Initials	

Volume Measurement	
Length (cm)	
Width (cm)	
Height (cm)	
Volume (m3) (L x W x H)	

Sample Location
(i.e. lower/ upper part of stockpile, south/ north/ central etc.)
Mark on Plan

MSW Component		Present	Volume (%)	Comments
Paper				
	Newspapers, Magazines, Books etc.			
	Paper packaging			
	Other papers			
Cardboard				
	Corrugated cardboard			
	Non-corrugated cardboard			
Plastics				
	Rigid Plastic			
	Film Plastic			
	Plastic Strapping			
	Polystyrene Packaging			
Organic				
	Food waste			
	Green/ garden waste			
Wood				
	Furniture			
	Pallets, Crates			
	Other Untreated Wood			
	Other Painted, Stained Wood			
Metals				
	Scrap metal			
	Food and beverage cans			
	Aerosol cans			
	Other metals			
Glass				
	Bottles & Jars			
	Other Glass			
Textiles				
	Clothing, Shoes, Bags, Sheets, Curtains etc.			
	Carpets			
	Mattresses			
Rubber				
	Tyres			
	Other Rubber			
Aggregate				
	Brick, Rubble, Masonary, Ceramic, Porcelain etc.			
	Rock, Gravel			
Gypsum				
	Plasterboard			
	Other Gypsum			
Fines				
	Dirt, Sand, Soil			
WEEE				
	White Goods			
	Other WEEE			
Hazardous				
	Light bulbs			
	Batteries			
	Gas Canisters			
	Solvents, petrol, oil, chemicals etc.			
	Other Hazardous			
Total				

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