MSWCONSULTANTS

MECKLENBURG COUNTY, NORTH CAROLINA

CONSTRUCTION AND DEMOLITION DEBRIS COMPOSITION STUDY

Final Report

September 2008

MID ATLANTIC SOLID WASTE CONSULTANTS

625 Sawyer Road, New Market, MD 21774 301/607-6428
842 Spring Island Way, Orlando, FL 32828 407/380-8951
3407 Chestnut Street, Camp Hill, PA 17011 717/731-9708
www.mswconsultants.us

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EXECUTIVE SUMMARY

INTRODUCTION

In May 2007, Mecklenburg County retained MidAtlantic Solid Waste Consultants (MSW Consultants) to conduct a comprehensive analysis of pallet and untreated wood waste disposal and reuse/recycling in Mecklenburg County. Because pallets and especially untreated wood waste are prevalent in the construction and demolition (C&D) waste stream, MSW Consultants and the County determined that conducting a characterization study of the overall Mecklenburg County C&D waste stream would not only identify the quantity of pallets and untreated wood in this stream, but could also inform County solid waste and recycling planners on other mid-term and long-term opportunities for C&D waste reduction. C&D waste is defined as solid waste resulting from construction, remodeling, repair, or demolition operations on pavement, buildings or structures.

Accordingly, MSW Consultants performed a C&D Waste Composition Study to investigate the composition of County-generated C&D being disposed in landfills. This study seeks to achieve the following objectives:

- Develop statistically defensible estimates of the annual composition of C&D waste generated in Mecklenburg County and disposed in landfills;
- Identify opportunities for increasing diversion from this sector; and
- Establish a baseline snapshot of the composition of Mecklenburg County's C&D waste stream against which future studies can be compared for the purpose of evaluating future programmatic changes.

METHODOLOGY

According to C&D disposal data that were compiled from annual landfill reports to the North Carolina Department of Environment and Natural Resources (DENR), Mecklenburg County generated 377,120 tons of C&D waste in FY2007. This C&D was reported by eight different C&D landfills inside and outside of Mecklenburg County. However, 76 percent of County-generated C&D was reported to be disposed at two facilities: the County's Foxhole Landfill on Mecklenburg County's southern border, and the North Mecklenburg Landfill in Cornelius, serving the northern part of the County.

In the Summer and early Fall of 2007, MSW Consultants arranged and conducted a total of three weeks of on-site sampling of incoming C&D loads at these two facilities. During field data collection, a total of 246 loads were randomly selected for sampling. For each load, MSW Consultants applied a visual surveying protocol to identify the prevalence of 30 discrete materials in the C&D waste stream. The visual surveying protocol, described in more detail in Section 2 of this report, required a professional field supervisor with solid waste industry experience to:

1. Measure the dimensions of the incoming truck or container;
2. Estimate how full the container is on a percentage basis;

3. Systematically identify and estimate the volume-percent of the constituents in the load; and
4. Acquire the actual weight ticket from the facility scalehouse indicating the actual weight of the load.

Volume-based estimates were converted to weights based on industry-standard density factors, and the resulting estimated weight was normalized based on the actual known weight of the load. The following results reflect the composition of C&D waste, measured in tons.

RESULTS

Prior studies have found that the composition of C&D waste is different for construction, demolition, and renovation. Further, C&D waste has been found to differ between residential and commercial structures. For this reason, the MSW Consultants field supervisor interviewed the vehicle operator to ascertain the origin of each of the loads selected for sampling. Table E-1 summarizes the origin of the loads sampled in this study. It is of interest that the majority of the loads, which were randomly selected during the three-week field study, contained debris that was generated during the construction of residential structures. Over 75 percent of C&D waste, by weight, was found to come from residential structures.

Table E-1 Origin of C&D Waste (Percent by Weight)

Activity	Percent by Weight		
	Residential Structure	Commercial Structure	Non-C&D [1]
Construction	60.3%	10.6%	3.2%
Renovation	7.3%	2.1%	
Demolition	9.4%	7.1%	

Figure E-1 presents a graphical breakdown of the major material categories of Mecklenburg County C&D waste being disposed at local landfills. As shown in the Figure, Wood and Inert materials each comprise almost one-third of disposed C&D, with Other C&D Materials contributing another 20 percent of the overall waste.

Figure E-1 Mecklenburg-Generated C&D Waste Disposed (annual tons)

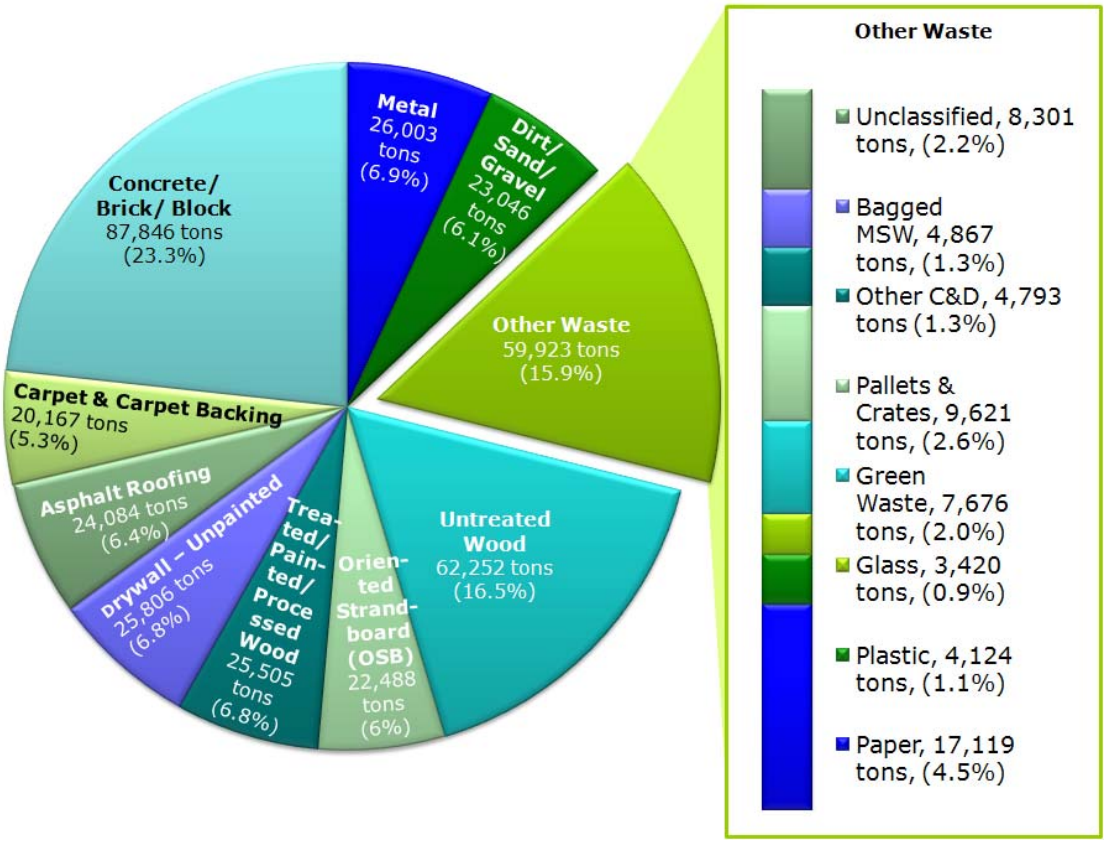
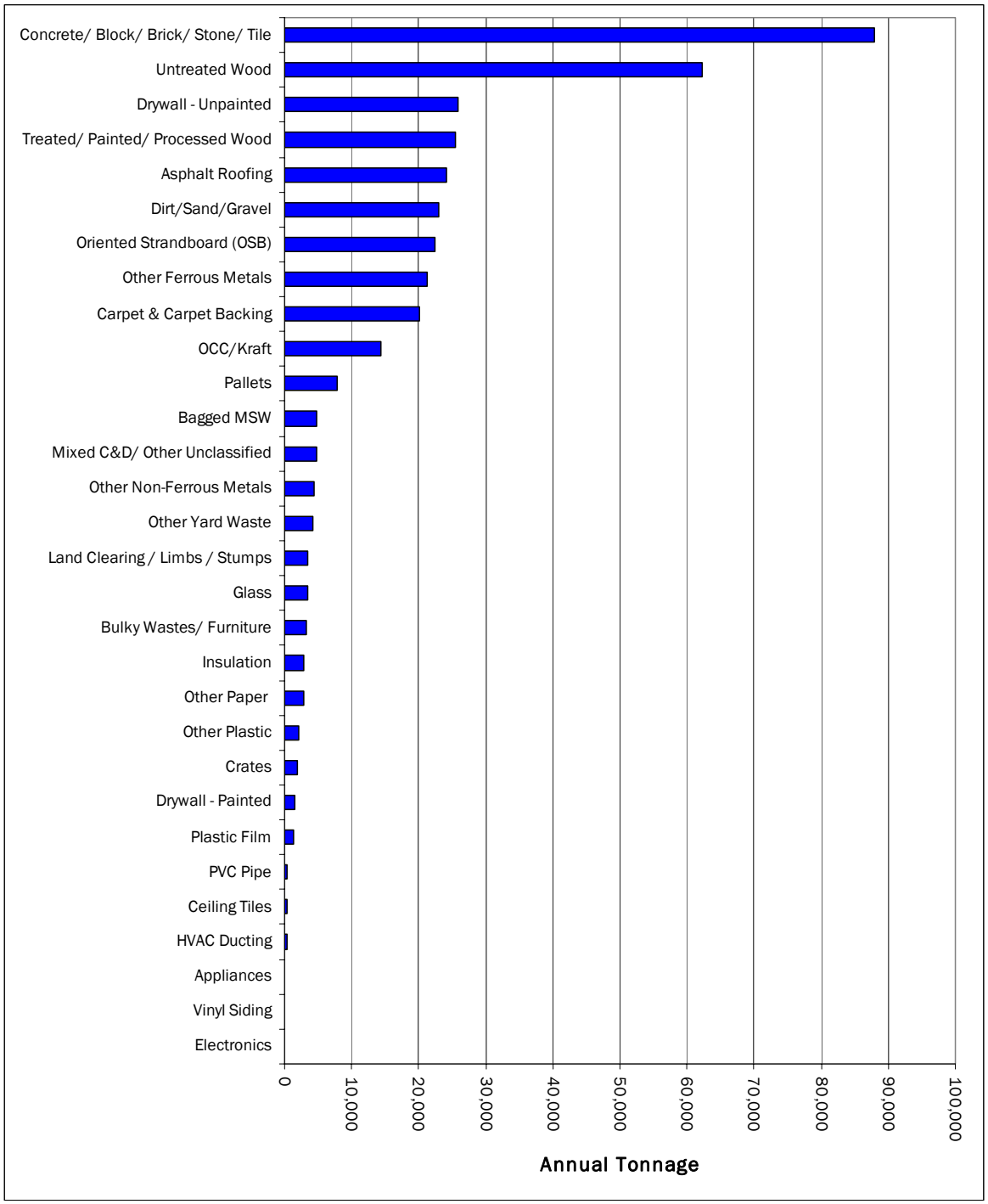


Figure 3-2 ranks the categories of C&D waste from most to least prevalent. It is of definite interest that some of the most commonly disposed materials are highly recyclable (if they could be separated from other C&D waste). For example, the top three most prevalent materials are inerts (concrete/brick/rock), untreated wood and drywall. Clean concrete, brick and block, as well as untreated wood, can be tipped at the Foxhole Landfill for a reduced tip fee if they are source separated, and local manufacturer Union Gypsum will accept drywall for recycling. Asphalt roofing, ferrous metals, carpet/carpet backing and OCC are also recyclable, with recycling programs in existence within the Charlotte region. Nonferrous metals and ceiling tiles are also recyclable. It appears that recycling opportunities within the C&D waste stream are significant.

Figure 3-2 Prevalence of C&D Waste by Material Category (annual tons)



It was beyond the scope of this study to investigate the availability of markets for the wide range of recyclable materials in the C&D waste stream. It was also beyond the scope of this study to address the likely feasibility of developing a C&D material recovery facility (MRF) to serve the Mecklenburg County market. Local markets for recyclables are a requirement for

meaningful recycling, and development of a C&D MRF would be considered a longer term strategy for maximizing diversion from the C&D waste stream.

However, in the interest of better understanding the longer term potential to increase diversion of the C&D waste stream, it is informative to break down the C&D waste stream by its hypothetically recoverable components. Specifically, each of the material categories in this study have been assigned to one of the following three categories to describe the diversion potential of the material.

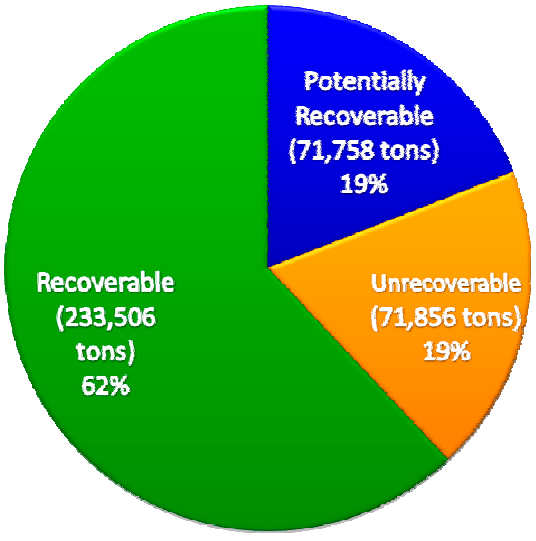
1) **Recoverable**: These materials are recyclable in their entirety and have currently existing markets in the Mecklenburg County region to the extent such materials are source separated for delivery to market.

2) **Potentially Recoverable**: At the current time, there is no mixed C&D waste processing capacity in the County. Many materials are technically recyclable, but only under any number of qualifying conditions: they must be available in significant quantity to be acceptable to the end market; they must be clean enough to recover; they must be further sorted into subcomponents prior to delivery to market; aggregate transportation and recycling costs must be competitive with disposal costs; and other reasons.

3) **Unrecoverable**: These are materials that do not appear to have near term potential for recycling or that occur in such small quantities in the C&D waste stream that it is unlikely they will ever be recycled.

Figure E-3 shows the resulting breakdown between recoverable, potentially recoverable, and unrecoverable materials in C&D waste.

Figure E-3. Prevalence of Hypothetically Recyclable Materials in Aggregate Disposed C&D Waste (Percent by Weight)



As shown in Figure 3-3, this study found that 62 percent of the C&D waste stream is made up of materials that are recoverable within the existing end markets in Mecklenburg County to the extent they can be source separated. At the current time, this represents the maximum potential diversion that could be achieved from the C&D waste stream. Realistically, this level

of diversion will not be approached in the absence of establishing a mixed C&D processing capability, because many of these recoverable materials cannot be economically source separated at construction sites.

It should also be noted that mixed C&D processing facilities in other areas of the country have demonstrated that there are significant limitations to achieving high capture rates even with a customized sorting system. While it was beyond the scope of this project to report on the range of C&D processing technologies and diversion potential at C&D processing facilities, anecdotal evidence from several facilities in the Northeast and South Florida indicate that sorting technology limitations, including pre-process size reduction that is necessary to feed C&D debris through a conveyor sorting system, render many recyclable items too difficult to recover, thereby reducing recycling rates. When viewing Figure E-3, it is therefore important to consider the 62 percent of "recoverable" C&D as being an academic portrayal of the materials contained in C&D debris. The maximum recycling rate in the C&D waste stream will likely be significantly lower, even in the face of aggressive diversion strategies such as mixed C&D processing.

1. INTRODUCTION

BACKGROUND

Mecklenburg County, home to the City of Charlotte and the towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville, has a population of approximately 870,000 residents. In May 2007, Mecklenburg County retained MidAtlantic Solid Waste Consultants (MSW Consultants) to conduct a comprehensive analysis of pallet and untreated wood waste disposal and reuse/recycling in Mecklenburg County. Because pallets and especially untreated wood waste are prevalent in the construction and demolition (C&D) waste stream, MSW Consultants and the County determined that conducting a characterization study of the overall Mecklenburg County C&D waste stream would not only identify the quantity of pallets and untreated wood in this stream, but could also inform County solid waste and recycling planners on other mid-term and long-term opportunities for C&D waste reduction.

Located at the intersection of Interstates 77 and 85, the County is experiencing a high population and economic growth rate within its borders. Mecklenburg County has long been a leader in waste management planning and recycling. The County owns and operates disposal and recycling facilities, and is especially active in the fields of commercial and construction and demolition (C&D) waste reduction. The County's 2006 Solid Waste Management Plan ("Plan") provides a comprehensive overview of the programs, policies, and initiatives that will guide waste management in the County through 2016.

C&D waste is defined as solid waste resulting from construction, remodeling, repair, or demolition operations on pavement, buildings or structures. Over the past several years, Mecklenburg County has generated roughly 350,000 tons per year annually of C&D that has been disposed in landfills. C&D waste is known to contain a large fraction of materials that can be recycled and, according to the 2006 Plan, C&D represents "the greatest single opportunity for waste reduction."

A first step in any long term waste reduction effort is to quantify the existing waste stream so that solid waste and recycling planners can develop targeted diversion programs. Accordingly, MSW Consultants performed a C&D Waste Composition Study to investigate the composition of County-generated C&D being disposed in landfills. This study seeks to achieve the following objectives:

- Develop statistically defensible estimates of the annual composition of C&D waste generated in Mecklenburg County and disposed in landfills;
- Identify opportunities for increasing diversion from this sector; and
- Establish a baseline snapshot of the composition of Mecklenburg County's C&D waste stream against which future studies can be compared for the purpose of evaluating future programmatic changes.

As mentioned above, the County is conducting this C&D waste characterization study in the context of a broader study of the sources and quantities of wood pallets and clean (untreated)

wood waste in Mecklenburg County. Pertinent data from the C&D waste characterization study will supplement this parallel project.

REPORT ORGANIZATION

This report presents the methodology and results of the waste composition study. The report is divided into the remaining sections:

- **Methodology:** This section provides an overview of C&D waste generation and disposal trends in the County, and provides the detailed sampling plan that was developed to govern the study process and to provide statistically defensible data. This section also summarizes the field data collection methods applied in the study.
- **Results:** Detailed results about the composition of Mecklenburg County C&D waste are presented in this section. Results are presented in both tabular and graphical format to highlight findings of interest.
- **Appendices:** Supplemental data and field data collection forms are contained in several appendices.

ACKNOWLEDGEMENTS

MSW Consultants would like to thank the following parties for their help with this project:

- Mike Griffin, President, Griffin Brothers Industries (owner, North Mecklenburg Landfill);
- Roger Barnes, Operations Manager, North Mecklenburg Landfill;
- Joe Hack, Solid Waste Services Manager, Mecklenburg County;
- Terry McCarver, Operations Manager, Foxhole Landfill;
- Michael Talbert, Project Manager of Study, Construction and Demolition Waste Recycling, Mecklenburg County;
- Laurette Hall, Environmental Manager, Mecklenburg County; and
- Bruce Gledhill, Mecklenburg County Solid Waste Director.

The project would not have been successful without the ongoing help and cooperation from these individuals and their staff.

2. METHODOLOGY

CONSTRUCTION AND DEMOLITION WASTE GENERATION

As a first step in characterizing construction and demolition (C&D) waste, C&D disposal data were compiled from annual landfill reports to the North Carolina Department of Environment and Natural Resources (DENR), which receives disposal data on an annual basis by permitted in-state landfills. Table 2-1 summarizes annual C&D waste disposed that was, according to DENR, reportedly generated by the facilities in Mecklenburg County for the past five years.

Table 2-1 Mecklenburg County C&D Debris Generation (annual tons) [1]

Landfill	FY03	FY04	FY05	FY06	FY07	2-year Average	Percent of Total
Mecklenburg County Foxhole LF	91,274	119,344	139,719	155,175	161,047	158,111	42.7%
North Mecklenburg C&D Landfill	192,669	172,186	180,578	119,795	129,209	124,502	33.6%
Gaston County C&D Landfill	37	7	121	5	7	6	0.0%
BFI-Lake Norman C&D Landfill	62,624	58,966	50,447	70,641	73,073	71,857	19.4%
Griffin Farms C&D Landfill	7,130	7,430	9,453	10,394	5,861	8,127	2.2%
Highway 49 C&D Landfill	4,004	7,811	7,559	6,938	7,804	7,371	2.0%
Red Rock Disposal, LLC C&D Landfill			335				0.00%
Rowan County C&D Landfill				104	98	101	0.0%
Total	**357,738**	**365,744**	**388,212**	**363,052**	**377,120**	**370,076**	**100%**

[1] Source: DENR Facility Reports

Overall, the reported historical C&D waste generation as shown in Table 2-1 is relatively flat, with spikes and dips from year to year. The only clear trends appears to be that C&D deliveries to the Foxhole Landfill have consistently increased for the past five years.

A notable conclusion in Table 2-1 is that over 76 percent of all County generated C&D wastes are being disposed in only two facilities: the Foxhole and North Mecklenburg Landfills.

Note that there are a number of Land Clearing and Inert Debris (LCID) landfills operating in Mecklenburg County. As their name suggests, these facilities are permitted by DENR to accept materials generated from land clearing activities, and also inert materials (i.e., materials which that is likely to retain its physical and chemical structure under expected conditions of disposal). In general, LCID facilities may also accept untreated wood waste and some yard trash (although the specific list of allowable materials will be contained in the individual permit for each LCID facility). Many inert materials (concrete, rock, gravel, etc.) and untreated wood are also commonly occurring in C&D waste, so it is likely that some of these C&D-type wastes are being disposed in LCID landfills.

2. METHODOLOGY

It was beyond the scope of this project to investigate the composition of the LCID waste stream. However, at the outset of the project, Mecklenburg County deployed a field inspector to investigate the incidence of pallet and untreated wood waste disposal at six in-county LCID facilities. The County inspector queried LCID facility operators about the frequency with which pallets and/or untreated wood waste were currently being disposed in their facilities. Qualitative results to these questions are shown in Table 2-2 below.

Table 2-2 LCID Landfill Survey Summary (Includes Six LCID Facilities)

Question	Response
Wood Pallets	
Do you currently accept wood pallets?	5 = yes; 1 = no
How frequently?	5 = 1 or 2 small loads a month
Are loads segregated loads or mixed with other LCID debris?	5 = Segregated
Are they delivered by recurring or different customers	5 = "same customers bring pallets"
Untreated Wood Waste (Dimensional Lumber	
Do you currently accept clean wood (dimensional lumber)?	6 = yes
How frequently?	5 = occasionally, 1 = infrequently
Segregated or mixed?	6 = segregated
Recurring customers or different?	6 = different

Although this survey was informal, it suggests that there are relatively small quantities of pallets and untreated wood waste being disposed in these facilities (inert debris was not investigated).

Also not shown in the discussion above, some C&D waste is also delivered to the BFI Charlotte Motor Speedway municipal solid waste (MSW) landfill (BFI-CMS), which is also the County's largest disposer of MSW. During the scoping phase of the project, MSW Consultants attempted to contact BFI-CMS facility management to request access to the facility for purposes of conducting some form of visual observation or other waste characterization analysis. However, no response was received and it was concluded that MSW Consultants could not expect site access or data to be provided by BFI-CMS. It is, however, assumed that the majority of County-generated C&D is captured in the facilities shown in Table 2-1. To the extent the composition of C&D wastes entering the BFI-CMS Landfill is different from the composition of C&D wastes being disposed at the two C&D landfills targeted in this study, it was beyond the ability of our approach to make such determination.

As a final note, it was reported to the Project Team that Mecklenburg County recently renegotiated its disposal contract with BFI-CMS. This renegotiation was potentially noteworthy because it eliminated a term that had been in the previous contract that limited

the delivery area from which the facility could accept C&D wastes that could be delivered to BFI-CMS. However, subsequent discussions with the County indicate that it is not currently believed that C&D disposal patterns will change significantly as a result of this contract renegotiation.

SAMPLING PLAN

Prior to conducting any field data collection, a Sampling Plan was developed to assure that the incoming truckloads of C&D waste that were ultimately sampled were representative of the entire incoming waste stream. This section summarizes the pertinent details of the Sampling Plan that governed field data collection.

HOST FACILITIES

As shown above, roughly 76 percent of all C&D waste that is generated in Mecklenburg County and disposed is delivered to only two landfills: the County-owned and operated Foxhole Landfill on the southern border of the County and privately-owned North Mecklenburg C&D Landfill in Cornelius (in northern portion of the County). MSW Consultants obtained permission from both landfills to conduct field sampling activities.

Despite inquiries made by MSW Consultants, it was not possible to obtain permission to perform field sampling of C&D wastes at the other major recipient of County-generated C&D wastes (BFI-Lake Norman C&D Landfill). In the absence of this data, we have assumed that the characteristics of C&D wastes delivered to this facility are similar to the C&D wastes delivered to the two participating facilities.

As also discussed above, no LCID facilities were included in the study, although these facilities could receive clean wood waste or other allowable inert debris.

SEASONAL DISTRIBUTION OF SAMPLING EVENTS

At the outset of the study, MSW Consultants and the County discussed the relevance of seasonal changes to the C&D waste stream. Based on feedback from the County and on MSW Consultants' prior experience, it was concluded that, while the *volume* of C&D waste generation may vary at certain times of year due to inclement weather, the underlying *composition* of C&D waste was not believed to vary significantly by season. As such, no attempt was made to obtain samples of C&D waste from multiple seasons as part of this study.

However, our methodology did provide for two separate field data collection events at each of the host facilities. Splitting the field data collection events enabled MSW Consultants to learn from observations in the first event and improve overall sampling productivity in the second event. The first sampling event was performed from August 6 through 13, 2007. The second sampling event was performed from October 15 through 24, 2007. Sampling was only performed during the week (i.e., no Saturdays). The data from both field events are combined in our analysis and analyzed in the aggregate.

2. METHODOLOGY

C&D WASTE STREAM AND INCOMING LOAD TYPES

This study focused exclusively on the C&D waste stream. C&D waste is defined to include all wastes that are generated as a result of construction, renovation, remodeling, and demolition activities performed on any structure (including buildings, roads and bridges). In many cases, the C&D wastes are delivered to the disposal facilities by private (or public) haulers in roll-off boxes. C&D wastes may also be delivered by self-haulers or contractors on construction/demolition/renovation projects (e.g., roofing contractor delivering shingles). Sampling of incoming wastes sought to represent deliveries from all types of haulers in a representative manner.

In North Carolina, individual landfill permits describe the waste types that are allowable (or prohibited) for disposal in that facility. The North Mecklenburg Landfill is a permitted C&D landfill, while the Foxhole Landfill is a permitted MSW landfill at which the County has, by policy decision, opted to accept only C&D debris and a small amount of non-putrescible, bulky wastes.

Prior studies have shown that the composition of C&D waste varies dramatically by the type of project being undertaken. Accordingly, throughout the data collection event, samples were further categorized as being generated at a residential structure[1] or a commercial structure. Finally, incoming samples were categorized as being delivered by private hauler (roll-off boxes for mixed C&D) or self-hauler (frequently smaller vehicles or trailers with more homogeneous waste, such as a roofer with shingles).

SAMPLE SELECTION

With any waste characterization study, it is important to obtain a representative sample of incoming loads of material. While there are several strategies for representative sampling, MSW Consultants predominantly applied a systematic sampling approach at both the North Mecklenburg and the Foxhole Landfills.

FOXHOLE LANDFILL

MSW Consultants performed a site visit at the Foxhole Landfill on July 12, 2007 to observe standard operations and to formulate the specific procedures for sample selection and visual surveying. C&D loads delivered to the Foxhole Landfill are weighed in at the scalehouse. C&D loads that are in a commercial truck with hydraulic dumping capability (dump trucks, roll-offs, and trailers) are directed to the working face to tip. All loads that have to be manually unloaded are directed to the residential self haul recycling area. These manual unloading/self haul trucks tip all C&D waste on the concrete pad. The material is loaded into County roll-off containers and hauled to the working face by a County roll-off truck.

The facility offers a reduced tip fee for clean wood and brush loads as an incentive to divert these materials from disposal. These are directed from the scalehouse to the chipping site about ¼ of a mile from the working face in a different section of the facility. Clean concrete and tires are also recorded separately in the facility accounting system.

[1] Both single family and multi-family buildings were characterized as residential for purposes of this study.

Mecklenburg County provided 12 months of scale transaction records for the Foxhole Landfill. The Project Team has aggregated and stratified these data, as shown in Table 2-4 below.

Table 2-4 Foxhole Landfill Waste Deliveries and Sample Allocation

Generator Type	Annual Material Quantity (tons) [1]	Percent of Total	Sample Allocation Percent	Target Samples
C&D Debris to Working Face				
All Points Waste Services, Inc.	21,958	13.2%	15.3%	15
Construction Waste Services	12,818	7.7%	8.9%	9
Waste Management	11,559	7.0%	8.1%	8
A Sani-Can Services	7,483	4.5%	5.2%	5
Other Haulers [2]	77,523	46.7%	54.1%	54
Subtotal C&D to Working Face	*131,341*	*79.1%*	*91.6%*	*92*
C&D Self-haul [3]	12,069	*7.3%*	*8.4%*	9
Subtotal County Generated C&D	143,411	86.3%	100%	100
Out-of-County C&D	3,559	2.1%		
Clean Wood	659	0.4%		
Yard Waste [4]	3,200	1.9%		
Tires [5]	886	0.5%		
Concrete	13,029	7.8%		
Bulky Waste [6]	2,291	1.4%		
Total	**166,148**	**100%**		

[1] 12 months of scale transactions from July 1, 2006 to June 30, 2007

[2] 152 other haulers deliver 5.0% or less of the annual C&D Debris to Working Face

[3] Weighed in roll-off boxes from self-haul area

[4] Excludes yard waste from automobiles and pickup trucks that are not weighed

[5] Reflects a count of the incoming tires (not a weight)

[6] Delivered by Goodwill Industries and Salvation Army

Note: Figures in the table may not sum precisely due to rounding.

As shown in the table, there are a number of haulers that consistently deliver C&D to the Foxhole Landfill. Because the stratification of waste deliveries is known, Table 2-4 shows the stratified sample targets for the Foxhole Landfill.

NORTH MECKLENBURG LANDFILL

A site visit was performed at the North Mecklenburg Landfill on July 12, 2007 to confirm that the facility can accommodate the data collection effort. Because this facility is privately owned and customer data was considered to be confidential, it was not possible to analyze delivery patterns by customer prior to the field study. For this reason, a pure systematic sampling process was used. This so-called "Nth truck approach" divides the total expected daily deliveries by the targeted number of samples to be obtained that day to determine which trucks to sample. For example, if there are 50 trucks delivering C&D on average, and 10 samples are needed, then the visual surveyor will sample every 5th truck (50 total loads / 10 targeted samples).

There are three exceptions to the Nth truck approach (i.e., times when the Nth truck may not be taken):

1) When surveying productivity is adversely impacted waiting for the Nth truck. In this case, the field surveyor was authorized to take the next load that arrives and reset the count for N.

2) When it is clear that the variable N needs to be adjusted. If actual vehicle delivery patterns, working face conditions, and other factors appeared to be increasing/decreasing the expected number of loads on a given day, it was acceptable to change N while the sampling is in process.

3) When the driver interview confirms that the load should not be surveyed (e.g., if the load was imported from an adjacent county). In this case the next load may be taken as a substitute.

In all cases, the intent of systematic sampling procedures was to remove qualitative load selection capability from the field surveyor. The rules above accomplish this critical objective and thereby assure that samples are representative.

SAMPLING TARGETS

Table 2-5 summarizes the targeted and the actual number of physical and visual samples obtained at each field data collection event at each host facility.

Table 2-5 Proposed and Actual Sample Allocation

Host Facility	Targeted Samples	Actual Samples	Variance
Foxhole Landfill	100	124	+24
North Mecklenburg Landfill	100	122	+22
Total	**200**	**246**	**+46**

Additional information about each incoming load was documented to further understand the distribution of the C&D waste samples that were taken. Table 2-6 summarizes the percent by weight for C&D of all loads sampled according to the origin of the load.

Table 2-6 Origin of C&D Waste (Percent by Weight)

Activity	Percent by Weight		
	Residential Structure [1]	Commercial Structure	Non-C&D [2]
Construction	60.3%	10.6%	3.2%
Renovation	7.3%	2.1%	
Demolition	9.4%	7.1%	

[1] Both single family detached and multi-family structures were classified as residential for this study.

[2] These loads contain materials that can lawfully be disposed at a C&D landfill, but were not generated by C&D activities. Examples include loads from manufacturing, retail, and warehouse establishments.

As shown above, just over 60 percent of incoming loads were generated at new residential (including both single family and multi-family) construction sites. The remaining loads were distributed across residential renovation and demolition, as well as commercial construction and renovation. A small number of non-C&D wastes were also found to be getting disposed as C&D. These loads included three from manufacturing facilities, three from retail stores, four from warehouses and 1 from a non specified source, two-thirds of which were delivered to the North Mecklenburg Landfill and the remaining third to the Foxhole Landfill. It is also of interest that the origin of incoming waste was comparable at the two host disposal facilities. Appendix A shows the breakdown of C&D waste by origin for each facility separately.

Table 2-7 shows the allocation of sample weight between self-haulers and private haulers. Not surprisingly, the majority of the load weight sampled was delivered by private haulers who generally offer larger volume containers (30 and 40 yard boxes) compared to self-haulers who may be relying on pick-up trucks, trailers, and small dump trucks.

Table 2-7 Delivery of C&D Waste (Percent by Weight)

Delivered By	Percent by Weight		
	Residential Structure [1]	Commercial Structure	Non-C&D [2]
Self-Hauler	2.5%	0.4%	0.3%
Private Hauler	74.5%	19.4%	2.9%

[1] Both single family detached and multi-family structures were classified as residential for this study.

[2] These loads contain materials that can lawfully be disposed at a C&D landfill, but were not generated by C&D activities.

The primary objective of collecting data about the origin and delivery method of sampled loads was to further document that the samples were representative of the overall C&D

waste stream in Mecklenburg County. It was beyond the scope of this study to analyze C&D waste composition separately for any of the different generator sectors of C&D waste.

FIELD SAMPLING AND VISUAL SURVEYING METHODS

In the past several decades, there has evolved a mature protocol for performing physical sampling and sorting of municipal solid wastes. For example, ASTM International (formerly known as the American Society for Testing and Materials) has developed a standard test method for the physical sampling and sorting of MSW,[2] and at least several state agencies[3] have adapted these protocols into a state-level standard for MSW characterization. In short, a well-developed body of literature exists about the methodology for weight-based sampling and sorting of wastes and the accompanying statistical analysis used to aggregate the data.

Conversely, protocols for the visual surveying of C&D wastes (and other bulky materials) is not as evolved. Based on limited research conducted by MSW Consultants, the literature for visual estimation of C&D waste characterization begins in the late 1990s when several states and academic institutions first began to aggressively investigate the C&D waste stream. Although MSW Consultants is not aware of an ASTM International test method for visual volume-based characterization of C&D debris, current best practices for C&D waste stream characterization uniformly apply a visual strategy.

MSW Consultants is aware of many of the published procedures for visual surveying of C&D wastes. Our methodology draws from the experience of our professional staff in conducting such studies, as well as a literature review of several of the most recent studies.[4] The following sections summarize the field sampling and visual surveying procedures used for this study.

LOAD SELECTION

As described above, incoming loads were systematically sampled at each host facility each day. As part of the quality control process, the Field Supervisor interviewed the drivers of selected loads to obtain information such as origin of the load, waste generating sector, hauler, vehicle type and number, and other data. This information was noted on the data recording form, along with a unique identifying number associated with that vehicle on that day. A summary of the physically sampled loads is shown as Appendix B at the end of this section. At the end of each day, MSW Consultants obtained copies of the weigh tickets for each load selected for sampling.

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[2] See ASTM D 5231-92 (Reapproved 1998).

[3] Examples include the California Integrated Waste Management Board and the Florida Department of Environmental Protection.

[4] One of the more detailed studies on C&D waste stream characterization methodology was developed by the California Integrated Waste Management Board (CIWMB) for the extensive waste characterization efforts it has conducted over the past 10 years.

MATERIAL CATEGORIES

Material categories were selected to provide meaningful breakdowns of the C&D waste stream from the perspective of evaluating current and potential future source reduction, diversion and recycling programs. A total of 30 material categories were ultimately defined for this study. Table 2-8 summarizes the material groups and material categories included in the C&D analysis. Detailed definitions for each material category are included in Appendix C.

Table 2-8 C&D Material Categories

Material Group	Material Category	Material Group	Material Category
Paper	OCC/Kraft Other Paper	**Inerts**	Concrete/Block/Brick/Stone/Tile Dirt/Sand/Gravel
Plastic	PVC Pipe Plastic Film Vinyl Siding Other Plastic	**Wood**	Pallets Untreated Wood Oriented Strandboard (OSB) Treated/Painted/Processed Wood
Glass	All Glass	**C&D Materials**	Drywall - Unpainted Drywall - Painted Asphalt Roofing Insulation Ceiling Tiles Carpet & Carpet Backing
Metal	Appliances Other Ferrous Metals HVAC Ducting Other Non-Ferrous Metals		
Other Wastes	Bagged MSW Electronics	**Green Waste**	Land Clearing/Limbs/Stumps Other Yard Waste
	Bulky Wastes/Furniture Mixed C&D/Other Unclassified		

VISUAL SURVEYING

All of the composition data obtained for each sampled load was based on visual volumetric estimates. Visual surveying of C&D loads involved detailed measurements of the truck and load dimensions, followed by the systematic observation of the major material components in the tipped load. The steps to visual surveying applied for this study are enumerated below:

1. Measure the dimensions of the incoming load (i.e., container) prior to tipping and (if possible) estimate the percent full of the vehicle.
2. Tip the load. If it is a large load, and if conditions permit, have a loader spread out the material so that it is possible to discern dense materials such as block, brick, and

dirt that tend to sink to the bottom of the pile. Take at least one digital photograph of the tipped load.[5]

3. Make a first pass around the load marking the major material categories that are present in the load—cardboard, drywall, dimensional lumber, etc. Estimate the percentage of the load made up of these major materials. If possible, estimate the yardage associated with this material.

4. Make a second pass around the load, noting the secondary material categories contained in the load. Estimate the percentage of the load made up of these materials. If possible, estimate the yardage associated with this material.

5. Count individual pallets. Differentiate between reusable and non-reusable pallets, if possible. This step was performed in support of another study being performed concurrently by Mecklenburg County to research pallet generation and disposal patterns.

6. Describe untreated wood items and estimate the number and type of each. This step was also performed in support of the concurrent pallet/clean wood waste study.

7. Validate that the estimated percentages sum to 100 percent, and that the estimated yardage of major material categories is realistic given the overall truck dimensions and volume.

Because some residential and commercial waste was included in self-haul and C&D waste, the field data form included a category for "Mixed MSW." Examples of Mixed MSW include loose or bagged debris that may have been thrown in a box by construction workers, contractors, or local residents that was not generated as part of the construction, renovation, or demolition activity (e.g., beverage bottles, fast food restaurant waste papers, etc.).

DATA RECORDING

For each sampled and visually surveyed load of C&D, the Field Supervisor recorded all information on a custom-designed data collection form. A sample of the Field Data Form used for visual surveying of C&D wastes is contained in Appendix D. All of the data contained on the forms were entered into a spreadsheet for further quality control and for statistical analysis.

CONCLUSION

MSW Consultants believes that the field data collection methods used in this study followed the emerging best practices for the conduct of visual C&D characterization analysis. Given the careful logistical management of the sample collection process, the field data collection was performed with no known problems. The resulting data meet the objective of being representative of C&D wastes generated in Mecklenburg County and intended for disposal.

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[5] MSW Consultants took multiple digital photographs of each tipped load during the field surveying. These photographs have been indexed by date and sample number, and delivered to the County separately in electronic format. Due to the number of photographs taken, it is not practical to include the photographs in an appendix to this report.

3. RESULTS

INTRODUCTION

This section presents the results of the Mecklenburg County construction and demolition (C&D) waste composition study. Further, this section describes the underlying assumptions, analytical techniques, and statistical analysis that was performed to generate the results. Specifically, this section discusses:

- Volume-to-Weight Conversion,
- Statistical Measures, and
- Results.

VOLUME-TO-WEIGHT CONVERSION

As described in the Methodology section, all of the field data collection relied on volumetric estimates of the composition of each incoming load of C&D waste that was representatively selected for sampling. For each load, the container volume, percent full, and estimated fraction of each C&D material category was estimated and recorded. While the methodology used for visual surveying was performed consistently and accurately, and relied on quantitative measurements for some portion of the estimate, in practice there is potential for error to be introduced because certain steps of visual characterization are, by nature, somewhat imprecise. For example, two well trained solid waste professionals with field experience may observe a fraction of drywall in the same sample, yet their estimate of the percent of that drywall may vary, in some cases by five percent (or more if there is a lot of drywall). Human judgment is a necessary obstacle of precise visual surveying.

Fortunately, for each load surveyed, it was possible in this study to obtain a copy of the weigh ticket from the scalehouse at each host facility. Because landfill scales must be calibrated on a regular basis to assure accurate reporting of incoming waste flows, the measured weight of each load from the scalehouse are highly defensible data points.

The first exercise to tabulating the results was therefore to convert volumetric estimates for each sample into weigh-based estimates. Doing so required the following process:

1. Research and compile the raw density factors for all of the material categories defined for the study. Raw density factors were compiled based on available literature (primarily other C&D characterization studies and various recycled material manuals) as well as on MSW Consultants' experience in conducting prior waste characterization studies;
2. Convert volumetric estimates to weight-based estimates by applying the raw density factors;
3. Compare the weight of the raw volume-to-weight conversion against the actual weight of each load as shown on the weigh tickets;
4. Apply targeted statistical analysis to identify the density factors that contribute to the variance between the calculated (item 2) and the actual (item 3) weights; and

5. Develop adjusted density factors that, when applied to the volumetric estimates observed in the field, yield calculated weights that are, in the aggregate, within acceptable tolerances of the actual weights

Table 3-1 presents the density factors compiled for this analysis. The raw and adjusted density factors are shown, as well as the adjustment that was applied.

Table 3-1 C&D Material Density Factors (Lbs/Cubic Yard) – Raw and Adjusted

Material Group	Material Category	Raw	Adjusted	Adjustment
Paper	OCC/Kraft	100	100	0
	Other Paper	157	157	0
Plastic	PVC Pipe	50	50	0
	Plastic Film	40	40	0
	Vinyl Siding	50	50	0
	Other Plastic	65	65	0
Glass	All Glass	600	600	0
Metal	Appliances	142	142	0
	Other Ferrous Metals	570	570	0
	HVAC Ducting	50	50	0
	Other Non-Ferrous Metals	570	570	0
Green Waste	Land Clearing/Limbs/Stumps	600	600	0
	Other Yard Waste	225	225	0
Inerts	Concrete/Block/Brick/Stone/Tile	1,500	1,275	(225)
	Dirt/Sand/Gravel	1,500	1,275	(225)
Wood	Pallets	50 lbs/pallet 150 lbs/crate	50 lbs/pallet 150 lbs/crate	0 0
	Untreated Wood	364	309	(55)
	Oriented Strandboard (OSB)	364	309	(55)
	Treated/Painted/Processed Wood	364	309	(55)
C&D Materials	Drywall - Unpainted	325	276	(49)
	Drywall - Painted	325	276	(49)
	Asphalt Roofing	1,250	1,063	(187)
	Insulation	100	100	0
	Ceiling Tiles	75	75	0
	Carpet & Carpet Backing	900	765	(135)
Other Wastes	Bagged MSW	200	200	0
	Electronics	400	400	0
	Bulky Wastes/Furniture	250	250	0
	Mixed C&D/Other Unclassified	200	200	0

An interesting result of this exercise is that all of the variance between the estimated weight (calculated by applying raw density factors to the observed volumetric estimates) and the actual weight could be minimized by downwardly adjusting the density of nine of the 30

material categories. It is noteworthy that these nine categories are among the denser materials in C&D waste. This suggests that either (a) the industry literature on material density seems to overestimate the density of these material types, or (b) in the judgment of the field surveyor, the volume of these more dense materials was routinely overestimated.

While it is not possible to assert that the density adjustments that are shown in Table 3-1 assure complete accuracy of the results, MSW Consultants believes that the step of normalizing the volumetric estimates to align closely with the known weight of the samples improves the accuracy of the overall study results.

STATISTICAL MEASURES

Once each sample is converted from volume to weight and normalized (as described above), the following statistical measures are calculated to determine the overall composition of C&D waste.

- **Sample Mean:** The sample mean, or average, composition is considered the "most likely" fraction for each material category in the aggregate C&D waste stream. The sample mean is determined by (i) summing the weight of each material in each sample; (ii) summing the total weigh of all samples, and (iii) dividing the first value by the second value to determine the percent-by-weight composition. Note that the *sample* mean, while a good estimate, is unlikely to be identical to the *population* mean value. The meaningfulness of the sample mean is enhanced by the following statistical measures.
- **Standard Deviation**: The standard deviation measures how widely values within the data set are dispersed from the sample mean. A higher standard deviation denotes higher variation in the underlying samples for each material, while a lower standard deviation reflects lower variation among the individual samples. The standard deviation is stated in the same unit as the sample mean, which in this case is percent by weight.
- **Confidence Intervals**: When a sample of data is obtained, it is analyzed in an attempt to determine certain values that describe the entire population of data under analysis. For example, in a poll of likely voters, the intent of the poll is to determine the percentage of *all* voters who support a given candidate, not simply the percentage of voters *in the poll* who support that candidate. The percentage of voters who support a given candidate in the poll can easily vary from sample to sample; but the percentage of *all* voters who support that candidate is a fixed value. In our sample of incoming loads of C&D waste, we are not primarily interested in the percentage composition of the *sampled* loads, but rather in trying to determine what the composition of the sampled loads tells us about the composition of *all* C&D waste generated in Mecklenburg County. A confidence interval is a statistical concept that attempts to indicate the likely range within which the true value lies. The confidence intervals reflect the upper and lower range within which the population mean can be expected to fall. Confidence intervals require the following "inputs":
  - The "level of confidence", or how sure one wants to be that the interval being constructed will actually encompass the population mean;
  - The sample mean, around which the confidence interval will be constructed;

- The sample standard deviation, which is used as a measure of the variability of the population from which the sample was obtained; and
- The number of sampling units that comprised the sample (a.k.a. sample size).

Throughout this section, confidence intervals have been calculated at a 90 percent level of confidence, meaning that we can be 90 percent sure that the population mean falls within the upper and lower confidence intervals shown. (The converse is also true: that there is a 10 percent chance that the population mean falls outside of the sample mean.) In general, as the number of samples increases, the width of the confidence intervals decreases, although the more variable the underlying waste stream composition, the less noticeable the improvement for adding incremental samples.

RESULTS

Figure 3-1 presents a graphical breakdown of the major material categories of Mecklenburg County C&D waste being disposed at local landfills. As shown in the Figure, Wood and Inert materials each comprise almost one-third of disposed C&D, with Other C&D Materials contributing another 20 percent of the overall waste.

Figure 3-1 Mecklenburg-Generated C&D Waste Disposed (annual tons)

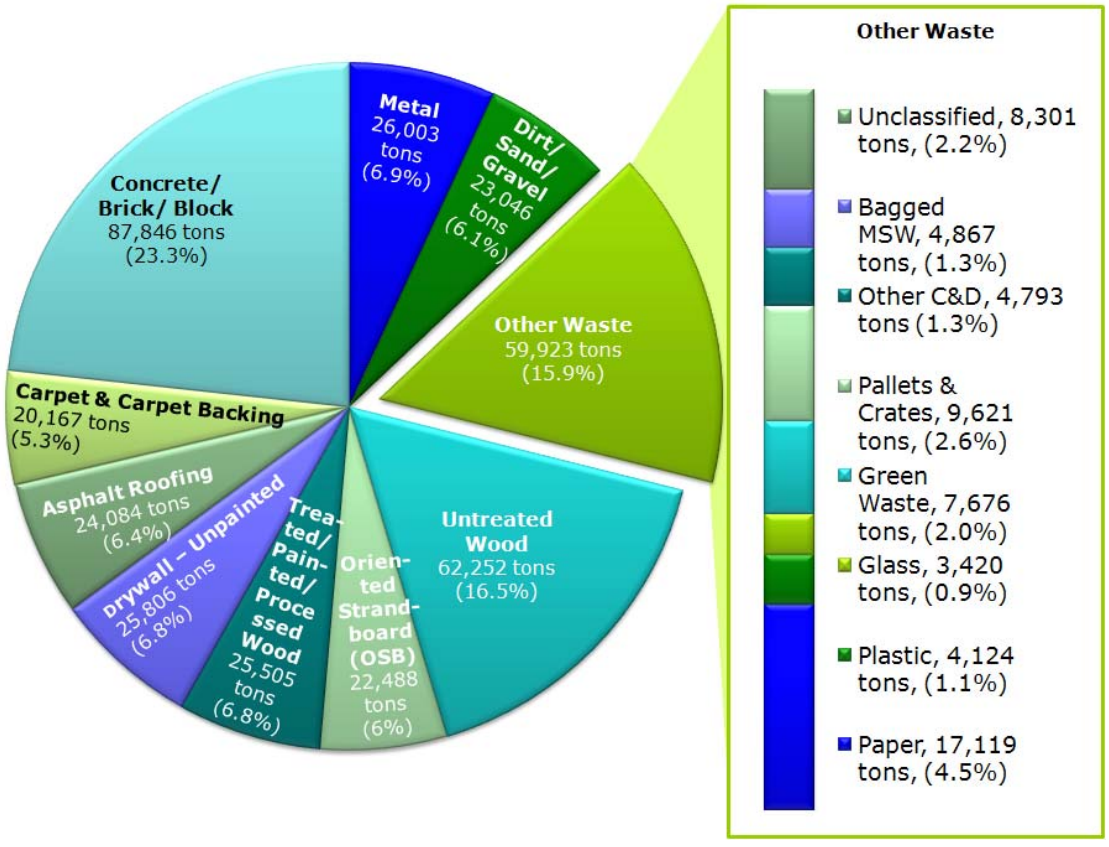
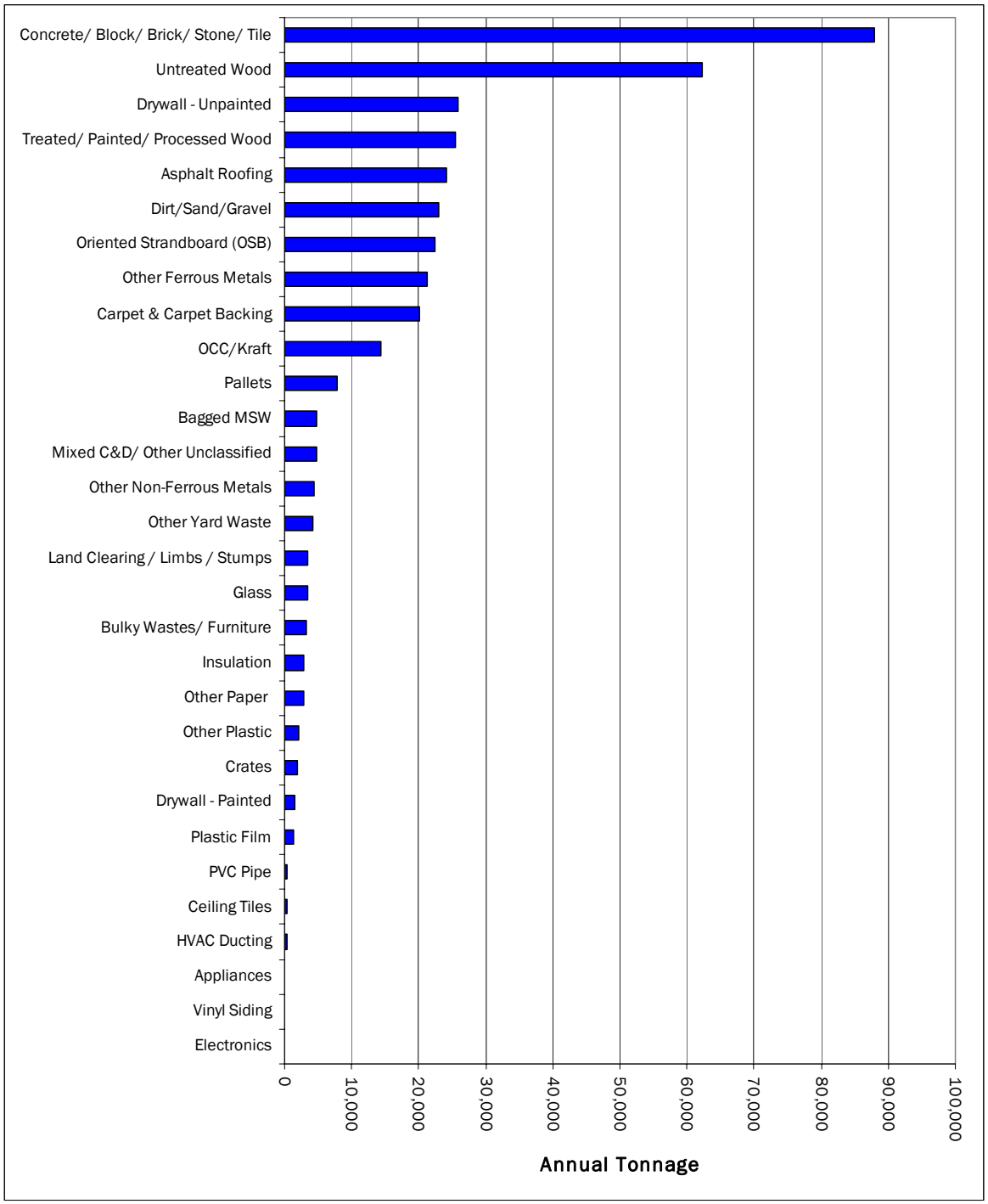


Figure 3-2 ranks the categories of C&D waste from most to least prevalent. It is of definite interest that some of the most commonly disposed materials are highly recyclable (if they could be separated from other C&D waste). For example, the top three most prevalent materials are inerts (concrete/brick/rock), untreated wood and drywall. Clean concrete, brick and block, as well as untreated wood, can be tipped at the Foxhole Landfill for a reduced tip fee if they are source separated, and local manufacturer Union Gypsum will accept drywall for recycling. Ferrous metals and OCC are recyclable, with recycling programs in existence within the Charlotte region. Nonferrous metals are also recyclable, and certain ceiling tiles are accepted for recycling by an out-of-region company if they are source separated and aggregated into trailer-size quantities for transport. It appears that recycling opportunities within the C&D waste stream are significant.

Figure 3-2 Prevalence of C&D Waste by Material Category (annual tons)



It was beyond the scope of this study to investigate the availability of markets for the wide range of recyclable materials in the C&D waste stream. It was also beyond the scope of this study to address the likely feasibility of developing a C&D material recovery facility (MRF) to serve the Mecklenburg County market. Local markets for recyclables are a requirement for

meaningful recycling, and development of a C&D MRF would be considered a longer term strategy for maximizing diversion from the C&D waste stream.

However, in the interest of better understanding the longer term potential to increase diversion of the C&D waste stream, it is informative to break down the C&D waste stream by its hypothetically recoverable components. Specifically, each of the material categories in this study have been assigned to one of the following three categories to describe the diversion potential of the material.

1) **Recoverable**: These materials are recyclable in their entirety and have currently existing markets in the Mecklenburg County region to the extent such materials are source separated for delivery to market.

2) **Potentially Recoverable**: At the current time, there is no mixed C&D waste processing capacity in the County. Many materials are technically recyclable, but only under any number of qualifying conditions: they must be available in significant quantity to be acceptable to the end market; they must be clean enough to recover; they must be further sorted into subcomponents prior to delivery to market; aggregate transportation and recycling costs must be competitive with disposal costs; and other reasons.

3) **Unrecoverable**: These are materials that do not appear to have near term potential for recycling or that occur in such small quantities in the C&D waste stream that it is unlikely they will ever be recycled.

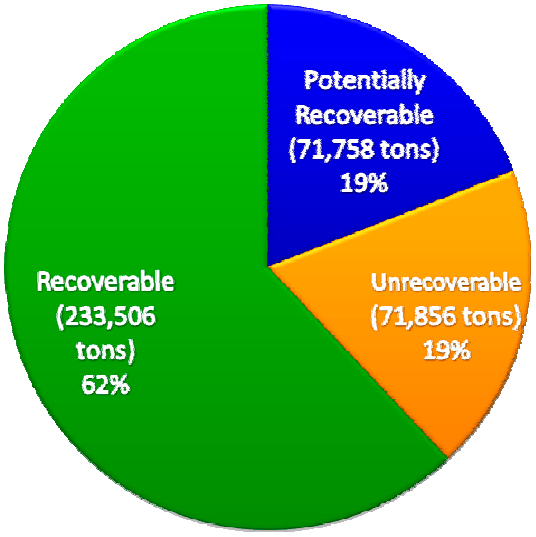
Table 3-2 assigns each of the C&D materials in the study to the above categories.

Table 3-2 Recoverability of C&D Material Categories

Recoverable
Corrugated Cardboard, Appliances, Other Ferrous Metals, HVAC Ducting, Other Non-ferrous Metal, Land Clearing/Limbs/Stumps, Other Yard Waste, Concrete/Block/Brick/Stone/Tile, Pallets, Drywall – Unpainted, Untreated Wood
Potentially Recoverable
PVC Pipe, Vinyl Siding, Dirt/Sand/Gravel, Asphalt Roofing, Ceiling Tiles, Carpet and Carpet Backing, Electronics, Bulky Wastes/Furniture
Unrecoverable
Other Paper, Film Plastic, Other Plastic, All Glass, Oriented Strandboard (OSB), Treated/Painted/Processed Wood, Drywall – Painted, Insulation, Mixed MSW, Mixed C&D/Other Unclassified

Figure 3-3 shows the resulting breakdown between recoverable, potentially recoverable, and unrecoverable materials in C&D waste.

Figure 3-3. Prevalence of Hypothetically Recyclable Materials in Aggregate Disposed C&D Waste (Percent by Weight)



As shown in Figure 3-3, this study found that 62 percent of the C&D waste stream is made up of materials that are recoverable within the existing end markets in Mecklenburg County to the extent they can be source separated. At the current time, this represents the maximum potential diversion that could be achieved from the C&D waste stream. Realistically, this level of diversion will not be approached in the absence of establishing a mixed C&D processing capability, because many of these recoverable materials cannot be economically source separated at construction sites.

It should also be noted that mixed C&D processing facilities in other areas of the country have demonstrated that there are significant limitations to achieving high capture rates even with a customized sorting system. While it was beyond the scope of this project to report on the range of C&D processing technologies and diversion potential at C&D processing facilities, anecdotal evidence from several facilities in the Northeast and South Florida indicate that sorting technology limitations, including pre-process size reduction that is necessary to feed C&D debris through a conveyor sorting system, render many recyclable items too difficult to recover, thereby reducing recycling rates. When viewing Figure 3-3, it is therefore important to consider the 62 percent of "recoverable" C&D as being an academic portrayal of the materials contained in C&D debris. The maximum recycling rate in the C&D waste stream will likely be significantly lower, even in the face of aggressive diversion strategies such as mixed C&D processing.

Of the remaining material in the C&D waste stream, it may be possible to target another 19 percent of the C&D waste stream for diversion through a combination of development of end markets and improvements in collection and processing. Further, the study found that 19 percent of disposed C&D waste is comprised of materials for which legitimate recycling, composting or reuse processes or opportunities have not yet been developed (or if they have, they are not widely in practice for material found in the C&D waste stream). Over time, it is possible that there would be opportunities to increase recycling of new materials that are currently being disposed, but achieving diversion of the "unrecoverable" materials is unlikely to be significant even after significant improvements to the C&D recycling infrastructure.

The detailed composition of C&D waste in Mecklenburg County, including the sample mean, standard deviation, and 90 percent confidence intervals, is contained in Table 3-3. In addition to showing the percent composition statistics, this table also applies the results to the 377,120 total tons of C&D waste that were reported to have been generated in Mecklenburg County in 2007 and disposed in landfills.

Table 3-3 Mecklenburg County Detailed C&D Waste Composition

Material Categories	Mean	Standard Deviation	90% Conf. Interval		Annual Quantity (tons)
			Lower	Upper	
OCC/Kraft	3.8%	0.4%	3.1%	4.5%	14,302
Other Paper	0.7%	0.1%	0.6%	0.9%	2,817
Paper Subtotal	**4.5%**	**0.5%**	**3.7%**	**5.3%**	**17,119**
PVC Pipe	0.1%	0.0%	0.1%	0.2%	457
Plastic Film	0.3%	0.1%	0.2%	0.4%	1,283
Vinyl Siding	0.1%	0.0%	0.0%	0.1%	194
Other Plastic	0.6%	0.1%	0.5%	0.7%	2,191
Plastic Subtotal	**1.1%**	**0.1%**	**0.9%**	**1.3%**	**4,125**
Glass	0.9%	0.1%	0.7%	1.1%	3,420
Glass Subtotal	**0.9%**	**0.1%**	**0.7%**	**1.1%**	**3,420**
Appliances	0.1%	0.0%	0.0%	0.1%	217
Other Ferrous Metals	5.6%	0.7%	4.4%	6.8%	21,174
HVAC Ducting	0.1%	0.0%	0.0%	0.1%	290
Other Non-Ferrous Metals	1.1%	0.1%	0.9%	1.4%	4,321
Metal Subtotal	**6.9%**	**0.8%**	**5.6%**	**8.2%**	**26,003**
Land Clearing / Limbs / Stumps	0.9%	0.3%	0.4%	1.4%	3,514
Other Yard Waste	1.1%	0.2%	0.7%	1.5%	4,162
Green Waste Subtotal	**2.0%**	**0.4%**	**1.4%**	**2.7%**	**7,676**
Concrete/ Block/ Brick/ Stone/ Tile	23.3%	3.1%	18.2%	28.4%	87,846
Dirt/Sand/Gravel	6.1%	1.3%	4.0%	8.2%	23,046
Inerts Subtotal	**29.4%**	**3.4%**	**23.9%**	**34.9%**	**110,892**
Pallets	2.1%	0.3%	1.6%	2.5%	7,765
Crates	0.5%	0.3%	0.0%	0.9%	1,856
Untreated Wood	16.5%	1.4%	14.2%	18.8%	62,252
Oriented Strandboard (OSB)	6.0%	0.8%	4.7%	7.3%	22,488
Treated/ Painted/ Processed Wood	6.8%	0.7%	5.7%	7.8%	25,505
Wood Subtotal	**31.8%**	**2.2%**	**28.2%**	**35.4%**	**119,865**
Drywall - Unpainted	6.8%	1.1%	5.0%	8.7%	25,806
Drywall - Painted	0.4%	0.2%	0.1%	0.7%	1,613
Asphalt Roofing	6.4%	1.2%	4.4%	8.4%	24,084
Insulation	0.8%	0.2%	0.5%	1.0%	2,888
Ceiling Tiles	0.1%	0.0%	0.0%	0.1%	292
Carpet & Carpet Backing	5.3%	1.0%	3.7%	7.0%	20,167
C&D Materials Subtotal	**19.8%**	**1.9%**	**16.7%**	**23.0%**	**74,850**
Bagged MSW	1.3%	0.2%	1.0%	1.6%	4,867
Electronics	0.0%	0.0%	0.0%	0.1%	173
Bulky Wastes/ Furniture	0.9%	0.2%	0.6%	1.2%	3,344
Mixed C&D/ Other Unclassified	1.3%	0.2%	1.0%	1.6%	4,784
Bulky/Other Subtotal	**3.5%**	**0.4%**	**2.9%**	**4.1%**	**13,168**
TOTAL	**100.0%**				**377,120**

Table 3-3 applies the results of this study to the total quantity of C&D reported by C&D landfills to have originated in Mecklenburg County. Tables 3-4 and 3-5 provide the composition of C&D debris at the Foxhole Landfill and the North Mecklenburg Landfill individually. Although it was not intended to analyze the results separately by facility, a cursory review suggests that the C&D waste stream entering each facility is comparable in its composition.

Table 3-4 Foxhole Landfill C&D Waste Composition

Material Categories	Mean	Standard Deviation	90% Conf. Interval		Annual Quantity (tons)
			Lower	Upper	
OCC/Kraft	4.3%	0.6%	3.2%	5.3%	6,890
Other Paper	0.8%	0.1%	0.5%	1.0%	1,240
Paper Subtotal	**5.0%**	**0.7%**	**3.8%**	**6.3%**	**8,130**
PVC Pipe	0.1%	0.0%	0.1%	0.1%	145
Plastic Film	0.4%	0.1%	0.2%	0.5%	619
Vinyl Siding	0.1%	0.0%	0.0%	0.1%	87
Other Plastic	0.6%	0.1%	0.4%	0.7%	953
Plastic Subtotal	**1.1%**	**0.2%**	**0.9%**	**1.4%**	**1,804**
Glass	0.9%	0.1%	0.7%	1.1%	1,436
Glass Subtotal	**0.9%**	**0.1%**	**0.7%**	**1.1%**	**1,436**
Appliances	0.1%	0.0%	0.0%	0.1%	110
Other Ferrous Metals	5.7%	1.0%	4.1%	7.3%	9,188
HVAC Ducting	0.1%	0.0%	0.0%	0.1%	134
Other Non-Ferrous Metals	1.2%	0.2%	0.8%	1.5%	1,859
Metal Subtotal	**7.0%**	**1.0%**	**5.3%**	**8.7%**	**11,292**
Land Clearing / Limbs / Stumps	0.8%	0.4%	0.2%	1.5%	1,354
Other Yard Waste	1.2%	0.3%	0.7%	1.8%	1,963
Green Waste Subtotal	**2.1%**	**0.6%**	**1.1%**	**3.0%**	**3,317**
Concrete/ Block/ Brick/ Stone/ Tile	26.0%	4.8%	18.1%	34.0%	41,927
Dirt/Sand/Gravel	4.2%	1.6%	1.6%	6.8%	6,800
Inerts Subtotal	**30.3%**	**5.1%**	**21.8%**	**38.7%**	**48,727**
Pallets	1.6%	0.2%	1.3%	2.0%	2,653
Crates	0.1%	0.1%	0.0%	0.2%	146
Untreated Wood	17.3%	2.2%	13.7%	20.8%	27,803
Oriented Strandboard (OSB)	7.1%	1.2%	5.1%	9.1%	11,402
Treated/ Painted/ Processed Wood	6.0%	0.9%	4.6%	7.4%	9,674
Wood Subtotal	**32.1%**	**3.3%**	**26.7%**	**37.5%**	**51,678**
Drywall - Unpainted	5.7%	1.5%	3.2%	8.1%	9,154
Drywall - Painted	0.4%	0.2%	0.1%	0.7%	597
Asphalt Roofing	6.8%	1.8%	3.9%	9.8%	10,993
Insulation	0.7%	0.2%	0.4%	1.0%	1,153
Ceiling Tiles	0.1%	0.0%	0.0%	0.1%	110
Carpet & Carpet Backing	4.2%	1.2%	2.2%	6.1%	6,719
C&D Materials Subtotal	**17.8%**	**2.6%**	**13.6%**	**22.1%**	**28,725**
Bagged MSW	1.4%	0.3%	1.0%	1.8%	2,286
Electronics	0.0%	0.0%	0.0%	0.1%	58
Bulky Wastes/ Furniture	0.8%	0.2%	0.4%	1.2%	1,264
Mixed C&D/ Other Unclassified	1.4%	0.3%	1.0%	1.9%	2,331
Bulky/Other Subtotal	**3.7%**	**0.5%**	**2.8%**	**4.6%**	**5,939**
TOTAL	**100.0%**				**161,047**

Table 3-5 North Mecklenburg Landfill C&D Waste Composition

Material Categories	Mean	Standard Deviation	90% Conf. Interval		Annual Quantity (tons)
			Lower	Upper	
OCC/Kraft	3.2%	0.5%	2.4%	4.1%	4,183
Other Paper	0.7%	0.2%	0.4%	1.0%	931
Paper Subtotal	**4.0%**	**0.6%**	**2.9%**	**5.0%**	**5,115**
PVC Pipe	0.2%	0.0%	0.1%	0.2%	203
Plastic Film	0.3%	0.1%	0.2%	0.4%	374
Vinyl Siding	0.0%	0.0%	0.0%	0.1%	63
Other Plastic	0.6%	0.1%	0.4%	0.7%	735
Plastic Subtotal	**1.1%**	**0.1%**	**0.8%**	**1.3%**	**1,374**
Glass	0.9%	0.2%	0.7%	1.2%	1,194
Glass Subtotal	**0.9%**	**0.2%**	**0.7%**	**1.2%**	**1,194**
Appliances	0.0%	0.0%	0.0%	0.1%	59
Other Ferrous Metals	5.5%	1.1%	3.7%	7.3%	7,121
HVAC Ducting	0.1%	0.0%	0.0%	0.1%	90
Other Non-Ferrous Metals	1.1%	0.2%	0.8%	1.5%	1,468
Metal Subtotal	**6.8%**	**1.2%**	**4.9%**	**8.7%**	**8,737**
Land Clearing / Limbs / Stumps	1.0%	0.5%	0.3%	1.8%	1,339
Other Yard Waste	1.0%	0.3%	0.4%	1.5%	1,256
Green Waste Subtotal	**2.0%**	**0.6%**	**1.0%**	**3.0%**	**2,595**
Concrete/ Block/ Brick/ Stone/ Tile	20.2%	3.5%	14.5%	25.9%	26,054
Dirt/Sand/Gravel	8.3%	2.0%	4.9%	11.6%	10,684
Inerts Subtotal	**28.4%**	**4.2%**	**21.5%**	**35.3%**	**36,738**
Pallets	2.5%	0.5%	1.6%	3.4%	3,268
Crates	1.0%	0.6%	0.0%	1.9%	1,229
Untreated Wood	15.6%	1.8%	12.7%	18.6%	20,212
Oriented Strandboard (OSB)	4.7%	0.9%	3.1%	6.2%	6,056
Treated/ Painted/ Processed Wood	7.6%	1.0%	6.0%	9.2%	9,855
Wood Subtotal	**31.4%**	**2.9%**	**26.7%**	**36.2%**	**40,619**
Drywall - Unpainted	8.2%	1.7%	5.3%	11.0%	10,553
Drywall - Painted	0.5%	0.3%	0.0%	1.0%	637
Asphalt Roofing	5.9%	1.6%	3.3%	8.5%	7,603
Insulation	0.8%	0.3%	0.4%	1.3%	1,063
Ceiling Tiles	0.1%	0.1%	0.0%	0.2%	114
Carpet & Carpet Backing	6.7%	1.7%	3.9%	9.5%	8,645
C&D Materials Subtotal	**22.1%**	**2.9%**	**17.4%**	**26.9%**	**28,614**
Bagged MSW	1.1%	0.2%	0.8%	1.5%	1,478
Electronics	0.1%	0.0%	0.0%	0.1%	74
Bulky Wastes/ Furniture	1.0%	0.3%	0.5%	1.6%	1,296
Mixed C&D/ Other Unclassified	1.1%	0.2%	0.8%	1.3%	1,375
Bulky/Other Subtotal	**3.3%**	**0.5%**	**2.5%**	**4.1%**	**4,222**
TOTAL	**100.0%**				**129,209**

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APPENDIX A

Origin of Incoming C&D Waste by Facility

Appendix A Percent by Weight

Foxhole Landfill

Percent by Activity

Activity	Percent by Weight			Total
	Residential Structure	Commercial Structure	Non-C&D [1]	
Construction	60.8%	13.7%	2.5%	74.5%
Renovation	5.0%	1.6%		9.1%
Demolition	9.7%	6.7%		16.4%
Total	75.5%	22.0%	2.5%	100.0%

Percent by Hauler Type

Delivered By	Percent by Weight			Total
	Residential Structure	Commercial Structure	Non-C&D [1]	
Self-Hauler	1.9%	0.0%	0.0%	1.9%
Private Hauler	73.6%	22.0%	2.5%	98.1%
Total	75.5%	22.0%	2.5%	100.0%

North Mecklenburg Landfill

Percent by Activity North Mecklenburg

Activity	Percent by Weight			Total
	Residential Structure	Commercial Structure	Non-C&D [1]	
Construction	59.8%	7.6%	3.9%	67.4%
Renovation	9.5%	2.5%		16.0%
Demolition	9.0%	7.6%		16.6%
Total	**78.4%**	**17.7%**	**3.9%**	**100.0%**

Percent by Hauler Type

Delivered By	Percent by Weight			Total
	Residential Structure	Commercial Structure	Non-C&D [1]	
Self-Hauler	3.0%	0.7%	0.6%	4.4%
Private Hauler	75.3%	17.0%	3.3%	95.6%
Total	78.4%	17.7%	3.9%	100.0%

APPENDIX B

Summary of Loads Sampled

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
1	8/6/2007	North Mecklenburg	1			1							12,200		30	66.0%	19.8
2	8/6/2007	North Mecklenburg	1			1							820	02-454128	4	120.0%	4.8
3	8/6/2007	North Mecklenburg	1			1							16,080	02-454131	30	90.0%	27
4	8/6/2007	North Mecklenburg	1				1						940	02-454136	20	25.0%	5
5	8/6/2007	North Mecklenburg		1	1				1				4,560	02-454140	15	100.0%	15
6	8/6/2007	North Mecklenburg	1		1		1						3,660	02-434149	15	95.0%	14.25
7	8/6/2007	North Mecklenburg	1		1		1						2,240	02-454184	12	80.0%	9.6
8	8/6/2007	North Mecklenburg	1			1							6,920	02-454166	30	100.0%	30
9	8/6/2007	North Mecklenburg	1			1							10,420		15	95.0%	14.25
10	8/6/2007	North Mecklenburg	1			1							4,060	20-454194	15	75.0%	11.25
11	8/6/2007	North Mecklenburg	1			1							13,840	02-454199	15	95.0%	14.25
12	8/6/2007	North Mecklenburg	1				1						4,800	02-454210	20	100.0%	20
13	8/6/2007	North Mecklenburg		1	1		1						220	02-454221	4	75.0%	3
14	8/6/2007	North Mecklenburg		1		1							8,900	02-454229	30	75.0%	22.5
15	8/6/2007	North Mecklenburg	1				1						5,360	02-454254	4	90.0%	3.6
16	8/6/2007	North Mecklenburg		1					1				5,360	02-454254	30	100.0%	30
17	8/6/2007	North Mecklenburg		1		1							4,180	02-454261	30	95.0%	28.5
18	8/6/2007	North Mecklenburg		1							1		2,500	02-454267	30	85.0%	25.5
19	8/6/2007	North Mecklenburg		1			1						5,480		10	100.0%	10
20	8/6/2007	North Mecklenburg	1			1							13,420	02-454276	30	85.0%	25.5
21	8/6/2007	North Mecklenburg	1					1					2,400	02-454280	10	95.0%	9.5
22	8/6/2007	North Mecklenburg		1			1						2,160	02-454298	30	95.0%	28.5
23	8/6/2007	North Mecklenburg	1			1							2,400	02-450306	15	70.0%	10.5
24	8/6/2007	North Mecklenburg	1					1					3,860	02-454325	15	100.0%	15
25	8/7/2007	North Mecklenburg	1			1							7,740	02-454414	30	85.0%	25.5
26	8/7/2007	North Mecklenburg	1			1							7,560	02-454420	30	95.0%	28.5
27	8/7/2007	North Mecklenburg	1			1							4,540	02-454423	30	100.0%	30
28	8/7/2007	North Mecklenburg	1			1							9,920	02-454438	15	95.0%	14.25
29	8/7/2007	North Mecklenburg		1			1						6,580	02-454466	15	100.0%	15
30	8/7/2007	North Mecklenburg	1					1					5,020	02-454477	12	60.0%	7.2
31	8/7/2007	North Mecklenburg		1		1							9,280	02-454492	30	90.0%	27
32	8/7/2007	North Mecklenburg		1				1					10,760	02-454504	12	100.0%	12
33	8/7/2007	North Mecklenburg	1			1							4,140	02-454511	15	100.0%	15
34	8/7/2007	North Mecklenburg	1			1							5,920	02-454529	30	85.0%	25.5
35	8/7/2007	North Mecklenburg	1		1			1					4,060	02-454576	6	150.0%	9
36	8/7/2007	North Mecklenburg	1			1							3,800	02-454579	15	75.0%	11.25
37	8/7/2007	North Mecklenburg	1				1						13,560	02-454587	30	99.0%	29.7
38	8/8/2007	North Mecklenburg	1			1							23,800	02-454686	30	100.0%	30
39	8/8/2007	North Mecklenburg	1				1						11,480	02-454695	20	55.0%	11

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
40	8/8/2007	North Mecklenburg	1			1							5,900	02-454705	30	95.0%	28.5
41	8/8/2007	North Mecklenburg	1			1							4,460	02-454714	18	60.0%	10.8
42	8/8/2007	North Mecklenburg		1				1					4,020	02-454736	12	90.0%	10.8
43	8/8/2007	North Mecklenburg	1			1							11,580	02-454746	30	90.0%	27
44	8/8/2007	North Mecklenburg		1				1					12,560	02-454773	30	95.0%	28.5
45	8/8/2007	North Mecklenburg	1				1						4,160	02-454783	12	60.0%	7.2
46	8/8/2007	North Mecklenburg		1				1					2,140	02-454807	18	90.0%	16.2
47	8/8/2007	North Mecklenburg	1			1							3,480	02-454813	15	105.0%	15.75
48	8/8/2007	North Mecklenburg		1				1					6,140	02-454839	30	95.0%	28.5
49	8/8/2007	North Mecklenburg	1				1						2,240	02-454846	4	100.0%	4
50	8/9/2007	Fox Hole Landfill	1		1		1						1,720		6	100.0%	6
51	8/9/2007	Fox Hole Landfill	1		1		1						500		2	100.0%	2
52	8/9/2007	Fox Hole Landfill		1				1					2,000		4	100.0%	4
53	8/9/2007	Fox Hole Landfill	1				1						500		4	50.0%	2
54	8/9/2007	Fox Hole Landfill	1		1		1						500		2	75.0%	1.5
55	8/9/2007	Fox Hole Landfill		1				1					3,320	336981	10	85.0%	8.5
56	8/9/2007	Fox Hole Landfill	1				1						5,000	336482	12	75.0%	9
57	8/9/2007	Fox Hole Landfill	1			1							7,200	336986	30	95.0%	28.5
58	8/9/2007	Fox Hole Landfill		1				1					4,040	336993	30	95.0%	28.5
59	8/9/2007	Fox Hole Landfill	1			1							12,420	336998	30	90.0%	27
60	8/9/2007	Fox Hole Landfill	1			1							8,080	337004	30	90.0%	27
61	8/9/2007	Fox Hole Landfill	1			1							28,640	337009	30	100.0%	30
62	8/9/2007	Fox Hole Landfill	1				1						7,420	337013	30	100.0%	30
63	8/9/2007	Fox Hole Landfill	1			1							25,680	337030	30	100.0%	30
64	8/9/2007	Fox Hole Landfill	1			1							12,320	337039	30	95.0%	28.5
65	8/9/2007	Fox Hole Landfill	1			1							1,760	337019	15	60.0%	9
66	8/9/2007	Fox Hole Landfill		1		1							7,400	337044	30	100.0%	30
67	8/9/2007	Fox Hole Landfill	1			1							7,400	337056	30	100.0%	30
68	8/9/2007	Fox Hole Landfill		1				1					6,320	337059	30	90.0%	27
69	8/9/2007	Fox Hole Landfill	1			1							8,220	337079	30	100.0%	30
70	8/9/2007	Fox Hole Landfill	1			1							15,000	337079	30	100.0%	30
71	8/9/2007	Fox Hole Landfill	1			1							2,620	337102	30	85.0%	25.5
72	8/9/2007	Fox Hole Landfill	1			1							2,100	337114	14	70.0%	9.8
73	8/9/2007	Fox Hole Landfill	1			1							9,740	337119	20	100.0%	20
74	8/9/2007	Fox Hole Landfill	1			1							8,000	333713	20	100.0%	20
75	8/9/2007	Fox Hole Landfill		1		1							6,180	337132	30	95.0%	28.5
76	8/10/2007	Fox Hole Landfill		1						1			5,220	337164	40	65.0%	26
77	8/10/2007	Fox Hole Landfill	1			1							7,300	337167	20	95.0%	19
78	8/10/2007	Fox Hole Landfill	1			1							7,880	337169	30	100.0%	30

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
79	8/10/2007	Fox Hole Landfill		1						1			13,260	337173	40	100.0%	40
80	8/10/2007	Fox Hole Landfill		1			1						2,300	337178	15	75.0%	11.25
81	8/10/2007	Fox Hole Landfill	1			1							860	337181	8	50.0%	4
82	8/10/2007	Fox Hole Landfill	1				1						2,900	337185	30	40.0%	12
83	8/10/2007	Fox Hole Landfill	1			1							660	337203	10	100.0%	10
84	8/10/2007	Fox Hole Landfill	1			1							2,600	337225	15	95.0%	14.25
85	8/10/2007	Fox Hole Landfill	1			1							12,180	337246	20	100.0%	20
86	8/10/2007	Fox Hole Landfill	1			1							3,280	337275	30	80.0%	24
87	8/10/2007	Fox Hole Landfill	1			1							680	337278	15	90.0%	13.5
88	8/13/2007	Fox Hole Landfill		1		1							5,100	337455	30	40.0%	12
89	8/13/2007	Fox Hole Landfill	1			1							5,720	337465	20	60.0%	12
90	8/13/2007	Fox Hole Landfill		1			1						1,900	337470	10	100.0%	10
91	8/13/2007	Fox Hole Landfill	1			1							3,380	337472	15	95.0%	14.25
92	8/13/2007	Fox Hole Landfill		1			1						3,300	337478	15	100.0%	15
93	8/13/2007	Fox Hole Landfill		1			1						4,280	337491	15	95.0%	14.25
94	8/13/2007	Fox Hole Landfill	1					1					3720	337498	15	60.0%	9
95	8/13/2007	Fox Hole Landfill		1		1							1,600	337506	30	85.0%	25.5
96	8/13/2007	Fox Hole Landfill	1			1							5,720	337536	30	85.0%	25.5
97	10/15/2007	Fox Hole Landfill	1			1							8,940	348689	30	90.0%	27
98	10/15/2007	Fox Hole Landfill	1					1					5,990	348695	15	90.0%	13.5
99	10/15/2007	Fox Hole Landfill	1				1						6,160	348708	30	65.0%	19.5
100	10/15/2007	Fox Hole Landfill	1			1							10,060	348722	30	90.0%	27
101	10/15/2007	Fox Hole Landfill	1			1							1,520	348725	30	60.0%	18
102	10/15/2007	Fox Hole Landfill		1				1					13,480	348742	30	95.0%	28.5
103	10/15/2007	Fox Hole Landfill		1							1		240	348753	30	60.0%	18
104	10/15/2007	Fox Hole Landfill	1			1							3,080	348760	30	75.0%	22.5
105	10/15/2008	Fox Hole Landfill		1		1							7,300	348770	30	100.0%	30
106	10/15/2007	Fox Hole Landfill		1		1							1,520	348776	12	90.0%	10.8
107	10/15/2007	Fox Hole Landfill	1			1							15,200	348795	30	95.0%	28.5
108	10/15/2007	Fox Hole Landfill	1			1							420	348810	10	95.0%	9.5
109	10/15/2007	Fox Hole Landfill	1			1							6,000	348825	30	90.0%	27
110	10/15/2007	Fox Hole Landfill		1				1					4,520	348844	15	85.0%	12.75
111	10/15/2007	Fox Hole Landfill	1		1			1					2,380	348859	10	90.0%	9
112	10/15/2007	Fox Hole Landfill	1			1							7,420	348868	30	90.0%	27
113	10/15/2007	Fox Hole Landfill		1				1					1,940	348885	30	85.0%	25.5
114	10/15/2007	Fox Hole Landfill		1		1							2,660	348897	30	80.0%	24
115	10/15/2007	Fox Hole Landfill	1		1			1					1,500	348902	12	45.0%	5.4
116	10/16/2007	Fox Hole Landfill	1			1							7,940	348913	30	90.0%	27
117	10/16/2007	Fox Hole Landfill	1			1							8,320	348920	30	55.0%	16.5

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
118	10/16/2007	Fox Hole Landfill	1			1							1,560	348924	15	100.0%	15
119	10/16/2007	Fox Hole Landfill		1				1					7,620	348929	30	75.0%	22.5
120	10/16/2007	Fox Hole Landfill	1			1							2,940	348942	30	75.0%	22.5
121	10/16/2007	Fox Hole Landfill	1					1					16,920	348950	30	100.0%	30
122	10/16/2007	Fox Hole Landfill	1				1						1,900	348960	20	75.0%	15
123	10/16/2007	Fox Hole Landfill	1			1							8,180	348976	30	90.0%	27
124	10/16/2007	Fox Hole Landfill	1			1							1,640	348988	15	100.0%	15
125	10/16/2007	Fox Hole Landfill	1					1					3,340	349002	14	95.0%	13.3
126	10/16/2007	Fox Hole Landfill	1			1							2,220	349018	20	60.0%	12
127	10/16/2007	Fox Hole Landfill	1			1							10,630	349021	20	100.0%	20
128	10/16/2007	Fox Hole Landfill	1			1							4,840	349034	30	80.0%	24
129	10/16/2007	Fox Hole Landfill	1				1						2,580	349043	10	95.0%	9.5
130	10/16/2007	Fox Hole Landfill	1			1							12,640	349060	30	99.0%	29.7
131	10/16/2007	Fox Hole Landfill	1			1							7,080	349062	30	80.0%	24
132	10/16/2007	Fox Hole Landfill	1		1			1					3,140	349081	8	75.0%	6
133	10/16/2007	Fox Hole Landfill		1		1							5,820	349095	30	100.0%	30
134	10/16/2007	Fox Hole Landfill	1			1							9,520	349107	30	95.0%	28.5
135	10/16/2007	Fox Hole Landfill		1		1							2,020	349114	12	90.0%	10.8
136	10/17/2007	Fox Hole Landfill	1			1							5,900	349142	30	100.0%	30
137	10/17/2007	Fox Hole Landfill	1		1			1					2,900	349150	10	60.0%	6
138	10/17/2007	Fox Hole Landfill		1				1					2,880	349151	12	85.0%	10.2
139	10/17/2007	Fox Hole Landfill	1			1							6,940	349163	30	90.0%	27
140	10/17/2007	Fox Hole Landfill	1			1							4,220	349167	30	95.0%	28.5
141	10/17/2007	Fox Hole Landfill	1				1						1,240	349177	10	35.0%	3.5
142	10/17/2007	Fox Hole Landfill	1			1							5,760	349179	30	75.0%	22.5
143	10/17/2007	Fox Hole Landfill	1			1							1,260	349192	15	60.0%	9
144	10/17/2007	Fox Hole Landfill	1			1							6,660	349208	30	100.0%	30
145	10/17/2007	Fox Hole Landfill	1			1							6,660	349202	30	75.0%	22.5
146	10/17/2007	Fox Hole Landfill	1			1							2,200	349204	15	75.0%	11.25
147	10/17/2007	Fox Hole Landfill	1			1							3,220	349232	15	40.0%	6
148	10/17/2007	Fox Hole Landfill	1			1							1,740	349237	30	50.0%	15
149	10/17/2007	Fox Hole Landfill	1					1					30,200	349255	30	100.0%	30
150	10/17/2007	Fox Hole Landfill	1			1							5,960	349258	30	90.0%	27
151	10/17/2007	Fox Hole Landfill		1		1							5,580	349303	30	85.0%	25.5
152	10/17/2007	Fox Hole Landfill	1			1							3,460	349305	12	100.0%	12
153	10/17/2007	Fox Hole Landfill	1			1							6,060	349318	30	100.0%	30
154	10/17/2007	Fox Hole Landfill	1			1							8,780	349323	30	100.0%	30
155	10/17/2007	Fox Hole Landfill	1			1							4,700	349346	15	35.0%	5.25
156	10/17/2007	Fox Hole Landfill		1		1							24,620	349352	30	80.0%	24

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
157	10/17/2007	Fox Hole Landfill	1			1							7,120	349361	30	90.0%	27
158	10/17/2007	Fox Hole Landfill	1			1							2,020	349360	12	95.0%	11.4
159	10/18/2007	Fox Hole Landfill	1			1							2,960	349382	30	90.0%	27
160	10/18/2007	Fox Hole Landfill	1			1							12,600	349388	30	100.0%	30
161	10/18/2007	Fox Hole Landfill	1			1							2,660	349392	30	40.0%	12
162	10/18/2007	Fox Hole Landfill	1		1			1					1,500	349395	8	90.0%	7.2
163	10/18/2007	Fox Hole Landfill	1			1							2,020	349412	30	90.0%	27
164	10/18/2007	Fox Hole Landfill	1			1							8,120	349416	30	90.0%	27
165	10/18/2007	Fox Hole Landfill		1		1							11,060	349430	30	80.0%	24
166	10/18/2007	Fox Hole Landfill		1				1					3,360	349440	30	75.0%	22.5
167	10/18/2007	Fox Hole Landfill	1				1						6,320	349446	30	95.0%	28.5
168	10/18/2007	Fox Hole Landfill		1		1							14,500	349467	20	85.0%	17
169	10/18/2007	Fox Hole Landfill	1			1							3,260	349487	30	90.0%	27
170	10/18/2007	Fox Hole Landfill	1			1							4,140	349508	30	60.0%	18
171	10/18/2007	Fox Hole Landfill		1		1							5,380	349522	30	70.0%	21
172	10/19/2007	North Mecklenburg		1				1					4,520	463353	30	60.0%	18
173	10/19/2007	North Mecklenburg	1			1							5,000	463357	18	65.0%	11.7
174	10/19/2007	North Mecklenburg	1					1					3,140	463358	20	90.0%	18
175	10/19/2007	North Mecklenburg	1			1							7,080	463360	30	95.0%	28.5
176	10/19/2007	North Mecklenburg	1			1							2,120	463362	12	85.0%	10.2
177	10/19/2007	North Mecklenburg	1			1							6,000	463363	20	80.0%	16
178	10/19/2007	North Mecklenburg		1		1							4,460	463364	18	95.0%	17.1
179	10/19/2007	North Mecklenburg	1			1							5,880	463365	30	70.0%	21
180	10/19/2007	North Mecklenburg	1			1							3,760	463372	30	75.0%	22.5
181	10/19/2007	North Mecklenburg	1					1					10,080	463374	20	100.0%	20
182	10/19/2007	North Mecklenburg	1			1							4,700	463378	30	70.0%	21
183	10/19/2007	North Mecklenburg	1			1							5,840	463380	30	80.0%	24
184	10/19/2007	North Mecklenburg		1		1							3,160	463385	40	45.0%	18
185	10/19/2007	North Mecklenburg	1					1					6,460	463390	10	100.0%	10
186	10/19/2007	North Mecklenburg	1			1							4,680	463398	40	70.0%	28
187	10/19/2007	North Mecklenburg	1		1		1						2,000	463401	8	90.0%	7.2
188	10/19/2007	North Mecklenburg	1					1					7,780	463402	30	95.0%	28.5
189	10/19/2007	North Mecklenburg	1			1							4,700	463409	30	90.0%	27
190	10/19/2007	North Mecklenburg	1			1							4,200	463411	15	50.0%	7.5
191	10/19/2007	North Mecklenburg		1					1				2,840	463414	40	60.0%	24
192	10/19/2007	North Mecklenburg		1				1					6,800	463422	30	60.0%	18
193	10/22/2007	North Mecklenburg	1		1		1						920	463495	5	105.0%	5.25
194	10/22/2007	North Mecklenburg	1			1							20,700	463494	30	70.0%	21
195	10/22/2007	North Mecklenburg	1			1							8,300	463496	30	90.0%	27

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
196	10/22/2007	North Mecklenburg	1				1						4,400	463499	15	90.0%	13.5
197	10/22/2007	North Mecklenburg	1			1							15,100	463505	35	100.0%	35
198	10/22/2007	North Mecklenburg	1			1							17,560	463507	30	95.0%	28.5
199	10/22/2007	North Mecklenburg	1		1	1							920	463508	3	100.0%	3
200	10/22/2007	North Mecklenburg	1		1			1					1,180	463517	5	100.0%	5
201	10/22/2007	North Mecklenburg	1			1							2,940	463522	15	35.0%	5.25
202	10/22/2007	North Mecklenburg	1					1					10,300	463525	15	75.0%	11.25
203	10/22/2007	North Mecklenburg	1			1							4,920	463529	30	90.0%	27
204	10/22/2007	North Mecklenburg	1			1							7,240	463535	30	95.0%	28.5
205	10/22/2007	North Mecklenburg		1							1		2,220	463541	40	35.0%	14
206	10/22/2007	North Mecklenburg	1				1						9,460	463554	30	95.0%	28.5
207	10/22/2007	North Mecklenburg	1		1	1							560	463564	3	120.0%	3.6
208	10/22/2007	North Mecklenburg	1			1							4,560	463568	18	100.0%	18
209	10/22/2007	North Mecklenburg	1			1							10,920	463571	20	95.0%	19
210	10/22/2007	North Mecklenburg	1			1							6,860	463580	30	90.0%	27
211	10/22/2007	North Mecklenburg		1		1							14,740	463583	30	95.0%	28.5
212	10/22/2007	North Mecklenburg	1					1					4,600	463588	4	90.0%	3.6
213	10/22/2007	North Mecklenburg	1			1							1,640	463591	18	85.0%	15.3
214	10/23/2007	North Mecklenburg	1			1							620	463608	12	100.0%	12
215	10/23/2007	North Mecklenburg	1				1						7,240	463611	30	85.0%	25.5
216	10/23/2007	North Mecklenburg	1			1							4,740	463614	15	95.0%	14.25
217	10/23/2007	North Mecklenburg	1		1	1							7,480	463619	30	90.0%	27
218	10/23/2007	North Mecklenburg	1			1							6,460	463620	15	80.0%	12
219	10/23/2007	North Mecklenburg		1	1			1					5,340	463625	12	50.0%	6
220	10/23/2007	North Mecklenburg		1								1	3,680	463626	12	95.0%	11.4
221	10/23/2007	North Mecklenburg	1			1							17,260	463629	30	40.0%	12
222	10/23/2007	North Mecklenburg	1			1							2,000	463631	10	100.0%	10
223	10/23/2007	North Mecklenburg	1					1					3,660	463635	12	85.0%	10.2
224	10/23/2007	North Mecklenburg		1		1							2,100	463639	12	95.0%	11.4
225	10/23/2007	North Mecklenburg	1			1							2,860	463644	10	90.0%	9
226	10/23/2007	North Mecklenburg		1						1			6,260	463647	30	80.0%	24
227	10/23/2007	North Mecklenburg	1			1							960	463654	10	95.0%	9.5
228	10/23/2007	North Mecklenburg	1			1							2,020	463661	10	85.0%	8.5
229	10/23/2007	North Mecklenburg	1			1							3,400	463662	16	95.0%	15.2
230	10/23/2007	North Mecklenburg	0.5	0.5		1							11,120	463674	15	90.0%	13.5
231	10/23/2007	North Mecklenburg	1			1							10,600	463676	20	105.0%	21
232	10/23/2007	North Mecklenburg	1			1							8,500	463682	30	95.0%	28.5
233	10/23/2007	North Mecklenburg	1			1							6,420	463688	30	80.0%	24
234	10/23/2007	North Mecklenburg	1			1							11,940	463693	15	90.0%	13.5

Appendix B Sample Summary

Sample No	Date	Facility Name	Res	Non-Res	SH	Con	Ren	Demo	Man	Retail	WH	Other	Load Weight	Ticket Number	Ydge	%full	Total Yd
235	10/23/2007	North Mecklenburg	1					1					6,060	463696	12	100.0%	12
236	10/23/2007	North Mecklenburg	1			1							9,160	463702	30	80.0%	24
237	10/23/2007	North Mecklenburg		1		1							5,660	463705	15	90.0%	13.5
238	10/24/2007	North Mecklenburg	1			1							3,760	463719	30	40.0%	12
239	10/24/2007	North Mecklenburg	1			1							6,960	463720	30	95.0%	28.5
240	10/24/2007	North Mecklenburg		1			1						3,400	463724	12	50.0%	6
241	10/24/2007	North Mecklenburg		1							1		2,480	463725	2	250.0%	5
242	10/24/2007	North Mecklenburg	1			1							4,060	463730	30	75.0%	22.5
243	10/24/2007	North Mecklenburg		1			1						1,180	463732	12	50.0%	6
244	10/24/2007	North Mecklenburg	1			1							5,600	463740	30	85.0%	25.5
245	10/24/2007	North Mecklenburg	1			1							5,080	463745	20	90.0%	18
246	10/24/2007	North Mecklenburg		1				1					5,220	463753	12	95.0%	11.4
Fox Hole Landfill		122	183.5	62.5	20	157	36	42	3	3	4	1	1,497,200				
North Mecklenburg LF		124															
Total Samples		246															

Abbreviations: Res =Residential; Non-Res = Non-Residential; SH = Self-Haul; Con = Construction; Ren = Renovation; Demo = Demolition; Man = Manufacturing; and WH = Warehouse

APPENDIX C

C & D Material Definitions

Appendix C - Mecklenburg County C&D Characterization Material Definitions

Material Category			Description
Paper	1	Corrugated Cardboard	Paperboard containers consisting of Kraft (brown) linerboard with corrugated (fluted medium) fillings. Includes yellow and waxed corrugated boxes and Kraft paper such as bags or wrapping paper. Does not include non-corrugated paperboard products such as cereal, shoe, or gift boxes.
	2	Other Paper	Consists of all non-corrugated and non-kraft paper products such as newspaper, magazines, catalogs, office, computer, polycoated gable top, aseptic juice boxes, paperboard boxes, direct mail, books soiled and unsoiled tissues, paper towels, napkins, file folders, carbonless paper forms, and tissue paper.
Plastics	3	PVC Pipe	Solid, rigid plastic pipe commonly used for household and industrial plumbing, electrical conduit, and commercial processing or chemical manufacturing.
	4	Film Plastic	Any recyclable polyethylene (high density, low density, linear low density) film plastic including sheet plastic, shrink wrap, and some tarping.
	5	Vinyl Siding	An engineered product, manufactured primarily from polyvinyl chloride resin, giving vinyl siding its name. Comprised of other ingredients that establish color, opacity, gloss, impact resistance, flexibility, and durability. It is the most commonly installed exterior cladding for residential construction.
	6	Other Plastic	All other plastic materials including plastic bottles, jars and containers; rigid plastic components; expanded foam plastics; and non-recyclable film plastics
Glass	7	All Glass	Clear, green, and brown glass food and beverage containers. Miscellaneous glass products such as mirrors, leaded crystal, eyeglasses, and blown glass such as light bulbs, auto glass, windows, TV tubes heat resistant cookware (Pyrex), pottery, ceramic plates and drinking glasses. Also includes broken container glass (mixed glass).
Metal	8	Appliances	Large appliances made primarily of metal including stoves, refrigerators, dishwashers, microwaves, etc.; smaller composite appliances including fans, clothes irons, toaster ovens, etc.
	9	Other Ferrous Metals	Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. Includes rebar, empty paint cans.\; excludes HVAC ducting.
	10	HVAC Ducting	A system of ducts used for a particular purpose, as in a ventilation or heating system the pipes, vents, sheet metal tubing, typically galvanized, used for conveying air in a ventilation system.
	11	Other Non-ferrous Metal	Non-magnetic metals such as aluminum, brass, bronze, silver, lead copper, zinc, and stainless steel.

Appendix C - Mecklenburg County C&D Characterization Material Definitions

		Material Category	Description
Green Waste	12	Land Clearing/Limbs/Stumps	Limbs, logs, and stumps generated by removing vegetation from public or private land by mechanical or manual means.
	13	Other Yard Waste	Plant material from any public or private landscapes. Examples include leaves, grass clippings, sea weed, plants, prunings, shrubs.
Inerts	14	Concrete/Block/Brick/Stone/Tile	Hard material made from concrete, brick, or rock. This category includes concrete mixed with or without rebar attached (e.g. building foundations, concrete paving, and cinder blocks), landscaping rock, paving stones, brick, and tile.
	15	Dirt/Sand/Gravel	Materials made of dirt, sand, and gravel. This category is often left over from land clearing activities. This subtype also includes non-hazardous contaminated soil, pathway gravel and other natural or mechanically crushed materials
Wood	16	Pallets	Wood pallets, whether painted or unpainted. [crates? packaging made of lumber/engineered wood?]
	17	Untreated Wood	Non-treated processed wood for building, manufacturing, landscaping, packaging. Examples include dimensional lumber, lumber cutoffs, wood scraps, wood shake roofing, and wood siding. May contain nails or other trace contaminants.
	18	Oriented Strandboard (OSB)	Layered, mat-formed panel product made of strands, flakes or wafers sliced from small diameter, round wood logs and bonded under heat and pressure. Can be painted, unpainted new or demolition scrap of OSB. May contain nails or other trace contaminants. Examples include wood panels and sheathing in walls, floors, and roofs.
	19	Treated/Painted/Processed Wood	Wood that has had an external coating applied, been pressure treated, chemically treated (with copper etc.) or treated with creosote. Examples include railroad ties, marine timbers and pilings, landscape timbers, and telephone poles. Wood that has an external coating applied. Examples include painted or stained dimensional lumber, lumber cutoffs, wood scraps, wood shake roofing, and wood siding. Plywood is manufactured from thin sheets of cross-laminated veneer. (Chipboard) engineered wood products formed by breaking down softwood into wood fibers and wood particles, combining them with wax or a resin, and forming panels by applying high temperature and pressure. Examples include MDF, particleboardcarpentry, and wood veneers.
C&D Materials	20	Drywall - Unpainted	Unpainted gypsum wallboard or interior wall covering made of a sheet of gypsum sandwiched between paper layers. Includes used or unused, broken or whole sheets. Gypsum board may also be called sheetrock, drywall, plasterboard, gypsomboard, gyproc.

Appendix C - Mecklenburg County C&D Characterization Material Definitions

		Material Category	Description
C&D Materials	**21**	Drywall - Painted	Painted gypsum wallboard or interior wall covering made of a sheet of gypsum sandwiched between paper layers. Includes used or unused, broken or whole sheets. Gypsum board may also be called sheetrock, drywall, plasterboard, gypsomboard, gyproc.
	22	Asphalt Roofing	Material that is used for roofing any structure. Examples include composite shingles, attached roofing tar and tar paper, asphalt shingles.
	23	Insulation	Any of the various types of insulation including synthetic fiber insulation, faced or unfaced batts, “rock wool,” and rigid board types. Used in ceilings, walls and around ducting for both thermal insulation and sound attenuation.
	24	Ceiling Tiles	Lightweight tiles, recyclable and non-recyclable, used for the interior of buildings. Examples include ceiling tiles, ceiling planks and ceiling panels.
	25	Carpet and Carpet Backing	Flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material. Includes plastic, foam, felt, and other materials used under carpet to provide insulation and padding
Other Wastes	**26**	Mixed MSW	Household and job site waste that is bagged or loose and consists primarily of municipal solid waste. Examples include bagged garbage, beverage containers, food wastes, and other refuse generated on construction sites by non-C&D activities (i.e., consumption by on-site staff), as well as bagged MSW deposited by third parties in C&D roll off containers.
	27	Electronics	Large and small electronic goods that have circuitry. Examples include stereos, VCRs, DVD players, radios, audio/visual equipment, and non-CRT televisions (such as LCD televisions); computer related electronics such as processors, mice, keyboards, laptops, disk drives, printers, modems, and fax machines; and other small consumer goods such as personal digital assistants (PDAs), cell phones, phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.
	28	Bulky Wastes/Furniture	Large composite items that are not defined separately. Examples include all sizes and types of furniture, base components, along with mattresses.
	29	Mixed C&D/Other Unclassified	Construction and demolition material that cannot be put in any other type or subtype. This type may include items from different categories combined, which would be very hard to separate. This type may also include demolition debris that is a mixture of items such as sinks, synthetic counter tops, plate glass, wood, tiles, gypsum board, bricks, masonry tile, ceramics, and porcelain toilets, painted or demolition gypsum and partially full containers of caulk or other, non-hazardous C&D materials.

APPENDIX D

C & D Visual Survey Field Data Form

Appendix D - Mecklenburg County Visual Survey Field Data Form

Sample ID:_____ Field Supervisor: _____

☐ Labeled & Photographed Facility Name: _____

Sector ☐ Residential ☐ Non-Residential ☐ Check if Self-haul

Date: _____ Time: _____

Load Generation Location:
☐ Mecklenburg County
Site: _____

Origin			
	☐	Construction	☐ Manufacturing
	☐	Renovation	☐ Retail
	☐	Demolition	☐ Warehouse
	☐	Roads & Bridges	☐ **Other:**

Hauler: _____ Load Weight / Ticket Number:_____

Truck Container Dimensions: _____ Container Yardage: _____ Percent Full: _____

Trailer Dimensions: _____ Container Yardage: _____ Percent Full: _____

		Material Group	% By Volume	% By Volume	Notes/Estimated Weight
PAPER	1	OCC/Kraft	☐		
	2	Other Paper			
				Subtotal 100%	
PLASTIC	3	PVC Pipe	☐		
	4	Plastic Film			
	5	Vinyl Siding			
	6	Other Plastic			
				Subtotal 100%	
GLASS	7	All Glass	☐		
				Subtotal 100%	
METAL	8	Appliances	☐		
	9	Other Ferrous Metals			
	10	HVAC Ducting			
	11	Other Non-Ferrous Metals			
				Subtotal 100%	
GREEN WASTE	12	Land Clearing/Limbs/Stumps	☐		
	13	Other Yard Waste			
				Subtotal 100%	
INERTS	14	Concrete/Block/Brick/Stone/Tile	☐		
	15	Dirt/Sand/Gravel			
				Subtotal 100%	
WOOD	16	Pallets ***Count of Pallets:***	☐		
	17	Untreated Wood ***Required Description at Bottom of Page***			
	18	Oriented Strandboard (OSB)			
	19	Treated/Painted/Processed Wood			
				Subtotal 100%	
C&D MATERIALS	20	Drywall - Unpainted	☐		
	21	Drywall - Painted			
	22	Asphalt Roofing			
	23	Insulation			
	24	Ceiling Tiles			
	25	Carpet & Carpet Backing			
				Subtotal 100%	
OTHER WASTES	26	Bagged MSW	☐		
	27	Electronics			
	28	Bulky Wastes/Furniture			
	29	Mixed C&D/Other Unclassified ***Required Description at Bottom of Page***			
				Subtotal 100%	
			100%	Total	

Description of Untreated Wood:

Description of Mixed C&D/ Other Unclassified: