

Connecticut Statewide Waste Composition and Characterization Study

Final Study Design

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Prepared by
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In cooperation with
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Introduction

The State of Connecticut Department of Environmental Protection (CTDEP) has commissioned a composition and characterization study of municipal solid waste (MSW) that is generated within the State of Connecticut. The primary purpose of the Statewide Waste Characterization Study is to estimate the composition of waste from residential and Industrial/Commercial/Institutional (ICI) sources. The resultant data will help guide CTDEP as it embarks on an effort to boost the disposal diversion rate, currently estimated at 30 percent, up to a rate of 58 percent.

It should be noted here that CTDEP does not collect or maintain data on state-wide quantities of ICI waste versus residential waste. Therefore efforts will be made by the Project Team to estimate the breakdown between residential and ICI waste as part of this Statewide Waste Characterization Study. However CTDEP recognizes that limited resources are available for this effort so that the resulting allocation will be a rough approximation based on limited surveying at sites where sampling is occurring.

It should also be noted that ICI waste often contains residential waste collected from multi-family and condominium complexes. As such, the characterization of ICI waste will include some residential waste characterized by the hauler as ICI waste.

The study will be carried out over the course of two seasons, with waste sampling activities occurring at five permitted solid waste facilities throughout the State. Solid waste from both the Residential and ICI waste sectors will be subjected to a statistical sampling process, and the representative, randomly chosen samples and loads of waste will be characterized in terms of the weight of certain defined material types that are present. An analysis of the weight data associated with each sample or load of waste will produce estimates of the average composition of the waste from each sector.

This document describes the logistical arrangements and data collection procedures that are to be implemented during the study, as well as the reporting that will occur.

Roles and Responsibilities

The roles and responsibilities of the Project Team are listed below:

The **CTDEP Project Manager**, Tessa Gutowski, will serve as the primary contact for the Project Team during the implementation of the study.

The **Consultant Project Manager**, Ted Siegler, of DSM Environmental Services, Inc., will coordinate the Project Team in all activities and have primary responsibilities for:

- Project Management
- Logistics
- Sample Site Selection
- Client Contact
- Problem Resolution
- Preparation of the Draft and Final Report

Cascadia Consulting Group will be responsible for:

- Preparation of Draft and Final Study Design
- Overall QA/QC effort
- Statistical Analysis
- Report Tables Preparation
- Report Review

MSW Consultants will be responsible for:

- Field Supervision
- On-site Logistics
- Sampling and Sorting
- Sort Crew Training
- Sorting QA/QC
- Compilation of Sorting Data

The **Field Supervisor**, Dennis Holt, will initiate the sampling process each day using the agreed upon approach. He will arrive before the facility opens to make contact with facility scalehouse personnel, the loader operator, or other designated personnel. He will also be the designated person to check in and check out with the scalehouse each day. He will be in charge of tracking samples that need to be taken that day. Lastly, he will be in charge of administering the Health and Safety Plan. If Mr. Holt is unavailable on certain days, then an alternate Field Supervisor will be designated. The CTDEP Project Manager shall be notified of any such changes.

The **Trainer**, Walt Davenport, will be in charge of training the waste sorting crew on technique and definitions at the outset of each season. The trainer will also cover all aspects of safety and health requirements at the beginning of each season.

The **Crew Chiefs**, Randy Bowen or John Bowles, will pick up, transport, and manage the sorting crew throughout the project. They will be in charge of weighing out all the materials after each sample has been sorted. Lastly they will make sure the sorting crew adheres to the Health and Safety Plan.

Contact information will be given to each member of the Project Team at the beginning of each season.

Site Coordination and Communication

Logistics

Before field work commences, the Project Team will work with the selected facilities in order to collect facility specific logistical information necessary to develop the sampling plan. The following information will be collected:

- The facility's contact information
- The facility's days and hours of operation
- The vehicle traffic expected for each sector on each day of the week, and the estimated peak time of day for each type of load
- What recycling or recovery operations exist at the facility, and how the Project Team may effectively obtain samples of waste prior to any diversionary measures
- Unusual conditions (e.g., weather, anomalies in traffic patterns, etc.) that might affect data collection and necessitate special logistical arrangements
- Procedure that will be used to determine the net weight of vehicles (e.g. reliance on scalehouse records or use of net weight cards)
- The facility's ability to provide assistance (e.g. front loader, sorting space, vehicle selection, etc.)

Communication with Disposal Sites

Following the data requests the Field Supervisor will schedule a site visit at each facility. The site visits serve the following crucial functions:

- Introducing the Field Supervisor to facility personnel;
- Clarifying information provided in response to the information request;
- Finalizing locations for setting up the work area, taking samples, queuing samples, discarding sorted samples, and other in-process activities;
- Confirming procedures requiring coordination between the host facility personnel and the Project Team;
- Reviewing facility-specific health and safety procedures and emergency contact numbers; and
- Answering any questions or addressing concerns of the Facility Managers.

The management of each disposal facility will be contacted by the Field Supervisor prior to the scheduled visit. The management will be reminded of both the visit and their role in the sampling activities.

Training and Supervision

At the outset of each season the Trainer will lead a detailed training session in the morning of the first day of the sort. At the conclusion of the training, the sorting crew will be fully prepared to conduct the seasonal sorts. For the rest of the sort, the Crew Chief will oversee and direct the sort crew.

The training will cover all aspects of the safety and health requirements, as well as sorting and weighing procedures and guidance to improve productivity. Training will include:

- General facility overview;
- Learning and reviewing the material categories and definitions;
- Facility-specific health and safety requirements;
- Personal protective equipment (PPE) requirements;
- Waste handling techniques; and
- Productivity strategies and daily sorting quotas.

Throughout the sort the sorting crew will be under close supervision by the Crew Chief. The Crew Chief will ensure the sorting protocol is being followed along with the health and safety requirements outlined in APPENDIX C – Health and Safety Plan. Lastly the Crew Chief will closely evaluate each individual sample to ensure that the material categories are understood and adhered to by the sorting crew.

Sampling Plan

Definitions of Waste Sectors

The sectors of the waste stream that are to be analyzed in the study are defined as follows:

- **Residential** – defined as waste brought to CTDEP facilities by commercially or municipally operated vehicles, in which 80% or more of the waste is from single-family and/or multifamily residential sources. Vehicles chosen for sampling in the Residential waste sector will include **Residential Transfer Trucks** arriving from rural transfer stations as well as **Packer Trucks** carrying waste from single family routes.
- **Institutional/Commercial/Industrial (ICI)** – defined as waste brought to CTDEP facilities by commercially operated vehicles, in which 80% or more of the waste is from institutional, commercial, or industrial sources. This sector excludes Construction and Demolition debris as well as Bulky Waste. Vehicles chosen for sampling in the ICI sector will include **Compacted Dropboxes** and **Packer Trucks**.
- **Unacceptable Loads** – Loads that contain less than 80% of either residential or ICI waste, and loads originating from outside of Connecticut.

Sampling Facilities

All samples will be captured and sorted at five permitted solid waste facilities recruited by CTDEP. A sixth facility was added as a backup. They are:

1. **Bristol Resource Recovery Facility:** 650 TPD mass burn WTE facility located in Bristol, CT and owned and operated by Covanta Bristol, Inc. 16 municipalities send waste to this facility. They are located to the west of the Mid-CT project listed below.
2. **Mid-Connecticut Waste Processing Facility (CRRRA):** 2850 TPD RDF facility operated by CRRRA, with resulting fuel conveyed to an adjacent power plant operated by Covanta. The Mid-CT project accepts waste from 70 municipalities around Hartford, CT.
3. **Southeastern Connecticut Resource Recovery Facility:** 690 TPD mass burn WTE facility serving communities in southeastern CT around Preston, CT. Owned and operated by Covanta.
4. **New Haven Transfer Station,** owned by the New Haven Solid Waste and Recycling Authority: Privately operated (under contract) 700 TPD facility accepting trash and C&D wastes.
5. **Wheelabrator Bridgeport Resource Recovery Facility:** 2250 TPD mass burn WTE facility owned and operated by Wheelabrator Bridgeport, L.P. serving the greater Bridgeport area. Note that for this facility especially, only waste generated in CT will be selected for sampling.

Backup facility:

6. **Wheelabrator Lisbon Resource Recovery Facility:** 500 TPD mass burn WTE facility located in eastern/central CT.

Role of Selected Facilities

Each facility included in this analysis will be expected to provide the following to the Project Team:

- A location on the tipping floor for sample collection and sorting
- The use of a front loader or skid steer loader to collect the sample and remove the sorted waste
- Estimates of the number of vehicles by vehicle type likely to deliver waste on each day of the sampling event
- Participation by the scale house in identifying qualifying vehicles and placarding them for selection for sorting

Expected allocation of samples to site, sector, vehicle type, and season.

The planned allocation of 240 samples is shown in the figure below. The plan calls for hand-sorting all 240 samples of residential and ICI waste, each weighing 200 to 250 pounds. The overall quota of 240 samples will be split evenly over two seasons. In order to meet the quotas, the sorting crew will spend two days at a facility each season.

As the table below shows, estimates of the variability of a comparable sampling program indicate that 240 samples will provide composition estimates with fairly tight precision levels, which will provide a reliable basis for CT DEP to make policy and program decisions. The table presents expected confidence intervals (error ranges) around mean composition estimates for several of the proposed Connecticut material categories. These estimates are based on a simulation using actual waste composition data from other studies.

Expected Error Ranges for Key Materials

Commercial Waste With a sampling size (n) of 120, you would expect the following error range:	Expected Percent (preliminary)	+/-
OCC	15.40%	3.18%
High Grade Paper	2.50%	0.89%
PET Bottles and Jars	0.90%	0.13%
Pallets and Crates	4.90%	2.80%

Residential Waste With a sampling size (n) of 120, you would expect the following error range:	Expected Percent (preliminary)	+/-
OCC	5.30%	1.02%
High Grade Paper	1.90%	1.02%
PET Bottles and Jars	1.40%	0.13%
Aluminum Cans	0.70%	0.13%

Waste samples are to be obtained in approximately equal numbers during each of the two seasons. The sorting crew will sort 120 samples during each season. If insufficient numbers arrive at CTDEP permitted solid waste permitted facilities, then changes may be required in the expected numbers of samples and the sampling schedule.

As shown in the table below, greater numbers of samples are allocated to the ICI waste sector. On average, a municipal waste stream similar to Connecticut's is made up of roughly 60-70% ICI waste and 30-40% residential waste. Samples have been allocated to match this ratio. The waste found in the ICI stream also tends to be more variable than that found in the residential stream, from load to load. Higher variability means that additional samples of ICI waste are required to provide precision levels comparable to the residential waste sector.

Estimated Allocation of Samples by Sector

Sector	Number of Samples
Residential	90
ICI	150
Total	240

Likewise, allocations of waste by vehicle type has been weighted more heavily toward packer trucks than to transfer vehicles or dropboxes due to the expectation that more of the waste in both sectors will arrive to each facility in this manner.

Due to uncertainties regarding traffic patterns and quantities at each facility, sample allocations at each facility have not been determined. Daily allocations will match the overall allocation ratios as closely as possible but will most likely vary due to the fact that not every facility will get the same quantity and ratio of vehicle types (packers, transfer trucks and compacted dropboxes). At the end of the first season of sampling the proportion will be finalized and adjusted accordingly for the second season.

It has been agreed with CTDEP that the first round of sampling will occur in February and March, and that the second round of sampling will occur in the fall during a time when leaves are likely to make up part of the incoming waste stream.

Estimated Allocation of Samples by Site, Sector, Vehicle Type & Season*

Facility	Residential		ICI		Seasonal Totals	Overall Totals
	Residential Transfer	Packer Loads	Compacted Dropboxes	Packer Loads		
Bristol					24	48
Mid-Connecticut					24	48
Southeastern Connecticut					24	48
New Haven					24	48
Wheelabrator Bridgeport					24	48
TOTALS	13	32	20	55	120	240

*allocations by facility had not yet been determined during the creation of the Final Study Design.

Acquisition of Samples

General Space Requirements

In order for the sorting crew to safely and successfully collect and sort samples at each facility they will need a space approximately the size of two truck bays or about 20x40 feet. This space must also allow a front loader to dump 200 to 300 pound samples onto a designated ground area frequently throughout the day. At the end of the day the crew will have accumulated a large pile of garbage, made up of both the sorted and unsorted portion of each grab sample, that will be disposed of properly at the direction of the solid waste facility.

Vehicle Selection

The Field Supervisor will follow a systematic selection procedure to identify residential and ICI waste vehicles for sampling. To calculate vehicle sampling frequency for each waste sector, the Project Team will establish a sampling interval for each. Sampling intervals are determined by dividing the total expected number of loads for each sector arriving at the facility on the scheduled day – based on questions asked of each facility in the planning phase of the study-- by the number of samples needed each day. The resulting number is the sampling frequency, which determines whether every third vehicle, every sixth vehicle, or every 20th vehicle is selected for sampling. This strategy is referred to as “selecting every nth vehicle” within a waste sector and subsector. A *Vehicle Selection Form*, similar to that shown in APPENDIX B – Field Forms, will be created for each day and each location of sampling activity.

All vehicles entering the sampling facility will be surveyed by a member of the Project Team (the Gatekeeper) or at times a weighmaster in the scalehouse. In order for a vehicle to be eligible for sampling, for each targeted waste stream the load must fit within the residential and ICI definitions. The Gatekeeper will collect data regarding the vehicle type, city of origin, and waste type and will also collect a net weight from each vehicle which will be used to help determine weighting factors for the residential and ICI waste sectors.

If a vehicle is selected for sampling, the Gatekeeper will record the survey data about the sample on the survey form and place a *Sample Placard* on the vehicle’s windshield or dashboard. The *Sample Placard* will contain a sample ID number, unique to every sample taken, that will be recorded on the survey form and on the *Hand-sort Tally Sheet* kept by the sorting crew. The Gatekeeper will alert the Crew Chief to the incoming vehicle, who in turn will direct the arriving residential and ICI trucks to the tipping area where a sample can safely and accurately be collected. The sample ID will match the corresponding waste sector prefix (RES and ICI). For example, the first ICI sample taken from a packer truck on a given day will be ICIP-1, while the fourth residential sample collected from a transfer load will be RTL-4.

Note that there are five instances where the nth vehicle approach may be modified:

- On the day of sampling and sorting, if the number of loads expected to arrive at the facility is less than previously anticipated, the sampling frequency will be shortened and a new “nth vehicle” selection strategy will be calculated and followed;
- If the nth residential vehicle selected is found to contain significant mixture of commercial, industrial, or institutional waste (above 20%), the next load (nth + 1) may be taken as a replacement;

- If the n^{th} commercial vehicle selected is found to contain significant mixture of multi-family residential waste (above 20%), the next load ($n^{\text{th}} + 1$) may be taken as a replacement
- To meet daily sampling targets, it is critical to keep the sorting crew actively sorting from the moment the work area is set up. To the extent the sort crew is set up and ready to sort, the Project Team may take the next available residential or ICI load in place of the n^{th} vehicle. If this becomes necessary, the remaining vehicles will be taken at every n^{th} interval.
- In the event that the waste is not from CT.

The Crew Chief will obtain and record the following information on the *Hand Sort Tally Sheet* for each vehicle that is identified for sampling.

- Waste sector – Residential or ICI
- Vehicle type --Compactor, Transfer Vehicle, Packer Truck
- Date and Time of Day
- Hauler
- Other data that may be needed

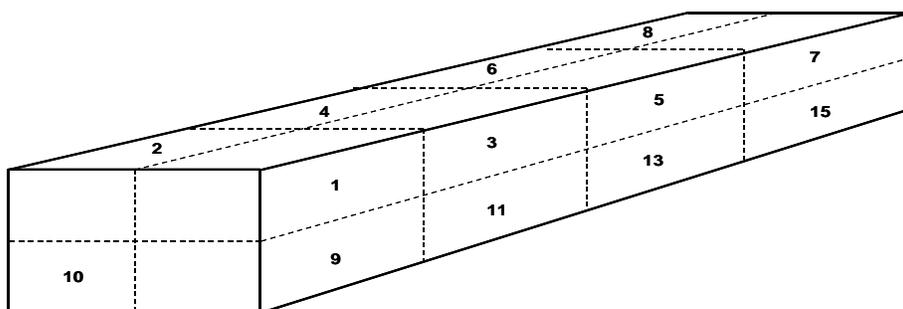
The Crew Chief will also note on the *Hand-Sort Tally Sheet* any unusual circumstances associated with the load or the sample.

In cases where an insufficient number of vehicles are available for sampling at a disposal facility, the data collection crew can first change the n^{th} vehicle to reduce the number between samples or make up the missing samples at a different location. This strategy may also be used when samples are missed for some other unforeseen reason. In all cases, the sampling plan will assign the frequencies of vehicles to be selected in such a way as to minimize the chance of "running out of" vehicles to represent a particular waste sector at a disposal facility.

Sample Selection

Each selected load of MSW and ICI waste will be dumped in an elongated pile three to six feet high. From each selected load, one sample of waste will be selected using an imaginary 16-cell grid superimposed over the dumped material, as illustrated below.

The 16-Cell Grid as Applied to a Dumped Load



The field crew supervisor will identify the randomly selected cell to be extracted. Then, with the assistance of a loader operator, a sample of waste weighing 200 to 250 pounds will be removed by machine from the designated cell and placed on a tarp. Each sample will be labeled by its identifying number using brightly colored spray paint. The Field Supervisor will take appropriate photos during the sampling and sorting process for use in the report and web content.

Characterization of Samples

Hand Sorting Procedure

The photograph below presents our typical layout of the sorting table and bins into which each targeted material is to be sorted. Based on our extensive experience, we believe a well-thought-out sort area is crucial to efficient and accurate sorting. Maintaining a consistent sort area also improves safety by establishing boundaries for all workers to follow consistently.

Layout of Hand-Sorting Table and Bins



Once the sample has been acquired and placed on the sorting table, the material will be sorted by hand into the prescribed component categories. Plastic 20-gallon bins with sealed bottoms will be used to contain the separated components. The sorting crew members typically specialize in groups of materials, such as papers or plastics.

The Crew Chief will monitor the homogeneity of the component bins as they accumulated, rejecting materials that may be improperly classified. Open bins allow the Crew Chief to see the material at all times and verify the purity of each component as it is weighed, before recording the weight into the database. The materials will be sorted to particle size of 2 inches or less by hand, until no more than a small amount of homogeneous fine material (“mixed residue”) remains. This layer of mixed 2-inch-minus material will be allocated to the appropriate categories based on the best judgment of the Crew Chief — most often a combination of Other Paper, Other Organics, or Food Waste. The overall goal is to sort each sample directly into component categories in order to reduce the amount of indistinguishable fines or miscellaneous categories.

Note that our sorting method includes the use of a customized, sturdy framed sorting table that includes a removable screen. The screen size is ½ inch, which allows small particles to pass through to a tray under the screen. These particles, or “fines,” will be swept into their own category.

The weigh-out and data recording process is the most critical of process of the sort. The Crew Chief will oversee all weighing and data recording of each sample. Once each sample has been sorted, and fines swept from the table, the weigh-out will be performed. Each bin containing sorted materials from the just-completed samples will be carried over to the scale. Sorting laborers will assist with carrying and weighing the bins of sorted material, and the Crew Chief will record all data.

The Crew Chief will use a Waste Composition Data Form, such as the one shown in APPENDIX B – Field Forms to record the composition weights. Each data sheet containing the sorted weights of each sample will be matched up against the Field Supervisor’s sample sheet to assure accurate tracking of the samples each day.

Sorting Wet and Organics Contaminated Waste

During the sorting event, it is common to encounter materials that have been contaminated or combined with organics or liquids. In this event, we will remove the contaminating material to the best of our ability. All food will be separated from other materials and all liquid, if beverage based, will be removed from containers and placed in the food waste bin for weighing. In our experience, we have found that contamination can be kept to a minimum when this process is followed.

Response to Unexpected Site Incidents

If an unexpected site incident occurs that involves injury or damage to property or equipment, the following steps should be taken:

1. Immediately stop what you are doing
2. Call 911 as appropriate
3. Make sure the sorting crew is safe and accounted for
4. Obtain first aid as appropriate
5. Contact and inform the permitted facility management about the situation
6. Contact and inform the Field Supervisor, the Crew Chief, and the Consultant Project Manager about the situation
7. Write down what happened, the date, and time
8. Fill out an incident report
9. Photograph the situation
10. Locate and write down any contact information for witnesses
11. Include the incident in quarterly activity report

Site Maintenance and Cleanup

The Project Team will be guests at each of the host facilities, and it is therefore critical to leave the work area clean and safe for subsequent operations. The sorting crew is also responsible for keeping litter to a minimum. This is especially important throughout the windy months. Steps will be taken accordingly to keep the litter problem to a minimum (e.g. renting fencing, tarping any load that will be sitting around for more than 20 minutes, etc). The Project Team will also conclude each day of sorting operations with sufficient time to perform site clean-up. Clean-up will include the following types of activities:

- Organized stacking and stowing of sorting supplies in a designated location;
- Removal of sorted wastes for burial or transfer (the host facility loader operator will help with this);

- Sweeping and cleaning the sort area to prevent windblown litter and other situations that could attract vectors;
- Removal and discard of day-use personal protective equipment and decontaminating personnel;
- Checking out with the Facility Manager each day; and
- Tarping of any unsorted samples, left for sorting the next day.

Data QA/QC Procedure

From the moment a vehicle is selected for sampling to the time we present the final report to CTDEP, our team's data collection process follows a well-established set of QA/QC strategies to ensure data accuracy and integrity. Our quality assurance/quality control process involves:

- Assigning a unique combination sample number, county of origin, date and time to each sample, and transferring that information to the tally sheet that is used to record material weights for the sample.
- Encoding the type of waste load into the sample number. For example, on a particular date, samples of commercial waste would be numbered Com-1, Com-2, etc.
- Using the *vehicle selection form* to track the numbers of each type of load obtained and sampled.
- Verifying that data forms were obtained for each day the data collection crew was in the field.
- Designing the data entry databases to prevent out-of-range values for vehicle and sample characteristics such as vehicle type, net weight, etc.
- Random checks of computer-entered data against the paper forms, to verify that all numbers are being entered correctly, and to look for any systematic or random errors.

Following each season of fieldwork, all field forms will be transported back to Cascadia's office and entered into a waste composition database created specifically for the Connecticut Statewide Study. Our team's data entry procedure has been developed to protect the integrity of the data at every step of the process, from collection in the field to final analysis.

After the *sample tally sheets* have been checked by the Field Supervisor, the data manager will verify that all required data has been recorded properly and will supervise the data entry process. As an additional step in quality control, an inspection of randomly selected records will be carried out to monitor the accuracy of the data entry process.

Data from the vehicle surveys and the waste sorts will be stored in Microsoft Access databases in order to permit easy manipulation and analysis. At the end of the project, the data will be presented to CT DEP in the final report, and also in an electronic version.

Generally, the waste composition calculations and the aggregation across groups will be done as follows. Composition estimates represent the **ratio of the components' weight to the total waste** for each noted material component in a particular segment of the waste stream. They are derived by summing each component's weight across all of the relevant samples and dividing by the sum of the total weight of waste, as shown in the following equation:

$$r_j = \frac{\sum_i c_{ij}}{\sum_i w_i}$$

where:

- c = weight of particular material component
- w = sum of all component weights
- for $i = 1$ to n
- where n = number of selected samples
- for $j = 1$ to m
- where m = number of material components

The confidence interval for this estimate is derived in two steps. First, the variance around the estimate was calculated, accounting for the fact that the ratio included two random variables (the component and total sample weights). The **variance of the ratio estimator** equation follows:

$$\hat{V}_{r_j} = \left(\frac{1}{n}\right) \cdot \left(\frac{1}{\bar{w}^2}\right) \cdot \left(\frac{\sum_i (c_{ij} - r_j w_i)^2}{n-1}\right)$$

where:

$$\bar{w} = \frac{\sum_i w_i}{n}$$

(Note: the standard deviation is the square root of the variance term.)

Second, **confidence intervals** at the 90% confidence level are calculated for a component's mean as follows:

$$r_j \pm t \cdot \sqrt{\hat{V}_{r_j}}$$

where:

- t = the value of the t-statistic corresponding to a 90% confidence level

A weighted average of composition percents is used when the findings for small segments of the waste stream are aggregated to describe a larger piece of the waste stream. The **weighted average for an aggregated composition estimate** is performed as follows:

$$O_j = (p_1 * r_{j1}) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + \dots$$

where:

- p = the proportion of tonnage contributed by the noted substream (i.e., the

weighting factor)

r = ratio of component weight to total waste weight in the noted substream (i.e.,
the composition percent for the given material component)

for $j = 1$ to m

where m = number of material components

The **variance of the weighted average** is calculated:

$$VarO_j = (p_1^2 * \hat{V}_{r_{j1}}) + (p_2^2 * \hat{V}_{r_{j2}}) + (p_3^2 * \hat{V}_{r_{j3}}) + \dots$$

(Note: the standard deviation is the square root of the variance term.)

Reporting

The project team is responsible for providing CTDEP with the following reports:

- A Final Study Design and Staffing Plan (this document fulfils this requirement)
- Draft Interim Report after the conclusion of the first season of sorting
- Draft Final Report after conclusion of the second season of sorting
- Final Report after review by CTDEP
- Web content –which will include pictures taken during the sorting at the various facilities.

APPENDIX A - Waste Categories

Paper

1. **Uncoated Corrugated Cardboard/Kraft Paper** means corrugated boxes or paper bags made from Kraft paper. Uncoated Corrugated Cardboard has a wavy center layer and is sandwiched between the two outer layers and does not have any wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This type does not include chipboard. Examples of Kraft paper include paper grocery bags, un-soiled fast food bags, department store bags, and heavyweight sheets of Kraft packing paper.
2. **Offshore Cardboard** means cardboard shipping containers manufactured overseas and containing bogus liners or center medium. Color is somewhat lighter/more yellow than North American produced materials.
3. **High Grade Office Paper** means the type of paper that is free of ground wood fibers; usually sulfite or sulphate paper; includes office printing and writing papers such as white ledger, color ledger, envelopes, and computer printout paper, bond, rag, or stationary grade paper. This subtype does not include fluorescent dyed paper or deep-tone dyed paper such as a goldenrod colored paper.
4. **Magazines/Catalogs** means items made of glossy coated paper. This paper is usually slick, smooth to the touch, and reflects light. Examples include glossy magazines, catalogs, brochures, and pamphlets.
5. **Newsprint** means the class or kind of paper chiefly used for printing newspapers – i.e. uncoated ground wood paper.
6. **Phone Books and Directories** means thin paper between coated covers. These items are bound along the spine with glue. Examples include telephone books, “yellow pages,” real estate listings, and some non-glossy mail order catalogs.
7. **Other Recyclable Paper** means paper, other than the paper mentioned above, which can be recycled. Examples include manila folders, manila envelopes, index cards, white envelopes, white window envelopes, notebook paper, carbonless forms, junk mail, chipboard and uncoated paperboard, groundwood paper, and deep-toned or fluorescent dyed paper.
8. **Compostable Paper** means low grade paper that is not capable of being recycled, as well as food contaminated paper. Examples include paper towels, paper plates, waxed papers and waxed cardboard, and tissues.
9. **Remainder/Composite Paper** means items made mostly of paper but combined with large amounts of other materials such as plastic, metal, glues, foil, and moisture. Examples include plastic coated corrugated cardboard, cellulose insulation, aseptic packages, polycoated (gable top) cartons, blueprints, sepia, onion skin, foiled lined fast food wrappers, frozen juice containers, carbon paper, self-adhesive notes, softcover and hardcover books, and photographs.

Plastics

10. **PET Bottles/Jars (which originally contained non-hazardous materials)** means clear or colored PET bottles other than CT deposit containers. When marked for identification, it bears the number “1” in the center of the triangular recycling symbol and may also bear the letters “PETE” or “PET”. The color is usually transparent green or clear. A PET container usually has a small dot left from the manufacturing process, not a seam. It does not turn white when bent.

11. **PET Containers other than Bottles (which originally contained non-hazardous material)** means types of containers such as PET jars, rectangular PET containers used for produce; etc.
12. **Plastic CT Deposit Beverage Containers** means plastic beverage containers subject to CT's bottle bill and marked as deposit containers in Connecticut.
13. **HDPE Bottles, colored and natural, (which originally contained non-hazardous material)** means natural and colored HDPE containers. This plastic is usually either cloudy white, allowing light to pass through it (natural) or a solid color, preventing light from passing through it (colored). When marked for identification, it bears the number "2" in the triangular recycling symbol and may also bear the letters "HDPE."
14. **HDPE Containers other than Bottles**(such as pails, paint cans, other) means colored and natural buckets and pails made of HDPE and designed to hold 5 gallons or less of material. This category includes buckets regardless of whether they are attached to metal handles. Examples include large paint buckets and commercial buckets used to contain food for commercial use (restaurants, etc.). These objects are packages containing material for sale, and are not sold as buckets themselves (such as mop buckets).
15. **Plastic Containers #3-#7 (which originally contained non-hazardous material)** means plastic containers made of types of plastic other than HDPE or PET. Items may be made of PVC, PP, or PS. When marked for identification, these items may bear the number 3, 4, 5, 6, or 7 in the triangular recycling symbol. This subtype also includes unmarked plastic containers.
16. **Expanded Polystyrene Non-food Grade** includes non-food packaging and finished products made of expanded polystyrene. Excludes Styrofoam products such as cups, plates, and bowls.
17. **Expanded Food-grade Polystyrene** means "Styrofoam" products used to contain food such as "clamshells," cups, plates, and bowls.
18. **Durable Plastic Items** means plastic objects other than disposable package items. These items are usually made to last for a few months up to many years. These include the plastics used in children toys, furniture, plastic landscape ties; plastic railroad ties, mop buckets, sporting goods, etc.
19. **Film (non-bag clean commercial and industrial packaging film)** means film plastic used for large-scale packaging or transport packaging. Examples include shrink-wrap, mattress bags, furniture wrap, and film bubble wrap.
20. **Grocery and other Merchandise Bags** means plastic shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase. Includes dry-cleaning plastic bags intended for one-time use.
21. **Other Film** means plastic film that is contaminated or otherwise non-recyclable. Examples include garbage bags and other types of plastic bags (sandwich bags, zipper-recloseable bags, produce bags, frozen vegetable bags), painting tarps, food wrappers such as candy-bar wrappers, mailing pouches, bank bags, X-ray film, metallized film (wine containers and balloons), and plastic food wrap.
22. **Pallets – Plastic** means plastic pallets and crating materials commonly used for industrial and commercial packaging and shipping.
23. **Remainder/Composite Plastic** means plastic that cannot be put in any other type or subtype. This type includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, plastic drinking straws, produce trays, foam packing blocks (not including expanded polystyrene blocks), plastic strapping, new plastic laminate (e.g., Formica), vinyl, linoleum, plastic lumber, imitation ceramics, handles and knobs, plastic lids, some kitchen ware, toys, plastic string (as used

for hay bales), and plastic rigid bubble/foil packaging (as for medications); durable plastic such as plastic outdoor furniture, plastic toys and sporting goods, CD's, and rigid plastic housewares, such as mop buckets, dishes, cups, and cutlery.

Metals

24. **Aluminum Beverage Containers** means beverage containers made from aluminum other than CT deposit containers.
25. **Aluminum CT Deposit Beverage Containers** means metal beverage containers subject to CT's bottle bill and marked as deposit containers in Connecticut.
26. **Tin/Steel Containers** means rigid containers made mainly of steel, such as food and beverage containers. These items will stick to a magnet and may be tin-coated.
27. **Other Ferrous** means any iron or steel that is magnetic. This subtype does not include "tin/steel containers". Examples include empty or dry paint cans, structural steel beams, boilers, metal clothes hangers, metal pipes, some cookware, security bars, and scrap ferrous items and galvanized items such as nails and flashing.
28. **Other Non-Ferrous** means any metal item that is not magnetic, as well as stainless steel. These items may be made of copper, brass, bronze, lead, zinc, or other metals. Examples include copper wire, shell casings, and brass pipe.
29. **Appliances** means major appliances that are primarily encased in metal, such as refrigerators, stoves, water heaters, dryers and microwaves; white goods.
30. **Compressed Fuel Containers/Propane Tanks** includes large compressed fuel containers/propane tanks and small one-pound propane tanks used for lanterns, camp stoves etc. as well as larger tanks such as those used in home gas grills, RVs.
31. **Remainder/Composite Metal** means metal that cannot be put in any other type. This type includes items made mostly of metal but combined with other materials and items made of both ferrous metal and non-ferrous metal combined. Examples include small non-electronic appliances such as toasters and hair dryers, motors, insulated wire, and finished products that contain a mixture of metals, or metals and other materials, whose weight is derived significantly from the metal portion of its construction.

Glass

32. **Clear and Amber Glass Packaging Containers (non-deposit)** includes clear or amber colored wine bottles, nonalcoholic beverage containers, malt beverage containers, mayonnaise jars, and jam jars.
33. **Green and Other Colored Glass Packaging Containers (non-deposit)** includes green or other colored beer bottles and other nonalcoholic beverage containers.
34. **Glass CT Deposit Beverage Containers** means glass beverage containers subject to CT's bottle bill and marked as deposit containers in Connecticut.
35. **Flat Glass – Plate Glass Uncoated** includes window and door glass, table-tops, and some auto glass (side windows).
36. **Remainder/Composite Glass** means glass that cannot be put in any other type. It includes items made mostly of glass but combined with other materials. Examples include Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, auto windshields, laminated glass, or any curved glass.

Organic Materials

37. **Food Waste** means food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food. This type includes material from industrial, commercial, or residential sources. Examples include discarded meat scraps, dairy products, eggshells, fruit or vegetable peels, and other food items from homes, stores and restaurants. This type includes apple pomace and other processed residues or material from canneries, wineries or other industrial sources.
38. **Branches and Stumps** means trees, stumps, branches, or other wood generated from clearing land for commercial or residential development, road construction, agricultural land clearing, storms, or natural disaster.
39. **Prunings and Trimmings** means woody plant material up to 4 inches in diameter from any public or private landscape. Examples include prunings, shrubs, and small branches with branch diameters that do not exceed 4 inches. This subtype does not include stumps, tree trunks, or branches exceeding 4 inches in diameter. This subtype does not include material from agricultural sources.
40. **Leaves and Grass** means plant material, except woody material, from any public or private landscapes. Examples include leaves, grass clippings, and plants. This subtype does not include woody material or material from agricultural sources. (CA)
41. **Manures** means manure and soiled bedding materials from domestic, farm, wild, or ranch animals. Examples include manure and soiled bedding from animal production operations, racetracks, riding stables, animal hospitals, laboratories, zoos, nature centers, and other sources.
42. **Remainder/Composite Organic** means organic material that cannot be put in any other type or subtype. This type includes items made mostly of organic materials but combined with other materials. Examples include cork, hemp rope, hair, cigarette butts, full vacuum bags, sawdust, and animal feces.

Construction and Demolition (in the MSW stream)

43. **Asphalt, Brick, and Concrete** includes asphalt paving, a black or brown, tar-like material mixed with aggregate used as a paving material. Concrete means a hard material made from sand, gravel, aggregate, cement mix, and water. Examples include pieces of building foundations, concrete paving, and cinder blocks.
44. **Wood – Treated** means wood that contains an adhesive, paint, stain, fire retardant, pesticide or preservative.
45. **Wood – Untreated** refers to any wood which does not contain an adhesive, paint, stain, fire retardant, pesticide or preservative; includes such items as pallets, skids, spools, packaging materials, bulky wood waste or scraps from newly built wood products. (CT) Under this definition, does not including land clearing debris or yard waste prunings and trimmings
46. **Asphalt Roofing** means composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper.
47. **Drywall/Gypsum Board** means interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include used or unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypoc, and wallboard.
48. **Carpet** means flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material.

49. **Carpet Padding** means plastic, foam, felt, or other material used under carpet to provide insulation and padding.
50. **Remainder/Composite Construction and Demolition** means construction and demolition material that cannot be put in any other type or subtype. This type may include items from different types combined, which would be very hard to separate.

Household Hazardous Waste

51. **Ballasts, CFLs, and Other Fluorescents** include ballasts, which are devices that electrically control fluorescent light fixtures and that include a capacitor, CFLs, which are compact fluorescent bulbs, and other fluorescent lighting, which includes tubular fluorescent lamps.
52. **Batteries – Lead Acid** means lead acid storage batteries most commonly used in vehicles such as cars, trucks, boats, etc.
53. **Other Batteries** means any type of battery other than lead acid (automotive) batteries. Examples include household batteries such as AA, AAA, D, button cell, 9 volt, and rechargeable batteries used for flashlights, small appliances, tools, watches, and hearing aids.
54. **Paint** means containers with paint in them. Examples include latex paint, oil based paint, and tubes of pigment or fine art paint. This type does not include dried paint, empty paint cans, or empty aerosol containers.
55. **Sharps** means discarded needles that have been used in animal or human patient care or treatment or in medical, research or industrial laboratories.
56. **Vehicle and Equipment Fluids** in containers and oil filters means containers with fluids used in vehicles or engines. Examples include antifreeze, oil, and brake fluid. This type does not include empty vehicle and equipment fluid containers. Oil filters include vehicle engine oil filters.
57. **Empty Metal, Glass, and Plastic Containers (that originally contained toxic materials)** means all containers that are empty but that at one time contained toxic or hazardous fluids or other materials. Examples include empty antifreeze, oil, or lye containers.
58. **Pesticides and Fertilizers** means households and commercial products used to destroy or control organisms, pests or enhance plant growth.
59. **Other Hazardous or Household Hazardous Waste** means all household or commercial products characterized as “toxic”, “corrosive”, “flammable”, “ignitable”, “radioactive”, “poisonous”, and “reactive”.

Electronics

60. **Computer-related Electronics** includes personal computers, laptop computers, notebook computers, processors, keyboards, etc. This category does not include automated typewriters or typesetters, portable handheld calculators, portable digital assistants or other similar devices.
61. **Other Small Consumer Electronics** includes cell phones, iPods, PDAs.
62. **Televisions and Computer Monitors** means a stand-alone display system containing a CRT or any other type of display primarily intended to receive video programming via broadcast. Examples also include non-CRT units such as plasma and LCD monitors.

63. **Other Larger Electronics** includes stereos, VCRs, DVD players, etc.

Other Waste

64. **Bulky Items** means large hard to handle items that are not defined separately. Examples include all sizes and types of furniture, mattresses, box springs, and base components.

65. **Textiles (other than carpet)** includes clothing, fabrics, curtains, blankets, stuffed animals, and other cloth material.

66. **Restaurant Fats, Oils and Grease** means any fats, oils and grease generated from the food preparation process.

67. **Bottom Fines and Dirt** means small fragments that pass through the ½" sort screen, and includes miscellaneous fines (paper, plastic, glass, etc.) and dirt.

68. **Other Miscellaneous** means any other type of waste material not listed in any other sort category.

APPENDIX B – Field Forms

Vehicle Selection Form-Example

Connecticut Statewide Waste Composition Study 2009 Vehicle Selection Form		
Site:	<u>Bristol</u>	
Date:	<u>Monday, Feb 23</u>	Goal: <u>12</u> Samples Total
<p>Each number represents an expected vehicle based on the available data.</p> <p>Cross off one number for each category of vehicle entering the landfill.</p> <p>When you reach the number circled, ask this vehicle to go to the sorting area.</p>		
Residential Packer Trucks (RPT 1-4)		NEED 4 TOTAL
<p><i>*Must be at least 80% single-family residential waste.</i></p> <p> (1) 2 3 4 5 6 (7) 8 9 10 11 12 (13) 14 15 16 17 18 (19) 20 21 22 23 24 25 26 (expect 26) </p>		
Residential Transfer Loads (RTL 1)		NEED 1 TOTAL
<p><i>*Must be at least 80% commercial waste.</i></p> <p>1 (2) 3 4 (expect 4)</p>		
ICI Packer Truck (ICIP 1-5)		NEED 5 TOTAL
<p><i>*Must be at least 80% commercial waste.</i></p> <p> (1) 2 3 4 5 6 7 8 (9) 10 11 12 13 14 15 16 (17) 18 19 20 21 22 23 24 (25) 26 27 28 29 30 31 32 (33) 34 35 36 37 38 39 40 41 42 (expect 42) </p>		
ICI Compacted Dropbox (ICID 1-2)		NEED 2 TOTAL
<p><i>*Must be at least 80% commercial waste.</i></p> <p>1 (2) 3 4 (5) 6 7 (expect 7)</p>		

Hand-sort Tally Sheet-Example

Paper			
OCC/Kraft Paper			
Offshore Cardboard			
High Grade Office Paper			
Magazines/Catalogs			
Newsprint			
Phone Books & Directories			
Other Recyclable Paper			
Compostable Paper			
R/C Paper			
Plastic			
PET Bottles/Jars (non-haz)			
PET Containers-non bottles (non-haz)			
Plastic CT Dep. Bev. Containers			
HDPE Bottles (non-haz)			
HDPE Containers other than Bottles			
Plastic Containers #3-#7 (non-haz)			
Expanded Poly. Non-Food Grade			
Expanded Poly. Food-grade			
Durable Plastic Items			
Film			
Grocery/Merchandise Bags			
Other Film			
Pallets - Plastic			
R/C Plastic			
Metals			
Alc. Beverage Containers			
Alc. CT Dep. Bev. Containers			
Tin/Steel Containers			
Other Ferrous			
Other Non-Ferrous			
Appliances			
Compressed Fuel Containers			
R/C Metal			
Glass			
Clear & Amber Glass Containers			
Green & Other Colored Glass Cont.			
Glass CT Dep. Bev. Containers			
Flat Glass - Uncoated			
R/C Glass			
Organics (wood, yard)			
Food Waste			
Branches & Stumps			
Prunings & Trimmings			
Leaves & Grass			
Manures			
R/C Organic			
Construction and Demolition			
Asphalt, Brick, & Concrete			
Wood - Treated			
Wood - Untreated			
Asphalt Roofing			
Drywall/Gypsum Board			
Carpet			
Carpet Padding			
R/C C&D			
Household Hazardous Waste			
Ballasts, CFLs, & Other FLs			
Batteries - Lead Acid			
Other Batteries			
Paint			
Sharps			
Vehicle & Equipment Fluids			
Empty Metal, Glass, & Plastic Cont. (Haz.)			
Pesticides & Fertilizers			
Other Hazardous Waste & HHW			
Electronics			
Computer-related Electronics			
Other Small Consumer Electronics			
TVs and Computer Monitors			
Other Large Electronics			
Other Waste			
Bulky Items			
Textiles (other than carpet)			
Restaurant Fats, Oils, & Grease			
Bottom Fines & Dirt			
Other Miscellaneous			
Waste Sector (circle): RES ICI	Sample ID: _____		Date: _____
Vehicle Type (circle): Packer Truck Transfer Vehicle Compacted Dropbox	Notes:		Time: _____
Hauler Name: _____			

Sample Placard-Example

RPT-1

Date: / /

Vehicle Type: Packer Transfer
(circle) Compacted Dropbox

Hauler/Truck: _____

APPENDIX C – Health and Safety Plan

The following Health and Safety Plan is the property of MSW Consultants and has been created to provide a Health and Safety Plan that applies broadly to waste composition projects.

MSW is responsible for the physical sampling and sorting at facilities, therefore the Health and Safety Plan concentrates on the essential safety aspects for physical sorting. While physical sampling and sorting will be performed by MSW Consultants, it is expected that anyone entering the field will follow MSW's Health and Safety Plan.

All field personnel from MSW Consultants, DSM Environmental Services, Inc. and Cascadia Consulting Group, Inc. will read, and understand the MSW Health and Safety plan before entering the field. All field personnel will also sign off saying they agree to abide by the sections that are relevant to them in this Health and Safety Plan.

INTRODUCTION

This Safety and Health Plan (SAHP) has been written for use by MSW Consultants, LLC, (MSW Consultants) personnel, their subcontractors, and any other individuals authorized access to areas where site control is established to conduct field work associated with the performance of a physical or visual composition study of municipal solid wastes.

MSW Consultants does not guarantee the health and safety of any person entering the designated work areas. Because of the nature of this work and the activity occurring therein, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to these health and safety guidelines will reduce, but not eliminate, the potential for injury or exposure to hazards on the site. The health and safety guidelines in this plan were prepared generally for this type of field activity. It may be necessary to refine this plan for each individual project, depending on local site characteristics and job requirements.

The following practices are included in this document:

- Safety and health framework at host municipal solid waste facilities;
- Sampling hazard evaluation and controls;
- Sorting hazard evaluation and controls;
- Fundamental safe work practices including site controls;
- Personnel protective equipment (PPE) applicable the field work; and
- Emergency response procedures.

A copy of this SAHP will be maintained by the MSW Consultants Field Supervisor at all times while field operations are in progress. A copy of the SAHP will be provided to the client, facility management, subcontractors, and other project stakeholders at their request. Each employee (MSW Consultants or subcontractor) is required to receive basic training on the safety and health principals and procedures contained herein at the outset of the project and sign a release documenting receipt of such training.

Statement of Safety and Health Policy

It is the policy of MSW Consultants to conduct all work in a manner that minimizes the physical and chemical/biological hazards to which workers might be exposed in the course of their work. MSW consultants also will conduct emergency planning in such as way as to minimize the consequences of any accident or exposure for their employees and subcontractors. MSW Consultants will provide adequate

training and supervision to all employees performing work on a given project and will be responsible for ensuring all employees and subcontractors follow the provisions of the Safety and Health Plan developed for that project.

Safety is basic or inherent to the work performed by MSW Consultants. Each employee (MSW Consultants or subcontractor) is held accountable and responsible for working safely, including following the procedures and guidance of this SAHP. All employees are required to comply with applicable safety regulations. Individuals who do not follow the procedure and guidance of this SAHP are subject to removal from the site and project.

Background Information

Contractor: MSW Consultants, LLC

Contract Number: _____

Corporate Address: 6225 Sawyer Road
New Market, MD 21774

Phone: (301) 607-6428

Designated Field Supervisor: _____

Brief Project Name: _____

Brief Project Description: This project entails the physical sampling and sorting of 200 to 300 pound samples of municipal solid waste into its component categories.

Safety and Health Framework

The figure below summarizes the three layers of organizations/personnel that are typically involved safety and health plan compliance for waste composition projects. One unique aspect to the performance of a waste composition study is that the project is typically hosted by a permitted solid waste management facility. Such facilities are required to have detailed safety and health plans, accident prevention plans, accident reporting plans, emergency response plans, and other procedures and policies in place to minimize risks associated with handling municipal solid waste in an operating environment with noise, dust, heavy machinery, and other risks. For this reason, it is MSW Consultants' policy first and foremost to obtain, review, and comply with the safety and health framework that exists at the facility hosting the project.



Occasionally, procedural conflicts may arise between the host facility safety and health procedures and processes and MSW Consultants' site controls. In these instances, the requirement most protective of worker health and safety, the public, and property shall take precedence.

The remainder of this section identifies task organization and personnel responsibilities for the management and implementation of this SAHP. It also specifies the training and physical qualifications of employees performing the work. Accident reporting, recordkeeping, and emergency planning also are discussed in this section of the SAHP:

Training Requirements

If required by the host facility, all MSW Consultant employees (and subcontractors) will participate in a training program provided by the host facility.

The following training will be provided by MSW Consultants Field Supervisor staff at the outset of the project and prior to conducting any field operations. This training is intended to be provided verbally in the form of tailgate meetings or roundtable discussions with the field employees.

- Understanding the SAHP;
- Personal protective equipment and use;
- Physical, chemical, and biological hazards and prevention;
- Site access and control;
- Roles and responsibilities;
- Accident prevention and reporting; and
- Emergency procedures.

Client Personnel and Visitors

Client personnel other than those already working at the host facility and other visitors must obtain clearance from both the host facility management and from the MSW Consultants Field Supervisor before obtaining access to controlled work areas. Visitors will receive a job-specific safety briefing. Visitors in areas requiring PPE must have the equivalent training and PPE as the on-site worker to gain entry. MSW Consultants is not responsible for distributing or obtaining PPE for visitors, or training visitors or client personnel on proper use of PPE, unless otherwise agreed to prior to the project.

Physical Qualification of Employees

All personnel associated with the sampling and handling of the materials collected from the field for this project will be trained in their safe handling. All personnel involved in the performance of physical work will be physically fit and demonstrate their ability to perform their duties. The MSW Consultants Field Supervisor can prohibit any person from performing work at the site should there be a question as to their fitness for duty.

Roles and Responsibilities

Corporate Safety and Health Managers: MSW Consultants principals Walt Davenport and John Culbertson are responsible for the health and safety of all MSW Consultants employees. As officers of the company, their role entails:

- Oversee maintenance and implementation of the MSW Consultants Safety and Health Program;
- Provide project personnel with technical guidance for conducting field work in a safe and healthful manner;
- Assist with preparation, or review and approval of project health and safety documents;
- Assign adequate levels of support;
- Interact with contracts personnel to verify that subcontractors are informed and can meet MSW Consultants health and safety requirements for this work; and

- Conduct field audits, as necessary, in accordance with MSW Consultants policies and procedures, and to verify that action plans are developed to correct any deficiencies.

Field Supervisor: The Field Supervisor will be assigned on a project by project basis and will be trained and knowledgeable in the MSW Consultants SAHP as well as the host facility health and safety requirements. This position will be required to:

- Administer the SAHP for the specific project and coordinate any amendments to the SAHP with the MSW Consultants Health and Safety Managers;
- Verify current certifications of individuals' fitness and training prior to authorizing access to areas where site control is established;
- Conduct emergency planning actions such as interfacing with emergency providers, assessing emergency supplies, assessing possible emergency needs;
- Verify availability of health and safety equipment on site in accordance with the SAHP;
- Verify that copies of plans and regulations are available at the site;
- Conduct employee health and safety orientations prior to the start of field activities;
- Monitor field activities;
- Establish and enforce site controls;
- Assist in independent health and safety site audits conducted by MSW Consultants Corporate Personnel, regulatory agencies, or the host solid waste management facility;
- Conduct accident investigations of injuries, illnesses, and near misses and to ensure the completion of associated documentation;
- Exercise "stop work authority" when an imminent hazard or potentially dangerous work practice exists; and
- Complete and submit recordkeeping forms mandated by the SAHP.

Subcontractors: MSW Consultants has historically relied on temporary light-industrial staffing agencies to supply the sorting laborers needed to perform the physical sorting of solid wastes. These laborers are required to perform the following:

- Attend site-specific orientation and safety meetings when participating in field work;
- Read, understand, and sign the training verification form that states "I have read, understood, and agree to abide by these safety and health policies and procedures," before working on site;
- Evaluate tasks to be performed and site-specific hazards; develop appropriate controls and supplement this SAHP, as required;
- Follow safe work procedures for this work that will address the specific hazards associated with the task to be performed for this work;
- Ensure that all employees are trained in the safe and proper use of all tools they may use;
- Ensure that all employees receive a safety orientation before beginning to work;
- Assure that all employees use all necessary personal protective equipment (PPE); and
- Promptly correct any unsafe conditions.

Accident Reporting

As soon as possible following an incident or emergency, the Field Supervisor, or his designee is to directly notify the MSW Consultants Corporate Safety and Health Manager, the host facility manager, the subcontractor contact (if applicable) and the client.

Emergency Planning

This section discusses the health and safety and emergency planning required for this project. If health and safety concerns arise during field activities, the following steps will be taken:

- Bring health and safety concerns to the attention of the host facility manager;
- If the host facility manager are unable to satisfactorily address concerns, bring the concerns to the attention of the MSW Consultants Corporate Safety and Health Manager;
- In the event of an incident or emergency, notify responsible personnel listed in this plan; and
- Discuss “stop work authority” for imminent danger situations.

SANITATION

Waste composition field sorting events typically last for one or more weeks. Because they may be carried out in multiple locations—on the face of a landfill or within the confines of a transfer station or other waste management facility—, it may be necessary to consider providing specialty sanitary requirements at the job site.

Drinking Water

Drinking water for the field work will be brought to the site and stored outside of the work area. It will not be brought within the work area, nor will it be accessed by any worker in a non-emergency situation without the worker first undergoing the proper decontamination procedure, as described elsewhere in this plan.

Toilets and Washing Facilities

If the host facility provides access to toilets, including washing facilities, within reasonable distance from the job site, such toilets will be used. If no such access is possible, portable toilet facilities, including washing capability, will be provided by MSW Consultants for field work. Portable toilet facilities will be located outside, but in close proximity to, the work area. Workers must first undergo decontamination before using portable toilet facilities.

MSW Consultants will also maintain anti-bacterial hand sanitizer for use outside the work area.

Waste Disposal

To the extent wastes are generated by field operations, this waste will be disposed in the same manner as the removal of sorted samples.

Vermin Control

MSW Consultants will comply with the vermin control measures in place at the host facility. This typically consists of maintaining daily site clean-up efforts, and requires that un-sorted samples be completely contained for overnight storage.

First Aid Kits

First aid kits will be stored at locations where field work will be performed or in vehicles used to transport workers to the field. The kits will contain standard first aid supplies, including, but not limited to bandages and treatment for minor abrasions and strains and will comply with the criteria contained in American National Standards Institute (ANSI) Z308.1 in the ratio of one for every 25 persons or less. Distilled water or portable saline solution bottles will be taken to the field for emergency eye wash purposes.

First-aid kits shall be easily accessible to all workers, and each item maintained sterile. The contents of first-aid kits shall be checked by the employer prior to their use and at least weekly when work is in progress to ensure that expended items are replaced.

First Aid Stations and Infirmaries

There are no first aid stations or infirmaries provided for this work, other than an eyewash station or a full supply of portable eye-wash bottles provided at by the Field Supervisor. Other than minor first aid procedures, all injuries or exposures will be treated by emergency personnel at off-site facilities.

If a medical emergency occurs, the Field Supervisor assumes charge until an ambulance arrives or until the injured person is admitted to the emergency room. Site personnel will prevent further injury by taking the following actions:

- If properly trained (including blood borne pathogen training) and properly equipped with appropriate PPE, initiate first aid and CPR, if needed.
- Call ambulance and hospital, as appropriate.
- Determine whether decontamination will make injury worse. If yes, seek medical treatment immediately.
- Make certain the injured person is accompanied to the emergency room by at least one field team member with the same employer.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

The purpose of personal protective clothing and equipment is to shield or isolate individuals from the hazards that may be encountered when engineering and other controls are not feasible or cannot provide adequate protection. Adherence to all prescribed controls is vital to minimize exposures.

PPE ensembles for site activities are defined by the EPA and OSHA. Either MSW Consultants or the subcontractor will supply appropriate PPE for their staff, as agreed prior to the field operations. PPE must conform to the requirements of this SAHP. Those not supplied with the proper PPE will not be allowed to work at the site. PPE will be inspected, tested, and used as required.

Employees shall be physically able and medically determined qualified to use the personal protective and safety equipment that may be required in their job duties. Employers shall ensure users of personal protective and safety equipment are trained to know the following: when PPE, and what types of PPE are necessary; how to properly don, doff, adjust, and wear PPE; limitations of the PPE; and proper care, inspection, testing, maintenance, useful life, storage, and disposal of the PPE.

Each affected employee shall demonstrate an understanding of this training and the ability to use PPE properly before being allowed to perform work requiring the use of PPE. When the employer has reason to believe that any affected employee who has been trained does not have the understanding and skill required for the task, the employer shall assure the employee receives the necessary retraining to acquire the appropriate skills.

Personal protective and safety equipment shall be inspected and maintained in serviceable and sanitary condition as recommended by the manufacturer. Defective or damaged equipment shall not be used and shall be removed from the work site to prevent accidental use. Most PPE required for waste composition projects is single-use only, with the intent of being discarded at the end of the day. For re-usable PPE, before being stored or reissued to another person, equipment shall be cleaned, disinfected, inspected, and repaired.

In general, MSW Consultants will comply with the PPE requirements of the host solid waste management facility. Such requirements supersede those described in this SAHP. However, MSW Consultants will require the following minimum PPE regardless of the host facility requirements

Gloves

Gloves are required to be worn by every employee involved in the physical handling of waste, regardless of the requirements of the host facility. Municipal solid waste may contain materials that are sharp or chemically dangerous if contacted by skin. Appropriate gloves are critical to worker safety.

MSW Consultants has evaluated safety gloves available from the safety products industry. Based on extensive field and office testing, we have standardized on heavy duty neoprene gloves that are compliant with CFR 21 Parts 170-199.



While no glove will effectively prevent every puncture, this glove provides extremely high puncture resistance, as well as chemical protection for chemical processing, alkaline units at petroleum refineries, metal plating operations, haz-mat handling, hazmat suits and for hazardous waste disposal. Although arguably overkill for handling municipal solid waste, we believe such precautions are appropriate.

Eye Protection

Eye protection will be worn by employees engaged in physical sorting of municipal solid waste. Eye protection equipment shall be distinctly marked to facilitate identification of the manufacturer. Every worker should know the location of the nearest eye wash station or the location of eye wash bottles prior to beginning work.

MSW Consultants has evaluated eye protection products available from the safety products industry. This product is compliant with ANSI Z87.1-1989, and features an optimal combination of protection, functionality, and comfort. The wraparound style has a hingeless frame system, a single lens design providing a continuous field of vision, and a dynamic shape that allows you to wear eyewear around your neck, on top of your head or over a hardhat. The gel temple sleeves and soft, secure gel nosepiece provide additional wearing comfort. A clip-on, breakaway retainer cord is included with every pair. The lens is constructed of impact-resistant polycarbonate lens filters out 99.9% of UV radiation, and includes a scratch-resistant coating.



Respiratory Protection

Due to the non-hazardous levels of contaminants anticipated in handling municipal solid waste, respiratory protection is not required but will be offered to all employees. MSW Consultants has evaluated respiratory protection products available from the safety products industry. Based on extensive field and office testing, we have standardized our respiratory protection on the product shown in the figure below. This product is National Institute for Occupational Safety and Health (NIOSH) approved. It conforms to facial contours, and comes in individual packages for ease of distribution and sanitary storage.



Footwear

Heavy-duty work boots with leather uppers are the minimum foot protection required to perform waste composition analysis. Although steel toes are not required, they are preferred. Employees (or subcontractors) not wearing the minimum foot protection shall not be allowed to enter the work site.

Protective Suits

Although not required, MSW Consultants will provide and encourage that all workers wear aprons or coveralls for the duration of physical sorting of wastes. For warm weather sorts, aprons are generally preferable because they allow greater airflow and help keep workers from overheating. For cold weather sorts, coveralls are preferred because they add a layer of warmth as well as barrier protection. The figure below shows a standard Tyvek coverall that may be worn in colder weather sorting events. These coveralls are available in a wide range of sizes, and meet sizing.



Other PPE

Although not required by MSW Consultants when performing waste composition analysis, many host solid waste management facilities may require the following PPE:

- Reflective vests;
- Hard hats; and
- Hearing protection.

If required, these PPE items will be provided by MSW Consultants.

HAZARDOUS SUBSTANCES AND ENVIRONMENTS

The activities covered by this SAHP present potential chemical, biological, and physical hazards that may be encountered during the conduct of work. This SAHP is written to provide guidance on ways to eliminate or minimize exposure to these hazards and the steps to take if an exposure occurs.

Hazardous Substances

Municipal solid waste by definition may not contain hazardous waste, with the exception of Household Hazardous Wastes (HHW) from residential generators, or commercial generators that dispose of HHW-like products at de minimus levels. Nonetheless, employees performing waste composition analysis must have an awareness of the possibility of these materials, which may include:

- Medical wastes from residential generators (e.g., sharps)
- Household poisons;
- Flammable chemicals; and
- Reactive agents.

Radioactive, biologically active, explosive and other highly hazardous materials are prohibited from being disposed as municipal solid waste, and to the extent these items are found during a waste composition study all sorting activities will be immediately postponed and the host facility management notified for removal of these wastes and site remediation.

This SAHP covers a wide variety of hazards known or suspected to exist or that are inherent to the process of waste management activities; however, unforeseen hazards may be present in the performance of these tasks. Hazards not covered by this SAHP specifically will be assessed by the Field Supervisor for the appropriate control measures to maximize worker, environment, and public safety.

Harmful Plants, Animals, and Insects

Depending on the location of the waste composition analysis, it is possible that the potential exist to exposure to harmful plants, animals or insects. Poison ivy may be encountered on the periphery of some work areas, and could conceivably occur in the sample itself. It is identified as having dark green, somewhat shiny foliage with sets of three, pointed leaves. Protective clothing will be worn during the performance of field work. Outer garments can either be disposed or washed at the end of each day. Protective gloves will be worn. If encountered, do not touch or burn this plant. If exposure occurs, thoroughly wash the exposed area with soap and water within 10 minutes to remove the irritating oil.

Although a remote risk, outdoor work areas may be in areas where deer ticks live. Deer ticks can carry Lyme Disease. Evidence of exposure is the presence of a tic on the body or clothes. A small, red circular area will appear shortly after a bite. If exposed, contact a physician and save the offending tics, if possible, for analysis. Avoid dense woods and wear a hat and light-colored, protective clothing. Check body at the end of each field day for the presence of tics.

Inclement Weather and Environmental Hazards

Hazards presented by the natural work environment may include heat or cold stress, and inclement weather. When there are warnings or indications of impending severe weather (heavy rains, damaging winds, tornados, hurricanes, floods, lightning, etc.), weather conditions shall be monitored and appropriate precautions taken to protect personnel and property from the effects of the severe weather. Table 5-3

outlines exposure control methods for working in extreme temperatures and summarizes symptoms and treatment procedures for heat and cold stress.

Table 1 Symptoms and Treatment of Heat and Cold Stress

Conditions	Symptoms	Treatment
Heat stroke	Red, hot, dry skin; no perspiration; dizziness; confusion; rapid breathing and pulse; and high body temperature.	This is a MEDICAL EMERGENCY! Cool victim rapidly by soaking in cool (not cold) water. Loosen restrictive clothing. Get medical attention immediately!
Heat exhaustion	Pale, clammy, moist skin; shallow breathing; profuse sweating; weakness; normal temperature; headache; dizziness; and vomiting.	Move victim to a cool, air-conditioned area. Loosen clothing, place head in low position. Have victim drink cool (not cold) water.
Frostbite	Blanched, white, waxy skin, but resilient tissue; tissue cold and pale.	Move victim to a warm area. Warm area quickly in warm (not hot) water. Do not break any blisters. Elevate the injured area and get medical attention.
Hypothermia	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; and slow respiration.	Move victim to a warm area. Have victim drink warm fluids - not coffee or alcohol. Get medical attention.

In the event of adverse weather conditions, the Field Supervisor will evaluate whether work can continue without compromising the health and safety of site personnel. The Field Supervisor will direct the implementation of precautions necessary to ensure the health and safety of site personnel. A lightning watch will go into effect 30 minutes prior to thunderstorms being within a five nautical mile radius of an activity. During the watch, operations or activities may continue, however all personnel must be prepared to implement warning procedures without delay. Workers must be alert for any lightning activity, to include audible thunder, and advise supervisory personnel of any observations.

Decontamination

Decontamination protects workers, the public, and the environment by limiting exposure to harmful substances and by preventing the spread of contamination. The Field Supervisor will oversee personnel and equipment decontamination to determine its effectiveness, and take corrective actions to rectify any deficiencies. Table 15-3 presents the decontamination procedures that will be followed for personnel and equipment. Subcontractors are responsible for decontaminating their own equipment and personnel according to these procedures.

Table 2 Decontamination Procedures

Item	Decontamination Procedure
Sampling Table, Bins, and Tools	Pressure wash at the conclusion of the waste composition study in an area with leachate collection
Personal – Mid day breaks	PPE shall be removed while the worker is in the work area. Employees shall wash hands and forearms in the washing facility supplied for the project.

Personal – End of Day	Hard hats, vests and eye protection shall be returned to the Field Supervisor for inspection and cleaning. Neoprene gloves shall be removed, inspected for tears and chemical damage, and if still in safe working condition, stored in the work area. Damaged gloves shall be replaced for subsequent work days. Tyvek suits, respirators, and ear plugs shall be discarded as solid waste. Employees shall wash hands and forearms in the washing facility supplied for the project.
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Personnel Decontamination

All personnel exiting the sampling area will follow decontamination procedures. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the work area before decontamination. The Field Supervisor may approve simplification of the procedures in the field when a determination has been made that decontamination procedures are unnecessary.

MATERIAL HANDLING

Although waste composition project do not require extensive handling of heavy material, there is significant lifting and carrying that must be performed to complete the data collection. This section describes considerations in handling materials during the waste composition study.

Lifting and Carrying

Employees shall be trained in and shall use safe lifting techniques. When lifting:

- Reaching out to lift an object fights against gravity, and increases strain on the lower back. Stand close to the load to be lifted and spread your feet for balance.
- Be certain the weight being lifted is within your capabilities. Ask for assistance if needed.
- Bend your knees and keep your spine straight. Grasp the object to be lifted and keep it close to your body.
- Using your leg muscles, straighten your knees and stand.

When carrying:

- Always keep the object you are carrying close to your body.
- When changing directions, shift your feet. Don't twist the upper body.
- Try to avoid changing your grip while carrying the load.
- After reaching your destination, keep the object close to your body, keep the spine straight, and slowly bend the knees as you lower the object to the floor.

Material and Equipment Storage

To the extent it is necessary to store sampled wastes, the entire sample shall be contained by either temporary or permanent means. Permanent storage is preferred in containers with lids. In some instances, tarping of sampled material is acceptable, provided the tarp can fully contain the sampled waste and be weighted down to prevent removal by vermin or from winds.

Work site equipment shall be stacked, consolidated, and placed at ground level so that it is stable and secured against sliding or collapse.

Housekeeping

Scrap, trash, and other wastes shall be placed in designated containers. Work areas shall be cleaned up as the job progresses. Cords and hoses shall be routed in a manner that will present no tripping hazard - preferably overhead. At a minimum, all tools, and equipment shall be stored in a stable position (tied, stacked, or chocked) to prevent rolling or falling. Tools and equipment will preferably be removed from the work site for secure storage in a vehicle overnight. A safe access way shall be maintained to all work areas and emergency exits.

Material Disposal

Waste generated onsite from field activities includes the sorted waste samples, PPE discards, and field trash. These wastes will be managed as non-hazardous, solid waste, and will be placed in the same receptacle being used to remove sorted waste samples.

Any HHW that is found in the samples wastes shall be stored and disposed according to host facility HHW collection policies. If no such policies exist, the HHW will be disposed with the remaining solid wastes. At the request of the host facility, recyclable materials may be set aside for recovery by the host facility.

SITE CONTROL

Effective site control procedures will reduce the potential safety and health risks to the workers on site. Site control includes the following safe work practices:

- Limiting work area access to essential personnel, both during work hours and off hours;
- Establishing work zones within the sampling and sorting areas, and restricting personnel entering work zones;
- Establishing decontamination procedures for personnel and equipment; and
- Assuring that personnel may be accurately and quickly located and evacuated during an emergency.

As a general site control, alcoholic beverages, food, cigarettes, and other consumable products are prohibited in work areas at all times.

Sampling Area Controls

An area at the host facility will be set aside for the oversight of vehicle load tipping and sampling of the tipped load. The sampling work area shall be controlled by:

- Delineating boundaries for the tipping of targeted loads of waste;
- Prohibiting entry into these boundaries by non-targeted truckloads;
- Providing for the safe queuing of material transport hoppers out of the way of collection vehicles and waste handling mobile equipment such as loaders or compactors; and
- Providing a storage location for a loader or bobcat that may be needed to transport samples.

Only the Field Supervisor or a trained sampling manager may enter into the sampling work area during the course of the project.

Sorting Area Controls

An area at the host facility will be set aside for the performance of sorting and weighing sampled wastes. The sorting work area shall be controlled by:

- Setting aside a 20 foot by 20 foot space where the sort table and bins can be positioned;
- Providing additional space for queuing samples;
- Maintaining a consistent site configuration so that employees know the proper position of all equipment and materials; and

- Being established out of the way of any heavy machinery or equipment that may be in operation within the facility boundaries.

No personnel will enter or work in delineated work zones without proper training or an escort.