

*Proposal to Conduct:*

Secondary 2007-2008  
Statewide Waste Characterization Study  
IWM06045



*For:*

**California Integrated Waste Management Board (CIWMB)**

Submitted by:  
**Cascadia Consulting Group, Inc.**



April 17, 2007

April 16, 2007



Carol Baker  
CIWMB, Contracts Unit  
1001 I Street  
Sacramento, CA 95814

Dear Ms. Baker:

On behalf of Cascadia Consulting Group, I am pleased to submit this proposal to conduct the Secondary 2007-2008 Statewide Waste Characterization Study. Our team is uniquely qualified to complete this project. Together we offer the State of California an unequalled combination of strengths:

- We have conducted eight successful state-wide waste characterization studies, including four previous statewide studies in California.
- We are well prepared to meet the CIWMB's expanded vision for this study. Consistent with the RFP, our proposal includes plans to visit 25 solid waste facilities and to include 65 days of gatehouse surveys.
- We know California's waste characterization requirements. We have conducted several waste studies using the Uniform Method and helped to define the CIWMB's material type classifications.
- Our sorting crew will be supervised by Brad Anderson, owner and operator of Sky Valley Associates. Brad has supervised the sorting and characterization field work in all of CIWMB's previous characterization studies for MSW.
- In order to meet the CIWMB's contracting guidelines, we have arranged with a certified California small business to provide and manage experienced waste sorting labor, and with a certified California DVBE to provide data entry services.
- We offer substantial statistical expertise to help the CIWMB meet its objectives in accurately characterizing the waste stream and in designing and implementing new, targeted studies.

We look forward to working with the CIWMB on this project. The attached proposal presents our qualifications and our approach to developing an accurate and cost-effective study and report.

Please contact me if I can provide you with any additional information.

Sincerely,

[Redacted signature]

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## Methodology

To provide the CIWMB with a comprehensive and accurate statewide study of waste composition, Cascadia Consulting Group will follow a data collection strategy similar to the one that was used in 2003. One of the objectives of the current study is to ensure that data is comparable with that of previous studies. Our approach to the scope of work represents the most efficient and cost-effective data collection approach that can be developed within the CIWMB's cost parameters.

Our study design will ensure statistically representative data. As we develop our proposed approach to the statewide waste characterization study, the most important consideration is to ensure that the data collected is representative of the MSW stream as a whole. To that end, we are distributing our data collection activities across every major geographical region of the state and across each major waste sector (residential, commercial, and self-hauled waste). In order to develop precise waste composition estimates for each waste sector, we will collect waste samples at 25 disposal facilities, and we will visit each disposal facility twice during the yearlong study. Fifty sampling days will be dedicated to hand-sorting and characterizing 250 samples of residential waste, 250 samples of commercial waste, and 250 samples of self-hauled waste. In addition, our proposal includes 65 days of vehicle surveys, as well as customized data collection efforts related to special materials found in the waste stream and related to asbestos in roofing samples. Highlights of our approach include:

- **Careful planning and ongoing communication with CIWMB staff.** We will develop the project schedule to ensure that there is adequate time between the completion of the study design and the implementation of site visits and data collection. In addition, we have developed procedures for quality control of all the steps of data collection and analysis that will ensure the study produces accurate findings.
- **Inclusion of more facilities than were visited during the 2003 study.** Our plan is to conduct sampling activities at 25 randomly-selected disposal facilities, distributed among all five regions of the state. We plan to visit each disposal facility twice, with those visits staggered approximately six months apart. This is consistent with the way sampling visits were scheduled for the previous study.
- **Inclusion of more multifamily locations than were visited during the 2003 study.** We plan to include 50 multifamily locations in the sampling plan. This represents an increase compared to the previous study, and it is expected to provide a broader set of waste disposal rate data and waste composition data. In general, our approach will be to consolidate the selection of multifamily sites to 10 - 12 communities. Communities that provide multifamily sites for inclusion in the study will be chosen from all five regions of the state, and multifamily sampling visits will be scheduled for the second and fourth sampling season.
- **Special steps to obtain enough samples at smaller solid waste facilities.** Based on our experience with previous studies, we are introducing a new method of obtaining samples at small, low-traffic facilities. Our method will involve sending a sampling scout to certain small facilities to "pre-capture" samples a day ahead of the sorting team.

Through our many years of experience implementing statewide waste characterization studies in California and elsewhere, we have learned what works. Therefore, we are proposing several innovative steps in our approach:

- We anticipate recruiting the multifamily sites using an on-the-ground "doorbelling" approach, because we know from experience that it is difficult to find representative lists of multifamily sites to use in a telephone recruitment approach.
- In order to obtain good data reflecting the quantity of disposed waste associated with each waste sector and each self-haul activity type, we plan to conduct vehicle surveys at every facility where sampling takes place. In addition, we will conduct vehicle surveys at up to 15 additional solid waste facilities selected by CIWMB staff.
- We plan to ensure that our crew obtains enough samples from all recruited facilities – even the smaller facilities. In order to accomplish that, we will send a team member to smaller facilities a day ahead of the scheduled sorting day, in order to "pre-capture" some of the required samples. The pre-capturing of samples will be done by the same person who normally conducts the vehicle surveys. That person will "leapfrog" ahead of the sampling crew when necessary and will pre-capture samples and conduct a vehicle survey at the smaller facility a day ahead of the sampling crew. On the next day, that person will "leapfrog back" to the facility where the crew was stationed previously, in order to complete the vehicle survey at that location. Thus, every facility will be surveyed, and enough samples will be obtained at every facility.
- In addition to surveying at the facilities where sampling occurs, we will conduct vehicle surveys at 15 additional facilities selected by CIWMB staff. Vehicle surveys at all of the facilities visited during the study will quantify MRF waste as well as waste associated with the traditional waste sectors and self-haul activity types.
- We will work with CIWMB staff to develop and implement a sampling method that captures data reflecting unusual and "special" materials in the waste stream, such as electronic items, hazardous waste, tires, etc. A suggested approach is presented later in this section.
- Based on our experience with previous large-scale waste characterization studies, we have developed a set of quality assurance and quality control procedures. These procedures are described later in this section.
- We are prepared to work with CIWMB staff to develop an approach for estimating the extent of asbestos contamination in material generated by roofing activity. Although the RFP specifies that a minimum of ten roofing loads must be selected and sub-sampled to produce material for an asbestos analysis, we believe it may be beneficial to obtain samples from more than ten loads.

## Task 1: Study Design

Immediately upon contract approval, Cascadia will prepare a draft version of the Study Design document. The Study Design will describe the plan for each element of the study, beginning with the initial contact with solid waste facilities and ending with final analysis of the data. The document will include complete plans for the collection of data to quantify and characterize residential waste, commercial waste, and self-haul waste, and it will include a plan for determining reliable estimates of special materials (tires, electronic waste, household hazardous waste, and others) in the waste stream. Data collection will be handled via solid waste facility sampling, generator sampling, and through gate-house surveys. A plan for collecting samples from rural facilities will be addressed, as will a pilot study for determining asbestos levels in roofing loads and an assessment on the divertibility of recoverable materials. The elements we recommend, including in the comprehensive Study Design document, are listed below.

### **Sample Site Selection Plan**

#### **Solid waste facility sampling** of single-family, commercial, and self-hauled sectors

- Determining number of facilities for sampling/surveying
- Develop questionnaire to determine facility suitability
- Selection of facilities for sampling/surveying, including rural facilities
- Selection of additional 15 facilities for surveying
- Contacting the facilities
- Scheduling the facilities and ongoing coordination with each site
- Data collection from the facilities (days/hours of operation, etc.)

#### **Generator sampling** for the multifamily waste sector

- Selection of multifamily buildings/complexes

### **Field Sampling/Sorting Plan**

#### **General design elements**

- Training and supervision of field staff
- Determination of numbers of waste samples
- Allocation of numbers of samples to regions, facilities & seasons
- Sampling and surveying schedule
- Sampling and sorting procedures
  - Diverting selected loads
  - Extracting samples; adequate sample weights
  - Sorting samples
  - Assessing divertibility of recoverable materials
  - Collection/submission of roofing sub-samples for asbestos analysis
  - Recording sorting data and QA/QC
  - Other data to be collected (subsector, vehicle type, etc.)
  - Health and safety measures for sampling/sorting
  - General contingency measures with respect to sampling/sorting
  - List of equipment and data forms for sampling/sorting

#### **Generator sampling** for the multifamily waste sector

- Selection of waste samples
- Extraction of samples from dumpsters; adequate sample weights
- Acquisition of waste disposal rate data for all multi-family locations

#### **Gate-house surveys**

- Interview procedures
- Data collection procedures and QA/QC
- Health and safety measures for surveys
- General contingency measures with respect to surveying
- List of equipment and data forms for surveying

### **Special Materials Study Plan**

#### **Preliminary Research and Design**

- Research and collect all available special materials data
- Explore all currently used data collection techniques

Summarize and report relevant findings  
Recommend data collection and analysis plan for California

**Data Collection Protocols**

Training and supervision of staff  
Timing and locations of field activities  
Facilities and equipment to be used

**Data Management & Analysis**

Data Entry & QA/QC  
Calculation methods for each sector  
Composition estimates  
Quantity estimates

**Lists of Material Categories and Special Materials categories**

**Definitions of Material Categories and Special Materials categories**

**Task 1 Deliverables**

- Preliminary Draft Study Design document
- Final revisions to Study Design document, submitted after receiving CIWMB-requested changes.
- Material list and definitions

**Task 2: Sample Site Selection and Schedule**

**Design of Method for Site Selection**

Cascadia will work with CIWMB staff to design the site selection process and develop a schedule for waste sampling and gatehouse surveys. The site selection process will be detailed in a Sample Site Selection Plan, which will be part of the Study Design document and which will be presented to the CIWMB contract manager for approval prior to actual selection of sites. Our recommended method of site selection is described in detail below.

*Implementation of Site Selection Process*

This section presents Cascadia's proposed method for selecting solid waste facilities and multifamily buildings or complexes for waste sampling and waste quantification purposes. This proposed method will be presented to CIWMB staff for approval during the Study Design process and will undergo any needed modifications during that time. The strategy for selecting MSW facilities, vehicles, and samples will be designed to ensure that the samples are entirely representative of the waste in each waste sector, at the regional and statewide levels.

In summary, we propose to obtain 750 waste samples from 25 sites in five regions. Each site will be visited twice, with the visits scheduled approximately six months apart. Waste sampling and vehicle surveys will be conducted over four seasons.

### Selection of Regions

To facilitate comparison with the previous statewide waste characterization study, Cascadia recommends dividing the state into the same five regions that were used in the 2003-2004 study. Our recommended division of the state into regions, following county boundaries, is summarized in the table below.

**Recommended Division of the State's Counties into Five Sampling Regions**

<b>Coastal</b>	<b>Bay Area</b>	<b>Southern</b>	<b>Mountain</b>	<b>Central Valley</b>
Del Norte	Alameda	Imperial	Alpine	Butte
Humboldt	Contra Costa	Los Angeles	Amador	Colusa
Lake	Marin	Orange	Calaveras	Fresno
Mendocino	Napa	Riverside	El Dorado	Glenn
Monterey	San Francisco	San Bernardino	Inyo	Kern
San Benito	San Mateo	San Diego	Lassen	Kings
San Luis Obispo	Santa Clara	Ventura	Mariposa	Madera
Santa Barbara	Solano		Modoc	Merced
Santa Cruz	Sonoma		Mono	Placer
			Nevada	Sacramento
			Plumas	San Joaquin
			Sierra	Shasta
			Siskiyou	Stanislaus
			Trinity	Sutter
			Tuolumne	Tehama
				Tulare
				Yolo
				Yuba

### Determination of Numbers of Samples to be Characterized

Cascadia recommends a characterization approach that will yield 50 residential samples, 50 commercial samples, and 50 self-hauled samples per region. During the entire study, we propose to obtain and sort 250 residential samples, 250 commercial samples, and 250 self-hauled samples. The proposed allocation of the 750 samples is not only consistent with what has been requested by the CIWMB, but exceeds the number of samples recommended by *California's Draft Regulations Governing Disposal Characterization Studies*. This allocation will provide representative waste composition data for each waste sector in each region of the state.

### Proposed Allocation of Samples among Seasons & Waste Sectors

	Season 1	Season 2	Season 3	Season 4	Total
Samples by Sector					
Single family	50	50	50	50	200
Multi-family	0	25	0	25	50
Commercial	65	60	65	60	250
Self Haul	65	60	65	60	250
<b>Totals</b>	<b>180</b>	<b>195</b>	<b>180</b>	<b>195</b>	<b>750</b>
Sorting Days	12	13	12	13	50
Facilities Sampled	12	13	(12)	(13)	25 (50)

We recommend that 50 of the 250 residential samples be assigned to the multifamily subsector. These will be collected and sorted as generator samples, and we will collect disposal rate data from participating multifamily sites as well. Multifamily sites will be chosen from all five regions of the state, and sampling visits will be scheduled for the second and fourth sampling season.

#### Determination of Number of Facilities to be Used for Data Collection

The best way to maximize the number of samples that can be afforded within the project budget is to allocate one or more whole days to each site visited during each season. Cascadia also recommends allocating sampling days such that the maximum number of facilities can be visited each season. Our recommended strategy is to employ a random selection method (described in the following section) to choose the sites at which waste characterization and vehicle survey data will be collected, and then to assign one full day of data collection to each site. In addition to the vehicle surveys given at the 25 sampling sites, Cascadia will extend vehicle survey data collection to vehicles at least 15 other facilities, whose locations will be selected by CIWMB staff.

In order to ensure that sampling is representative of the waste disposed throughout the year, we propose visiting each selected disposal facility twice, with visits being approximately six months apart. Therefore, we recommend sampling waste at 25 disposal facilities, allocating 12 facilities to the first and third seasons, and allocating 13 facilities to seasons two and four.

#### Method and Criteria for Choosing Facilities and Days of the Week for Data Collection

Cascadia recommends using a random selection process to choose the solid waste facilities to be visited for data collection. The days of the week on which data collection occurs will be governed by the selection of facilities and the days on which the selected sites normally operate, as well as the availability of an adequate number of waste loads from which to select samples. An additional factor affecting the scheduling of sites will be the waste collection cycles of participating multifamily buildings in the nearby communities.

A list of possible facilities to be used for data collection will be drawn from a list of all eligible facilities which will be provided by the CIWMB. The eligible solid waste facilities will be grouped by region, and a random selection strategy will be employed to select facilities in each region for use in data collection. Cascadia

will then interview facilities via a questionnaire which will be developed by the contractor and approved by the CIWMB contract manager prior to recruiting.

The initial set of facilities selected in each region will be compared against certain criteria to ensure they are suitable for inclusion in the study. Facilities must handle waste that is destined for final disposal (i.e., waste that is not subject to any further processing or sorting after it passes through the site), and sites must have scales that can be used to obtain vehicle net weights during the gatehouse surveys. Furthermore, each candidate facility must handle waste from all sectors in enough quantity (number of vehicles) to guarantee that the requisite number of samples can be obtained. If any facilities are screened out because of these criteria, then replacement sites will be chosen at random from the list of eligible sites.

### Contacting the Solid Waste Facilities

Following approval of the recruitment questionnaire, Cascadia will contact the selected solid waste facilities and verify their suitability for waste sampling and vehicle surveying. For each selected facility, we will obtain contact information for individuals associated with the facility who (1) can give permission for data collection to occur there, (2) are responsible for managing the facility on a day-to-day basis, and (3) can provide daily and weekly tonnage and traffic data for the facility. After obtaining an agreement to participate in the study, we will work with the facility staff to construct a chart of weekly vehicle traffic for each waste sector, permitting the construction of a sampling plan unique to that facility. In addition, we will keep a unique record for each facility, recording data that the facilities are able to provide regarding tons received from direct haul, transfer stations, and MRF's as well as information on the makeup of particular materials disposed there, such as biosolids, food processing waste, MRF residuals, agricultural plastic, etc.

If the management of a selected facility proves to be uncooperative or the facility appears unsuitable for some unexpected reason, then an alternative facility will be chosen at random from the list of remaining eligible sites. Once the final group of facilities is in place, the list will be submitted to the CIWMB staff.

Other information we will obtain by contacting each selected facility includes:

- Written directions to the facility
- Plan or agreement about the exact location of sampling and sorting operations at the facility
- Plan for the use of scales and the cooperation of gatehouse personnel to obtain vehicle net weights
- Determining whether the facility is willing to make the use of a loader available to obtain waste samples
- Approximate daily and weekly load counts and tonnage by waste sector and subsector
- The nature and extent of material recovery operations and processing activities

### Considering Special Data Collection Needs

To ensure that this waste characterization study is statistically representative of the entire waste stream, it is important to maintain the integrity of data collection at all participating facilities, including large and small ones, and including urban and rural ones. At small, rural, solid waste facilities, where traffic levels may be low and can sometimes be unpredictable, it can be challenging to obtain enough samples to represent

each waste sector, based on a single day of sampling activity. With that in mind, we will ensure that all available information is collected ahead of time about the traffic levels expected at each disposal facility and that the operators of each facility have a complete understanding of the nature of our sampling operation and the cooperation that is expected of them. We also will employ a strategy of "pre-capturing" samples at some small facilities.

Our "pre-capturing" strategy will include sending a "sampling scout" to visit selected small facilities the day before the larger waste sorting crew arrives. The sampling scout will collect and set aside a number of samples which will supplement what the larger crew is able to capture on the following day. The sampling scout will be the same person who normally conducts the vehicle surveys, and that person will also conduct vehicle surveys at the small facility during times between capturing samples.

On the day following a pre-capture day, the waste sorting crew will arrive at the small facility and continue the process of capturing samples. The sample scout/vehicle surveyor will "leapfrog" back to the previous facility and complete a full day of surveys at that location. Thus, every facility will be surveyed, and enough samples will be obtained at every facility.

A specific data collection approach will be designed for each disposal facility, based on the challenges presented by the facility's design, the traffic patterns, and the existence of diversion programs. For example, at a transfer station that has a material recovery facility (MRF), we will attempt to develop a sampling method that reflects the composition of waste after it has passed through the sorting line. In the past, we have used tape to mark off boundaries around a waste load before it passes along the MRF's sorting line, thus isolating the particular load from other waste. We then obtain a waste sample from the load after material has been recovered from it.

Other data collection challenges that often arise during the planning phase of a waste characterization study are related to obtaining information from disposal facilities about the numbers and types of waste loads they receive on a daily basis. Since this information is a necessary part of a sampling plan, we will work with each selected disposal facility to obtain counts or best estimates of the numbers of residential, commercial, and self-hauled loads arriving on each day of the week.

#### **Scheduling Days and Times for Data Collection**

Cascadia will use the vehicle traffic information that it obtains from each of the selected facilities to develop a unique sampling plan for each facility and for each region of the state. At the regional level, the sampling plan will ensure that MSW from each sector is adequately represented. At the level of individual facilities, scheduling days for waste sampling and vehicle surveys will depend partly on the availability of an adequate number of loads from each waste sector and partly on the construction of a sampling schedule that produces a cost-efficient path of travel through the state for the data collection crew. Scheduling will also be affected by the collection cycles for multifamily buildings that are chosen to provide generator samples. Vehicle surveys will be scheduled at each facility, starting at a randomly chosen starting time, such that the surveyor is able to put in a full day of surveys before the facility closes.

Individual waste samples will be chosen using a systematic selection process for each waste sector at each facility. Generally, the sampling crew will use a random starting time that occurs some time after the facility opens and still is expected to allow capture of the requisite number of samples from each waste sector. The

number of vehicles expected to arrive as part of a given waste sector during the allotted time will be divided by the number of samples desired for that sector, resulting in a number  $n$ . Our systematic selection method is then to obtain a sample from every  $n$ th vehicle from the relevant waste sector, beginning at the randomly chosen start time. The sampling crew will be given some discretion to adjust sampling intervals, if it appears necessary in order to meet sampling goals.

## Arranging for Collection of Multifamily Residential Waste Samples

Our experienced team will use a multi-step process to select, recruit, and schedule sites to participate in the multi-family portion of the study. The information gathered will offer an accurate appraisal of the overall statewide multi-family disposal rate (tons per unit year) as well as providing representative composition data. RFP18 Waste from the multifamily residential subsector will be obtained and studied using a generator sampling strategy involving multifamily buildings or complexes that will be recruited by Cascadia for participation in the study.

In order to maximize efficiency, multifamily sites will be recruited in selected communities representing all five regions during the second and fourth sampling seasons. In each of the two seasons, 4-6 multifamily sites will be chosen in each of 5 communities that are located near participating solid waste facilities, resulting in a total of 24-26 multifamily samples per season, and a total of 50 for the study. Waste from the selected multifamily buildings in that community may then be obtained and taken back to the disposal facility for sorting and characterization.

We anticipate recruiting the multifamily sites using an on-the-ground "doorbelling" approach, because we know from experience that it is difficult to find representative lists of multifamily sites to use in a telephone recruitment approach. Lists of multifamily locations that have been created for marketing purposes and lists of multifamily locations that appear in telephone directories often exclude smaller apartment buildings. In addition, they often provide incorrect contact information for apartment managers. A doorbelling approach, in conjunction with a random selection strategy, allows for face-to-face contact with apartment managers as well as the ability to quickly assess and overcome most problems related to recruiting. Communities will be chosen from areas that include multifamily housing in communities near participating solid waste facilities. A street map of each selected communities will be obtained, a grid will be overlaid on the map, and 4-6 grids will be randomly selected. In each grid, one multifamily building will be recruited for sampling. Again, this technique will result in 24-26 samples and site visits per season, for a total of 50 overall.

In general, subcontractor Sky Valley Associates will obtain one multifamily waste sample from each recruited apartment building or multifamily complex on the morning of each sorting day, shortly before the regularly scheduled collection time for the waste. On some occasions, when sampling arrangements are complicated, it may be preferable to collect the sample the previous night. Cascadia will attempt to select multifamily sites that have their normal collection scheduled on the same day our crew is scheduled to visit the local disposal facility.

From the owners or managers of the selected multifamily sites, Cascadia will obtain basic information on the frequency, day of week, and time of waste collection service, the number and size of dumpsters at the site, and specific instructions for accessing the dumpsters. We also will determine the number of existing and occupied dwelling units in each selected multifamily site. For sites where the waste containers are not

accessible (e.g. they are in a locked area), arrangements will be made to ensure that the sampling crew will be granted access, or the sites will be discarded from the study in favor of other multifamily sites. We recommend that one extra multifamily site be recruited in each community as a contingency, in the event that something prevents the capture of valid waste samples at the intended multifamily sites.

For each of the two multifamily sampling seasons, a list will be prepared that contains the names and locations of the multifamily sites to be included in the study, along with exact instructions for accessing their waste, locating all of their waste containers, contacting their management personnel (if necessary) and timing the sampling event to occur prior to collection by the regular waste hauler. This list and information will be provided to the field data collection crew prior to the beginning of the sampling season.

## Quality Assurance and Quality Control during Sample Site Selection and Scheduling

The purpose of QA/QC measures during this task is to ensure that accurate information is collected and communicated ahead of time, so that data collection activities can proceed smoothly and according to plan. In our communications with solid waste facilities, Cascadia will ensure that we are speaking to the individuals who are authorized to grant permission for data collection to occur at each facility and the individuals who are empowered and able to provide accurate information about the facility's operations and traffic levels. We will note all of the required information on prepared facility interview forms and present the recorded information to each facility's staff for review and confirmation prior to scheduling data collection activities at that facility.

During the multifamily recruitment phase, we will use prepared multifamily site interview forms to collect all required data with respect to procedures and timing for accessing the waste. Pertinent contact information for the multifamily management and the waste haulers will be recorded during the face to face interview, and data will be collected to reflect the number and locations of waste containers and the days and times of waste pick-up. Another benefit of the doorbelling approach is that all information can be collected and verified in person which ensures that the waste sample will be quickly and accurately obtained during the subsequent sampling visit.

## Task 2 Deliverables

- Sample Site Selection Plan
- List of solid waste facilities selected for sampling and surveying activities, along with assignments of facilities to seasons
- Schedule of field work which describes sampling dates at each facility, start-up tasks, travel, set-up, sample capture, sorting, and gatehouse surveys for the entire four-season study period.

## Task 3: Field Data Collection

### Design of Method for Field Data Collection

Cascadia will work with the CIWMB contract manager and staff to design the process for collecting statewide waste characterization and vehicle survey data. The data collection process will be detailed in a Data Collection Plan, which will be part of the Study Design document and which will be presented to the CIWMB contract manager for approval prior to commencement of field work. Cascadia's recommended methods of data collection are described in detail below.

#### *Implementation of Waste Sampling and Sorting*

This section describes Cascadia's proposed method for collecting field data through waste sampling and sorting, generator visits to multifamily locations, and gatehouse surveys. This proposed method will be presented to CIWMB staff for approval during the Study Design process and will undergo any needed modifications during that time.

#### Number of Field Staff to be Assigned to On-Site Waste Characterization Activities

Cascadia will assign to this study a data collection field crew consisting of three to four experienced waste sorters, a gatehouse surveyor, an experienced crew supervisor and an experienced assistant crew supervisor. Our sampling crew is capable of obtaining and sorting an average of 15 samples per day.

#### Training and Supervision of Waste Characterization Staff

To provide consistent sorting, we plan to use the same experienced waste sorters and supervisors throughout the study, and each will be trained in the use of this project's specific protocol and waste component definitions throughout the project. Pacific Waste Consulting Group will provide and manage a skilled, well trained sorting crew consisting of three or four experienced workers, and the crew will operate in the field under the experienced direction of Sky Valley Associates owner, Brad Anderson.

#### Health and Safety Measures for Waste Sampling and Sorting

Sky Valley Associates will train the PWCG sorters using its established safety and training program. Before sampling begins at each site the crew first identifies and discusses all of the unique hazards, emergency procedures, and operational restrictions that may be present. The safety training and safety plan include written safety procedures and conduct guidelines, including a Bloodborne Pathogen Exposure Control Plan. These procedures are updated whenever new safety information, products or regulations appear.

#### Diverting Selected Loads of Single-Family, Commercial, and Self-Hauled Waste

Cascadia will use a systematic selection procedure to identify the vehicles that provide waste samples at MSW facilities. To calculate vehicle sampling frequency for each waste sector, we establish a sampling interval for each. Sampling intervals are determined by dividing the total number of loads for each sector arriving at the facility by the number of samples needed each day. The resulting number is the sampling

frequency and determines whether every third vehicle, every sixth vehicle, or every 20th vehicle is selected for sampling. We refer to this strategy as “selecting every nth vehicle” within a waste sector.

Paper vehicle selection forms will be created for each day and each location of sampling activity. The staff member responsible for conducting vehicle surveys will have the additional duty of keeping a tally of vehicles from each waste sector as they enter the facility. When the designated nth vehicle in each waste sector arrives, the staff member will obtain certain information from the driver, will mark the vehicle by placing a brightly colored card on the windshield, and will send the vehicle to the sampling area.

The staff member positioned at the gatehouse will obtain and record the following information for each vehicle that is identified for sampling.

- Jurisdiction from which the load originated
- Waste sector – single family residential, commercial, or self-hauled waste
- For self-haul, the type of activity that generated the waste:
  - Residential self-hauled waste
  - Construction and demolition waste
  - Landscaping and landclearing waste
  - Roofing waste
  - Other self-hauled waste
- Waste sector – single family residential, commercial, or self-hauled waste
- For self-haul, the type of activity that generated the waste:

This information will be noted on the vehicle selection form, along with a unique identifying number associated with that vehicle on that day. A brightly colored card labeled with the identifying number will be placed on the vehicle’s windshield or dashboard to identify it as a vehicle destined for sampling. When the sampling crew intercepts the vehicle, the field crew supervisor will note the unique number of the card on the waste composition field form. The field crew supervisor also will note any unusual circumstances associated with the load or the sample.

#### Extracting Samples from Single-family, Commercial, and Self-Hauled Loads

Selected loads of residential, commercial, and self-hauled waste will be dumped in elongated piles three to four feet high. From each selected load, one sample of waste will be selected using an imaginary 16-cell grid superimposed over the dumped material. The field crew supervisor will identify the randomly selected cell to be extracted. Then, with the assistance of the landfill’s loader operator, a sample of waste weighing at least 200 pounds will be removed by machine from the designated cell and placed on a tarp. If a loader is not available, samples will be removed from the pile by hand. Prior to sorting each sample, Cascadia will take a digital photograph of it.

When extracting samples from self-hauled loads, if the load weighs over 250 pounds, then a sample of at least 200 pounds will be collected and sorted. If the total self-hauled load is estimated to weigh between 175 and 250 pounds, then the entire load will be sorted as a sample. If the selected self-hauled load is estimated to weigh less than 175 pounds, then additional loads from the same class of vehicle and waste-

generating activity will be collected until the total sample weight exceeds 200 pounds. The combined small vehicle loads will then be counted as one sample.

#### Extracting and Analyzing Roofing Loads to Determine the Presence of Asbestos

Ten to twenty-five roofing loads will be systematically chosen, and relevant materials from the samples will be isolated and sent to a laboratory to quantify the asbestos present in those materials. Safety protocols will be followed at all times while extracting and handling potential asbestos containing materials. Commonly known asbestos-containing roofing materials such as shingles, roofing paint, felt, paper, and flashings will be collected in small amounts, labeled, and packaged for shipment to an approved laboratory. When possible, a specimen of roofing material will be removed with all layers intact, because asbestos may be present in different amounts in each layer.

#### Identifying Disposal Containers and Selecting Samples at Multifamily Sites

Members of the field data collection crew who are assigned to collect samples of multifamily waste will be prepared with extensive written instructions regarding the location of each selected multifamily site, the location of all waste containers at the site, and detailed procedures for accessing the waste. This information will have been gathered ahead of time as part of Task 2.

Each multifamily site will be visited the night before or early on the morning of the normal sorting day. At each site, the volume of waste in each waste container will be measured using a tape measure or yardstick along each dimension, and the dimensions will be recorded on a *multifamily visit field form* created specifically for that multifamily site. (The total volume of accumulated waste, divided by the time since the most recent waste pick-up, will provide a waste generation rate for the multifamily site.) The number and size of the waste containers also will be recorded.

At each site, a sample of waste will be obtained through the following method. All bins at the site will be recorded and all bins will be inspected to determine whether any substantial differences exist among bins, and if so, subsamples will be taken to ensure a representative sample. Each sample will be extracted from the waste containers by pulling a vertical cross-section of waste from each relevant container, such that the total amount of waste is estimated to weigh at least 200 pounds. Measurements will be taken and will reflect the volume of waste in the container before and after the sample is removed. These data will be used in calculating the volume and density of the sample. Then the sample will be transported to the MSW facility where waste sampling and sorting is occurring. Multifamily waste samples will be sorted according to the same protocol that is used for other waste sectors.

#### Sorting and Characterizing Waste Samples

Once the sample has been acquired and placed on a tarp, the material will be sorted by hand into the prescribed component categories. We anticipate that materials will be sorted into approximately 87 material categories as directed by CIWMB staff. Plastic laundry baskets will be used to contain the separated components. The sampling crew members typically specialize in groups of materials, such as papers or plastics.

The Field Manager (either Brad Anderson or another staff member of Sky Valley Associates) will monitor the homogeneity of the component baskets as they accumulate, rejecting materials that may be improperly classified. Open laundry baskets allow the Field Manager to see the material at all times. The Field Manager will also verify the purity of each component as it is weighed, before recording the weight into the database. The materials will be sorted to the greatest reasonable level of detail by hand, until no more than a small amount of homogeneous fine material ("mixed residue") remains. The overall goal is to sort each sample directly into component categories in order to reduce the amount of indistinguishable fines or miscellaneous categories. For the "leaves and grass" material category, the percent of leaves and the percent of grass present will be estimated visually.

For a portion of the samples analyzed, the field manager will conduct a divertibility assessment of commonly recoverable materials. Approximately one in four loads will be systematically chosen for assessment. The sorting crew will be told which samples to include in the divertibility assessment via a written indicator on the *daily sample capture sheet*. The divertibility analysis will include estimates of the percentage of each targeted material that appears to be (a) clean, (b) contaminated during collection, (c) contaminated prior to collection, and (d) a composite of materials unsuitable for diversion. Photos will be taken of sorted materials to reflect the condition and percentage of contamination.

#### Recording Data from Waste Sorting

The field crew supervisor will use a waste composition field form to record the composition weights and the information obtained from the driver interview for each selected load and sample. Copies of each field waste composition field form will be made on a biweekly basis, and the originals will be sent to Cascadia's offices for entry into a database.

#### Overcoming Obstacles and Challenges in the Field

There are numerous things that can go wrong during the data collection phase of a waste characterization study. Over the years, our data collection team has encountered nearly every contingency. We find that careful, up-front planning is crucial for the data collection process to work smoothly. With that in mind, we will ensure that adequate information is collected ahead of time about the traffic levels expected at each disposal facility and that the operators of each facility have a complete understanding of the nature of our sampling operation and the cooperation that is expected of them. We also employ several quality assurance steps (described in the following section) that help ensure consistent and accurate data collection.

#### Quality Assurance and Quality Control during Sample Selection and Waste Sorting

Our data collection crew uses many strategies to ensure the accuracy of all data collected in the field. The steps we take include:

- Developing a thorough sampling plan, to verify that there will be enough vehicles to choose from on the particular sampling day.
- Talking to the driver when the vehicle arrives at the waste sampling location (i.e. after the staff member at the gatehouse has sent the vehicle to the sampling crew) to verify the type of waste load.

- Using 2-way radios or cell phones with text messaging to communicate with the gatehouse staff person, to resolve any questions about vehicle selection immediately.
- At the moment when the sample is extracted from the selected load, checking to ensure the sample meets the minimum weight criterion.
- Training the entire sampling crew in the definitions of each material, and referring to the written definitions as often as needed during sorting.
- Using two to three people to read, record, and verify the weight of each material as it crosses the scales after sorting.

### *Implementation of Gatehouse Surveys*

In order to determine how many tons of disposed waste are associated with each of the waste sectors, subsectors, and activities addressed in the study, a survey will be administered to drivers at all facilities that are visited by the sampling team, as well as 15 facilities selected by CIWMB staff. This survey, in conjunction with daily transaction reports and annual tonnage reports from facilities, will be used to determine the relative proportions associated with each waste sector at the facility level, the regional level, and the statewide level. These 65 total survey days will result in an estimated 5000-8000 total vehicles surveyed for the study. At each facility, vehicle surveys will begin at a randomly selected start time that is early enough to allow a complete eight hours of surveying before the facility closes. For facilities that have multiple entrances, the surveyor will be assigned to different entrances at different times.

The person who conducts the vehicle surveys will also handle the pre-capturing of samples at smaller waste facilities. As described above, on days when pre-capturing of samples is deemed necessary, the surveyor will leave the facility where a sort is taking place and will "leapfrog" ahead to the smaller facility in order to pre-capture samples as well as survey for that day. On the following day, that person will "leapfrog back" to the facility where the crew was stationed previously, in order to complete the vehicle survey at that location. Thus, every facility will be surveyed, and enough samples will be obtained at every facility.

### *Interview and Data Recording Procedures*

On surveying days, the surveyor will place a sign indicating "surveys in progress" near the entrance of the facility. When the surveys are being conducted, the surveyor will interview the driver of each incoming vehicle and record the following data:

- The type of vehicle
- The waste sector and subsector to which each waste load belongs (i.e., single-family, multifamily, commercial, self-hauled, or MRF)
- For mixed loads (such as mixed multifamily and commercial waste, or mixed single-family and multifamily waste), the percentage of the load that the driver estimates as belonging to each sector
- For self-hauled loads, the activity that generated the waste, such as:
  - residential,
  - construction and demolition,
  - roofing,
  - landscaper,
  - other sources.

It will be necessary to determine the net weight of each vehicle entering the facility, in order to calculate the tonnage of each waste sector. To achieve this, the surveyor will note on *the vehicle survey form* the total incoming weight and tare weight for each vehicle that has a tare weight. For each vehicle that does not have a tare weight, the surveyor will give a numbered card to the driver while noting the number in the unique record for that vehicle on the *vehicle survey form*. The surveyor will then instruct the driver to give the card to gatehouse personnel upon exiting the facility, and gatehouse staff will be asked to write the net weight of each vehicle on the appropriate card. The surveyor will collect the weight cards from the gatehouse at the end of each survey day and will write the net weight of each vehicle on the *vehicle survey forms*.

In addition to asking questions verbally, the surveyor will have copies of the survey questions printed on cards that may be handed to drivers. On the cards, the survey questions will be printed in English and Spanish. The surveyor will record data from the interviews and net weight records on a *vehicle survey form*. Twice each week, copies will be made of the completed *vehicle survey forms*, and the originals will be sent to Cascadia's offices for entry into a customized database.

#### Training, Supervision, and Quality Assurance for Vehicle Surveyors

The surveyor will be trained in techniques for obtaining correct and complete information from drivers and in a standardized method for recording survey data on the *vehicle survey form*.

In the field, the surveyor will be supervised directly by the field crew supervisor. Instruction and ongoing direction regarding implementation of the vehicle surveys will be provided by Cascadia senior staff. The completeness of vehicle surveys will be checked regularly when they are delivered to Cascadia's offices, and senior staff will manage the surveyor to ensure that data is collected in a thorough manner consistent with the study's methodology.

#### Health and Safety Measures for Surveys

The surveyor will be equipped with a hard hat, high-visibility safety vest, stop sign, steel-toed boots, and clothing to protect from sun exposure. The surveyor will be trained in safe procedures for conducting work near moving vehicles and will be instructed to stop work if conditions at the surveying location become unsafe.

## Progress Reports

Progress reports will be provided to the CIWMB's contract manager on a weekly and seasonal basis.

#### *Weekly Reports*

On each Tuesday prior to, during, and after sampling periods, Cascadia will provide the CIWMB's contract manager with a report covering the data collection events of the previous week. The report will include:

- A schedule and sampling plan for the upcoming week;
- A summary of the samples obtained and sorted during the previous week;
- Copies of all data sheets for the previous week's waste sorting and vehicle surveys;

- A photograph of each sample;
- Reports of any problems, contingency measures taken, or significant findings encountered; and
- Recommendations for adjustments for field procedures, sites, or general study design, if needed.

### *Seasonal Reports*

Cascadia will submit seasonal reports to the CIWMB's contract manager within 30 calendar days after the end of each sampling season. The seasonal reports will include:

- a summary of samples completed (numbers & locations for each sector & subsector);
- a description and explanation of any differences between the Data Collection Plan and actual field sampling performed; and
- an accompanying database containing sample data and vehicle survey data for the completed season

### **Task 3 Deliverables**

- Field Data Collection Plan (to be included as part of the Study Design document submitted as part of Task 1).
- Weekly reports of sampling and survey activities to cover the data collection events of the previous week.
- End-of-season reports of sampling and survey activities.
- Database containing sample characterization data and vehicle survey data.
- Copies of all field sheets and photographs.

### **Task 4: Special Materials Research Project**

Cascadia will work with CIWMB staff to develop a method for detecting and quantifying certain rarely-occurring materials that are of concern, such as electronics, hazardous waste, mercury-containing products, tires, and other items. We anticipate developing the method during the study design phase (Task 1 of the project) and implementing it in conjunction with regular waste sampling activities (Task 3 of the project). One possible approach that Cascadia has developed to detect special materials is described below.

### **Possible Approaches for the Special Materials Study**

Two possible methods are suggested below for conducting the Special Materials Study. Cascadia will work with CIWMB staff to choose a research method, perhaps including elements of one or both methods described below, or perhaps relying on completely different methods.

### *Possible Approach #1: Hybrid of weight-based and observation-based techniques*

In this approach, selected loads of waste will be intercepted and screened for suitability for the Special Materials Study, based on the waste sector and activity type represented. Each selected load will be tipped on the ground and spread out as much as possible in an area where the load can be examined without disruption to normal facility operations. The load will then be subjected to the following two-phase process.

**Phase 1:** The characterization specialist assigned to the task will note the number and estimated volume of all large items in the load that belong to the material categories that are of concern. Large items may include materials such as tires and large electronic appliances.

**Phase 2:** Material from different portions of the load will be scooped up using a shovel or a small dozer and will be dumped into a series of tared baskets that are each expected to hold approximately 40 pounds of material. Each tared basket will be weighed along with its contents, and the net weight of the sample will be recorded. Then, the contents of the basket will be emptied onto a tarp or table for inspection. A count will be made of all the items found in the baskets that belong to each of the targeted material categories. For example, separate counts will be made of all batteries, all mercury-containing products, all electronic items, etc. The tallies will be recorded for each basket.

### *Possible Approach #2: Technique based on observation and counting*

In this approach, selected loads of waste will be intercepted and screened in the same way as described above for Approach #1, above. Large items of interest will be noted and counted, also in the same manner as described in Phase 1, above. Then, with the load spread out as flat as possible, the characterization specialist will choose sections at the surface of the load at random. The selection of areas to observe at the load's surface may be accomplished by overlaying a grid of imaginary cells over the spread-out load or possibly by tossing a delineator, such as a "hula hoop," onto the load and examining the section where it lands. The characterization specialist will then count the number of smaller items of interest that are seen near the surface of the load, within the area delineated by the grid or the marker. Multiple areas may be selected for observation in each load.

### *Analysis*

Following the field data collection, Cascadia will analyze the data to produce estimates of the numbers of each product type to occur per ton of waste or per cubic yard of waste. For example, an estimate will be developed for the average number of household batteries that occur per ton or per cubic yard, along with a statistical confidence interval.

The number of samples to be sorted in this manner is to be determined as part of this task. The number will be dependent on the productivity realized in the field using this new, untried method, and on the budget assigned to this task.

## **Task 4 Deliverables**

- Summary of current special materials data available and potential data collection methods, to be included in the draft study design

- Final data collection and analysis plan, to be included in the finalized study design
- Paper forms, databases and/or spreadsheets containing collected data, to be submitted within 30 days of the completion of each data collection season
- Final results of the special materials study, to be included with the draft final report

## Task 5: Data Entry and Analysis

From the time the sample leaves the vehicle, quality control measures are in place to ensure that the sorting is precise, consistent, and meticulously performed for every sample that is collected throughout the study. All data is verified, copies of the forms are made, and the originals are shipped by courier back to the Cascadia office for data entry. A database will be designed to suit the specific needs of the study.

### Design of Method for Data Entry and Analysis

Cascadia will work with CIWMB staff to plan the data entry and analysis phase of the study. A preliminary version of this plan will be incorporated into the Study Design document. However, it is understood that further modifications of the plan for data entry and analysis may take place at later dates. Example printouts of spreadsheets and/or databases used during this task will be submitted to the CIWMB's contract manager at least 30 calendar days prior to commencement of data entry, along with a description of agreed-upon quality control procedures for the data entry process.

#### *Data Entry*

Cascadia will design customized databases for the entry of data from gatehouse surveys and waste characterization. The databases will be designed with built-in safeguards to reduce the chance of mistaken entries. For example, each field in the data entry screens will be designed to accept data values that lie only within certain ranges. We will provide the CIWMB's contract manager with explanations, diagrams and example printouts of the databases for approval prior to commencement of data entry.

As data is collected from gatehouse surveys and waste sorting on a week-by-week basis, all field forms from those activities will be transferred to Cascadia's office. Cascadia will then send copies of data forms to subcontractor Stanfield Systems for entry into the customized databases. Cascadia senior staff will inspect the entered data and conduct various tests for anomalous data points (outliers), and any anomalies will be resolved against the hand-written field forms. When data entry is complete, the data will be exported into a format compatible with the statistical analysis package that is used for the remainder of this task.

#### *Conducting the Analyses*

##### *Analysis of Vehicle Survey Results to Quantify Waste Sectors*

For each waste sector and subsector at each disposal facility, the total net weight of vehicle loads will be added together to determine the amount of waste from that sector that arrived on the survey day. Likewise, a total amount of waste for all sectors will be calculated for the facility on the survey day.

At the regional level, the calculations for individual facilities will be combined in a weighted manner, and the annual disposed tons at each surveyed facility will be used as the weighting factor. This will produce an estimate of the portion of the regional overall MSW stream represented by each waste sector (or subsector). Then, the proportions for each of the state's five regions will be combined in a similar weighted manner to produce an estimate of the portion of the statewide overall MSW stream represented by each waste sector (or subsector). When these ratios are paired with total regional and statewide tonnage data from the Disposal Reporting System, it will be possible to quantify each waste sector and subsector with precision.

In addition, Cascadia will work with CIWMB staff to develop a method for comparing the results of vehicle surveys conducted at the 25 randomly chosen facilities that are included in waste sampling activities, versus those surveys that conducted at the 15 facilities selected by staff.

#### Analysis of Disposal Composition for the Single-Family, Commercial, and Self-Hauled Sectors

We recommend using the following method to estimate the composition of the waste sectors/subsectors that are sampled at disposal facilities. This is the analytical method that was used in the previous statewide waste characterization study.

The composition estimates represent the **ratio of the components' weight to the total waste** for each noted sector or subsector. They will be derived by summing each component's weight across all of the selected samples in a given stratum and dividing by the sum of the total weight of waste for all of the samples in that stratum, as shown in the following equation:

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

where:

c = weight of particular 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 components

The confidence interval for this estimate will be derived in two steps. First, the variance around the estimate will be calculated, accounting for the fact that the ratio includes 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:

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

Second, precision levels at the 90% confidence interval will be 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 (1.645) corresponding to a 90% confidence level

For a given waste sector, composition results at the regional level will be combined using a weighted averaging method to determine waste composition at the state level. A weighted average of composition results from all of the waste sectors would be used, with the relative tonnage of each sector serving as its weighting factor. The calculation will be 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 waste sector (i.e., the weighting factor)

r = ratio of component weight to total waste weight in the noted waste sector (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 will be calculated as follows:

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

### Analysis of Disposal Composition for the Multifamily Sector

For the generator-based samples from the multifamily sector, we recommend using the same method that was used in 2003 to analyze the composition of multifamily waste. In this case, data from samples of multifamily waste will be analyzed first at the regional level and then at the statewide level. The tonnage

factors that are used to weight results among different regions will be determined either by vehicle surveys or by the waste generation measurements that are obtained at the apartment buildings and complexes that are visited during the data collection phase of the study. As with the other individual waste sectors, statistical error ranges will be calculated based on the variability revealed by “bootstrap” randomized resampling of the multifamily data.

#### Analysis of Disposal Composition for the Overall MSW Stream

Composition results for each waste sector will be combined using a weighted averaging method to produce an overall composition estimate for all MSW statewide. The method would be essentially the same as what is described above for combining results among regions.

#### Specialized Analyses

To the extent permitted by the project budget, Cascadia will conduct specialized analyses at the direction of the CIWMB’s contract manager to determine waste quantities, compositions, and sources of variability among regions, seasons, sites, waste sectors, etc.

#### Quality Assurance and Quality Control during Data Entry and Analysis

Steps we take to ensure the integrity of data during entry and analysis include:

- Verifying that data forms were obtained for each day the data collection crew was in the field.
- Having our data collection crew keep copies of all forms while the originals are being shipped by courier to Cascadia’s office
- Random checks of the computer-entered data against the paper form, to verify that all numbers are being entered and to look for any systematic or random mistakes
- Encoding the composition analysis formulae into a routine that can be applied consistently to different data sets. (This minimizes errors that arise from mistyping formulae, etc.)

#### Task 5 Deliverables

- Sample printouts displaying database and/or spreadsheet format prior to data entry
- Electronic and paper copies of databases/spreadsheets containing data for each sample grouped by subsector and/or sector where appropriate and including sample ID number, facility, date, sample weight, weight of each component, and sector, jurisdiction of origin, and any notes
- Electronic and paper copy of average composition and statistical data for each subsector and sector for which composition data was collected
- Vehicle gate survey data, including analysis and comparison of data from the two groups of survey sites
- Electronic and paper copies of databases/spreadsheets containing data for the special materials research project

## Task 6: Prepare Comprehensive Report and Present Results

Cascadia will prepare a draft outline of the project's Final Report and will submit the outline to the CIWMB's contract manager. Feedback and comments from the contract manager and other CIWMB staff will be used to guide the draft version of the Final Report. After comments and edits are received in response to the draft Final Report, Cascadia will implement changes and submit a completed Final Report to the CIWMB's contract manager. The report will adhere to all reporting requirements for waste characterization studies, as specified in California's Draft Regulations Governing Disposal Characterization Studies.

The Final Report is expected to include the following elements:

- An executive summary
- An introduction that discusses project background, purpose, objectives, and an overview of methodology
- A description of the study design and how it was developed
- A description of how waste characterization was conducted and how data were collected
- A description of how vehicle survey and waste generation data were collected and how it was used to quantify the waste sectors
- Explanations regarding special circumstances, alteration of plans or techniques, and any significant findings.
- Results for all parts of the study, including:
  - Waste composition tables for single-family, multifamily, overall residential, commercial, and self-hauled waste, as well as the overall MSW stream
  - A table showing the number of samples characterized for each sector and subsector from each jurisdiction at each facility, to show the distribution of samples
- Explanation of how data was aggregated to develop compositions for each subsector, sector, and for the statewide overall composition
- Quantity of special materials disposed by type in each sector and statewide
- Statewide percent and estimated tonnage for each sector and subsector
- Statewide and regional per capita residential disposal rates and a statewide multi-family per-unit disposal rate
- Discussion of new information obtained on field methods and study design, and recommendations for improving future studies

An example of a waste composition table is presented on the following page.

Cascadia staff will be available to present the results of the study at public meetings as required.

### Task 6 Deliverables

- Outline of Final Report
- Draft Final Report
- Completed Final Report
- Presentations of study results at public meetings.



## Example of Waste Composition Table (Statewide Overall Waste Composition from California's 2003-04 Study)

	Est. Pct.	+ / -	Est. Tons		Est. Pct.	+ / -	Est. Tons
<b>Paper</b>	<b>21.0%</b>		<b>8,445,989</b>	<b>Organic</b>	<b>30.2%</b>		<b>12,166,452</b>
Uncoated Corrugated Cardboard	5.7%		2,312,147	Food	14.6%		5,854,352
Paper Bags	1.0%		386,037	Leaves and Grass	4.2%		1,696,022
Newsprint	2.2%		887,091	Prunings and Trimmings	2.3%		920,356
White Ledger	1.1%		447,516	Branches and Stumps	0.3%		119,754
Colored Ledger	0.1%		20,583	Agricultural Crop Residues	0.0%		0
Computer Paper	0.1%		20,845	Manures	0.1%		36,506
Other Office Paper	0.7%		296,203	Textiles	2.4%		947,789
Magazines and Catalogs	0.6%		311,143	Carpet	2.1%		838,869
Phone Books and Directories	0.2%		89,403	Remainder/Composite Organics	4.4%		1,752,803
Other Miscellaneous Paper	3.5%		1,400,526				
Remainder/Composite Paper	5.7%		2,274,433	<b>Construction &amp; Demolition</b>	<b>21.7%</b>		<b>8,732,074</b>
				Concrete	2.4%		966,607
<b>Glass</b>	<b>2.3%</b>		<b>934,926</b>	Asphalt Paving	0.0%		10,414
Clear Glass Bottles and Containers	0.9%		356,467	Asphalt Roofing	1.9%		767,981
Green Glass Bottles and Containers	0.4%		160,570	Lumber	9.6%		3,881,214
Brown Glass Bottles and Containers	0.3%		104,568	Gypsum Board	1.7%		676,430
Other Colored Glass Bottles and Containers	0.0%		3,106	Rock, Soil, and Fines	2.4%		977,419
Flat Glass	0.4%		151,344	Remainder/Composite Construction and Demolition	3.6%		1,452,009
Remainder/Composite Glass	0.3%		138,870				
				<b>Household Hazardous Waste</b>	<b>0.2%</b>		<b>73,599</b>
<b>Metal</b>	<b>7.7%</b>		<b>3,115,357</b>	Paint	0.0%		19,203
Tin/Steel Cans	0.8%		323,540	Vehicle and Equipment Fluids	0.0%		1,000
Major Appliances	1.5%		616,663	Used Oil	0.0%		548
Used Oil Filters	0.0%		1,376	Batteries	0.1%		34,021
Other Ferrous	2.4%		969,676	Remainder/Composite Household Hazardous	0.0%		18,827
Aluminum Cans	0.2%		74,851				
Other Non-Ferrous	0.3%		111,008	<b>Special Waste</b>	<b>5.1%</b>		<b>2,038,431</b>
Remainder/Composite Metal	2.5%		1,018,242	Ash	0.1%		60,160
				Sewage Solids	0.0%		0
<b>Electronics</b>	<b>1.2%</b>		<b>481,353</b>	Industrial Sludge	0.0%		0
Brown Goods	0.1%		41,394	Treated Medical Waste	0.0%		15,367
Computer-related Electronics	0.3%		119,917	Bulky Items	3.4%		1,348,224
Other Small Consumer Electronics	0.2%		93,273	Tires	0.3%		126,633
Television and Other Items with CRTs	0.6%		226,769	Remainder/Composite Special Waste	1.2%		488,047
<b>Plastic</b>	<b>9.5%</b>		<b>3,809,699</b>	<b>Mixed Residue</b>	<b>1.1%</b>		<b>437,448</b>
PETE Containers	0.5%		216,134				
HDPE Containers	0.5%		189,549	<b>Totals</b>	<b>100.0%</b>		<b>40,235,328</b>
Miscellaneous Plastic Containers	0.5%		206,470	<b>Sample count:</b>	<b>550</b>		
Plastic Trash Bags	1.0%		390,460				
Plastic Grocery and Other Merchandise Bags	0.4%		147,038				
Non-Bag Commercial and Industrial Packaging Film	0.7%		290,331				
Film Products	0.2%		93,073				
Other Film	2.1%		826,757				
Durable Plastic Items	1.4%		561,543				
Remainder/Composite Plastic	2.2%		888,343				

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

## Project Timeline

The schedule shown below reflects the timeline Cascadia anticipates for key milestones and deliverables as part of this project.

Date	Milestone
May 1, 2007	Contract approval (presumed date)
Week of May 14, 2007	Kickoff Meeting
June 15, 2007	Draft study design Facility recruitment/survey questionnaire Summary of current data available and potential data collection methods for Special Material Study
30 days following receipt of Board requested changes	Final study design Data collection plan for Special Materials Study
November 2, 2007	List of participating solid waste facilities and schedule of which facilities will be used in each season. Asbestos analysis lab for approval
December 2007 March 2008 June 2008 September 2008	Lists of facilities to be used, scheduled field days, overall fieldwork schedule, and the number of samples from each sector/subsector to be characterized at each site.
January 2008 April 2008 July 2008 October 2008	Waste sampling & sorting periods Weekly reports of sampling activities
30 days following end of each season	Preliminary report upon completion of field operations for each season
November 16, 2007	Sample printouts displaying database and/or spreadsheet formats prior to data entry
March 31, 2008 June 30, 2008; September 30, 2008 December 31, 2008.  Data for combined seasons: January 21, 2009.	Electronic and paper copies of database/spreadsheets containing data for each sample grouped by sector and/or subsector where appropriate  Electronic and paper copy of average composition and statistical data
December 1, 2008	Outline of final report
February 1, 2009	Preliminary draft of comprehensive report Final results of Special Material Study
March 15, 2009	Final Report
April or May 2009	Presentation of results at public meetings

## Organization

**Cascadia Consulting Group, Inc.** Since 1987, Cascadia Consulting Group has performed over 50 waste characterization studies for private and public-sector clients in the Pacific Northwest, California, Hawaii, Arizona, and New York. Our Research and Analysis professionals possess in-depth knowledge of how to design and conduct waste-characterization studies, analyze data, and present findings in ways that help our clients make informed decisions and design effective solid waste and recycling programs. Incorporated in 1993, Cascadia is located in Seattle, Washington. There are no known conflicts of interest regarding the work called forth in the RFP.

Cascadia will be the prime consultant for this study. Included on the Cascadia Team are:

- **Pacific Waste Consulting Group**, the **Small Business partner** working with Cascadia, provides solid waste planning and environmental support for governmental jurisdictions and private clients for projects related to solid waste collection, recycling and disposal. Led by Marc White, the company started in 1994 as Solid Waste Associates. It was renamed to PWCG and incorporated in 1998. A partial list of their clients and the projects they have completed can be found later in this document.
- Brad Anderson of **Sky Valley Associates** has established a reputation throughout the West Coast region for their ability to obtain cooperation from all parties to make waste sampling run smoothly. They are also known for their understanding of the solid waste industry and their respect for data confidentiality.
- **Stanfield Systems, Inc.**, a **DVBE partner**, specializes in technology solutions, and their services are based on tailored application of industry standards and industry "best practices", to assist organizations in accomplishing system initiatives. Stanfield Systems, Inc. provides senior systems engineering support to State Agencies and Departments. Their expert technical staff and strategic partnerships allow them to provide operational support of everything from desktops to data centers, including Internet-based solutions and data entry expertise.

Pacific Waste Consulting Group (PWCG) will provide the study with skilled and experienced waste sorting labor and will manage arrangements related to travel, hotel, scheduling, and logistics for the sorting crew. Sky Valley Associates owner and general manager Brad Anderson and one other Sky Valley staff member will provide day-to-day direction of sampling and sorting activities in the field. Stanfield Systems, Inc. will provide technology and administrative support to Cascadia to complete the scope of work in each Task Order issued, at a level no less than that which is commensurate with DVBE participation needs.

## Qualifications & Resources

### Statewide and Large-Scale Studies

**Cascadia Consulting Group** has specialized in waste characterization studies since 1988. Numerous states such as California, Washington, Oregon, Delaware, and Wisconsin as well as major metropolitan areas across the country from New York to Honolulu, depend on our waste characterization expertise to develop, focus, and evaluate their waste reduction and recycling initiatives.

Having led over 50 waste characterization studies, we possess unmatched knowledge of solid waste and recycling issues and extensive experience in collecting information about the flow of recycled materials. Our firm's roles have included:

- Designing and implementing statistically representative sampling methodologies;
- Working with local government agencies and private haulers to plan and schedule sampling;
- Coordinating solid waste field sorting operations; and
- Conducting analysis and reporting about waste characterization data.

Cascadia, with assistance from Sky Valley Associates, has managed and implemented every major statewide waste characterization study in California since 1995. Those studies have included the study to determine the amount of RPPCs disposed statewide, conducted for the American Plastics Council in cooperation with CIWMB, the 1998-2000 statewide disposal-site and generator-based study, the 2003-2004 disposal-site-based study, and the 2004-2005 four-part study of C&D waste, self-hauled waste, MRF residuals, and targeted industry groups.

### Study Design

Cascadia Consulting Group and project manager Kurt Hulse have worked extensively with CIWMB staff to develop methods for data collection and analysis that are believed to be statistically accurate and representative. In consultation with CIWMB staff, Cascadia has developed material sampling and classification methods, visual characterization methods, standardized indexes of material densities, vehicle selection methods, generator sampling methods and waste quantification methods, and statistical methods for estimating waste quantities and composition at the sector and regional level based on disposal samples as well as generator samples.

Cascadia's approach to waste characterization relies on three key principles to ensure that data is representative and statistically valid.

#### *Cascadia has designed and implemented:*

- *All three of California's comprehensive statewide waste characterization studies in 1999, 2003, and 2005.*
- *Wisconsin's and Delaware's recent statewide characterization studies.*
- *Washington's first Recycling and Waste Stream Survey in 1987.*
- *The initial statewide waste characterization study for the Oregon Department of Environmental Quality.*
- *Other large-scale waste characterization studies for clients such as the City of Los Angeles, the County of Los Angeles, the City of San Diego, the City of Phoenix, and the City of San Francisco.*

- **Selection of waste for sampling and characterization that is representative of each waste sector.** Representativeness is achieved by selecting disposal facilities, waste sheds, vehicle loads, and actual waste for sampling, in a way that is statistically representative of the entire “population” of waste being studied. We achieve statistical representativeness through the application of systematic and random selection processes.
- **Consistent sorting and characterization methods.** The knowledge and experience of the sorting crew is important to the quality of the results and to the overall efficiency of sorting operations. Our highly trained, professional sorting crew is ready to hit the ground running to obtain characterization data quickly and efficiently.
- **Careful planning to ensure that sampling operations are efficient and that the required data is collected with minimal disruption to normal operations at disposal facilities.** Our team is ready to work with CIWMB staff to develop a thorough, efficient, and cost-effective data collection plan that covers the entire state.

These principles are incorporated into our methods for characterizing and quantifying MSW throughout the state. Described below are some of the ways our extensive experience is relevant to the methods that the CIWMB wishes to incorporate in its 2003 statewide waste characterization study.

Our study design will ensure statistically representative data. When we developed our proposed approach to the statewide waste characterization study, the most important consideration was to ensure that the data collected is representative of the MSW stream as a whole. To that end, we are distributing our data collection activities across every major geographical region of the state and across each major waste sector (residential, commercial, and self-hauled waste). Beyond that, we plan to employ systematic and random selection procedures that give waste from all generation sources an opportunity to be sampled. The disposal facilities and “wastesheds” at which we obtain waste samples will be chosen randomly, and the individual vehicles that provide waste samples will be chosen through a systematic selection procedure. The portions of vehicle loads from which the samples are obtained will be chosen randomly.

This approach has proved successful in previous studies – most notably in California's 1998-2000 and 2003-2004 Statewide Waste Characterization Studies. In our recent implementation of a waste characterization study for the State of Wisconsin, we used a similar approach of dividing the state into regions and selecting disposal facilities at random within each region for sampling. Several of our previous waste characterization studies have employed systematic selection of vehicles within specific sampling strata such as waste sector, construction type, vehicle type, etc. Systematic selection of vehicles provides for complete representation of waste that is delivered to the disposal facility throughout the day, and it permits accurate planning and timing of sample capture.

## Field Work

Our careful approach ensures accuracy of data collected in the field. We enforce numerous quality-control steps throughout the data collection process. A few of the many strategies and steps we employ are described below.

- We use a full-time, professional sorting crew that includes only highly trained and experienced crew members and supervisors. Our crew has worked together sampling waste for over ten years and has recently completed major waste characterization studies in Seattle, King County, and the

State of Oregon. Our sorting crew is efficient and — most importantly — the sorting is precise, consistent, and meticulously performed every day throughout the study.

- Before we conduct waste sampling at each scheduled disposal facility, we work with the facility to inventory all vehicle traffic expected for the sampling day. Besides ensuring that our selection of vehicles is representative of the day's traffic, it also allows us to conduct our sampling with confidence that we will obtain enough samples from each waste sector on that day.
- On sampling days, our staff member assigned to the gatehouse interviews vehicle drivers to record the characteristics of their waste loads, including the generating waste sector (residential, commercial, or self-hauled), subsector, generating activity, etc. When selected vehicles arrive at the sampling area, our sampling crew supervisor then interviews the drivers again to verify that the load is being categorized properly.
- All members of the waste sorting crew are thoroughly trained in the material list and definitions being used for the particular study. Each crew member then goes on to "specialize" in the classification of certain materials, so that waste sorting may proceed even more efficiently. The supervisor monitors the homogeneity of the component baskets as they accumulate, rejecting materials which may be improperly classified. Open-topped baskets allow the supervisor to see the material at all times.
- Materials from each category are placed in tared baskets and weighed. During the weighing process for each sample, one crew member reads the weight of each basket aloud while another crew member records the weight value and reads it back aloud for verification.
- We design data collection forms that are easy to use, and we train our crew members in consistent application of data collection protocols and measurement methods.

Our consistent training, high standards, and professionalism in data collection have earned high praise from our clients. Notably, the Oregon Department of Environmental Quality has issued an official proclamation commending our data collection contractor for excellent and committed work.

## Quantifying Major Waste Sectors

Cascadia is experienced with a variety of methods for quantifying the major waste sectors in the State of California and elsewhere. Our approach for quantifying the waste sectors in California will rely on data from two sources – the Disposal Reporting System and the vehicle surveys we will conduct at individual disposal facilities. By determining the classification and net weight of every vehicle visiting the selected facilities on the selected days, we will arrive at estimates of the relative portion of disposed tonnage represented by each waste sector and subsector. Those portions will then be applied to the total reported disposed tonnage for each region and for the state as a whole to quantify the waste sectors.

As an additional check of our estimates, we will collect data on the disposal rate of waste at multifamily complexes, calculated on a per-apartment basis. This data will be used to calculate an independent figure for the disposal of multifamily waste regionally and statewide.

We have honed our vehicle survey and waste quantification methods during many years of implementing waste characterization studies at numerous disposal facilities with different operating procedures and physical configurations. Specific Cascadia studies described below that involved vehicle surveys and waste

quantification include those conducted for the CIWMB, the American Plastics Council, the Wisconsin Department of Natural Resources, the Washington Department of Ecology, King County Solid Waste Division, and Sonoma County.

Nobody has more experience than we do in collecting decontamination data for RPPCs. Our data collection crew has implemented the two largest studies on the west coast of RPPC disposal and contamination rates – the American Plastics Councils 1995 study of RPPC recycling and disposal in California and the State of Oregon recent three-year waste composition study. These projects are described below.

Our proposed approach for determining RPPC contamination levels in the present study is essentially the same as what was done for the 1995 California statewide study, with a slight modification to accommodate the fact that waste composition estimates generally will be calculated on a regional basis before they are calculated statewide.

RPPCs will be sorted and weighed in their “contaminated” state in the field, and then will be placed in plastic bags and transported to a facility in Oregon for decontamination. We will then weigh the “clean” RPPCs of each category and compare the clean weights to the contaminated weights. The resulting data will permit calculation of RPPC contamination rates and disposal rates for each waste sector and for the overall MSW stream statewide.

## Developing & Following Health & Safety Plans

Cascadia pays strict attention to health and safety measures. Our data collection crew has an ongoing safety and training program. Safety meetings and field trials are used to discuss and practice new safety procedures and sorting techniques. Each time we sample at a new site, we first identify and discuss all of the unique hazards, emergency procedures, and operational restrictions that may be present. We have written safety procedures and conduct guidelines, including a Bloodborne Pathogen Exposure Control Plan, and we update these procedures when new safety information, products or regulations appear.

To meet the objectives of the waste sort, our team is prepared to obtain and characterize 300 waste samples from Pentagon offices, food services, and Operations and Maintenance shops, with sampling activity distributed among four seasons. Our recommended sample weights and numbers of samples are based on the best available waste characterization research and standards, as developed by the California Integrated Waste Management Board for characterizing waste from specific types of facility or waste generating activities, and as set forth in their *Draft Regulations Governing Disposal Characterization Studies*. Our waste characterization protocol is consistent with the guidelines presented in the 2005 (Fifth Edition) LEED EB, Reference Guide Version 2.

We have included a Health and Safety Plan in Appendix A.

## Complete Tasks

Cascadia Consulting Group, Inc. places a premium on results-oriented and efficient project management. Over the years we have developed systems, controls, and procedures to ensure effective management so

that the highest quality outcomes are achieved consistent with available resources and schedule requirements. Most recently we invested in Deltek Vision project management software and have appointed a Project Management Institute-certified Senior Associate to oversee project management systems and policies at the firm.

Cascadia equips its project managers and task leads with the tools necessary to manage projects successfully. Cascadia makes extensive use of the Deltek<sup>(TM)</sup> project management system, which allows daily desktop access to current budget and cost status for each phase and task of our projects. Labor and cost data are continuously updated, allowing real-time status of expenditures on each task, as well as detailed staff resource scheduling and forecasting. These measures help ensure that each phase of a project will be completed on time, in relationship to other tasks and project deadlines. In addition, Cascadia has developed protocols for checking and cross-checking data and analyses that are key parts of our research projects. Cascadia implements a carefully-crafted QA/QC protocol for all waste characterization studies, monitoring and verifying data when it is recorded in the field and later upon entry into databases and data management systems.

## Research & Develop Methodology

Cascadia has extensive experience in researching waste characterization methods and sources of data, as well as developing methodologies for waste characterization studies. The firm has worked extensively with CIWMB staff to develop methods for data collection and analysis that are believed to be statistically accurate and representative. In consultation with CIWMB staff, Cascadia has developed material sampling and classification methods, visual characterization methods, standardized indexes of material densities, vehicle selection methods, generator sampling methods and waste quantification methods, and statistical methods for estimating waste quantities and composition at the sector and regional level based on disposal samples as well as generator samples.

## Project Experience

Below is a selected list of Cascadia's extensive waste characterization experience.

### California Studies

#### **California Integrated Waste Management Board, Statewide Characterization of Targeted Waste Streams, 2004-2006**

Cascadia conducted a four-part study to quantify and characterize certain waste streams that were believed to contain relatively large amounts of recoverable material. The areas of focus included (1) waste from specific industry types, including food stores, retail stores, and distribution centers, (2) waste from material recovery facilities (MRFs), (3) construction and demolition waste, and (4) self-hauled waste. The study entailed gathering waste samples and associated data from 300 businesses, 12 MRFs, and 16 disposal facilities throughout the state. Each type of waste was characterized, and findings were presented with respect to geographical region and season. The results of this study were used to supplement the findings of Cascadia's earlier work for the CIWMB – the 2003 statewide characterization of residential, commercial, and self-hauled waste streams.

#### **California Integrated Waste Management Board, Statewide Waste Characterization Study, 2003-04**

Cascadia designed and implemented a statewide study to characterize California's disposed waste. Special arrangements were made to obtain single-family and commercial garbage collection routes, as well as from randomly chosen self-hauled vehicles. Waste sampling and characterization took place at 22 landfills and transfer stations distributed among five regions of the state and across four seasons. In addition to disposal site sampling, Cascadia sampled multifamily waste at selected apartment building, condominiums, and housing projects. In total, the study included characterization of 550 waste samples. In addition, the study team conducted an extensive survey of drivers arriving at participating solid waste facilities in order to quantify the waste associated with each waste sector.

#### **California Integrated Waste Management Board, Statewide Disposal Characterization Study, 1999**

Cascadia conducted this two-season study to determine the amounts and composition of waste from five generating sectors: single-family residential, multifamily residential, commercial, residential self-haul, and commercial self-haul. In addition, the study presented detailed characterizations of the waste generated by 26 categories of businesses throughout the state. For the study, 400 waste samples were sorted at 25 disposal sites throughout the state, and 1,280 waste samples were taken from specific business and multifamily waste generators. To estimate the relative proportions of each substream as part of the entire MSW stream, Cascadia surveyed about 2,000 vehicle drivers at disposal sites, as well as representatives of 1,280 businesses and apartment complexes.

#### **Los Angeles County Base Year Study, 2006**

As part of the effort to develop a new solid waste management Base Year Study for the Los Angeles County, Cascadia is conducting a major characterization study of solid waste originating in unincorporated areas of the county. The study involves making arrangements with more than 250 businesses in targeted industry groups, as well as 50 apartment buildings, to obtain and characterize samples of disposed waste. It also involves arranging the interception of waste from 100 single-family curbside set-outs and 115 self-haul vehicles as they arrive at disposal facilities. The results of the study will provide the county with precise identification of key recycling and diversion opportunities throughout its waste stream.

#### **Sunshine Canyon Waste Composition, 2002 - 2005**

Cascadia conducted waste characterization studies twice yearly for Sunshine Canyon Landfill from 2002 to 2005. These studies involved characterizing samples of waste brought in by five types of vehicles. Waste was characterized using both hand-sorting and visual estimating methods. The data was analyzed to produce mean estimates of waste composition for the landfill overall and by vehicle type. The findings were presented in concise reports to the landfill management.

#### **San Francisco Waste Composition, City of San Francisco, 2004**

Cascadia assisted in developing the study design and field data collection protocols for the City of San Francisco's extensive examination of waste from multiple waste sectors. Our work included the development of a method for identifying waste sectors that distinguish waste from single-family, and multifamily, and a variety of commercial origins, as well as input on data recording and management protocols. In addition, Cascadia performed the waste composition calculations for the study.

#### **Orange County Waste Composition, County of Orange, 2003**

Cascadia was contracted to conduct this waste characterization of three active landfills in Orange County, California. This study targeted self-hauled and loose roll-off box loads from 22 distinct jurisdictions of origin.

The study included two seasons of waste sorting in summer 2003 and winter 2004, and collected over 880 samples. Additionally, six weeks of surveying yielded over 12,500 vehicle surveys. Another key component of the study included regulatory review and analysis of statutes and regulations.

#### **Santa Barbara Waste Composition, Santa Barbara County, 2003**

For this study the Cascadia team characterized 110 loads of municipal solid waste at the Tajiguas Landfill and the Santa Barbara County transfer station in order to provide detailed composition estimates of waste disposed in Santa Barbara County. The study results include composition estimates, both for the overall waste stream and for the franchised residential (single-family waste), franchised commercial (multi-family and business waste), and self-haul loads.

#### **San Bernardino Waste Characterization, San Bernardino County, 2003**

To help the County determine the optimal waste diversion strategy for each solid waste disposal site, Cascadia conducted this waste composition study specifically targeting the self-hauled and loose roll-off box substreams. The study visually sampled over 750 loads of material from nine disposal facilities over the course of two sampling seasons. Cascadia also collected over 2,600 vehicle surveys. The study results identified how much of each type of "readily recoverable" material was disposed, what types of activities generated it, and where it came from.

#### **Characterization of San Jose Curbside Recyclables and Curbside Residuals, NORCAL, 2003**

In 2002, the City of San Jose changed the city's curbside recycling program by introducing Norcal as one of two collection companies servicing the city, expanding the list of acceptable recyclables, and shifting to a single stream recycling system collected with split trucks—trucks with two compartments, one for garbage, one for recyclables. Cascadia Consulting Group conducted this two-part characterization study in the fall of 2002 and summer of 2003. The first characterization assessed the extent to which recyclables remained in the stream of residuals after processing by the Material Recovery Facility (MRF). The second phase of the study characterized incoming material from the single stream residential recycling program to assess the level of contamination arriving at the MRF.

#### **San Mateo Waste Characterization, San Mateo County, 2001**

For this project, Cascadia field staff conducted visual composition estimates of 450 loads of C&D waste at Ox Mountain landfill. For each observation, the field crew provided percentage composition estimates, by volume, for 82 material categories and recorded the sample's vehicle type, the city of origin, the hauler type, and the activity that generated the waste. Composition profiles by percents and weights were then developed for overall C&D disposed and for each of four vehicle types.

#### **Los Angeles Generator Study, City of Los Angeles, 2000**

Cascadia conducted a large waste characterization study for the City of Los Angeles. The study examined the commercial and multi-family waste streams, which were sampled at the point of generation (i.e., the dumpster), and the C&D, landscaping, and single-family residential waste streams, which are sampled at disposal facilities. Extensive surveying of businesses preceded the actual sampling of commercial waste. In all, more than 2,000 businesses were contacted, and more than 900 were included in the sampling schedule. The selected businesses were chosen from 41 industry group categories. The disposal-site sampling included 240 randomly chosen loads of commercial C&D and landscaping waste.

### **Los Angeles Airport Waste Composition Study, Los Angeles World Airports, 2000**

The Cascadia Team completed a two-season study of waste disposed at the Los Angeles International Airport (LAX). This study involved over 150 tenant interviews designed to obtain detailed waste generation and recycling information. Over 200 samples were collected directly from selected tenants and hand-sorted into 58 material categories. An additional 30 loads of construction and demolition waste were visually sampled. In addition to estimating the overall composition and quantity of waste that is disposed at LAX, the study's analysis led to composition profiles and generation rates for seven generator groups: terminal areas, hangars, vehicle/fleet maintenance, cargo facilities, catering/kitchens, construction and demolition, and mixed uses.

### **San Diego Waste Comp Study, City of San Diego, 2000**

Cascadia conducted a comprehensive characterization study of MSW and construction and demolition waste that is disposed at San Diego's Miramar Landfill. The study involved physically sorting 468 loads of residential and commercial waste and visually estimating the composition of more than 1,200 loads of construction and demolition waste. Besides presenting the composition of the different waste substreams, the analysis examined differences in the amounts of recyclables and yard waste disposed by residents in various neighborhoods.

### **Sonoma County Waste Composition, Sonoma County, 1996**

This project involved a solid waste characterization and vehicle survey for the Sonoma County Department of Transportation and Public Works, Integrated Waste Division. The sampling quantified waste disposed at County transfer stations and disposal facilities by type, season, and residential, commercial, and self-haul substreams. The survey collected additional data concerning yard and wood waste destined for chipping. Analysis in this study involved a comparison with similar data from a 1991 study in order to evaluate current recycling and waste reduction efforts.

## **Additional Statewide & Large-Scale Waste Composition Studies**

### **Delaware Waste Characterization Study, Delaware Solid Waste Authority, 2006**

For the Delaware Solid Waste Authority, Cascadia is conducting a year-long statewide waste characterization study. This comprehensive study of Delaware's disposed waste stream involves characterizing residential, commercial, self-hauled, and construction and demolition waste as it arrives at each of the state's six solid waste facilities. Data will be collected during each of four seasons, and a variety of waste characterization methods will be used, including hand-sorting of samples as well as visual characterization of entire loads. Results from the study will be compared against the state's only previous statewide study, which occurred ten years ago. Results also will be compared against composition studies that have been conducted for other eastern states. The study will be completed in autumn 2007.

### **Wisconsin Statewide Waste Composition Study, Wisconsin Department of Natural Resources, 2002**

For this study, Cascadia conducted two seasons of sampling to characterize Wisconsin's residential, industrial/commercial/institutional, and construction & demolition in-state generated wastes. A total of 400 waste samples were taken from 14 landfills throughout five regions of Wisconsin. Vehicle tonnage information was also gathered from each participating site and utilized during the data analysis phase of the project. Cascadia designed and produced a sampling plan and final report documents for this study; these

included field forms, health and safety procedures, sampling methodology, as well as composition and quantity results for each substream, hauler type, and the five state regions.

#### **Washington Department of Ecology, Statewide Rural Waste Characterization Study, 2003**

The Washington Department of Ecology commissioned this waste characterization study for two purposes – first, to gather data on waste disposal in rural Washington counties, and second, to gather data on types of waste disposal that traditionally have not received attention in waste characterization studies. Until this study, no waste characterization study had been conducted for rural counties in central and eastern Washington. Cascadia characterized 120 samples of waste at disposal facilities from commercial, consumer, and agricultural/industrial sources in Grant and Okanogan Counties. The second component of the study involved obtaining and analyzing 160 generator based samples reflecting a variety of agricultural and industrial disposal practices. These practices included traditional landfill disposal, as well as putting waste to beneficial use or finding other methods of disposal. Cascadia used the data collected to create a more complete picture of the disposal practices of nine types of business. These business types represented agricultural and industrial enterprises typically found in rural Washington counties.

#### **Oregon Department of Environmental Quality, Statewide Waste Characterization Study, 1992**

Cascadia designed and implemented a statewide waste characterization study for Oregon. Sampling included sorting 840 loads at 10 disposal sites across the State. The program covered 11 sites during each of four seasonal samplings and targeted single- and multi-family generation as well as six categories of commercial, institutional, and industrial generators. This aggressive sampling program involved coordinating our sampling with over 40 haulers and facility operators.

#### **King County Monitoring, King County Solid Waste Division, 1992-2007**

Since 1992, Cascadia has managed this multi-year study of waste flows into King County's transfer station system. The project has involved the design of a system-wide study for (1) residential and (2) nonresidential waste delivered by franchised haulers, as well as (3) self-hauled waste. Cascadia conducted a transfer station vehicle survey to characterize waste by substream, vehicle type, and point of origin. Cascadia also conducted waste sorts to characterize disposed material by each sector and for the County overall. For the commercial generator component of this study, Cascadia conducted a series of waste sorts at 30 of the county's largest businesses over a nine-month period. This analysis was used by King County to design recycling services targeted at large volume generators.

#### **Waste Composition Study, Seattle Public Utilities, 1988-present**

Cascadia has directed this ongoing program since its inception in 1988. This work has included the sampling of residential waste and curbside recycling, as well as commercial and self-haul waste. Cascadia designs sampling plans, oversees field operations, performs statistical calculations, and produces all final documents for the City. Since 1988, Cascadia has characterized over 1,500 samples of residential waste and more than 1,200 samples from Seattle's residential curbside recycling program. Data from the recycling stream is vital for auditing hauler reports, for use in determining payments from the City to the processor, and for monitoring the City's progress towards reaching its goal of 60% recycling by 2008. About 1,300 commercial and 1,200 self-haul samples have also been captured and sorted. One of the benefits of Cascadia's approach is that a consistent sampling methodology is maintained over the years, making it possible to identify statistically significant year-to-year changes in composition. This waste characterization data enables the City to monitor and forecast its waste stream, identify new materials to target for recovery, and design and improve its residential, commercial and self-haul recycling programs.

### **NYC Waste Composition Study, City of New York, 2004-2005**

Cascadia assisted with this study to characterize and quantify waste generated in New York City. Over the quarterly sampling period Cascadia collected over 4,000 samples from nine unique socioeconomic strata. Sampling of single family, multi-family, and street basket refuse and recycling occurred in each of the four seasons. Samples were sorted and weighed into 92 material categories. Following the sampling period, Cascadia visited each multi-family building sampled and completed an in-person survey with the building superintendent to determine barriers and opportunities for recycling.

### **Phoenix Waste Characterization Study, City of Phoenix, 2003**

This study determined the composition of disposed solid waste from single-family sources in each of six waste collection districts, paying particular attention to the amounts of key recyclables and compostable organic materials present in the waste. Statistical comparisons were made among collection districts and also between neighborhoods that showed high or low participation in curbside recycling programs. A significant finding of the study was that 19% of single-family refuse citywide consisted of readily recyclable materials, and an additional 49% consisted of compostable organic materials.

### **City of Chandler Waste Composition, City of Chandler, 2006**

In this waste composition study that was recently conducted for the City of Chandler, Arizona in 2006, Cascadia analyzed waste samples from residential, self-hauled solid waste. Cascadia submitted its study protocol and methodology to the City for review and approval before sampling commenced. Our firm will also be responsible for producing analysis and a final report of findings and recommendations in the near future, based on the waste composition study.

### **Hawaii Waste Characterization Study, County of Hawaii, 2001**

Cascadia conducted this comprehensive characterization study of MSW that is disposed at the South Hilo Landfill. This study examined the composition of waste from three sources: transfer stations, commercially hauled waste, and self-hauled waste. Results from field research included documentation of the potential for recycling waste from these sources, as well as an assessment of the feasibility of recovering additional waste through MSW processing. The information from this study was used to construct an updated solid waste management plan.

### **City and County of Honolulu, Hawaii, Waste Composition Study, 1998**

Cascadia characterized solid waste from residential, commercial, and convenience center waste sources within the City and County of Honolulu. This study focused on the amounts of paper and green waste disposed in the residential waste stream, and the amounts of wood and recyclables disposed in the commercial waste stream. For this project, both the residential and commercial composition results were compared with results from three other waste characterization studies conducted by the Cascadia team: the City of Seattle, City of San Diego and King County. Cascadia, working closely with the employees of the City of Honolulu, also conducted generator sampling at office buildings, hotels, and restaurants to assess current and potential recycling opportunities for both paper and containers.

## **Project Experience of the Subconsultant**

Below is a selected list of Pacific Waste Consulting Group's (PWCG) extensive waste characterization experience. Pacific Waste Consulting Group provides solid waste planning and environmental support for

governmental jurisdictions and private clients for projects related to solid waste collection, recycling and disposal.

#### **City and County of Honolulu, Various Years**

- 2006 to current: PWCG has been preparing the Alternatives Analysis for the Environmental Impact Statement that will support expansion of the City's landfill for at least 20 years.
- 2005: Working with a local firm, PWCG provided support to the Mayor's Special Committee to Locate a New Landfill Site. PWCG provided the technical support for the siting criteria and for the site evaluations using the criteria. PWCG prepared the final report that was submitted to the City Council to select the site and to the State of Hawaii to comply with a requirement they had established for the City.
- 2003: PWCG prepared the revision to the Solid Waste Integrated Management Plan and incorporated updated landfill life projections, waste composition information, and new program descriptions.
- 2001: PWCG prepared an analysis of the conditions necessary for use of plasma arc processing for the waste stream being accepted at the City's Waimanalo Gulch Landfill. The analysis became part of the Environmental Impact Statement for expansion of the landfill.
- 1998 to 2000: PWCG participated with RM Towill, an engineering company located in Honolulu, on an evaluation of several collection and recycling programs in the City and County. The projects PWCG supported included an evaluation of curbside recyclable collection, an evaluation of weekly refuse collection, a waste composition study, an evaluation of the alternative technologies that could be used for waste disposal, an evaluation of the cost of green waste collection, and a report on market subsidies for recycling. The firm was tasked with preparing a request of proposals for food waste composting, but that was changed during the project to a request for processing organic materials.
- 1993: With a prior employer, PWCG assisted with preparation of the Solid Waste Integrated Management Plan for the City in response to state law.

#### **City of Half Moon Bay, 1997 - Present**

PWCG provides consulting and reporting services to assist the City in complying with the California 50 percent diversion mandate. The assignments completed have included negotiating a new waste collection franchise and preparing the document, implantation of residential recycling programs, providing outreach services to the community, preparing compliance documents to report to the state agency, and general support needed for the programs. PWCG evaluated the composition of the recyclables collected at the City's annual Pumpkin Festival, which is attended by an estimated 300,000 people over a two day period. That program was done over two years. Since then, our firm has assisted with the recycling facilities at the Festival.

#### **City of Concord, Various Years**

- 1997 to Current: Our firm provides consulting and reporting services to assist the City in complying with the California 50 percent diversion mandate. PWCG have completed a request for revised base-year for calculating diversion rates, a new base-year, an evaluation of the new green waste collection program, and provided other general support activities.
- 2002 to current: PWCG has worked with the local disposal facilities to identify the source of self-hauled waste that threatens the City's compliance with AB 939.

- 2005 to Current: PWCG has prepared a new approach to regulating C&D diversion and have been working with the city staff and the waste hauler to adopt the ordinance.

#### **City of Capitola, 1998 – Present**

PWCG provided consulting and reporting services to assist the City in complying with the California 50 percent diversion mandate. The firm has also prepared a request for new base-year and other supporting documents and activities for the city's program.

#### **City of Gilroy, 2001 - Present**

PWCG provided consulting and reporting services to assist the City in complying with the California 50 percent diversion mandate. PWCG prepared the documentation to support a request for new base-year for calculating diversion rates. We have prepared a performance audit of the city's waste hauler. PWCG completed a waste composition analysis at the Garlic Festival, which is attended by 125,000 people over a three day period. The firm also assisted with setting up the recycling at the Festival.

#### **City of Pacifica, 2001 - Present**

PWCG is preparing the documentation to support a request for new base-year. PWCG completed a search to locate a site to accept the biosolids produced by the city's waste water treatment plant and increased the city's diversion rate significantly.

#### **Salinas Valley Solid Waste Authority, 2006**

Working with a team made up of EBA Engineers and Charles Sax, Architect, PWCG prepared an analysis of the diversion facilities recommended for the two landfills and transfer station operated by the Authority. The diversion facilities were needed to comply with the Authority's 75 percent diversion requirement. The other members of the team prepared a conceptual design for the expanded transfer station and our firm collaborated on that design.

## **Project Manager & Key Personnel**

To conduct this study successfully, the consultant must have a clear organizational structure, an effective communication plan, a sound methodology, and strong project management skills. Cascadia Consulting Group has assembled a highly qualified team to implement the Solid Waste Characterization Study. Our team is skilled in sampling plan design, statistical analyses, field management, interview and focus group research, market assessment, and project management. Together, the Cascadia Team brings the spectrum of required skills and experience to this project. Brief descriptions of the qualifications of each team member are presented below.

### **Project Manager**

**Kurt Hulse, Senior Associate, Cascadia**

**Role: Overall Project Manager**

**Tasks: 1-6                      Hours: 268**

Kurt Hulse has managed the data collection, analysis, and reporting tasks for more than 15 major waste characterization studies, including three statewide characterization studies for the State of California and

similar characterization studies for the Cities of Los Angeles, San Diego, San Francisco, and Phoenix. His experience includes development and application of analytical techniques for traditional hand-sorted samples and visual composition estimates, as well as the development of extensive and detailed models of solid waste disposal and recycling for the residential and commercial sectors. He also is experienced at developing and implementing research approaches that target particular segments of the waste stream, such as specific classes of business, industry, and institutions. Kurt has worked closely with CIWMB staff to develop methods of data collection, waste characterization, and statistical analysis for a wide variety of waste characterization tasks. He coordinated the field research and conducted the analysis for the CIWMB's statewide waste characterization studies in 1998-1999 and 2003-2004, as well as the City of Los Angeles comprehensive waste characterization study in 2000. He later went on to manage the generator-based portion of the CIWMB's 2004-2005 statewide waste characterization study. Kurt holds a B.A. degree in Political Science from Macalester College and a B.S. degree in Biochemistry from the University of Washington.

## Key Personnel

### **Charlie Scott, Principal, Co-founder of Cascadia**

**Role: Principal-in-Charge**

**Tasks: 1,4, and 6**

**Hours: 40**

Charlie has more than 25 years of experience in environmental consulting. He has managed more than 50 major waste composition and survey projects, including studies for both public and private sector clients. Major public sector clients include King County, City of Seattle, City of Los Angeles, LAX, City of San Diego, City of Phoenix, City and County of Honolulu, Orange County, and the states of Washington, Oregon, California, Hawaii, and Wisconsin. Recent private sector clients for whom Charlie has conducted research include Weyerhaeuser, Starbucks, and Norcal Waste Systems. He also has organized and facilitated focus groups, stakeholder committees, and market commodity groups to assess opportunities and barriers to waste reduction and other resource conservation initiatives. Charlie is past President of the Washington State Recycling Association (WSRA), which represents Washington's recyclers and haulers, and he served on the WSRA/Washington Department of Ecology committee to review and improve the State's methodology for establishing recycling rates. He also served on the California Integrated Waste Management Board's Working Group for establishing standard waste characterization methods. Charlie will manage the study design and will oversee the analysis and reporting aspects of the study. Charlie holds a Master of Public Administration degree from the Graduate School of Public Affairs at the University of Washington as well as a Bachelor of Arts in Economics from Denison University.

### **Tanya, Senior Project Manager, Cascadia**

**Role: PMO and QA/QC Advisor for Tasks 1, 2, 4, 5, and 6**

**Tasks: 1,2,4, 5 and 6**

**Hours: 36**

Tanya has worked with Cascadia for over seven years, managing and providing analysis for several waste management projects. Her most recent work includes the study design, crew supervision, data collection, and analysis for New York City, Fort Lewis Army Post, City of Palo Alto, and University of Utah waste characterization studies. Since 2004, Tanya has also served as project manager for the King County Waste Monitoring Program, a multi-year study including transfer station customer surveys, waste, recyclables, MRF product and residuals characterization, and recyclable commodity market analysis. Her background includes recycling program management, environmental education, mediation, and consensus building. Tanya is a certified Project Management Professional, PMP, from the international Project

Management Institute and has developed and led Cascadia's internal seven course project management training. She is also an active member of the Solid Waste Association of North America. Tanya holds a dual Bachelors degree in Government/Legal Studies and Environmental Studies from Bowdoin College.

**Dieter Eckels, Research Associate, Cascadia**

**Role: Task 3 Lead - Field Sampling and Sorting and Vehicle Surveys**

**Tasks: 1-6                      Hours: 564**

Dieter manages recruitment, sample collection, and analysis needs for a number of Cascadia projects. He recruited multi-family complexes and businesses for a waste characterization study in Los Angeles County. He managed a multifamily building manager survey for the New York Waste Characterization study. Dieter also managed the collection of thousands of samples for clients such as the Pentagon, New York City, the State of California, King County, and the city of Palo Alto. Dieter has hand sorted or visually characterized loads of garbage, recyclables, food waste and construction/demolition debris at businesses and public facilities across the country including California, Arizona Washington, D.C., and Washington state. As a member of Cascadia's quality assurance/quality control (QA/QC) committee, Dieter is involved in the data entry and analysis for many research projects including the Pentagon Waste Characterization Study, King County's Waste Monitoring Program, and a waste characterization study for Chandler, AZ. He has created waste modeling systems for King County, the City of Palo Alto, Spokane County, Grant County, and Douglas County. He has also provided on-site technical assistance to many large and small businesses throughout King County and Seattle. Dieter's greatest skills lie in data analysis, problem-solving, and team management. Dieter holds a B.S. in Sustainable Resources and a B.S. in Ecology, Evolution and Conservation Biology from the University of Washington.

**Patrick, Research Assistant, Cascadia**

**Role: Assist in recruitment of facilities, tracking of data collection activities, and analysis. Manage subtask of recruiting multifamily locations.**

**Tasks: 1,2,3,5, and 6                      Hours: 648**

Patrick conducts research and analysis for a number of research projects. As a key recruiter for Cascadia's Waste Characterization study of Los Angeles County, Patrick recruited approximately 300 businesses to participate in this project and oversaw the quality control of all project data collection efforts. He also has experience surveying and sorting for multiple King County and Seattle characterization projects. Most recently, as part of the 2007 Pentagon Waste Sort and Recycling Plan, Patrick coordinated all pre-sort logistics and handled much of the on-site, 10-day, waste sort in February. Patrick's strengths include data analysis and report-writing for waste and recycling-related projects, including the 2006 City of Chandler Waste Composition Study and the 2006 King County Recycling Program. Given his strong quantitative abilities, Patrick also assists the Cascadia Controller on financial work and data entry. Patrick holds a B.S. in Biology from the University of Montevallo.

**Brad Anderson, Sky Valley Associates**

**Role: Field Crew Oversight**

*(Subcontractor)*

Brad Anderson is General Manager of Sky Valley Associates, directing company operations and designing the firm's characterization programs. He has over 23 years of public works management experience, with the past 18 years in the area of waste characterization. He has the proven ability to overlay logistically complex tasks with a workable management interface, providing clients with solutions that go beyond their expectations.

Brad began conducting successful waste composition sampling in 1987, and has since directed over 55 characterization studies. From studies focusing on specific wastes to comprehensive statewide studies, his experience in fielding sampling crews is unparalleled. He directed the field composition samplings for all previous CIWMB characterization studies. Brad managed sampling operations for the American Plastics Council's 1995 statewide characterization study in California related to RPPC plastics, the CIWMB's 1998-99 Statewide Waste Characterization Study, CIWMB's 2003-04 Statewide Waste Characterization study, and Tasks 1, 3, and 4 of the CIWMB's 2005-06 Statewide Waste Characterization study of targeted industry groups, construction and demolition waste, and self-hauled waste. In 1992, he formed Sky Valley Associates, and devotes most of his professional time to sampling fieldwork. Brad holds a B.S. in Construction Management from Washington State University.

**Mark White, Pacific Waste Consulting Group**

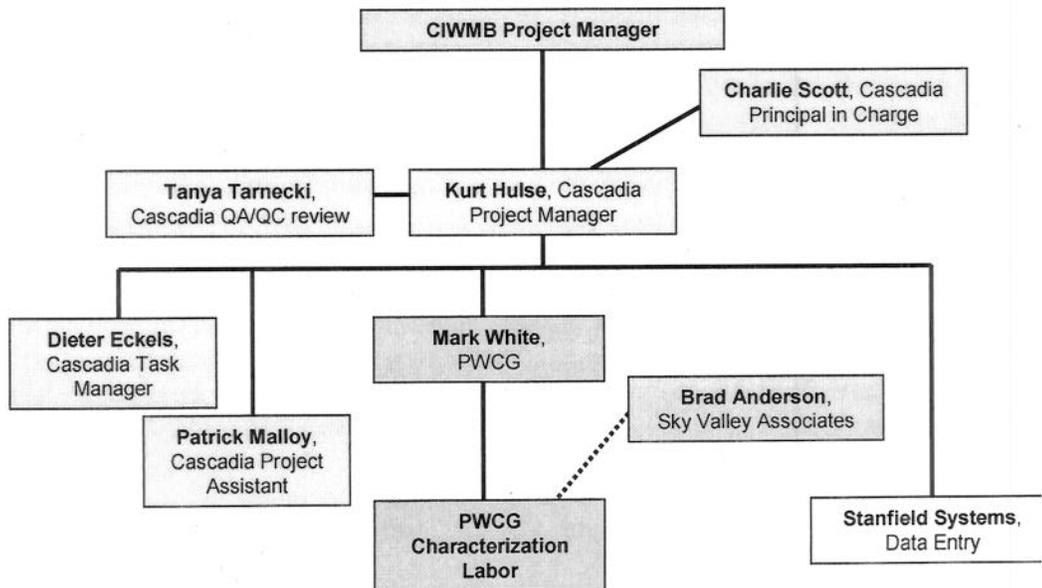
**Role: Managing waste sorters and making logistical arrangements for Task 3**

*(Subcontractor)*

Since 1994, Mark White has acted as the President of Pacific Waste Consulting Group. Mark has been responsible for project management for complex projects, development of waste disposal and recycling projects, permitting, solid waste planning, and management activities. Mark is the Chairman of the American Society of Mechanical Engineers Solid Waste Processing Division, Western Chapter, the past Chairman of the Mother Lode Chapter of the Air and Waste Management Association, and a member of the Solid Waste Association of North America, the California Refuse Removal Council, the California Resource Recovery Association, and the Partnership for the Environment in Honolulu, Hawaii. In his spare time, he also acts as the President of the Board of Directors of Juvenile Diabetes Research Foundation, Northern California Inland (Sacramento Valley) Chapter. He has years of experience successfully leading and executing waste related projects for the City and County of Honolulu, the City of Half Moon Bay, the City of Concord, the City of Capitola, the City of Gilroy, the City of Pacifica, and the Salinas Valley Solid Waste Authority. Marc holds a B.S. in Mechanical Engineering from the University of California.

Resumes for each team member can be found in Appendix B.

The project team, including each member's respective role, is represented in the following organizational chart:



## References

<i>Name/Affiliation</i>	<i>Address</i>	<i>Phone/Fax/Email</i>
<b>Christine Williams</b> Solid Waste Contracts Administrator City of Phoenix, Dept. of Public Works	101 South Central Ave. Phoenix, AZ 85004	<a href="mailto:christine.williams@phoenix.gov">christine.williams@phoenix.gov</a> Phone: (602) 256-5602 Fax: (602) 534-9864
<b>Alexandra Thompson</b> King County Solid Waste Division	King Street Center 201 S Jackson St, Suite 701 Seattle, WA 98104-3855	<a href="mailto:alexandra.thompson@metrokc.gov">alexandra.thompson@metrokc.gov</a> Phone: (206) 296-8454 Fax: N/A
<b>Tim Morrison</b> Asset Mgmt. Economic Services Seattle Public Utilities	700 5th Ave., Suite 4900 PO Box 34018 Seattle, WA 98124-4018	<a href="mailto:timj.morrison@seattle.gov">timj.morrison@seattle.gov</a> Phone: (206) 615-1336 Fax: (206) 684-0206
<b>Cynthia Moore</b> Wisconsin Department of Natural Resources & Waste Management	101 S. Webster St. Madison, WI 57307	<a href="mailto:cynthia.moore@dnr.state.wi.us">cynthia.moore@dnr.state.wi.us</a> Phone: (608) 267-7550 Fax: N/A
<b>Lynsey Konseko</b> Delaware Solid Waste Authority	1128 South Bradford Street Dover, Delaware 19904	<a href="mailto:LBK@dswa.com">LBK@dswa.com</a> Phone: (302) 739-5361 Fax: N/A
<b>Sue Gordon</b> Manager Environmental Services County of Orange	320 N. Flower St., Suite 400 Santa Ana, CA 92703	<a href="mailto:sue.gordon@iwmd.ocgov.com">sue.gordon@iwmd.ocgov.com</a> Phone: (714) 834-4118 Fax: (714) 834-4110

For subcontractor references, please see the Client Reference Form Attachment G in Appendix C.

## Work Samples

We have included one set of the following work samples that are similar in nature to the proposed project and deliverables.

- "Statewide Waste Characterization Study: Results and Final Report," CIWMB, December 1999
- "Characterization of Waste from Single-family Residences," City of Phoenix Public Works Department, November 2003
- "Wisconsin Statewide Waste Characterization Study," Wisconsin Department of Natural Resources, May 2003
- "2002/2003 Comprehensive Waste Stream Characterization and Transfer Station Customer Surveys – Final Report," King County Department of Natural Resources and Parks, Solid Waste Division, April 2004
- "Statewide Waste Characterization Study," CIWMB, December 2004
- "Waste Disposal and Diversion Findings for Select Industry Groups," CIWMB, June 2006

## Contract Eligibility

Cascadia Consulting Group and subcontractors Pacific Waste Consulting Group, Sky Valley Associates, and Stanfield Systems are eligible to contract with the State of California pursuant to PCC 10286.

## Licenses & Certifications

We have included the following:

- Copy of Cascadia's City of Sacramento issued license with proof of expiration
- Proof of **Small Business Certification** for Pacific Waste Consulting Group
- Copy of **Disabled Veteran Business Enterprise (DVBE)** for Stanfield Systems Incorporated
- Proof of Small Business Certification for Stanfield Systems, Inc.

Business Operations License issued by the City of Sacramento with Proof of Expiration

MUST BE POSTED IN CONSPICUOUS PLACE

	<b>CITY OF SACRAMENTO</b>		109320	109320
	<b>BUSINESS OPERATIONS TAX CERTIFICATE</b>			
	Business Name	THE CASADIA CONSULTING GROUP	FROM	TO
	Business Address	811 FIRST AVE #480	Mo. Day Yr.	Mo. Day Yr.
	Owner	SCOTT, CHARLES R.	07/01/06	06/30/07
Type of Business	ENVIRONMENTAL RESOURCE ISSUES	EXPIRES		TOTAL
Tax Classification	401	CITY OF SACRAMENTO		PAID: \$266.45
THE CASADIA CONSULTING GROUP KURT HOLSE 1109 FIRST AVE #400 SEATTLE, WA 98101		VOID AUG 03 2006 IF NOT PAID		THIS STUB MAY BE FOLDED/DETACHED BEFORE POSTING

This certificate is not to be construed to represent or imply that the City of Sacramento has investigated, or approves or recommends, the holder of this certificate. Any representation to the contrary is fraudulent. (This certificate must be renewed within 30 days of expiration)

Small Business Certification for Pacific Waste Consulting Group

Patty Hardesty

From: SBDVBEcert@dgs.ca.gov  
 Sent: Monday, April 02, 2007 4:32 PM  
 To: Patty Hardesty  
 Subject: SB/DVBE Certification Approval-REF #45778

Congratulations! This is to confirm that you have been approved with the State of California, Department of General Services as a SMALL BUSINESS

Your reference number (REF #) is 45778 and your certification is valid from 04/02/2007 to 4/30/2008.

You will be notified about six weeks prior to your expiration to renew your certification.

Your certification is not transferable. The new owner(s) must apply for their own certification.

The following links provide information on the various program benefits and tasks that you must perform to maintain your approved status.

1. Small Business and DVBE Services homepage - <http://www.pd.dgs.ca.gov/smbus>
2. Maintaining Your Certification Status - <http://www.pd.dgs.ca.gov/smbus/maintcert.htm>
3. Reporting a Change - <http://www.pd.dgs.ca.gov/smbus/certupdate.htm> (Certifications are not transferable. The new owners must apply for a new certification.)
4. Prompt Payment Program - <http://www.pd.dgs.ca.gov/promptpay/default.htm>

If you need further assistance, please contact the Office of Small Business and DVBE Services (OSDS) by email at [SBDVBEcert@dgs.ca.gov](mailto:SBDVBEcert@dgs.ca.gov) or by phone at (916) 375-4940.

Regards,

State of California  
 Department of General Services  
 Procurement Division  
 The Office of Small Business and DVBE Services

For questions regarding Pacific Waste Consulting Group's small business certification, please contact Principal, Mark White, at:

Pacific Waste Consulting Group  
5714 Folsom Blvd, PMB 240  
Sacramento, CA 95819  
Phone: (916) 387-9777  
Fax: (916) 387-9802  
Email: [mark@pwcg.net](mailto:mark@pwcg.net)

Proof of Disabled Veteran Business Enterprise (DVBE) for Stanfield Systems Incorporated:



State of California \* Department of General Services \* Arnold Schwarzenegger, Governor

**PROCUREMENT DIVISION**

**Office of Small Business and DVBE Certification**

707 Third Street, 1st Floor, Room 400 \* PO Box 989052

West Sacramento, California 95798-9052 \* (800) 559-5529

DVBE APP 20050623

June 23, 2005

REF# 0023905  
STANFIELD SYSTEMS INCORPORATED  
718 SUTTER ST SUITE 108  
FOLSOM CA 95630

Dear Business Person:

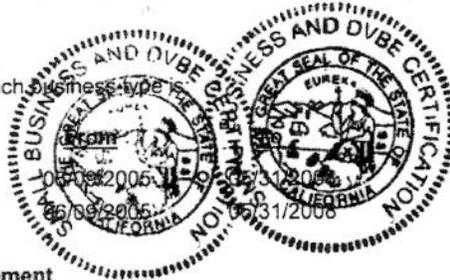
Congratulations on your certified disabled veteran business enterprise (DVBE) status with the State of California. Your certification entitles you to benefits under the state's DVBE Participation Program within state contracting, including the three percent DVBE participation goal for overall state contract dollars.

**Certification period**

Your certification period for each business type is:

Industry

NON-MANUFACTURER  
SERVICE



**Annual Submission Requirement**

All DVBEs must submit to the Office of Small Business and DVBE Certification (OSDC) each postcertification tax year, a complete copy of your business' federal income tax return, including extensions, within 90 days of the tax return's filing due date. If your business is a partnership, each partner must also submit a complete copy of his or her individual tax return. Additionally, if you are a DVBE that is not a sole proprietorship and your firm rents equipment to the state, you must also include in your submittal a complete copy of the personal federal income tax returns for each of your disabled veteran owners, including extensions, and within 90 days of the individual's tax return filing due date. Failure to comply will result in the suspension of your DVBE status and possible decertification, and it shall prohibit your business from participating in any state contract until all requirements are met.

**Maintained Your Online Certified Firm Profile**

A secure access feature on our website enables you to maintain certain company profile information, including customizable keywords to best describe your business specialties with. Details about the Certified Firm Profile and your secure logon information are available on the final page of this letter. Please keep your logon information page in a secure place and DO NOT share it with anyone or include it with any of your bid documents or submittals.

**Reporting Business Changes**

You must notify OSDC of all business changes or your certification status will be subject to revocation. The enclosed "Certification Information Change" form identifies specific items that may be reported using the change form and it identifies other changes that require a new certification application submittal.

**Proof of Eligibility**

Office of Small Business and DVBE Certification

REF# 0023905 STANFIELD SYSTEMS INCORPORATED

June 23, 2005  
DVBE APP 20050623

2

Maintain this original certification letter for future business needs. To demonstrate your firm's DVBE eligibility, include a copy of this letter in your state contract bid submittals.

*Prior to contract award, agencies will assure the vendor is in compliance with Public Contract Code, Section 10410 et seq. addressing conflict of interest for state officers, state employees or former state employees.*

**Certification Renewal**

A renewal application will be mailed to you prior to the expiration of your DVBE certification. If you do not receive an application, please call us so that you may timely renew your certification.

If you have any questions, please contact me at 800.559.5529 (Procurement Division receptionist) or 916.375.4940 (OSDC receptionist), by e-mail [sherry.felder@dgs.ca.gov](mailto:sherry.felder@dgs.ca.gov), or by fax 916.375.4950. The Procurement Division oversees many programs to further state contracting participation. For more information regarding these programs, visit our website at [www.pd.dgs.ca.gov/smbus](http://www.pd.dgs.ca.gov/smbus), or visit the Procurement Division's website at [www.dgs.ca.gov/pd](http://www.dgs.ca.gov/pd).

Sincerely,



Sherry Felder  
Certification Officer  
Office of Small Business and DVBE Certification

APPLTR Rev. 06/28/2004

Proof of Small Business Certification for Stanfield Systems, Inc.:

State of California \* Department of General Services \* Arnold Schwarzenegger, Governor



**PROCUREMENT DIVISION**

**Office of Small Business and DVBE Certification**

707 Third Street, 1st Floor, Room 400 \* PO Box 989052

West Sacramento, California 95798-9052 \* (800) 559-5529

SB APP 20050623

June 23, 2005

REF# 0023905  
STANFIELD SYSTEMS INCORPORATED  
718 SUTTER ST SUITE 108  
FOLSOM CA 95630

Dear Business Person:

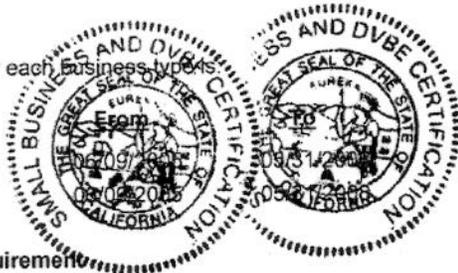
Congratulations on your certified small business status with the State of California. Your certification entitles you to benefits under the state's Small Business Participation Program within state contracting, including a five percent bidding preference and special provisions under the Prompt Payment Act.

**Certification period**

Your certification period for each business type is

Industry

NON-MANUFACTURER  
SERVICE



**Annual Submission Requirements**

To maintain your certified status, you must annually submit to the Office of Small Business and DVBE Certification (OSDC), proof of annual receipts and proof of employees for your firm and each of your affiliates (if any).

Proof of Annual Receipts

Submit to OSDC, a copy of your firm's and any affiliate firm's ENTIRE federal tax return each year following your certification. Include ALL accompanying schedules, forms, statements, and any other support documents filed with that specific tax return.

If you request a tax filing extension with the Internal Revenue Service, submit to our office a copy of the extension form. When your tax returns are filed, submit a copy of the entire federal tax return to our office.

Proof of Employees

If you have employees whose taxable wages are reported to the California Employment Development Department (EDD) on a quarterly basis, you must annually submit to our office along with your proof of annual receipts, proof of employees for your firm and any affiliates.

We will accept a copy of the EDD's "Quarterly Wage and Withholding Report" (Form DE6) or other format accepted by the EDD. Your employee documents must cover the same four quarters as the tax return you submit for your proof of annual receipts.

If you have out-of-state employees, submit the employee documentation comparable to EDD's "Quarterly Wage and Withholding Report" for the same four-quarter period.

**Maintain Your Online Certified Firm Profile**

A secure access feature on our website enables you to maintain certain company profile information, including customizable keywords to best describe your business specialties with. Details about the Certified Firm Profile and your secure logon information are available on the final page of this letter. Please keep your logon information page in a secure place and DO NOT share it with anyone or include it with any of your bid documents or submittals.

### **Reporting Business Changes**

You must notify OSDC of all business changes or your certification status will be subject to revocation. The enclosed "Certification Information Change" form identifies specific items that may be reported using the change form and it identifies other changes that require a new certification application submittal.

### **Prompt Payment Rubber Stamp**

The Prompt Payment Act requires state agencies to pay the undisputed invoices of certified small businesses and registered nonprofit organizations on a timely basis. Prompt payment is reinforced by adding interest penalties for late payment. Covered under the Act are certified small businesses that are either a service, manufacturer, or non-manufacturer firm, and nonprofit organizations registered with OSDC.

Compensation on late or unpaid progress payments for certified construction firms is addressed in Public Contract Code, Section §10261.5.

Use of the prompt payment rubber stamp alerts state agencies of a firm's certified small business or registered nonprofit status.

#### Ordering a rubber stamp

To purchase a prompt payment rubber stamp, submit the enclosed Prompt Payment Rubber Stamp Order Form along with your payment to FRS Marking Devices, 1730 H Street, Fresno, CA, 93721.

### **Proof of Eligibility**

Maintain this original certification letter for future business needs. To demonstrate your firm's small business eligibility, include a copy of this letter in your state contract bid submittals.

*Prior to contract award, agencies will assure the vendor is in compliance with Public Contract Code, Section 10410 et seq. addressing conflict of interest for state officers, state employees or former state employees.*

### **Certification Renewal**

A renewal application will be mailed to you prior to the expiration of your small business certification. If you do not receive an application, please call us so that you may timely renew your certification.

If you have any questions, please contact me at 800.559.5529 (Procurement Division receptionist) or 916.375.4940 (OSDC receptionist), by e-mail [sherry.felder@dgs.ca.gov](mailto:sherry.felder@dgs.ca.gov), or by fax 916.375.4950. The Procurement Division oversees many programs to further state contracting participation. For more information regarding these programs, visit our website at [www.pd.dgs.ca.gov/smbus](http://www.pd.dgs.ca.gov/smbus), or visit the Procurement Division's website at [www.dgs.ca.gov/pd](http://www.dgs.ca.gov/pd).

Sincerely,



Sherry Felder  
Certification Officer  
Office of Small Business and DVBE Certification

APPLTR Rev. 06/28/2004

For questions regarding Stanfield Systems Incorporated's Disable Veteran Business Enterprise (DVBE) certification, please contact Principal, Chris Nail, at:

Stanfield Systems, Inc.  
718 Sutter Street, Suite 108  
Folsom, California 95630  
Phone: (916) 608-8006  
Fax: (916) 608-0657  
Email: [cnail@standfieldsystems.com](mailto:cnail@standfieldsystems.com)

# Cost Proposal

## Cost Proposal Sheet 2007-2008 Statewide Waste Characterization Study IWM06045

Contractor/Company Name: Cascadia Consulting Group, Inc.

### Task 1: Study Design

Personnel Services: These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Principal	\$65.85	24	\$1,580.40	\$73.33			\$124.00	\$2,307.38		\$4,085.11
Senior Associate	\$47.89	56	\$2,681.84	\$124.44			\$124.00	\$3,915.49		\$6,845.76
Senior Associate	\$41.90	8	\$335.20	\$15.55				\$489.39		\$840.15
Associate 1	\$23.95	96	\$2,299.20	\$106.68				\$3,356.83		\$5,762.71
Project Assistant	\$18.68	96	\$1,793.28	\$83.21				\$2,618.19		\$4,494.68
Airfare (2 people, round trip) for kick-off meeting							\$800.00			\$800.00
Car rental + fuel (1 day)							\$125.00			\$125.00
Operating expenses (paper, copying, etc.)					\$200.00					\$200.00
<b>Total by category</b>		280	\$8,689.92	\$403.21			\$1,173.00	\$12,687.28		\$23,153.42

### Task 2: Site Selection and Schedule

Personnel Services: These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Senior Associate	\$47.89	48	\$2,298.72	\$106.66				\$3,356.13		\$5,761.51
Senior Associate	\$41.90	8	\$335.20	\$15.55				\$489.39		\$840.15
Associate 1	\$23.95	96	\$2,299.20	\$106.68				\$3,356.83		\$5,762.71
Project Assistant	\$18.68	192	\$3,586.56	\$166.42				\$5,236.38		\$8,989.35
Recruiter for Multifamily Sites	\$28.73	96	\$2,758.08	\$127.97				\$4,026.80		\$8,400.85
Airfare (1 person, 2 trips) for multifamily recruitment							\$800.00			\$800.00
Car rental + fuel (12 days) for multifamily recruitment							\$1,800.00			\$1,800.00
Operating expenses (paper, copying, etc.)					\$200.00					\$200.00
<b>Total by category</b>		440	\$11,277.76	\$523.29			\$4,088.00	\$16,465.53		\$32,554.58

**Task 3: Field Sampling and Sorting and Vehicle Surveys**

**Personnel Services:** These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Senior Associate	\$47.89	20	\$957.80	\$44.44			\$1,398.39			\$2,400.63
Associate 1	\$23.95	80	\$1,916.00	\$88.90			\$2,797.36			\$4,802.26
Project Assistant	\$18.68	120	\$2,241.60	\$104.01			\$3,272.74			\$5,618.35
Vehicle surveyor & sample pre-capturer	\$28.73	552	\$15,858.96	\$735.86			\$8,556.00	\$23,154.08		\$48,304.90
Subcontractor Sky Valley Associates, Director of Sorting Crew									\$131,600.00	\$131,600.00
Subcontractor PWCG, Sorting Crew Labor (California Small Business)									\$151,800.00	\$151,800.00
Airfare (4 round trips) for vehicle surveyor									\$1,600.00	\$1,600.00
Car rental + fuel for vehicle surveyor									\$10,350.00	\$10,350.00
Laboratory costs for asbestos analysis (50 samples)									\$5,000.00	\$5,000.00
Equipment (survey equipment, notebooks, protective gear, signs, etc.)					\$200.00	\$200.00				\$200.00
Operating expenses (paper, copying, etc.)					\$200.00	\$200.00				\$200.00
<b>Total by category</b>		<b>772</b>	<b>\$20,974.36</b>	<b>\$973.21</b>	<b>\$200.00</b>	<b>\$200.00</b>	<b>\$20,506.00</b>	<b>\$30,622.57</b>	<b>\$288,400.00</b>	<b>\$361,876.14</b>

**Task 3 Additional Cost Detail:**

Marginal Sample Cost for MSW Sample: \$415.00  
 Marginal Sample Cost for Roofing Samp \$100.00 (approximate)  
 Gate surveyor cost per surveyor day \$850.00

**Task 4: Special Materials Research Project**

**Personnel Services:** These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Principal	\$65.85	8	\$526.80	\$24.44				\$769.13		\$1,320.37
Senior Associate	\$47.89	36	\$1,724.04	\$80.00			\$2,517.10			\$4,321.13
Senior Associate	\$41.90	4	\$167.60	\$7.78			\$244.70			\$420.07
Associate 1	\$23.95	40	\$958.00	\$44.45			\$1,398.68			\$2,401.13
Characterization specialist	\$28.73	128	\$3,677.44	\$170.63			\$1,984.00	\$5,369.06		\$11,201.14
Airfare (2 round trips) for characterization specialist							\$800.00			\$800.00
Car rental + fuel for characterization specialist							\$2,400.00			\$2,400.00
Equipment (field equipment, to be determined based on characterization method)					\$400.00	\$400.00				\$400.00
Operating expenses (paper, copying, etc.)					\$200.00	\$200.00				\$200.00
<b>Total by category</b>		<b>216</b>	<b>\$7,053.88</b>	<b>\$327.30</b>	<b>\$200.00</b>	<b>\$400.00</b>	<b>\$5,184.00</b>	<b>\$10,298.66</b>		<b>\$23,463.84</b>

**Task 5: Data Entry and Analysis**

**Personnel Services:** These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Senior Associate	\$47.89	36	\$1,724.04	\$80.00				\$2,517.10		\$4,321.13
Senior Associate	\$41.90	8	\$335.20	\$15.55			\$248.00	\$489.39		\$840.15
Associate 1	\$23.95	120	\$2,874.00	\$133.35				\$4,196.04		\$7,203.39
Project Assistant	\$18.68	120	\$2,241.60	\$104.01				\$3,272.74		\$5,618.35
Subcontractor Stanfield Systems Inc., data entry (California DVBE)					\$200.00				\$15,000.00	\$15,000.00
Operating expenses (paper, copying, etc.)					\$200.00					\$200.00
<b>Total by category</b>		<b>284</b>	<b>\$7,174.84</b>	<b>\$332.91</b>	<b>\$200.00</b>	<b>\$200.00</b>	<b>\$248.00</b>	<b>\$10,475.27</b>	<b>\$15,000.00</b>	<b>\$33,183.02</b>

**Task 6: Final Report and Presentation of Results**

**Personnel Services:** These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Name/Position	\$/Hr	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Total by Task
Principal	\$65.85	8	\$526.80	\$24.44				\$769.13		\$1,320.37
Senior Associate	\$47.89	72	\$3,448.08	\$159.99			\$248.00	\$5,034.20		\$8,890.27
Senior Associate	\$41.90	8	\$335.20	\$15.55				\$489.39		\$840.15
Associate 1	\$23.95	132	\$3,161.40	\$146.69				\$4,615.64		\$7,923.73
Project Assistant	\$18.68	120	\$2,241.60	\$104.01				\$3,272.74		\$5,618.35
Airfare (1 person, round trip) for presentations							\$400.00			\$400.00
Car rental + fuel (2 days)					\$200.00		\$250.00			\$200.00
Operating expenses (paper, copying, etc.)					\$200.00					\$200.00
<b>Total by category</b>		<b>340</b>	<b>\$9,713.08</b>	<b>\$450.69</b>	<b>\$200.00</b>	<b>\$200.00</b>	<b>\$898.00</b>	<b>\$14,181.10</b>		<b>\$25,442.86</b>

**Project Total**

**Personnel Services:** These figures include wages and profit, but do not include fringe benefits, travel expenses or overhead. An alternate breakdown of costs can be provided if necessary.

Personnel Totals	Hrs	Total \$	Fringe Benefits calculated as a percentage of personal service costs	Operating Expenses related to the services provided in this agreement, including rent and supplies, as applicable	Equipment Costs	Travel Expenses. All travel expenses reflect DPA-specified per-diem rates. Airfare is estimated at \$400 per round trip.	Overhead	Other	Grand Total
	2,332	\$64,863.84	\$3,010.61	\$1,200.00	\$600.00	\$31,849.00	\$94,730.41	\$303,400.00	\$499,673.86

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**Acknowledgement/Authorization**

The undersigned acknowledges the submittal of this proposal constitutes an irrevocable offer for a ninety (90) day period for the CIWMB to award an Agreement. Additional acknowledgement is made of receipt of all competitive documents, including Addenda, relating to this Agreement. The undersigned acknowledges that the Proposer has read all of the requirements set forth in CIWMB documents and will comply with said provisions.

The undersigned hereby authorizes and requests any person, firm, agency, or corporation to furnish any information requested by the CIWMB in verification of the recitals comprising this Proposal and also hereby authorizes the CIWMB to contact such persons, firms, etc., in order to obtain information regarding the undersigned.

The undersigned acknowledges that there are no potential conflicts of interest, as defined in Public Contract Code (PCC) 10410, 10411, and Government Code (GC) 87100, by the submitting firm and/or any subcontractors listed in the Proposal.

I declare under penalty of perjury that the foregoing is true and correct.

Name & Title of Authorized Representative:

Charles R. Scott

Contractor Name: Cascadia Consulting Group, Inc.

Address:

1109 First Avenue, Suite 400

Telephone #: (206) 343-9759

City, State Zip:

Seattle, WA 98101

Email: charlie@cascadiaconsulting.com

Signature of Authorized Representative:



Date Signed: April 12, 2007

## Appendix A: Health & Safety Plan

A sample of Cascadia's seven part health and safety plan is detailed below.

### 1. RESPONSIBILITY

Tanya Tarnecki, acting as the designated Safety Officer, has the authority and the responsibility for implementing and maintaining the Health and Safety Program for Cascadia Consulting Group, Inc. while working on site at the Pentagon. Managers and supervisors are responsible for implementing and maintaining safe working practices in their work areas and for answering worker questions about the Health and Safety Plan. A copy of this Health and Safety Plan is provided to all Cascadia Consulting Group, Inc. employees.

The Cascadia Consulting Group, Inc. Health and Safety Plan is not a static plan. As conditions and situations arise, this Health and Safety Plan will be updated and augmented in accordance to OSHA and MSHA standards.

### 2. COMPLIANCE

All workers, including managers and supervisors, are responsible for complying with safe and healthful work practices. Our goal is to ensure that all Cascadia Consulting Group, Inc. workers understand and comply with these practices. To accomplish this, our procedures include informing workers of the provisions of our program, evaluating the on-going safety performance of all workers, and providing additional training to workers whose safety performance may be deficient.

The employees of Cascadia Consulting Group often perform their duties as guests of many different facilities. The procedures described in our program in no way supersede the requirements which may already be in place at these facilities. Instead, this plan is designed to augment and work in conjunction with any site safety plans already existing at these facilities. We follow all host facility safety requirements which are more stringent than our own. Our safety procedures often exceed those of our host. Workers must follow our procedures, regardless of whether the host facility has any such requirements.

### 3. COMMUNICATION

Cascadia Consulting Group is committed to providing a safe work environment for all of its workers. All managers and supervisors are responsible for communicating with all workers about occupational safety and health in a form readily understandable by all workers. Workers are encouraged to inform their managers and supervisors about workplace hazards without fear of reprisal. The safety of the entire team could be in jeopardy - if you discover something that could cause injury, or is unsafe, tell your manager or supervisor immediately.

Cascadia Consulting Group routinely communicates with and instructs employees orally about general safe work practices and hazards unique to each employee's job assignment. Our overall communication system includes the following items:

- New worker orientation, including discussion of safety and health policies and procedures
- Worker training in the specific protocols of our field procedures
- Scheduled and "tailgate" safety meetings
- Posted or distributed safety information

- Periodic review of our Health and Safety Program

The Safety Officer is responsible for ensuring that all field personnel have read, and understood, the master copy of this Health and Safety Plan document, and that all workers have received orientation and training in the safety protocols to be followed in conducting our work

The Safety Officer delegates daily on-site responsibilities to the Supervisor in charge of the work. Each Supervisor has the duties and responsibilities to:

- Ensure that the procedures in this document are followed for the day's work
- Be familiar with local emergency services, and maintain a list of emergency phone numbers
- Conduct "tailgate" health and safety meetings to notify workers of any changes in safety protocol
- Inspect personal protective equipment and to ensure proper use of such equipment
- Monitor on site hazards and the early health warning signs (e.g., heat stress/stroke, dehydration, or fatigue) of site personnel
- To stop unsafe operations, and to summon emergency services when needed

Nearly every day we work, we may be at a different facility; the Supervisor will brief workers on health and safety protocols of the host site. This will include emergency evacuation and rally point information, to ensure that, in the event of an emergency, all Cascadia Consulting Group workers will adhere to site-specific evacuation and management procedures

#### **4. HAZARD ASSESSMENT**

We perform assessments of possible work hazards, and the procedures to work safely around them, when:

- We initially established our Health & Safety protocols;
- New substances, processes, procedures or equipment which present potential new hazards are introduced into our workplace;
- New, previously unidentified hazards are recognized;
- Workplace conditions warrant an assessment; and,
- When occupational injuries and illnesses occur.

On a daily basis, Supervisors are to identify and evaluate workplace hazards which may be present at each work site. We routinely encounter the same day-to-day risks when we conduct our work. Yet, every facility is different, and may present unique hazards which can affect us. These are some possible hazards that may occur during our work:

##### **Physical hazards:**

- Cuts and punctures
- Lifting
- Slipping and falling
- Heat stress and fatigue
- Traffic or heavy equipment movement
- Noise exposure
- Animal and/or insect bites

**Airborne contaminants:**

- Dust and windblown debris

**Chemical hazards:**

- Liquid spills from containers
- Household and hazardous chemicals

**Biological hazards:**

- Household hazardous wastes
- Medical wastes
- Blood/body fluid contaminated items
- Hypodermic needles

Due to the nature of waste composition sampling, exposures to airborne pathogens and subcutaneous introduction of pathogens are possible. Because of this all Cascadia Consulting Group employees will be given the opportunity to be vaccinated with Tetanus and Hepatitis B vaccines at the cost of Cascadia Consulting Group. Any employee that forfeits having the vaccine will do so in writing.

**5. ACCIDENT/EXPOSURE INVESTIGATIONS**

Procedures for investigating workplace accidents and hazardous substance exposures include:

- Interviewing injured workers and witnesses;
- Examining the workplace for factors associated with the accident/exposure;
- Determining the cause of the accident/exposure;
- Taking corrective action to prevent the accident/exposure from reoccurring; and
- Recording the findings and actions taken.

**6. HAZARD CORRECTION**

Timely corrective action will be taken to remedy an unsafe condition, practice or procedure. When an imminent hazard exists which cannot be immediately abated without endangering employee(s) and/or property, we will remove all exposed workers from the area.

**7. TRAINING AND INSTRUCTION**

All Cascadia Consulting Group workers, including managers and supervisors, shall have training and instruction on general and job-specific safety and health practices. Training and instruction is provided:

- To all new workers
- To all workers given new job assignments for which training has not previously provided
- Whenever new substances, processes, procedures or equipment are introduced to the workplace and represent a new hazard
- Whenever Cascadia Consulting Group is made aware of a new or previously unrecognized hazard
- To supervisors to familiarize them with the safety and health hazards to which workers may be exposed
- To all workers with respect to hazards specific to each employee's job assignment

Cascadia Consulting Group provides for its workers the proper safety equipment for performance of duties associated with waste sampling. These items include:

- Coveralls or protective outer wear (optional)
- Rubber gloves and liners (required)
- Lower back support apparatus (optional)
- Hearing protection (optional/based on site requirements)
- Safety glasses (optional/based on site requirements)
- Reflective safety vests (required)
- Hard hats and liners (required)
- Knee pads (optional)

During the conduct of our fieldwork, the following personnel health and safety guidelines are to be followed:

- All workers should be in good physical condition, maintain a current tetanus booster and Hepatitis B shot, and not be over-sensitive to odors and dust. All workers must be able to communicate in English, and be able to read warning signs/labels.
- Routinely check personal protective equipment and work clothing for proper fit and condition; replace or repair defective items immediately.
- Always look at what you are picking up or sorting – the most effective way to prevent cuts and punctures is to see what you are handling. Use one of the small rakes or shovels to move material around for sorting.
- Lift properly, and ask for assistance when lifting heavy or bulky items. Be particularly careful when you are tired or fatigued.
- Be on the lookout for slipping and tripping hazards.
- Do not attempt to identify unknown chemical substances in unlabeled containers; never sniff anything to see what it is.
- Wash hands and face before eating or drinking. Smoke only in designated areas.
- Consume plenty of fluids during hot days, and watch for signs of heat-related illness, both in yourself and your crewmates.
- Be aware of your surroundings and alert to the possibility of unexpected hazards.
- Alert your Supervisor if you feel ill, overly fatigued, or injured. Treat even minor cuts and injuries immediately.

## Appendix B: Resumes

Resumes have been included for key personnel.



**Kurt Hulse**  
*Senior Associate*

Kurt manages many of Cascadia's data collection and data analysis projects for clients in Washington and California. He is experienced in developing and managing research plans that rely on multiple team members working in the field. These skills have contributed to the in-depth analysis that accompanied several of Cascadia's waste characterization and recycling rate studies.

Kurt is talented at choreographing the activities of numerous team members on projects with complex interrelated tasks. He is experienced with publicity, design, copy writing, and the development and implementation of outreach strategies. In addition, he is knowledgeable about recycling markets, material testing and transformation issues, and market research.

Kurt's additional strengths include his abilities to summarize complex analyses in clear, concise language and graphics, and his skills in writing content and designing layout for printed pieces directed at the public. Kurt has worked at Cascadia since 1995 in roles that included data collection, database design, data analysis, project management, and business development.

**Selected Prior Experience**

Center for Human Investment Policy, Graduate School of Public Affairs, University of Colorado at Denver  
Governor's Office of Policy and Initiatives, State of Colorado

**Education**

Macalester College, B.A. Political Science, 1989

Univ. of Washington, B.S. Biochemistry, 2000

**Selected Experience**

Waste Characterization Study as part of Base Year Study, County of Los Angeles, 2006-2007

Kurt is managing an extensive research effort to characterize the disposed waste stream of unincorporated Los Angeles County, including waste from residential, commercial, and self-haul sources. The project is particularly challenging, because of the complicated geography of Los Angeles County, which includes numerous areas of unincorporated space that lie between the various cities. More than 300 business and multifamily sites were recruited to participate in the study, and in total the research team will obtain and characterize 800 waste samples throughout the unincorporated regions.

Statewide Waste Composition Study for Targeted Commercial Groups, California Integrated Waste Management Board, 2004-2005

Kurt managed this large statewide waste characterization study that quantified and characterized the disposed waste and recycled materials for representative sites belonging to 25 major commercial groups in urban areas. More than 500 business sites, institutions, public venues, and industrial locations were recruited and screened prior to their participation in the study. Recycling and waste diversion at each site were quantified and audited, and samples of disposed waste were obtained from each site for hand sorting and characterization. The results of this study will assist California municipalities in identifying the best opportunities for additional waste diversion in the commercial sector.

Statewide Waste Composition Study, California Integrated Waste Management Board, 2003-2004

Kurt managed this year-long project to quantify and characterize disposed waste from the commercial, single-family residential, multifamily, and self-hauled sectors of the waste stream. The study involves coordinating sampling arrangements with 20 disposal facilities spread throughout the state, and visiting each facility twice throughout the year. The study called for 550 sorted samples of waste.

Statewide Waste Composition Study, California Integrated Waste Management Board, 1999-2000

Managed the data collection and analysis tasks for this generator study, which obtained waste generation and composition information for more than 1,200 businesses throughout the State of California. Information was collected for 38 business and residential groupings. Worked with University of Washington Ph.D. candidates in statistics to develop a new method of estimating waste quantity and composition by generator group and for the state as a whole.

Waste Characterization Study, City of San Francisco, 2004-2005

In Cascadia's role as a subcontractor to Environmental Science Associates, Kurt managed the study design, data management and analysis of information gathered through hand sorting and visual characterization of waste samples at San Francisco's transfer station and material recovery facility. The objective of this project is to characterize each waste stream separately, with special attention to quantifying recyclables and hazardous materials, and to produce an overall waste disposal picture for the entire city.

Characterizing Solid Waste by Type of Business, City of Los Angeles, 2000-01

Managed the collection and analysis of solid waste quantity and composition data obtained by visiting ("generator sampling") more than 900 businesses and multifamily buildings within the City of Los Angeles. Data was collected for 42 specific categories of business. The task involved

locating and recruiting generators in the designated categories, surveying all generators to obtain detailed information about their operating practices, instructing the sampling teams in the specific measurements and observations to record in each case, and performing statistical analyses on data from visits and from trash sorting.

**Waste Composition Analysis, City of San Diego, 2000**

Coordinated the scheduling and sorting of more than 400 waste samples at the City of San Diego's Miramar Landfill, and he worked extensively with city staff to quantify the waste associated with various generating sectors vehicle types. Performed the analysis and wrote the final report, which presented detailed quantity and composition estimates of waste from more than 50 categories.

**Model of the Commercial Disposed Waste Stream, King County Solid Waste Division, 2005**

Working with data from the Washington Employment Security Division and waste composition profiles calibrated to individual types of businesses, Kurt developed a model of King County's commercial disposed waste stream that allows prediction of the amount of key materials being disposed by any group of businesses within the county, as defined by type of business, size of business, or geographic location. This model permits the Solid Waste Division to identify parts of the commercial sector where high-return recycling opportunities exist.

**Development of Data Sharing System for Water Purveyors, Seattle Public Utilities, 2002**

Managed the project to work with water purveyors throughout King County in placing their water consumption data in a central repository. Aggregation of data and use of a common format permits analysis of patterns in water conservation and discovery of a correlation between conservation programs and actual conservation behavior. Cascadia worked with 25 water purveyors to develop a permanent, repeatable, automated method for transferring water billing data from each member's billing systems to an Oracle database that resides at SPU.

**Washington State Recycling Industry Survey, King County Department of Natural Resources, 2001**

Managed this survey of over 400 recycling-industry businesses in Washington State. Designed and field-tested survey instrument and secure database to store confidential company responses and track survey progress. Coordinated between the client and two sponsoring agencies to conduct the survey, which identified employment, capital, and material use trends in the industry. Wrote an easily understandable final report designed for a public and policy-maker audience.

**Estimate of Street-side Litter Quantity and Composition, Seattle Public Utilities, 2001**

Designed and conducted the statistical analysis of quantity measurements and waste sorting data obtained from litter cans in public areas. Estimates were developed for litter cans in five distinct urban environments.

**Development of a Program Evaluation Model, Seattle/King County Local Hazardous Waste Management Program, 1999-2000**

Led a series of informational interviews with staff of the Seattle/King County Local Hazardous Waste Management Program and prepared a report detailing ways the program may evaluate the impact of each of its many initiatives. Approximately 40 program heads and project managers were involved in these interviews, which covered specific approaches to program evaluation, strategies for future initiatives, and methods of cross-agency data management.

## Charlie Scott

Principal

Charlie Scott, Principal and co-founder of Cascadia, has more than 25 years of experience in environmental consulting. He has managed more than 50 major waste composition projects, including studies for both public and private sector clients. Major public sector clients include City of Los Angeles, LAX, City of San Francisco, City of San Diego, City of Phoenix, City of New York, Orange County, City and County of Honolulu, City of Seattle, King County, and the states of Washington, Oregon, California, Hawaii, and Wisconsin. Recent private sector clients for whom Charlie has conducted research include Weyerhaeuser, Starbucks, and Norcal Waste Systems. He also has organized and facilitated focus groups, stakeholder committees, and market commodity groups to assess opportunities and barriers to waste reduction and other resource conservation initiatives. Charlie is past President of the Washington State Recycling Association (WSRA), which represents Washington's recyclers and haulers, and he served on the WSRA/Washington Department of Ecology committee to review and improve the State's methodology for establishing recycling rates. He also served on the California Integrated Waste Management Board's Working Group for establishing standard waste characterization methods.

### Education

Master of Public Administration, Graduate School of Public Affairs, University of Washington

Bachelor of Arts, Economics, Denison University

### Selected Experience

California Integrated Waste Management Board, Statewide Characterization of Targeted Waste Streams, 2004-2006  
Served as Principal-in-Charge for this four-part study to quantify and characterize certain waste streams that are believed to contain relatively large amounts of recoverable material, including: waste from specific industry types, including food stores, retail stores, and distribution centers; waste from MRFs; construction and demolition waste; and self-hauled waste.

California Integrated Waste Management Board, Statewide Waste Characterization Study, 2003-04  
Served as Principal-in-Charge for this statewide study to characterize California's disposed waste. Single-family and commercial garbage collection routes were obtained, as well as from randomly chosen self-hauled vehicles. Waste sampling and characterization took place at 22 landfills and transfer stations distributed among five regions of the state and across four seasons. Multifamily waste at selected apartment building, condominiums, and housing projects were sampled.

Statewide Disposal Characterization Study, California Integrated Waste Management Board, 1999  
Directed the design of this two-season study to determine the amounts and composition of waste from five generating sectors: single-family residential, multi-family residential, commercial, residential self-haul, and commercial self-haul.

Waste Characterization Study, County of Orange, 2004  
Managed this waste characterization study that targeted self-hauled and loose roll-off box loads from 22 distinct jurisdictions of origin. The study included two seasons of waste sorting in summer 2003, and winter 2004, and collected over 880 samples, as well as over 12,500 vehicle surveys from six weeks of surveying.

City of San Francisco, Citywide Waste Characterization Study, 2005  
Directed the development of the study design and field data collection for the City of San Francisco's extensive examination of waste, designed to evaluate current recycling programs including the recently implemented Fantastic Three program.

Characterization of Curbside Recyclables & Residuals, Norcal Waste Systems of San Jose, 2002-2003  
Managed this two-part characterization study: the first characterization assessed the extent to which recyclables remained in the stream of residuals after processing by the Material Recovery Facility (MRF). The second phase of the study characterized incoming material from the single stream residential recycling program to assess the level of contamination arriving at the MRF.

Waste Characterization Study, City of Los Angeles, 2001  
Designed and managed this large waste characterization study, which examined the commercial, residential, and self-haul waste streams. This involved sampling at the point of generation for 34 SIC-based business groups and at disposal facilities for C&D, landscaping, and single-family residential waste streams.



**Los Angeles County Residential Sector Program Effectiveness Study, Los Angeles County, 2000 – 2001**

Managed this broad assessment of the effectiveness of the County's residential sector waste reduction and recycling programs. His responsibilities included overseeing the information gathering and data collection. The final report documents diversion rates from the residential sector and evaluates programs targeting both single-family and multi-family households and makes recommendations for future program enhancements.

**Waste Characterization and Quantification Study, Los Angeles World Airports, 2001**

Designed and supervised this project, which involved conducting a two-season study of waste disposed at the Los Angeles International Airport (LAX). This study estimated the overall composition and quantity of waste disposed at LAX, and developed composition profiles and generation rates for seven generator groups: terminal areas, hangars, vehicle/fleet maintenance, cargo facilities, catering/kitchens, construction and demolition, and mixed uses.

**Characterization of Waste from Single-family Residences, City of Phoenix Public Works Department, 2003**

Directed this study, which included sampling and analyzing residential waste throughout the City's six collection districts. The study estimated the amounts of key recyclables and compostable organic materials present in the waste and assessed the potential for increased recycling of glass, plastic, and aluminum beverage containers, paper, and green waste.

**Solid Waste Monitoring Study, King County Solid Waste Division, WA, 1993-Present**

Serves as Principal-in-Charge for this study of waste flows into King County's transfer station system. This project has involved waste sorts of more than 1,000 samples of residential, non-residential, self-haul, CDL, and large generator waste; transfer station vehicle surveys; customer satisfaction surveys; and an examination of changes over time in waste composition and customer use.

**Waste Stream Composition Study, City of Seattle, 1988-Present**

Serves as Principal-in-Charge for this ongoing study since its inception in 1988. His role consists of designing sampling plans, overseeing field operations, and reviewing all statistical calculations and final documents. The results of this research are used to help design and improve Seattle's residential curbside collection program. This work has included sampling incoming waste streams at Seattle's MRFs. waste stream.

**Weyerhaeuser, Office Pack Contamination Rates In Commercial Paper Recycling Facilities, 1999**

Directed this study which determined relative proportions of paper grades and contaminants in two grades of office pack and sorted white ledger. The data was used to compare differences in OP grades that are sold into the recycled fiber market, and to compare manual- and machine-sorting technologies.



Tanya has worked with Cascadia for over seven years, managing and providing analysis for several waste management projects. Her most recent work includes the study design, crew supervision, data collection, and analysis for New York, Fort Lewis, and University of Utah waste characterization studies. Tanya also served as project manager for the 2004 King County Waste Monitoring Program. Her background includes recycling program management, environmental education, mediation, and consensus building.

Tanya is a certified Project Management Professional, PMP, from the international Project Management Institute and has developed and led Cascadia's internal seven course project management training. She is also an active member of the Solid Waste Association of North America.

## Education

B.A., Double Major: Government / Legal Studies and Environmental Studies, Bowdoin College

## Selected Experience

Survey and Waste Characterization Study at Three Active Landfills, *County of Orange, 2004*

Performed project management and developed work plan, survey instruments, and training materials for this study focusing on self-hauled and drop-off box waste. Performing analysis and reporting for each sector, vehicle type, activity and jurisdiction of origin.

MRF Incoming Stream and Residuals Characterization Study, *San Jose, CA, 2002-2003*

Drafted study designs, supervised sorting crews, and performed composition analysis for this two part study to examine San Jose's incoming stream of recyclable material and MRF residuals.

Recoverable Material Waste Characterization Study, *San Bernardino County, 2003*

Managed project to visually sample over 750 loads of material from nine disposal facilities during two sampling seasons. Drafted work plan and survey, sampling and analysis methodologies.

King County Waste Monitoring Program, *King County, WA 2003-2004*

As 2004 project manager, led activities to conduct a customer satisfaction survey, hauler interviews, and waste reduction and recycling survey. In 2003, developed sampling plan and revised material categories to sort 160 loads of self-hauled waste and 240 loads of commercially collected waste. Developed research plan, managed and performed data collection via interviews, quarterly surveys and visual waste sampling to characterize C&D waste and the C&D recycling industry.

Wastemobile On-site Education Program, *King County, WA, 2000-2003*

Managed annual budget of approximately \$200,000. Supervised, recruited, and hired staff of 15 charged with educating approximately 20,000 King County residents each year about household hazardous waste.

New York City Waste Characterization Study, *City of New York, 2004-2005*

Directed all activities at facility where nearly 2,000 refuse samples were sorted in 92 material categories. Ensured data collection accuracy and consistency among 4 sorting tables, and 30 on-site staff. Coordinated site preparations for the filming of a project documentary. Developed street basket sampling plan.

University of Utah Waste Characterization Study, *2005*

Developed sampling plan and materials categories for campus wide waste study. Evaluated cost effectiveness of implementing a comprehensive, centralized, recycling program focused primarily on recycling fiber, aluminum cans, and plastics.

Fort Lewis Waste Characterization Study, *Fort Lewis Army Post, 2005*

Managed all work and developed sampling plan, material categories, and custom database for visual characterization of 120 samples from 11 generator groups on base.

## Dieter Eckels

*Associate*

Dieter manages recruitment, sample collection, and analysis needs for a number of Cascadia projects. He recruited multi-family complexes and businesses for a waste characterization study in Los Angeles County. He managed a multi-family building manager survey for the New York Waste Characterization study. Dieter also managed the collection of thousands of samples for clients like the Pentagon, New York City, the State of California, King County, and the city of Palo Alto. Dieter has hand sorted or visually characterized loads of garbage, recyclables, food waste and construction/demolition debris at businesses and public facilities across the country including California, Arizona Washington, D.C., and Washington state. As a member of Cascadia's quality assurance/quality control (QA/QC) committee, Dieter is involved in the data entry and analysis for many research projects. He has created waste modeling systems for King County, the city of Palo Alto, Spokane County, Grant County, and Douglas County. He has also provided on-site technical assistance to many large and small businesses throughout King County and Seattle.

Dieter's greatest skills lie in data analysis, problem-solving, and team management.

### Education

BS in Sustainable Resources, University of Washington, 2004

BS in Ecology, Evolution and Conservation Biology, University of Washington, 2004

### Selected Experience

Pentagon Waste Characterization Study, *Dept. of Defense, 2007*  
Developed sampling plan and managed collection of samples. Coordinated logistics with DOD contract manager and loading dock staff. Supervised data entry, analysis and seasonal reporting.

Base Year Planning, *County of Los Angeles, 2006*  
Managed recruitment of 400 business and multi family complexes for a generator based waste study. Created custom data entry database.

Waste Monitoring Program, *King County, 2006*  
Managed collection of more than 7,000 surveys at King County transfer stations. Coordinated data entry and completed analysis of the recycling, satisfaction and customer surveys. Produced final reports.

Zero Waste Plan, *City of Palo Alto, 2006*  
Directed collection of samples from selected businesses. Managed logistics for a team of six. Developed model to characterize the waste streams of several industry sectors and city government offices.

New York City Waste Characterization Study, *City of New York, 2004-2005*

Directed field surveying efforts apartment buildings in four boroughs. Director of sampling for latter half of the study. Directed collection of over 2,000 samples by a team of 14 people at six disposal sites. Coordinated staffing and supplies for production of a mini-documentary of the sampling procedures.

Recycling Rate Model, *King County, 2004-2006*  
Created database of King County and City of Seattle recycling tonnages from Department of Ecology data. Developed model to smooth annual recycling rate fluctuations.

Commercial Sector Outreach, *Seattle Public Utilities, 2004-Present*

Conduct waste audits at large businesses in Seattle. Provide recommendations and technical assistance to reduce the volume of waste being generated. Develop expanded recycling programs for the targeted businesses. Assist with analysis and reporting.

Snohomish County Take-It-Back Network, *Snohomish County, 2005*

Developed database of independent electronics retailers. Recruited businesses to collect consumer electronic waste as part of the regional Take-It-Back Network.

Statewide Waste Characterization Study, *CIWMB, 2004-2005*

Field tested new C&D visual estimation method. Recruited businesses for generator study. Assisted with waste composition analysis and report writing.



**Patrick Malloy**  
*Research Assistant*

Patrick conducts research and analysis for a number of research projects. As a key recruiter for Cascadia's Waste Characterization study of Los Angeles County, Patrick recruited approximately 300 businesses to participate in this project. He also has extensive experience recruiting individuals for focus groups, demonstrated by his work for Cascadia's Beyond Waste project with the Washington State Department of Ecology. Patrick's strengths include data analysis and report-writing for waste and recycling-related projects, including the 2006 City of Chandler Waste Composition Study and the 2006 King County Recycling Program. Given his strong quantitative abilities, Patrick also assists the Cascadia Controller on financial work and data entry.

#### **Education**

Bachelor of Science in Biology, 2006  
University of Montevallo, Montevallo, AL

#### **Selected Experience**

**Waste Characterization Study as part of Base Year Study, County of Los Angeles, California, 2006-2007**

Assisted in the recruitment of approximately 300 businesses for this waste characterization study of the County of Los Angeles. Conducted hundreds of phone interviews and exchanges with Los Angeles businesses. Recruited businesses in person. Managed the database tracking of successfully recruited businesses.

**Beyond Waste, Department of Ecology, Washington State, 2006**

Recruited 40 stakeholders, including hazardous waste handlers, hazardous waste generators, state employees, and concerned citizens for statewide focus groups on improving the Department of Ecology's Hazardous Waste and Toxics Reduction website.

**Environmentally-Friendly Carpeting Information Resource, WA Department of Ecology, 2006**

Compiling and organizing data on the material composition, production methods, and environmental impacts of various carpeting options for the Department of Ecology to use in their Environmentally Preferable Purchasing program.

**Pentagon Waste Characterization Study, Department of Defense, 2007**

Handled logistical arrangements for all cross-country equipment transport. Accompanied sampling team to Washington D.C. and carried out the first season of a two season characterization of the entire Pentagon waste stream. Undertake much of the post-sort data entry, analysis, and report writing.

**King County Regional Recycling Campaign, King County, Washington, 2006**

Performed statistical analysis on waste sorting and survey data to determine the major components of the waste stream and identify potential recycling opportunities. Summarized findings in report for King County.

**C&D Waste Composition Study, Seattle Public Utilities, 2007**

Developed sampling plan for this city-wide effort to determine the amount of construction and demolition waste contained in the waste stream. Responsible for coordinating and carrying out all gatehouse survey activities. Assist with all seasonal C&D analysis and report writing.

**Waste Composition Study, City of Chandler, Arizona, 2006**

Performed statistical analysis on waste sorting and survey data to determine the major components of the waste stream and identify potential recycling opportunities. Summarized findings in report for the City of Chandler.

#### **Other Relevant Experience**

**Conservation and Quantitative Analyst, Ebenezer Wetlands, Alabama, 2003-2006**

Designed and conducted field research in an ecologically sensitive wetland preserve. Analyzed wetlands water flows, air and water quality, and genetic hybridization.

## **J. BRAD ANDERSON**

*General Manager*

Mr. Anderson has led some of the most demanding and comprehensive waste composition sampling programs on the West Coast. His experience in the field is complimented by his knowledge of sampling design, allowing him to respond appropriately to the challenges of difficult and tightly scheduled programs. As the General Manager, Mr. Anderson is responsible for the overall execution of each sampling. Working with the design team, haulers, and site operators, his input often heads off problems before they occur.

### **EXPERIENCE**

Sky Valley Associates, 1992 to present, representative studies:

- Seattle Public Utilities (SPU), **2006 Waste Composition Study.**
- Oregon Department of Environmental Quality (ODEQ), **2005 Statewide Composition Study.**
- California Integrated Waste Management Board (CIWMB), **2005 Statewide Composition Study.**
- City of San Francisco, **2004/2005 Waste Composition Study.**
- SPU, **1994, 1997, and 2005 Recycling Composition Studies.**
- CIWMB, **2004 Statewide Composition Study.**
- Orange County, CA, **2004 C&D/Self-haul Composition Study.**
- City of Phoenix, **2003 Waste Composition Study.**
- Washington Department of Ecology (WDOE), **2004 Roadside Litter Study.**
- ODEQ, **1992 - 2002 Solid Waste Characterization Studies.**
- WDOE, **2002 Rural Waste Composition Study.**
- King County, WA, **1993-1999 Waste Monitoring Programs.**
- CIWMB, **1998 Statewide Composition Study.**
- City of San Diego, **1996/97 Waste Composition Study.**
- American Plastics Council (APC), **1995 California RPPC Recycling Rate Study.**
- Sonoma County, CA, **1995 Waste Stream Characterization Study.**
- SPU, **1992-1998 Composition Studies and 1994/95 CDL Composition Study.**
- Clean Washington Center, **1995 Electronics Industry Waste Assessment.**
- Whitman County, WA, **1994/95 Waste Composition Study.**
- APC, **1993 Hospital Waste Characterization Study.**

### **EDUCATION**

B.S., Construction Management, Washington State University

**MARK N. WHITE**  
**PROFESSIONAL RESUME**

**REGISTRATION:** Registered Mechanical Engineer, California  
Qualified Environmental Professional

**EDUCATION:** BS Mechanical Engineering, University of California

**EMPLOYMENT HISTORY:**

- Pacific Waste Consulting Group  
Position: President  
Period 1994 to present
- EBA Wastechologies  
Position: Vice President and Regional Manager  
Period 1992 to 1994
- Resource Management International, Inc.  
Position: Project Manager and Manager of Solid Waste Projects  
Period 1989 to 1992
- Conversion Industries, Inc. (and Pacific Waste Management)  
Position: Senior Vice President  
Period 1984 to 1989
- PRC Engineers  
Position: Project Manager  
Period 1983 to 1984
- Cooper Engineers  
Position: Project Manager  
Period 1983 to 1984
- State of California (Air Resources Board, Integrated Waste Management Board,  
Department of Toxic Substances Control (all are current agency names))  
Position: Various Engineering Classifications

**Period 1969 to 1983**

**EXPERIENCE:**

Mr. White has been responsible for project management for complex projects, development of waste disposal and recycling projects, permitting, solid waste planning, and management activities. Following is a brief summary of the assignments that he has completed.

**PROFESSIONAL ACTIVITIES:**

Chairman of the American Society of Mechanical Engineers Solid Waste Processing Division,  
Western Chapter  
Past Chairman of the Mother Lode Chapter of the Air and Waste Management Association  
Member of the Solid Waste Association of North America  
Member of the California Refuse Removal Council  
Member of the California Resource Recovery Association  
Member of the Partnership for the Environment in Honolulu, Hawaii

President of the Board of Directors of Juvenile Diabetes Research Foundation, Northern California  
Inland (Sacramento Valley) Chapter

**LOCATION INFORMATION**

Pacific Waste Consulting Group  
5714 Folsom Boulevard, PMB 240  
Sacramento, CA 95819-4068  
(916) 387-9777  
(916) 387-9802 (Fax)  
Email mark@pwcg.net

# Appendix C: Forms

## Contractor Status Form

Contractor's Name Cascadia Consulting Group County King  
 Address 1109 First Avenue, Suite 400 Phone No. (206) 343-9759  
Seattle, WA 98101 Fax No. (206) 343-9819  
 Federal Employer Identification No. [REDACTED]

### STATUS OF CONTRACTOR PROPOSING TO DO BUSINESS:

Individual       Limited Partnership       General Partnership       Corporation       Other

#### INDIVIDUAL:

If a sole proprietorship, state the true name of sole proprietor: \_\_\_\_\_

#### PARTNERSHIP:

If a partnership, list each partner, including limited partners, stating their true name and their interest in the partnership:

\_\_\_\_\_  
 \_\_\_\_\_

#### CORPORATION:

If a corporation, place and date of Incorporation: March 4, 1993

Date corporation was authorized by Secretary of State: March 4, 1993

President: Marc Daudon Vice-President: Charlie Scott

Secretary: Charlie Scott Treasurer: Charlie Scott

Other Officers: \_\_\_\_\_

#### OTHER: (Explain)

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*SMALL BUSINESS PREFERENCE*

Are you claiming preference as a small business or as a non-small business certifying to subcontract 25% of the total bid amount?

- YES – Please attach approval letter from OSDS  
 NO

If claiming preference as a small business, date you filed for small business certification: \_\_\_\_\_  
Your small business ID No. \_\_\_\_\_

**NOTE: THIS FORM MUST BE COMPLETED OR YOUR BID MAY BE REJECTED**

*Client References*

List at least three (3) client references that can attest to the Bidder's qualifications to fulfill the requirements of the Scope of Work. List the most recent first. Client references must also be provided for any subcontractors identified in the Bidder's response. Duplicate and attach additional pages as necessary.

**BIDDER / SUBCONTRACTOR'S NAME:** Cascadia Consulting Group

**REFERENCE 1**

Name of Firm **City of Phoenix, Dept. of Public Works**

Street Address 101 South Central Ave.	City Phoenix	State AZ	Zip Code 85004
Contact Person Christine Williams	Telephone Number (602) 256-5602		
Dates of Service 1/1/03 – 12/31/03	Cost of Service \$150,000		

**Brief Description of Service Provided**

This study determined the composition of disposed solid waste from single-family sources in each of six waste collection districts, paying particular attention to the amounts of key recyclables and compostable organic materials present in the waste. Statistical comparisons were made among collection districts and also between neighborhoods that show high or low participation in curbside recycling programs.

**REFERENCE 2**

Name of Firm **King County Solid Waste Division**

Street Address 201 S Jackson St, Suite 701	City Seattle	State WA	Zip Code 98104
Contact Person Alexandra Thompson	Telephone Number (206) 296-8454		
Dates of Service 1/1/06 - present	Cost of Service \$630,600		

**Brief Description of Service Provided**

Since 1992, Cascadia has managed this multi-year study of waste flows into King County's transfer station system. The study involved the design of a system-wide study for (1) residential and (2) nonresidential waste delivered by franchised haulers, as well as (3) self-hauled waste. Cascadia conducted a transfer station vehicle survey to characterize waste by substream, vehicle type, and point of origin and waste sorts to characterize disposed material by each sector and the County overall.

**REFERENCE 3**

Name of Firm **Seattle Public Utilities**

Street Address 700 5th Ave., Suite 4900, PO Box 34018	City Seattle	State WA	Zip Code 98124
Contact Person Tim Morrison	Telephone Number (206) 615-1336		
Dates of Service 1995-present	Cost of Service \$95,500 (for 2007)		

**Brief Description of Service Provided**

For this study which is currently in progress, Cascadia integrates project management, research design, and the collection and analysis of sampling data to assess Seattle's residential waste stream. By the end of the study, a total of 360 samples will have been sorted and analyzed during monthly sampling events. Cascadia has conducted similar studies for the city since 1988 that permit comparisons across study years.

#### REFERENCE 4

Name of Firm **Wisconsin Department of Natural Resources**

Street Address	City	State	Zip Code
101 S. Webster St.	Madison	WI	57307

Contact Person Cynthia Moore	Telephone Number (608) 267-7550
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Dates of Service 6/1/02 – 3/31/03	Cost of Service \$150,000
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#### Brief Description of Service Provided

For this study, Cascadia conducted two seasons of sampling to characterize Wisconsin's residential, industrial/commercial/institutional, and construction & demolition wastes. A total of 400 waste samples were taken from 14 landfills throughout five regions of Wisconsin. Vehicle tonnage information was also gathered from each participating site and utilized during the data analysis phase of the project. Cascadia designed and produced a sampling plan and final report documents for this study; these included field forms, health and safety procedures, sampling methodology, and composition/quantity results for each substream, hauler type, and the 5 state regions.

#### REFERENCE 5

Name of Firm **Delaware Solid Waste Authority**

Street Address	City	State	Zip Code
1128 South Bradford Street	Dover	DE	19904

Contact Person Lynsey Konseko	Telephone Number (302) 739-5361
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Dates of Service 6/28/06-7/31/07	Cost of Service \$380,514
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#### Brief Description of Service Provided

For the Delaware Solid Waste Authority, Cascadia conducted a year-long statewide waste characterization study. This comprehensive study of Delaware's disposed waste stream involved characterizing residential, commercial, self-hauled, and construction and demolition waste as it arrived at each of the state's six solid waste facilities. Data was collected during each of four seasons, and a variety of waste characterization methods were used, including hand-sorting of samples as well as visual characterization of entire loads.

#### REFERENCE 6

Name of Firm **County of Orange**

Street Address	City	State	Zip Code
320 N. Flower St., Suite 400	Santa Ana	CA	92703

Contact Person Sue Gordon	Telephone Number (714) 834-4118
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Dates of Service 6/1/03 - 8/31/04	Cost of Service \$236,327
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#### Brief Description of Service Provided

Cascadia was contracted to conduct this waste characterization of three active landfills in Orange County, California. This study targeted self-hauled and loose roll-off box loads from 22 distinct jurisdictions of origin. The study included two seasons of waste sorting in summer 2003 and winter 2004, and collected over 880 samples. Additionally, six weeks of surveying yielded over 12,500 vehicle surveys.

*Client References*

List at least three (3) client references that can attest to the Bidder's qualifications to fulfill the requirements of the Scope of Work. List the most recent first. Client references must also be provided for any subcontractors identified in the Bidder's response. Duplicate and attach additional pages as necessary.

**BIDDER / SUBCONTRACTOR'S NAME:** Pacific Waste Consulting Group

**REFERENCE 1**

Name of Firm

City of Gilroy

Street Address

7351 Rosanna Street

City

Gilroy

State

CA

Zip Code

95020

Contact Person

Lisa Jensema

Telephone Number

(408) 846-0245

Dates of Service

2001 to current

Cost of Service

Varies

Brief Description of Service Provided

Composition of disposed C&amp;D, AB 939 services, and support for the Gilroy Garlic Festival.

**REFERENCE 2**

Name of Firm

Concord

Street Address

1950 Parkside Dr MS 1A

City

Concord

State

CA

Zip Code

94519

Contact Person

Peter Dragovich

Telephone Number

(925) 671-3085

Dates of Service

1997 to current

Cost of Service

varies

Brief Description of Service Provided

Analysis of disposal data. Analysis of self-haul data. Preparation of C&amp;D ordinance, and general AB 939 support.

**REFERENCE 3**

Name of Firm

Half Moon Bay

Street Address

501 Main Street

City

Half Moon Bay

State

CA

Zip Code

94019

Contact Person

Paul Nagengast

Telephone Number

(650) 726-8265

Dates of Service

1996 to current

Cost of Service

varies

Brief Description of Service Provided

AB 939 support, Pumpkin Festival recycling support. Self-haul evaluation, franchise evaluation and review.

*Client References*

List at least three (3) client references that can attest to the Bidder's qualifications to fulfill the requirements of the Scope of Work. List the most recent first. Client references must also be provided for any subcontractors identified in the Bidder's response. Duplicate and attach additional pages as necessary.

**BIDDER / SUBCONTRACTOR'S NAME:** Stanfield Systems, Inc.

REFERENCE 1			
Name of Firm [REDACTED]			
Street Address		City	State Zip Code
[REDACTED]		[REDACTED]	[REDACTED]
Contact Person		Telephone Number	
[REDACTED]		[REDACTED]	
Dates of Service August – December, 2004		Cost of Service \$7,500	
Brief Description of Service Provided Data entry and analysis for child development Facility Accreditation Project (CDFAP).			

REFERENCE 2			
Name of Firm [REDACTED]			
Street Address		City	State Zip Code
[REDACTED]		[REDACTED]	[REDACTED]
Contact Person		Telephone Number	
[REDACTED]		[REDACTED]	
Dates of Service August – December, 2004		Cost of Service \$3,000	
Brief Description of Service Provided Data entry and analysis for Traumatic Brain Injury Survivor study.			

REFERENCE 3			
Name of Firm [REDACTED]			
Street Address		City	State Zip Code
[REDACTED]		[REDACTED]	[REDACTED]
Contact Person		Telephone Number	
[REDACTED]		[REDACTED]	
Dates of Service January - May, 2004		Cost of Service \$20,000	
Brief Description of Service Provided Data entry and analysis for Program for Infant and Toddler Care (PITK).			

ATTACHMENT G

Small Business/Disabled Veteran Business Enterprises (DVBE) Participation Summary

MARK ONE FOR EACH FIRM USED		NAME OF FIRM	NATURE OF WORK	TOTAL AMOUNT OF WORK (Mark one for each firm used)		IS CERTIFICATION FORM ATTACHED?
PRIME BIDDER	SUBCON-TRACTOR			SMALL	DVBE	
		SUPPLIER				
	X	Pacific Waste Consulting Group	Waste Sorting Labor & Management	\$151,800	\$	Yes
	X	Stanfield Systems	Data Entry	\$	\$15,000	Yes
				\$	\$	
				\$	\$	
				\$	\$	
				\$	\$	
				\$	\$	
				\$	\$	
				\$	\$	

<i>To be completed by Contractor</i>	
Name of Contractor: <i>Cascadia Consulting Group, Inc.</i>	
Contract #: <i>IWM06045</i>	Work Order #:

## Recycled-Content Certification

Check this box if no products, materials, goods, or supplies were purchased with contract dollars and submit to your CIWMB contract manager.

This form may be completed by contractor, vendor, bidder, buyer, state-contracting officer, or state purchasing agent. The form must be completed and returned to the CIWMB with a row completed for each product purchased with contract dollars. Attach additional sheets if necessary. Information must be included, even if the product does not contain recycled-content material. Product labels, catalog/website descriptions, or bid specifications may be attached to this form as a method of providing that information.

Contractor's Name Cascadia Consulting Group, Inc. Date 4/16/07

Address 1109 First Avenue, Suite 400, Seattle, Washington 98101 Phone (206) 343-9759

Fax (206) 343-9819 E-mail Charlie@cascadiaconsulting.com Website www.cascadiaconsulting.com

Product Manufacturer	Product Description / Brand	Purchase Amount (\$)	<sup>1</sup> Percent Postconsumer Material	<sup>2</sup> SABRC Product Category Code	Meets SABRC
Harbor100	Copy Paper	Approx. \$30/box	30%	2	
First Choice Business Machines	Ink Cartridges for Savin Printer	Cost is through lease agreement for Savin copier	Cartridges recycled through Corporate Express	6b, option c	

Public Contract Code sections 12205 (a) (1) (2) (3) (b) (1) (2) (3) 10233, 10308.5, 10354, and 12205(a)

I certify that the above information is true. I further certify that these environmental claims for recycled content regarding these products are consistent with the Federal Trade Commission's Environmental Marketing Guidelines in accordance with PCC 12404.

Charlie Scott



Cascadia Consulting Group, Inc. 4/16/07

Print name

Signature

Company

Date

