



Memorandum

MONTEREY REGIONAL WASTE MANAGEMENT DISTRICT

Reviewed by: [Signature] Date: 6/14/19
General Manager

DATE: June 14, 2019
TO: General Manager
FROM: Senior Engineer and Director of Engineering & Compliance
SUBJECT: Authorize the General Manager to Execute the Contract for a Single Stream Recycling Characterization Study with SCS Engineers not to exceed cost of \$110,000

RECOMMENDATION: That the Board authorize the General Manager to execute the contract for a Single Stream Recycling Characterization Study with SCS Engineers. The cost for the services will be billed on time and materials basis with a not to exceed cost of \$110,000.

BACKGROUND

The Monterey Regional Waste Management District is responsible for implementing solid waste reduction, recycling, and diversion programs on behalf of its member agencies. The passing of AB939 required all jurisdictions (e.g., Cities and Counties) in California to divert at least 50% of their solid waste by the Year 2000. District member agencies reached that goal and are now aiming to reach the State of California's current goal of 75% diversion by the Year 2020.

The District began testing and adjustments of the new Material Recovery Facility (MRF 2.0) in February of 2018. Performance testing of the new sorting equipment was conducted in June 2018. Prior to the opening of MRF 2.0, the District operated a sort line to process Construction and Demolition (C&D) debris and did not previously receive nor process mixed Single Stream Recycling (SSR).

In 2012, the District conducted a waste characterization study of commercial Municipal Solid Waste (MSW) to assist in the design process of the SSR/MSW sort line in MRF 2.0. A characterization study of the single stream recycling materials being delivered to the District had not been conducted by MRWMD, the jurisdictions, nor the waste haulers. The District proposed conducting a characterization study of the single stream recyclable materials in 2018.

In 2018, the District conducted a single stream recyclable characterization study of commercial and residential Single Stream Recyclables (SSR) to assist with recycling operations, outreach, and to assess the need for processing and/or residual debris disposal charges. The study results were published in a report that was subsequently accepted by the Board.

DISCUSSION

In the past year and a half, the global recycling market has experienced dramatic changes due to China's imposition of unprecedented contamination standards (e.g., significantly lower limits on the amount of waste materials that is allowed to be comingled with the recyclable materials). These new contamination standards have changed the landscape of the recyclable commodities trade by requiring that contamination levels be below 0.5% prior to shipment to China. This requirement has lead sorting facilities in the U.S. to look at the sources and type of contamination found in the single

stream materials. The origin and type of contamination can be used to modify upstream collection processes or sorting behaviors of the customers (residential and commercial) to ensure that solid waste materials (e.g., non-recyclables) do not get into the sorting facility (e.g., MRF).

Recycling composition studies that characterize the types of materials present in the ‘recycling stream’ are important tools in the solid waste industry. The studies are designed to scientifically measure the contents of the recycling stream and report defensible information to the waste hauler and jurisdictions. The composition study involves discrete sampling and sorting of material types into components such as plastic, cardboard, glass, metal, contamination (non-recyclables), etc.

The information collected by this effort is valuable and can be used for several purposes including, but not limited to, the following:

- Identify types of materials in the recycling stream
- Identify the percentages of the various material types in the recycling stream
- Identify contamination levels in the recycling stream
- Identify potential hazards in the recycling stream
- Assess diversion efforts within specific jurisdictional areas
- Inform hauler’s outreach campaigns and subsequently, the quality of the recycling stream
- Fine tune MRWMD’s MRF operations

The characterization study is designed to collect a sufficient number of samples of a representative size (e.g., weight) to characterize the recycling stream that the materials came from (e.g., various municipal areas). The table below indicates the number of samples that will be taken for each jurisdictional area:

| Municipality and Collection Company | Tons Per Month | Number of Samples Per Load |
|---|-------------------|----------------------------------|
| <i>Greenwaste Recovery</i> | | |
| • Marina | 170 | 10 |
| • Sand City | 10 | 5 |
| • Del Rey Oaks | 25 | 5 |
| • Seaside | 265 | 10 |
| • Carmel by the Sea | 150 | 10 |
| • Pebble Beach | 110 | 10 |
| • Pacific Grove | 175 | 10 |
| <i>Monterey Disposal</i> | | |
| • Monterey (Estimated tons) | 175 | 10 |
| <i>Waste Management</i> | | |
| • Unincorporated Monterey | 1350 | 40 |
| • King City | 150 | 10 |
| <i>Republic Services</i> | | |
| • Salinas | 1600 | 50 |
| <i>City of Watsonville Public Works</i> | | |
| • Watsonville | 12 | 10 |
| <i>Recology</i> | | |
| • San Benito | 416 | 20 |

Each sample consists of 150 lbs. of material that is weighed and sorted into its components. The components are then weighed individually and documented to determine the contents of the load. The number of samples noted above represents a statistically significant sample size for the given community and its recycling stream. The result of the

study is a defensible set of data that can be used to incentivize proper recycling and design public information campaigns. Given the market conditions being experienced, staff recommends the completion of this study on all jurisdictions delivering single stream recycling to MRWMD so steps can be taken to reduce the amount of contamination in the loads and ultimately in the materials being sold by the District.

FINANCIAL IMPACT

Funds for this project are included in the FY 2019/20 professional services expense budget. Reduction in the amount of contamination handled by the District in the MRF and increased bale quality will enable the District to more effectively and profitably market recyclable commodities in the future.

STRATEGIC PLAN

The SSR Composition Study fits under several general policy directives cited in the District's "Pillars of Sustainability" plan.

Environment. Understanding what is in the recycling stream and the origin of the materials is the first step in creating targeted action plans to increase the quality of recyclables delivered to MRWMD from each of the jurisdictional areas. Higher quality recyclables mean an increased ability for commodities to be recycled and diverted from landfills.


People. Identifying the potential safety hazards in the recycling stream helps to protect District staff from injury. This composition study will identify potential safety hazards and enable staff to educate the public as to why keeping dangerous materials out of the recycling bin is important. In addition, the District can implement safety standards if and when dangerous materials are discovered.

Community. The study can help inform targeted community outreach campaigns by the hauler and the District for underperforming areas of the community. The study data will increase awareness and participation by the community in ensuring the recycling stream is kept clean. Increases in the quality and quantity of recyclables will mitigate the rate of cost increases over time; both the District's and a Community interest.

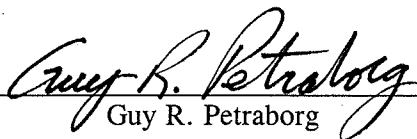
Financial. Quality bales that meet the contamination standard are sold at higher prices than bales that do not. Increasing the quality of the bales means the District can sell recyclables at higher prices. Having less contamination in the recycling stream received at the District's MRF will result in lower operating costs to handle that waste.

CONCLUSION

Conducting a study to characterize the materials in the recycling stream that are being received at the District's MRF will have multiple benefits of informing the MRF operations, informing improvements in the public outreach of recycling programs, reducing contamination in the recycling stream, and improving the quality of the bales of recyclable materials. Staff therefore recommends that the Board authorize the General Manager to execute the contract for a Single Stream Recycling Characterization Study with SCS Engineers. The cost for the services will be billed on time and materials basis with a not to exceed cost of \$110,000.



David Ramirez



Guy R. Petrabor

June 13, 2019

Mr. David I. Ramirez
Senior Engineer
Monterey Regional Waste Management District
dramirez@mrwmd.org

Subject: **Recycling Characterization Study**

Dear Mr. Ramirez:

Monterey Regional Waste Management District (MRWMD) has requested a proposal from SCS Engineers (SCS) to conduct physical characterizations of the commercial and residential single-stream recycling hauled by GreenWaste Recovery, Monterey Disposal, Waste Management, Republic Services, Recology San Benito County and City of Watsonville Public Works. The goal of this project is to understand the level of contamination in each recyclables load delivered to the MRWMD Material Recovery Facility (MRF) by the franchised hauler for each municipality they service and compare the data to the 2018 recycling characterization study SCS performed. The study will inform outreach staff on contamination challenges and where to target behavior change and outreach efforts.

SCOPE OF WORK

To complete this assignment, SCS will:

1. Provide two SCS Sampling/Sorting Managers and four field sorters for fourteen days of field activity.
2. SCS will provide Health and Safety training at the start of the field activity to personnel involved in sampling and sorting of recyclables.
3. Provide equipment and materials for conducting the field activity, including safety equipment, personnel protective equipment, scales, and other equipment deemed suitable and necessary for this project.
4. Manually sort 200 150-pound recycling samples.
5. Record data for recycling sample and record data from a visual characterization of the residual material category.
6. Provide a report with results.
7. Provide a protocol to assess contamination in single-stream recycling loads.

A detailed description of the tasks to be undertaken by SCS are described below.

Task 1: Project Kick Off Meeting

Following contract award, SCS will meet with MRWMD staff to clarify mutual expectations and objectives for the study. SCS proposes the same methodology used to complete the 2018 recycling characterization study. Adjustments to this methodology will be discussed at the initial meeting. SCS will request background information regarding the recyclables collection, including 2018 tonnages, routes, and special circumstances. SCS will prepare a detailed stratified sampling plan that identifies the targeted recycling routes and includes representative samples from each hauler and municipality. Based on available information, SCS will create field data forms, develop the field protocols, and define the project schedule.

SCS will discuss the following at the kick off meeting:

- Any changes of the list and definitions of materials from the 2018 study.
- The proposed sampling and sorting schedule.
- Field forms.
- The protocol for load and vehicle selection, sorting procedures, and combining and splitting material categories.
- Reporting schedule.

Deliverables

- SCS will prepare meeting notes confirming all actions and next steps.

Task 2: Develop Methodology and Sampling Protocol

Based on information provided by MRWMD at the kick off meeting, SCS will develop a sampling protocol, which details the field procedures, sampling plan, and sorting material categories. SCS recommends selecting ten samples per day from the commercial and residential single-stream recycling loads over an twenty day period (Monday through Friday), or a total of 200 150-pound samples. This number of samples will provide precision by hauler and community detailed in Table 1. If the MRWMD would like to split the characterization into four quarters over the year, the number of samples will be split evenly by municipality during those periods. With the exception of Unincorporated Monterey County and City of Salinas, which will be sampled each quarter (10 samples per quarter) due to its large quantity of material.

Efforts will be made to minimize sampling biases or other impacts on the integrity of the database, consistent with good practice in such sampling programs. To this end, field activities will be coordinated to avoid holidays and other out of the ordinary events.

Number of Samples

Sample size design is based on the premise that by specifying goals for a confidence interval, it is possible to compute the number of samples required to achieve these goals. The goals are typically stated in terms of two criteria for evaluating statistical procedures: validity and sensitivity.

Validity involves the likelihood that the confidence interval contains the true parameter of interest, namely the proportion that each recycling component comprises of the total recycling stream. For this project, SCS will develop a 90 percent confidence interval for each material (i.e., the confidence interval will contain the true proportion of each material with 90 percent probability).

Sensitivity involves the ability to pinpoint the true recycling composition. It has the sense of precision and accuracy. A reasonable measure of sensitivity would be the length of the confidence interval, or half-length since the confidence interval is constructed around the sample average. Recent studies we have conducted to assess the contamination in incoming source-separated loads of recyclable materials have indicated that contamination is about 16 to 27 percent by weight due to its large variability. Contamination from load to load can be quite variable, with some loads having very little contamination and other loads having significant quantities. Additionally, the weight of contaminants varies considerably given the difference between polystyrene and food or for something large like a tire.

Based on data we have collected from the 2018 study, the contamination percentage that will be estimated will have an associated precision level, which is based on the variability in the data and the number of samples, as presented in **Table 1** below. In addition, **Table 1** identifies the number of samples recommended by SCS for each municipality in order to provide statistically reliable data. The number of samples is, based on the estimated monthly tonnage provided by MRWMD and from the 2018 study.

Table 1. Number of Samples and Anticipated Precision Level

| Hauler (City) | Tons/ Month | No of Samples | Anticipated Precision for Average Contamination | |
|---|----------------|------------------|--|-------------------------|
| | | | Composition | Tons/ Month (tpm) |
| Greenwaste Recovery | 905 | 60 | | |
| Marina | 170 | 10 | +/- 7.2% | +/- 12 tpm |
| Sand City | 10 | 5 | +/- 10.2% | +/- 1 tpm |
| Del Rey Oaks | 25 | 5 | +/- 10.2% | +/- 3 tpm |
| Seaside | 265 | 10 | +/- 7.2% | +/- 19 tpm |
| Carmel by the Sea | 150 | 10 | +/- 7.2% | +/- 11 tpm |
| Pebble Beach | 110 | 10 | +/- 7.2% | +/- 8 tpm |
| Pacific Grove | 175 | 10 | +/- 7.2% | +/- 13 tpm |
| Monterey Disposal | 175 | 10 | | |
| City of Monterey | 175 | 10 | +/- 7.2% | +/- 13 tpm |
| Waste Management | 1,500 | 50 | | |
| Unincorporated Monterey County | 1,350 | 40 | +/- 3.6% | +/- 49 tpm |
| King City | 150 | 10 | +/- 7.2% | +/- 11 tpm |
| Republic Services | 1,600 | 50 | | |
| Salinas | 1,600 | 50 | +/- 3.2% | +/- 51 tpm |
| City of Watsonville (Public Works Dept.) | 120 | 10 | | |
| City of Watsonville | 120 | 10 | +/- 7.2% | +/- 9 tpm |
| Recology | 416 | 20 | | |
| San Benito | 416 | 20 | +/- 5.1% | +/- 21 tpm |
| Total | 4,716 | 200 | +/- 1.6% | +/- 76 tpm |

Transfer Station / Sort Location Considerations

Conducting characterization studies at a solid waste transfer station or MRF involves strategic planning, preparation, and scheduling. The main objective is to not disrupt normal activities at the

facility, while still accomplishing the goals of the sampling plan. For this project, we propose the following steps to create minimal impacts to the transfer station operations:

- Visit the MRWMD MRF / Transfer Station site prior to sampling/sorting date;
- Identify contact at site where sampling/sorting will be performed;
- Make arrangements for reserving an area where loads will be set aside for sampling/sorting;
- Establish procedures with facility representatives for off-loading of waste at the designated areas;
- Provide equipment to be used in waste sampling/sorting, such as personal protective equipment, loader, scales, sorting tables, shovels, rakes, brooms, and buckets;
- Create tally sheets for recording sampling/sorting; and
- Review safety and sampling procedures with field crew.

Deliverables

- The material list and definitions of materials.
- The proposed sampling and sorting schedule.
- Field forms.
- The protocol for load and vehicle selection, sorting procedures, and combining and splitting material categories.
- Reporting schedule.

Task 3: Conduct Sampling and Recycling Characterization

SCS will provide a Site Manager experienced in supervising recycling characterization studies, an assistant to help manage the sampling and sorting operations and a sorting crew (People Ready) to carry out the field sampling for the study. To maximize the use of resources, we propose to conduct the hand sorting using a crew of four sorters over a period of twenty days. The sorting crew will be fully equipped with hard hats, gloves, safety glasses, vests and other safety equipment. SCS will provide scales, data forms, and other equipment necessary to conduct the field work. A Health & Safety Plan will be prepared for this project and provided to the MRWMD for review and comment prior to the field work. SCS staff and the sorting crew will attend a Health and Safety briefing from MRWMD staff as well. Like 2018, we assume MRWMD will provide a loader and operator to assist with moving selected samples.

SCS relies on proven protocols and a trained crew to ensure meticulous field work and consistent, reliable results. Our approach to conducting the highest quality field work is described below.

Selecting the Samples to Be Sorted

SCS will develop a stratified sampling plan in order to select representative commercial and residential routes for sampling and sorting. Randomly-selected vehicles targeted by hauler and municipality will be directed to dump their recyclable loads into a designated area at the MRWMD MRF. The SCS Sort Supervisor will consider two important methodological factors:

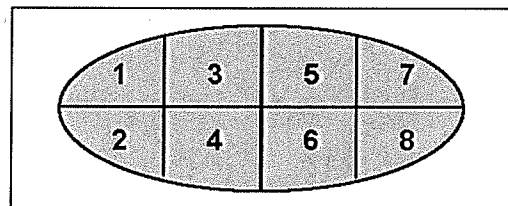
1. The target vehicle selected for sampling will contain representative recyclables collected from a particular municipality; and
2. The process of acquiring the recyclable sample will not, in itself, alter the apparent composition of the sample.

The SCS field staff's responsibilities include interviewing truck drivers to screen out atypical loads, supervising the sorting operation, and providing quality assurance of sorting, weighing, and data recording. Given the limited size of the data set, it is important that simple random sampling (and the potential for unrepresentative data) be avoided. To this end, incoming vehicles will be interviewed briefly to assess the "representativeness" of each load, the point of origin, and other specific information.

If the targeted recyclables collection vehicle is deemed suitable for sampling and sorting, the SCS field staff professional will then direct the driver to a pre-arranged area at the MRF for load discharge, and the sample will subsequently be obtained as follows:

1. The vehicle dumps its load onto the designated area. This area should have sufficient room to allow inspection and access around the pile.
2. The load is visually separated into approximately eight subsections (see **Figure 1**). The SCS field staff randomly selects a subsection to be sampled and directs an end loader to grab the sample from the subsection. The sample will be weighed prior to sorting to ensure an appropriate sample size of approximately 150 pounds.

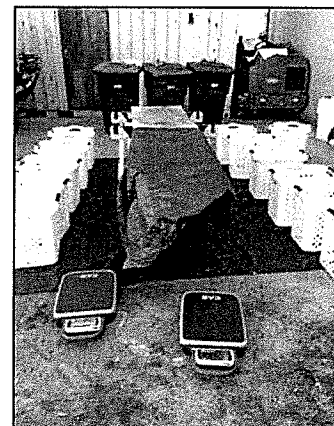
Figure 1. Plan View Showing "Cells" of Pile



3. This material will then be transported to the sorting area for weighing and sorting.
4. A photograph of the sample will be taken at this time as well, including any unique information about the sample.

Hand-Sort Procedure

Our hand sort procedure is based on ASTM procedure D 5231- 92. The recyclables samples will be placed on a sorting table (or equivalent) and separated by hand into the pre-determined material types. The material types may include Cardboard, Mixed Paper, Plastics 1-5, 7, Aluminum and Steel, Glass Containers, Organics (Food Recycling, Food Soiled Paper, and Yard Recycling), and contaminants. Separated materials will be placed in containers to be weighed and recorded. Members of the sorting crew will be assigned material categories to focus on. For each sample, the SCS Site Manager will



review the sorted material for homogeneity before the containers are weighed, and will record the weight for each sorted material category on a sampling form.

Visual Characterization of Contaminants

Once the entire sample is sorted into the defined material categories, the contaminants bin will be emptied onto the ground, and separated for viewing. SCS will perform a visual characterization by visually splitting the contaminants material into eight sections, and then estimate the percentage of notable material by volume. For example, if after reviewing the entire sample there appears to be a significant number of juice cartons or film plastic, those percentages would be noted. The objective is to identify large amounts of contaminants that will help inform the MRWMD on next steps for outreach efforts and changes to the recycling program.

Task 4 – Compile Sampling Results and Perform Data Analysis

The SCS Field Supervisor will place data on a *Material Weight Tally Sheet* for each sample, and input all data from the sheets into a spreadsheet designed by SCS Engineers. This spreadsheet will then be sent for review and Quality Assurance / Quality Control, confirming information was input correctly into the system. SCS will perform final data analysis, which is described below.

1. Conduct quality control measures to ensure accuracy of data entered. The data entered will be verified for accuracy and adherence to the hand-written sampling forms.
2. Calculate composition estimates using the ratio of the material's weight to the total sampled recycling. Provide standard statistical analysis to determine average composition, standard error, and confidence interval at the ninety-five percent (90%) confidence level using annual disposal totals.
3. Provide findings in an Excel Spreadsheet and submit along with the draft and final report that includes a summary of characterization data and findings.
4. Develop detailed estimates of recycling composition for each material type, presented with confidence intervals at the 90% confidence level. The MRWMD will provide annual tonnage data to serve as the basis for this analysis.

Task 5 – Draft and Final Report

A draft and final report will be prepared presenting the results of the study. The draft report will include the number of samples analyzed by hauler and municipality, the quantity of material by types, in pounds and percent of total, and the types of materials and contaminants found in the recycling stream. Field data and photographs will be appended.

The draft report will be submitted and include:

1. A summary of the characterization data and findings for each municipality. If the MRWMD decides to perform quarterly characterizations, a quarterly report will be prepared including the municipalities that were characterized that quarter.
2. Findings in an Excel Spreadsheet.
3. Detailed estimates of recycling composition by material type, presented at a 90% confidence level. The analysis will be based on annual tonnage data provided by MRWMD.

4. The relative presence of material categories and contaminants in the recycling stream will be shown using pie charts. .

SCS will submit a draft report to MRWMD staff within 4 weeks after completing the characterization study. Following receipt of comments and edits from MRWMD staff in response to the draft report, SCS will revise and submit the final report within seven business days. If MRWMD decides to split the characterization into four quarters, a brief report will be provided for each quarter and include data from the characterization performed for each municipality.

Task 5 Deliverables

- Draft and Final Report

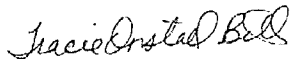
BUDGET

Work will be performed on a deliverables basis in accordance with SCS's Standard Fee Schedule and your project priorities. A copy of the schedule and budget are included in **Attachment 1**.

CLOSING

We look forward to working with you on this project. If you have any questions regarding this submittal or desire any additional information, please contact the undersigned.

Very truly yours,



Tracie Bills
Northern California Director of SMM
SCS ENGINEERS



Michelle P. Leonard
Vice President
SCS ENGINEERS

