



MRF Audit Guide

Material Stream Compositions

CIF Project 803



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This guide is provided as opinion for discussion only and is not designed to replace qualified engineering, architectural or legal advice in any way. Municipalities are cautioned to obtain qualified advice and certified/approved drawings, plans and/or permissions prior to undertaking or adopting any recommendations that may affect their programs or facilities.

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PREFACE

The purpose of this document is to provide municipalities with a reference document for planning composition studies, commonly referred to as audits, of Blue Box recyclables received at their Material Recycling Facility (MRF) or at a contracted (third party/private sector) MRF.

The procedures outlined in this document cover sampling and sorting for inbound (feedstock) audits, residue audits and end-product commodity audits.

The procedures can be applied to all recycling program types (i.e. single, dual or multi-stream) and from all generating sectors including: single and multi-family, depots and Industrial, Commercial & Institutional (ICI).

It is important for the reader to recognize that while the information provided can be employed as written, local circumstances, situations or conditions may require adjustments to the procedures. This document is intended as a guide to assist municipalities with the planning and implementation of MRF audits and is not a comprehensive procedure for carrying out the work. Municipalities must conduct the work in accordance with their own health and safety policies and standard operating procedures or engage qualified consultants to perform the activities.

It is recommended that every audit that takes place in a MRF include team members and active participation from each party, namely the municipality and the MRF operator even if the work is to be performed by a third party. Provided the audit work was performed in a professional manner, with active participation from both parties, there can be no question about integrity of the data when the results are presented. The success or failure of an audit is directly linked to the project manager's ability to effectively engage the MRF owner/operator in the development and execution of the audit.

This reference document outlines and provides a general guide for planning and conducting audits on inbound (feedstock), residue and outbound material specific sorted commodities. Good quality audits will assist municipalities in determining the relative performance of the recycling program and provide a source of relevant data from which to plan and implement continuous improvement.

1.0 AUDIT PURPOSE

Rights to conduct audits should be clearly stated in the municipality's Request for Proposal (RFP) when procuring services for Blue Box recyclables so as to clearly articulate the municipality's performance expectations. For more information on preparing contractor specifications, refer to the CIF's web page for resources and training courses; <http://cif.wdo.ca/>

While the purpose, and scope, of your audit program is unique to your municipality's needs, typically, audits are performed to measure and monitor your program performance relative to a set of standards and expectations. For example, if your solid waste management plan outlines a target for recovery rate (program wide

and/or material specific), audits at the MRF can provide clear information on your degree of success at achieving that goal. For example:

- Inbound (feedstock) audits assess the quality of material delivered for processing as well as the quantity of specific material types within your recycling stream. By knowing these, subsequent MRF processing operational analyses (if desired or required) could be performed to assess material (general or specific) recovery performance.

Inbound contamination levels provide direct information about program participation, the degree to which educational materials are understood by program participants and curbside collection enforcement performance. Knowing your municipality's material composition and residue level can lead to a more informed discussion with MRF operators/haulers about fees and collection enforcement performance.

- Outbound residue and commodity audits assess the degree to which your contracted MRF's operation is fulfilling its contractual obligations in terms of material recovery (either broadly or material specific) material quality and revenue generation. Residue audits yield information about the overall, and relative, amounts of unsolicited waste (non-recyclable materials) and process loss (recyclables that weren't recovered). High levels of either material result in increased processing costs. Similarly, audits of baled or sorted stockpiled commodities can provide information about the degree of contamination (residue in the finished product) and/or cross contamination (recyclables incorrectly sorted and sent to the wrong market).
- Minimizing inbound contamination aids in increasing material recovery, quality/revenue, diversion rates and lowering operating costs. However, it must be recognized that residue generation and cross contamination in any MRF is not 100% avoidable. Therefore, establishing reasonably acceptable residue and cross contamination levels is a requirement. For municipalities that own their MRF or contract with a private sector MRF for whom processing of recyclables is exclusive to your municipality, outbound composition auditing is straight-forward, however, for municipalities that contract with a private sector MRF processing recyclables from multiple municipalities, objectively auditing the material recovery based on only your own municipal feedstock is difficult and likely not practical. In this case, inbound, source separate, feedstock audits should be utilized to determine processing rates and revenue share (if included in the contract) and outbound audits should only be used if benchmarked against the overall combined inbound feedstock for evaluating overall processing performance.

2.0 PREPARING FOR AN AUDIT

It is important to have a planning framework in place for conducting audit work at any MRF, including privately operated MRFs. Safety, above all other issues, is the paramount concern when planning for an audit. Ideally, the planning framework should be established formally and written into the RFP/tender/contract document(s) whereby specifics for the assessment are clearly established and agreed to in advance. However, even if a procedure has not been previously articulated, it can be established intra-contract through negotiation with the MRF processor.

CIF has a reference document entitled, “Curbside Waste Audit Considerations for Small Communities” and much of the information contained in that document is applicable to the planning of an audit. (See: <http://cif.wdo.ca/pdf/CIF-Waste-Audit-Curb-Sm-Communities.pdf>)

At a high level, the procedures should include the following:

- Defined audit frequency;
- Defined procedures such as:
 - Lead and support staff
 - Required equipment (sample selection, sorting, and personal protection)
 - Location where the work will be performed
 - Scheduling and communication plan (both prearranged and ad hoc)
 - Funding (i.e. who pays for the audit)
 - Reporting (timing post-audit, content and level of detail)
- Defined quantity for analysis
- Municipal representation on the audit team (either active or passive)

With respect to scheduling, the procedure can be both pre-determined for scheduled intervals and/or unscheduled. Unscheduled, or “spot” audits can, and should, be performed on specific deliveries if new sources of recyclables are received or, in the opinion of the MRF operator (or the municipality), higher contamination levels from a given source of material or load is suspected. For example, if a new transfer station (or depot) is added to a municipal program, this may warrant a spot audit.

Furthermore, spot audits may be appropriate, from time to time, on routine loads if it is suspected that a given collection route/driver, is underperforming. Audits can be at any frequency (weekly, monthly, quarterly, annually or spot) based on the needs of the municipality and/or MRF contractor. Regardless of the frequency, audits should be considered a vital component of a municipality’s ongoing measurement and monitoring program.

The following procedures should be employed when conducting any audit. These will help to ensure that the audit results are accurate and representative.

Communication

MRFs are inherently dangerous operations and can be particularly so for audit staff who are unfamiliar with the specific operation of the facility. To ensure that an audit is performed safely, effectively and efficiently, a communication plan between the MRF staff and the auditing team should be established in advance, complete with defined roles and responsibilities. For inbound audits, this would involve ensuring weigh scale staff, tip floor staff and the auditing team are aware of when a subject load arrives at the site and how/where to manage the tipped material. For outbound audits, this would involve specific MRF staff (i.e. baling operators, loader operators) and the auditing team to ensure appropriate sample selection and transport to the auditing area.

Equipment

Table 1 below outlines a basic sample of equipment and supplies that should be used. Ideally, the auditing area would be a minimum of 7 meters by 7 meters, in a climate controlled building complete with good ventilation and lighting. If, however, a secure indoor area is not available, an exterior space should be provided in a low vehicle traffic area, under a temporary tent with temporary fencing suitable to control windblown material from the sorting tables.

Table 1: Sample Audit Equipment and Supplies

Personal Protective Equipment	Sorting Equipment	Safety
Tyvek coveralls (disposable)	Digital scale	Health and Safety Plan
Certified steel toe footwear	Large and small plastic bins	First aid kit, eye wash kit
Dust masks and hard hats	Garbage bags and labels	Cell phone and contact list
Puncture resistant gloves	Sorting tables, broom, shovel	Fire extinguisher
Safety glasses and ear plugs	Digital camera, audit logs & forms	Traffic cones
High visibility safety vests	Tent, temporary fencing, tarps	

3.0 INBOUND (FEEDSTOCK) SAMPLING

Performing inbound (feedstock) audits at your MRF can be viewed as supplementary to performing curbside audits. However, if curbside audits have not been performed, inbound audits can serve as a means to document the quality of material collected. Additionally, inbound audits can serve to verify composition to support contract management activities at the MRF including but not limited to, tip/processing fees paid to the MRF operator and confirming the feedstock complies with contracted collection specifications.

Ideally, sampling should be conducted over a full curbside collection cycle (e.g. Monday-Friday) to ensure material from across the municipality is represented. The audit dates should avoid weeks that could represent atypical generation habits (i.e. immediately after a holiday weekend or break) so as to avoid misrepresentation of the feedstock quality or composition. Additionally, and similarly to when curbside audits are performed, advance notice to program participants should be avoided to prevent behavioural change and notifying collection drivers in advance should be avoided to prevent any change in collection habits.

The inbound audit procedure can be designed several different ways depending on the type of information desired. A variety of operational and logistic factors come into play when determining how to perform an inbound audit, such as tip floor space availability. There are a number of sampling options available including:

- 1) Random: Extraction of material from the inbound receiving pile on the tip floor that can't be or is not identified from any particular source or vehicle type
- 2) Specific: Extraction of material identified/separated by truck type or source (i.e. curbside, front-end, roll off, specific route/driver) and/or by a particular generating sector (i.e. single family, multi-family, specific depot, ICI or individual municipality).

If the MRF does not have available tip floor space or sampling from a given vehicle type or material source is not needed, Option 1 would be the choice. Option 2 would be the choice if segregation of inbound loads is possible and contracts/programs require separate data for your monitoring and measurement metrics.

If your municipality is the only source of recyclables processed at the MRF, then the means by which material selection and segregation is done are clear. If the MRF services more than one municipality, then the audit coordination and segregation becomes more complex.

- If the MRF processes a single municipality's material exclusively, the receipt of material on the tip floor could be managed such that different sources or vehicle types could be tipped in different areas. This would facilitate composition qualification by source and/or vehicle type. In this case, accumulation of a sufficient quantity of material is all that would be required prior to sample selection (then subsequent auditing). If sampling by source/vehicle type is not required to suit your needs, an amalgamated sample from all of your sources would be sufficient (i.e. Option 1).
- If the MRF processes multiple municipal materials, the tip floor segregation of your loads should be performed (i.e. Option 2). By segregating your feedstock from that of other sources, the auditing would yield results specific to your municipality thereby avoiding any bias towards the overall or general feedstock quality delivered to the MRF. This could also prove financially beneficial to your municipality in so far as knowing your municipality's individual composition, relative to that of other jurisdictions and/or the MRF's overall inbound composition, could serve as a negotiating point to lower your

tipping/processing fees (provided that your feedstock met with the processing requirements and contained minimal contamination).

Sampling Guidelines

Option 1, Random Inbound Receiving Pile Sampling

For the purposes of this section, whereby tip floor segregation of loads cannot be accommodated due to limited floor space and your municipality is the only source of material processed by the MRF. As such, the sample would contain material from multiple sources or generators and multiple vehicle types from only your jurisdiction. A sample of unprocessed tip floor material will be extracted from the receiving pile for the audit.

Sample Extraction

A minimum 1,250 kg should be sampled over the course of an audit. The 1,250 kg can be an aggregate sample collected from several separate (daily or individual load) sub-samples, provided the minimum sub-sample size is 250 kg. The sample will provide an estimate of composition of the inbound material prior to processing. It should be noted that CIF's curbside audit methodology uses 100 households (two-week recycling generation per household) as a representative sample size for a municipality. The recommended minimum 1,250 kg sample size ensures the equivalent of two-weeks' generation from over 100 households is represented.

- Prior to sample selection, a tare weight of the tip floor loader (or secondary transportation container and vehicle, if used) should be obtained and recorded on the audit log form.
- The tip floor loader will take random, unbiased, scoops from five to seven separate locations from the material on the tip floor (each weighing approximately 100 kg).
- The sample locations should be evenly spread throughout the pile, including both low and high areas.
- The loader should approach the pile and insert the bucket into the pile at the designated location and height, to obtain the sample. To avoid crushing sample material with the wheels of the loader, the scoops from the bottom areas of the pile should be collected prior to taking scoops from higher in the pile.
- Scoops from the bottom of the pile should be taken at approximately 15 cm above the floor as this will avoid biasing the sample from small / broken items that could skew the composition results.
- The five to seven scoops will be dumped in a separate, clear/clean area of the tip floor and mixed gently with the loader. From this pile, a minimum 250 kg sub-sample will be collected.
- Depending on the location of the auditing area relative to the tip floor, the collected material could either be driven by the loader to the weigh scale to obtain a gross weight, weighed on a portable scale brought in for the audit or transferred to a secondary transportation container. The gross weight minus the tare weight will yield the sample weight. If a secondary transportation

container is to be used (as opposed to the loader), the material sampled by the loader should be placed (dropped slowly) into a secondary container (such as a Gaylord box, rolling cart, roll-off bin or similar) on the tip floor. Slowly putting the material into the secondary container will avoid unnecessary breakage of bottles which, when sorted, could skew the composition results.

- Once the net weight of the sample has been obtained, it should be transported to the audit area. If secondary transportation containers are used, the material should be placed (tipped slowly) into a pile near the sorting table.
- This process will be repeated until a 250 kg sub-sample has been obtained.

The purpose of obtaining the sample weights prior to sorting is to verify that the required sample size is obtained and once the audit has been completed, the pre and post weights can be compared to determine any differences. Note that vehicle truck scales, if used to weigh the pre-sorted weights, may not have the same degree of accuracy as a floor scale used to weigh the post-sorted materials. This can result in audit results that appear to show less/more post-sort material than is actually present. If possible, use more accurate (0.01 kg) floor scales for all measurements to avoid the appearance of sort results tampering. Ideally, each audit should span the municipality's full collection cycle days and be performed seasonally.

Option 2, Specific Sampling by Source or Vehicle Type

If your municipality is the only source of recyclable material processed by the MRF, determining the composition by vehicle type and/or source is beneficial to understanding the differences therein and could lead to modifications to collection procedures or P&E materials. Furthermore, if your municipality consists of several local municipalities, determining the composition by local sub-set could identify better and less than ideal performers which would serve as a feedback mechanism for continuous improvement. Similarly, Option 2 should be used if your MRF processes materials from multiple jurisdictions since it will clearly identify the quality of your recyclables relative to that of the other generators.

This methodology requires a clear communication plan along with the assistance of scale house staff and tip floor staff. The lead auditor role should be to coordinate with scale house staff to ensure that auditors and MRF staff are notified when a particular truck type or source of material arrives at the MRF. Upon scaling-in, the vehicle would be tipped in a pre-determined location on the tip floor segregated from the general receiving pile.

On each of the sampling days, at least one inbound vehicle (by vehicle or source type) should be selected for auditing. Depending on the number of vehicles per day, and the frequency at which they tip during the day, the number of daily samples can increase. Where possible, loads arriving in the morning and afternoon should be sampled from each day.

Ideally, the sampling procedure should be designed to gather samples from as many different sources and/or vehicle types as possible, based on a historical ratio of material quantity received. For example, if the MRF receives 75% of the material

from single family curbside and 25% from multi-family, the total number of samples obtained and audited should correspond with that ratio.

Each audit should span a municipality's full collection cycle days and be performed seasonally.

For each vehicle to be audited, it must weigh in at the MRF before tipping and weigh out after tipping. The scale ticket will be included as a record of the load by the auditing team as part of the documentation procedure. The load must be tipped in a clear area of the tip floor and not mixed with other material in the general receiving pile.

Sample Extraction

From each vehicle identified for auditing, a 100 to 150 kg unbiased sub-sample must be extracted. The minimum recommended number of sub-samples audited over the course of an audit is 12, totalling a minimum 1,250 kg overall. In this instance, unbiased means that a random sample from the load will be taken as opposed to a section of the load that appears visually to be relatively free of or contain greater quantities of contamination. The following steps should be used to extract the sub-samples:

- The MRF loader will gently mix/turn-over the load approximately three to five times. This ensures a thorough blending of the load and counteracts any settling that may have occurred during collection and transport. Care should be taken to not crush items by driving over the material.
- To extract a sub-sample, a modified 'cone & quarter' method should be used. From two of the four corners of the load, the loader operator will approach and extend the loader bucket into the pile to back-drag out some material. The back-dragged material from these corners should be amalgamated. The material not selected should be moved into the general receiving pile on the tip floor. From the material selected, the 'cone & quarter' method should be repeated until approximately 100 to 150 kg of material remains.
- The extracted 100 to 150 kg sample can either be transported for audit using the loader bucket or placed (dropped slowly) into a secondary transportation container for delivery to the auditing area.
- If the loader bucket is used, the loader should first have been weighed to obtain its tare weight as outlined in Option 1. Similarly, if used, the tare weight of the secondary transportation containers, forklift and operator should be obtained prior to collecting the sample. Once the sample is ready for transport to the auditing area, the sample is weighed to obtain the gross weight. The gross weight minus the tare weight yields the net weight of the sample and these weights are recorded by the auditing team on the audit log sheets.
- Once the net sample weight has been obtained, it should be transported to the audit area. If secondary transportation containers are used, the material should be placed (tipped slowly) into a pile near the sorting table.
- This process will be repeated for each of the samples.
- Each sample must be collected, stored and audited separately.

The purpose of obtaining the sample weights prior to sorting is to verify that the required sample size is obtained. Once the audit is completed, the pre and post weights can be compared to determine differences. Note that vehicle truck scales, if used to weigh the pre-sorted samples, may not have the same degree of accuracy as a floor scale used to weigh the post-sorted materials.

4.0 RESIDUE SAMPLING

Residue audits should be performed regularly in addition to feedstock and processed commodity audits. While residue sampling can be performed at any time to gather a general sense of the composition, there may be a requirement (contractual or otherwise) whereby performing a residue audit is required following a specific MRF operational performance test. In this case, a known quantity of recyclable material is received on the MRF tip floor for the performance test (amount can range from a few tonnes to a few hundred tonnes) and a feedstock composition audit is performed. The residue bunker/bin/area is cleared of all previously stored residue and the recyclables (known quantity and composition) is then processed through the MRF and all of the residue generated is collected. The entire residue generated is then weighed, sub-sampled and sorted. It is recommended that a minimum 100 -150 kg sub-sample of residue is audited for each 5 tonnes processed during the sample run.

Depending on the design of the MRF and the material flow through it, there may be multiple residue conveyors and/or bins/bunkers into which the contamination is deposited and ultimately sent for disposal as residue. For example,

- At a pre-sort station (where oversized material is removed early in the MRF's process flow), there may be a conveyor leading directly to a residue area and this could be a roll-off bin, compactor bin or floor bunker
- After the pre-sort station, there are many subsequent sorting stations where contamination is removed and deposited onto a residue conveyor(s) leading to a different residue bin/bunker than the pre-sort station.

However, there may be only one conveyor for all contamination destined for residue disposal regardless of origin within the MRF.

For the purposes of this section, residue refers only to the material removed from the processing line and directly sent for disposal. Residue does not include the quality (cross contamination) of products destined for marketing covered in the next section.

If your municipality is the only source of recyclables being processed, residue auditing provides direct feedback on how your MRF is performing and recovering your materials by quantifying how much recyclable material is being landfilled and how much non-recyclable waste is delivered to the MRF. If your MRF processes recyclables from multiple jurisdictions, MRF residue audits can still provide you with information on the operational performance of your contractor(s) but the results will be an average from all sources of recyclables processed. (E.g. a municipal supplier of cleaner material may be charged the same contamination penalty by the MRF as a supplier with relatively more inbound contamination as the inbound loads are

mixed together on the tipping floor). In this case, a greater emphasis should be placed on performing inbound composition audits as a means to aid in contract and individual contractor management.

Sample Extraction

If there are multiple residue conveyor outlets from your MRF, the above procedure should be used for each outlet.

The post-sorting management of contamination, disposed of as residue, can vary from MRF to MRF. In some MRFs, contamination is deposited directly onto a tip floor where a loader scoops and transports the material into a roll off bin or hopper feeding a compactor bin or compacting trailer. In other MRFs, contamination is directly fed into a roll off bin, compactor or compacting trailer. Each of these management options requires a different initial sampling method.

- For MRFs that deposit contamination directly onto a tip floor, sampling can follow the same procedure as outlined in Section 3, Option 1 or Option 2.
- For MRFs that deposit contamination directly into a roll off bin, compactor bin or compacting trailer, two options are possible:
 - Remove the receiving container, if possible, from under the contamination conveyor to allow the material to fall directly onto the floor then follow the procedure outlined in Section 3, Option 1 or Option 2; or
 - Allow the receiving container to remain and fill as normal and once full, tip the contents onto a floor then follow the procedure outlined in Section 3, Option 1 or Option 2.

5.0 COMMODITY SAMPLING

The samples of each commodity type to be audited should be obtained in an unbiased way directly from the storage bunkers, cages and/or the baler in-feed conveyor. This is likely a manual process (i.e. by hand) using shovels and bins or with the assistance of a MRF loader.

In cases where access to obtaining loose material is restricted, it would be necessary to get the samples post-baler. If this is required, the baler's settings should be adjusted to minimize density/compaction. As a last resort, bales would have to be broken. Obtaining samples pre-baler does not apply for commodities shipped to market loose (i.e. glass).

For each commodity, an ideal sample quantity is six (50 kg) over a 5 day audit period (i.e. five consecutive days). This would yield 300 kg of each material type. A reduced number of samples may be audited for some higher volume/lower weight commodities (e.g. PET bottles, aluminum).

6.0 SORTING

Regardless of the material to be audited, the sorting procedure is the same. The procedures for sorting material at a MRF, inclusive of all health and safety requirements, is the same as that for curbside auditing. (See: <http://cif.wdo.ca/pdf/CIF-Waste-Audit-Curb-Sm-Communities.pdf>)

All material obtained for the audit is to be hand sorted into the individual primary and secondary material categories based on a materials categories list developed.

An auditing team of three to four staff should reasonably be able to sort 100-150 kg of unprocessed inbound material per hour using 15-25 material categories. Sorting efficiency is highly linked to the level of detail required in the sorting categories. For example, sorting to primary categories only (paper, plastic, metal, other) is significantly quicker than detailed breakdown of sub-categories (PET bottles, PET Thermoform, HDPE Bottles, Organics, Textiles, etc.).

Each material category should be sorted into separate bins and weighed separately using a digital scale with 0.01 kg precision up to 40 kg +/- 1% of true weight. The weigh scale shall be calibrated annually and if the MRF operator provides the weigh scale, the municipality should request proof of the scale's accuracy and calibration records.

All bins are to be tared and zeroed on the scale to calculate the net sample weight for each material category. The tare weights of the bins to be used should be verified prior to the audit and regularly throughout the process to maintain accuracy. It is recommended that prior to weighing the sorted material, photographs of any substantial, or unusual material categories and items found in the samples, should be taken and included with the log records and audit report. The weights of each material category are to be recorded on the approved audit log sheet.

The audit procedure developed for your specific work must outline the material categories and how certain materials should be sorted. Depending on the purpose of the study, and level of detail required, sorting procedures may need to be adjusted. Unlike typical curbside composition audit material categories, to mimic regular MRF sorting operations, the MRF audit log sheets should include provisions for subcategorizing specific contamination items such as liquids in bottles and bagged garbage.

Recyclables in residue also need to be tracked carefully. These items may be treated as contamination by MRF operators based on the way they are handled on the sort line, however, when broken down, they would increase the proportion of accepted materials. These items may include but are not limited to:

- Unopened bagged recyclables
- Over compacted material

Once the physical sorting has been completed each day, the auditing area should be cleaned of all materials and returned to a pre-audit state. With respect to post-sort material management, the auditing team, working in cooperation with MRF staff, should transport the materials to their respective location. For contamination, these items should be managed as residue and disposed of, for recyclables, these should be transferred to the respective holding bunker for subsequent shipment to end markets.

7.0 DATA ANALYSIS AND REPORTING

Upon completion of the physical sorting, the weights of all materials should be recorded on hard copy audit log sheets, as would be done for curbside audits. For further information on example hard copy audit log sheets refer to the appendix. For sample Microsoft Excel log spreadsheets, contact CIF directly.

Once the audit results have been entered into the electronic spreadsheet, analyses and graphical representations of the composition of the material stream audited can be developed. The analysis' level of detail is variable and subject to the needs of the municipality and/or the MRF operator. The spreadsheet should contain the following calculations:

Contamination Rate (for both feedstock and commodity audits)

$$\frac{\text{Weight of the unsolicited materials in the sample}}{\text{Weight of the sample}}$$

Residue Rate (for residual audits only)

$$\frac{\text{Weight of recyclables received / processed}}{\text{Weight of the residue sample}}$$

Production Loss Rate (for residual audits only)

$$\frac{\text{Weight of recyclables in the residue stream}}{\text{Weight of the residue sample}}$$

Cross Contamination Loss Rate (for commodity audits only)

$$\frac{\text{Weight of improperly sorted materials in the commodity stream}}{\text{Weight of the commodity stream sample}}$$

Once the audit work has been completed, and ideally within one week of completion, the results are communicated to all parties

Depending on your program's specific acceptable materials, and the commodities that are produced, that which is acceptable (in the feedstock, residue and marketed materials) and that which is not acceptable is variable. As such, the categories used during the audit should be specific to the particulars of your program and as such,

the log sheets should be customized accordingly. Careful consideration must be given during the planning and execution stages of the audit to ensure the auditing team is sufficiently trained, whether the audit is being done by municipal, MRF or third party staff. This will ensure that the sorting and interpretation of the post-audit results are clear, concise and relevant to your municipality.

APPENDIX

Sample Sorting Log Sheets

- Categories and Descriptions

Composition audit results

Date Collected (month/day/year), Time:			
Inbound Sub-Sample Weight (kg)			
Audit Supervisor:			
City Representative:			
MRF Representative:			
Date Audited (month/day/year), Time:			
Material Category	Accepted? ("X" if accepted in recycling program)	Weights (kg)	% of Sample (Weight/Total Weight)
FIBERS			
1	Newsprint (including flyers)	X	
2	Mixed Recyclable Paper	X	
3	Corrugated Cardboard	X	
POLYCOAT			
1	Gable Top & Aseptic Cartons	X	
PLASTICS			
1	PET Bottles/Jars/Jugs	X	
2	PET Thermoform	X	
3	HDPE Bottles/Jars/Jugs	X	
4	Other Mixed Recyclable Plastics	X	
METALS			

1	Aluminum Cans, Foil/Trays	X		
2	Steel Cans	X		
GLASS				
1	Food & Beverage Bottles/Jars	X		
OTHER MATERIALS				
1	Over compacted/co-packed Recyclables			
2	Other Materials (non-accepted)			
Total Acceptable Recyclable Materials			0.00	
Total Contamination (Non-Acceptable Material)			0.00	
Total audit weight of inbound sub-sample			0.00	

CONTAMINATION RATE
$\frac{\text{Weight of non-acceptable material in the inbound sub-sample} \times 100}{\text{Total audit weight of the inbound sub-sample}}$

Sample MRF Audit Categories			
Material Category	Accepted ? ("X" if accepted in recycling program)	Description	
FIBERS			
1	X	Newsprint Newspapers, flyers/inserts	
2	X	Mixed Recyclable Paper Magazines, catalogues, books, mixed fine paper, kraft paper, boxboard/cores, moulded pulp, shredded (in a bag)	
3	X	Corrugated Cardboard empty boxes, trays, etc.	
POLYCOAT			
1	X	Gable Top & Aseptic Cartons milk, juice, soup cartons, etc.	
PLASTICS			
1	X	PET Bottles/Jars/Jugs #1 marked, beverage bottles, salad dressing, dish soap, etc.	

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2	PET Thermoform	X	#1 marked trays/clamshells
3	HDPE Bottles/Jars/Jugs	X	#2 marked, e.g. shampoo, laundry detergent, etc.
4	Other Mixed Recyclable Plastics	X	Numbered #2-7, tubs (e.g. margarine, sour cream, yogurt, etc.), condiment bottles, bakery trays, etc.
METALS			
1	Aluminum Cans, Foil/Trays	X	Food & beverage cans, aluminum aerosol cans, pie plates
2	Steel Cans	X	Food & beverage cans, steel aerosol cans
GLASS			
1	Food & Beverage Bottles/Jars	X	Beer/wine, condiment bottles, includes small mixed broken glass
OTHER MATERIALS			
1	Over-compacted /co-packed Recyclables		Materials stuck together due to compaction (e.g. steel can pinched onto plastic bottle) or materials packed together (e.g. bottles/cans stuck into a box), which can't be easily separated by a quick shake/tumble
2	Other Materials (non-accepted)		All other non-accepted materials including: unmarked plastics, durable goods, laminated paper packaging, scrap metal, ceramics, film plastics, organics, hazardous wastes, fines (<5cmx5cm), textiles, coffee cups, bagged materials, etc.