



Boulder County Recycling Center Analysis

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Executive Summary

Background

In September 2014, Boulder County Resource Conservation Division (RCD) contracted with Kessler Consulting, Inc. (KCI) to conduct an analysis of the Boulder County Recycling Center (BCRC) – the single stream materials recovery facility (MRF) operated by Eco-cycle (E-C) that serves the County. KCI's analysis was limited to an operational and financial analysis of the BCRC and comparing it to other regional MRFs and general industry standards for well-operated MRFs. The analysis was based on data from 2012, when a series of retrofits was completed and the BCRC began operating in its current configuration, through 2014.

The genesis of the project has been RCD's and E-C's mutual interest to improve operational efficiency and financial performance of the BCRC and consider capital improvements at the facility. The BCRC analysis is also being undertaken in part to help support the work of the County's Resource Conservation Advisory Board.

Inbound Tonnage

The BCRC handles approximately 45,000 to 50,000 tons per year of recyclables (see Table E-1). During the period of time from 2012 through 2014, average inbound tonnage declined by about 260 tons per month. According to the County and E-C, this was attributable to several factors, primarily:

- Bestway stopped delivery part way through 2012 when it opened its own MRF in Colorado Springs.
- Waste Management delivered materials to the BCRC on a temporary basis in part of 2012 and 2013 when capacity at its own MRF was limited.
- Strong fiber markets in 2012 increased inbound source-separated fiber tonnage over historical trends, which subsequently declined with weaker market prices in 2013 and 2014.

Also the broad trend of declining amounts of newspaper in residential waste is affecting tonnage at MRFs nationwide. E-C staff explained that tonnage from other sources increased in the past two years which actually compensated for some of tonnage lost to the reasons above. KCI also notes that commercial single stream monthly tonnage increased in 2014 despite the fact that the County rebates dropped from an average \$7.25 per ton in 2013 to \$5.00 per ton in 2014.

Operational and Financial Profile

Tables E-1 and E-2 summarize key operational and financial metrics for the BCRC.

Table E-1 – BCRC Operational Summary

	2012	2013	2014
Inbound Tonnage	49,370	48,521	46,118
Staffing (full time equivalents (FTE))			
Sorters, Operators & Line Leads	54.0	53.3	51.0
Supervisors	4.2	4.3	4.0
Clean up, Mechanics & Other	7.8	7.0	6.0
Total	66.0	64.6	61.0
Productivity (tons per hour (tph))			
Fiber Line	16.7	16.2	15.6
Container Line	11.1	10.8	10.4
Total	27.8	27.0	26.0
Staff Productivity (tph/Production FTE)	0.5	0.5	0.5

Note: Number may not add due to rounding.

Table E-2 – BCRC Financial Summary

	2012	2013	2014
BCRC Revenue			
Commodity Sales	\$5,185,000	\$4,916,000	\$4,984,000
BCRC Expenses			
Eco-cycle	\$3,585,000	\$3,762,000	\$3,688,000
County/RCD	\$764,000	\$446,000	\$400,000
Hauler Rebates	\$877,000	\$449,000	\$314,000
<i>Total</i>	<i>\$5,226,000</i>	<i>\$4,657,000</i>	<i>\$4,402,000</i>
Net BCRC Revenue/Expense	(\$41,000)	\$259,000	\$582,000
Other Enterprise Revenue	\$80,000	\$51,000	\$19,000
Other Enterprise Expenses	\$315,000	\$259,000	\$312,000
Net Enterprise Revenue/Expense	(\$276,000)	\$51,000	\$289,000

Note: Figures rounded to the nearest \$1,000; per ton costs based on inbound tonnage.

Overview of the BCRC and Other MRFs in the Front Range Area

BCRC: The BCRC is the only publicly owned and privately operated MRF in Colorado. The RCD operates as an enterprise fund that includes County staff and programs not related to the BCRC. The BCRC MRF revenue provides 99% of enterprise revenue which needs to cover both MRF and non-MRF related general and administrative overhead expenses. Hauler rebates are based on revenue that remains after all MRF and RCD expenses.

Larimer County: The Larimer County Recycling Facility is not a MRF, but rather a recyclable materials transfer and baling facility. It operates as part of a solid waste enterprise fund that

also includes landfill, transfer stations, HHW/CESGQ and education. The landfill is a major revenue source that sometimes subsidizes recycling when recycling expenses exceeds earnings. Hauler rebates are not tied to overall enterprise performance. Instead, the current contract with WM to operate the facility stipulates that WM returns 25% of gross revenue in hauler rebates.

WM-Franklin: The WM-Franklin MRF currently controls most of the residential recyclables in the Front Range & southern Wyoming, excluding Boulder County. The facility also has financial arrangements with other WM divisions and corporate that cross-subsidize each other. It has significant leeway to set terms for residential single stream recyclables depending on the services provided and terms of agreements. For example, pricing for Denver recyclables is likely subsidized by the revenue earned from WM's contract to operate the city's landfill.

Bestway: The Bestway MRF in Colorado Springs is privately owned and operated. It handles internal tonnage (from Bestway's collection operations) and operates as a merchant facility processing recyclables from other haulers such as Waste Connections, WM, Spring Waste and others.

Alpine: The Alpine MRF handles primarily commercial recyclables plus the company's own residential material.

Payments (rebate) or tip fees for inbound recyclables are determined not only by revenue and expenditures associated with MRF operations, but also by other aspects of the solid waste management system within which they operate and specific services being provided. Consequently, the financial terms in Table E-3 need to be seen in context of each MRFs' business model and the services and commitments being made by supplying communities.

Table E-3 shows that BCRC payments in 2014 are in the \$0 to \$10 per ton range of payments made by Bestway (open market) and WM-Franklin (open market, Summit, Laramie and Cheyenne) for single stream residential material. Communities that exclude glass generally receive higher payments for their single stream recyclables because the costs impacts of glass are avoided. So one would expect that payments made to Northglenn, Summit County, and Cheyenne would be lower than they are currently.

It is also important to note that at the time of this report, Larimer County had negotiated a new contract with WM to begin January 2015 which would reduce the rebate to \$0 under market conditions comparable to the fall of 2014.

Table E-3 – Fees, Rebates and Revenue Shares at Regional Facilities in 2014

Facility/ Community	Fixed Rebates/ Processing Fee	Additional Revenue Share
BCRC	Payment: \$5.00/ton Fee: None	None
Larimer County (WM-Franklin)	Payment: \$20/ton (thru 2014) Fee: None	None
Denver (WM-Franklin)	Payment: \$33.00/ton for 95% of delivered recyclables Fee: None	50% of annual average market value above \$80.70/ton
WM-Franklin (Open Market)	Payment: ~\$9.00/ton Fee: None	None
Bestways (Open Market)	Payment: \$6 - \$20/ton Fee: None	None
Northglenn (WM-Franklin)	Payment: \$15.25/ton for single stream without glass	None
Summit County (WM-Franklin)	Payment: \$9.00/ton for single stream without glass Fee: hauling cost	None
Laramie, WY (WM-Franklin)	Payment: None Fee: \$65.00/ton plus hauling	New contract begins Jan 2015 with much lower rebate terms
Cheyenne, WY (WM-Franklin)	Payment: \$10.00/ton for single stream without glass Fee: None	None
Non-Regional MRFs		
Charleston, SC	Payment: ~\$30/ton in 2014 Fee: None	None
Confidential MW MRFs	Confidential	Confidential
Lee County, FL	Payment: ~70% of net revenue Fee: \$0	None
Mecklenburg County, NC	Payment: ~70% of net revenue Fee: \$0	None

Facility Assessment Findings and Recommendations

In September 2014 KCI performed a two-day on-site assessment of the BCRC. Facility operations were observed and discussed with management, operational and maintenance records reviewed, and the condition of the facility and equipment assessed. Overall the BCRC is a well-run MRF, and as with any operation, there are numerous opportunities to improve. KCI identified a number of major findings and provided recommendations regarding various aspects of the BCRC equipment, operations, staffing, and maintenance and repair.

The BCRC will need multiple retrofits and changes in operations if it is to accommodate increased throughput associated with expanded commercial recycling. One of the key challenges is that the BCRC site physically constrains the ability to expand the building. Major retrofits being considered include enlarging the tip floor, adding more indoor bale storage area, expanding and reconfiguring the OCC screen and pre-sort area, and adding plastic optical sorting equipment on the container line.

Conceptual layouts reviewed by KCI and discussed with the County and E-C are reasonable. Prior to finalizing them, however, the County may want to conduct a commercial generation and recovery analysis to more specifically define MRF expansion requirements and support design, retrofit and operational planning. Design, analysis and implementation of the next phase of retrofits should be undertaken in an integrated manner that addresses, for example, how a new pre-sort and OCC screening system will impact “downstream” processes like the fiber and container sort lines, or how to reconfigure glass separation, add optical plastic sortation, and re-orient the container baler at the same time.

Conclusion and Next Steps

Once the County and E-C have reviewed this report and begin to formulate next steps for the BCRC infrastructure and operations, more detailed analysis should be undertaken before any major decisions are made. Any recommendations outlined in this report that the County and E-C choose to implement in the next year should be approached as an integrated process so that the necessary analyses can be coordinated; design and specification integrated; and implementation phased in a coordinated manner.

While the information and recommendations provided in this report can support some of that deliberation, a broader strategic planning exercise may help align the BCRC and County’s materials management program goals; assess various future operating scenarios; and chart the course to advance materials recovery for the County and its citizens.

Section 1

Introduction

1.1 Background

In September 2014, Boulder County Resource Conservation Division (RCD) contracted with Kessler Consulting, Inc. (KCI) to conduct an analysis of the Boulder County Recycling Center (BCRC) – the single stream materials recovery facility (MRF) that serves the County. Eco-cycle (E-C) is responsible for BCRC operations under a contract with the County. KCI's analysis was limited to an operational and financial analysis of the BCRC and comparing it to other regional MRFs and general industry standards for well-operated MRFs.

The genesis of the project has been RCD's and E-C's mutual interest to improve operational efficiency and financial performance of the BCRC. The two parties are also considering several capital expenditure projects at the facility to address current operational and future capacity needs, including an expanded tipping floor, expanded bale storage, and optical sorters for plastics and paper. The BCRC analysis is also being undertaken in part to help support the work of the County's Resource Conservation Advisory Board.

1.2 Contractual and Financial Framework

The RCD owns the BCRC and oversees the contract with E-C for its operations. The County owns the building, fixed equipment and rolling stock. E-C is responsible for all operational aspects of the BCRC including staffing, equipment operations, commodity marketing, general maintenance, and repair. RCD is responsible for building maintenance and repair. Revenue from commodity sales is paid to Boulder County and RCD fully reimburses E-C for all expenditures plus an operating fee. Payments to E-C also include reimbursement for major unusual expenses such as equipment replacement and major repairs (pass through costs).

The RCD is responsible for two County budgetary accounts. Fund 099 is an enterprise fund used for BCRC operations and RCD staff and programs. Its primary source of revenue is sale of recyclables from the BCRC plus a small amount of revenue from grants, rebates and other sources. Payments to E-C account for the majority of expenditures. Finances are discussed in greater detail in Section 3.5 of this report.

Budgeted revenue and expenses for Fund 099 for 2014 are approximately \$5 million. Reserve in Fund 099 was utilized to pay for the BCRC retrofit in 2012, hence the decline in cash reserve balance. Fund 099 had a reserve balance of approximately \$1.2 million at the end of FY 2013.

RCD also manages Fund 013 which was originally funded with proceeds from a County recycling tax that raised the funds used to finance construction of the BCRC. Fund 013 had a balance of approximately \$3.2 million at the end of FY 2013.

Section 2

BCRC History and Infrastructure

The BCRC was originally built in 2000 as a dual stream MRF, retrofitted to handle single stream in 2008, and subsequently further retrofitted in 2012 to improve single stream sortation. The current facility is comprised of an amalgamation of multiple designs, technologies and equipment vendors from its 14 years of evolution. It should be noted that few MRFs contain the same degree of integration of multiple vendor technologies and layered retrofits. Following is a brief description of the BCRC infrastructure as it has developed.

2.1 Original Facility

The original BCRC was a RRT Design & Construction dual stream MRF. The fiber line utilized the same two-deck OCC screen, discharging OCC to the floor as is in the current facility. Non-OCC fiber (unders from the screen) were conveyed to an elevated manual sort line (C-702 & C-703) where various fiber commodities could be positively picked and dropped into the storage bunkers below. Bunkers and OCC on the floor were then baled with a 2-ram Marathon baler.

The container line had a separate in-feed conveyor leading to an elevated sort line with ferrous magnet separation, air separation of aluminum and plastics, manual color separation of glass, manual separation of plastics, and eddy current separation of aluminum. Glass was conveyed directly to storage in roll-off containers while other container commodities were stored in elevated cage bunkers and subsequently baled with a 2-ram Marathon baler.

The original BCRC cost was approximately \$15.5 million, of which approximately \$12 million was specifically for the MRF building, equipment and rolling stock.

2.2 2008 Single Stream Conversion

In 2008 the BCRC underwent a major re-design and conversion to handle single stream recyclables. The fiber line was retrofitted using a Van Dyk Recycling Solutions design and Lubo and Bollegraaf equipment. A Lubo fines screen was installed prior to the fiber line to remove broken glass and fines. The fiber sort platform was significantly expanded, adding a double-deck ONP screen, two additional fiber sort lines to negatively sort ONP and positively sort other fiber commodities and trash. “Unders” and “roll-backs” from the ONP screen were conveyed to a French Banana Screen to separate three-dimensional containers from other fiber. Fiber from the Banana screen was discharged to a fourth conveyor on the fiber sort platform for further manual sorting. Three-dimensional materials from the Banana screen were conveyed to the container line along with fines from the Lubo fines screen. A new Bollegraaf HC-120 baler was also installed to serve the fiber line.

On the container line, a Binder automated glass sorting and processing system was installed that consisted of an initial Resonance screen (a combination three-deck shaker screen with air separation of light-weight materials) from which the large fraction is conveyed to manual

quality control, roll crusher and screen that then looped the overs back to the Resonance screen. The air separated light-weight fraction is conveyed to a waste container. The small fraction materials from the Resonance screen are conveyed to the ORCA system where organic contaminants (i.e., shredded paper) are separated and conveyed to a waste container. The remaining broken glass is then conveyed to a shaker deck screen where fine glass is removed and conveyed to a separate container. Remaining glass is then processed through a set of two optical sorters to remove ceramic, stones and non-glass contaminants.

The 2008 single stream conversion cost approximately \$5.5 million.

2.3 2012 Retrofit

After the 2008 retrofit, the BCRC encountered problems in two major areas. First, the Binder glass system relied on bucket elevators which did not operate well, and the optical sorters were not sized sufficiently to handle the amount of glass in the BCRC's material. Second, cross contamination of glass in fiber, and fiber in containers, was negatively impacting sorting operations and commodity quality. Two factors contributed to this latter issue. The system did not break and remove glass early enough in the process. And the Banana Screen was found to be insufficiently sized for the BCRC volume and composition of recyclables; more containers (3-dimensional material) remained in the fiber than expected.

To address these issues, the BCRC worked with Bulk Handling Systems to implement a series of retrofits.

- The Lubo fines screen (post OCC screen and before the fiber line) was modified with steel disks to serve as a glass breaker and fines screen.
- The Banana screen was replaced with a debris roll screen to further break and remove glass and fines followed by a polishing screen that functions to better separate small fiber from containers and 3-D materials.
- A vibrating deck screen and air classifier were installed ahead of the Binder system to more effectively remove fines and light-weight materials (i.e., small and shredded paper).
- The Binder system was modified to remove the bucket elevators and re-circulating of overs from the Resonance screen.

The 2012 retrofit cost approximately \$1.5 million.

Section 3

Description of Current Operations

Since the BCRC underwent a significant retrofit in 2012, KCI did not research or assess BCRC operations prior to that time. Instead the following description of current operations focuses on 2012 through July 2014 – the latter being the most recent data available from the County and E-C at the time research was conducted in September 2014. For the sake of clarity and year to year comparison, KCI annualized partial 2014 data to full year data based on average monthly data.

3.1 Material Sources and Materials Flow

The BCRC handles primarily single stream residential recyclables (81%) and single stream commercial recyclables (11%) plus minor amounts of other materials (see Table 1). The BCRC handles 45,000 to 50,000 tons per year of recyclables. During the period of time from 2012 through mid-2014, average inbound tonnage declined by about 260 tons per month. Single stream tonnages have fluctuated somewhat from year to year, while commingled containers, and source separated fiber and containers tonnage has declined.

According to the County and E-C, the primary reasons for tonnage changes in the past three years are:

- Bestway stopped delivery part way through 2012 when it opened its own MRF in Colorado Springs.
- Waste Management delivered materials to the BCRC on a temporary basis in part of 2012 and 2013 when capacity at its own MRF was limited.
- Strong fiber markets in 2012 increased inbound source-separated fiber tonnage over historical trends, which subsequently declined with weaker market prices in 2012 and 2014.

Table 1 – Inbound Materials

Item	Tons/year			Tons/month			Average %
	2012	2013	2014	2012	2013	2014	
Single Stream Residential	38,090	40,502	38,684	3,174	3,375	3,224	81.4%
Single Stream Commercial	5,843	4,985	5,361	487	415	447	11.2%
Commingled Containers	1,055	243	76	88	20	6	1.0%
Source Separated Materials							
Fiber	4,194	2,693	1,978	349	224	166	6.2%
Containers	190	99	18	16	8	2	0.2%
Total	49,370	48,521	46,118	4,114	4,043	3,843	100%

Another factor impacting MRF tonnage is the national trend of declining newspaper and magazines in residential waste, with fewer pounds per household being generated of these materials that represent the largest percentage of residential recyclables on a weight basis.

E-C staff explained that tonnage from other sources increased in the past two years which actually compensated for some of tonnage lost to the reasons above. KCI also notes that commercial single stream monthly tonnage increased in 2014 despite the fact that the County rebates dropped from an average \$7.25 per ton in 2013 to \$5.00 per ton in 2014.

The RCD and E-C are interested to assess the potential impact a wide-spread commercial recycling program might have on inbound tonnage on the BCRC. While developing an estimate of potential commercial recycling tonnage was not part of this study's scope, KCI conducted the Zero Waste Evaluation Study for the City of Boulder that included consideration of a mandatory multi-family and commercial recycling program. That evaluation estimated that such programs may divert an additional 13,000 to 19,000 tons per year, which would represent approximately 25% to 40% increased need for processing capacity.

E-C has performed several composition and materials flow analyses of the BCRC. The most recent analysis was a mass balance performed in August 2014. This study tracked the flow of 163 tons of residential single stream materials over 5.7 hours through the current system configuration. Quantities of materials separated at many points throughout the system were weighed to determine the facility mass balance. Other data provided for this study were 2010 and 2011 composition estimates and a 2010 mass balance. E-C has also performed a mass balance for commercial single stream.

Since 2011, the BCRC has been retrofitted and the composition of recyclables has likely changed due to changes in packaging and printed paper generation and discards. Therefore, KCI utilized the 2014 mass balance as the most reliable proxy for developing a detailed materials flow analysis of the BCRC (see Table 2). It is important to note that these numbers are estimates because the residential mass balance has been applied to all inbound tonnage. The data in Table 2 are utilized later in this report in the determination of productivity metrics and allocated financials.

Table 2 – Facility Materials Flow Estimate

Item	% Removed	2012	2013	2014
<u>OCC Pre-Sort & OCC Screen</u>				
Manual Sort - Trash	0.95%	471	463	440
Manual Sort - Mixed Rigid	0.47%	230	226	215
Manual Sort - Chipboard	0.10%	51	51	48
OCC Screen - OCC	14.60%	7,210	7,087	6,735
<u>Lubo Screen</u>	not measured			
<u>Fiber Lines</u>				
Manual Sort - OCC	5.96%	2,944	2,894	2,750
Manual Sort - Wood & Metal	0.42%	209	206	195
Manual Sort - Mixed Rigid	0.02%	12	12	11
Manual Sort - Trash	1.05%	520	511	486
Manual Sort - Chipboard	0.91%	447	440	418
ONP Screen & Polishing Screen	not measured			
ONP Negative Sort	35.02%	17,290	16,992	16,150
<u>Glass System</u>				
Fiber (Combi Shred)	0.55%	272	267	254
Clean Mixed Glass	14.25%	7,035	6,914	6,571
Fine Glass	2.70%	1,334	1,311	1,246
CSP Glass	6.80%	3,359	3,301	3,138
Trash	2.93%	1,448	1,424	1,353
Glass Spillage	0.98%	483	475	452
<u>Container Pre-Sort</u>				
Manual Sort - Chipboard	0.45%	224	220	209
Manual Sort - Scrap Metal	0.17%	85	83	79
Manual Sort - Trash	0.04%	21	21	20
Manual Sort - Cartons	0.31%	154	152	144
Manual Sort - Mixed Rigid	0.12%	57	56	54
<u>Container Line</u>				
Ferrous Magnet - Steel	1.74%	857	842	801
Manual Sort - HDPE-N	0.79%	391	384	365
Manual Sort - HDPE-P	0.63%	312	307	291
Manual Sort - PET	2.69%	1,329	1,306	1,242
Manual Sort - PP	0.51%	251	247	235
Manual Sort - Mixed Rigid	0.12%	61	60	57
Eddy Current - Aluminum	1.12%	551	542	515
Ferrous Head Pulley	0.12%	57	56	54
Negative Sort - Residue	2.64%	1,303	1,280	1,217
<u>Baler Pre-Sort</u>				
Manual Sort - Chipboard	0.20%	97	95	90
Manual Sort - Trash	0.07%	33	33	31
Manual Sort - Containers	0.14%	69	68	65
<u>Miscellaneous</u>				
Manual Sort - Alum Foil	0.04%	21	21	20
Clean up & Trash	0.36%	178	175	167
Total Processing	100.00%	49,370	48,521	46,117

Outbound commodity tonnage is summarized in Table 3. These data also are utilized later for determining productivity metrics and allocated financials. It is noted that the data in Table 2 and Table 3 do not match exactly, which is attributable primarily to two factors. First as noted above, the mass balance is based on residential single stream which represents more than 80% of inbound tons versus commercial single stream which has a different mass balance more weighted toward fiber. Second, processed tonnage does not exactly match outbound tonnage over any fixed time period because of inventory.

Table 3 – Commodity Production Tonnage

Commodity	2012	2013	2014
<u>Fiber Commodities</u>			
ONP #8	17,419	15,815	14,676
OCC #11	11,601	11,413	12,064
Chipboard / Soft Mix	1,012	1,060	532
Office Pack (SOP)	1,880	1,242	1,172
Other Fiber	50	371	606
<u>Container Commodities</u>			
Aluminum UBC	445	450	454
Steel Can	900	897	850
PET	880	1,080	1,188
HDPE-N	352	359	362
HDPE-P	305	326	305
PP	0	65	264
Mixed Rigid / Mix 3-7 Plastic	782	106	360
Glass-Mix	7,156	7,739	144
Other Containers	650	171	7,154
<u>Other Commodities</u>	193	158	190
<u>Total Commodities</u>			
	43,625	41,252	40,320
Residue	6,345	5,752	6,136
Total Production	49,970	47,004	46,457
Residue Rate	12.9%	11.9%	13.2%

Note: The residue rate is calculated according to the method used by E-C, which is tons of residue divided by inbound tonnage (see Table 2).

3.2 Staffing and Staff Productivity

E-C provided detailed records on staffing levels at the BCRC for recent years. In addition to total head counts by position (e.g., sorter, operators and supervisors), E-C has also performed detailed operational studies to estimate how much time individual sorters dedicate to separate

materials at assigned work stations. For example, on the fiber line, a given work station may pick OCC, chipboard and trash, while on the container line one position may pick HDPE and PP. KCI compiled these records to determine staffing levels for sorters on a material-specific basis and totals for other staff positions (see Table 4).

Since 2012, E-C has reduced the total staff by five full-time equivalent (FTE) positions.

Table 4 – Staff Count by Position and Function

	2012	2013	2014
Sorters – Fiber Line			
OCC	11.8	11.6	10.8
Chipboard	3.5	3.5	3.2
Commingle	4.3	4.3	4.0
Large Plastic	0.4	0.3	0.3
Scrap Metal	0.5	0.5	0.4
Trash	7.6	7.6	7.0
<i>Sub-total</i>	<i>28.1</i>	<i>27.8</i>	<i>25.7</i>
Sorters – Container & Glass Lines			
HDPE-N	1.1	1.1	1.0
HDPE-P	1.1	1.1	1.0
PET	5.5	5.3	5.2
PP	2.6	2.5	2.5
Mixed Rigid Plastic	0.0	0.0	0.0
Cartons	1.2	1.1	1.1
Other	0.5	0.5	0.5
Fiber	1.4	1.3	1.3
Glass	2.2	2.1	2.1
Trash	0.9	0.8	0.8
<i>Sub-total - Fiber Line</i>	<i>16.4</i>	<i>15.9</i>	<i>15.7</i>
Operators	8.4	8.7	8.0
Line Lead	1.0	1.0	1.7
Super	4.2	4.3	4.0
Clean up & Mechanic	6.1	6.0	5.0
Outside	1.7	1.0	1.0
Total	66.0	64.6	61.0

The BCRC sorts materials during the day shift 5 days per week. In addition, the facility operates a second shift to complete fiber baling. The second shift is also staffed with maintenance and repair as well as cleaning staff. The BCRC also operates a Saturday maintenance shift periodically in order to undertake more extensive maintenance and repair work than can't be accomplished during the week.

Overall staffing has declined from 66 in 2012 to 61 in July 2014. Likewise, as noted previously in Table 1, average monthly tonnage at the MRF has also declined. E-C noted that retaining sorting staff has been challenging in recent years due to the County’s low unemployment rate.

Labor productivity is a commonly utilized metric for MRFs stated in terms of the tons per hour per FTE production staff position (i.e., staff on the sorting lines and operating equipment). This metric can be determined based on tons processed, the number of staff and the average hours worked. Table 5 shows that while staffing and tonnage have declined, production staff has consistently averaged 0.5 tons per hour per FTE.

Table 5 – Staff Productivity Metrics

	2012	2013	2014
<u>Inbound Tons</u>			
Fiber Line	29,585	29,077	27,713
Container Line	19,784	19,444	18,532
Total	49,370	48,521	46,245
<u>Production Staff (Sorter, Operators and Line Leads) (FTE)</u>			
Fiber Line	34.1	33.8	31.5
Container Line	19.9	19.5	19.5
Total	54.0	53.3	51.0
<u>Time</u>			
Productive hrs/shift	7.33	7.33	7.33
Days/Year	255	255	255
Run-time based on working hours*	96%	96%	97%
Run-time based on paid hours	85%	85%	85%
Hours/FTE/Year	1,776	1,794	1,776
<u>Productivity (tons per hour)</u>			
Fiber Line	16.7	16.2	15.6
Container Line	11.1	10.8	10.4
Total	27.8	27.0	26.0
<u>Productivity (tons per hour/Production FTE)</u>			
Fiber Line	0.5	0.5	0.5
Container Line	0.6	0.6	0.5
Average	0.5	0.5	0.5

* E-C calculates run-time based on working hours (e.g., 8 hour shift minus breaks, clean-up and training). Many other MRFs calculate run-time based on paid shift hours (e.g., 8 hours).

3.3 Maintenance and Repair

E-C is responsible for maintenance and repair (M&R) of the BCRC equipment. The plant management on the day shift monitors and adjusts system settings and addresses minor

maintenance and repair issues as necessary. Maintenance personnel work on the second shift, but can be called in early if needed. Plant management maintains a maintenance schedule of daily, weekly, and monthly preventative maintenance (PM) and M&R activities as well as a request list for special work activities. In general, a Saturday shift is scheduled every other week to perform major M&R work.

E-C relies primarily on its own staff to perform most equipment PM as well as M&R such as conveyor belt replacement and baler repairs including major repair and servicing. E-C maintenance staff conducts some major repairs not commonly performed by MRF staff, for example: redesigning star screens, redesigning baler hydraulic systems, relining balers, replacing baler rams, fabricating conveyor parts and replacing whole conveyors.

For rolling stock, E-C performs standard PM work and relies on outside contractors for standard M&R, e.g., 500 and 1,000 hour servicing. E-C relies on outside contractors and OEMs occasionally for specialized equipment (e.g., Binder optical sorters) or work it cannot perform itself.

3.4 Commodity Marketing

The BCRC markets the majority of its fiber commodities under a long term contract with International Paper (IP). Originally, the contract dates back to an agreement with Weyerhaeuser who subsequently sold its recycling assets to IP. Since that time the contract has been interpreted by the parties to establish very high quality standards based on guidelines set by the mills that receive BCRC fiber.

As a result, the BCRC works to produce ONP and OCC commodities of much higher quality than is typical for single stream MRFs, and has done so by assigning additional sorters to the fiber line. E-C stated that it has evaluated the cost-benefit of producing the high quality of commodities, particularly in the case of ONP and OCC, and decided the increased investment in labor is warranted because the increased revenue and reduced market risk more than offsets the increased labor cost input.

The BCRC markets its container commodities differently. It has no market contracts in place, but instead spot markets these commodities through a well-developed network of brokers and end users. Material quality for container commodities is more closely aligned with standard market specifications.

In 2013, the 3-7 plastics market collapsed due to the Chinese Green Fence initiative. E-C made mechanical and operational changes and developed a market for new commodity Mixed Rigid Plastic for which domestic markets exist, thereby ensuring continued recovery of plastic containers.

3.5 Financials

Financial information presented in this report was compiled from documents provided by the RCD and E-C which do not necessarily exactly reconcile. E-C transitioned to a new bookkeeping system in 2013 making it difficult to generate financial reports with consistent alignment across

accounting codes. Likewise budget sheets provided by RCD varied in format slightly from year to year and did not consistently provide budget versus actual expenditures. KCI reconciled data to the degree possible within the time constraints of the project and reviewed results with RCD and E-C personnel. The information presented here is sufficiently accurate for the purposes of this project to analyze the operational and financial performance of the BCRC.

Table 6 summarizes revenue earned by the BCRC by commodity as reported by E-C. On an aggregated basis the facility received gross revenue of \$119 per ton in 2012 and 2013, and \$124 in 2014. While fiber commodity prices have declined since 2012, they were more than offset by increased prices for aluminum, steel, HDPE and other commodities. It is important to note that commodity prices fluctuate due to many reasons and will continue to do so in the future.

Table 6 – BCRC Gross Revenue from Commodities

	2012	2013	2014
Fiber Commodities			
ONP #8	\$1,511,670	\$1,382,243	\$1,285,920
OCC #11	\$1,278,085	\$1,318,596	\$1,259,073
Chipboard / Soft Mix	\$61,973	\$63,852	\$27,786
Office Pack (SOP)	\$314,034	\$185,928	\$182,785
Other Fiber	\$12,173	\$28,245	\$31,040
Container Commodities			
Aluminum UBC	\$681,475	\$655,453	\$724,241
Steel Can	\$208,593	\$195,959	\$189,844
PET	\$418,471	\$409,535	\$379,196
HDPE-N	\$224,794	\$252,970	\$340,017
HDPE-P	\$157,270	\$146,902	\$187,867
PP	\$0	\$16,996	\$76,628
Mixed Plastic	\$57,778	\$10,646	\$66,607
Glass	\$192,786	\$209,256	\$183,643
Other Containers	\$31,118	\$9,275	\$11,038
Other Commodities	\$34,545	\$29,828	\$37,938
Total/Average Revenue	\$5,184,764	\$4,915,684	\$4,983,622
Average Revenue Per Ton	\$119	\$119	\$124

Note: Commodity-specific per ton pricing is not provided in order to protect confidentiality.

Table 7 provides detailed information on BCRC expenditures compiled from reports provided by E-C and RCD. E-C direct labor costs ranged from \$33 to \$37 per ton; other direct costs ranged from \$23 to \$24 per ton. Including indirect MRF costs and its operating fee, E-C cost for operating the BCRC ranged from \$73 to \$80 per ton.

RCD costs associated with the BCRC ranged from \$9 to \$15 per ton. RCD pays all building maintenance and repair costs as well as capital replacement and repair costs (referred to by RCD as “changes to budget”) which are not consistent from year to year. These are the major factors causing the significant year to year fluctuation. Hauler rebates (the average of payments for single stream and other materials) have ranged from \$18 per ton in 2012 to \$7 per ton in 2014.

In summary, the net cost of the BCRC ranged from \$106 per ton in 2012 to \$95 per ton in the first part of 2014.

Table 7 – BCRC Expenditures

	2012	2013	2014
<u>Eco-cycle</u>			
Staff			
Staff – Fiber Line	\$769,423	\$762,164	\$761,843
Staff – Container Line	\$450,097	\$435,620	\$465,021
Staff – Operators	\$164,868	\$187,293	\$194,842
Staff – Mechanics	\$92,561	\$136,722	\$102,048
Overhead	\$163,862	\$193,855	\$204,698
<i>Subtotal/Average</i>	<i>\$1,640,810</i>	<i>\$1,715,654</i>	<i>\$1,728,452</i>
Direct MRF Expenses			
Fuel	\$82,924	\$73,329	\$73,038
Utilities – Electricity	\$137,567	\$172,517	\$157,112
Utilities – Gas	\$6,845	\$6,457	\$11,455
Parts & Supplies	\$47,697	\$155,499	\$152,373
Glass Hauling	\$63,650	\$69,027	\$61,248
Residue Disposal	\$249,535	\$210,682	\$185,363
M&R – Equipment	\$277,928	\$334,605	\$330,326
M&R – Building	\$20,237	\$7,003	\$9,410
Other	\$34,309	\$47,488	\$97,104
<i>Subtotal/Average</i>	<i>\$920,692</i>	<i>\$1,076,606</i>	<i>\$1,077,430</i>
Indirect MRF Expenses			
Staff	\$494,274	\$428,266	\$415,426
Other G&A	\$148,991	\$177,736	\$98,737
Operating Fee	\$380,581	\$363,356	\$368,052
Total/Average Eco-cycle Expenditure	\$3,585,348	\$3,761,618	\$3,688,096
<u>RCD</u>			
County Staff	\$139,939	\$141,021	\$138,638
M&R – Building	\$291,970	\$58,000	\$64,650
Insurance	\$13,877	\$17,000	\$18,400
Capital Replacement/Repair	\$318,500	\$229,610	\$178,158
Total County Expenses	\$764,286	\$445,631	\$399,846
Hauler Rebates	\$876,952	\$449,126	\$313,724
Total BCRC Expenses	\$5,226,587	\$4,656,374	\$4,401,666

Overall financial performance of the BCRC and RCD’s enterprise fund (Fund 099) are summarized in Table 8. E-C expenses account for approximately 72% of enterprise expenses while other BCRC-related expenditures such as hauler rebates, building M&R, equipment replacement and RCD staff time represent another 23%. The remaining 5% of Fund 099 expenditures are non-MRF related, including grants, programs, non-MRF RCD staff time, and RCD office expenses.

Table 8 – Summary of Fund 099 Revenue and Expenses

	2012	2013	2014
BCRC Revenue			
Commodity Sales	\$5,185,000	\$4,916,000	\$4,984,000
BCRC Expenses			
Eco-cycle	\$3,585,000	\$3,762,000	\$3,688,000
County/RCD	\$764,000	\$446,000	\$400,000
Hauler Rebates	\$877,000	\$449,000	\$314,000
<i>Total</i>	<i>\$5,226,000</i>	<i>\$4,657,000</i>	<i>\$4,402,000</i>
Net BCRC Revenue/Expense	(\$41,000)	\$259,000	\$582,000
Other Enterprise Revenue	\$80,000	\$51,000	\$19,000
Other Enterprise Expenses	\$315,000	\$259,000	\$312,000
Net Enterprise Revenue/Expense	(\$276,000)	\$51,000	\$289,000

Note: figures rounded to the nearest \$1,000.

Section 4

Comparison to Other MRFs

While the scope of this project included comparison of the BCRC to other MRFs in the region and general industry standards, KCI cautions the reader against making direct comparisons because every MRF is impacted by unique circumstances, including differences in the services provided, level of competition in the procurement process, contract provisions, material composition, ownership and operational responsibility, types of equipment utilized, commodities produced, and available markets for commodities.

4.1 Regional Single Stream MRFs

Table 9 provides a summary comparison of the BCRC and other MRFs in the Front Range. Information was obtained through interviews with facility personnel and KCI's knowledge of the local marketplace.

General Observations:

- The BCRC is the only publicly owned and privately operated MRF in Colorado. Alpine, Bestway Recycling and Waste Management Franklin Street (WM-Franklin) are all privately owned and operated, which enables them more flexibility to attract tonnage with preferential pricing.
- In the past two years, residential suppliers have switched from Alpine Waste & Recycling to WM-Franklin. The primary reason has been lower payments (rebates) offered by Alpine and the company strategically deciding to focus on the commercial sector, but there is some anecdotal information that access & queuing at Alpine was a problem.
- Alpine declined to provide any information for this project and limited information could be confirmed from other sources. The Alpine MRF was built in 2007 with a design capacity of 30 tons per hour (tph) and is believed to be handling approximately 20 – 25 tph of primarily commercial recyclables plus its own internal residential tonnage.
- The Larimer County Recycling Center does not provide a good comparison for the BCRC because it is a fundamentally different kind of facility. It functions primarily as a recyclables transfer station for single stream materials and baling facility for source separated materials. Single stream materials are shipped to WM-Franklin for processing and marketing. The facility was originally developed in 1992. Sorting equipment was removed in 2005. The facility handles 17 – 19 tph of recyclables.

Table 9 – Profiles of MRFs Handling Primarily Residential Single Stream Recyclables

	Front Range MRFs			Other MRFs				
	BCRC	Bestways	WM-Franklin	Charleston, SC	Confidential Midwest US	Confidential Midwest US	Lee County, FL	Mecklenburg County, NC
Ownership/Operations	County/ Eco-cycle	Bestways/ Bestways	WM/ WM	County/ Sonoco	Private/ Private	Private/ Private	County/ ReCommunity	County/ ReCommunity
Sources of Recyclables	82% resi 18% comm	80% resi 20% comm	75% resi 25% comm	95% resi 5% comm	90% resi 10% comm	90% resi 10% comm	100% resi 0% comm	100% resi 0% comm
Design Capacity (tph)	25	10 – 15	30	15	35	50	30	35
Sorting Throughput (tph)	26 – 28	10 – 13	30	18	35	30	30	35
System Manufacturer	Multiple	BHS	CP	Count Machinex	Machinex	Machinex	CP	CP
Year	2001, 2008, 2012	2011	2008	2000, 2012	2012	2013	2001	2010
Optical Sorters	2 glass	0	3 fiber & plas	0	3 plastic	3 plastic	1 plastic	3 plastic
Glass Separation	Breakers, clean-up systems & optical sort	Manual sort	Breakers & clean-up systems	Breakers	Breakers & clean-up systems	Breakers & clean-up systems	Breakers	Breakers & clean-up systems
Balers	2	1	2	2	2	2	2	2
Residue Rate	12 – 13%	3 – 5 %	15 – 20%	15 – 18%	12 – 15%	12 – 15%	13 – 17%	8 – 9%

Table 9 – Profiles of MRFs Handling Primarily Residential Single Stream Recyclables (continued)

	Front Range MRFs			Other MRFs				
	BCRC	Bestways	WM-Franklin	Charleston, SC	Confidential Midwest US	Confidential Midwest US	Lee County, FL	Mecklenburg County, NC
Shifts	1 sort plus 0.5 baling	1	2	2	1	2	1	2
Full-time (FTE) Production Staff	51	13	23 – 25	22 – 24	34 – 36	24 – 26	45	50
Labor Productivity (tph/FTE)	0.5	0.8 – 0.9	1.2 – 1.3	0.7	1.0	1.2	0.7	0.7
Residential Paper Commodities	ONP#8, OCC, Chipboard	ONP/MP, OCC	ONP/MP, OCC	Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC
Plastic Commodities	#1, #2, #5, Mixed Rigid	#1, #2, #5, Mixed Rigids	#1, #2, #5, Mixed Rigid	PET, HDPE, Mixed Rigid	PET, HDPE, Mixed Rigid	PET, HDPE, Mixed Rigid	PET, HDPE, Mixed Rigid	PET, HDPE, Mixed Rigid
Glass Commodities	3-color Mix	Clear & Brown	Alternative Daily Cover	ADC	3-color mix	3-color mix	3-color mix, ADC	3-color mix

Note: Alpine facility not included because it handles primarily commercial recyclables and declined to provide information. Larimer facility is not included because it is not a MRF.

Design and Equipment:

- The BCRC is in the same general class as WM-Franklin, handling 20 - 30 tons per hour, predominantly comprised of residential single stream recyclables. Consequently WM-Franklin provides the best match for operational comparison. While of similar capacity, Alpine handles primarily commercial recyclables, not residential. Bestway is a relatively small MRF handling 50% - 60% less tonnage than the BCRC.
- BCRC is a unique amalgamation of various MRF technologies and equipment, unlike the Alpine, Bestway and WM-Franklin, which were built more recently as single stream facilities from the outset.
- The BCRC lacks adequate storage space for its primary fiber commodities – OCC and ONP. The existing ONP bunkers fill so quickly that the fiber baler and feed conveyor must be run constantly during the main shift just to keep bunkers from overflowing. Consequently, the BCRC operates an additional half shift each day for baling to catch up with sorting production. E-C staff noted that the Larimer facility has a similar capacity baler but handles 30% less tonnage than the BCRC.
- BCRC employs more fiber line sorting personnel to produce higher quality ONP and OCC than other facilities. Also the BCRC does not have optical sorting equipment for plastics on the container line and requires personnel to positively pick all plastic commodities.
- The BCRC uses two optical sorters to separate ceramic, stone and contaminants from broken glass, however, they are out-of-date (from original MRF) and under-sized for the amount of glass handled by the facility. As a result, a significant percentage of recyclable glass ends up in the residuals stream. The BCRC is actively investigating alternate solutions for container glass recovery.

Operations:

- Labor productivity stated in terms of the tons per hours per FTE production staff (i.e., sorters and equipment operators, not including supervisors and management) is a commonly used comparative metric. The BCRC appears to have lower productivity compared to other regional MRFs (0.5 tph/FTE versus more than 0.8 tph/FTE at other MRFs). This appears to be due in part to the fact that the BCRC dedicates more labor than is the norm in an effort to produce high quality materials to meet specifications of its IP marketing contract. It is also due to the absence of optical sorting and reliance on staff to perform primary separation of plastic commodities.
- BCRC has an extensive and outmoded glass processing equipment system. More modern MRFs like WM-Franklin, utilize glass breaker screens and clean up systems comprised of shaker screens and air classifiers. Unlike others MRFs, Bestways manually sorts out clear and brown glass at the pre-sort stations.

Commodities and Commodity Marketing:

- BCRC is the only MRF in the region known to produce a chipboard commodity. It separates chipboard as part of efforts to produce high quality ONP and OCC. Other MRFs typically blend some chipboard and colored paper into a #7/#8 ONP or “news

rich” Mixed Paper. The BCRC manually separates chipboard in order to comply with IP OCC commodity specifications. It is common practice at other MRFs to include carrier stock and some chipboard in the OCC.

- All the regional MRFs are believed to produce similar plastic commodities, namely #1 PET, #2 HDPE, #5 PP and either Mixed Rigids. Since the Chinese “Green Fence” program effectively shut down the #3-#7 plastic market in 2013, most MRFs have switched over to producing a Mixed Rigids plastic commodity.
- Both BCRC and Bestway produce glass for Rocky Mountain Bottle Company, although they use different methods to produce it. WM-Franklin utilizes its glass for alternative daily cover and it is believed that Alpine does the same with the limited amount of glass it produces.

4.2 Regional Processing and Marketing Services

Each of the regional facilities described in Section 4.1 has a distinct business model that greatly influences their financial terms for handling residential single stream recyclables.

- BCRC: The RCD operates as an enterprise fund, with BCRC MRF revenue from sale of recyclables providing 99% of its revenue. Enterprise fund costs include not only the MRF but also all other costs associated with the RCD. Hauler rebates are based on revenue that remains after all MRF and RCD expenses.
- Larimer County: The LCRC is not a MRF, but rather a recyclable materials transfer and baling facility. It operates as part of a solid waste enterprise fund that also includes landfill, transfer stations, HHW/CESGQ and education. The landfill is a major revenue source that sometimes subsidizes recycling when recycling expenses exceeds earnings. Hauler rebates are not tied to overall enterprise performance. Instead, the current contract with WM to operate the LCRC stipulates that WM returns 25% of gross revenue in hauler rebates. The County is currently negotiating a new contract with WM, the financial terms of which are expected to result in significantly lower hauler rebates comparable to those paid in Boulder County.
- WM-Franklin: The WM-Franklin MRF currently controls most of the residential recyclables in the Front Range & southern Wyoming, excluding Boulder County. The facility also has financial arrangements with other WM divisions and corporate that cross-subsidize each other. It has significant leeway to set terms for residential single stream recyclables depending on the services provided and terms of agreements. For example, pricing for Denver recyclables is likely subsidized by the revenue earned from WM’s contract to operate the city’s landfill. And as noted above, the Larimer contract establishes how much of revenue must go to hauler rebates.
- Bestway: The Bestway MRF in Colorado Springs is privately owned and operated. It handles internal tonnage (from Bestway’s collection operations) and operates as a merchant facility processing recyclables from other haulers such as Waste Connections, WM, Spring Waste and others.

Table 10 summarizes the financial terms for residential single stream recyclables at these MRFs.

Payments (rebate) or tip fees for inbound recyclables are determined not only by revenue and expenditures associated with MRF operations, but also by other aspects of the solid waste management system and legal agreements within which they operate. Consequently, it is not appropriate to compare the financials terms in Table 10 without taking into consideration how each MRFs’ business model impacts the payments and fees for residential single stream recyclables.

With that caveat in mind, the following general observations and conclusions can be made about the regional market place for MRF services.

Table 10 – Fees, Rebates and Revenue Shares at Regional Facilities in 2014

Facility/ Community	Fixed Rebates/ Processing Fee	Additional Revenue Share	Notes
BCRC	Payment: \$5.00/ton Fee: None	None	Financials includes cost of County administration and general expenditures
Larimer County (WM-Franklin)	Payment: \$20/ton (thru 2014) Fee: None	None	New contract under negotiation; expected payment will be significantly lower; likely comparable to BCRC
Denver (WM-Franklin)	Payment: \$33.00/ton for 95% of delivered recyclables Fee: None	50% of annual average market value above \$80.70/ton	City pays WM to operate City landfill under indefinite term contract
WM-Franklin (Open Market)	Payment: ~\$9.00/ton Fee: None	None	Residential & commercial recyclables from private haulers
Bestways (Open Market)	Payment: \$6 - \$20/ton Fee: None	None	Residential & commercial recyclables from private haulers
Northglenn (WM-Franklin)	Payment: \$15.25/ton	None	Single stream without glass
Summit County (WM-Franklin)	Payment: \$9.00/ton Fee: hauling cost	None	Single stream without glass baled and hauled to WM-Franklin

Table 10 – Fees, Rebates and Revenue Shares at Regional Facilities in 2014 (continued)

Facility/ Community	Fixed Rebates/ Processing Fee	Additional Revenue Share	Notes
Laramie, WY (WM-Franklin)	Payment: None Fee: \$65.00/ton plus hauling	Based on ONP#8 index	WM built transfer site; City operates site and is buying back over 20 years
Cheyenne, WY (WM-Franklin)	Payment: \$10.00/ton Fee: None	None	Single stream without glass baled and hauled by city to WM-Franklin
Non-Regional MRFs			
Charleston, SC	Payment: ~\$30/ton in 2014 Fee: None	None	Payment based on average market value index minus processing fee
Confidential MW MRFs	Confidential	Confidential	
Lee County, FL	Payment: ~70% of net revenue Fee: \$0	None	
Mecklenburg County, NC	Payment: ~70% of net revenue Fee: \$0	None	

- The BCRC rebates tend to be lower than what may be offered by other facilities because they reflect the limited financial scale of the RCD enterprise fund which lacks other revenue sources that can offset costs or subsidize rebates.
- A second factor is that BCRC rebates are based on the actual financial performance of the RCD enterprise fund. Contractual obligations do not exist like Larimer County where WM-Franklin is required to pay 25% of net revenue in hauler rebates.
- The BCRC contract has evolved over the years of its operation and has not been competitively bid. The comparatively high Denver payments came about due to a number of factors. The contract was competitively bid at a time when regional competition and commodity markets were strong. In general there are a number of market factors that dictate pricing.
- Contract negotiations are underway between Larimer County and WM at the time of this report, and preliminary indications are that payments will be significantly lower

than the current contract and more closely in line with the range of rebates paid by the BCRC.

- BCRC payments in 2014 are in the \$0 to \$10 per ton range of payments made by Bestways (open market) and WM-Franklin (open market, Summit, Laramie and Cheyenne) for single stream residential material.
- Communities that do not include glass in single stream can get a higher payment as demonstrated by WM-Franklin’s pricing for Northglenn (\$15.25/ton) versus its “open market” payment at \$9.18/ton. It is KCI’s experience that, in general, communities that exclude glass tend to get higher payments for their single stream recyclables.

4.3 General Industry Standards

In this section KCI provides a comparison of BCRC performance metrics from 2012 through July 2014 versus general industry standards for comparable MRFs, namely single stream MRFs handling approximately 50,000 tons per year, primarily from residential sources. These industry standards are compiled from various facilities and discussions with industry experts and represent benchmarks that MRFs should achieve unless extenuating circumstances dictate otherwise.

Performance

The general industry goal depending on equipment utilized for throughput is 1.0 tons per hour per production person. The metric for the BCRC is significantly lower than this standard and is likely due to the number of manual sorters dedicated to positively sorting commodities and ONP quality control on the fiber line.

Average picks per minute performed by sorters as reported by BCRC are comparable to industry standards, however, KCI noted during the assessment that a number of staff performed “false picks” – hand motions that did not actually remove an item from the sort conveyor. During the limited time spent observing sorting, KCI noted actual picks in the range of 40 to 60 picks per minute on both lines.

The BCRC performs well compared to industry standards with regard to residue rate. KCI notes that the inbound recyclables at the BCRC have less contamination than observed in other MRFs. This may be due to the broader efforts of E-C focused on community outreach and public education supporting the recycling programs in the County.

The BCRC also performs well compared to industry standards in terms of system run time.

Table 11 – Comparison of BCRC versus Good Industry Performance Standards

Metric	BCRC	Industry Standard
Performance		
Production Staff (sorters, operators & line leads)	51 – 53	25 – 30
Throughput (tons per hour per production person)	0.5	1.0
Sorting rate (picks per minute)	50 on fiber 70 on container	60
Residue rate (% of inbound)	12% - 13%	10% - 20%
System Run Time (%) ¹	85% - 90%	85% - 90%
Equipment & Operational Configuration		
OCC Screen Number of Decks	2	3
Sort Staff Prior to ONP Screen	8	6 – 8
Sort Staff Post ONP Screen (Fiber)	11	6 – 8
Optical Sorters on Fiber Line	0	0 – 1
Optical Sorters on Container Line	0	1 – 2
Sort Staff on Container Line (including Glass)	15	6 – 8
Financial Performance (costs without cap ex)		
Revenue (blended \$/ton of commodity) ²	\$119 - \$124	\$100 - \$120
MRF labor cost (\$/ton inbound)	\$33 - \$37	\$25 - \$30
Other MRF operating costs (\$/ton inbound)	\$40 - \$42	\$35 - \$45
RCD cost (\$/ton inbound)	\$9 - \$15	n/a
Total MRF cost (\$/ton inbound) ³	\$87 - \$89	\$60 - \$75

Notes:

¹ KCI's industry standard run time is based on system run time versus total paid shift hours (including breaks, clean-up, and trainings). Consequently KCI adjusted the BCRC run time (shown in Table 5) to the same basis of calculation.

² Commodity sales revenue is dependent on numerous variables including composition (e.g., deposit versus non-deposit), commodities produced (e.g., mixed paper versus #8 ONP) and markets (e.g., regional and export price differentials).

³ Total MRF costs prior to revenue share payments for inbound tonnage. The cost ranges for the BCRC do not add because the low costs for different line items occurred in different years, and likewise for the high costs.

Equipment and Operational Configuration

The equipment and operational configuration of the BCRC does not match standards for modern MRFs of similar capacity and feedstock.

With regards to equipment, the BCRC has the standard pieces of automated sorting equipment, with the notable absence of optical sortation on the container line for plastics. Also while the BCRC has a two-deck OCC screen, newer generation MRFs often are equipped with a three-deck OCC screen which allows faster disk rotation while maintaining residence time, which leads to better OCC separation.

Production staffing at the BCRC is higher than is typical for privately operated MRFs. Primary reasons for this are more labor dedicated to producing high quality fiber commodities meeting IP contract specs (for which the BCRC obtains premium pricing) and the need for more labor on

the container line due to the lack of optical sortation technology. But even accounting for these factors, opportunities exist to streamline line staffing as discussed in the recommendations section of this report.

Sort staff on the fiber line exceeds typical levels seen in other comparable MRFs. MRFs that produce #8 ONP as their primary residential grade, commonly have six to eight sorters ahead of the ONP screen and six to eight after the ONP screen. The BCRC currently positions eight sorters ahead of the ONP screen (including the two OCC pre-sort stations) and eleven after the ONP screen. E-C attributes the high labor commitment to producing a quality of OCC and ONP sufficient to meet the quality standards of its IP contract.

State-of-the-art MRFs of comparable capacity have at least one and possibly two optical sorting machines on the container line. For non-bottle bill recyclables at least one optical sorter dedicated to PET is essential. A common labor configuration for a similar capacity single stream container line with PET optical would be eight sorters (e.g., two pre-sort, two HDPE, one PP, one PET quality control, one aluminum quality control, and one “floating position”). In comparison the BCRC had 15 sorters (three pre-sort, 10 on the container line, and two on the glass line) at the time of the site visit.

Financial Performance

Total MRF cost per ton has averaged \$87 to \$89 per ton versus an industry benchmark of \$60 to \$75 per ton. In general the higher labor assets at the BCRC appear to be due to the BCRC producing high quality fiber commodity, lack of optical plastic sortation, and commitment to producing mixed glass for container glass markets. However, it appears that the BCRC is not getting the “bang for its buck” in terms of sufficiently higher commodity revenue to offset the high labor input. BCRC labor costs ranged from \$33 to \$37 per ton versus an industry benchmark of \$25 to \$30 per ton. Another unique cost borne by the BCRC is the \$9 to \$15 per ton associated with RCD facility and program costs not directly associated with the BCRC.

Comparison to Other MRFs

After reviewing the Boulder MRF operations, specifically its mechanical configuration, sorting staff configuration and commodity profile, comparisons with specific MRFs has limited value in assessing the BCRC performance because comparable technology and material peers to the BCRC do not exist. Despite this, KCI has provided metrics for several other MRFs in Table 12.

Table 12 – Profiles of Other MRFs Handling Comparable Volume and Composition of Recyclables

	BCRC	Charleston, SC	Confidential Midwest US	Confidential Midwest US	Lee County, FL	Mecklenburg County, NC
Ownership/Operations	County/ Eco-cycle	County/ Sonoco	Private/ Private	Private/ Private	County/ ReCommunity	County/ ReCommunity
Sources of Recyclables	82% resi 18% comm	95% resi 5% comm	90% resi 10% comm	90% resi 10% comm	100% resi 0% comm	100% resi 0% comm
Throughput (tph)	25	18	35	30	30	35
System Manufacturer	Multiple	Count Machinex	Machinex	Machinex	CP	CP
Number of Optical Sorters	2 glass	0	3 plastic	3 plastic	1 plastic	3 plastic
Number of Balers	2	2	2	2	2	2
Number of Shifts	1 plus 0.5 baling	2	1	2	1	2
Full-time (FTE) Production Staff per Shift	51	22 – 24	34 – 36	24 – 26	45	50
Labor Productivity (tph/FTE)	0.5	0.7	1.0	1.2	0.7	0.7
Residential Paper Commodities	ONP#8, OCC, Chipboard	Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC	ONP8, Mixed Paper, OCC
Plastic Commodities	#1, #2, #5, Mixed Rigid	PET, HDPE, Mixed Rigid				
Glass Commodities	3-color Mix	ADC	3-color mix	3-color mix	3-color mix. ADC	3-color mix

Section 5

Facility Assessment: Findings and Recommendations

KCI conducted a two-day on-site assessment of the BCRC during September 2014. Facility operations were observed and discussed with management, operational and maintenance records reviewed, and the condition of the facility and equipment assessed. The following sections summarize KCI's major findings and recommendations. The County may wish to conduct a more detailed analysis before making any financial decisions, operational changes, or facility modifications or retrofits.

5.1 OCC Screen and Fiber Line

- **Assessment:** The two deck OCC screen is not as effective as a three deck screen at separating OCC. The County and E-C have already developed preliminary conceptual designs for a reconfigured pre-sort line and OCC screen. At the time of the assessment, the OCC screen had a broken variable frequency drive (VFD). The screen was running more slowly than is commonly practiced in MRFs, consequently OCC was not being separated effectively. E-C reports that the VFD was subsequently fixed. It is estimated that improving OCC screen performance could reduce the need to manually sort OCC at C-702 by as much as 50% (see Figure 1).

Recommendation: In the near term, work to improve separation performance of the existing OCC screen by adjusting running speed, deck inclination, disk size and spacing. The BCRC should also continue to evaluate the design, operational impacts, costs and project payback for installing a pre-sort and OCC screen retrofit.

- **Assessment:** Pre-sort stations ahead of the OCC screen do not have proper storage bunkers or containers for materials being separated. Materials are dropped to the floor below and pile up in the inaccessible corner below the infeed conveyor. Workers on the second shift must manually shovel out this pile each day (see Figure 2).

Recommendation: Reconfigure the OCC pre-sort platform to increase the number of potential pre-sort stations and construct storage bunkers below the platform that are accessible by materials handling equipment. RCD and E-C already have developed preliminary engineering plans for such a retrofit.

Figure 1 – Manually Sorted OCC Not Separated by OCC Screen

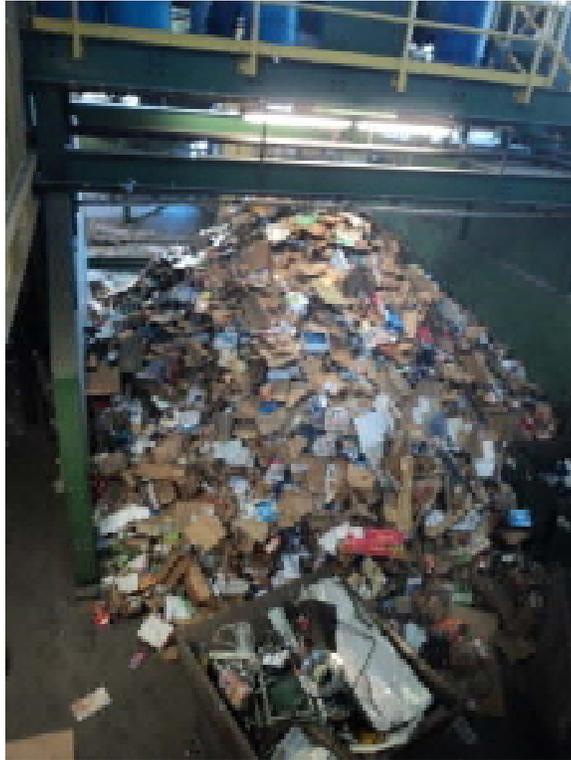


Figure 2 – Inaccessible Pre-sorted Rejects Below OCC Screen



Figure 3 – Highlift Forklift Used to Collect from C-702 OCC Sort Stations



Figure 4 – “Black” Belt on B-5



- **Assessment:** Scrap metal separated at the C-702 pre-sort stations is collected in barrels and on the platform floors. Then periodically, a forklift raises a dump hopper up to the platform so that staff can load scrap metal into it. This appears to be a risky operation given the potential for the forklift to become top heavy and unstable (see Figure 3).

Recommendation: Construct a metal chute sized to handle scrap metal to drop the material into dumping hoppers located on the floor below the platform.

- **Assessment:** The ONP screen splits the ONP fraction from its two decks sending overs from the first deck to B5 and the second to B3. A significant amount of “black belt” was observed on the B3 and B5 sorting conveyors during the assessment. The amount of ONP being presented to sorters on these two belts for quality control and picking of other paper grades is lower than is typically seen in comparable facilities (see Figure 4). E-C said the reasons for maintaining this level of “black belt” include the following. The downstream commingled container line is the “weak link” in the MRF and can become overloaded if the fiber line is more fully loaded. The depth of burden needs to be limited so that manual sorter can achieve ONP quality levels. It is also noted that overall the MRF is operating at approximately 28 tons per hour which more than the 25 tons per hour design capacity of the 2008 single stream retrofit.

Recommendation: Conduct a more comprehensive analysis of the throughput on these two belts, and based on the results, determine the benefit of combining all ONP screen overs onto either B3 or B5, which would eliminate 4 to 6 sort staff on the fiber line.

- **Assessment:** Much of the trash removed on the fiber sorting lines is plastic film. Reliable markets can be secured for baled plastic film that has been positively sorted. While it may not be justified on a strictly financial basis, given its commitment to maximizing recovery, the County may want to conduct a more detailed analysis of this opportunity to further increase recovery and reduce residue at the BCRC.

Recommendation: Perform a composition analysis of the trash to determine if dedicated separation of plastic film is feasible, and conduct a feasibility study and economic analysis of film plastic recovery into a dedicated compacting unit.

5.2 Container Line and Glass System

- **Assessment:** The pre-sort station is not sufficiently sized or designed for the functions being performed by staff. At the time of the assessment, three sorters were pulling various materials including paper, cartons, scrap metal and large rigid plastics. In addition they were targeting aerosol containers as part of a pilot test to capture this material to reduce the potential for explosions when baling steel cans. The pre-sort

area lacks sufficient chutes and containers for materials being targeted. Significant amounts of spilled material and overflowing barrels were noted. Rigid plastics are thrown across the platform poses a potential injury risk (see Figures 5 and 6).

Recommendation: As part of a more comprehensive reconfiguration of the container to address other recommendations below, extend the platform and conveyor to accommodate four pre-sort stations, and reconfigure the pre-sort area so that large plastics can be tossed directly into a storage cage.

- **Assessment:** The pre-sort stations currently drop materials through chutes into self-dumping hoppers located on the floor below. Spillage accumulates around these hoppers and requires daily clean-up. It was estimated that the paper hopper fills as much as 10 – 12 times daily (see Figure 7).

Recommendation: Fabricate new chutes (potentially split chutes to allow better material separation, install better fitting skirting, and adjust size of receiving containers.

- **Assessment:** The BHS retrofits added in 2012 appear to be doing an effective job of removing fines and light fraction paper and delivering a relatively clean stream of glass and heavy mid-sized materials to the Binder system. However, observation of material flow through the Resonance screen and Orca suggests that these units are not significantly improving the quality of glass materials. It appears that the BHS shaker deck and air classifier are performing most of the work previously done by the Resonance and Orca to remove fines and light fraction from glass. Also the Resonance screen produces very little oversize materials now, so the dedication of a FTE sorter to separate recoverable materials from this fraction may not be warranted.

Recommendation: Conduct a more detailed mass balance, materials analysis, and electrical load analysis of the Resonance screen and Orca to determine their actual performance and operating cost. Also, quantify the amount and value of recyclable materials recovered at the sort station for Resonance screen overs and decide whether to eliminate it. The BCRC should also bring in equipment vendors and commodity buyers to design a better system to meet specifications.

Figure 5 – Insufficient Chutes at Container Pre-Sort



Figure 6 – Spilled Material and Space Constraints at Container Pre-Sort



Figure 7 – Drop Chutes and Hoppers for Container Line Pre-Sort



Figure 8 – Manual Sorters on Container Line



- **Assessment:** The BCRC container line relies on manual labor for all plastic sortation versus common industry practice to utilize one or two optical sorters. RCD and E-C are in the process of reviewing various equipment options and configurations for incorporating optical sortation (see Figure 8).

Recommendation: Removing non-essential pieces of the glass system will increase the amount of available space for optical installation. One optical sorter dedicated to PET is clearly justified; it should eliminate three to four sorting positions. An operational and cost-benefit analysis should be performed to determine if a second one dedicated to HDPE is justified. While the County is looking at machines that separate more than one stream of material, it is recommended that machines that target just one material be specified to ensure effective and consistent operation. Any optical sortation needs to be followed by a manual quality control position.

5.3 Baling

- **Assessment:** The original BCRC design placed the two balers in separate areas of the building. The preferred MRF design principle is to locate balers near each other so that a single piece of rolling stock can handle production from both machines. Currently the Marathon baler serving the container line is located in a corner with poor access and poor drainage for the residual liquids in recyclable containers. The baler is located on the opposite side of the facility from bale storage areas.

Recommendation: During the consideration of the container line recommendations outlined above, it should also be determined if it is possible to reverse the direction of the Marathon's feed conveyor and relocate it closer to the product side of the BCRC.

5.4 Staffing

- **Assessment:** BCRC management staff noted that during the past year Lead Point has had difficulty providing the required head count for the BCRC. Staff also noted that in the recent past, turnover rate for contract labor has been 50% over six months. This is reportedly due to other more attractive contract labor positions available in the area and difficulty recruiting sufficient head counts to work in Boulder. BCRC records for four months from late 2013 to early 2014 indicated that staffing was at a full roster only 38% of the days and down by 1-2 persons on 48% of the days. Retaining and maintaining a trained cadre of contract labor is critical to MRF productivity. Hand sorting recyclables requires a specific combination of training and skills to achieve expected performance standards.

Recommendation: Encourage better retainage by increasing engagement of and communication among work teams. Staff can be engaged actively in sharing responsibility for achieving performance goals. If not already in practice, production

staff should be engaged in determining and understanding the goals. If not already in practice, efforts to connect the work teams (i.e., Eco-cycle, Lead Point, fiber line, and container line) should be implemented.

- **Assessment:** The sort personnel at the BCRC are crucial to enabling the facility to operate successfully. Continuously engaging and benchmarking performance against quantifiable metrics is essential. Currently the Gemba is located in the break room. At the time of the audit the Gemba was not being kept up to date in terms of performance against goals.

Recommendation: Have separate boards for Fiber and Container Line. Locate the Gambas in highly visible locations in the MRF and integrate them directly into work activities. Provide more detail regarding downtime on the Gambas so that responsibility and control can be assigned to reduce downtime. Ensure that production staff understands the basis for production goals. Update the Gambas throughout the day so that staff knows where they stand versus daily goals, e.g., bale production. Include product quality goals on the Gambas so that production staff is aware and invested in both quantity and quality.

- **Assessment:** Observations of sort staff on both the fiber and container line noted false picks which could be counted as hand motions but which did not actually remove an item from the sort line.

Recommendation: When measuring sorter productivity, measure actual picks and not hand speed.

- **Assessment:** Sort staff on both lines does not have the necessary visual aids to support proper sorting practices. A number of steps can be taken to improve the work environment at sorting stations.

Recommendation: Provide visual aids at each sort station, such as pictures of target materials, prioritized list of materials, and color-coded chutes and barrels. This will help staff to constantly re-orient to their assigned work, as well as be able to switch sort positions more readily. It will also help newly trained staff become accustomed to the work.

- **Assessment:** While a thorough inspection was not performed of PPE usage, it was noted during the audit that some staff were not wearing safety vests and proper footwear.

Recommendation: Require 100% compliance with PPE use.

5.5 Maintenance and Repair

- **Assessment:** Some conveyors were observed to not be tracking correctly. This was noted on the tail pulleys of B-5 and the take-away conveyor for 3-D materials from the polishing screen. Conveyors that are not tracking properly are subject to excessive tension and risk of wear and abrasion that can cause sudden failure. The BCRC preventative maintenance schedule includes daily checking and adjusting of conveyor belts.

Recommendation: Belt tracking should continue to be monitored and adjusted on a daily basis.

- **Assessment:** The drum feeder was inspected and it was noted that spacers and the teeth were extremely worn and had not been replaced since the equipment was installed in 2012. The manufacturer's manual did not provide a rotation or replacement schedule. E-C noted that spacer bars and teeth have since been repaired and a preventative maintenance schedule established.

Recommendation: Continue to monitor and maintain the drum based on the established schedule, and adjust the schedule as necessary.

- **Assessment:** The star disks located on the ONP at the impact point where materials initially hit the screen, tend to need more frequent servicing and replacement. E-C has impact zone disks on a quarterly replacement schedule.

Recommendation: Continue to monitor and maintain disks on the established schedule, and adjust the schedule as necessary.

- **Assessment:** Overall, the BCRC is well maintained, has good housekeeping procedures, and maintains a safe environment for its staff. All MRFs have some minor issues with regard to housekeeping and safety and while KCI did not perform a safety inspection of the facility, a few items were noted that should be addressed including loose extension cords, unremoved oil spill and absorbent, and fire extinguishers that were slightly behind on their inspection tags.

Recommendation: On a regular basis, BCRC management should conduct a health and safety inspection throughout all areas of the facility to identify issues and take corrective action.

5.6 Accommodating Expanded Recycling

- **Assessment:** A number of possibilities exist to expand recycling tonnage at the BCRC. As noted previously, a comprehensive multi-family and commercial recycling program in the City of Boulder could divert an estimated 13,000 to 19,000 additional tons of recyclables, and a County-wide program would generate more. It is also possible that agreements could be negotiated with private haulers to direct more tonnage to the BCRC, or arrangements could be made with other jurisdictions in the region.

The RCD and E-C have undertaken initial assessment and planning for various retrofits and upgrades to improve operations and enable the BCRC to manage increased volume. For example, OCC off the OCC screen is currently pushed outside during the day shift and then pushed back in and baled on the second shift (see Figure 11). The facility will need multiple retrofits and changes in the operations program if it is to accommodate the increased throughput. One of the key challenges is that the BCRC property physically constrains the ability to expand the building. Facility expansions and retrofits being considered by the County include:

- Expanding the tip floor eastward (see Figure 9).
- Expanding the building to the southward to provide indoor bale storage and a reconfigured pre-sort and OCC screen (see Figure 10).
- Adding optical sorting equipment for PET and possibly HDPE on the container line.
- Providing additional capacity to stockpile OCC and ONP prior to baling.
- Adding a full second shift for sorting.
- Adding a second fiber baler to handle current and increased OCC volume.
- Replacing the C-800 baler feed conveyor with a higher capacity one.

Recommendation: Retrofits are necessary and the conceptual layouts reviewed by KCI and discussed with the County and E-C are reasonable. Prior to finalizing them, however, the County may want to conduct a commercial generation and recovery analysis to more specifically define MRF expansion requirements and support design, retrofit and operational planning. Design, analysis and implementation of the next phase of retrofits should be undertaken in an integrated manner that addresses, for example, how a new pre-sort and OCC screening system will impact “downstream” processes like the fiber and container sort lines, or how to reconfigure glass separation, add optical plastic sortation, and re-orient the container baler at the same time.

5.7 Commodities and Marketing

- **Assessment:** As noted previously, the IP marketing contract places demands on the BCRC to produce higher than typical quality ONP and OCC. The IP contract dates from 1995 and lacks adequate definitions of the recovered paper grades conforming to the current commodity market practices. The quality standards being pushed by the buyers are in all likelihood much higher than the majority of recovered paper they

consume, and the BCRC does not appear to be getting paid enough for the quality that it is producing.

Recommendation: Continue to market ONP outside the IP contract as much as is contractually allowable. BCRC should continue to work with IP to adjust the terms of the contract as well as investigate options for exiting the contract early. The BCRC should conduct a thorough investigation of alternative markets to support negotiations and, in any event, provide the basis for determining what commodities to produce after the contract expires.

- **Assessment:** The ONP produced by the BCRC is marketed as a #8 ONP through the IP contract. However, the quality of the ONP is actually better than the typical market standard for #8 ONP and could potentially be sold at a higher price as an equivalent to #9 over-issue grade.

Recommendation: The BCRC should conduct a more detailed allocated cost analysis to confirm its ONP production cost, obtain pricing and specifications from various buyers for different grades of ONP and Mixed Paper, estimate production costs for these other grades, and decide what grade to produce either through the IP contract or elsewhere. The BCRC may choose to continue to sort ONP to the same level of quality, but it should have the flexibility to market it to its greatest advantage.

- **Assessment:** The BCRC expends significant labor sorting chipboard. The primary reason being its commitment to producing high quality OCC and ONP to comply with the standards of the IP contract. MRFs can make money on some commodities and lose money on others (i.e., the net cost to produce and market chipboard can be more than offset by increased revenue from ONP and OCC).

Recommendation: The BCRC should work within the limits of the existing IP contract to include as much of chipboard and carrier as possible in its #11 OCC so that it can be sold at OCC prices rather than chipboard prices, while it investigates alternatives to the current contract.

- **Assessment:** The County produces and markets 3-color mix glass for bottle manufacturing and does not consider marketing it for alternative daily cover to be an acceptable use of recycled glass. The operational and financial assessment indicates that the BCRC has significant cost associated with producing the three-color glass mix that it markets. Removing the components of the Binder system may reduce costs some and still allow the BCRC to market a glass commodity. The KSP optical sorters are not able to handle the throughput being presented to them. As a result, a significant amount of brown glass is being ejected with the ceramic and stone fraction and disposed. The long term viability of continuing to market glass is dependent on

whether a beneficiation facility is developed in the area.

Recommendation: Remove as much of the Binder system as possible while still producing a color-mix glass until the prospect of beneficiation is clarified. If no such option comes about, investigate options to install new glass processing equipment. This assessment should be undertaken in coordination with other retrofits discussed previously to ensure all aspects of MRF operation can be integrated and optimized.

Figure 9 – Tip Floor with Unprocessed Materials at End of Shift



Figure 10 – Primary Storage of Baled Commodities is Outdoors



Figure 11 – OCC Stored Outside Prior to Baling on Second Shift



Section 6

Conclusion and Next Steps

KCI was tasked by Boulder County to appraise the effectiveness and efficiency of the BCRC's current operations and economics as well as review proposed future improvement plans. The work included assessment of the facility's financial records and operational performance metrics, the results of which are summarized in Section 3.

KCI also compared the BCRC to other MRFs in the region as well as general industry standards for well-operated MRFs handling similar quantities and types of recyclables. While comparative information for MRFs in the Colorado Front Range is provided in Section 4, direct comparisons should not be made between their financial terms and operational parameters, because every MRF is impacted by unique circumstances, including whether it is publicly or privately owned and operated, the procurement process used to establish service agreements, contract provisions, the technologies and equipment utilized, commodities produced, and other factors.

KCI's assessment of the BCRC found that in general it is a well-run MRF, and like all facilities there are opportunities for improvement as described in Section 5. Once the County and E-C have reviewed this report and begin to formulate next steps with regard to the BCRC infrastructure and operations, more detailed analysis should be undertaken before any major decisions are made. Any recommendations outlined in this report that the County and E-C choose to implement in the next year, should be approached as an integrated process so that the necessary analyses can be coordinated; design and specification integrated; and implementation phased in a coordinated manner.

While the information and recommendations provided in this report can support some of that deliberation, a broader strategic planning exercise may help align the BCRC and County's materials management program goals; assess various future operating scenarios; and chart the course to advance materials recovery for the County and its citizens.