

*Via Facsimile*

May 27, 1998

Mr. Mark Corey  
Township Engineer  
Harborcreek Township  
5601 Buffalo Road  
Harborcreek, PA 16421

Subject:       **Analysis of Recycling Options for Harborcreek Township**

Dear Mark:

The purpose of this letter is to provide Harborcreek Township with the results of R. W. Beck's analysis of selected recycling options available to the Township. Harborcreek currently owns a recyclables collection vehicle and contracts with a hauler to operate the vehicle. Recyclables are collected on an every-other-week schedule, using a curb-sort approach. Materials are unloaded from the recycling collection vehicle directly into roll-off containers at the Township staging area and taken to intermediate markets by the contractor. Based on input from local haulers who would like the Township to transition to commingled recycling in Harborcreek, the purpose of R. W. Beck's analysis was to determine:

- The estimated annual cost per household (labor, vehicle and equipment capital, vehicle operation and maintenance, and processing/marketing costs) to operate the current recycling system; and
- The projected annual cost per household to operate a two-stream commingled recycling system.

## **ANALYSIS OF SELECTED RECYCLING OPTIONS FOR HARBORCREEK**

To begin the analysis of recycling options for Harborcreek, R. W. Beck defined four scenarios for recyclables collection. Table 1 provides information on each scenario analyzed, including truck type, bins required, and type of materials separation.

**Table 1**  
**Recycling Options Analyzed for Harborcreek**

<i>Scenario</i>	<i>Truck Type</i>	<i>Bins Required</i>	<i>Materials Separation</i>
1 (current system)	Manual side-load truck, 6 compartments	3 Township-provided bins, 1 resident-provided bin, and newspaper bundled separately	Curb sorted
2	Use current truck; replace plastics compactor with 6.2 yd <sup>3</sup> bin; specify bins for fiber stream versus container stream (no compaction)	Use current bin and bundle system.	Two-stream commingled (container stream and fiber stream)
3	Same as Scenario 2	1 large Township-provided bin for commingled containers, newspaper bundled separately	Two-stream commingled
4	New manual front-load truck, two compartments with 2:1 compaction.	Same as Scenario 3	Two-stream commingled

## **COST ANALYSIS**

In order to estimate the direct costs of equipment, labor, and processing associated with the Township's current recycling program, the costs of collection and processing were examined. Other impacts such as intangible costs are also discussed, but are not included in the quantitative cost analysis. The paragraphs that follow detail the cost analysis performed for Harborcreek Township.

### **COLLECTION COSTS**

R. W. Beck first examined the collection costs associated with each scenario. The collection analysis performed includes estimated annual costs for direct labor, capital expenditures, equipment operation and maintenance, recycling containers, and marketing/processing.

Using primarily data provided by Harborcreek and some estimates developed from R. W. Beck's database of recycling performance measures, the following data, which is used for all four scenarios, was compiled:

- 707 tons of recyclables collected per year;
- 5,000 households served;
- 26 collection days per household per year;
- Collection crews work 5 days per week;
- Scheduled length of work day is 8 hours;
- 1.5 multiplier used to calculate overtime pay rates;
- 15 minutes spent at the vehicle yard prior to starting the route;
- 5 minutes spent traveling from the vehicle yard to the start of the route;

- 30 minutes spent on lunch and breaks during a typical day;
- 10 minutes spent traveling from the route back to the vehicle yard;
- 5 minutes spent at the vehicle yard for post-trip inspection, maintenance, etc.;
- 75 percent average set-out rate (in other words, on any given route an average of 75 percent of the households will set out one or more containers for recycling pick up);
- 1 person in the collection crew (driver only);
- Average hourly pay rate for driver is \$8;
- Cost of annual benefits approximately equal to 30 percent of annual wage;
- 52 work weeks per year;
- Driver has 100 percent availability rate;
- No front-line supervisor costs built in;
- 6 percent rate of interest used to finance vehicle or container purchases;
- Expected useful life of vehicle of 7 years;
- No spare trucks;
- Expected useful life of containers of 10 years; and
- No annual operation and maintenance costs for recycling bins.

Collection data that changes between scenarios is displayed in Table 2. The paragraphs below the table explain why these values changed between scenarios.

**Table 2**  
**Collection Data that Varies Between Scenarios**

<i>Data</i>	<i>Input for Each Scenario...</i>			
	<i>Scenario 1</i>	<i>Scenario 2</i>	<i>Scenario 3</i>	<i>Scenario 4</i>
Time Spent Traveling from(/to) the Route to(/from) the Processing Facility (minutes)	10	20	20	20
Time Spent Unloading at the Processing Facility (minutes)	20	20	20	10
Average Seconds per Stop	47	36	30	30
Average Capacity of the Collection Vehicle (tons)	1.4	4.0	4.0	6.0
Capital Cost of One Collection Vehicle	\$95,000	\$100,000 <sup>1</sup>	\$100,000 <sup>1</sup>	\$115,000
Estimated Scrap Value of Vehicle at End of Its Useful Life	\$9,500	\$9,500	\$9,500	\$11,500
Operation and Maintenance Cost of Vehicle	\$4,000	\$4,000	\$4,000	\$6,000
Capital Cost of New Containers	\$53,200	\$53,200	\$27,500	\$27,500

<sup>1</sup> Includes \$5,000 capital cost to replace plastics compactor with 6.2 yd<sup>3</sup> compartment.

As shown in Table 2, Scenarios 2, 3, and 4 include more time for traveling from the route to the processing facility. The longer travel times were estimated to account for the trip to the only local processor that accepts commingled recyclables -- World Resource Recovery Systems in Erie. Based on R. W. Beck's conversations with World Resource Recovery Systems, the facility is capable of accepting the types and quantities of materials generated by Harborcreek.

Unloading time is reduced for Scenario 4, as compared to Scenarios 1, 2, and 3, because the truck used in Scenario 4 will only require dumping two compartments. The other scenarios use Harborcreek's current truck, which takes longer to unload because of the numerous compartments on the truck.

The times shown in Table 2 for seconds per stop are estimates of the time required to make one pick-up and travel to the next household for the next pick-up. Scenario 1 includes picking up as many as four recycling bins and one fiber bundle, while the estimated seconds per stop for Scenario 2 are reduced because the materials will be commingled and collection will involve picking up fewer recycling bins/containers at each stop. Scenarios 3 and 4 would include collecting only one recycling bin and one bundle at each stop, so the collection time is even lower -- an estimated 30 seconds per stop.

In the current scenario, the average capacity of the truck is 1.4 tons, which is based on the quantity of recyclables collected in calendar year 1997, the estimated number of vehicle trips per day, and the number of collection days. Scenarios 2 and 3 use the same vehicle as Scenario 1, but because the materials would be collected commingled, the truck would not go off-route as often and the average capacity of the truck would be increased because the truck would be more fully utilized. Finally, the capacity of the truck in Scenario 4 is even greater because of the use of light compaction in both chamber compartments.

Capital costs of the trucks and containers required vary by scenario. Scenario 1 accounts for the \$95,000 purchase price of the collection vehicle currently used in Harborcreek. Scenarios 2 and 3 include an additional \$5,000, on top of the \$95,000 purchase price, for the purchase and retrofit of a 6.2 yd<sup>3</sup> compartment to replace the plastics compactor currently being used. Finally, Scenario 4 includes an estimate of \$115,000 for a new truck with two adjustable compartments with light compaction.

Regarding operation and maintenance (O&M) costs, current costs of \$4,000, which are paid to the Township's contractor, were used for Scenarios 1 through 3. Scenario 4 includes higher O&M costs to track more closely with expected vehicle O&M.

Capital costs paid for the Township's existing containers were used for Scenarios 1 and 2 -- \$53,200 total for 15,300 bins<sup>1</sup> at \$3.48 each. For Scenarios 3 and 4, R. W. Beck estimated a cost of \$5.00 per bin for 5,500 bins (includes extra bins to account for system growth) or \$27,500.

R. W. Beck analyzed the fixed and variable data discussed above; the results are shown in Tables 3 and 4.

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<sup>1</sup> Includes 3 bins for each of the 5,000 households plus an extra 300 bins.

**Table 3**  
**Summary of Collection System Results for Each Scenario**

<i>Result of Analysis</i>	<i>Result for Each Scenario...</i>			
	<i>Scenario 1</i>	<i>Scenario 2</i>	<i>Scenario 3</i>	<i>Scenario 4</i>
Total Variable Non-Productive time Associated with Taking a Full Load to the Processing Facility, Unloading, and Returning to the Route	0.67 hours	1.00 hours	1.00 hours	0.83 hours
Number of Stops to Fill One Truck	193	551	551	827
Time to Fill One Truck	2.5 hours	5.5 hours	4.6 hours	6.9 hours
Total Time Required to Fill One Truck, Travel to the Processing Facility, Empty the Truck, and Return to the Route	3.2 hours	6.5 hours	5.6 hours	7.7 hours
Total Number of Trips to Be Made to the Disposal Facility Each Day	2.16 trips	1.06 trips	1.24 trips	0.90 trips

Table 4 shows the direct operating costs estimated for each scenario associated with collection only. It is important to note that these costs are macro-level planning estimates designed to help determine whether a system change has enough merit to warrant further consideration/investigation by the Township.

**Table 4**  
**Summary of Collection System Costs for Each Scenario**

<i>Result of Analysis</i>	<i>Result for Each Scenario...</i>			
	<i>Scenario 1</i>	<i>Scenario 2</i>	<i>Scenario 3</i>	<i>Scenario 4</i>
Annual Labor Cost per Route	\$21,632	\$21,632	\$21,632	\$21,632
Annual Truck Capital and O&M Costs per Route	\$19,313	\$20,211	\$20,211	\$24,540
Annual Recycling Bin Capital Costs per Route	\$8,033	\$12,049	\$7,474	\$7,474
Total Average Annual Capital and Labor Cost per Route	\$48,978	\$53,893	\$49,318	\$53,646
Total Number of Routes Needed	0.9	0.6	0.5	0.5
<b>Total Annual Recycling Collection System Cost</b>	<b>\$44,480</b>	<b>\$32,336</b>	<b>\$24,659</b>	<b>\$26,823</b>
<b>Annual Recycling Collection System Cost per Household</b>	<b>\$8.82</b>	<b>\$6.47</b>	<b>\$4.93</b>	<b>\$5.36</b>

## PROCESSING COSTS

In all four scenarios analyzed for Harborcreek it is assumed that marketing functions are handled by the contractor. However, while the Township is not directly handling the marketing of the materials, processing costs are still covered by the Township through the contractor's fees.

At present, the Township is refunding its contractor for any tip fees paid for newspaper and no tip fees are being paid for the separated containers. If the Township began commingling recyclables, it is expected that tip fees would be charged for both newspaper and commingled containers. Based on conversations with World Resource Recovery Systems in Erie, R. W. Beck estimates that the Township could expect tip fees of \$10 per ton for newspaper and \$15 per ton for commingled containers. Using calendar year 1997 tonnages provided by the Township of 365 and 342 tons, respectively, for newspaper and containers (when commingled), these tip fees would result in the following costs:

- Scenario 1 - \$3,647 per year for newspaper or \$0.73 per household; and
- Scenarios 2 through 4 - \$8,784 per year for newspaper and commingled containers or \$1.76 per household.

## TOTAL ESTIMATED DIRECT COSTS (COLLECTION AND PROCESSING)

Table 5 shows the total direct costs estimated when collection costs and processing costs are combined.

**Table 5**  
**Total Estimated Cost per Household<sup>1</sup>**

<i>Scenario</i>	<i>Collection Cost per Household</i>	<i>Marketing Cost per Household</i>	<i>Total Cost per Household</i>
1	\$8.82	\$0.73	<b>\$9.55</b>
2	\$6.47	\$1.76	<b>\$8.23</b>
3	\$4.93	\$1.76	<b>\$6.69</b>
4	\$5.36	\$1.76	<b>\$7.12</b>

<sup>1</sup> Includes direct labor, equipment and vehicle capital, and vehicle O&M, for collection and estimated annual costs to process/market recyclables.

## OTHER IMPACTS

Aside from actual recycling program costs incurred by the Township, other intangible factors must be considered. In the case of Harborcreek, intangibles include the fact that the residents have been trained to separate their recyclables. If the Township made the switch to commingled recyclables and then, at some later date, opted to source separate again, retraining and reeducating the residents could require significant funds.

## CONCLUSION

The need across the nation to reduce the cost of collecting recyclables, as well as the increased availability of processing for commingled recyclables, has resulted in a growing trend toward

increased commingling. In fact, some communities have access to processing facilities that accept fully commingled materials (paper and containers mixed together).

While commingling improves collection costs, there are impacts on processing costs and material quality. For example, residue rates from materials recovery facilities that accept commingled materials are typically higher than those facilities that receive source-separated or curb-sorted materials. The higher residue rates are typically attributed to several factors:

- Once materials have been mixed together it is more challenging to fully separate them by type and color (especially glass); and
- In curb-sort programs, the collector can more easily identify non-targeted materials or materials that have been improperly prepared. This process allows collectors to enforce the community's educational program by leaving undesired materials at the curb (with additional educational materials, if needed). In a commingled system, it may be more difficult for a contractor to spot contaminants easily during collection.

In spite of the tendency toward higher residue rates (often on the order of 6 to 15 percent), commingling is widely practiced and recyclables from two-split commingled programs can be (and are) successfully marketed to reclaimers and end users.<sup>2</sup>

Commingling can offer an additional advantage of reducing the number of home storage containers that residents need to find a place for in their home and carry to the curb. In some communities, fewer containers to deal with is perceived as a plus by the public.

Further, advocates of commingling suggest that it is more appropriate to have separation occur at a facility where minimal-wage workers typically staff the sorting lines rather than pay higher wages for a driver to handle those functions.

## RECOMMENDATIONS

Based on our analysis, R. W. Beck estimates that any of the commingled collection options could improve the cost-effectiveness of the current collection system. The lowest cost option would be two-stream commingled collection using the Township's existing truck but a single, larger bin for containers (paper continues to be bundled). This scenario would also allow the Township to return to a curb-sort approach if needed at some point in the future with relatively few retrofits.

Because the cost estimates used in this analysis are based on a variety of untested assumptions (including vehicle retrofit costs, impacts of commingling on the Township's per-stop collection times, and real-life tonnage capacity of a retrofitted vehicle), R. W. Beck recommends that the Township seek base and optional bids from recycling collectors that mirror the scenarios evaluated in this project. (Scenario 1 from this analysis would become the base bid and Scenarios 2 through 4 would be options.) This approach will give the Township the opportunity to better evaluate the impacts of purchasing new bins, investing in a new vehicle, and changing historically successful set-out patterns.

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<sup>2</sup> Fully commingled programs (where fiber and containers streams are combined) are less common and thus have a shorter history of documented success. Some end users, particularly the paper industry, are concerned about the impact of these fully commingled systems on material quality. Therefore, fully commingled approaches have not been evaluated for Harborcreek Township.

Mr. Mark Corey  
May 27, 1998  
Page 8

Please feel free to call me at (407) 422-4911 if you have any questions on the analysis explained in this letter report.

Sincerely,  
R. W. BECK, INC.

Jessica K. Lucyshyn  
Engineer

cc: Charlotte Frola, SWANA  
Carl Hursh, PA DEP  
Rick Schlauder, R. W. Beck  
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