

A Cost Comparison of Alternatives for Providing
the Proposed Martinsburg Yard Waste Compost Facility
with Equipment

Blair County



Photo of Blair County Yard Waste Compost Recycling Facility
From Blair County Department of Solid Waste & Recycling Website

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BACKGROUND

The Pennsylvania Department of Environmental Protection (PaDEP), the Governor's Center for Local Government Services, the Pennsylvania State Association of Township Supervisors (PSATS) and the Solid Waste Association of North America (SWANA) formed a training partnership for Pennsylvania local governments interested in achieving higher recycling rates. Through this partnership, Blair County was awarded \$6,000 in technical assistance services from Gannett Fleming, Inc. to assess several alternatives for supplying a proposed yard waste composting facility in Martinsburg with equipment.

INTRODUCTION

The Blair County Department of Solid Waste and Recycling (BCDSWR) operates a yard waste composting facility, which is located on the border of Blair and Cambria Counties, near the town of Buckhorn. It is known as the Ashville facility for its mailing address. The facility accepts grass clippings, leaves, brush, and yard waste, and produces both compost and mulch, which is made available for pickup to citizens of both counties. In 2001, the Ashville facility produced 5,000 cubic yards of compost and 7,000 cubic yards of mulch.

The BCDSWR is working with the County Conservation District on developing another composting operation to be placed in Martinsburg, which is 15 miles to the south-southeast of Altoona. The County Conservation District submitted a Growing Greener grant application in 2001 to create a demonstration site for composting leaf waste with dairy manure. With a successful grant bid, a two-year demonstration project is planned to begin in the spring of 2003. In support of this project, the BCDSWR intends to provide both equipment and technical support.

Two locations in Martinsburg were identified as potential demonstration sites: a Borough owned parcel behind the Borough equipment garage, and a parcel under the care of the Blair County Airport Authority. One of these two locations for the demonstration project will be selected at a later time.

Upon completion of a successful demonstration project, composting with dairy manure will be carried out at local farms rather than a centralized facility. The Martinsburg facility will then be turned over to the County to become a yard waste composting operation similar to the one in Ashville. In preparation, the County requested technical assistance to compare the costs associated with purchasing new equipment for the Martinsburg operation and sharing equipment with the Ashville facility.

This study provides an economic analysis of eight alternatives for supplying the Martinsburg facility with equipment with considerations for the type of facility to operate, the equipment to either purchase or transport, and the applicability of grant funding for equipment purchases. The recommendations can assist the BCDSWR with decisions to be made for supplying the Martinsburg facility with equipment both during the demonstration period and after.

SCOPE OF WORK

The following is the Scope of Work for this SWANA Technical Assistance project:

- Task 1:** Meet with the Blair County Recycling Coordinator and County Conservation District to visit the proposed composting site in Martinsburg Borough, and discuss with them equipment and operational aspects for the County operated facility in Ashville.
- Task 2:** Generate a list of equipment needs and capital costs on the basis of the anticipated size of the proposed operation in Martinsburg Borough.
- Task 3:** Compare the cost of purchasing equipment for the Martinsburg facility with sharing equipment with the Ashville facility.

TASK COMPLETION

Task 1: *Discuss the equipment and operational aspects of the Ashville Composting Facility.*

Understanding the operational aspects of the Ashville facility will help to determine the uses and availability of equipment. A yard waste composting operation is active for approximately eight months in a year. Activities begin normally in April with the first arrival of yard debris and conclude in November with the end of the leaf collection season. The “active season,” which is referred to periodically in this report, is the eight months of high activity between April and November.

The composting and mulching equipment that is available at the Ashville facility, and could potentially be shared with a second facility is a horizontal grinder, windrow turner, skid loader, front-end loader, dump truck, and a compost and mulch screen. A tub grinder, which serves the same function as the horizontal grinder, is also available at the Ashville facility. It operated for 10 years before its replacement in 2002, and could possibly be used again with repair.

To address sharing this equipment with the Martinsburg facility, usage rates are an important consideration. The uses for each piece of equipment are listed below:

- The horizontal grinder is used once a week in the active season to produce mulch.
- The windrow turner is mounted onto the front-end loader to turn windrow piles. It is used once a month during the active season, and maybe once or twice in winter.
- In addition to pile turning, the front-end loader is also used to shape windrow piles.
- The skid loader is used to transport, load, and unload compost and mulch from vehicles.
- A compost/mulch screen has not been purchased yet. When it becomes available, it will be used for creating various grades of both compost and mulch on the basis of particle size. Compost screening is expected to occur in spring and autumn. Mulch screening will be necessary throughout the active season.

Table 1 lists the equipment that is available at the Ashville facility, and estimates equipment usage on both an annual and weekly basis. The number of operating hours per year for each piece of equipment is estimated with assistance from County personnel.

Table 1: Equipment Details and Usage for the Composting Facility in Ashville

Equipment	Make	Model	Power (HP)	Production	Operating Hours per year	Operating Hours per Week
Horizontal Grinder	Morbark	4600	600	300 yards per hour	300	8
Windrow Turner	Wildcat	LS117A	125	1,500 tons per hour	150	8 ^A
Skid Loader	Bobcat	963	105	78 inch utility bucket	1,200	30
Front-end Loader	John Deere	544E	120	4 cubic yard bucket	500	12
Compost & Mulch Screen	--	--	45	100 cubic yards/hour	500	8 to 16 ^B
Dump Truck	GMC			10 to 12 cubic yards	110	4

Note A: The windrow turner is used 8 hours at a time when used.

Note B: The compost/mulch screen will likely be used 8 hours a week for 3 months of the year and 16 hours a week for 6 months

On the basis of estimated operating time, it would be possible to use most of the equipment at a second facility without a scheduling conflict. The frequent use of the skid loader, however, would make it difficult to split time with a second facility.

Aside from the skid loader, the remaining equipment could be transported to Martinsburg as follows:

- The horizontal grinder is road-ready and can be pulled with a tractor trailer and hitch.
- The compost/mulch screen is road-ready and can also be pulled with a dump truck.
- The front-end loader and windrow turner can be transported together with a tractor trailer that is equipped with a low-boy.

Task 2: *Generate a list of equipment needs and capital costs on the basis of the anticipated size of the proposed operation in Martinsburg.*

With assistance from a Growing Greener grant, the County Conservation District intends to develop a demonstration site in Martinsburg Borough for composting yard waste with dairy manure. The project intends to help schools meet their environmental education goals as well as to train municipal and agricultural composters. Upon completion of the planned two-year demonstration project, manure composting will continue at local farms rather than a centralized facility. The facility will be turned over to the County to become yard waste composting (no manure) operation.

When the site becomes available to the County for yard waste composting, it is likely to have a 0.4-acre active composting pad with a permitted capacity of 1,200 cubic yards per year. The site is likely to have concrete-based composting pads, stormwater runoff control, odor control mechanisms, collection boxes, and fencing. The site might also have perforated piping in-place across the active composting pads. For the demonstration project, the Conservation District is considering passive aeration, which involves the installation of 8,400 lineal feet of perforated piping.

If passive aeration is chosen for the demonstration project, the County should plan to remove the perforated piping and distribute it among the local farmers who intend to compost yard waste and manure. Researchers in Lehigh County have found that passive aeration can be effective for composting a thoroughly mixed batch of manure and yard waste, but it is ineffective for composting yard waste batches of primarily leaf waste. The leaves tend to mat and clump, creating anaerobic pockets within the compost heap.

The County should plan to compost 1,200 cubic yards of yard waste per year in a turned windrow operation. Some expansion of the active composting area might be possible, but the operating capacity of the Martinsburg facility is likely to remain at less than half that of the Asheville facility.

On the basis of this anticipated operating capacity and materials to be processed, the equipment that is available from the Ashville operation should be adequate. The cost of hauling equipment between the two facilities considers the traveling distance and time, the number of times that the equipment will be needed each year, and an estimated hourly rate for hauling as described in further detail below:

Traveling distance and time: The round-trip traveling distance is approximately 50 miles. At an average speed of 25 miles per hour, the total travel time is approximately two hours.

Transport frequency and schedule: The smaller operating capacity of the proposed Martinsburg facility doesn't necessarily mean that equipment will be needed less frequently. However, the transport of two sets of equipment between facilities each week would seem to place a heavy burden on the employees. Therefore, the following schedule is suggested:

- The horizontal grinder could be transported with a tractor trailer every even week from April until November for a total of 15 times per year.
- The compost/mulch screen could be transported with the County dump truck every odd week from April until November for a total of 15 times per year.
- The windrow turner and front-end loader might only be necessary five times a year.

Due to the relatively small size of the proposed operation, it is assumed that composting piles could be shaped with a skid loader, which would minimize the need for transporting the front-end loader between the two facilities.

Hourly rates and time commitment: The following hourly rates and time commitments for equipment transport were developed with assistance from local haulers and composting professionals.

- A local hauler has charged the County \$35 an hour to transport the horizontal grinder with a tractor trailer. Two four-hour days are assumed for transport of the horizontal grinder: four hours for drop-off on one day, and four hours for pick-up on the following day.

- The compost/mulch screen can be transported with the dump truck using one County employed driver at an hourly rate of \$16. A second County employee would be necessary at each facility to assist with equipment loading and unloading. Hauling costs are estimated as follows: four hours for transport, and four hours between two employees for mobilization. A rate of \$15 an hour is assumed for fuel and additional maintenance costs, which equates to approximately \$1 to \$1.50 per mile.
- A local hauler estimated the cost for hauling the windrow turner and front-end loader together on a low-boy trailer at \$75 an hour. Two five-hour days are assumed for transport of the windrow turner and front-end loader: five hours for drop-off on one day, and five hours for pick-up on the following day.

Table 2 presents estimated hauling costs for the horizontal grinder, compost/mulch screen, and the co-transport of the windrow turner and front-end loader. Hauling costs are not eligible for Section 902 funding.

Table 2: Estimated Annual Hauling Costs for Equipment Transport between Ashville and Martinsburg

Transport	Mode of transport	Trips per year	Cost per Trip	Annual Cost
Windrow turner and front-end loader	Tractor trailer with a low-boy	5	\$800	\$4,000
Horizontal grinder	Tractor trailer with a hitch	15	\$300	\$4,500
Compost/mulch screen	Dump truck with a hitch	15	\$200	\$3,000

Table 3 presents quoted prices for the purchase of new composting equipment, and lists the cost for this new equipment with a 90% matching funds from the State under the Section 902 grant program. The quoted prices are current as of 2002 and subject to change over time.

Table 3: Quoted Prices for the Purchase of New Equipment, and Costs to the County with a 90% Matching Grant from the State

Equipment	Make	Model	Power (HP)	Quoted Purchase Prices	Cost to the County w/ 90% State Match
Horizontal Grinder	Morbark	4600	600	\$292,000	\$29,200
Dump Truck	Ford	F550		\$56,000	\$5,600
Windrow Turner	Wildcat	LS117A	125	\$77,000	\$7,700
Front-End Loader	John Deere	544E	120	\$108,000	\$10,800
Compost Screener	--	--	45	\$97,000 ^A	\$9,700
Skid Loader	Bobcat	963	105	\$35,000	\$3,500
TOTALS				\$665,000	\$66,500

Note A: Price is estimated from a set of quotes for compost and mulch screeners in the 45 HP range.

Task 3: Compare the cost of purchasing new equipment with transporting the equipment from the Ashville operation between the two sites.

This section establishes criteria for comparing the costs presented in the previous section, and introduces additional considerations, which create several alternatives for supplying the proposed facility with equipment. Such considerations include the type of facility to operate, equipment storage methods, and the pieces of equipment to either transport or purchase. The facility could produce both compost and mulch or compost only. Additionally, the facility could operate with or without the compost/mulch screen. If equipment is to be purchased for the Martinsburg facility, then storage becomes an important consideration. Another consideration is the repair of the Olathe tub grinder.

Criteria for Comparison of Alternatives: A present worth analysis is used to compare the alternatives. To compare alternatives involving annual costs on equal terms with first costs, a time period must be selected and an interest rate assumed. The County uses a 6% interest rate for planning purposes. A time period is established through consideration for the life cycle of each piece of equipment, and selection of the shortest life cycle. For planning purposes, a horizontal grinder can be expected to last for seven years before it needs to be replaced. Other equipment can be expected to last for longer. Therefore, an appropriate planning period is seven years.

Additional Considerations: There are several additional factors to consider for determining the most cost effective means of supplying the proposed composting site with equipment. Some of these additional considerations are outlined below:

- **A “compost only” facility:** If only leaves and grass clippings are accepted for composting, then the need for a horizontal grinder to produce mulch is not necessary. The compost/mulch screen will also be needed less frequently.
- **Some site-dedicated equipment is necessary:** A site-dedicated skid loader appears to be necessary due to its frequent use at the Ashville facility.
- **Site-dedicated equipment requires storage:** Storage methods for equipment can range from covering equipment with a tarp to constructing a storage facility. It might also be possible to store some pieces of equipment at a local facility. For the purpose of discussing the alternatives, the following assumptions are made for equipment storage:
 - If only a skid loader or dump truck requires storage, then it is assumed that free space is available at a local off-site facility.
 - If a horizontal grinder or compost/mulch screen requires storage, then it is assumed that it could be placed under a tarp at the composting facility. The cost of a tarp for a large piece of equipment is estimated at \$2,000.
 - If several pieces of equipment need to be stored, then a storage facility will need to be constructed. The size is estimated at 3,000 square feet. For planning purposes, a cost of \$60 per square foot is assumed, which equates to a construction cost of \$180,000.

Operation and maintenance costs are not expected to influence the conclusions. Unless there is evidence that newer equipment is significantly more efficient than older equipment, it is assumed that the operating costs at the two facilities will be proportional on the basis of capacity.

Alternatives: The details of eight alternatives are presented below. These alternatives involve a combination of purchasing, transporting, and repairing equipment. Alternatives one through four consider use of the compost/mulch screen whereas alternatives consider operating the

Martinsburg facility without it. A facility that produces both compost and mulch is considered as well as one that produces only compost.

- **Alternative 1:** Purchase a skid loader, and share the dump truck, horizontal grinder, front-end loader, windrow turner, and compost/mulch screen with the Ashville operation. Store the skid loader at a local facility.
- **Alternative 2:** Purchase a skid loader, dump truck, horizontal grinder, front-end loader, windrow turner, and compost/mulch screen for the Martinsburg facility, and construct a 3,000 square foot storage facility for the equipment.
- **Alternative 3:** Fix the Olathe tub grinder, store it under a tarp at the Martinsburg facility, purchase a skid loader to store at a local facility, and transport the windrow turner, front-end loader, dump truck, and compost/mulch screen from the Ashville operation when needed.
- **Alternative 4:** Develop a compost only operation (no mulch). Purchase a skid loader to store at a local facility, and transport the windrow turner, front-end loader, and compost/mulch screen from the Ashville operation when needed. Use of a horizontal grinder is not necessary in this case. The compost/mulch screen will be needed less frequently in this case because mulch screening is unnecessary.

Alternatives five through eight follow the pattern of alternatives one through four. The major difference is that the compost/mulch screen is removed from the equation, and the purchase of a site-dedicated dump truck is added to the equation. It is anticipated that public access to the compost facility might not be feasible in which case a site-dedicated dump truck would be necessary for material transport between the facility and off-site (satellite) locations .

Table 4 presents a present worth analysis of these eight alternatives with and without the availability of a State grant through the Section 902 grant program.

Table 4: Present Worth Comparison of Eight Alternatives for Supplying the Martinsburg Facility with Equipment

	Item	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8	
Details of the Alternative	Operation	Compost and Mulch	Compost and Mulch	Compost and Mulch	Compost only	Compost and Mulch	Compost and Mulch	Compost and Mulch	Compost only	
	Incorporate Screening	Yes	Yes	Yes	Yes	No	No	No	No	
	Equipment to Purchase	skid loader -- -- -- -- --	skid loader dump truck h. grinder end loader windrow turner screener	skid loader -- -- -- -- --	skid loader -- -- -- -- --	skid loader -- -- -- -- --	skid loader dump truck -- -- -- --	skid loader dump truck h. grinder end loader windrow turner --	skid loader dump truck -- -- -- --	skid loader dump truck -- -- -- --
	Equipment to Transport	dump truck h. grinder end loader windrow turner screener	-- -- -- -- --	dump truck -- end loader windrow turner screener	dump truck -- end loader windrow turner screener	dump truck -- end loader windrow turner screener	-- h. grinder end loader windrow turner --	-- -- -- -- --	-- -- end loader windrow turner --	-- -- end loader windrow turner --
	Equipment to Repair	none	none	tub grinder	none	none	none	none	tub grinder	none
	Equipment	\$3,500	\$66,500	\$3,500	\$3,500	\$9,100	\$56,800	\$9,100	\$9,100	
	Equipment Storage	0	\$18,000	\$200	0	0	\$18,000	\$200	0	
Equipment Repairs	0	0	\$10,000	0	0	0	\$10,000	0		
Annual Hauling Costs	- \$11,500 -	0	- \$7,000 -	- \$5,600 -	- \$8,500 -	0	- \$4,000 -	- \$4,000 -		
Present Worth of Hauling*	\$64,200	0	\$39,100	\$31,300	\$47,500	0	\$22,400	\$22,400		
Present Worth w/Grant	\$67,700	\$84,500	\$52,800	\$34,800	\$56,600	\$74,800	\$41,700	\$31,500		
Costs w/o Grant	Equipment	\$35,000	\$665,000	\$35,000	\$35,000	\$91,000	\$568,000	\$91,000	\$91,000	
	Equipment Storage	0	\$180,000	\$2,000	0	0	\$180,000	\$2,000	0	
	Equipment Repairs	0	0	\$10,000	0	0	0	\$10,000	0	
	Annual Hauling Cost	- \$11,500 -	0	- \$7,000 -	- \$5,600 -	- \$8,500 -	0	- \$4,000 -	- \$4,000 -	
	Present Worth of Hauling*	\$64,200	0	\$39,100	\$31,300	\$47,500	0	\$22,400	\$22,400	
	Present Worth w/o Grant	\$99,200	\$845,000	\$86,100	\$66,300	\$138,500	\$748,000	\$125,400	\$113,400	

* Hauling is listed as the present worth value of a 7-year annual cost with a 6% interest rate.

CONCLUSIONS

On the basis of the present worth analysis of eight alternatives for supplying the Martinsburg facility with equipment, the following conclusions are offered:

1. If grant money is available for the purchase of equipment, then the most cost effective alternative is to operate a “compost only” facility, do without screening, purchase a dump truck and skid loader, and transport the windrow turner and front-end loader from the Ashville facility when needed (Alternative 8).
2. If grant money is not available for the purchase of equipment, then the most cost effective alternative remains to create a “compost only” facility, and transport the windrow turner and skid loader from the Ashville facility when needed as well as the compost/mulch screen and dump truck (Alternative 4). The reason that it becomes cost effective to transport the compost/mulch screen is that the cost of a dump truck without the availability of grant money is significantly greater.
3. The repair of the Olathe tub grinder does not appear to be a cost effective alternative, which is just as well because the study assumed the unlikely event that it would last for seven years following repair.
4. The purchase of a full set of composting equipment does not appear to be the most cost effective alternative under any scenario (with or without the screening and with or without grant money).
5. If construction of a storage facility becomes unnecessary due to the availability of rental space or even a donated facility, it still remains less cost effective to purchase new equipment than to share equipment with the Ashville facility regardless of the availability of grant money.

There are many additional conclusions to draw from Table 4. These five conclusions, however, will hopefully assist the BCDSWR with some initial decisions. After the demonstration period is complete, the BCDSWR might consider revisiting these alternatives to determine which ones remain applicable.