The Future of Sustainable Composting at Williams College

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The Importance of Composting

"1,000 Pounds a Day," by Melissa Umezaki

Williams College currently produces approximately one thousand pounds of food waste per day. We determined this number by weighing the food waste, which is collected daily from each of the five dining halls as well as Co-Ops, the Center for Development Economics and the Faculty Club, for six days and averaging the weights. Although dining services is actively trying to reduce the amount of food waste it produces, there will inevitably be accumulation of food waste in the dining halls, whether it is from pre-consumer waste (food preparation scraps) or post-consumer waste (unfinished food scraps from plates). What the College decides to do with this fairly large amount of food waste is important in minimizing its environmental impacts and economic costs. For instance, if the College decided to treat our food as "trash" and to send it to the landfill, there would be many negative consequences of this action. First of all, it costs money to send trash to the landfill; not only would the College have to pay a hauler to bring the food waste to the landfill, but there is also a tipping fee of $70 per ton to dump. Environmentally, dumping our food waste adds to the reduction of valuable land space. The more we contribute to the landfill, the more we contribute to pollution associated with landfills and add to the volume

of trash. Furthermore, by treating our food waste as trash, we throw away organic material and nutrients that could be harnessed and potentially utilized as a valuable soil amendment. In a landfill, the food waste would simply rot because it would be improperly aerated. Composting, however, takes advantage of the natural decomposition process, a process that can turn our food waste into a valuable, nutrient-rich soil amendment.

The History of Composting at Williams College

The complex, history of composting at Williams College spans nearly ten years. The program began in 1994, when environmentally concerned students initiated a small-scale composting program behind Dodd House in an effort to reduce the amount of waste sent to the landfill. At first, they collected food from Dodd house only and composted it using a pile system. As the program began to expand, it became possible for students to collect food waste from all five dining halls on a nightly basis. CES granted the funds to pay two students per night to work for two hours to collect the food waste and transport it in a 15-passenger van. For a few years, the students drove the food waste to Caretaker Farm, owned and operated by Sam Smith in South Williamstown, but the inherently sporadic nature of a student-run program made this relationship difficult at times. In 1996, the students began storing the food waste in a dumpster at the "Agway" site located off of Spring Street. From there, a hired hauler transported the dumpster of food waste to a farm in Sheffield, MA, located about 70 miles away from Williams College. Over the next couple of years, the economical and environmental inefficiency of this situation became evident. As an improvement in 1998, the program established a contracted relationship with Holiday Farm, where Dicken Crane owns and runs a commercial composting operation. Located about 30 miles from campus in Dalton, MA, Holiday Farm proved to be a

more economically viable and a less environmentally harmful destination for the College's food waste.

The program continued in this fashion for the next few years. Primarily run by students, the program demonstrated incredibly strong student initiative, but it became evident that the busy students who go to Williams College have minimal time to dedicate to such an important but time-consuming program. Although the food collection only took the students about two hours per night, this effort still cut into class and studying time, as well as other student commitments. The direction of the program began to change when Brian Werner '01 became the program's student director, and drafted the report, "Moving Towards a Sustainable, Campus Wide Composting Program at Williams College." In his report, Werner addressed many important issues that deserved the attention of the administration, including the inherent weaknesses in the current system: the net economic loss and the inefficiency of the student-run program. Werner proposed that the administration make an institutional commitment to composting. He states that, "It is unrealistic to ask students to solely administrate such a large-scale program. Students' time is in short supply, and it is not the students' duty to see that the college manages with its waste in an environmentally responsible manner" (Werner, 5). He envisions a long-term composting program that would be located close to the center of campus and "close-looped" in nature, meaning that the finished product would be used on campus.

Werner's report presents two possible composting techniques, windrows and in-vessel composting (IVC). These two methods are quite different, windrows being a cheaper and more simplistic way to compost, while the more technologically advanced IVC requires a higher capital investment. More specifically, Werner suggests the adoption of the IVC made by Wright Environmental Systems of Ontario, which has a flow-through design allowing continuous

loading of food waste. Werner acknowledges that the $90,000+ price tag may frighten the administration, but he explains how this system offers many benefits over the less costly windrow system. The IVC system requires less manual labor and land, produces finished compost faster than windrows, and eliminates environmental and potential pest concerns by containing all of its smells and leachates (Werner, 6).

Werner's report also presents three potential on-campus sites: Mt. Hope Farm, the field off of Potter Road and the old Cole Field landfill. He comments on the large amount of unused land at Mt. Hope Farm and its favorable distance from neighbors, but he predicts large resistance from the Purple Mountain Partners, as they have complained about yard waste being dumped there in the past. He describes the field off of Potter Road as favorable for windrows, but he explains that this site's location in a residential area would make it necessary to plant trees to screen the composting operation. According to Werner, the last and most promising possibility is the old landfill site behind Cole Field. The advantages include, "proximity to the college (B&G would actually save time dumping yard wastes there versus the current site), lack of neighbors, low development needed and nearby utilities…The site represents an opportunity to put to good use a piece of college land that otherwise will continue to lie dormant" (8). He concludes his report by asking the administration to commit on an institutional level to a composting program on campus by May 1, 2001.

Unfortunately, the administration did not rise to meet Werner's challenge to take full responsibility for the composting program at Williams. In response, Briana Halpin, Werner's successor as student composting director, submitted "To the Rescuers a la Compost" in December 2001. She reiterates many of the same reasons that Werner makes concerning the need for change in our composting program. Halpin includes a very detailed analysis of different

methods of composting as well as countless helpful contact numbers. In addition, she states that hauling the food waste thirty miles to Holiday Farm places environmental, economic and educational costs on the College. It is important to note that she believes that Williams should eventually follow the form of other New England schools, such as Middlebury and UMass-Amherst, which would in turn bring Williams many benefits. For example, she states that creating an on-campus system would eliminate the financial and environmental costs of hauling and would provide a highly educational opportunity. Furthermore, Halpin discusses the symbolism of such an action, because the composting program could serve as a strong environmental statement of the College's acceptance of responsibility for one of its largest waste "streams." Although Halpin describes an on-campus system as the most ideal option for the College, she presents a local farm as a viable first-step for the College to take to decrease both environmental and economic costs.

As a response to the multiple requests by dedicated students for administration to institutionalize the program, a Compost Task Force was formed in early 2002. In addition to the students, faculty and staff members, the team also included Silvio Eberhardt, an outside consultant. Eberhardt was hired to aid the Task Force in the research and compilation of information. The Task Force's mission included considering workable strategies for the disposal of Williams' food waste, and their report brings up some interesting weaknesses of the program that had not been previously addressed. The Compost Task Force Report states strongly that the current responsibility required of students is far too great, and that the College is being irresponsible and unfair in expecting students to oversee the program. They go so far as to say:

> Unfortunately, Williams' food recycling operation may be coming to a close because 1) dragging and lifting heavy bins is hazardous and is not suited for student involvement; 2) students do not derive much educational value from a task requiring two students daily to spend two hours each; 3) student leadership may wane over the next few years as the

> motivated project leaders graduate; 4) van break-downs are occurring more frequently; 5) students do not feel comfortable with some aspects of the operation, such as negotiating contracts and vehicle maintenance; and not least, 6) it is unlikely that B&G and CES will fund the work after this year (Eberhardt et al, 3).

The Task Force report identifies and describes seven different disposal scenarios: 1) Landfilling; 2) Donating to an off-campus composting operation; 3) On-campus windrows; 4) On-campus bunkers; 5) On-campus IVC; 6) On-campus vermicomposting; and 7) On-campus greenhouse composting. The report then compares and contrasts the financial costs and educational benefits of the different scenarios. The report also stresses the importance and need for research for amendment availability; to run a successful composting program, the College would have to find sources of yard waste and animal manure to serve as effective amendments required in the composting process.

Overall, the report offers an informative overview of possible options for the College's composting program, and the report concludes with Task Force's seven recommendations for the College. These recommendations bring all of the aspects of the program together and make the administration's responsibilities clear and concise:

1. The college should not landfill food waste.
2. The college should support B&G in taking over food waste collection starting in September, 2002.
3. The college should engage in composting.
4. Students in the fall 2002 Envi 302 Environmental Planning and Analysis Workshop should be involved in the designing of the composting operation (that's us!).
5. The college should employ a staff person rather than students to run the program.
6. The college should start with a more simple system such as an outdoor bunker with the intent of upgrading to more complex system such as IVC and a heated greenhouse.
7. The college should recognize the multiple opportunities "to integrate the composting operation into a larger picture of education, community connections and sustainability" (18).

The Task Force submitted their report in May 2002, and in response, the administration made a verbal commitment to continue composting at Williams. As the next step, in June 2002, Kai Lee (Acting CES Director) and Steve Mischissin (Buildings and Grounds Director) drafted a written request for funding of the initial phase of a College composting program for the fiscal year 2003. They requested a $42,000 in capital and $20,000 in operating costs to fund the hiring of a part-time staff member at B&G and the purchase of a new truck with a hydraulic lift. The request mentioned their expected need for additional funding to build an on-campus composting area. They also expressed hope for the Envi 302 study to provide site evaluations and organizational information to guide their next budget submission in January 2003. According to Kai Lee, he sent the funding request to Mr. Mischissin to co-sign and then to submit to Helen Ouellette (Vice President of Administration) and Thomas A. Kohut (Dean of Faculty). Unfortunately, the request "fell through the cracks", and no financial commitment was made by the College. As a result, at the beginning of the 2002-2003 school year, the food waste collected in the dining halls was treated as trash and sent to the landfill.

The Current Program, Fall 2002

"Larry Robinson, Our Hauler" by Melissa Umezaki

As the College realized the inefficiency of landfilling the food waste, all responsibility of the composting program was shifted to Dining Services in fall of 2002. Robert Volpi, the new

Director of Dining Services, quickly came to the rescue of the program. Currently, he has reestablished the relationship with Dicken Crane at Holiday Farm, who was very receptive to receiving the food waste. Volpi also hired a local hauler, Larry Robinson, to collect food waste from all five dining halls as well as the other College buildings each morning. Furthermore, Volpi also hired another hauler to take the food waste from the dumpster at the "Agway" barn site in Denison Park to Dalton on a bi-weekly basis. This system has proved to be efficient and successful for the time being, and it is important to note that this commitment by the College, and more specifically by Dining Services, is an extremely positive step that Williams College has taken.

Our Charge

"A Day's Work" by Melissa Umezaki

As mentioned earlier, the Compost Task Force recommended that Environmental Studies 302 students take on the project and propose a plan and provide a budget for a sustainable composting program at Williams College. Although the current program is very useful and effective, it is necessary, at this point, to research the options for a more sustainable and cost-effective composting program in order to ensure that the College continues to compost in the long-term. Therefore, as the student planners, we realized our role in answering these questions: **What should the design of the operation be? Where should all of the food waste go? What is the most appropriate composting method?**

As the first step in our investigation, we met with our clients, Tim Reisler, the Assistant Director for Administrative Services at Building and Grounds and Robert Volpi, the Director of Dining Services. In our meeting, they expressed their satisfaction with the current system in place, but they also both acknowledged their concern regarding the sustainability of the relationship with Holiday Farm. Both believe that hauling our food waste 45 minutes away is inefficient, and they agree that the composting program should be brought closer to home. Reisler and Volpi agreed that establishing a partnership with a local farm (in Williamstown) would be the most beneficial way to bring the composting operation closer to the College. Along with this suggestion, Reisler recommended different college–owned parcels of land which could be potential locations for a college–run composting operation. After meeting with our clients and talking with our professors, we realized that three potential pathways exist for the food waste to follow. The College's food waste could be composted at: 1) a local farm; 2) a College-owned parcel of land; and 3) the Hoosic Water Quality District where a composting operation currently composts human sludge.

A Local Farm Partnership

Volpi's enthusiasm for a local partnership stems from his recent work at Bates College, where he established a strong and sustainable composting program that involves a farmer in nearby Lisbon, Maine. This farmer receives $1000 per semester to receive and compost the college's food waste, and horse farms pay him as well to take away their manure to compost with the food waste. This system works really well for Bates, and developing a similar local farm partnership in Williamstown would generate many benefits. First, the College would not have to invest in the equipment and land preparation needed for composting on a College–owned site.

Second, sending our food waste to a local farm would keep the food waste and finished compost closer, reducing environmental impacts. Furthermore, a partnership with a farm in Williamstown would support local agriculture in that the farms could use the finished product to fertilize their fields and then grow vegetables, and the College, in return, could potentially buy vegetables from the farm. By supporting local agriculture, the College would be protecting the environment. Local farms make it possible for Williamstown residents to buy local produce, and this option minimizes the environmental impact of their consumption. Local farms also help to preserve open space, a valuable component of not only the natural environment but also the Williamstown community.

To explore the feasibility of establishing a local partnership, we devised a farmer survey to conduct over the telephone. After Henry Art, our professor, compiled a list of some likely candidates, we contacted eleven farmers and conducted a guided, conversational phone interview (see Appendix A). The purpose of the survey was to gauge the interest of these farmers in working with the College. We asked them about their current composting activities and asked about their interest in receiving more food waste. Basically, we wanted to gain a better understanding of what would make this partnership feasibly and attractive for the farmers. In addition, we asked whether the farmers would be interested in receiving finished compost if the College decided to run its own operation. Our wide range of questions received an even wider range of responses (see Appendix B). Some results were promising; for instance, we interviewed Dicken Crane of Holiday Farm to reassess his interest, which remains very high. Also, Sam and Elizabeth Smith, who own Caretaker Farm in South Williamstown, seemed incredibly receptive to the idea. Most of the farmers, however, expressed a lack of interest in composting in such a large scale, in working with the College, or, in some cases, a combination of the two.

Survey Results

Holiday Farm

"Windrows and Piles at Holiday Farm" by Sarah Torkelson

As mentioned above, we contacted Dicken Crane of Holiday Farm, who currently composts our food waste. We drove down to Dalton, MA, and Crane proceeded to lead us on a long morning tour of his composting operation, during which he offered us a great deal of helpful information. Crane runs a commercial composting program and composts primarily horse manure and yard waste as well as renderings from the butcher. As a result, the donation of food waste he receives from the College serves as a very small fraction of his input. He accepts our food waste because he supports the College's efforts to compost; however, Crane believes that the College should be composting on campus, "I really think you guys should get your own operation going" (Dicken Crane, Personal Communication, 5 November 2002). This perspective translated into a willingness on Crane's part to explain any and all aspects of his composting system. He left a strong impression on us regarding the intricacies of composting that arguable make it an art. Since he feels strongly about keeping the process as local as possible, Crane also encourages and supports the prospect of sending some of the food waste to Caretaker Farm.

Caretaker Farm

"Caretaker Farm: Fields and Driveway" by Bethie Miller

Situated on Route 43, about 15 minutes from campus, Sam Smith runs Caretaker Farm, a community supported farm including about 200 family members. While Dicken Crane currently composts the College's food waste, Sam Smith of Caretaker Farm also expressed great interest in the possibility of receiving the College's food waste, as he is an avid supporter of keeping our composting operation local. Smith has received the College's food waste in the past; however, the relationship experienced difficulties when students ran the program. During the conducted survey, Smith initially expressed concern about the amount of food waste produced by the College, and he requested a trial load to assess his ability to handle the daily load. Smith ended up receiving a few daily loads, and he determined his comfort and capability of receiving such a large volume of food waste to be high. After receiving the food waste on a daily basis, Smith determined that it would be most convenient and effective to receive the load on a weekly-basis. In addition to the volume of food waste, Smith also expressed concern regarding the access to his composting site in the winter. On the farm, he has a great area for composting, about 1/2 acre in size, which he can currently only access for nine months out of the year. This is because in the winter, his tractor cannot travel along the dirt road which leads to the composting site. With financial support from the College, he would be interested in improving the road, but he also requests that the College pay for winter plowing down to the site. By working with Caretaker Farm, Dining Services would still have to hire two haulers (one for the daily collection from the

dining halls and the other for the weekly haul to Caretaker), but the second hauler would not have to travel as far as they currently do (Sam Smith, Personal Communication, 27 October 2002).

Like Sam Smith, Bill Stinson of Peace Valley Farm has demonstrated an ongoing interest in the College's composting program. However, unlike Sam Smith's immediate interest, Bill Stinson displayed a more cautious response. He expressed some skepticism regarding a partnership with the College for a few reasons. He has discussed college composting with the man involved in the composting program at the University of Massachusetts - Amherst, and the discussion instilled great fear in Bill Stinson. He does not want to get buried under our tons and tons of our food waste! On numerous occasions, Stinson has requested that he receive the College's leaf litter, but the College continues to ignore his proposal. Overall, Bill Stinson remains uncertain about his willingness to commit to a partnership. He has the land and the experience, but he also has reservations about possible rodents and his foreseeable problems in his relationship with the College (Bill Stinson, Personal Communication, 26 October, 2002). Patch Mason of Northwest Hill Road also expressed some interest in receiving the food waste; however, he has strong reservations about forming a relationship with the College. Despite a couple positive responses, the majority of our surveys ended in a fairly negative way, making Caretaker Farm and Holiday Farm the only farm options to pursue further.

An On-Campus Operation

While Bates College models their operation after a local partnership with a farm, other New England colleges have initiated completely on-campus composting operations. Among other things, these operations take advantage of the educational potential of composting, as it

brings the process closer to home and more visible to students. We decided to explore this option as a possibility for Williams College. In order to do so, we needed to research different composting methods and various possible sites for an on-campus operation.

Middlebury College's Model

Middlebury College in Vermont has an efficient on-campus composting program currently in operation. In order to gather accurate information about this program, we contacted Connie Bisson (Sustainable Campus Coordinator at Middlebury) and Norm Cushman (Assistant Director for Maintenance and Operations at Middlebury). They provided us with valuable information about the passively aerated windrow system (P.A.W.S), and the possible economic costs of started such a program here at Williams. The program at Middlebury was initiated mainly for economic purposes – in Vermont the tipping fee for landfilling is approximately $150 per ton (In Williamstown the fee is $72 per ton). Consequently, composting was seen as a good way to reduce the amount of garbage being sent to the landfill and an easy way to save a significant amount of money. Norm Cushman attended a composting workshop hosted at Cornell University in Ithaca, NY, to learn more about the process. He returned to Middlebury with ideas on how to initiate an operation on-campus and researched possible methods. The result is a staff-initiated operation that has become a model for other composting programs. The operation has evolved over the years, and by 1998 it was an entirely on-campus procedure.

The process begins in the three dining halls. The dining staff collects pre-consumer food waste during the meal preparation process, and then they collect post-consumer waste during meal times. From there, a school-owned truck collects the food waste from each dining hall and takes it to the site for storage. Specially fitted for the operation, the truck transports the food

waste to a storage container at the composting site. The storage bin is also specially designed for composting: the plastic material prevents rusting and deterioration, and its two-piece design allows for leachate collection. Two bins are stacked on top of each other – the top bin has perforations to allow water and moisture to leak out from the food waste and into the second bin. The leachate collected in this second bin is later used to "water" the windrows (a later step). Once enough food is collected in the top bin, it is used to form a new windrow (Connie Bisson, Personal Communication, 26 November 2002).

Middlebury utilizes passively-aerated windrows. In this method, food waste and amendments are mixed and arranged into long rows. In addition, standard drainage pipes are set within each row to allow for more circulation. The pipes are laid out perpendicular to the direction of the windrow and are positioned within 6 feet of each other. Because there is more circulation created by air moving through the pipes, the need to turn the rows is eliminated. This convenience is offset by a slower turnout rate, as food waste must remain in windrows for 90 to 120 days. This method is called "passive aeration," because no outside energy is being used to pump air into the rows- the pipes simply allow some air to run through them and into the core of the pile. While the rows do not need to be turned, they still require some maintenance. A certain level of moisture needs to be maintained to ensure that the decomposition process continues properly, so moisture levels must be measured and the rows need to be "watered" (mainly with the leachates from the storage phase). While in the rows, microbes decomposing the food waste produce heat as they work, and temperatures at the core of the row can remain at over 100º Fahrenheit – even in the dead of winter. Middlebury harnesses this heat in their on-campus greenhouse, where a small windrow helps vegetables grow through the winter season ("Compost Happens at Middlebury College").

When there is enough food in the storage bin to create a windrow, the food waste is mixed with amendments which provide the additional nutrients required to produce good quality compost. These nutrients are supplied by animal manure and yard waste. Middlebury uses horse manure donated by a nearby farm and yard waste collected from its own campus. The amendments are added to the food waste according to a recipe that fits the nature of their food waste. In addition to providing nutrients, amendments are used to mask the smell of the food waste and to prevent pest infestation. Each row is ultimately covered with a six-inch layer of dry manure, and this actively "seals in" any odors. It is important to note that despite its sensitive neighbors – an assisted living facility, a hospital, and a golf course – there have been no complaints of the sight or smell of the compost (Connie Bisson, Personal Communication, 26 November 2002).

The windrowing site is a large plot of open land with a large concrete pad to facilitate maintenance, movement of equipment, and to control leaching. In addition, they place a layer of cardboard (flattened boxes in which fruit is delivered to the dining halls) and wood chips underneath each row, and this base layer absorbs leachates from the composting food. After approximately 12-16 weeks in windrows, the compost is usually in its curing stage, which is a slower composting process when the row does not need to be turned. After the curing phase, the pile is stored until screening. Middlebury stockpiles compost ready for screening in order to save the cost of an expensive screener. Instead, they lease a screener for one day and screen all their stockpiled compost in one day. After screening, the compost is complete and ready for use on campus. Any compost that did not pass through the screener gets returned to the windrows for further decomposition ("Compost Happens at Middlebury College").

Middlebury does not sell its compost but rather uses it entirely on campus. Most of the compost goes to the campus landscaping, but a small portion does go to the greenhouse. Interestingly, the greenhouse does grow some vegetables which are used occasionally in the dining halls thus completing the cycle. The estimated market price for the end product is approximately $25 per yard. Economically speaking, the operation is a very stable one. Although Middlebury does not sell the end product, the savings from avoiding landfilling costs and from the campus landscaping outweigh the cost of running and maintaining the program. Initially, the program was budgeted $150,000 from the administration to construct an efficient operation. All of these funds were used towards preparing the site (laying the concrete slab), the equipment (the retro-fitted truck and a tractor), the aeration pipes, and the storage vessel (Connie Bisson, Personal Communication, 26 November 2002).

Whether or not this type of operation would be possible at Williams is questionable. In terms of economics, the program may not be as appealing as it was to the Middlebury administration: tipping fees in Massachusetts are almost half of what they are in Vermont (approximately $70 per ton). As a result, our focus spreads to include the educational value and environmental benefits of such a program, as well as the potential marketability of the final product.

The Windrow Method of Composting

There are a number of composting techniques, but after reviewing recommendations made by the Compost Task Force, the current operations at Holiday and Caretaker Farms, and the Middlebury model, the windrowing technique is the most attractive. Because it is a relatively simple technique, it requires less construction and financial input. Also, for an institution of our

size (approximately 2000 students), it is the most logical technique for handling the amount of waste we produce. Windrowing requires approximately an acre of open space – this will allow room for the windrows themselves, as well as for storage of yard wastes and equipment. The windrow technique allows for aeration to occur and incorporates necessary nutrients from animal and yard wastes, which in turn allow the decomposition to occur naturally and successfully.

Food waste is mixed with amendments according to a specific recipe. This ratio of inputs is essential to produce quality compost with enough carbon and nitrogen from the amendments. A good ratio (approximately 3:1 in volume) of amendment to food scraps promotes a diverse and productive community of bacteria decomposing the food waste. Acquiring amendments should not prove to be too difficult for Williams College; as an institution, the College generates a good amount of yard waste each fall, and the Department of Public Works agreed to allow the College access to any additional yard waste it may need. Dick DeMayo offered to donate "more horse manure than we could ever handle" (Dick DeMayo, Personal Communication, 13 November 2002) as long as the College would be able to transport it. As another possibility, Carol Henderson has also shown high interest in donating her horse manure to our program.

Normally, the mix of food scraps and amendment gets arranged into rows approximately 4 to 6 feet high and wide. If the row is too tall or wide, then it will not heat properly; however, it can be as long as desired. In addition, rows should run parallel with the wind direction to prevent the pile from scattering. To insure that the windrows are being properly aerated it is necessary to "turn" the piles using a tractor occasionally. Aeration brings oxygen to the microbes in the windrows, and microbes require oxygen to aerobically decompose organic material. If oxygen ceases to be available, the microbes revert to anaerobic decomposition, which takes longer than the aerobic process and produces H_2S, a gas with a strong, unpleasant

odor. In addition, aerating the windrows helps to regulate the temperatures: microbial activity produces heat and without occasional turning temperatures can rise well over 140º at which point microbes begin to die. The optimal windrow temperature is approximately 130º. Another important aspect of the windrow technique involves monitoring the amount of moisture within the mixed windrow. If the pile becomes too dry, it will not heat properly, and consequently, and the decomposition process will cease. However, if the pile becomes too wet, then oxygen will not be able to penetrate the pile. As mentioned above, the resulting anaerobic decomposition or fermentation requires more time and produces undesirable odors. (Dicken Crane, Personal Communication, 5 November 2002)

As microbes actively compost food scraps, more and more heat is produced. Eventually, as they run out of food scraps they become less active and temperatures gradually begin to drop. If, even after turning, the compost no longer heats, then the windrowing phase of the operation is complete, and the curing phase begins. In this phase, materials continue to compost at a much slower rate. Therefore, turning is no longer necessary, because there is a significantly lower rate of oxygen consumption. After the curing phase, the compost must be screened. Screening separates the finished (fine) compost from larger particles which will be returned to the windrow phase. The estimated time needed for a full cycle of compost is 90-120 days depending on the conditions.

Other methods of composting include in-vessel composting, vermicomposting and the bunker system. The Compost Task Force reviewed these different methods, and more information about each can be found about them in the Compost Task Force report.

Our Ideal Site

Before we examined the potential sites for an on-campus operation, we wanted to depict our ideal site for a composting endeavor. First, the site would be located within the campus tour's walking loop, because we feel that the educational value of this program correlates with the visibility of the site. The site would consist of at least one acre of open space with a moderate sloping topography to facilitate leaching. This ideal site would be far enough away from any environmentally sensitive habitats, because we do not want to create any negative environmental impacts in our effort to make the campus more environmentally responsible and sustainable. Furthermore, in order to avoid resistance from the community, the site's ideally secluded location would make it impossible for private residences to deem it a nuisance. Lastly, the site would be in close proximity to utility hook-ups, and the site's soil structure would be able to support the weight of the composting equipment and be able to sustain the program year-round (Eberhardt, S. et al, pg. 11).

Site Options

In addition to the local farms, we also looked at five other sites. Four of these sites are College-owned parcels: the old Cole Field landfill, a clearing in Hopkins Memorial Forest, a field off of Potter Road, and the former piggery at Mount Hope Farm. The last site, the Hoosic Water Quality District, provides an alternative beyond a local partnership and a College-run program.

Cole Field Landfill



"Cole Field Landfill" by, Melissa Umezaki

History

The historical use of the Cole Field site plays an important role in its current potential for use for a composting program. The site was used as a public landfill as early as 1952 until 1973 when it was closed. By 1982, the landfill had fully revegetated (E-12). In 1987, Alliance Technologies Corporation conducted a study of landfills, both open and closed, in Williamstown. The report describes how the erosion occurring on the Hoosic River banks actively exposed waste on the northern and western boundaries of the landfill. There are multiple accounts of people canoeing along the river and seeing refrigerators and stoves embedded in the bank. Alliance investigated environmental and public health impacts by sampling water quality at different depths below the landfill. The 1987 report concludes that, "the Cole Field landfill has, at present, a minimal impact on the environment and a slight potential to impact public health" (E-14). It describes that the ground water quality in the shallow aquifer away from the landfill has "probably not been impacted" and that the water quality in the deep aquifer is of excellent quality. Furthermore, the report concludes that there is an extremely small probability that the material in the landfill contaminated the town wells. Lastly, Hoosic River samples indicated that the landfill does not significantly alter water quality.

Since 1997, Camp, Dresser & McKee (CDM), a different consulting firm, has been conducting site assessments and making extensive recommendations for cleaning up the site.

CDM collected water samples and concluded that no environmental contamination occurred, and their final report made the recommendations which guided the 1999 clean-up of the surface waste. According to Scott Park, the Director of Highway Services who headed up the clean-up project, the DPW removed the surface metal and reseeded the area. In 2001, the CDM presented a Corrective Action Design, which was submitted to the Department of Environmental Protection. This report provided recommendations for the closure of the site and the protection of the nearby riverbank. However, the proposal has yet to be accepted, and the landfill remains officially open. This detail becomes very important, since no development can take place on the site until the landfill is officially closed.

Site Characteristics

The landfill site is currently cleared and unused. Probably one of the biggest advantages of the Cole Field Landfill site is its location; it is the closest site to the center of campus, and it has virtually no neighbors. The site is situated right off a paved access road bordering Cole Field and the softball diamond and leading up to the field's restroom facilities. Thus, the site also is easily accessible – only a short section of road would need to be extended into the two clearings which exist on the site. These two clearings could be used for food waste piles and equipment storage. Aside from the educational benefits, which may result from having an operation so close to home, Buildings & Grounds would save a significant amount of time transporting yard waste (reduced from the distance to the DPW), as they would simply take it directly to the Cole Field site. If we chose to use the windrow method, a section of wooded area would need to be cleared to create a corridor between the two clearings; however, a row of trees would be left as to provide screening between the composting operation and the playing fields. It is also important

to note the presence of an earth sculpture created by Karen McCoy, a former Williams art professor, on the western clearing. This earth sculpture will need to be removed before an operation could begin. Furthermore, utility hook-ups are available close to the site because of the surrounding fields and nearby restroom facility.

Legal Issues: Zoning, Rivers Protection Act and Wetlands Protection Act

The Williamstown zoning map places the Cole Field site in a General Residence 2 (GR2) zone. According to the zoning bylaw use regulation schedule, agriculture would be allowed to occur on parcels smaller than 5 acres in all zones, including GR2. However, according to Michael Card, Inspector of Buildings, composting alone does not qualify as an agricultural use, even though the bylaw glossary does not provide a specific definition of agriculture. As a result, before any composting occurs at Cole Field, or at any of the sites to be discussed, the College would need to receive a Special Permit from the Zoning Board of Appeals. Most likely, this step would not be a limiting one.

In terms of the Rivers Protection Act, the Hoosic River runs along the northern boundary of the old landfill site. The two clearings under consideration and the possible area for a corridor are both a safe distance from the Hoosic River. The western clearing lies more than 200 feet from the Hoosic River, just outside the outer riparian zone, making the site out of the jurisdiction of the Rivers Protection Act. However, the southern end of the clearing enters the buffer zone of a swamp forest created by the artificial outlet drainage from Eph's Pond. The clearing begins about 75 feet from the bank of this drainage. Since composting in this clearing would occur within the 100-foot buffer zone, we will need permission from the Conservation Commission.

The eastern clearing currently holds a large pile of topsoil. We contacted Buildings & Grounds, and no one seems to know who is using this topsoil and why it is being stored there. This clearing sits more than 200 feet away from the river. However, while measuring out the riparian zone, Henry Art, a member of the Conservation Commission, noted the presence of some swamp forest species. He proposed that a portion of the riparian zone may qualify as a swamp forest. However, he also explained that the dry, high land makes the site seem less likely to qualify as a wetland. The species population may reflect a nearby wetland seed source, rather than the presence of wetland. We feel that either clearing would be suitable for the initial compost piles. The windrows would most likely run in the east-west direction, parallel to the river, in the area in between these two sites. This area appears to be free of swamp-indicator species and outside of the riparian zone.

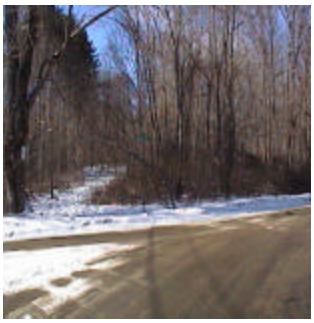
In addition to swamps, the Wetlands Protection Act addresses floodplain protection. It is important to note that the Conservation Commission only has jurisdiction over the 100-year floodplain, not the 500-year floodplain. The Williamstown floodplain map reveals that both the clearings at Cole Field lie above the 500-year floodplain, but the windrows may pass through the 500-year floodplain. Although the surrounding playing fields serve as the large 100-year floodplain, the high ground quality of this site makes it a feasible location for composting. The access road, on the other hand, will need to be lengthened if we use one or both of the clearings. The road current lies within the 100-year floodplain, so adding volume to the road before it enters the 500-year floodplain would necessitate subtracting volume nearby to keep the flood line at its current level. The construction of the bathroom facility by the softball diamond included adding and subtracting volume in order to comply with floodplain regulations, but accommodating the regulations does not seem to require significant costs or effort.

Legal Issues: Restrictions Resulting from Historical Use

Beyond the complicated applicability of the Wetlands Protection Act, the site's history may create some restrictions. When discussing our plans for the site with Tim Kaiser and Scott Park at the Department of Public Works (DPW), they both voiced concern regarding getting the Department of Environmental Protection's (DEP) approval of a composting operation on the old landfill site. Henry Art also explained that the DEP may have specific restrictions for using closed landfills. Tim Kaiser, the director of the DPW, first mentioned that the DPW is currently working with the DEP to officially close the landfill.

According to Paul Emond (Solid Waste Regulations and Policies) at the DEP, before any development can take place on the old landfill, even composting, we would need to get a Post-Closure Landfill permit (Solid Waste; Chapter 1.11.50A). This would basically insure that the landfill is capped properly, and that the site is clean and safe for any further use. There is no time limit. If the landfill site stayed undisturbed for one hundred years, developers would still have to get this permission. The DEP requires a site assessment, which the CDM report provides, and the decision will depend on the size, location and proposed use of the site. Emond also reassured us that getting this permit may not be too hard depending on the site specifics. We would need to apply for a Post-Closure Landfill Permit at the regional office, and then once submitted, the DEP would have 60-90 days to approve it.

Hopkins Memorial Forest



"Hopkins Memorial Forest" by Sarah Torkelson

History

Hopkins Memorial Forest (HMF) has a long agricultural history, but, interestingly, it is one of the only places in the United States with a reverse trend of development. In the past, it was primarily made up of farmland, but as time passed the land was donated to the College and towards conservation. More recently, the forest is open to recreational users, including hunters and hikers, as well as for educational purposes during the school year. Various biology and environmental classes carry out some of their labs using the forest's resources.

Site Characteristics

Hopkins Memorial Forest is relatively close to campus, only a 15-minute walk. Also, students are already accustomed to visiting HMF for various educational and recreational purposes. Behind the Rosenberg Center, a trail leads to a clearing, about one acre in size. This area of the forest does not contain any permanent research plots, and according to Drew Jones, the forest caretaker, this area holds little biological value relative to other regions of the forest. More specifically, this area once had poplar plantations, but currently, non-native honeysuckle serves as a dominant species. The eastern end of the clearing appears to be pretty wet, so Jones suggested the possibility of clearing some of the drier and higher forest to the west of the

clearing. According to Jones, clearing an acre of forest costs about $10,000; however, this investment would generate a large amount of carbon amendments such as wood chips. Access to this clearing would require creating an access road about 200 yards in length. This road could follow the power lines starting at the end of Bulkley Street and then join the walking path, where the owl nets stood this fall (see Appendix C). The poorly drained soil would necessitate at least a thick layer of gravel and possibly even pavement to be poured.

In addition to the physical characteristics of the clearing in HMF, the Forest's mission statement and minor regulations provide further advantages for this option:

> The primary mission of the HMF is to sustain and enhance research and undergraduate teaching opportunities while preserving and monitoring forest resources…The CES strongly encourages disciplinary and interdisciplinary teaching, scholarly activity and experimental research in HMF…Our vision for the HMF in the future is a more widely known and better understood landscape that will continue to provide opportunities for reflection and connection with the natural world (http://www.williams.edu/CES/hmf/Policy.html).

Based on this mission, composting seems to be an appropriate and important activity to include in Hopkins Forest. Student participation in the operations as well as the research would maximize the educational value of our composting system, and HMF seems like the most suitable place for this extent of participation. Regarding the regulations specific to Hopkins Forest, agriculture is not listed as a use not requiring a permit, but it is not listed as a prohibited use either. Research and educational activities require permission from the HMF manager, but Jones has already expressed interest and support of the idea, leading us to believe that composting is an allowable activity. Jones will continue to be involved in the planning of the operation if Hopkins Forest becomes the chosen location. Joan Edwards, Chair of HMF Users Committee also agrees that a composting operation would be in line with the HMF mission statement and supports the possibility of HMF as an option.

Although HMF seems like an appropriate location to those of us who support the concept of composting, the neighbors of HMF may not share our sentiment. While Tim Reisler described HMF as an attractive option based on its proximity to campus and its lack of neighbors, Jones offered a slightly different perspective. He mentioned his concern about the response of the property owners on Bulkley and Northwest Hill Road to the truck traffic, diesel smells and food waste odors. Jones explained that the neighbors had recently complained about the nightly owl netting operations, a fairly low-key activity. The clearing in consideration lies close to, about 100 feet from, the Alden property. On a hopeful note, Jones did explain that the neighbors may initially show resistance but that they often change their opinion once they become better educated and more comfortable with the projects. In response to this concern, we would launch an education campaign before beginning a composting operation at HMF.

Legal Issues: Zoning, Rivers Protection Act and Wetlands Protection Act

Also located in the GR2 zone, this site would need to receive a Special Permit from the Zoning Board of Appeals before any composting could begin. Furthermore, the absence of any nearby rivers or wetlands makes this site an attractive one for hosting a composting operation, because the activity would not threaten any vulnerable environments.

Potter Road Field



"Potter Road Field" by Sarah Torkelson and Melissa Umezaki

History

As far as we know, this field has been used for agriculture in the past. It was originally part of the Mount Hope Farm, which indicates that it was probably used for livestock grazing and/or as a hay field. Currently, a fence exists around the perimeter of the property, indicating that it still could be used for these things. According to Buildings & Grounds, the field is currently being hayed by Jim Sylvester, a hired caretaker for the field. Mr. Sylvester sells the hay to local farmers.

Site Characteristics

The field off of Potter Road is a College – owned site located approximately ten minutes (by car) from campus. Located off of Route 43, Potter Road is a dirt road which branches off from Hopper Road, which leads to the Mt. Hope Farm. The field lies just off of the dirt road. Fairly large in size, the field has a gentle slope. This feature makes the site conducive to windrow composting, as the slope would allow for leachates to drain and be collected.

Currently, the College pays high property tax on this field from which it reaps no benefits. The field contains clay soil which makes it impossible for any housing development to be built there; however, clay soil would prove to be very good for composting because it is very supportive, strong, and stays relatively dry throughout the seasons. Across the street from the field are three or four residential houses. The houses stand fairly close to the road, and there not any trees along the edge of the field. If the College chooses to use this field to house the composting operation, it would be extremely important to plant trees to screen the operation from the neighbors. The College would not want to strain its relationship with the residents of Williamstown.

On the more northern end of the field, a natural screen exists. The field rises from the road and then dips down on the far side towards the woods on the western boundary of the field. Because a composting operation would only require about one acre of land, and the field is significantly larger than one acre, this corner of the field, which dips down and becomes hidden from the road, may be the optimal location for the composting operation. Furthermore, the closest neighbor to this piece of the field is set back fairly far off the road; there is a substantial screen of trees in front of the house, making the house barely visible from the road. Another important aspect to note is that using only one or two acres of this field would allow the rest of the field to be hayed or utilized in another beneficial way. Much of the open space could be conserved.

Another aspect to take into consideration is that a very short access road would be required for a composting operation to successfully occur here. Establishing a short driveway into the northern end of the field would not be very difficult, but currently no form of access exists. Therefore, the access would be built from scratch and would require some leveling of the land. While an access driveway could lead into anywhere along the field, it would make the most sense to plant the operation on the most northern end or most southern end of the field. This would ensure that the open space of the field would not be completely divided.

Legal Issues: Zoning, Rivers Protection Act, Wetlands Protection Act

The field off of Potter Road is zoned in the Rural Residence 2 zone. This means that to compost on this field, a Special Permit from the Zoning Board of Appeals would need to be attained. Importantly, a small brook runs along the western border of the field. The edge of the field, denoted by trees and a fence, begins about 100 feet from the bank of the brook, and this

distance corresponds with the end of the protected inner riparian zone. If a composting operation were to occur at this site, even in the northwestern most corner of the field, the health of the river would probably not be impacted by a composting operation. Of course, before any composting would begin, the Conservation Commission would be consulted to officially examine the site and provide recommendations and/or restrictions.

Mt. Hope Farm Piggery

"Mt. Hope Farm Piggery" by, Melissa Umezaki

History

The Mt. Hope Farm Piggery was formerly used for agricultural purposes, as denoted in its name. It is part of the greater Mt. Hope Farm, which is currently not a working farm; however, two buildings still stand as remnants of the working farm, which could be used for storage of yard waste or animal manure as well as farming equipment. As far as we know, the land has never been used for anything besides agriculture, and utilizing this site for composting seems like an appropriate future for this College-owned land.

Site Characteristics

The Mt. Hope Farm Piggery is located about ten minutes, by car, from campus. The piggery lies right off of Route 43, fairly close to five corners, and the existing access is a low-grade dirt driveway. Fairly large in size, the site is clear of trees and brush. The site contains a grassy area between the barns and beyond the further barn, as well as what remains of a cornfield

on the most western end of the property. The College would only need to dedicate a portion of this site to the composting program. Also, this site's history of agriculture makes it very suitable for such an operation. Since the Piggery is owned by the College, Williams pays high property taxes on the land. Currently, the College reaps very few, if any, benefits from the land. The Piggery is simply a dormant piece of land that could become more valuable to and useful for the College if it were used for composting.

The Piggery, as mentioned before, is located right off of Route 43, however, reaching the site involves driving down a long (quarter mile) driveway which extends all of the way down to where the barns sit and where the composting operation would be located. This driveway is not very well established, and in the winter and spring seasons, the access may become quite muddy and impassable. Therefore, the driveway would require some upgrading or paving. Also, as a result of this long access road, the Piggery site sits fairly isolated from other houses and Route 43. However, the surrounding properties are primarily owned by people in a group called the "Purple Mountain Partners." This group owns land surrounding the Piggery, making them quite powerful in the decision making of other property owners in Williamstown. The relationship with the Purple Mt. Partners and the College is a sensitive one, making it so that the College does not wish to create friction. Knowing this, we contacted Jim Richardson, who is part of the Purple Mt. Partners group and lives in Williamstown year-round. He responded quite negatively, indicating that he spoke as one voice for the entire group. Richardson strongly stated that he and the other members do not want the College's trash in their backyards, and then he went so far as to mention that one half of a ton of food waste per day was an exorbitant amount of "trash." Even after an attempt to educate Richardson on composting, he wanted nothing to do with an operation so close to his and the other members' property. If the College decides to pursue using

this site, then the College should first organize an education campaign directed at the Purple Mt. Partners that emphasizes the benefits of composting, stressing that the process of decomposition does not smell and is not ugly to look at.

Legal Issues: Zoning, Rivers Protection Act, Wetlands Protection Act

Similarly to the field off of Potter Road, the Mt. Hope Farm piggery is zoned as Rural Residence 2, which means that the College would have to get a Special Permit from the Zoning Board of Appeals in order to compost on this site. Also, the Green River runs along the far edge of the site; however, the location of the composting operation would be much further than 200 feet away from the bank of the river. Far away from the outer riparian zone, the composting operation would be out of the jurisdiction of the Conservation Commission and would most likely have no impact on the health of the river.

Hoosic Water Quality District



"Hoosic Water Quality District" by Melissa Umezaki

Site History

The Hoosic Water Quality District (HWQD) currently receives sewage from Clarksburg, North Adams and Williamstown. More specifically, the HWQD also runs a composting operation which composts human sludge and sells the finished product to local landscapers.

Site Characteristics

The HWQD is located on Simmonds Road off of Route 7, north from campus. It takes about five minutes by car to get to the HWQD. At the HWQD, the compost operation uses an aerated bunker system. To do this, the sludge is piled with amendments in a bunker, and oxygen flows through pipes buried in the pile, and this effective aeration enables the sludge to compost incredibly quickly. It takes about 28 days for the sludge to be transformed into high quality, usable compost, whereas it takes approximately 90-120 days for food waste to decompose completely. Currently, the operation runs close to capacity, meaning that the HWQD probably cannot handle much more volume, but Brad Furlong, our contact at the HWQD, did not seem particularly concerned about the volume of waste. He explained that they would be able to receive the food waste for free and simply mix it in with the sludge. After inspecting the composition of our food waste and requesting a list of all of the possible food items in our waste, Furlong presented the idea to the HWQD's Board of Commissions on November 20, 2002. Unfortunately, the Board rejected the idea all together, concerned mostly about the food's slower rate of decomposition. Since the HWQD markets the finished compost, they fear that incorporating the food waste could reduce the quality of the product. For example, Furlong had expressed concern about fruit and vegetable seeds requiring a long time to completely break down. Furlong explained the possibility that the finished product could be sold to a golf course, and tomato seeds that had not fully decomposed could give rise to tomato plants along the golf greens. Therefore, in fear of "contaminating" the compost, reducing their standard of quality and even hurting their credibility and profits, the HWQD does not want to receive the College's food waste. Because the Board of Commissions rejected the proposal, we deem this option currently infeasible and unsustainable. However, it is important to note that there have been rumors of

privatization at the HWQD. If this does happen, the composting operation may be cut from the system. At that point, the College should seriously consider purchasing the composting infrastructure in place. The site has very positive aspects, such as an existing access road, which would not need any upgrading, existing equipment, and its close proximity to campus.

Legal Issues: Zoning, Rivers Protection Act, Wetlands Protection Act

Although the HWQD lies near the Hoosic River, the operation lies will outside of the riparian zone, suggesting that the operation does not impact on the health of the river. Because the operation is currently running, the site must fall under the proper zoning category. Hopefully, the HWQD takes responsibility to see that the composting system follows existing restrictions and that it operates in a healthy and environmentally friendly manner.

Weighing the Options: A Ranking System

After collecting the extensive data on each of the sites, we wanted to devise an effective system to compare and evaluate the sites as objectively as possible. In weighing our options, we feel it is important to consider the economic costs, the environmental impacts, the educational values and the feasibility of using each of the seven sites. For each of these four criteria, we came up with six specific subcategories. For each of the six subcategories, we then gave each site a ranking as compared to the other sites. After ranking the sites for each of the subcategories, we totaled the rankings for each site and determined the overall rankings for each site for each of the criteria. To determine the overall ranking, we simply totaled the rankings each site received for the four main criteria. Importantly, for this system, a ranking of 1 is the most desirable, and a ranking of 7 is the least desirable. Looking at economic costs as an

example, a ranking of 1 would go to the least expensive option. These grids helped us compare the different sites quantitatively and highlighted the strengths and weaknesses of each site. While we found the ranking system to be the most appropriate method, it did present some limitations. For example, relative rankings do not always capture the degrees of difference. Nevertheless, this system certainly helps to synthesize a large amount of data (see Appendix D). The following text gives commentary on the results of our ranking system.

Economic Costs:

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
ECONOMIC COSTS:							
HAULING	7	6	2	1	2	4	4
ROAD UPGRADING	1	4	1	3	7	5	6
SNOW PLOWING	1	5	1	3	3	5	7
EMPLOYEE SALARY	2	2	1	4	4	4	4
VEHICLES/EQUIPMENT	1	1	1	4	4	4	4
LAND PREP	1	1	1	7	6	5	4
TOTAL:	13	19	7	22	26	27	29
ECONOMIC RANKING:	2	3	1	4	5	6	7

Looking at the economic costs, it should not seem surprising that the three non – College sites take the first three rankings. By sending the food waste to a farm or the HWQD, the College would not have to make the capital investments that establishing a College site would require. However, if the College starts its own composting operation, this would mean that the College would be able to produce its own soil amendment and avoid the cost of buying soil inputs for landscaping. Additionally, the College could potentially start selling the finished compost to landscapers and gardeners for up to $25/cubic yard. This revenue could help finance the operational expenses.

Environmental Impacts:

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
ENVIRONMENTAL IMPACTS:							
TRUCKING DISTANCE	7	6	2	1	2	4	4
PROXIMITY TO WETLANDS	1	1	5	7	1	6	4
VISUAL IMPACTS	1	1	1	5	4	7	5
HABITAT LOSS	1	1	1	6	6	4	4
SUPPORT OF LOCAL AGRICULTURE	6	1	7	2	2	2	2
CLOSED-LOOPNESS	6	5	6	1	1	1	1
TOTAL:	22	15	22	22	16	24	20
ENVIRONMENTAL RANKING:	4	1	4	4	2	7	3

The College has committed to composting in order to avoid the negative environmental impacts of landfilling; therefore, it would be counterproductive and hypocritical to choose a site where the establishing a composting operation would negatively impact the surrounding environment. Unlike the economic rankings, which produced a clear divide between the College and non-College sites, the environmental impacts are more spread out, making the rankings less decisive. This is because each site has its own environmental advantages and disadvantages. It is also important to realize that the first four subcategories look at potential negative impacts; with these considerations, the lower rankings go to the sites which would have the least negative impact. In contrast, the last two subcategories consider the potential environmental benefits created by composting at the different sites. For example, supporting local farms, either by

donating our food waste to them or by removing their horse manure, produces environmental benefits. The "closed-loopness" subcategory takes into consideration how well the College could close its consumption loop by using each of the sites. If the College uses its food waste to produce its own soil amendment, this kind of behavior helps to close the consumption loop. Ideally, the College could decide to follow the Middlebury model and use its compost to heat a greenhouse, thereby reusing its food waste to grow more food. By improving the College's self-sufficiency, this kind of system would successfully make the consumption loop as tight as possible. Similarly, if the College sends the food waste to Bill Stinson of Peace Valley Farms and purchases produce grown on the farm, the college could close the loop and internalize environmental impacts.

Educational Values:

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
EDUCATIONAL VALUE:							
CREATES AWARENESS	7	5	6	1	2	3	4
RESEARCH & CLASSROOM OPPS. FOR STUDENTS	6	5	6	1	1	3	3
COMMUNITY OUTREACH OPPS.	7	5	6	1	1	3	3
SHOWS COLLEGE'S COMMITMENT TO ENVIRO.	6	5	6	1	1	3	3
ENGRAINS A LIFE HABIT	6	5	6	1	2	3	3
POTENTIAL INCLUSION OF LOCAL	5	5	5	1	1	1	1

INSTITUTIONS							
TOTAL:	37	30	35	6	8	16	17
EDUCATIONAL RANKING:	7	5	6	1	2	3	4

Because of Williams' reputation as a highly motivated educational institution, we found it fitting to include a criterion regarding educational values of a composting program. While the economic costs and environmental impacts of using the sites incorporate aspects of the site descriptions given earlier in the report, these educational rankings require a more thorough explanation, as we have not yet addressed these important considerations. A College-run composting operation should not be regarded as a waste management business, but rather as a potential and highly valuable educational activity. Looking at the rankings, it quickly becomes clear that the College sites, especially Cole Field and HMF, have the greatest potential to offer educational benefits. First, we considered how well the sites could create awareness; we decided that the most visible and accessible sites would instill a strong sense of consciousness. We also evaluated the sites that would be most conducive to research and classroom opportunities. The Compost Task Force report gives a thorough description of the many ways professors could incorporate the composting operation into their curriculum, especially field lab work.

In addition to Williams College students, the entire community would benefit from learning about composting. Situating the composting operation close to the center of town would improve the effectiveness of the community outreach. The composting program could offer technical assistance as well as workshops for homeowners who want to start compost piles in their yards. Furthermore, a College-run program could also include other local institutions, such as the Williamstown Elementary School, Mount Greylock Regional High School as well as

local restaurants. Composting programs located on non-College sites could also include the community and local institutions; however, this inclusion would ultimately be the farmer's decision, not the College's.

Another subcategory considers how well the different sites illustrate the College's commitment to the environment, a quality which could attract environmentally-responsible students. Obviously, our ideal site would be located in the campus walking tour loop, be very attractive, and enable our tour guides to express pride in our College's dedication to the environment as the tour walked by the odorless windrows. Although tours would not walk past the Cole Field site, many people do journey down to the playing fields when they visit Williams. By locating the operations as close to the campus as possible, the College could illustrate the importance it places on this environmentally beneficial activity. More and more, colleges are being judged and pressured to fill the role as environmental leaders in the world of institutions. Environmentally-minded students want to spend their college experience at an institution that actively invests in solutions to protect the environment. Bringing these students to Williams will encourage more dialogue and awareness on campus, and this would in turn provide educational value for the whole community.

Clearly, the educational opportunities in composting are endless. Nevertheless, the idea of engraining a life habit probably serves as the most important component. Students spend four years at Williams, and during that time they establish many habits. How they consume energy and dispose waste during the first few weeks of their college experience quickly become the norms. The College certainly focuses on the environmental impacts students cause while they live in Williamstown; however, the environmental impacts of Williams' students once they leave the College are rarely taken into consideration. Every year, 500 students leave Williams and

spread all across the world, which in turn essentially spreads the College's environmental impact. The students will acquire the habit of separating their food waste within the dining halls whether the composting program is run on campus or forty-five minutes away. However, by locating the operation on a site as close to the center of campus as possible, the students would acquire the habit of seeing their food waste being turned into a usable source through the composting process. Cole Field and HMF are considered the "backyards" of the College's campus; therefore, locating the composting operations on one of these sites would engrain a very replicable habit in the students as they watch this cycle occur. This will, in turn, make composting a habit for life; when students acquire their own homes, a compost pile in the backyard should be a necessity. Unfortunately, trucking the food waste away denies the students the opportunity of watching their food waste turn into beautiful compost.

Feasibility:

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
FEASIBILITY:							
ACCESS	1	4	1	3	7	5	6
TRAVEL TIME	7	6	2	1	2	4	4
NEIGHBORS	1	1	1	1	5	6	6
WETLANDS CONSTRAINTS	1	1	1	7	4	6	4
PAST USE	1	1	1	7	6	4	4
LONG-TERM COMMITMENT	5	6	7	1	1	1	1
TOTAL:	16	19	13	20	25	26	25
FEASIBILITY	2	3	1	4	5	7	5

RANKING:							

For the last criterion, we addressed the issue of feasibility because even the most ideal site may not be the most realistic one to put into action. In the long run, the goal remains finding the most appropriate location for our food waste to be composted. By recommending a site that ranks high in feasibility, it is more likely and realistic that the plan be implemented. All of these considerations have been mentioned directly in the site descriptions, except for the sites' long-term commitment. Although Dicken Crane, Sam Smith and the HWQD may seem interested now in working with the College, their interest or capability may wane in a couple of years. If they decide, for some reason, to back out of the partnership, this would mean that the College would have to start from scratch to find a new place to send the food waste. After hearing our presentation on the 11th of December 2002, Bill Stinson of Peace Valley Farm expressed great interest in the possibility of a partnership with the school – this may be a feasible destination for our food waste.

Overall Rankings:

	HOLIDAY	**CARETAKER**	**HWQD**	**COLE**	**HMF**	**POTTER**	**PIGGERY**
ECONOMIC RANKING:	2	3	1	4	5	6	7
ENVIRONMENTAL RANKING:	4	1	4	4	2	7	3
EDUCATIONAL RANKING:	7	5	6	1	2	3	4
FEASIBILITY RANKING:	2	3	1	4	5	7	5

OVERALL TOTAL:	15	12	12	13	14	23	21
OVERALL RANKING:	5	1	1	3	4	7	6

The overall rankings produce a tie between Caretaker Farm and the HWQD. However, the HWQD quickly loses this high ranking when we acknowledge the Board of Commissions' recent rejection of our proposal to donate the food waste to the HWQD composting operation. While this potential site seemed promising, we can no longer consider it a plausible option at this time. Eliminating the HWQD from the rankings would move the Cole Field site into 2nd place, and it is established as the 1st place of the College – owned sites.

Recommendations

Due to the closeness of the final totals, we do not feel comfortable proposing one specific site over the others. Rather, we would like to offer all of the site information as well as our ranking system as the recommendation to our clients. To fully realize the potential of this evaluation tool, it is important to realize the equal weighting currently assigned to each of the four criteria. In order to remain as objective as possible, we chose not to weight any of the rankings. However, if the final decision makers choose to prioritize one consideration, they can weight that ranking, and this adjustment certainly could alter the rankings. For example, the College may want to prioritize the educational component, and weighting the educational ranking would achieve this bias. As student planners – as well as environmentalists – we would weight educational and environmental benefits over economic costs. This would push Cole Field into the first-place ranking.

Sample Budget

Along with our ranking system, we decided that a sample budget of two of our options would provide a model to lead our clients through their final decision. (Appendix E). The two sites we chose reflect the results of the ranking system. We chose Holiday Farm, because it is our current program and represents the status quo. We also chose the Cole Field site, because it received the highest ranking among College sites. It is important to note that we did not do a formal budget for Caretaker Farm (the top-ranked option), because its budget would look similar to that of Holiday Farm. We would pay the same local hauler to collect the food from the dining halls and take it to the collection site daily, and another hauler to transport the food waste from the collection site to Caretaker Farm weekly. It is very possible that any savings we would make by shortening the hauling distance could be used up in road improvements on Caretaker Farm.

Budget for Holiday Farm Option

With the help of Jim Cirillo, Associate Director of Dining Services, and Tim Reisler, we estimated this year's budget, assuming we would keep the operation running as it currently does, with Williams' food waste traveling to Holiday Farm.

In the Holiday Farm option, the only capital costs come from the purchase of plastic barrels in which to sort food waste. These barrels have been purchased over the past two years and would not be a constant cost – some years the total would be higher than in others. We estimated this total to be approximately $2,400 for this year.

Operational costs include employee salary and direct costs like the price of the plastic bags we use to hold the food waste. The local hauler, who collects the food waste from the various dining halls and takes it to the collection site near the bottom of Spring Street, receives

an annual salary of approximately $20,000. The hauler works for about one hour, seven days a week. In addition to the salary for the local hauler, the College pays an additional $4,200 annually to another hauler to take food waste from the collection site near campus to Holiday Farm. Thus, the total operational costs of the Holiday Farm option totals about $27,200, giving us an annual total of approximately $29,600.

Budget for Cole Field Option

For Cole Field, we did a rough estimate of the budget for the initial year. Obviously, this would include costs that would not exist in following years so we can expect the total to be much higher than it will be in following years. Capital investments include costs such as land preparation, road upgrading and the purchase of essential equipment. We estimate the cost of clearing and preparing (such as land-grading) for a ½ acre of land to total around $7,000. Once the land is cleared and flat, we can pour a 300-foot by 30-foot concrete pad estimated to cost about $5,000. Any road upgrading necessary, most likely short gravel extensions from the existing access road to each of the clearings, would total approximately $3,000. In addition, an estimated $35,000 in equipment costs for a used tractor with a front-end loader and a truck for hauling food wastes and compost amendments. These estimates leave us with a total capital cost of $50,000.

Operational costs include the same direct costs for plastic bags and twisty-ties as in the Holiday Farm option, as well as a changed employee salary and maintenance costs for new equipment. As a sidebar, it is important to note that the College could save money and increase sustainability by investing in more plastic bins rather than using plastic bags to hold food waste. Perhaps an improved system of cleaning existing bins for daily use would bring about significant

savings. The new position needed to oversee a College-run composting program would require a slightly larger employee salary, anticipated to total around $22,000 yearly. The new position would require a skilled worker, with the ability to operate a tractor, who could spend a little extra time maintaining the windrows, in addition to hauling food waste from the dining halls to the composting site. Additional maintenance costs totaling around $5,000 would be needed to keep equipment in working order each year. These operational costs would total to about $30,000 each year, giving us a first year budget of $80,000.

Justifying a $50,000 Capital Cost

After comparing the estimated budgets for the Holiday Farm option and the Cole Field option, it becomes apparent that the operational costs would be approximately the same, about $30,000 per year. Therefore, it becomes necessary to confront the $50,000 capital investment of the Cole Field option. What does $50,000 mean to Williams College? $50,000 breaks down to $25 per student; this begs the question, would students be willing to pay $25 to fund this initiative? Some would, but many probably would not. However, could Dining Services simply add $25 to the meal plans for one year to collect the amount needed for capital investment? Does this money, however, have to come from the student body? To put this monetary figure into context, $50,000 is less than two annual tuition bills. Although it is difficult to place a price tag on the potential educational and environmental benefits, these aspects of the program definitely justify the small financial investment. Composting needs to be viewed as an educational activity, not a waste management business. Through this perspective, composting becomes not only justified, but also a valuable and essential part of campus activity.

Consequently, as student planners we strongly recommend that the College initiate its own composting program on College-owned land.

A Williams College Model

To follow through with our recommendation for a composting program on the Cole Field site, we decided to illustrate what this operation could look like. Much like the Middlebury model, we would have a completely closed-loop program, with our compost being used towards growing produce we might eat in our dining halls.

The food waste would be sorted by the dining staff in each of the five dining halls and then transported to the Cole Field site. We would also collect animal manure (most likely horse manure from Dick Demayo's farm) and yard waste from the College campus to mix with our food scraps. Once the food scraps and amendments are mixed, they can be arranged into windrows. After approximately two to three months in windrows, the compost can be screened, and any larger particulates, which do not pass through the screen, would be returned to the windrows. Williams can choose from there what to do with the finished compost. The College could use the compost entirely on campus, much like Middlebury does, and save money by not investing in commercial soils and fertilizers. The College could also choose to sell the compost to farms, landscapers, and the general public, which would bring in some revenue. Or, Williams could choose to donate compost to local farms. The College could further this relationship even more by agreeing to buy food products from those local farms to which it sells or donates the compost. This would be one effective way of closing the College's loop of consumption.

Interestingly, a program like this would also potentially benefit local agriculture in three important ways. First, by receiving animal manure from surrounding farms, the College would

relieve them of a potentially burdensome amount of animal waste. Second, if the College decides to donate the compost to farms, these farmers could spread valuable nutrients on their fields. Lastly, by agreeing to purchase local produce, the College would be providing the farms with a valuable market for their products.

Conclusion: Tasks Ahead

After reviewing the history of composting at Williams and interviewing local farmers and composters, we conclude that windrowing on College-owned land would be the logical next step for the program. Based on our estimated budgets and ranking system, which evaluates economic, environmental, educational qualities as well as feasibility of each potential site, the Cole Field option is the most appealing and feasible College-owned site. Before launching a composting program on campus, our clients and the College would need to acquire and commit the necessary funds, as well as take some committed actions. The following is a list of tasks that would need to be done in order to ensure that a composting program is successfully established. These tasks are Cole Field – specific; however, the requirements of any of the other researched sites would be fairly similar, and the steps required would be nearly the same. The other sites would not require a Post – Closure Landfill Permit, as they are not landfills; however, Special Permits would be needed from the ZBA for all of the College – owned sites, as well as communication with the Conservation Commission regarding wetlands protection. The other steps would be the same for all five College – owned sites.

1. Post-Closure Landfill Permit from DEP
2. Define wetlands restrictions with Conservation Commission
3. Special Permit from Zoning Board of Appeals
4. Create a composting employee position
5. Send the employee to a composting workshop or farm
6. Prepare the site

7. Buy necessary equipment
8. Collect amendments and experiment with ratios
9. Start composting!

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Sam Smith
Bill Stinson
Kathy Thompson
Robert Volpi
Arthur Williams
Brian Young

Appendix A

Guided Conversation

Hello, my name is _____. I am a student at Williams College, and I am currently working on the plan for our composting program. Hank Art is my professor, and he gave me your name. We are trying to contact local farmers and landowners who may be interested in some aspect of the project. I was wondering if I could ask you a few questions. Is now a good time? I can call back. Or I could come out to talk to you.

I am working with Bob Volpi, our new director of Dining Services. He used to work at Bates College, and he established a successful composting program there. He formed a partnership with a local farmer who would receive all of the College's pre-consumer food waste. He mixes the food waste with horse manure and yard waste and uses about five acres of land for the process; however, he reports that only one acre is necessary for this system. Horse farms pay him to take their manure, and he has a contract with the town of Lisbon to receive all of the town's yard waste. He spends about 2 hours per week making the compost piles and mixing them. He sells the finished product to landscapers, homeowners and greenhouses for $20/cubic yard. The process takes about ten weeks.

Having explained the Bates system, we have a few questions for you concerning composting:

1. Do you currently compost? If so, what do you compost and how do you compost it? If not, would you be interested in starting a composting program/business?
2. Would you be interested in receiving any or all of Williams' food waste? We currently produce about 0.5 tons per day.
3. Would you be more interested in composting pre-consumer waste, post-consumer waste, or both?
4. Would you be interested in a donation of food waste from the College?
5. Would you be interested if the College paid you to take its food waste?
6. Under what circumstances would you enter a composting business in conjunction with the school?
7. What would make this partnership completely feasible for you?
8. Do you have a foreseeable use for compost on your own property?
9. Do you know of a local market, such as other landowners, gardeners, landscapers or greenhouses, which would be interested in purchasing the finished compost?
10. Do you know of anyone else who would be interested in starting or expanding a composting business?
11. Do you know of any local farms/businesses/private homeowners who would be willing to donate/sell manure (horse, cow, hen) or yard waste?

Could I ask you a few specific questions about your land?

1. What are you currently using your land for?
2. How much land to you have/use for farming?
3. What do you produce on your farm? Do you sell it? To who?
4. Are you planning on farming for the long-term?

Thank you for your time, I really appreciate it. Are there any other possible contacts you can give me?

Thank you again and I'll be in touch.

Appendix B

Farmer Survey

Subject	Farm name & address	Currently composting? If so, what is composted and how? If not, would you be interested in starting a composting business?	Interest in receiving Williams' food waste?	More interested in pre-consumer or post-consumer food waste?	Interest in donation of food waste from the College?
Sean Barbera	Green River Farm, near Five Corners	No, because they feed all of their crop waste to their cattle.	Open to the idea, but with a number of concerns	Pre-consumer, because they are concerned about post-consumer trash and bones ending up in their soil. "We don't want people to be picking their own flowers and finding bones in the soil."	Yes
Winthrop Chenail	Mt. Williams Farm 481 Luce Road	No, he runs a dairy farm	No	Neither	No
Daniel Galusha	Fairfields Farm, 954 Green River Road	Yes – Cow manure	No	Neither	No
Patch Mason	Northwest Hill Road	No, he runs a topsoil business.	Not right now, but he wants "to leave the door open."	N/A	N/A
Sam Smith	Caretaker Farm, Hancock Road	Yes, he composts crop, cow and sheep waste as well as food waste from members and Wild Oats	Yes, but he expressed concern about the amount. He	Interested in both	Yes

		market. He received Williams' food waste for 3 years.	requested a trial load.		
Bill Stinson	Peace Valley Farms 85 Treadwell Hollow Rd		Not really – but very interested in receiving yard waste. Is skeptical because of past experiences with the college	Neither	No
Arthur Williams	Route 43	No	No	Neither	No
Brian Young	Hancock Road	No	No interest; not willing to take survey	N/A	N/A

Farmer Survey (con't)

Subject	Would you be interested if College paid you to take its food waste?	Under what circumstances would you enter a composting business in conjunction with the school?	What would make this partnership feasible for you?	Do you have any foreseeable use for compost on your own property?
Sean Barbera	Yes, "money is good"	If they could find an appropriate site and the necessary manpower. "We are not set up with the manpower to do the whole process."	If they could be certain that the smell and visibility would not upset their residential neighbors. "It would be nice to have good, solid compost, but it may be more convenient to just buy it."	"That is a definite Yes." The farm manager would decide how much they would be willing to spend on the compost.
Winthrop Chenail	No	Not interested at all in composting – too much work as it is; can not even consider	Nothing	None
Daniel Galusha	No – don't want to become involved in new business	Right now – not much; has a system that works and doesn't want to change	Nothing	Maybe – gardens, etc.
Patch Mason	N/A	Since the College has made some decisions that the Masons do not agree with, they are waiting for the College to respond to resolve the situation. He requested literature about composting and explained that we should contact him if out other options do not work out.	He has the location, the land and the equipment, but he just does not feel like he can establish this kind of a relationship with the College now.	Yes, but he would first want to assess the quality of the compost before incorporating it into his soil production.
Sam Smith	"Are you offering to	If the College helped him	He would need some	Yes

	pay me?" He would be interested in forming a financial relationship with the College to expand his operations and receive all of the food waste.	improve the accessibility to his composting site, because he road cannot be used in the winter. He would also need the College to plow the improved access road.	help financially to compensate for the wear and tear on his tractor.	
Bill Stinson	Not really	Perhaps would be willing if he were given access to the college's yard waste; could do a trial run with food waste	If college's yard waste was donated to his farms he would be more open to composting food wastes from the college; would need a some convincing	Yes
Arthur Williams	No – no need for this business	Nothing	Nothing	Fields/Gardens
Brian Young	N/A	N/A	N/A	N/A

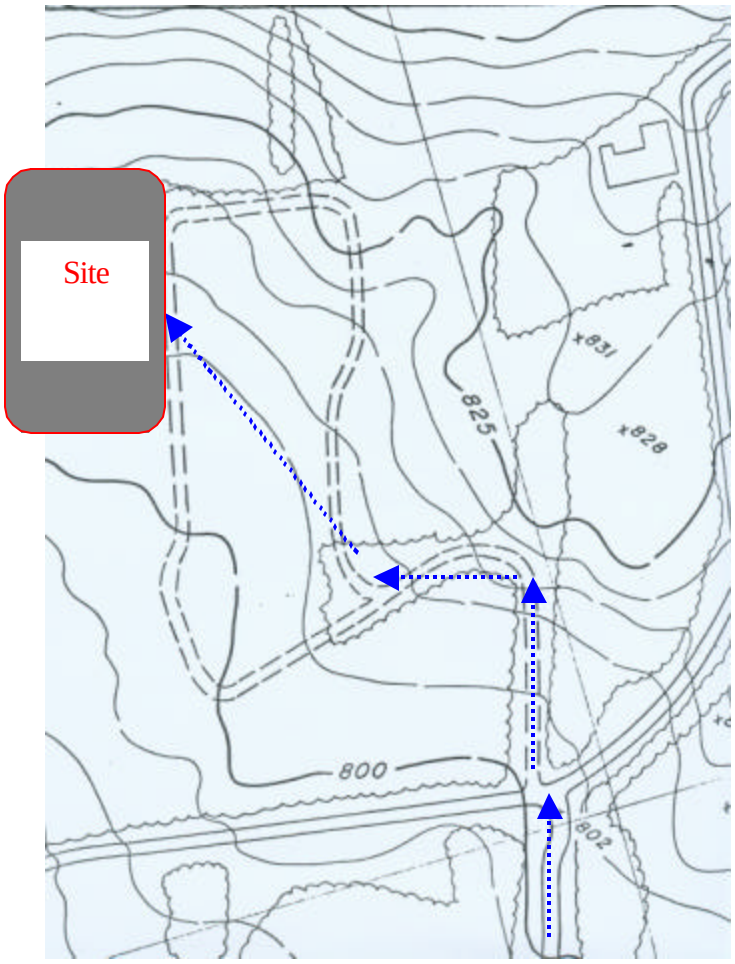
Farmer Survey (con't)

Subject	Do you know of a local market which might be interested in purchasing finished compost?	Do you know of anyone else who would be interested in starting/expanding a composting business?	Do you know of any local sources who might be willing to donate/sell manure or yard waste?
Sean Barbera	No	No	Daniel Galusha
Winthrop Chenail	No	No	
Daniel Galusha	No	Told us that we wouldn't find a local farmer who is willing to do this	Other local farms
Patch Mason	No	No	No
Sam Smith	No	Bill Stinson	"If I did, I would get it" (referring to animal manure). Williams College and landscapers for yard waste.
Bill Stinson	No	No	No
Arthur Williams	No	No	No
Brian Young	N/A	N/A	N/A

Some Farm Details:

Subject	What are you currently using your land for?	How much land do you have/use for farming?	What do you produce on your farm? To whom do you sell your product?	Are you planning on farming for the long-term?
Sean Barbera	Raising cattle and crops	300 acres	They sell vegetable produce, apples and cider at a retail stand on their property and through whole sale relationships	"Oh yes! We are aiming to make the farm self-sustaining, though we are not breaking even yet."
Daniel Galusha	Dairy farming	100+ Acres	Milk	As long as possible
Patch Mason	Top soil business	150 acres	Sells topsoil to landscapers and contractors	Family property
Sam Smith	Community supported agriculture	35 acres, only 7 grow vegetables	250 members buy shares for about $400/household. He produces about 30 different vegetables.	He has been farming for 30 years, and the farm has been recently approved for Agricultural Preservation Restriction.

Appendix C



"Hopkins Forest Site with Potential Access Road"

Appendix D

Weighing the Options: A Ranking System

Economic Costs

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
ECONOMIC COSTS:							
HAULING	7	6	2	1	2	4	4
ROAD UPGRADING	1	4	1	3	7	5	6
SNOW PLOWING	1	5	1	3	3	5	7
EMPLOYEE SALARY	2	2	1	4	4	4	4
VEHICLES/EQUIPMENT	1	1	1	4	4	4	4
LAND PREP	1	1	1	7	6	5	4
TOTAL:	13	19	7	22	26	27	29
ECONOMIC RANKING:	2	3	1	4	5	6	7

We divided the economic costs into six subcategories: hauling, road paving, snow plowing, employee salary, vehicles and equipment and land preparation. The further the College hauls the food waste, the more the College with have to pay a hired hauler for time and possibly gas. For all of the potential sites, including the status quo, someone will need to collect the food waste from the dining halls on a daily basis. Transporting the food waste to Holiday Farm or Caretaker Farm on a weekly or biweekly basis would require a second, hired hauler. If the College starts its own composting operation or works out a relationship with HWQD, the food waste would be transported directly from the dining halls to the composting site. Based on these conditions and sheer distances, Cole Field receives the 1st place ranking, and Holiday Farm receives the last place or, 7th ranking. In order to haul food waste to a site, the site needs an

access road. According to Eric Beattie of Buildings & Grounds, it costs about $25 to pave 1 linear foot of a 15-foot wide road. However, we do not necessarily need to pave the roads. Tim Reisler seems to think that throwing down gravel to upgrade the road would be sufficient, even for winter use.

In addition, we need to consider clearing and grading where necessary. Because creating access to the HMF site would require connecting and widening paths, grading the land and then paving a road about 600 feet in length, this site earns the last place ranking. Although a rough road current exists, Piggery site would require the most paving, so it receives the 6th. Potter field earns 5th place, because this site would require constructing a rather short driveway from scratch. If the College decides to send the food waste to Caretaker Farm on a year-round basis, Sam Smith will need to improve and pave his access road and will expect the College to finance this expense. While Caretaker earns 4th place, Cole Field receives the 3rd place ranking by only requiring a minimal extensive of the paved access road. Holiday and HWQD tie for the 1st place ranking, neither requiring any road paving. We also wanted to consider snow plowing, because B&G would need to plow access roads to all of the College-owned parcels as well as Caretaker Farm. These rankings took into account driving time to the sites as well as road length. As a result, the Piggery site receives the 7, and Holiday Farm and HWQD tie for 1st place.

While currently employed B&G staff should be able to cover the necessary snow plowing, either B&G or Dining Services will need to hire a staff member to carry out the composting operations: mixing the food waste and the amendments, forming and turning the windrows, etc. This position will require special skills like driving a tractor with a front-end loader as well as conducting "moisture management" of the windrows. We learned from Dicken Crane that composting truly is an art, so this staff member will require some training. However,

if Holiday Farm, Caretaker Farm or HWQD were to receive our donated food waste, the College will only have to pay for the hauling, which is taken into account above. Therefore, the non-College sites earn the top rankings, while the College sites tie for the 4th (or last ranking). Similarly, using the non-College sites will not require investing in any vehicles or equipment, so those sites tie for the 1st place ranking. A College-run operation will need a tractor to work the windrows as well as a vehicle to transport the food waste, horse manure and yard waste, so those sites all share the 4th ranking.

The College sites will also require land preparation to make them suitable for windrows. Land preparation may include clearing, screening, grading the land and/or pouring a concrete pad. It seems like the Cole Field and HMF sites will require the most intensive land preparation, especially with clearing being a costly activity, so these two sites receive the lowest rankings. The Cole Field site comes in last place because officially closing the landfill may require some additional costs. Although Potter field's current existence as a hay meadow makes it better prepared for composting, significant screening will be necessary, and this site receives the 5th ranking. Similarly, the past agricultural use of the Piggery earns it the 4th place ranking. Because Holiday Farm, Caretaker Farm and HWQD already have composting systems in place, these sites will not require any preparation. They all tie for 1st place.

After tallying the rankings for the subcategories, the final rankings deem HWQD as the least economically costly option, followed by Holiday Farm (2nd) and Caretaker Farm (3rd). These rankings did not surprising us, since sending the food waste to farms or HWQD free the College from investing in a composting operation. However, by making composting a College-run operation, the College would be able to produce its own soil amendment and avoid the cost of buying amendment for landscaping. Additionally, the College could potentially start selling

the finished compost to landscapers and gardeners for up to $25/cubic yard. This revenue could help finance the operational expenses.

Environmental Impacts

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
ENVIRONMENTAL IMPACTS:							
TRUCKING DISTANCE	7	6	2	1	2	4	4
PROXIMITY TO WETLANDS	1	1	5	7	1	6	4
VISUAL IMPACTS	1	1	1	5	4	7	5
HABITAT LOSS	1	1	1	6	6	4	4
SUPPORT OF LOCAL AGRICULTURE	6	1	7	2	2	2	2
CLOSED-LOOPNESS	6	5	6	1	1	1	1
TOTAL:	22	15	22	22	16	24	20
ENVIRONMENTAL RANKING:	4	1	4	4	2	7	3

Because the College aims to encourage positive environmental benefits and avoid negative environmental impacts through the process of composting our food waste, we would **not** want to pick a site where the composting operations may cause environmental degradation. We specified our notion of environmental impact with six subcategories: trucking distance, proximity to wetlands or rivers, visual impacts, habitat loss, support of local agriculture and "closed-loopness." While hauling created an economic cost, it also creates an environmental impact by emitting carbon dioxide (CO_2), the most prominent greenhouse gas contributing to

global warming. Since trucking the food waste to Holiday Farm will generate the most CO_2, this site receives the 7th ranking, while Cole Field appears to be the most climate-friendly option. However, the Cole Field site sits near wetlands and the Hoosic River, giving this location the last place ranking for the "proximity to wetlands" category. It will be important to protect wetlands and water sources from leachate contamination. Holiday Farm and Caretaker Farm share the 1st place, since their composting operations do not threaten any wetlands or rivers. HMF also receives a 1, because the site and its surrounding area appear free of wetlands. While the Piggery parcel borders on the Green River, the composting operation could be situated sufficiently far from the water, and this site earns a 4. However, the HWQD site receives a 5, and Potter field receives a 6, due to their increasing proximity to water.

Another environmental consideration addresses visual impact. The non-College sites tie for the 1st place ranking, because agriculture and composting serve as the normal activities at these locations; therefore, people are used to seeing them. The HMF site receives the 4th place ranking, because the clearing has one neighbor to consider, Nancy Alden, as well as the visual impact of truck traffic on Bulkley Street. The Cole Field site falls close behind with the 5th place ranking. Although the well-hidden location has no residential neighbors, many athletes spend their afternoons down at Cole Field in the fall and spring seasons. The Piggery shares this ranking, because the Purple Mountain Partners own parcels bordering on this site. Although their homes cannot be viewed from the Piggery, the property owners have still voiced resistance, and the composting operation may be visible from Route 43. However, Potter Field is located on a residential road, and this location earns the 7th place ranking. While location in a wooded area improves the visual impact, forest clearing to make a windrow corridor at the Cole Field site or to establish an access road in HMF will cause some habitat loss, so these two sites tie of 6th or

last place in this subcategory. Because no land preparation, and thus habitat loss, will occur on the non-College sites, these three tie for 1st place. The Potter Field and the Piggery tie for 4th place, because they are already cleared yet contain field species.

The first four environmental impact subcategory rankings assess the potential negative impacts caused by using the different sites, but we also want to consider the environmental benefits of operating at different locations. By sending our food waste to Caretaker Farm, the College would be supporting local agriculture in Williamstown, where development and subdivisions threaten the future of environmentally valuable agricultural land. Local farms are important for the environment, because they enable residents of Williamstown to consume on a local scale. While supporting Holiday Farm would be positive, its location in Dalton makes it not exactly "local" and thus the relationship not as beneficial for the environment. In terms of the College sites which all tied for 3rd place, a College-run operation could benefit local farms not only by producing compost that could be sold or donated to farms to use on their fields but also by removing their animal manure. Because the HWQD has no relationship with local farms, it received the last place ranking. By bringing a composting program onto campus, we could use the finish product for landscaping, and this would illustrate the College's success in converting food waste, once destined for a landfill, into a productive and valuable soil amendment. As a result of this potential, the College sites all share the 1st place ranking for "closed-loopness." If the College eventually implemented a program similar to the Middlebury model, we could completely close the loop of consumption at Williams and produce food for the dining halls in a greenhouse heated by our food waste. Caretaker Farm receives the 5th ranking, just behind the College sites, because the College could potentially purchase produce from the farm grown using the final compost product. This would also help us close our consumption loop. However, we do

not know if Caretaker Farm is interested in or capable of growing produce for the school. Overall, totaling the subcategory rankings gives Caretaker Farm the 1st place ranking, followed by HMF at 2nd and Piggery at 3rd.

Educational Value

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
EDUCATIONAL VALUE:							
CREATES AWARENESS	7	5	6	1	2	3	4
RESEARCH & CLASSROOM OPPS. FOR STUDENTS	6	5	6	1	1	3	3
COMMUNITY OUTREACH OPPS.	7	5	6	1	1	3	3
SHOWS COLLEGE'S COMMITMENT TO ENVIRO.	6	5	6	1	1	3	3
ENGRAINS A LIFE HABIT	6	5	6	1	2	3	3
POTENTIAL INCLUSION OF LOCAL INSTITUTIONS	5	5	5	1	1	1	1
TOTAL:	37	30	35	6	8	16	17
EDUCATIONAL RANKING:	7	5	6	1	2	3	4

The next criterion considers the education value that each of the sites could provide; we find this incredibly important because of Williams' strong reputation as a highly motivated educational institution. While the high economic costs of landfilling helped to inspire

Middlebury College to initiate a composting program, the educational value alone of a composting program should legitimize the effort. We assessed the potential of each of the sites to promote the educational component of composting by considering how well the sites: generate awareness, create classroom and research opportunities, facilitate community outreach, illustrate the College's commitment to the environment, engrain a life habit and whether or not they open the possibility to involving additional food waste from local institutions. Because of the Cole Field site's proximity to campus, this site would make the composting operation the most visible and accessible to students, and therefore, it would create the most awareness. In contrast the Cole Field, Holiday farm receives the last place ranking, because transporting our food waste 45-minutes away makes the composting process neither visible nor easily accessible. Similarly, Cole Field and HMF tie for the 1st place ranking regarding their potential for creating classroom or research opportunities. Students already visit HMF for exactly those reasons, and students already walk down to Cole Field on a regular basis. The Compost Task Force report gives a thorough description of the many ways professors could incorporate the composting operation into their curriculum, especially field lab work. While this opportunity would still exist if the composting operations were located at the Potter field or the Piggery, the further distance would likely be limiting and discouraging. As a result, these two sites share the 3rd place ranking. While Sam Smith prides himself on all of the Williams students that have used him as a resource for projects and would probably be receptive to students participating in the operation, sending the food waste to someone else's property would reduce the amount of possible curriculum involvement. For this reason, Caretaker Farm and the other two non-College sites shared the 5th and last ranking for their ability to create classroom and research opportunities.

Another subcategory considers how well the different sites illustrate the College's commitment to the environment, a quality that could attract environmentally responsible students. Obviously, our ideal site located within the campus walking tour loop would attract the most, because every tour guide would be able to gloat about our College's dedication to the environment as the tour walked by and observed the odorless windrows. Although tours would not walk past the Cole Field site, many people do journey down to the playing fields when they visit Williams. By locating the operations as close to the campus as possible, the College could illustrate the importance it places on this environmentally beneficial activity. More and more, colleges are being judged and pressured to fill the role as environmental leaders in the world of institutions. Environmentally-minded students want to spend their college education at an institution that actively invests in solutions to protect the environment. Bringing these students to Williams will encourage more dialogue and awareness on campus, and this would provide educational value for the whole community. Along these lines, if the College runs its own composting operation, the program could potentially grow to include other local institutions like the Williamstown Elementary School, Mt. Greylock Regional High School and even restaurants. While this expansion is not out of the question at the non-College sites, it seems less likely, so in this subcategory, the College sites tie for 1st ranking and the non-College sites share the 5th place. Furthermore, this inclusion of other institutions could serve as a way for the College to strengthen its relationship with the local community, and this idea ties nicely into the ability of different sites to create community outreach opportunities. The College is always looking for ways to improve the Town vs. Gown relationship, and the composting program could help. For example, the College-run program could offer workshops and technical assistance for residents that want to start their own backyard compost piles. The College could also donate some of its

finished compost to local residents for their gardens. Locating the operation close to the center of town would facilitate more community outreach, so the Cole Field and HMF sites share the 1st place ranking, then Potter field and the Piggery tie for 3rd, and then Caretaker Farm, HWQD and Holiday Farm follow in that progressive order. As a Community-supported farm, Sam Smith already receives the food waste from his 300 member families as well as Wild Oats Cooperative Market.

Clearly, the educational opportunities are endless. Nevertheless, the idea of engraining a life habit probably serves as the most important component. Students spend four years at Williams, and during that time they establish many habits. How they consume energy and dispose waste during the first few weeks quickly become the norms. While the College and the community seem to focus on the environmental footprint of the Williamstown-based institution, the College's environmental impact globally expands once you consider how the College disperses 500 young adults into the world each year. No matter which site hosts the operation, the students will continue to acquire the habit of separating their food waste to be composted. However, by locating the operation on a College site, the students can acquire the habit of seeing their food waste being composted into a usable resource. If you consider Cole Field and HMF the "backyards" of the College's campus, then locating the composting operations there would engrain the most replicable habit in the students. For this reason, these two sites receive the top two rankings. The Cole Field site comes out ahead of the HMF site, simply because Cole Field gets visited by a wider diversity of students. As usual, Potter field and the Piggery tie for 3rd, followed by Caretaker Farm. Holiday Farm and HWQD share last place, because students would be least aware and connected to the processes occurring there. Unlike the environmental impacts which were dispersed among the seven sites, the educational values appear to be concentrated at

the College sites and strongest at Cole Field and HMF. With no surprise, Cole Field and HMF receive the 1st and 2nd place rankings, respectively, for their strongest potential to produce educational benefits. It also seems appropriate that HWQD and Holiday Farm earn the last two rankings, due to the locations and structures of their programs.

Feasibility

	HOLIDAY	CARE-TAKER	HWQD	COLE	HMF	POTTER	PIGGERY
FEASIBILITY:							
ACCESS	**1**	**4**	**1**	**3**	**7**	**5**	**6**
TRAVEL TIME	**7**	**6**	**2**	**1**	**2**	**4**	**4**
NEIGHBORS	**1**	**1**	**1**	**1**	**5**	**6**	**6**
WETLANDS CONSTRAINTS	**1**	**1**	**1**	**7**	**4**	**6**	**4**
PAST USE	**1**	**1**	**1**	**7**	**6**	**4**	**4**
LONG-TERM COMMITMENT	**5**	**6**	**7**	**1**	**1**	**1**	**1**
TOTAL:	**16**	**19**	**13**	**20**	**25**	**26**	**25**
FEASIBILITY RANKING:	**2**	**3**	**1**	**4**	**5**	**7**	**5**

For our last criterion, we addressed the issue of feasibility, because the most ideal sites may not be the most realistic ones. In the long run, the remaining goal rests in finding the most appropriate location for our food waste to be composted. By recommending a site that ranks high in feasibility, the more likely the plan will be implemented. In order to gauge the feasibility of each site, we considered the following subcategories: access, travel time, neighbors, wetlands

constraints, past use, and long-term commitment. Regarding access, the easier it will be to create and use an access road to the site, the more feasible that option becomes. Because Holiday Farm and HWQD already receive waste, food and human sludge, respectively, access will not be an issue, and these two sites tie for the 1st place ranking. Cole Field receives the 3rd place ranking; the already existing paved, access road will just need to be continued onto the dirt "driveways" to reach the two clearings. Caretaker Farm receives the 4th place ranking, with a longer dirt road that already exists but it will need upgrading or paving. Because no form of access currently exists into Potter field, this site will require the building of a short driveway and therefore receives the 5th ranking. It will not need to be very long but will have to be constructed from scratch. A rough, dirt road leads into the Piggery (about ¼ mile long), so this access road needs improving and possibly paving, earning this site the 6th place ranking. Because only power lines and walking paths currently lead to the HMF clearing, creating access to the HMF site will require significant clearing and paving. As a result, this site receives the last place ranking.

Just as access makes some sites more plausible than others, travel time affects feasibility. The more time and money spent on transporting the food waste, the less efficient and practical the site. With this consideration in mind, Cole Field takes the 1st place ranking, followed by HMF and HWQD tying for 2nd, as usual, and Holiday Farm takes the last place ranking. Thinking about which sites are most attractive for the College to use also needs to consider how the operation could affect its neighbors. While it is easy to support the notion of composting, not everyone wants to live next door to windrows. As mentioned earlier, the College always tries to maintain positive relations with its neighbors, so sending our food waste to the Potter field site may cause some tension. The Purple Mountain Partners have already voiced resistance, so these two sites tie for last place. The three non-College sites tie for 1st, because neighbors of these sites

already accept the activities occurring there. Cole Field also shares the 1st place ranking, because it has absolutely no neighbors. HMF receives the 5th place ranking, because its hidden location protects it from all neighbors except for the Alden property which begins about 100 ft from the clearing. This space is sufficient in terms of legal issues; it is simply a matter of possible resistance from the surrounding neighbors.

While we want to avoid choosing a site where the composting operations could harm nearby wetlands, the Wetlands Protection Act and the Conservation Commission could also constrain our options with restrictions. As for possible wetlands constraints, the three non-College sites share the 1st place ranking, because these already composting site do not contaminate wetlands. The HMF site receives 4th place, because of the apparent lack of wetlands in and around the site. The Piggery site shares that ranking, because of the more than sufficient distance between the site and the Green River. Because the Potter hayfield sits only 100 feet away from a small brook, the Conservation Commission may call for some restrictions, and this site earns the 6th ranking. Although the Cole Field clearings lie outside of the Hoosic River's 200 foot buffer zone and above the 100-year floodplain, the west clearing sits in the swamp forest buffer zone, and as a result, this site receives the last place ranking. The Cole Field site also receives the last place ranking for the past use subcategory, seeing as the landfill is not officially closed. If it does get closed, the DEP may not approve using the site for composting. In contrast, the three non-college sites earn the 1st place ranking, since their past uses are conducive to uses involving agriculture, such as composting. Similarly, the Potter field and the Piggery share the 4th place ranking, with agricultural histories but no composting infrastructure. The HMF site receives the 6th place ranking.

In addition to looking into the past to measure the feasibility of these site options, it is important to anticipate which options may not be interested in a long-term commitment, specifically the non-College sites. Sam Smith and Brad Furlong may be interested right now in receiving the College's food waste, but their interest and capability may wither over time. Then the program would need to reestablish itself from scratch. The HWQD receives the last place ranking, because they have uncertain interest and no commitment. Caretaker Farm takes the 6th place ranking. Although Sam Smith has demonstrated interest and support for many years now, his involvement has been limited and sporadic. Holiday Farm earns the 5th place ranking, because Dicken Crane appears flexible and supportive regarding his relationship with the College. However, there always exists the possibility that he will begin charging a dumping fee. In contrast, using a College site may guarantee the most sustainable future for the program. If the College commits a parcel to the composting program, it seems unlikely that this commitment would be revoked. For this reason, these sites share the 1st place ranking. Looking at overall feasibility rankings, HWQD comes in 1st place, followed by Holiday Farm at 2nd and Caretaker Farm at 3rd. Because sending the food waste away to these sites would require the least effort from the College, these rankings are appropriate.

Overall Rankings

	HOLIDAY	CARETAKER	HWQD	COLE	HMF	POTTER	PIGGERY
ECONOMIC RANKING:	2	3	1	4	5	6	7
ENVIRONMENTAL RANKING:	4	1	4	4	2	7	3
EDUCATIONAL RANKING:	7	5	6	1	2	3	4

FEASIBILITY RANKING:	2	3	1	4	5	7	5
OVERALL TOTAL:	15	12	12	13	14	23	21
OVERALL RANKING:	5	1	1	3	4	7	6

To determine the overall rankings of the sites, we tallied the rankings for each of the four categories. In our effort to remain as objective as possible, we decided to weight each category equally. This approach generated a tie between Caretaker Farm and HWQD for the 1st place ranking. Cole Field, HMF and Holiday Farm closely followed, but Potter field and the Piggery ended up with the lowest rankings. Importantly, the Board of Commissions at HWQD has expressed their rejection of our proposal of sending our food waste to them to be composted with the sludge. This complete infeasibility dethrones HWQD from its high ranking, allowing the Cole Field site to move ahead to 2nd place. It is important to recognize the very close final tallies of Caretaker Farm, Cole Field and HMF. Slight changes in subcategories or weighting could cause large shifts in the rankings. Having said this, we want the ultimate decision makers to take advantage of our established analysis system. If they want to choose the least expensive site, the most environmentally friendly site, the most educationally beneficial site or the most feasible site, then they can add extra weight to the appropriate category. Our objective was not to push one particular option but to present our research and collected data in the most helpful, accessible manner.

Appendix E

Budget for Holiday Farm Option (Status Quo)

Total Capital Cost (Plastic Barrels)	$2,400
Employee Salary (per year)	$20,000
Hauling to Dalton, MA	$4,200
Direct Costs	$3,000
Total Operational Cost	$27,200
Yearly Total	**$29,600**

Budget for Cole Field Option

Capital Investments	
Clearing and Land Prep (1/2 acre)	$7,000
Concrete Pad	$5,000
Road Upgrading	$3,000
Tractor w/ Front-end Loader	$15,000
Big Pick-up and Retro-Fitting	$20,000
Total Capital Investment	$50,000
Direct Costs	$3,000
Employee Salary	$22,000
Maintenance Costs	$5,000
Total Operational Costs	$30,000
First Year Budget	**$80,000**