Composting Feasibility Study for the Dallas Zoo

By: Caroline Bork
Jan Cloutier
Andrew Stewart
Management Summary
The Dallas Zoo has, for as long as we know, had their animal waste picked up on zoo grounds by an outside contractor to dispose of it at a local landfill. This practice has become outdated and desperately needs renovation. We have been given the task of reporting all available feasible options, so that the Zoo can more easily make a decision on how to change their ways. These alternative programs should in some manner incorporate the animal waste into some sort of composting program. There are 3 possible recommendations that we have found suite the needs of the Zoo. The 3 models range from a financial one, to an ecological one, and to finally a full composting program, which is not really feasible to start out with immediately.

The first and second alternatives both involve a small composting program on-site, which would use minimal waste and allow for a gradual progression into a full composting program. The difference between the two cases is what happens to the rest of the waste. In the first scenario, the excess waste continues to be transferred to the city dump. This system allows for some cost savings and makes a good first step into an environmentally sound zoo. In the second case, the rest of the waste is going to be loaded into a 30 cu. yd. roll-off dumpster and taken to a commercial composting facility such as Living Earth Technology. This would allow for all of the waste to be composted, just not all in the same site. The main drawback, however, is that this case involves a significant increase in transportation costs and therefore makes it cost ineffective. Finally in the last case, we proposed a full composting program on-site which is going to incur a large initial cost, but has been proven by other zoos to have a short payback period.

We analyzed these various programs through a financial model comparing the costs and saving of each. We also calculated a payback period and a net present value for each. The NPV of the first one was $-13,800.59 which means that given the $19,536.96 initial cost we can save $5,736.37 each year while having a payback period of 2.45 years. For the second case, the NPV is $-37,519.11 and having a savings of $-12,482.15 which also means that it can not have a payback period and is actually losing money throughout the years. Finally, the last alternative had an NPV of $21,955.38 and a savings of $11,606.58 for which there is a payback period of only 2.08 years.

All of these alternatives are possible at any time for a zoo to implement, just some are better than other for different reasons. We chose to evaluate all options to give a better understanding of the possibilities. The last case, however, is not a strong recommendation for the simple fact that composting is a learned technique and requires a stepping process to get to the end result. We still wanted to include it to show the direction that we would be headed if a composting program was initiated and we went along with the planned progression.
Background and Description of the Problem/Situation
Problem:

The Dallas Zoo has always striven to promote environmental conservation. Although there is an interest to implement an animal waste composting program, they lack the time and resources to explore their available options. Animals create an exorbitant amount of waste each year, which needs to be dealt with by zoos everywhere. Many zoos today have taken the initiative and made a plan of action so that the waste is not merely discarded into the city landfill. The Dallas Zoo, however, has not been able to launch such a program as of yet.

Current System:

There is very basic system set up at the Zoo for waste disposal at this present time. Basically there are seven 4 cu. yd. dumpsters located at selected animal barns and exhibits from which they are taken to a centralized location, the maintenance yards, to be emptied into a waste disposal truck. From there it is taken to the McCommas landfill here in Dallas.

The Zoo is divided into two areas: Zoo North and the Wilds of Africa. In Zoo North there are 3 of these 4 cu. yd. dumpsters one is located at the large mammal barns and the other two are at the “Hill.” The large mammal dumpster before going to the maintenance yards makes a stop at Big Cat Row to pick up a waste can full. At the “Hill,” before leaving a waste can is combined with it from the Cheetah exhibit. From there it makes two stops on its way to the maintenance yards. First it picks up a waste can at the Children’s Zoo and then the non-quarantined waste from the primate exhibit. These 3 dumpsters are now located at the maintenance yards and contain all of the waste from Zoo North.

In the Wilds of Africa, there are four 4 cu. yd dumpsters located at different numbered barns. Barns 7, 10, 11, 13 each have a dumpster stationed at it. From barn 13, the dumpster makes a stop at barn 12 before going to the maintenance yards. Barns 10 and 11 dumpsters are taken straight to the maintenance yards. Finally, the dumpster at 7 picks up a waste bin from behind the hay barn and goes to the maintenance yards. This waste bin contains a collection of waste from the Mandrill exhibit, the gorilla barn and barns 1 and 2. Now all of the waste from the Wilds of Africa is located at the maintenance yards lined up next to the dumpsters from Zoo North.

All seven dumpsters are at the maintenance yards where the await the pick up of BFI 4 times a week and a city force disposal unit twice a week. When the truck reaches the Zoo, it has already made many stops along its route so this animal waste is going to be combined with all of the other trash already picked up and then taken to the city dump. This fact will become important later when we take a closer look at the possible alternatives.
Analysis of the Situation
The Dallas Zoo has had many reasons why they have not started a composting program before. The main one of these is that they did not have the resources such as time or money to research and implement a new waste management system. The secondary reasons included veterinarian opposition, initial cost, associated with composting, fear of change due to complexity, and local issues for example run-off considerations.

We started our project by first deciding what it entailed and what were our main concerns. This was accomplished by a comprehensive survey, library research and many phone calls. Much of the preliminary research had the goal of basically finding any information about composting as we could. One of the most effective and relevant research strategies that we used was to send a survey out to as many zoos across the country as we could.

We sent out 217 surveys and received a 41% return rate which gave us first hand information from other zoos who compost. The information from these surveys was compiled into an Excel spreadsheet in order to make a comparative study of the results. The questions that we asked ranged from “do you compost and why?” to the detailed questions of “how do you turn your windrows and what are your savings?” This survey gave us direction for our project and showed us a starting point for our local research. It also provided us with averages to more accurately estimate some of our figures used in the financial evaluation.

From our survey and preliminary research, we found some general problems associated with composting. Odor, space, initial costs, local regulations and labor costs are all major obstacles that must be overcome before starting a composting program. The two of the problems that needed to be solved through a model are cost comparisons between possible programs and space efficiency along with a systems model to explain composting.

We created an excel spread sheet model to compare the cost of the 3 cases which we are going to propose. This spread sheet allows for a detailed description of the financial savings and cost of each alternative and the relationship between them. The Economic model’s 3 cases range from one being an ecological oriented project, an economical oriented project and the last being an ideal project.

The systems model we used was to explain in detail the process for the windrows and the composting procedure. This system was composed of an explanation of the terms and conditions of composting and a step by step outline of the agendum required. Composting is fairly basic in nature, however there are many considerations that need to be taken into account, and this explanation provides answers to all questions to alleviate any misconceptions.
Surveys Results
Zoo Composting Survey: Results Compilation

Number of Zoos surveyed: 217
Number of Zoos responded: 88
Percentage of Zoos responded: 41%

1) Do you have a composting program?
   # Responded to this Question 88
   Yes 46 52%
   No 42 48%

2) If no, are you interested in beginning a program?
   # Responded to this Question 42
   Yes 29 69%
   No 13 31%

Q1. What was your motive for beginning a compost program? (circle all that apply)
   # Responded to this Question 32
   Profitable 4 13%
   Saves money 21 66%
   Helps the environment 25 78%
   Leader of community in composting 10 31%
   Other: 12 38%
   Use as fertilizer 8 25%
   Use as mulch 1 3%
   Good P.R. 1 3%
   Contribute to Community 1 3%
   Demo/Educational 1 3%

Q2. What do you compost? (circle all that apply)
   # Responded to this Question 37
   Herbivore Waste 34 92%
   Carnivore Waste 5 14%
   Animal Bedding 27 73%
   Primate Waste 4 11%
   Lawn Clippings 20 54%
   Tree limbs, shrubs 18 49%

2a. Is your composting programming restricted to certain types of animal waste because of federal, state, or city regulations?
   # Responded to this Question 27
   Yes 3 11%
   No 24 89%

2b. If you exclude certain types of waste from composting, what is the criteria for exclusion?
   # Responded to this Question 19
   If they exclude carnivore and primate waste, reasons cited were:
   Potential to transmit zoonotic diseases 7 37%
Quantity too small, not worth it 4 21%
Just want to do elephants & hoofstock 4 21%
State regulations don't allow, must incinerate 3 16%
Too slow to properly and safely breakdown 2 11%
It's "good practice" & makes quality compost 2 11%
Smell 1 5%
Vermin control 1 5%
Carnivorous waste used as deer repellant 1 5%

If they exclude hay, reasons cited were:
Takes too long to breakdown 2 11%
Don't have enough space 1 5%

2c. If you compost carnivorous waste, how do you stay within USDA/Federal guidelines?
# Responded to this Question 3
Extremely small quantity compared to other waste 1 33%
Do not put compost in public areas 1 33%
State Dept classifies us Agricultural, so need no license 1 33%

2d. If you compost dead tree limbs and shrubs, what kind of machinery is necessary and how do you handle this waste in your composting program?
# Responded to this Question 19
Chipper 14 74%
Tub Grinder 5 26%

Q3. How do you handle waste from animals that are possible carriers of infectious or zoonotic diseases? (may be more than one way) # Responded to this Question 22
Send it to the landfill 8 36%
Compost reaches 180 degrees, so it disinfects 2 9%
Incinerate it 7 32%
Keep it separate and compost for 6 months 1 5%
Our tests shows composting kills infection 1 5%
Separate hazardous waste pickup/sanitary landfill 4 18%
Bleach & seal in plastic bag before disposal 1 5%

Q4. In what ways have you saved money through composting? (circle all that apply) # Responded to this Question 24
Landfill costs 16 67%
Waste collection costs 10 42%
Other:
Fertilizer 5 21%
Mulch 2 8%
Compost 2 8%
Don't overload septic 1 4%

4a. How much have you saved each year through composting? # Responded to this Question 5
Q5. Do you (circle one): compost in-house or outsource the composting?

<table>
<thead>
<tr>
<th>Compost in-house</th>
<th>29</th>
<th>81%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outsource</td>
<td>7</td>
<td>19%</td>
</tr>
</tbody>
</table>

Average $10,940

If you outsource the composting:

Q1. What is the name, address, phone #, and Fax # of the composting agency:

# Responded to this Question 3

Q2. How much does this service cost, and for what time period? Receive any revenue back?

# Responded to this Question 3

1 Dan Eichenlaub, Pres. AGRECYLE, INC. AGRECYCLE, INC. P.O. Box 38783 PGH, PA 15238-8783 (412)767-7645 Cost: $250/wk Revenue No Back? No get back $.25/bag sold & free organic products $20,000

2 Whitney Farms P.O. Box 278 Independence, OR 97351 Cost: $0 Revenue No Back? No estimate for '98: $20,000

3 Chuck Wilson, VP Sales, Mktg A1 Organics Eaton, CO 80615 Cost: 155/20yd³ rolloff + $2 tip/yard³ at dump site Revenue No Back? No estimate for '98: $20,000

Q3. Who collects the waste at the zoo?

Zoo grounds staff 3 100%

Q4. How is the waste transported from the zoo? How often? In what kind of containers?

Compost Company truck 1 33% How often transported from zoo? "truck" 1 33% 1/wk 2 20 yd³ roll-off 1 33% 3/wk 1

Q5. (This question is merged with Question 18 below.)

If you compost in-house:

Q11. Did you hire a separate individual(s) to coordinate your composting? Yes or No

Yes 4 14%
No 24 86%

1a. How many hours per week total do your staff members spend on the composting aspect of their work?

# Responded to this Question 16
Technical Description of the Economical Model
<table>
<thead>
<tr>
<th>Costs for first year only:</th>
<th>Current State</th>
<th>Case 1: Landfill + No Compost</th>
<th>Case 2: Commercial + Min Compost</th>
<th>Case 3: Complete Compost Program</th>
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<tbody>
<tr>
<td>Waste Removal</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Animal Waste</td>
<td>$20,573.28</td>
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<td>$38,040.00</td>
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<td>Tree Branches</td>
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<td>$0.00</td>
<td>$0.00</td>
</tr>
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<td>Hay, Bedding Material</td>
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<td>$0.00</td>
<td>$0.00</td>
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<td>Labor for composting</td>
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<tr>
<td>Dumping for in-house</td>
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<td>$1,240.20</td>
<td>$1,240.20</td>
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<tr>
<td>Turning</td>
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<td>$333.90</td>
<td>$667.80</td>
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<tr>
<td>Dumping for out-house</td>
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<td>$0.00</td>
<td>$4,960.80</td>
<td>$0.00</td>
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<td>Testing</td>
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<tr>
<td>Compost Purchased</td>
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<td>$0.00</td>
<td>$0.00</td>
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<tr>
<td>Compost Equipment</td>
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<tr>
<td>Chipper</td>
<td>$0.00</td>
<td>$14,000.00</td>
<td>$14,000.00</td>
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<td>Water Hose</td>
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<td>$66.96</td>
<td>$66.96</td>
<td>$66.96</td>
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<td>Compost Thermometer</td>
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<tr>
<td>Free-standing Cart dumper</td>
<td>$0.00</td>
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<td>2.5 cu.yd. Tilt hopper trailer</td>
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<td>$1,900.00</td>
<td>$11,400.00</td>
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<td>Salvage value of 4 cu.yd. Trailers</td>
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<td>($375.00)</td>
<td>($2,250.00)</td>
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<td>Site Preparation</td>
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<td>Stipend (food, transport)</td>
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<td>$0.00</td>
<td>$100.00</td>
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<td>Total Costs:</td>
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<td>$38,870.30</td>
<td>$69,736.86</td>
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### Continuous Costs/Savings

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<tr>
<th>Waste Removal</th>
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<tr>
<td>Animal Waste</td>
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<td>Tree Branches</td>
<td>$3,540.00</td>
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<tr>
<th>Labor for Composting</th>
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<tr>
<td>Dumping for in-house</td>
<td>($1,240.20)</td>
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<td><strong>Continuous Total:</strong></td>
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<td>($17,392.62)</td>
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### Initial Costs/Savings

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<td>Compost Equipment</td>
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<td><strong>Initial Total:</strong></td>
<td>($19,536.96)</td>
<td>($25,036.96)</td>
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<p>| Payback Period (in years):        | 2.45             | DNE              | 2.08             |
| Net Present Value:                | ($13,800.59)     | ($37,519.11)     | ($21,955.38)     |</p>
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<thead>
<tr>
<th>CASE 1:</th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
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<th>Month 8</th>
<th>Month 9</th>
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<td>NPV=</td>
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<td>CASE 3:</td>
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Cash Flow Diagram for Case 1

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<td>$-5,000.00</td>
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<td>10</td>
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<tr>
<td>$-5,000.00</td>
<td>11</td>
</tr>
<tr>
<td>$-5,000.00</td>
<td>12</td>
</tr>
</tbody>
</table>

Initial Costs/Savings: $-19,536.96

Continuous Costs/Savings: $884.37 $676.42 $668.47 $660.52 $660.52 $660.52 $660.52 $660.52 $660.52 $660.52 $660.52 $660.52
Current State:

Description: The current state of the Dallas Zoo waste disposal is that all animal waste is collected at a centralized location called the maintenance yards. The waste is then compacted at a ratio of 4 to 1 by the waste hauler, while being mixed with all other waste in the truck. Finally, it is transported to the McCommas by BFI four days per week and the City Force twice a week. Currently, no composting is done on site. All figures used in this cost analysis were quoted by June Howard as actual expenses. We have excluded labor costs in the current state model because we assume each case hereafter will use this amount of labor as a minimum.

Explanation of Costs:

Waste Removal

- Animal Waste = $9.42 per 4 cubic yard dumpster
  \[ \times 7 \] dumpsters
  \[ \times 6 \] days per week
  \[ \times 52 \] weeks per year

\[ \text{--------} \]

\[ $20,573.28 \text{ per year} \]

- Tree Branches = $295.00 per dumpster
  \[ \times 1 \] time per month
  \[ \times 12 \] months per year

\[ \text{--------} \]

\[ $3,540.00 \text{ per year} \]

- Hay, Bedding = $47.00 per week
  \[ \times 52 \] weeks per year

\[ \text{--------} \]

\[ $2,444.00 \text{ per year} \]

\[ \text{Total: } $26,557.28 \]

Compost Purchased $750.00

\[ \text{Total: } $750.00 \]

\[ \text{Total for Current State: } $27,307.28 \]

CASE 1:

Description: In Case 1, a mini-composting program is started. The zoo will use the waste from the large mammal dumpster, the excess and unused hay, and wood
chippings in their compost piles. The remaining six 4 cubic yard dumpsters of animal waste will continue to be transported to the McCommas landfill as under the current state. The zoo would have to purchase a chipper to save money by using tree branches in their composting. Estimate for a heavy-duty, gas-run chipper came from Paul Hunt at Industrial Disposal Supply. The zoo would either use what is now the maintenance yards as their compost site or the "moldy hay area"—as marked on Appendix D. We based our cases on using the moldy hay area which needs to be cleared before use. The cost of clearing this site from all the debris that has been piled on it is an estimated $3900, according to Ferris Containing. However, we see this cost as inevitable regardless of how this site will be used. So, this $3900 is incurred now as a barrier to implementation of a compost site, but would definitely be incurred sometime in the future of the zoo.

To transport the waste from the large mammal dumpster to the compost piles, the zoo would be best advised in buying a 2.5 cu. yd. Tilt hopper trailer. This trailer, which is used in the Denver Zoo composting program, would cost $1900 according to Mr. Hunt at IDS. Since this would be filled faster than a 4 cu. yd. dumpster, it would sometimes have to be dumped twice a day. To dump it, one would have to attach the tilt-hopper trailer on the hauling mechanism already used to haul around the 4 cu. yd. trailers and bring it to the compost site. Then, to get the waste out of the tilt-hopper, one just has to trip the lever—this extra time is minimal if only done once. So, we estimated ½ hour average labor per day, above labor used in the current state, to dump the tilt-hopper to cover dumping once or twice a day onto the piles. Buying a tilt-hopper would free up a 4 cu. yd. trailer to be used elsewhere, or to be sold. Paul Hunt said that the salvage value would probably be only 25%, because they are only used for spatial applications—specific for places like the zoo. They are not widely used anymore. So, this is 25% of the original value of $1500, equaling $375. The systems model for this compost site uses a windrow system.

To turn these windrows, we had to estimate hours used for the first year in an accumulated approach. To turn one windrow, we have estimate 1 hour of labor, using a bobcat. Thus, the first month will only require one windrow being turned and result in 1 hour of labor; the second month, two windrows will be turned and will require two hours of labor; and so on, until the maximum four windrows are turned each month, resulting in a half-day of labor, or four hours of labor for the last nine months of the year. Therefore, 42 hours of labor will be used in the first year to turn the piles. No time is allotted for marketing hours based on our final recommendation; this could change based on decision of zoo. All estimates for labor hours are based on statements by Tom Gannon from the Woodland Park Zoo.

To moisten the windrows, a water spigot can be found 150 ft. away from the suggested compost sites. Estimate for 200 ft. of water hose comes from an average of quotes given by several Dallas stores (from Wal-Mart to Smith & Hawkin). To test the piles for appropriate temperatures, a composting thermometer should be used. According to Tom Gannon, a cheap one can be found for $10 and go up to $80. Therefore, we used an average of $45 for the compost thermometer. The
testing done on the piles could vary depending on what the zoo decides to test for, such as temperature tests, fecal tests, NPK tests, salmonella tests, etc. The equipment to test the compost is either already estimated (i.e., the compost thermometer) or can be found in a regular zoo laboratory, according to Tom Gannon. Thus, the cost of testing is a function of the man-hours spent on this area. We used an average of testing costs from zoos questioned on this topic.

Explanation of Costs:

Waste Removal
- Animal Waste = $9.42 per 4 cubic yard dumpster
  x 6 dumpsters
  x 6 days per week
  x 52 weeks per year
-------------
$17,634.24 per year

Total: $17,634.24

Labor for Composting
- Dumping waste = $7.95 per hour per employee
  x .5 hours per dump per day
  x 6 times per week
  x 52 weeks per year
-------------
$1,240.20 per year
- Turning piles = $7.95 per hour per employee
  x 42 hours per year
-------------
$333.90 per year
- Testing = $125.00 per year

Total: $1,699.10

Compost Equipment
- Chipper = $14,000.00
- Water hose = $66.96
- Thermometer = $45.00
- 2.5 cu. yd. Tilt hopper trailer = $1,900.00
- Salvage value of 4 cu. yd. trailer = ($375.00)

Total: $15,636.96
Site Preparation

- Site clearing = $3,900.00  labor costs

Total: $3,900.00

Total for Case 1: $38,870.30

CASE 2:

Description: Case 2 suggests a much more revised system from the current state. Again, a mini-composting system is implemented. All of the same figures and estimates are used in this case as they pertain to Case 1. The difference between the two cases is what happens to the animal waste not being used in the windrow system. In Case 2, we suggest that this waste is separated from the routine pickup by BFI and City Force, and transported instead to a commercial composter. The two commercial composters we have found in Dallas are Living Earth Technology and the City of Dallas composting site. This change in where the waste is transported incurs substantial costs because the animal waste & bedding cannot be compacted and combined on a route, as in the current process. An entirely new transport system would have to be implemented. The 4 cu. yd. dumpsters would still be used, but a free-standing cart dumper would have to be purchased to dump them into a 30 cu. yd. trailer. The estimate for the dumper was gotten from IDS. This extra labor incurred by the zoo was estimated by using two people for 2 hours a day at a rate of $7.95 per hour. The 30 cu. yd. trailer of only compostable material would then be hauled to a commercial composter by a waste hauler. Estimates for hauling this waste from the Dallas Zoo in to Living Earth came from Grady Hicks at Duncan Disposal.

Explanation of Costs:

Waste Removal

- Animal Waste = $120.00
  x 6 dumpsters per week
  x 52 weeks per year
  + $50 x 12 rental fee for 30 cu. yd. / mo.

-----

$38,040.00 per year

Total: $38,040.00

Labor for Composting

- Dumping waste = $7.95 per hour per employee
  (in-house) x .5 hours per dump per day
  x 6 times per week
Turning piles = $7.95 per hour per employee x 42 hours per year
--------
$333.90 per year

Dumping waste = $15.90 per two employees per hour x 52 weeks per year
--------
$4,960.80 per year

Testing $125.00 per year

Total: $6,659.90

Compost Equipment
- Chipper = $14,000.00
- Water hose = $66.96
- Thermometer = $45.00
- Free-standing cart dumper = $5,500.00
- 2.5 cu. yd. Tilt hopper trailer = $1,900.00
- Salvage value of 4 cu. yd. trailer = ($375.00)

Total: $21,136.96

Site Preparation
- Site clearing = $3,900.00 labor costs

Total: $3,900.00

Total for Case 2: $69,736.86

CASE 3:

Description: This case explores the option of a complete composting program. In this option, 6 of the 7 dumpsters of animal waste would be used for the in-house composting program at the Dallas Zoo. The seventh dumpster would consist purely of primate and carnivorous waste, which we are recommending the zoo not compost. In this case, we used the same estimates as above for labor costs, but adjusted them to fit the larger composting program. We suggest the purchase of 6 Tilt hopper trailers for the complete ease of transporting waste from the barns to
the compost site in-house. Then 6 – 4 cu. yd. trailers would be available for resale.
We also added an estimate for fencing the compost site to deal with run-off and smell issues. This fencing is an approximation from the fencing used in the upgraded compost site of the North Carolina Zoo. This figure is for 300' of fencing. Lastly, in this case, we would suggest a consulting visit from Dr. Doo himself—aka, Tom Gannon. He said he would not charge consulting fees if the zoo pays for hotel and airfare. We got the airfare estimate from American Airlines and the 1-night hotel cost from the Hampton Inn, Downtown Dallas. We also included a stipend for food, transportation, etc. during his stay.

Explanation of costs:

Waste Removal

- Animal waste $9.42 per 4 cu. yd. dumpster
  x 1 dumpster of carnivore waste
  x 6 days per week
  x 52 weeks per year
  --------
  $2,939.04 per year

  Total: $2,939.04

Labor for Composting

- Dumping $7.95 per hour per employee
  (in-house) x 3 hours per day
  x 6 days per week
  x 52 weeks per year
  --------
  $7,441.20 per year

- Turning $7.95 per hour per employee
  x 84 hours per year
  --------
  $667.80 per year

- Testing $125.00

  Total: $8,234.00

Compost Equipment

- Chipper = $14,000.00
- Water hose = $66.96
- Compost Thermometer = $45.00
- 2.5 cu. yd. Tilt hopper trailer = $11,400.00
- Salvage value for 4 cu. yd. trailer = ($2,250.00)
Total: $23,261.96

Site Preparation
- Site Clearing = $3,900.00  labor costs
- Fencing = $6,400.00  for 300' fence

Total: $10,300.00

Compost Consultant
- Airfare = $380.00
- Hotel stay = $107.42
- Stipend = $100.00

Total: $587.42

Total for Case 3: $45,322.42

Note: We included a spot on the Cost Analysis Model for Miscellaneous expenses towards site preparation. We included it because we wanted to raise the issue of how much it is going to be to deal with the run-off/groundwater regulations. This cost could be large or small, depending on the decisions made by the Dallas Zoo on how to control this problem, (if it needs controlling at all). So, we left an asterisk (*) in the cell to be left until this figure can be ascertained.
Technical Description of the Systems Model
What is Compost?

Compost is the result of a 4-6 months process by which organic material breaks down through decay and other processes to form rich, dark humus. Compost is basically a very fertile soil that is used in gardens and vegetative beds as a supplement. “Compost makes your plants healthier by improving aeration, root penetration, water retention, and by reducing the crusting of the soil surface” (www.zoo.org/special/zoodoo.stm).

What types of Composting are there?

There are 3 main types of composting procedures. First, there is anaerobic composting. This is the most basic of the 3 for there is little effort required. The process is simply to collect organic waste into a pile or row and let it sit until it has broken down enough to become compost. The drawbacks are primarily the length of time that is needed and the possibility of odor to become uncontrollable. Vermicomposting is the second option, which is fairly similar to anaerobic except there is a small twist. Once the piles have been established, a special type of worm is added to the heap. These worms speed up the process by significantly reducing the decay time. The problems here are that worms are expensive and there is no guarantee that the worms that you buy are not going to die in the heap before they do their job. Finally, there is aerobic composting, which again is similar to anaerobic. The only difference this time is that once the piles are lined up they require aerating. This allows for the piles or windrows in the case to “air out” reducing decay time and odor problems. All 3 of these cases are feasible, but aerobic is the best due to the reduction in odor and time is not too much of an issue.

For aerobic composting, What is the general set-up?

Aerobic composting as mentioned before is a set of windrows, or piles, that are lined up in an orderly fashion allowing room between them for machinery to pass through. These windrows contain all of the necessary ingredients for good compost. There is nothing added to them once they have been laid except for some water on occasion in order to prevent them from drying out. After the first windrow is in place, every couple of weeks to a month they need to be turned. The turning is what aerates them reducing odor and time of decay.

How are the Windrows “turned”?

Turning is a misleading term. The object of turning as discussed before is to reduce the decay process and to aid in odor control. The process starts by first laying one windrow, preferably in a corner of the compost site. After the first period has elapsed, which in most cases is two weeks to a month, the first turn needs to be performed. This turn involves moving the original windrow to a new location about 15 feet away leaving a cleared space behind. To move the windrow a front end loader or bobcat is used to pick up the waste and driven to the next location where it is shaken out of the bucket in order to expose the waste to as much air as possible. Once all of the waste of the original windrow has been moved, and new windrow takes its place at the original location. This routine is done at the end of every period moving the original windrow farther and farther away from its origin until it is fully composted. It is recommended that there should be at
least 3 turns made before the final period to guarantee that the compost has been properly aerated.

How is odor controlled?

Odor is one of the major problems with composting programs. There is no real way to totally avoid it, but there are some precautions that can be taken. First and foremost, herbivorous waste should be used instead of carnivorous and primate waste. Not only is the carnivore and primate waste the source of many other concerns such as diseases and parasite transfer, it yields the most amount of odor of any feces. Animal manure is not the concern, rather it is what kind which makes the difference.

Another cause of bad odor is the lack of aeration. Anaerobic composting, as discussed previously, does not allow for air to move through the compost. Nitrogen gases that should have been released, therefore, are trapped below the surface of the windrow. Once these gases are finally let free by a turn, “the stench can be overwhelming” (www.zoo.org/special/advanced_composting.stm). So it is recommended to turn piles on a regular basis.

What is a good Ratio of Carbon to Nitrogen?

If the pile still have a stench even though they have been properly aerated and there is no presence of carnivore waste, then there is a strong likelihood that there is an improper balance of Carbon and Nitrogen (www.zoo.org/special/advanced_composting.stm). That is, there is a proper Carbon to Nitrogen ratio that is supposed to be upheld. This ratio is about 30:1 (www.zoo.org/special/advanced_composting.stm). Which mean that it is recommended that there are 30 parts Carbon to ever 1 part Nitrogen. If the carbonaceous material is too much, the ability of the bacteria to process the mix will be greatly reduced. On the other hand when there is too much nitrogenous substance there is going to be too much Nitrogen that is going to be released to the atmosphere.

What tests can and should be done?

There is a variety of tests that can be used on the compost to insure quality and that it is non-hazardous. The first of these tests is NPK (Nitrogen, Phosphate and Potassium). This test is basically a quality assurance test. There is a minimal NPK value that must be achieve to commercially sell compost as a fertilizer as opposed to a soil supplement. Since the Dallas Zoo is not going to sell as a fertilizer this test is not necessarily important to run.

The standard fecal test is another test that is used often by other zoos. This test is no different than the test that should be already run on fecal matter of all zoo animals. The third type of test is a bacterial test that would be looking for such bacteria as Salmonella. This test is fairly basic as well and does not differ from any standard tests that can be used.

The last test, which is a must, is a temperature test. This is basically used to determine if the compost windrows are at their minimal temperatures for the particular stages of the process. After the first day of composting, the windrows should be at least 140-150 degrees Fahrenheit. This should stay at this level for the first 3 days. After that, this test should be run once a week reporting the temperatures of each windrow. The
temperatures should dip down by the time of the first turn, but once it is turned it should shoot back up again. This cycle for the temperature should continue throughout the composting process with each relative high being less than the previous one. The reason that the temperature is important is that this is the indication that the pathogens and weeds are being killed off.

Process for the Dallas Zoo:

Month 1:
- Lay 1 windrow. This windrow should be 12 feet wide, 6 feet tall, and 20 feet long in the middle of the composting area (see diagram). It will not reach this total size until the end of the month. Every day another load of animal waste should be added, increasing the volume daily. The other ingredients of this windrow is going to be the weekly unused/excess hay, and the monthly tree branches chippings from the zoo grounds. This first month should include temperature tests administered on the first 3 days of the month in addition to a weekly test.

Month 2:
- Time for first turning. Using a front-end loader or a Bobcat, move the compost of the first windrow to the location of the second (see diagram). In order to aerate the waste as much as possible, when dumping it onto the new location “shake” the waste out of the bucket. This should leave a clean area where the original windrow was and a freshly moved windrow at the second location. Now, start a new windrow in the original location. This by the end of the month should leave us with two windrows of approximately the same size filling location 1 and 2. Again this new windrow is going to have the same ingredients as the first and also is going to be tested for temperature with the same regularity.

Month 3:
- Time for the second turning. This is going to be very similar to the previous month. First relocate the original windrow to a new location, location 3, using the same technique of shaking the bucket to aerate the waste. As this windrow is laid into its third location we will begin to see some reduction in the volume of the material. Now we need to move the second windrow to location 2 repeating the shaking process. At this point we should have two windrows moved to their new locations 2 and 3, respectfully. It is now time for the windrow 3 to begin. We start to lay down the waste for this new windrow keeping in mind that this is a daily process and is going to contain the same amount of ingredients as the two previous ones. The ingredients include the animal waste, the weekly excess/unused hay, and the monthly tree branch chippings. We should have 3 windrows in place.
now. The testing for temperature should keep the same schedule, checking the first 3 days of the month and then weekly thereafter.

Month 4:
- Time for the forth turning. This is going to be almost the exact same process as the previous month except that there is going to be an extra windrow added. So, we need to move the first windrow to the final location, location 4. Remember we do this by moving the waste by the front-end loader and "shaking" it out of the bucket. Next, the second windrow needs to be moved to location 3 by the same process. Then, the third windrow needs to be moved to location 2, leaving the starting location empty. Finally we start a new windrow in the starting location made of the same material as the previous 3. Again, the same tests are going to be run with the same frequency. Now we should have all of the windrow locations full of waste. This should be the final turn for the original windrow.

Month 5:
- Now the original windrow has made its progression through the system making it to the fully composted stage. This material that has been produced is a dark, rich looking soil. This can be used in any garden or vegetation bed around the zoo grounds. At this point also it could be sold off for profits. So to finish it completely, we need to move it out of the way into a storage pile off to the side. Next, we move the second windrow to its final location, the third windrow to location 3, and so on. This routine is now made one whole cycle. Don’t forget to add another windrow onto the starting location so that the cycle is not broken. It is necessary to remember that the turning helps with the odor control and it is an integral part of the composting process. Remember, also, to make sure that the temperature tests are run at the scheduled days of the month, just like always.
Layout of Compost Site

100'

35.4'
70.7'
70.7'
35.4'

50'
Windrow Systems Model

- 50 ft.
- 21.7 - 30.38 cu.yds. of output per cycle
- 43.4 cu.yds. waste of input per cycle
- Blue arrows signify turning of windrows.

Dimensions:
- 100 ft.
- 50 ft.
- 32.55' x 13'
- 12'
- 6' tall

Ready-reduced Compost
Numbers used in the Systems Model:

The amount of waste that will go into the compost site for the mini-composting program was found as follows:

All estimates of waste produced have been received from June Howard.

<table>
<thead>
<tr>
<th></th>
<th>Winter (6 mos.)</th>
<th>Summer (6 mos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 cu. yd. trailer</strong></td>
<td>1 cu. yd. of carnivore waste</td>
<td>1 cu. yd. of carniv. waste</td>
</tr>
<tr>
<td></td>
<td>1.5 cu. yd. of herbiv. Waste</td>
<td>1.5 cu. yd. of herbiv. waste</td>
</tr>
<tr>
<td></td>
<td>1.5 cu. yd. of hay</td>
<td>0.75 cu. yd. of hay</td>
</tr>
<tr>
<td><strong>Animal waste only</strong></td>
<td>1.5 cu. yd.</td>
<td>1.5 cu. yd.</td>
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<tr>
<td></td>
<td>x 6 days / week</td>
<td>x 6 days / week</td>
</tr>
<tr>
<td></td>
<td>x 26 weeks per half year</td>
<td>x 26 weeks per half year</td>
</tr>
<tr>
<td></td>
<td>234 cu. yd. / winter</td>
<td>234 cu. yd. / summer</td>
</tr>
<tr>
<td><strong>Hay only</strong></td>
<td>1.5 cu. yd.</td>
<td>0.75 cu. yd.</td>
</tr>
<tr>
<td></td>
<td>x 6 days / week</td>
<td>x 6 days / week</td>
</tr>
<tr>
<td></td>
<td>x 26 weeks / half year</td>
<td>x 26 weeks / half year</td>
</tr>
<tr>
<td></td>
<td>234 cu. yd. / winter</td>
<td>117 cu. yd. / summer</td>
</tr>
<tr>
<td></td>
<td>12 cu. yd. per week</td>
<td>12 cu. yd. per week</td>
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<tr>
<td></td>
<td>x 52 weeks per year</td>
<td>x 52 weeks per year</td>
</tr>
<tr>
<td></td>
<td>312 cu. yd. / winter</td>
<td>312 cu. yd. / summer</td>
</tr>
<tr>
<td></td>
<td>234 cu. yd.</td>
<td>117 cu. yd.</td>
</tr>
<tr>
<td></td>
<td>+ 312 cu. yd.</td>
<td>+ 312 cu. yd.</td>
</tr>
<tr>
<td></td>
<td><strong>546 cu. yd. / winter</strong></td>
<td><strong>429 cu. yd. / summer</strong></td>
</tr>
<tr>
<td><strong>Wood chippings</strong></td>
<td>30 cu. yd. per month</td>
<td>30 cu. yd. per month</td>
</tr>
<tr>
<td><em>optional</em></td>
<td>x 1/3 shrinkage by chipper</td>
<td>x 1/3 shrinkage by chipper</td>
</tr>
<tr>
<td></td>
<td>10 cu. yd. / month</td>
<td>10 cu. yd. / month</td>
</tr>
<tr>
<td></td>
<td>x 6 mo. / year</td>
<td>x 6 mo. / year</td>
</tr>
<tr>
<td></td>
<td><strong>60 cu. yd. / winter</strong></td>
<td><strong>60 cu. yd. / summer</strong></td>
</tr>
<tr>
<td>Total</td>
<td>Winter</td>
<td>Summer</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Animal waste</td>
<td>234 cu. yd</td>
<td>234 cu. yd</td>
</tr>
<tr>
<td>Hay</td>
<td>546 cu. yd</td>
<td>429 cu. yd</td>
</tr>
<tr>
<td>Wood Chippings</td>
<td>60 cu. yd</td>
<td>60 cu. yd</td>
</tr>
<tr>
<td>+-------------</td>
<td>+------------</td>
<td></td>
</tr>
<tr>
<td>840 cu. yd. waste / winter</td>
<td>723 cu. yd. waste / summer</td>
<td></td>
</tr>
</tbody>
</table>

So, 840 cu. yd. + 723 cu. yd. = 1563 cu. yds. of waste total for the year.

However, we did not feel this was an accurate estimate for our windrow system, based on experiences of other zoos, namely the Fort Worth and Woodland Park Zoos. Before decomposition, the waste compacts by what we estimate, based on others’ experiences, is a compaction ratio of a little less than 3 to 1. This estimate makes sense logically, because manure and hay when collected in 4 cu. yd. dumpsters are not compressed in the current process. They are left to be compressed by BE mechanically. Therefore, there is quite a bit of unused volume in these 4 cu. yd. estimates that can be attributed to air. Also, these dumpsters are sometimes full and sometimes not. This discrepancy could create a major overestimation error if we assumed they were always full. Thus, we will use a ratio of exactly 3 to 1 for settling and unfilled dumpsters to ensure accuracy in our model.

Therefore, our final calculation of the volume of waste that will be composted in the mini-composting program is:

\[
1563 \text{ cu. yd.} / 3 \text{ (ratio)} = 521 \text{ cu. yds. of waste to be composted each year}
\]

This number could also vary according to whether or not wood chippings were actually used. Also, if the desired 30 to 1 Carbon to Nitrogen ratio was being exceeded by too much hay vs. manure, or vice versa, the zoo would have to remedy this by disposing of a dumpster by alternative means every now and then.

We would build each windrow once a month, so the amount of actual waste inputted into our model would be:

\[
521 \text{ cu. yds.} / 12 \text{ months} = 43.4 \text{ cu. yds / month}
\]

The decomposition process in composting decreases the volume of waste again by as little as 30 to as much as 50%, according to Tom Gannon. Thus, the actual amount of compost outputted by our model would be between:

\[
\text{Lose 30\% Volume: } 43.4 \text{ cu. yd.} \times 70\% = 30.4 \text{ cu. yd. compost outputted}
\]
\[
\text{Lose 50\% Volume: } 43.4 \text{ cu. yd.} \times 50\% = 21.7 \text{ cu. yd. compost outputted}
\]
Therefore the total amount of compost produced by this mini-composting system in the first year would range from:

**260.4 cu. yd. / year to 364.8 cu. yd. / year of ready-to-use compost**

Equations:
- \(21.7 \text{ cu. yd.} \times 12 \text{ months} = 260.4 \text{ cu. yd. compost / year}\)
- \(30.4 \text{ cu. yd.} \times 12 \text{ months} = 364.8 \text{ cu. yd. compost / year}\)

**The Windrow Systems Model:**

The actual area of the possible compost site is about 100 ft. long by 50 ft. wide, according to June Howard. (This compost site is the moldy hay area.) This means that it is an almost perfect right-angled rectangle of two adjacent squares with 50 ft. sides. In theory, the most distance across a square is along its diagonal. So the most efficient use of space in this rectangle is to use the diagonals of the two squares, and the square made by their bisection.

These would each be 70.7 ft. long, by using the Pythagorean Theorem:

\[50^2 \times 50^2 = 5000, \text{ SQRT}(5000) = 70.71\]

These diagonals are Locations 2, 3, and 4 in our windrow system. The first windrow would be placed on the upper left hand corner, of total length 34.5 ft., which is large enough to hold the waste produced by the large mammal trailer, unused hay, and wood chippings for a month.

34.5 ft. is gotten from the Pythagorean Theorem. also, by using the smaller square in the upper left corner, which is 25 ft. on each side.

We then calculated how long the original windrow must be to accommodate 43.4 cu. yd. of waste, which will be generated each month.

Each windrow is triangular in volume, or

\[\frac{1}{2} \text{ base} \times \text{ width} \times \text{ height}. \text{ So, for 43.4 cu. yd.,}\]

\[\frac{1}{2} (32.55') \times (12') \times (6') / 27 \text{ cu. ft./ cu. yd.} = 43.4 \text{ cu. yd.}\]
The width and the height are based on the size of compost piles at other zoos, while the length is variable upon how much volume the original windrow needs to contain.

Therefore, our dimensions for each original windrow are 32.55' in length, 12' in width, and 6' tall. We could fit four of these, 13' apart in our allotted area. However, as the windrow shrinks in size this 13' area between them will grow and allow for greater maneuverability.
Analysis and Managerial Interpretation
Zoo Composting Survey Results:

From our extensive Zoo Composting Survey, we have been able to gauge how widespread the practice of composting at zoos has become, as well as what the common practices and implications of doing so might be.

Out of the 88 zoos across the United States that responded to our survey, over 52% of them currently have some type of composting program. 69% of those zoos, that do not compost, said they would be "interested in beginning a program." This overwhelmingly positive response was surprising. Indeed, it should motivate the Dallas Zoo to aggressively pursue composting, not just for the good of the environment, but also in order to stay abreast of current movements in the Zoological community.

Among the zoos that compost, 52% cited lack of space as their biggest challenge to composting. This is understandable, since the ideal site for composting is out of the public’s range of smell and the average amount of space used to compost is 9500 square feet. Next, as challenges to composting were state regulations(20%), odor problems(12%), and time(12%). Others said the most difficult impediment was initially convincing some people in the zoo community that changing their waste removal practices would be a positive change and worth the investment. In most cases, these hindrances have eventually been overcome as the motives of conservation(78%), saving money(66%), and desire to be an environmental leader in the community(31%) have won out. These findings about typical motivations to compost and the obstacles to doing so seem compatible with the current circumstances at the Dallas Zoo.

One reason why there seems to be opposition to the development of a composting program is the anxiety felt by some regarding the types of waste that could be safely composted. The following table shows the percentages of zoos that compost each type of waste:

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbivore Waste</td>
<td>91.89%</td>
</tr>
<tr>
<td>Animal Bedding</td>
<td>72.97%</td>
</tr>
<tr>
<td>Lawn Clippings</td>
<td>54.05%</td>
</tr>
<tr>
<td>Tree limbs, Shrubs</td>
<td>48.65%</td>
</tr>
<tr>
<td>Carnivore Waste</td>
<td>13.51%</td>
</tr>
<tr>
<td>Primate Waste</td>
<td>10.81%</td>
</tr>
</tbody>
</table>

From these findings, it appears that carnivorous and primate wastes are commonly excluded from the compost mix. In many cases, the reason for their exclusion is to avoid the risk of the compost becoming contaminated by zoonotic diseases, including viruses, parasites, and bacteria. In the worst case scenario, pathogens present in carnivorous and primate waste could be mixed into the compost, and survive the high temperatures inherent in the composting process. If this happened, the contaminated compost, when used, could run into a creek or down a storm sewer, contaminating drinking water and harming other animals and even humans. This, in turn, brought up the question of governmental regulation of large scale composting projects. The survey found that only 11% of respondents were bound by such limitations. We have found that there are very
few, if any, actual governmental regulations which will apply to the Dallas Zoo. Although the city of Dallas’ agencies themselves seem unsure what might apply, it is likely that the only issues moderating the Zoo’s decisions will be the concern of water run-off. As long as the composting site is located where water will not runoff into a creek or down a storm drain, thus contaminating the drinking water supply, there should be no problems. Dallas Storm Water Utilities suggested that a site that is on low or flat ground, or one that is fenced would prevent water quality problems.

As confirmed by the survey results, one of the major benefits of composting is saving money which is otherwise spent on non-environmentally conscious waste management. Of the zoos that responded to this question specifically, the average amount saved yearly by composting was $10,940. 67% of zoos that compost save money on landfill fees, 42% save on waste collection costs, and 29% save on the purchase of compost and fertilizer. In fact, 55% of composting zoos use the compost they produce on zoo grounds, 30% give it to the local city parks department, and 21% use it for both. Considering the fact that the Dallas Zoo now spends $750 a year to purchase compost for zoo landscaping, it would be logical to use the compost produced on zoo grounds, thus eliminating that needless cost.

Whether the Zoo’s employees have enough extra time to begin composting in-house or if an additional employee would have to be hired to coordinate the composting efforts is another crucial question which we sought to answer. 86% of composting zoos said they did not hire new employees. The survey found that the average amount of time required to coordinate and implement composting was 9.5 hours per week. This leads one to the conclusion that no additional employees would be required, although special scheduling may be required, especially during the harvesting of the compost, should the zoo choose to market the product.

The majority of zoos (i.e. 70%), do not market their compost, due to the low volume of compost they produce or because of the time, effort, and complication brought on by launching a new product line. However, those that do decide to aggressively seek marketing opportunities, reap stable and quite substantial benefits, both financially and in terms of very favorable publicity within their communities and the zoological community as well. Two excellent examples of zoos that have been successful are Seattle’s Woodland Park Zoo and the North Carolina Zoo. The Woodland Park Zoo’s “Dr. Doo” has become a phenomenon and has gained local fame for his environmentally friendly and exceptionally fun initiatives for the zoo. Dr. Doo, who is really Dr. Tom Gannon, coordinates the Zoo’s extensive composting program and also his creative marketing of it. Seattle’s compost is sold retail as “Zoo Doo” in various sizes of novelty packaging at the gift shop. Compost is also available by the truck-full at a wholesale rate to those willing to shovel it. Dr. Doo reports that the composting business brings in $25,000 of revenue on top of the savings annually.

The North Carolina Zoological Park has been composting for some time, but is now in the process of expanding its program from a capacity of 1,114 tons to a total of 1,414 tons of waste that will be diverted from the landfill. Even with an initial expansion expenditure of $128,600 and an $25,000 per year increase in the yearly operating costs this project still pays for itself in only 2.4 years from its enormous savings all. Without any composting facility at all, the zoo would have yearly costs of $84,000. With the
current compost site, the zoo saves $53,000 above its costs, and with the upgraded site, the zoo will save $52,500 each year. This situation demonstrates how lucrative composting is, despite the initial expenditures. If the Dallas Zoo were to begin a complete animal waste composting program excluding, of course, carnivorous and primate waste, it would instantly save $17,634 in waste collection costs alone. That is before any of the profits that could be made by marketing and selling the compost retail at the zoo gift shop and at other local nurseries and also wholesale to local farmers, etc. For details on marketing possibilities, see Appendix F.

Despite its profitability, many zoos are still reluctant to initiate composting in-house. Instead, 19% of composting zoos outsource the composting to commercial composting companies. They choose this option, because although they desire to help the environment, they are overwhelmed and less than enthusiastic at the prospect of coordinating an in-house program. Most of these zoos (15% of all composting zoos) also leave the marketing up to those same composting companies. Another 15% of zoos market their compost themselves. The remaining 70% do not market their compost at all. Rather, many (78%) use the compost on zoo grounds, 43% allow their local Parks Department to use it, and 9% donate it to community development projects, local farmers, and other groups in need.

The next major area of exploration of this survey are the mechanics of how and with what a composting site is operated. Firstly, a grinding or chipping machine is necessary to break down tree branches so they can be used as mulch or included in the compost mix. 74% of zoos own a chipper and the remaining 26% own a tub grinder so they can reuse these branches rather than paying to send them to the landfill regularly.

Next, some type of tractor or loader is essential to any zoo composting in-house for “turning” the windrows. 100% of zoos surveyed use this aerobic composting process of turning the windrows as their sole method of controlling potential odor problems, not to mention that this significantly speeds up composting. Although a few zoos do more than one type, 100% of zoos do some or all of their composting aerobically, as opposed to anaerobic or vermicomposting. In order to maintain these windrows, 42% of respondents use a front-end loader, and 16% each use a bobcat, a skid loader, or turn the windrows by hand. The Dallas Zoo already has two bobcats available for its use.

However, it does not currently have access to a chipper or tub grinder and, therefore, must strongly consider purchasing one. A chipper can cost anything from $1000 for a home model, to $14,000 for an industrial quality 12-inch variable screen-size chipper. The last and most versatile option is to purchase a heavy-duty tub grinder, which can produce chips of all different sizes, for around $45,000. Some machine of this type is almost essential for the zoo to take advantage of enormous savings in branch disposal costs. Also, by not having to purchase mulch and compost, it would quickly prove to be extremely cost-effective. Although the deluxe end-all model is not necessary, it is logical to purchase a piece of equipment that that will be trustworthy and able to withstand the bulk of work necessary. Since the Dallas Parks and Recreation Department currently occupies Dallas Zoo property, another alternative is to capitalize on the Zoo’s relationship with the Parks Department. By exploring options to share time on the Parks Department’s chippers, a great deal of money could be saved. In return, the Zoo could
donate some of its compost to the Parks and Recreation Department, thus strengthening their relationship.

Testing the developing and finished compost is a procedural aspect which is easily overlooked. 55% of zoos do not perform any formal tests on their compost. However, testing is important for several reasons, two of which are to calm fears and lessen the risk of health problems from zoonotic disease contamination. Also, performing various tests (including temperature, NPK, consistency, pH, fecal, bacteria, foreign matter, and bacteria) provides zoo employees with experiences from which to learn the finer points of composting, especially in the beginning. 30% of zoos periodically test the temperature and, 10% do the NPK test which determines whether compost has the levels of Nitrogen, Phosphorus, and Potassium which allow it to be classified as fertilizer instead of a soil amendment. To be cautious, yet realistic about time and monetary constraints, zoos that are experienced at composting tend to conduct a small number of basic tests, namely weekly temperature tests and standard fecal tests once every 3 months, which are already used by veterinarians routinely. The safety and peace of mind that can be gained easily offset the minimal cost of regular testing.

System Model:

In order to determine the capacity that would be needed in the windrows to be able to accommodate the bedding, chipped tree branches, and the selected herbivore waste, we devised a systems model. This model shows the design of the composting site, which is a 50' by 100' rectangle. Because of the fact that the greatest length of a rectangle is on its diagonal, the diagonal layout of the windrows was decided upon so the area's composting potential could be maximized. The windrows will be approximately 12 feet wide, 6 feet tall, and either 70.71 feet or 35.4 feet long. Each month between 720 and 940 cubic yards will be inputted into the location where the newest windrow always originates, (in the top left corner of the Windrow Systems Model.) After one month, this windrow is "turned" into the number two windrow spot. At this time, new waste is put in the newest or number 1 windrow spot, and so on. At the end of the fifth month, the compost at the bottom right of the Windrows Systems Model is ready to be used. Its ending volume after the process of shrinking during compost will be around 300 cubic yards, each year.

Economic Model:

As outlined in the economic model, we have identified 3 different options for the Dallas Zoo to successfully incorporate a composting program into their operations. The four situations represent different increments of the Zoo taking on involvement with composting from the current state of none, all the way to a complete commitment to composting. This model explains exactly how and when the zoo will be impacted financially by each case. In addition to a purely economic analysis, though, it is important to consider the other implications of each case. Such issues include the environmental, health, organizational, and public relations effects as well as the time constraints.
Case 1 is the option with the minimum participation in composting. The Zoo would begin limited composting with certain types and amounts of waste, but still send the majority of its waste to the landfill as before. The strength of this option is that it would enable the Zoo to jump into composting on a major, but not overwhelming, level, so that the learning process can occur before the stakes are high. Economically, this plan is quite feasible. The total cost is $38,870, compared with a $27,300 cost for the current plan with no composting. This difference of $11,570 includes the purchase of a significant amount of equipment which will last for years to come. Also, the inevitable cost of clearing the composting site on the hill behind the maintenance yards is included (in all 3 cases.) The value of the equipment to be purchased actually comes to a total of over $16,000, but because of the immediate savings from not sending tree branches and bedding material to the landfill, some of this cost is immediately offset. Once the compost site has been cleared, and the chipper, tilt hopper trailer, and the other equipment is purchased, the Zoo will be in a position to save even more in each coming year. For each year that the Zoo carries out Case 1, it should phase out one of its four cubic yard trailers in favor of a new tilt hopper trailer. A tilt hopper trailer enables grounds workers to turn the trailer on its side so that its contents can be dumped on the ground. The currently owned trailers are not able to do this. The salvage value of the four cubic yard trailers ($375) can be put towards the purchase of the new trailers at $1900 each. Each year, as this switch is made, the Zoo can add one more trailer’s worth of animal waste to the compost mix, saving $2939.04 more. The payback period of Case 1 is 2.45 years.

Environmentally, Case 1 is a small, but safe step in the right direction. Under this plan, 1500 cubic yards of uncompacted waste are saved from the landfill, and instead can be put to good use nourishing the soil on the Zoo grounds and maybe even on local parks. Healthwise, it is low-risk, since we are not recommending the inclusion of any carnivorous nor primate waste into the compost mix. In fact, the only types of waste actually used in Case 1 are chipped tree branches (made possible by the new chipper), hay and bedding material, and herbivore waste from the Zoo’s elephants and giraffes, which do not tend to carry zoonotic diseases. These types of waste are considered optimal for composting and therefore, should also help convince the skeptical to give the plan a try.

Operationally, this plan should be relatively simple. The giraffe and elephant waste is already collected separately in a dumpster. The only change will be that the trash cans of waste from the big cats can no longer be added to it, but must simply be added to a different dumpster. Case 1 is a solid and cautious plan of action that will certainly demonstrate the Dallas Zoo’s desire to adhere to its mission and be a leader in the community for environmental conservation.

Case 2 is very similar to case 1, in their proposal of the limited composting program and the investment in some basic equipment, which will give the Zoo the fundamental tools and experience to eventually have a complete composting program. Case 2, however, proposes that all of the animal waste, animal bedding, and lawn clippings that are not composted on-site be sent via a waste hauler not to the landfill, but instead to
a commercial composting company, such as Living Earth Technology. Environmentally, this plan is ideal, because every bit of waste associated with the animals is recycled and without the worry time requirements of coordinating it all. Even carnivorous and primate wastes can be composted by Living Earth Technology at their large facility. This means that over 25,000 cubic yards of waste could be saved from the landfill every year, a number that is even better than what a complete on-site composting program could provide. On top of this staggering environmental improvement, the limited composting program would provide the Zoo with composting experience so that eventually the complete composting program could be implemented at a much smaller cost than with outsourcing.

This brings us to the major drawback of Case 2, which is the economic aspect of it. As shown by the economic model, this plan never actually generates a net savings or profit, but instead, keeps costing money each year. As with Case 1, money is saved on the removal of the branches and bedding material. On top of that, the landfill dumping fee is also eliminated. However, there is a significant cost added by the transport of the waste to Living Earth instead of to the landfill. This is because the waste collection trucks going to the landfill compact the waste picked up at the Zoo and then proceed to make many other pickups before dumping its load at the landfill. For this reason, the Zoo has actually been sharing the truck cost (and the daily landfill fee) with the other customers of the waste collectors. A truck transporting the Zoo’s waste to Living Earth would be hauling only the Zoo’s waste, therefore, leaving the whole cost of transport to the Zoo. In addition the Free-standing Cart dumper would need to be purchased so the animal waste could be dumped into the thirty cubic yard dumpster, which is being rented by the waste hauler and taken daily to be dumped at Living Earth’s compost site. This process would require more labor than before, adding to the cost. Another drawback is that, as the four cubic yard dumpsters are phased out in favor of the tilt hopper trailers, the $5,500 free-standing cart dumper that must be purchased under this plan becomes more and more obsolete.

Case 2 leaves the Zoo open to no health risks, and the publicity received after implementing such a progressive plan could only be exceptional. Organizationally, this plan could be more of an adjustment for the grounds workers, but definitely is feasible.

Case 3 is the ultimate goal for the Zoo to achieve in its composting program. Although it might be unwise to jump immediately into this commitment, it is a plan which should be kept in mind as something to continuously work towards. This plan combines a large environmental impact with an economic plan that requires much less capital than does Case 2. For the first year, the total costs are $45,300, compared to $38,900 for Case 2. Six thousand dollars is a relatively small difference between the 2, especially since Case four’s environmental impact is so much greater. Over the course of a year, this plan would save almost 24,000 cubic yards of waste from the landfill, only 1,200 less than Case 2. For each year after the first, Case 3 continues to save $16,100, which makes the payback period for this option only 2.08 years.

With this option it is necessary to buy, not only the chipper, but also a fence and all six Tilt hopper trailers at once. These new trailers would replace the four cubic yard trailers, which could be salvaged for about $2,250 total, or $375 each. Labor costs for this option are significant, however, they are still far outweighed by the savings.
Furthermore, these savings do not even reflect the enormous potential profits that could be earned by selling the compost to the public. This would also increase public awareness of the Dallas Zoo, the Zoo's conservation efforts, and the importance and benefits of composting.

In order to assure that this composting program will be a complete success, it would be advisable to have Tom Gannon from the Woodland Zoo come to Dallas and consult with the zoo on the operations of composting and the marketing of the resulting compost. His years of experience could save the Dallas Zoo many months of trial and error, and all for the cost of a plane ticket and hotel room.
Conclusion and Recommendations
Originally, the Dallas Zoo had requested our help in creating a survey for zoos in the US to respond about their efforts in composting, and to conduct a feasibility study to see if the Dallas Zoo could begin a composting program. We have accomplished both of these goals, by collecting survey results and formulating several different options for change in the zoo’s waste management.

After exhausting research efforts towards each option, we have drafted both a financial recommendation as well as an ecological recommendation. The reason for presenting two recommendations is as follows: the financial recommendation will be the most feasible, economically as well as operationally, whereas, the ecological recommendation will be the most environmentally beneficial. We could not, in good faith, make the financial recommendation alone, because it does not make the desired impact on the environment.

We recommend as the financial recommendation to implement Case 1. As seen in the Economic Model, this option will cost the zoo a little over $10,000 the first year, but has a payback period of only 2.45 years. This payback period is estimated in savings alone. If the zoo decided to sell or market excess compost, the possibilities for return on investment are endless. In this case, we are recommending a graduated approach to starting a composting program, while continuing to send the rest of the animal waste to the McCommas landfill. This case is not only the most economically feasible, but also operationally feasible. In this option, the zoo creates a mini-composting program while not changing any of the other operations in the current state.

For the ecological recommendation, we recommend Case 2. In Case 2, the zoo would outsource the compost efforts and start sending their waste to a commercial composter such as Living Earth Technology. In this option, we would also recommend that the zoo begin a graduated approach to composting. There would be a substantial cost associated with sending waste to Living Earth. This cost would come primarily from having to change the current operations of waste disposal. A change like this incurs costs in equipment and labor. Whatever the financial cost of this option may be, it would be outweighed by the environmental benefits. This option would be the most environmentally efficient, before escalating composting efforts to a program like Case 3. In time, as the zoo increases the in-house composting program, cost of this option would decrease significantly.

In each case, we recommend the zoo start a small composting program that increases as more space and resources can be found. We are recommending that the zoo begin with the trailer of animal waste that holds elephant and giraffe waste for several reasons. First, the waste in this 4x4 cu. yd. dumpster can easily be separated from other waste to be dumped into the compost pile. Secondly, these 2 animals are both herbivores. We are advising against using any carnivorous or primate waste in the zoo’s composting efforts, now and in the future, because of liability reasons. From our survey, we only found that about 14% of zoos compost carnivorous waste and 11% compost primate waste. We have found in our research that compost made from the feces of felines and primates can carry diseases that can be passed on to humans (if the compost is used on gardens or farms producing food products). And finally, through our research we have found that elephant waste is one of the best manure available for composting. Using this manure should result in a desired quality compost product.
In each of these recommendations, about 300 cubic yards of compost would be produced in the first year. This amount of compost would not only replace the 40 cu. yds. of compost that the zoo already purchases for zoo grounds, but would provide enough to be shared or sold. Many zoos that produce compost provide their product to the Parks Department of their city. Accordingly, the Dallas Zoo is a part of the Parks & Recreation Department of the City of Dallas. We recommend that the surplus compost, for the first year, be given or sold at minimal cost for parks of Dallas. This recommendation would build a better relationship between the Parks Department and the zoo, while benefiting the Dallas community. This recommendation also avoids the extra man-hours involved in marketing the product.

However, this graduated compost program does not end there. Each year, or as the zoo deems appropriate, we suggest that compost efforts be increased. This increase would be best attained by adding another trailer of animal waste to the compost piles. Each time a trailer is not sent to the landfill, another $2,939.04 is saved per year. Of course, this savings would be offset by the purchase of another Tilt hopper trailer and added labor costs.

We did not recommend that the zoo dive into Case 3 by creating a full-scale compost program in their first year, because we see threats by this option. Taking baby-steps like the addition of one trailer per year to the compost program would allow zoo employees to adjust to the changes. Problems with the small compost system could be solved before escalating compost efforts. The public could warm up to the idea of buying a quality compost product at the zoo before full-scale marketing is attempted. We think this change will be very significant in the operations of the zoo and not one to be taken lightly or to be hurried through.

As the compost product increases in volume, we suggest that the zoo begin marketing this product. In our survey, we found that only 15% of zoos market their compost themselves. However, those that do market their compost have seen substantial profits. This success can be seen in the marketing efforts of the Seattle Woodland Park Zoo as they plan to make $25,000 in revenue this year from compost sales. We believe that the Dallas market is ripe for available compost, as the only local commercial composter is Living Earth Technology. Also, the zoo will have an automatic advantage over its competition in that buying compost from them is not only a purchase, but also a donation to the conservation of animals.

We also recommend that in order to implement a successful composting program, the Dallas Zoo should be willing to spend a little money on resources. The Composting Council offers a Compost Facility Operating Guide for $125 + $6 shipping that could be very useful in creating a full-scale operation. Also, as included in our Economic Model, Tom Gannon is available for composting consulting. He has had many years of experience in this arena and is obviously successful. Although we only added his cost in Case 3, we would recommend bringing him down to Dallas if there is an inclination to continue the graduated compost program until it reaches the level of Case 3. If a composting program is to be started, it should be started correctly. Investing in these and other resources could save money in the future.

Unfortunately, our best recommendation could have been one that we were not able to research fully. This recommendation would be that of sending the animal waste to
the City of Dallas composting site. The City of Dallas has a city compost site that is managed by BFI. Currently, only brush, or carbon substances, are being used in this compost program. It would only be logical then, that this compost pile would need a substantial amount of waste rich in nitrogen, i.e., animal waste. Because the zoo is owned by the City of Dallas, and the city definitely owns the equipment needed for separating animal waste, some kind of agreement may be reached. If a relationship could be built around this compost site, it could be extremely beneficial to both parties. For example, the Dallas Zoo could possibly give waste and get compost, thereby saving their money and the environment. The reasons we were not able to research this option fully are apparent in the nature of the bureaucracy of the city. We could not get in touch with the correct people to ask pertinent questions. Therefore, we leave as our final recommendation, a recommendation to research this option and to see the benefits that can be gained from both sides.

Zoos nationally are following a trend that steers away from being for entertainment purpose only to being a place of conservation. This conservation effort should not only include the conservation of animals, but also that of conservation of the environment. The Dallas Zoo, as a role model in this arena, should be keenly aware of its affect on the environment. Sending the magnitude of waste that it creates from animals to a landfill is not environmentally efficient or beneficial. When asked on our survey what the biggest challenge to beginning a compost program was, the North Carolina Zoo responded that they could not “convince people of the importance” of composting. We would hope that this is not the case with the employees of the Dallas Zoo. In the volunteer handbook, one of the goals stated by the Dallas Zoo/Dallas Aquarium at Fair Park is to serve the community by “act[ing] as a role model in social, economic, conservation, and environmental issues and initiatives which support the mission and vision.” A composting program would absolutely fulfill this responsibility to the community and would position the zoo as a leader in this environmental movement.

Limitations:

We see 3 main limitations we have had in completing this project. Firstly, none of the members of our group had any prior experience in composting. This does not necessarily affect our knowledge of it, but it does affect our recommendations in the procedures the zoo should use in a composting program. It is cited in numerous publications about starting a composting program that one should experiment with their materials until they get the perfect mix for a quality compost product. We obviously do not have the resources to experiment, so all of our assumptions are based on other composters’ experiences, not our own.

The second limitation in our proposal is the complete accuracy of our numbers. We have done extensive research to find the numbers used in our Economic Model. Some of them are based on assumptions or estimations made by employees of the zoo, some are from employees in the respective area, and some are found by averaging responses from the survey results. We are confident that the numbers we have used are not inaccurate, but some could possibly change depending on vendor, quality, etc., if the zoo actually did implement a composting program. For example, we know we need a 150-ft. water hose
to water the compost piles. Through calling several places, we found the price of a water hose could range from $17.99/100-ft. to $48.97/100-ft., depending on brand, quality, etc. We tried to use the average cost in these cases so our savings/expenditures would not be over-inflated. However, the numbers could change depending on the choice of the zoo.

That leads to our third and biggest limitation. If we were to describe a decision tree in this project, it would go something like this:

As one is able to visualize by this diagram, for each decision in this project, there are at least 3 to 4 more questions and sometimes an infinite amount of answers. Unless we were working on a day to day basis with zoo officials to make interim decisions, we could not possibly research every option thoroughly enough. Thus, we created a fair representation of the data and explained each of our decisions according to our options. We have given a thorough explanation of how we came to use each of the numbers in our models and we believe that these figures are objective and supportive of our recommendations.
Appendices
SMU
SENIOR DESIGN CONSULTING PROJECT
FOR THE DALLAS ZOO

The Dallas Zoo with its mission of wildlife conservation and environmental awareness needs to be a model for its community in recycling, waste reduction and disposal. The zoo generates an enormous amount of waste - animal, food, plant, packaging, and trash from visitors. Much of this waste is recyclable and much can be done on Zoo grounds. We are requesting your assistance in the following:

* Design and implement a survey of the existing programs in U.S. Zoos with regard to:
  * composting plant and animal matter
    * how to address the toxic nature of carnivore waste
    * man/hour requirements for program
  * collection, transportation, and disposal site of recyclable materials
  * public awareness/education of zoo visitors encouraging recycling of their trash
  * model for recycling containers on zoo grounds -
    * instructional graphics
    * user friendly
  * profit and savings potential of recycling/composting

* Conduct a recycling/composting feasibility study for the Dallas Zoo

* Build a model for the implementation of the above

We're very excited about working with your class on this project. A fresh, new, creative approach from the academic community will be a wonderful springboard to not only finding solutions for this particular challenge, but to building community partnerships for the future. Thank you.
# PROJECT OVERVIEW

**Project Name:** Dallas Zoo Compost  
**Project Team Members:** Jan Cloutier, Caroline Bork, Andrew Stewart

## Problem or Objective:
The Dallas Zoo should strive to be a leader in environmental and conservation issues. Currently, it is lacking a progressive waste management program.

## Project Goal:
The objective of this project is to determine what type and level of composting program, if any, is feasible and profitable for the Dallas Zoo.

## Project objectives:
- Perform exhaustive research from existing sources
- Conduct original study of zoo composting through surveys
- Analyze options according to various considerations (investment in manpower, equipment, and finances, risks involved, marketing and public relations possibilities, and projected benefits)
- Create a model of composting processes
- Make a recommendation for a composting program at the Dallas Zoo

## Success and Completion Criteria:
- Survey
- Survey Results
- Assess the current practices of zoos’ composting programs
- Research report on composting resources in Dallas
- Create models of possible composting scenarios
- Final recommendation for implementation of composting program with project results in a presentation and report

## Risks and Obstacles:
- Soil contamination from toxic animal waste
- Financial losses
- Un-marketability of compost in Dallas, due to attitudes of less environmentally conscious Dallasites
- Zoo employees may have a negative reaction to the change
- Odor control
- Bacteria from carnivorous animals
- Improper testing

<p>| Approved by (manager) | Date: | Approved by (client) | Date: |</p>
<table>
<thead>
<tr>
<th>Task Description</th>
<th>Week of</th>
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<td>1.2 Group meeting to discuss scope</td>
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March 3, 1998

Dear Sir or Madam:

Through preliminary research, we have found that your zoo engages in composting animal waste. We are doing a study to determine the feasibility and profitability of an animal waste compost program for the Dallas Zoo. Please take a moment to fill out a response to as many of the following questions as possible. We would appreciate a reply as soon as possible, but no later than March 19, 1998.

1. What was your motive for beginning a compost program? (circle all that apply)
   - Profitable
   - Saves money
   - Helps the environment
   - Leader of community in composting
   - Other

2. What do you compost? (circle all that apply):
   - Herbivore waste
   - Carnivore waste
   - Animal bedding
   - Primate waste
   - Lawn clippings
   - Tree limbs, shrubs

2a. Is your composting program restricted to certain types of animal waste because of federal, state, or city regulations? Please explain.

2b. If you exclude certain types of waste from composting, what is the criteria for this exclusion?

2c. If you compost carnivorous waste, how do you stay within USDA/federal guidelines?

2d. If you compost dead tree limbs and shrubs, what kind of machinery is necessary and how do you handle this waste in your composting program?

3. How do you handle waste from animals that are possible carriers of infectious or zoonotic diseases?

4. In what ways have you saved money through composting? (circle all that apply)
   - Landfill costs
   - Waste collection costs
   - Other

   How much?

5. Do you (circle one): compost in-house or outsource the composting

If you outsource the composting:

1. What is the name of the composting agency: __________________________
   Address: __________________________
   Phone: ( ) -  Fax: ( ) -

2. How much does this service cost _______________ per ________?

3. Who collects the waste at the zoo?
   __________________________________________

4. How is the waste transported from the zoo?

How often? ______________
In what kind of containers? ____________________________

5. Who markets the compost? (circle one) The zoo  Composting company  Not marketed
   If the zoo:  Where is it sold? ____________________________
   In what quantity? ____________________________
   At what price? ____________________________
   If composting company: Does the zoo receive a percentage of revenue? Circle: Yes / No
   How much? ____________________________
   If not marketed: Where is the compost used? ____________________________

If you compost in-house:
6. Did you hire a separate individual(s) to coordinate your composting? Circle: Yes / No
   If so, how many full-time employees? ____
   If not, how many current staff members coordinate your composting efforts? ____
   On average, how many hours/week do these staff members spend on the composting aspect of their work? ________ hours

7. How much space do you use in your zoo for the windrows? ____________________________

8. What type of composting does your zoo engage in? (circle one)
   Aerobic  Anaerobic
   Vermicomposting  Other________________________
   Please explain why you chose this type.

9. How do you control the odor of the composting piles? (circle all that apply)
   Aerate by turning  Negative aeration
   Add rock phosphate  Other________________________

10. What type(s) of machines do you use to turn windrows? ____________________________

11. Please list the tests you perform on the windrows and how often these tests are performed.

12. Could you explain why you chose to compost on zoo property instead of outsourcing (profits, expenses, public relations, etc.)?

13. Who markets the compost? (circle one) The zoo  Outside company  Not marketed
   If the zoo:  Where is it sold? ____________________________
   In what quantity? ____________________________
   At what price? ____________________________
   If outside company: Does the zoo receive a percentage of revenue? Circle: Yes / No
   How much? ____________________________
   If not marketed: Where is the compost used? ____________________________

14. What was(has been) the biggest challenge of starting a composting program at your zoo? (circle all that apply)
   Odor control  Federal regulations
   City regulations  Space for windrows
   State regulations  Other________________________

15. Please include any other relevant information and literature about your composting program, including any documentation already used at the zoo for your process.

Thank you for your time. Please return the survey in the envelope provided.
A Study of the Woodland Park Zoo’s Marketing of ZooDoo

by Jan Cloutier

The Woodland Park Zoo (WPZ) has found a way to produce and sell their compost to make a profit off of the once costly landfill-matter. The profitability of this program is largely accredited to its marketing aspects, as WPZ is not only the manufacturer of the compost, but also the retailer. In successfully marketing the compost they have branded “ZooDoo”, the Woodland Park Zoo has had to identify their opportunity, position their offer, communicate the offer to the consumer, and distribute the product.

The first step for the WPZ to be able to market their compost was to identify an opportunity. They recognized that Seattle is a very environmentally conscious city with many home gardeners and landscapers, so the demand for this nutrient-rich soil would not be hard to find. The WPZ also considered the national trend for environmental awareness and felt that a composting program would allow them to be a leader in the community in this arena. Originally, WPZ’s target was a niche market of private and professional gardeners and landscapers who shared in a mission to preserve the environment while enriching the quality of their soil. This niche market soon expanded as the ZooDoo became more popular and was being bought for gifts and as a novelty item.

Secondly, the WPZ had to position the offer of a compost product by offering the customer a distinct advantage. WPZ itself states that quality is of the utmost importance in their product as their ZooDoo is “the highest quality bulk compost available in the Seattle area for use in gardens, flower beds, etc.” (www.zoo.org/special/zoodoo.stm). They also have another advantage in that there are virtually no exact substitutes for compost. Actual composted soil is rich in minerals and nutrients which cannot be found in regular bagged soil. And although fertilizer does wonders for a gardener, it still does not have the same affect on the quality of the soil as compost does. WPZ also branded its product with the name ZooDoo, which is humorous, catchy, and well-known now in the gardening community of Seattle. Another reason to purchase ZooDoo is its many uses; WPZ advertises many different uses for their compost as it can be used for mulch, as a soil enricher, or for potting mix. Lastly, ZooDoo has a distinct advantage over any competition just by the simple fact that it is produced and sold at the zoo. Customers who already support the zoo financially have no problem paying premium dollar for ZooDoo as gifts for gardening friends because the purchase is also a donation to the zoo.

The next step in marketing this compost product to the public was to communicate through advertising, publicity, word-of-mouth, and “Dr. Doo”—the composting coordinator and personal salesman. Believe it or not, the WPZ does not have to spend that much on advertising because of the amount of publicity that surrounds ZooDoo. They originally advertised their fall and spring sales events, called “Fecal Fests,” in local papers, but the demand is so high now, they’ve turned to less expensive means (www.zoo.org/special/zoodoo.stm). They now rely mostly on their “Poopline”, a 24-hour hotline for information on compost sales, that customers call to hear about the scheduled sales events. Because they’ve targeted a niche market of gardeners and
landscapers that share information, WPZ relies heavily on word-of-mouth advertising for the quality of their product.

Lastly, the compost coordinator Dr. Doo, affectionately known as the Prince of Poo, has contributed an indeterminable amount of credibility to this program. He focuses a lot on creating primary demand for the product as he updates the web site and talks to zoo-goers about the benefits of using compost in general. Many consumers still do not know what compost is and may have certain fears about using it. It is one of Dr. Doo’s duties as a salesman to dispel any of these unnecessary fears. For example, some customers might think that compost made from animal waste would smell, but this is not true and has to be explained. Also, his extensive knowledge about compost is a comfort for those who do know a lot about compost. Compost that is not ready and is used too early can be harmful to use. Because Dr. Doo has made a name for himself and his compost, customers do not have to worry about buying anything but quality compost. He is the primary salesperson of ZooDoo, so he also focuses a lot of his energy on creating selective demand for this product. His personality even exudes from his voice over the phone—it’s no wonder that his program is so successful.

To complete their marketing effort, the Woodland Park Zoo has developed a couple different ways to distribute their product to the consumer. They distribute through an integrated system, whereby they are both the manufacturer and the retailer. However, the most money is made when they act as a downstream wholesaler by breaking bulk before it reaches the ultimate consumer. As mentioned above, one of the main ways WPZ sells their compost is through the twice a year “Fecal Fests” where each cubic yard is sold for $16 (www.zoo.org/special/can_you_zoodoo.stm). The customer makes an appointment, drives their pickup truck up at the specified time, pulls out their shovel, and takes as much compost as they can fit in the bed of their truck. (The price comes out to about $25 for a small truck and $40 for a large one.) The second most compost sold is sold in their “Holidoo” sales. During this sales event, compost is sold in bags and buckets and sold for $5 and $10, respectively (www.zoo.org/special/can_you_zoodoo.stm). The result of breaking bulk and distributing it in these quantities is that they are now making approximately $500 per cubic yard versus $16. The most profitable form yet is their new pint-size ZooDoo, sold in the Zoo Store for $2.50 (www.zoo.org/special/advanced_composting.stm). The result of breaking bulk down to this quantity is that they are now making thousands per cubic yard. The WPZ plans to exploit every marketing aspect of this ZooDoo product, as they have plans for gallon-size packages, T-shirts, etc.

The Woodland Park Zoo, with the help of Dr. Doo, has created a very profitable way to market their compost product. The sale of this product creates a profit upwards of $25,000 annually, and rising. Moreover, the first year that this composting program was initiated, WPZ saved about $60,000 from not having to pay landfill fees (www.zoo.org/special/can_you_zoodoo.stm). They have created a huge demand for their product as it outweighs the supply of compost by twofold, which opens up possibilities for expansion and other marketing tactics. In addition to the financial aspect of ZooDoo, there are many other benefits to this program. The zoo has also become a leader in its community, educating the public about composting that can be done at home, about recycling in general, and about the various uses of ZooDoo. Not only does ZooDoo get publicity from the press, but ZooDoo creates publicity for the Woodland Park Zoo as a
whole. By making a name for itself through a creative marketing strategy, ZooDoo has brought WPZ into the public eye.

WORKS CITED

From the Woodland Park Zoo Web Site:
www.zoo.org/special/zoodoo.stm
www.zoo.org/special/can_you_zoodoo.stm
www.zoo.org/special/advanced_composting.stm

Information from a Phone Interview, with Dr. Doo himself, otherwise known as Tom Gannon. Conducted by Jan Cloutier.
The COMPOST FACILITY OPERATING GUIDE is a 389-page, 11-chapter, loose-leaf manual that features the basic biological principles of composting, and composting process control. It is a practical, up-to-date reference guide for composting facility and process management including feedstock recovery, feedstock preparation, composting high rate and stabilization, compost screening and refining, compost curing, compost storing and packing, odor and nuisance control, and other compost production site requirements.

Its easy-to-grasp style makes it especially useful for plant managers, process engineers and technicians, technology developers, engineers, designers, solid waste management consultants, public policy makers, municipal planners, regulators and enforcement agencies and agricultural cooperative extension service departments. As a guidance document it is useful as a basis for technician training programs and for site-specific start-up and process control plan development.

Compost Facility Operating Guide
Loose-leaf, 389-pages, with Binder and Dividers
$125.00 Nonmember ~ $75.00 Member
+ $6.00 Shipping

Compost Facility Operating Guide
Loose-leaf, 389-pages, Document Only
$110.00 Nonmember ~ $65.00 Member
+ $6.00 Shipping

Shipping to Canada: $10.00  International Shipping: $30.00

Revisions to the COMPOST FACILITY OPERATING GUIDE may be made by The Composting Council within approximately two years of initial publication. All registered purchasers of the Guide will be eligible to receive updates during this two-year period.

☐ I am not a Council member. My payment for ____Compost Facility Operating Guide(s) including shipping charges is enclosed.

☐ I am a Council member, please bill me for ____Compost Facility Operating Guide(s) including shipping charges.

Name:  
Company:  
Address:  
City:  
Country:  
Phone:  
Email:  
State:  
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Chapter 332. COMPOSTING

Subchapter A. GENERAL INFORMATION

§ 332.1 Purpose
The purpose of this chapter is to establish regulations that will divert organic materials from the typical municipal solid waste stream, and promote the beneficial reuse of those materials while maintaining standards for human health and safety and environmental protection.

Source: The provisions of this § 332.1 adopted to be effective November 29, 1995, 20 TexReg 9717.

§ 332.2 Definitions
The following words and terms, when used in this subchapter, shall have the following meanings unless the context clearly indicates otherwise.

Agricultural materials—Litter, manure, bedding, feed material, vegetative material, and dead animal carcasses from agricultural operations.

Agricultural operations—Operations involved in the production of agricultural materials.
Air contaminant--Particulate matter, radioactive material, dust, fumes, gas, mist, smoke, vapor, or odor or any combination thereof produced by processes other than natural. Water vapor shall not be considered an air contaminant.

All-weather roads--A roadway that has been designed to withstand the maximum load imposed by vehicles entering and exiting the facility during all types of weather conditions.

Anaerobic composting--The controlled biological decomposition of organic materials through microbial activity which occurs in the absence of free oxygen. Anaerobic composting does not include the stockpiling of organic materials.

Backyard operations--The composting, land application and mulching of non-industrial organic material, such as grass clippings, leaves, brush, clean wood material or vegetative food material, generated by a homeowner, tenant of a single or multi-family residential or apartment complex, or a commercial or institutional complex where the composting, land application or mulching occurs on the dwelling property and the final product is utilized on the same property. Backyard operations includes neighborhood composting demonstration sites which generate less than 50 cubic yards of final product per year.

Batch (or Sampling batch)--The lot of produced compost represented by one analytical sample (3,000 cubic yards or 5,000 cubic yards depending on facility type).

Beneficial reuse--Any agricultural, horticultural, reclamation, or similar use of compost as a soil amendment, mulch, or component of a medium for plant growth, when used in accordance with generally accepted practice and where applicable is in compliance with the final product standards established by this chapter. Simply offering a product for use does not constitute beneficial reuse. Beneficial reuse does not include placement in a disposal facility, use as daily cover in a disposal facility, or utilization for energy recovery.

Bulking Agent--An ingredient in a mixture of composting materials included to improve structure and porosity (which improve convective air flow and reduce settling and compaction) and/or to lower moisture content. Bulking agents may include but are not limited to: compost, straw, wood chips, saw dust or shredded brush.

Clean wood material--Wood or wood materials, including stumps, roots, or vegetation with intact rootball, sawdust, pallets and manufacturing rejects. Clean wood material does not include wood that has been treated, coated or painted by materials such as, but not limited to, paints, varnishes, wood preservatives, or other chemical products. Clean wood material also does not include demolition material, where the material is contaminated by materials such as but not limited to paint or other chemicals, glass, electrical wiring, metal and sheetrock.

Commission--The Texas Natural Resource Conservation Commission and its successors.

Compost--The stabilized product of the decomposition process that is used or distributed for use as a soil amendment, artificial top soil, growing medium amendment, or other similar uses.

Composting or functionally aerobic composting--The controlled, biological decomposition of organic materials through microbial activity which occurs in the presence of free oxygen. Composting or functionally aerobic composting does not include the stockpiling of organic materials.

Cured compost (CC')--A highly stabilized product which results from exposing mature compost to a prolonged period of humification and mineralization.

Dairy material--Products which have a Standard of Identity defined in the Code of Federal Regulations, Title 21 § 131.
Distribute--To sell, offer for sale, expose for sale, consign for sale, barter, exchange, transfer possession or title, or otherwise supply.

Executive director--The Executive Director of the Texas Natural Resource Conservation Commission or his duly authorized representative.

Facility--All structures, other appurtenances, and improvements within the property boundaries used for receiving and storage of organic materials and processing them into useable final products.

Feedstock--Any material used for land application or as a basis for the manufacture of compost, mulch or other useable final product.

Final Product--Composted material meeting testing requirements of § 332.71 of this title (relating to Sampling and Analysis Requirements for Final Product) and awaiting distribution or disposal.

Fish feedstocks--Fish, shellfish, or seafood and by-products of these materials whether raw, processed, or cooked. Fish feedstocks does not include oils and/or greases that are derived from these same materials.

Foreign matter--Inorganic and organic constituents which are not readily decomposed, including metals, glass, plastics and rubber, but not including sand, dirt, and other similar materials.

Grab sample--A single sample collected from one identifiable location.

Grease--See the definition of Oil in this section.

Hours of operation--Those hours which the facility is open to receive feedstock, incorporate feedstock into the process, retrieve product from the process, and/or ship product.

Land application--The spreading of yard trimmings, manure, clean wood material and/or vegetative food materials onto the surface of the land or the incorporation of these materials within three feet of the surface.

Leachate--Liquid which has come in contact with or percolated through materials being stockpiled, processed, or awaiting removal and which has extracted, dissolved or suspended materials. Leachate also includes condensate from gases resulting from the composting process.

Manure--Animal excreta and residual materials that have been used for bedding, sanitary or feeding purposes for such animals.

Mature compost--Mature compost is the stabilized product of composting which has achieved the appropriate level of pathogen reduction (i.e., PFRP or PSRP) and is beneficial to plant growth, and meets the requirements of Table 2 of § 332.72 of this title (relating to Final Product Grades).

Maturity--A measure of the lack of biological activity in freshly aerated materials, resulting from the decomposition of the incoming feedstock during the active composting period.

Meat feedstocks--Meat and meat by-products whether raw, processed, or cooked including whole animal carcasses, poultry and eggs. Meat feedstocks does not include oils and/or greases that are derived from these same materials.

Mixed municipal solid waste--Garbage, refuse, and other solid waste from residential, commercial, industrial non-hazardous, and community activities which is generated and collected in aggregate.

Mulch--Ground, coarse, woody yard trimmings and clean wood material. Mulch is normally used around plants and trees to retain moisture and suppress weed growth, and is intended for use on top of soil or other growing media rather than being incorporated into the soil or growing media. Mulch does not include wood that has been systemically killed using herbicides.
Municipal sewage sludge--Solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works.

Nuisance--Nuisances as set forth in the Texas Health and Safety Code, Chapter 341, the Texas Water Code, Chapter 26, and § 101.4 of this title (relating to Nuisance).

Oil--Any material rendered from vegetative material, dairy material, meat and fish feedstocks, that is soluble in trichlorotrifluoroethane. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test. Oil and greases do not include grease trap waste.

One hundred-year floodplain--Any land area which is subject to a 1.0% or greater chance of flooding in any given year from any source.

Operator--The person(s) responsible for operating the facility or part of a facility.

Quality Assurance/Quality Control (QAQC) plan--A written plan to describe standard operating procedures used to sample, prepare, store, and test final product, and report test results. The plan outlines quality assurance criteria, as well as quality control procedures, needed to meet the operational specifications of this chapter.

Quality Assurance Program Plan (QAPP)--A QAQC plan prepared by the TNRCC that may be substituted for the QAQC plan.

Paper--A material made from plant fibers (such as but not limited to wood pulp, rice hulls, and kenaf). The sludge byproduct resulting from the production of paper may be approved as a feedstock pursuant to § 332.33(b) of this title (relating to Required Forms, Applications, Reports, and Request To Use the Sludge Byproduct of Paper Production).

Permit--A written document issued by the commission that, by its conditions, may authorize the owner or operator to construct, install, modify, or operate a facility or operation in accordance with specific limitations.

Person--Any individual, partnership, corporation, association, governmental subdivision, or public or private organization of any character.

PFRP--The process to further reduce pathogens as described in 40 Code of Federal Regulations Part 503, Appendix B.

PSRP--The process to significantly reduce pathogens as described in 40 Code of Federal Regulations Part 503, Appendix B.

Positively-sorted organic material--Positively-sorted organic material includes materials such as, but not limited to, yard trimmings, clean wood materials, manure, vegetative material, paper, meat and fish feedstocks that are sorted or pulled out as targeted compostable organic materials from mixed municipal solid waste prior to the initiation of processing.

Processing--Actions that are taken to land apply feedstocks or convert feedstock materials into finished compost, mulch or a useable final product. Processing does not include the stockpiling of materials.

Recyclable material--For purposes of this chapter, a recyclable material is a material that has been recovered or diverted from the solid waste stream for purposes of reuse, recycling, or reclamation, a
substantial portion of which is consistently used in the manufacture of products which may otherwise be produced from raw or virgin materials. Recyclable material is not solid waste unless the material is deemed to be hazardous solid waste by the administrator of the United States Environmental Protection Agency, whereupon it shall be regulated accordingly unless it is otherwise exempted in whole or in part from regulation under the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Protection Act. If, however, recyclable materials may become solid waste at such time, if any, as it is abandoned or disposed of rather than recycled, whereupon it will be solid waste with respect only to the party actually abandoning or disposing of the material.

Recycling—A process by which materials that have served their intended use or are scrapped, discarded, used, surplus, or obsolete are collected, separated, or processed and returned to use in the form of raw materials in the production of new products. Recycling includes the composting process if the compost material is put to beneficial reuse as defined in this section.

Residence—A single-family or multi-family dwelling.

Run-off—Any rainwater, leachate, or other liquid that drains over land from any part of a facility.

Run-on—Any rainwater, leachate, or other liquid that drains over land onto any part of a facility.

Semi-mature compost (SMC)—Organic matter that has been through the thermophilic stage and achieved the appropriate level of pathogen reduction (i.e., PFRP or PSRP). It has undergone partial decomposition but it is not yet stabilized into mature compost. Semi-mature compost shall not be packaged, as uncontrolled microbial transformations will occur.

Solid waste—Garbage; rubbish; refuse; sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining and agricultural operations from community and institutional activities.

Source-separated—Set apart from waste after use or consumption by the user or consumer.

Source-separated organic material—Organic materials from residential, commercial, industrial, and other community activities, that at the point of generation have been separated, collected and transported separately from non-organic materials, or transported in the same vehicle as non-organic materials but in separate compartments. Source-separated organic material may include materials such as, but not limited to, yard trimmings, clean wood materials, manure, vegetative material, and paper. Yard trimmings and clean wood material collected with whitegoods, as in brush and bulky item collections, will be considered source-separated organic materials for the purposes of these rules.

Stockpile—A collection of materials that is either awaiting processing or removal.

Unauthorized material—Material which is not authorized to be processed in a particular type of composting, mulching or land application facility.

Vegetative material—Fruit, vegetable or grain material whether raw, processed, liquid, solid, or cooked. Vegetative material does not include oils and/or greases that are derived from these same materials.

Vector—An agent, such as an insect, snake, rodent, bird, or animal capable of mechanically or biologically transferring a pathogen from one organism to another.

Voucher—Provides the same information as required on a label to persons receiving compost distributed in bulk.

Wetlands—Those areas defined as wetlands in the Texas Water Code, Chapter 26.
### Important Contacts, Phone Numbers, & Information Received

<table>
<thead>
<tr>
<th>Howard Garrett</th>
<th>214 365 0606</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advertisers:</strong></td>
<td></td>
</tr>
<tr>
<td>Living Earth Technology 972 869 4332</td>
<td></td>
</tr>
<tr>
<td>Back to Earth Resources 214 828 0090 (Lubbock)</td>
<td></td>
</tr>
<tr>
<td>Silver Creek Materials</td>
<td>(composts material from FW Zoo)</td>
</tr>
<tr>
<td>Clear Fork Materials</td>
<td></td>
</tr>
<tr>
<td>Vital Earth (Saline, TX)</td>
<td></td>
</tr>
<tr>
<td><strong>He said many people in Dallas buy compost and many companies compost their waste:</strong></td>
<td></td>
</tr>
<tr>
<td>Johnson &amp; Johnson (Arlington)</td>
<td></td>
</tr>
<tr>
<td>FritoLay (Plano)</td>
<td></td>
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<tr>
<td>Gardenville (San Antonio)</td>
<td></td>
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<tr>
<td>Golf Courses</td>
<td></td>
</tr>
<tr>
<td><strong>Living Earth</strong></td>
<td>972 869 4332</td>
</tr>
<tr>
<td>Contact:</td>
<td>Paul Tomaso</td>
</tr>
<tr>
<td><strong>Where do you get your waste to compost?</strong></td>
<td></td>
</tr>
<tr>
<td>- Several sources—landscapers, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>Questions:</strong></td>
<td></td>
</tr>
<tr>
<td>- Do you charge for sending waste to your compost area? NO</td>
<td></td>
</tr>
<tr>
<td>- Do you give % of profits back or discount on buying compost? NO</td>
<td></td>
</tr>
<tr>
<td>- Are you interested in animal waste from Dallas Zoo? Yes.</td>
<td></td>
</tr>
<tr>
<td>- Do you compost on Dallas property? Yes</td>
<td></td>
</tr>
<tr>
<td>- Do you already compost animal waste? Yes</td>
<td></td>
</tr>
<tr>
<td>- What are your regulations? None, animal waste is exempt.</td>
<td></td>
</tr>
<tr>
<td><strong>Procedure:</strong> Zoo would pay haul charge to get waste to Living Earth and Living Earth would take care of it from there. (Transfer of liability).</td>
<td></td>
</tr>
<tr>
<td><strong>Living Earth sells compost bulk at yards and retail at Sticks &amp; Stones (on Miller, off Knox-Henderson) and at the Farmer’s Market.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Gave me Grady Hicks’ name, as waste hauler for Duncan Disposal. 817 261 8812.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Grady Hicks @ Duncan Disposal</strong></td>
<td>817 261 8812</td>
</tr>
<tr>
<td><strong>Advantages of hauling to Living Earth:</strong></td>
<td></td>
</tr>
<tr>
<td>- Reduce waste in McComas Landfill. A 30 cu. yd. dump in McComas costs $147.</td>
<td></td>
</tr>
</tbody>
</table>
- Transport costs: from zoo to Living Earth = about $120 per 30 cu. yd. trailer
- Trailer Rental: $50-$75 rent for box per month
- Disposal Rate at Living Earth = $0
- We also have a cardboard recycling dumpster, if you’re interested.
- 30 cu. yd. trailer = 22ft x 7ft x 6ft (open-top, roll-off)

Back to Earth Resources 214 828 0090

- Compost in Lubbock. Headquartered in Dallas. Not possible to transport Dallas Zoo waste to their compost facilities. They mostly compost: cotton gin trash.

Fort Worth Zoo info: 817 871 7050
admin: 817 871 7000
education: 817 871 7055
Contact: Anthony Davis 817 871 7453

- They don’t compost on-site because of several issues: liability with animal waste, run-off issues, initial costs.

- They do compost: bad hay & chipped wood
  about 120 cu. yds. per year (varies by necessity)
  used in landscape

- Procedure: watered & turned by a bobcat, they produce more than they can use, so produce on an as-needed basis.

- Silver Creek is commercial composter. They send all of their animal waste to them (primate, carnivorous, and herbivorous).
  - Procedure: send 1 - 30 cu. yd. trailer 2 time a week to Silver Creek, picked up down at elephant barn
  - Hauled by Waste Management.

- The only other charge is an excess tonnage charge, but otherwise, they only pay a hauling fee.
- They talk about in-house composting every year, but it’s easier to continue to outsource.
- They don’t get any compost or fertilizer back from Silver Creek, no discount, etc.

Dr. Doo (Tom Gannon) from WPZ 206 684-4828 (Direct Line)
206 625 POOP (Poopline)

- Tests:
  - Standard Fecal Test – run on compost
- Pathogens – vet. can do this at zoo
- these are anything that can affect people
- Salmoniilla – extraordinarily rare
- Nutrients
- Cation
- Temperature – test 1 time a week with a composting thermometer
- need above 140°F to kill dangerous bacteria & weed seeds

• Exception: no primates
  no felines, b/c toxoplasmosis
  avoid grass clippings b/c of smell

• Only compost herbivores & bedding. WPZ has mulching mowers, so don’t have to worry about grass clippings.
  - Moisten piles & turn.

Main Problems:

• Local Health Dept. – inform them about product
  - concern about contamination of groundwater
  - lechiate collection system – may have to collect water
  - WPZ has 15,000 gallon water tank that pumps water back out to piles; overflow goes to sewage treatment plant
  - for their local dept., they had to perform a Comprehensive Pathogen Study – found nothing & was very expensive—can borrow their study for the Dallas Zoo, but each local health dept will probably want a new one done

• USDA Guidelines – 1996 – farm born animal manure after 6 mos. of quarantine, any animals’ waste can be composted

• Space – WPZ compost area: 70ft x 130ft (6-8 active compost piles at most)
  several hundred tons: 600-700 tons/waste per year

Procedure:

• Turn piles at least 3 times within entire period. 4 – 8 mos. to compost entirely. More turning produces compost faster. But, compost for at least 4 mos. regardless.

• Leading cause of compost failure = not ready compost. This can actually be harmful if used.

Types of Composting:

• Aerobic Composting = regularly turned & aerated compost piles, small initial capital outlay
• Anaerobic = leave it alone, but temps don’t get high enough, odor probs, building up of volatile nitrogens (creates nasty amonia smell), doesn’t kill weed seeds
• Vermicomposting = much harder, lots of initial capital, need machines, labor intensive, need 1000 lbs of worms to start which are $5-8 / lb., but makes a great product

Labor:

• 1 employee (himself) over water conservation, recycling, energy conservation, organic farming, and compost program

• How much time do you spend on compost program?
  - 1/3 of week MAX. This fluctuates. Usually only spend 1 day every 2 weeks to turn piles, testing, grabbing samples. Sales is major part of labor – customer service. This is twice a year—very labor intensive. Also have to deal with press, advertising.

• Outsourcing advantages? don’t have to deal with it, don’t have to have resources
• Disadvantage of outsourcing? may charge you for taking doo.
• Insourc e advantages? PR, save $, make $, goodwill in community

• In the past Dr. Doo has:
  - saved $60,000 in landfill fees.
  - made $15-$20,000 off compost sales

• Other zoos who are trying this: Honolulu, Vancouver, Kansas City, Brookline in Chicago

***He is available to come to Dallas Zoo to consult; no consulting fee, just need airfare & hotel.

Susan Haskew          (W) 214 599 2530     (H) 214 522 9308
susan_haskew@dfwecrc.com
(Works for Dallas Electoral Commerce Resource Center)

• Dallas Compost Coordinator – at McCommas Landfill
  - diverting brush to another spot on landfill
  - managed by Private Contractor (BFI)
  - city used to run it, but spending too much ($30/ton)
  - BFI bid it lowest for $10/ton –losing lots of money
  - brush = only carbon, no nitrogen
  - it would be great to have animal waste in the mix
  - contractor = Rober Delling – office 972 225-2973
  - city owns scarab & 2 tub grinders

• For Dallas Regulations:
  - Call Scott Tems with Storm Water Utilities: 214 948-4215 to discuss run-off issue.
  - Call Code Enforcement for any other minor codes to follow.
- Call John Elliot (670-4475) to ask who to call in Code Enforcement to get info.

- For Texas Regulations:
  - If can’t get ahold of Scott McCoy, call Recycling at TNRCC & ask for anyone in compost group: 512 239-6750
  - Or Kitty Coley at home 512 447-8556 (she was manager of composting when they wrote rules.)

Scott McCoy (512) 239-6750
With TNRCC

- Regulations for hay & manure & wood chippings – EXEMPT.
- Cannot pollute surface or groundwater of Texas.
- Cannot bother neighbors (smell, etc.)
- ***look at marketing aspect
- ***go for a grant to clear off possible composting site (set up as an educational program)
  --go to local CoG (Council of Governors) in North Texas (they have ability to give out grants)
- clay = tight soil – no perculation through to get to ground water source
  run-off- make sure it doesn’t feed into creek or stream – might have to make a run-off pond to collect run-off
- You have to make run-off decision yourself—could get a city engineer to come look at site & make determination.

- Other options:
  - Ag Bag = $50,000
  - 5ft x 200ft long, hold 200 cu. yd., no odor, no worries

- In-vessel system—like big cement mixer, feed manure in one end & compost comes out the other
  - talk to Dr. Doc Hawthorn – inventor

***He would be willing to help with anything—give zoo his number.

Paul Hunt @ Industrial Disposal Supply (IDS) 972-423-1423

- for estimates on equipment used in composting & waste disposal options
- would like to make a bid for any composting equipment needed by the Dallas Zoo
- he’s already tailored equipment for the Denver Zoo composting program

Jane Valentine 301-907-7777
Public Affairs for American Zoo and Aquarium Association (AZA)

• Have there ever been any studies or surveys done on composting programs at zoos?  
  - NO.

Scott Timms  214-948-4215  
Dallas Storm Water Utilities

• What are the water runoff issues/requirements to be concerned with when considering a composting program?  
  - Put the composting site in a place where it won’t runoff into a creek, or where it would go down drains and into sewers... This could clog them and endanger the water supply.  
  - Perhaps put the site on low or flat ground where there are no storm drains.  
  - Put a fence around the site.  
  - Do not know specific regulations, etc. so call:  
  Carleen Bowman, an environmental inspector for Streets and Sanitation, Storm Water Quality

John Elliot  214-670-4475  
Code Enforcement Department of Keep Dallas Beautiful

• so far, out of town...  
• Want to find out who to call in Code Enforcement who will know the answer to our questions?

Carleen Bowman  214-670-0294  
Environmental inspector for Dallas Streets and Sanitation, Storm Water Quality

• Ask her about the specific policies and regulations that would apply to the Zoo.  
• unable to contact...

Smith and Hawken  214-522-6522  
Lawn and Garden Supply Store

• 100 ft. water hose = $49

Wal-Mart (Richardson)

• 125 ft. water hose = $60.97  
• 100 ft. water hose = $17.96
Northwest Airlines 1-800-225-2525

- 21-day advance round trip airfare from Seattle to DFW during weekday = $513-$1075
  unrestricted fare = $852

American Airlines 1-800-433-7300

- 21-day advance round trip airfare from Seattle to DFW during weekday = $380

Hampton Inn – Downtown 214-742-5678

- 1 single room on a weeknight (incl. Continental Breakfast) = $99

Ferris’ Containing 972-286-1800

- for estimate on clearing space for compost site

Web Sites Consulted:

- Woodland Park Zoo: www.zoo.org/special/can_you_zoodoo.stm
- Water Quality and Waste Management Study: www2.ncsu.edu/bae/programs/extension/publicat/wqwm/ebae185_93.htm
- American Zoo and Aquarium Association: www.aza.org/aza/aboutaza.htm