Resource Recycling Systems
Sustainable Systems for a Waste-Free Future

University of Michigan – Ann Arbor
Campus-Wide Compost Feasibility Study

USCC January 25, 2011

Nicole Chardoul, PE, Principal and C.O.O.

416 Longshore Dr. | Ann Arbor, MI 48105 | 734.996.1361 p | 734.996.5595 f | www.recycle.com

OVERVIEW

- Project Objectives
- Background
- Data Collection and Analysis
- Options (Technologies, Sites, Operations)
- Business Case Summary
- Conclusions
- Next Steps

PROJECT OBJECTIVES

- Involve and Educate stakeholders: student sustainability group, food services, custodial, operations, grounds, finance, planning, hospital, botanical gardens
- Develop a most feasible option or combination of options for managing all UM organics
- Produce a business case & next steps
- Work toward UM zero waste goals

TIMELINE

- 7/10-10/10: Data Collection, Analysis, Research
  - 7/10: Stakeholder Kick-off Meeting
  - 8/10: Stakeholder Update Meeting
  - 10/10: Stakeholder Options Review Meeting
- 10/10-12/10: Finalize Options
  - 12/10: Stakeholder Conclusions Meeting
- 12/10-1/11: Final Report with Economic Analysis for Best Option

Background – Main Considerations

- Cost
  - Capital and Operating Costs
  - Participation Fee
- Contamination
  - Who's Responsible?
  - How to reduce & educate?
  - Outside Vendors
- Location
  - On-campus or off-campus
- Space
- Food Service Operations
  - Carts, liners
  - Garbage disposals
  - Labor
- Compostable Products
- Grounds Operations
  - Travel Time
  - Collection Frequency
  - Labor
- Buy-in/Support
- Education

BACKGROUND - UM STATISTICS

- UM is one of the largest public universities in the state of Michigan
- Ann Arbor campus
  - 712 acres
  - Student population of 41,674 - 63% undergraduate (2009)
  - University housing for 10,900 students - 30% of the campus's total student population
  - Serve about 22,000 meals per day during school year

BacKground – Current UM Operations

- Program began in 1997
  - 5 Dining Halls, 1 Catering Kitchen, 1 Coffee Shop
- 67 tons of food waste annually
- 32-gal bins picked up 2-3 times/week
- Organics processed at City of Ann Arbor Compost Facility
- All organics + bioware from Business School now processed at Tuthill Farms
- $40/ton compost tip fee at the City ($10 more than trash) plus transport and truck costs

Source: Resource Recycling Systems Inc.

Source: City of Ann Arbor

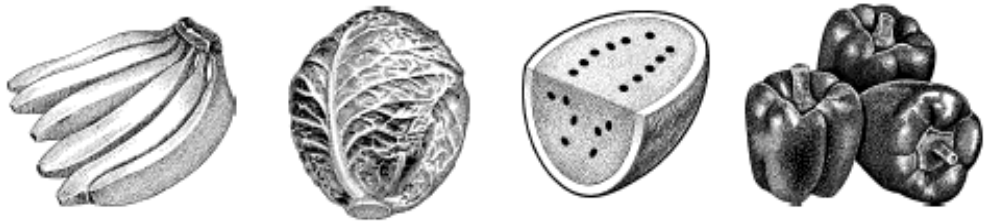
Resource Recycling Systems
www.recycle.com

UNIVERSITY OF MICHIGAN

FOOD WASTE ONLY!

http://www.housing.umich.edu/dining/sustainable

YES!	NO!
Fruit & Salad Trim	Meat, Poultry or Fish
Vegetable Peelings	Liquids or Sauces
Onion Skins	Oils, Fats or Butters
Egg Shells	Cheese, Yogurt
Old Bread and Bagels	Cooked Food
Plain Potatoes or Rice	Plate Scrapings
Plain Noodles	Foil
Coffee Grounds	Rubberbands
Coffee Filters	Polystyrene Foam
Paper Egg Cartons	Plastic Wrap
Paper Napkins	Gloves or Utensils



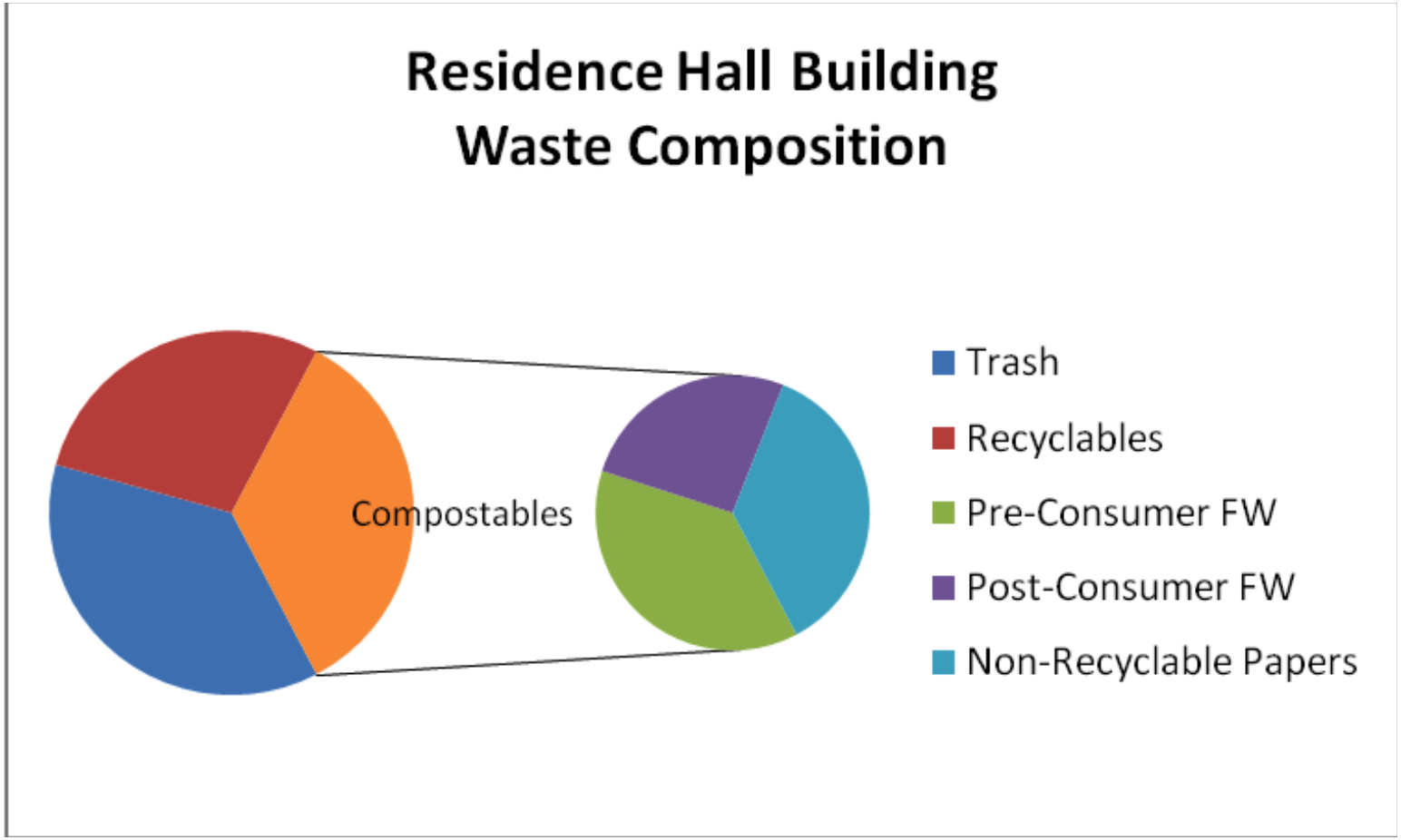
Resource Recycling Systems
www.recycle.com

UM Waste Management Services
763-5539, www.recycle.umich.edu

Data Collection – 2007 Waste sort

PERCENTAGES OF COMPOSTABLES BY BUILDING TYPE			
Building Type	**% Compostable Organic Waste**	**% Non-Compostable Organic Waste**	**% Non-Recyclable Paper**
Administrative	9.0 %	5.0 %	27.0%
Classroom	4.0 %	3.0 %	27.0%
Research	1.5 %	67.5 %	4.0%
Residence Hall	13.0 %	9.0 %	12.5%
Union	11.5 %	25.5 %	17.0%
Recreational	6.5 %	0.5 %	22.0%

Data Collection – 2007 Waste sort



DATA ANALYSIS

- Case studies of food waste operations at similar-sized universities
- Received trash and compost data on monthly basis in CY
- 5,615 tons of MSW in a landfill each year
- 1,725 tons of compostables in the landfill each year (about 31% of their waste stream)

Food Waste Bin in Kitchen
http://www.housing.umich.edu/node/34

Data Analysis – Program Expansion

- Significantly more organics available
  - animal bedding
  - yard waste (currently composted at UM grounds)
  - post-consumer foods and products
  - fats, oils, greases
  - soiled paper towel, napkins and cardboard
- 6 more cafeterias
- 3 more student unions
- Special Events and Athletics, UM Hospital

Data Analysis – Estimated Future Operations (preliminary)

	Current Compost	Pre-Consumer Compostable Materials	Including All Compostable Materials
Total Annual Trash from Buildings (tons)	24,236	24,236	24,236
Compostable Fraction (%)	15%	23%	36%
In-building compostable (tons)	67	2,078	5,269
Yard Waste (est. tons)	3,500	3,500	3,500
Annual Compostable Quantity (tons)	3,567	5,578	8,769

- Estimated Compostable Fraction of refuse from 2007 Waste Sort Report
- Does not include Ross School of Business

Options – Overview

- Roll-out campus-wide program in Phases
  - Begin with residence hall cafeterias
  - Incorporate Ross School of Business compostables
  - Expand across campus
- Centralized or Local, Technology, Sites
  - One large facility
  - Kitchen by kitchen systems
  - On-campus or off-site
- Operational Changes
  - Kitchen, equipment, collection

Options – Overview of Phases

- Phase I: Expand to post consumer composting in the cafeterias from buildings currently collected, collect Ross material and animal bedding
  - 446 tons
- Phase II: Expand to compostable to-go containers for same buildings
  - 633 tons
- Phase III: Expand post consumer and compostable to-go program to all residence halls and unions
  - 1,153 tons
- Phase IV: Expand compostable collection to all buildings
  - 1,385 tons

Options – Phases

PROPOSED PHASING INCREASE IN COMPOSTABLES				
Phase	Food Waste: incl. food waste, napkins and compostable containers (tons)	Other: Animal Bedding (tons)	Total Compostables (tons)	Average Tons per day (including bulking material)
Current	67	0	**67**	**0.3**
Phase I	203	243	**446**	**1.5**
Phase II	390	243	**633**	**2.2**
Phase III	910	243	**1153**	**4.0**
Phase IV	1142	243	**1385**	**4.9**

TECHNOLOGY OPTIONS

- RFI to ten vendors; 7 responded
- Dry AD is expensive for the available tonnage
- In-Vessel Composting is preferred technology
  - HotRot was selected for the business case
  - Wright Environmental and Engineered Compost System (ECS) are similar
  - 2.5 tons/day per unit; works for initial program
  - Scalable; Continuous loading
  - Small footprint and small material loading building

Technology Options – In-vessel Composting

- Shorten breakdown time
  - 14-25 days instead of 4-6 months
- Guarantee pathogen destruction
- Need space for receiving & curing
- Batch vs. Continuous
- Centralized (2-50 tpd)
  - Hot Rot, ECS, CV Composter, BioTower
- Local (~2 tpw)
  - Earth Bin, GoMixer

Source: EarthBin

Source: Engineered Compost Systems

Source: Hot Rot Composting Systems

Siting Considerations – Michigan Draft Compost Rules

- Yard waste composting site
  - Limits site to 5% by volume Class 1 Compostables (food waste, paper, compostable products)
  - UM would need to design for Class 1 Compostables Site
- Siting Requirements for Class 1 Site
  - 500 feet from neighbors, 200 feet from property line
  - Impermeable pad
  - Water reused as process water

OTHER SITING CONSIDERATIONS

- Access to electrical connections, 480v
- Area for stormwater basin or rain garden
- Water connection or rain water harvesting system
- 2 acres available land
  - Space for curing pile and storage pile (2-3 months)
  - Space for unloading and loading
- Adequate buffer for noise and dust; visibility
- Cost of development, Distance from material sources
- Proximity and ease of use for UM operations

SitE Options – Process Off-site

Pros

- Contract to third party
- Cost effective tip fees

Cons

- Food waste limited at YW compost sites in MI
- Final product not available for campus use
- Educational component/program visibility lost

Site options – Glazier Way Site

Pros

- Location
- Electrical connection
- Capped landfill
- Natural buffers

Cons

- Size
- Potential future planning

Site options – North Campus Research Complex

Pros

- Location
- Electrical connection
- Vacant buildings

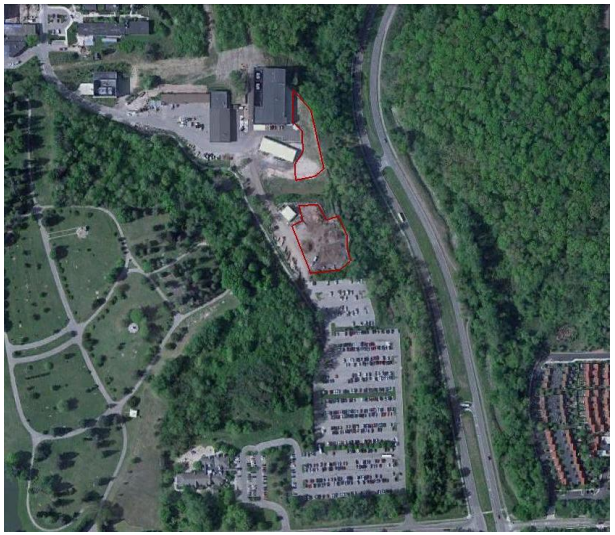
Cons

- Not located with any other operations
- Likely to be developed

Site options – Current Grounds Site

Pros

- Location
- Electrical connection
- Shared operations
- Current YW compost/mulch ops



Cons

- Size
- Need site for current operations

Site options – Matthaei Botanical Gardens

Pros

- Size, Electricity
- Proximity to end use
- Combine with current “composting” operation
- Integrate into educational programs
- Site not likely to be developed

Cons

- Distance from Main Campus

SITE OPTIONS - SUMMARY

ADVANTAGES OF POTENTIAL SITES FOR PROPOSED COMPOST PROGRAM				
Advantage	**Glazier Way**	**Current Grounds**	**Matthaei Botanical Gardens**	**NCRC**
Sufficient space to site in-vessel operation	✓		✓	✓
Centrally located to campus	✓	✓		
Educational opportunities			✓	
Long-term site potential			✓	
Lack of regulatory hurdles			✓	✓
Available supply of wood chips	✓	✓	✓	
Utilities available	✓	✓	✓	

Site Options – Siting Requirements

- 35’x60’ material receiving and shredding building
- 30’x35’ covered curing area
- Bio-filter
- Trommel screen
- Finished compost storage area
- Retention pond
- Gravel drive
- 2 hours to operate and maintain each day (5-6 days)

In-Building Options – Operational Considerations

- Kitchen staff and practices
- Consumer outreach & education
- Lined vs. unlined carts
- Equipment (disposals, pulpers)
- Space at the docks
- Minimizing odors

In-Building Options – System Integration

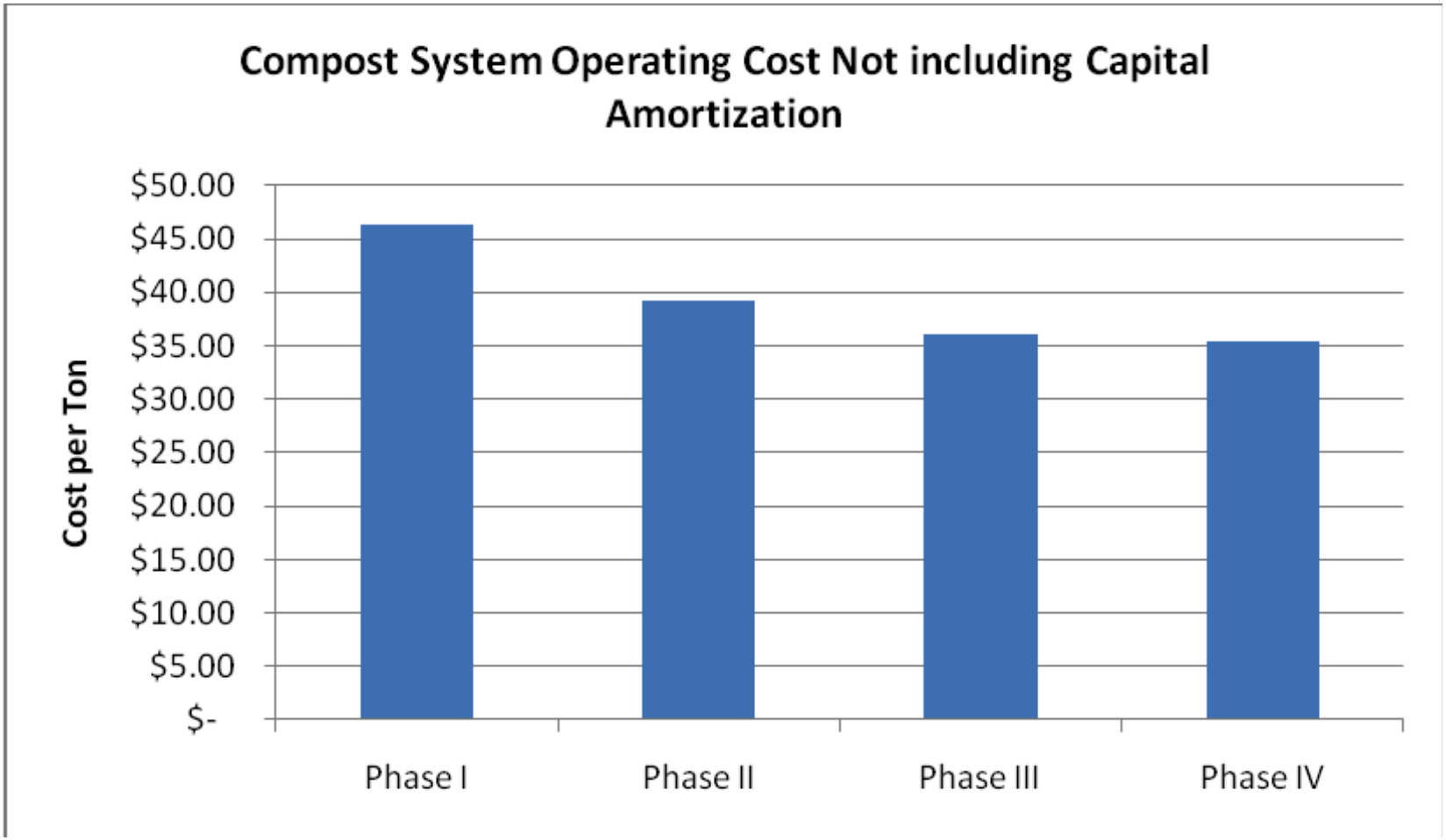
- Phase I, purchase compostable-only products in the dining areas
- Phase II, convert ‘to-go’ containers to compostable products
- Increase number of 32-gal roll-carts
- Increase freq. of collection: 5 d/wk
- Can reduce frequency of food-waste/grease interceptor pumping and disposal costs

BUSINESS CASE SUMMARY

- Estimated Capital Cost: Hot Rot System
  - Phase I: $850k
    - Site Costs: $250k
    - Equipment: $600k
    - Carts: $3.5k
  - Phase IV: $1.3 mil
    - Site Costs: $250k
    - Equipment: $900k
    - Additional Collection Truck + Carts: $135k

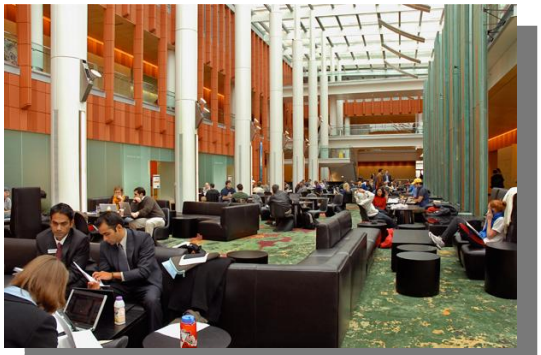
- Other systems around $1 mil
  - Wright Environmental, Engineered Compost Systems

CONCLUSIONS

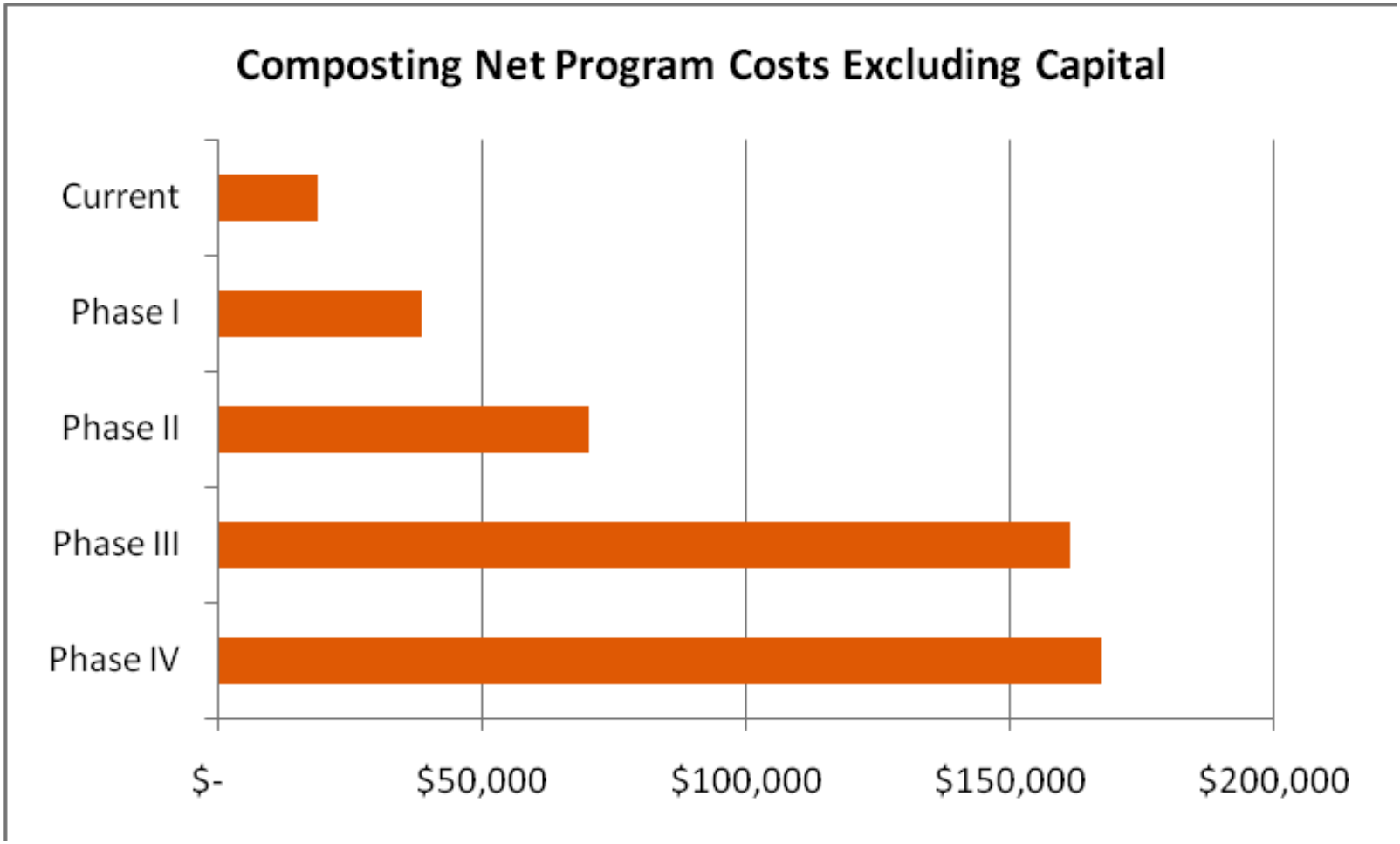


A LITTLE PERSPECTIVE

- Estimated Cost for Ross Business School Program
  - $33,700 for 1,300 CY (approximately 70 tons/year)
- Estimated Cost for Phase II
  - $70,000 for 633 tons (excluding capital)
  - Using Ross Program would cost $195k annually
  - Including Capital Costs: $172k annually



CONCLUSIONS



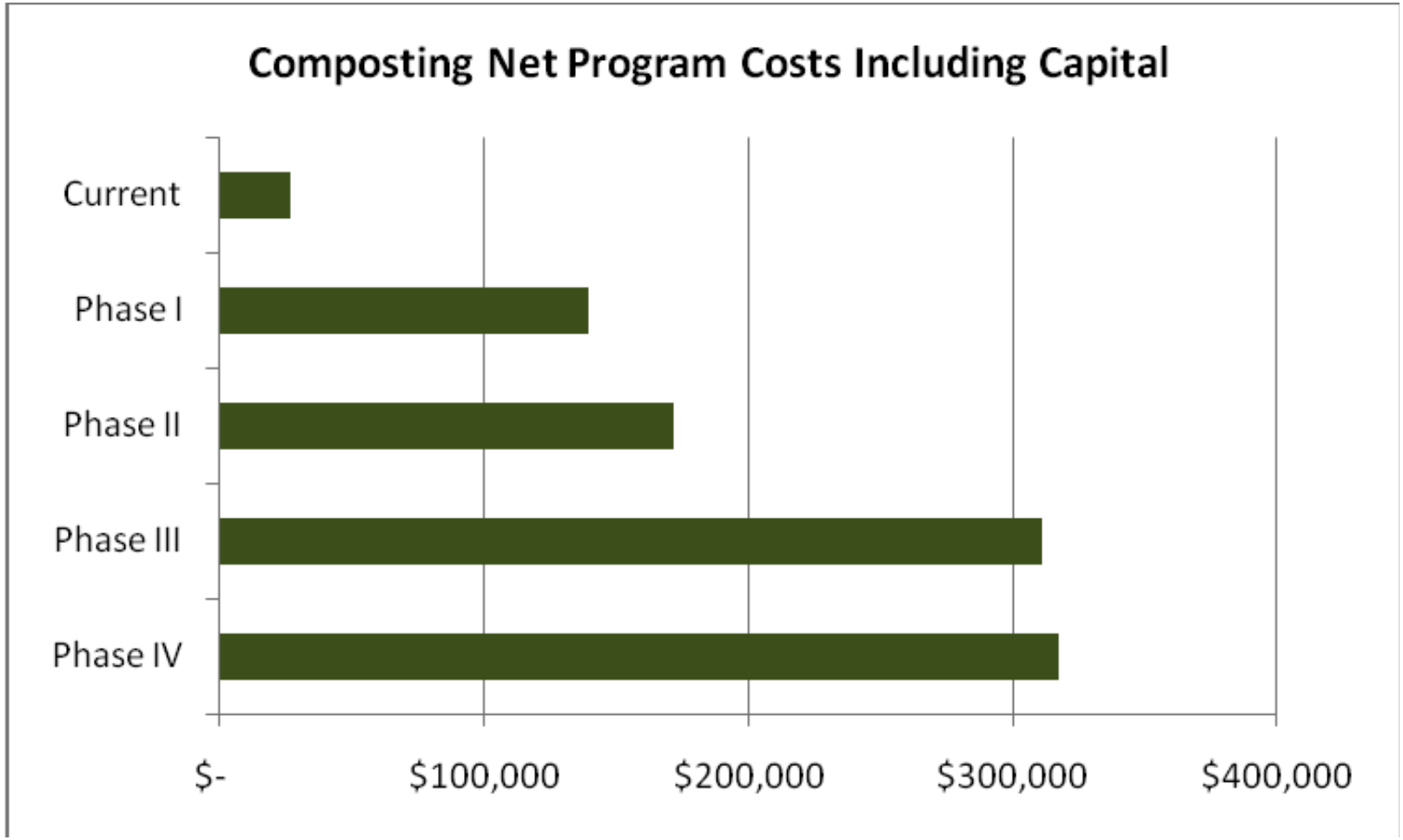
Estimated Savings – Phase I

- Reduced pumping for grease interceptors:
  - $14,500 to Dining Services
- Waste Tip Fees
  - $8,000 to Plant Ops
- Use of Compost
  - Replacement of purchased top soil
  - $5,200 to Grounds
- Compost Tip Fees
  - $2,700 to Plant Ops

COSTS NOT INCLUDED

- Increase in costs for compostable containers
  - Estimates vary widely from no increase to double the cost
  - However, compostable bags for carts ARE included
- No pulpers included in base option
  - Will be summarized in final report as an option

CONCLUSIONS



NEXT STEPS

- Sit down with WeCare Organics
  - May be willing to accept wider variety of materials than City
- Develop Pilot for one cafeteria to test assumptions
  - Determine system that works best for cafeteria
    - Students scrape plates? 3 day a week collection or 5?
    - Effects on odors in cafeterias or at docks
    - Monitor contamination
    - Recruit students to help with education
- Details in-house costs
- Determine funding sources

QUESTIONS/DISCUSSION

Thank you for your time and attention!

Nicole Chardoul

734-417-4387 (cell)

734-996-1361 x 227 (office)

nchardoul@recycle.com

www.recycle.com