

SECTION 5

Cost Review

This section presents a cost summary for the current system and a cost estimate for the preferred system, both defined in Section 4 of this report. Relevant costs for this discussion are those that occur after garden refuse has been collected and has reached its first transfer or processing point. Refer to Figure 1-2 for locations of these transfer and processing facilities. Specifically, this section presents the following:

1. **Current System Costs**—Summary of current costs paid by each SWA member jurisdiction for complete garden refuse processing services following collection and delivery to the primary transfer or processing location, including specific discussion of estimated current garden refuse transportation costs to each secondary processing location, as applicable
2. **Planning Level Cost Estimate**—Cost estimate for preferred system configuration including the cost estimate basis, public and private sector capital costs, public and private sector operating costs, product value, and cost variables
3. **Discussion of Existing Costs and Estimated Costs**—Comparison of existing costs and projected planning level costs for preferred system configuration with emphasis on differences in service
4. **Recommendations**—Considerations which would reduce the cost per ton of the preferred system configuration, as well as other preferred system-related considerations that will have cost impacts

5.1 Current System Costs

The current garden refuse management system for SWA member agencies is briefly described in Section 4, and more completely in Appendix 4A. The current system costs examined for this project consist of the following components:

- Transfer/primary processing location use fees
- Haul cost to secondary processing facility
- Primary and secondary processing fees
- Bulking and marketing costs

Primary processing locations and a schematic presenting overall SWA member agency material flow are presented in Section 4, Figures 4-2 through 4-5. Costs for the existing garden refuse transfer and processing service for each member agency are summarized in Table 5-1.

TABLE 5-1

SWA Member Agency Transfer and Processing Costs
 Sacramento Regional SWA Garden Refuse Processing Facility Development

Jurisdiction ^a	Cost per Ton ^b	Approximate 2002 Cost
City of Citrus Heights To NARS @ 8,400 tons per year	NARS use fee = \$3.00 per ton Grover = \$20.43 per ton Total = \$23.43 per ton	\$25,200 \$171,612 \$196,812
City of Sacramento to NARS @ 15,800 tons per year	NARS use fee = \$3.00 per ton Grover = \$16.60 per ton Total = \$19.60 per ton	\$47,400 \$262,280 \$309,680
City of Sacramento to SATS @26,800 tons per year	SATS use fee = \$1.50 per ton Grover = \$16.30 per ton Total = \$17.80 per ton	\$40,200 \$436,840 \$477,040
City of Sacramento to Recycle America @ 37,500 tons per year	Total = \$15.10 per ton	\$566,250
City of Sacramento Total @80,100 tons per year	\$16.89 average cost per ton	\$1,352,970
County of Sacramento NARS @53,000 tons per year	NARS use fee = \$3.00 per ton Grover = \$20.43 per ton Total = \$23.43 per ton	\$159,000 \$1,082,790 \$1,241,790
County of Sacramento to Kiefer @31,500 tons per year	Total = \$15.00 per ton	\$472,500
County to Elder Creek @2,400 tons per year	Not Available	Not Available
County of Sacramento Total @84,500 tons per year^c	\$20.28 average cost per ton^c	\$1,714,290^c
Total tons @ 175,400	Average cost per ton = \$18.61	Total 2002 costs = \$3,264,072

^a Tonnage totals are as presented in Section 4, Table 4-1.

^b Fees shown are as of July 1, 2003. Sacramento County's fees paid to Grover are subject to annual adjustments; City of Sacramento's contracts with Grover and Recycle America expire in 2004 and 2005 respectively, and the City has indicated that it will go out to bid for the services provided.

^c Price information is not available for Sacramento County tonnage handled at the Elder Creek facility. Adding the tonnage for the Elder Creek facility brings the total Sacramento County tonnage to 86,900.

5.1.1 Haul Cost

Haul cost is a major component of the rate paid for all garden refuse processing services by SWA member agencies. As an example, Grover Landscaping processes a considerable portion of the SWA members' garden refuse in Vernalis near Tracy. There are significant transportation costs to haul the material to Vernalis. Table 5-2 presents estimated haul costs for each transport path. This table also includes distances between primary processors/transfer locations and secondary processors (and some end users) and estimated haul times. The cost estimates assume \$65 per hour for transportation and an average transfer payload of 22.7 tons. The haul distances, travel times, and tonnage per pay load are based on information provided by SWA staff. Figure 4-5 shows the haul distances from each primary processor to the secondary processors/end users.

TABLE 5-2
 Transportation Costs
 Sacramento Regional SWA Garden Refuse Processing Facility Development

Transport Path	Haul Distance (miles one way)	Round Trip Travel Time (hours)	Estimated Transport cost per ton
NARS to Grover (Vernalis)	87	4.0	\$11.45
SATS to Grover	80	3.8	\$10.88
Recycle America to biomass markets	20-50	1.2 - 2.9	\$3.44 – \$8.30
Recycle America to Yolo County Central Landfill (YCCL)	20	1.2	\$3.44
Kiefer	0	0	\$0
Elder Creek – Scott's-Hyponex (Linden)	53	3.3	\$9.45

Note: Travel times provided by SWA staff based on analysis using Microsoft Street and Trips 2002 software.

5.2 Planning Level Cost Estimate

This section presents a summary of the planning level cost estimate prepared for Phase I of the Sacramento Regional SWA garden refuse facility development. Detailed information on the cost estimate and supporting calculations is contained in Appendix 5A. CH2M HILL prepared this planning level cost estimate to clarify the types and ranges of expected costs given the P3 structure and preferred system defined respectively in Sections 3 and 4 of this report. Following development of the capital and operating cost estimates, CH2M HILL developed a cost pro forma to incorporate the costs and potential revenues, and present the results on a cost-per-ton basis. All costs are presented as current (2003) dollars.

Given the conceptual level of this project at this time, a Class 5 Cost Opinion is the appropriate cost estimate level. The estimate was prepared in accordance with the guidelines of the American Association of Cost Engineers (AACE) International. According to the definitions of AACE International, a Class 5 Cost Opinion is defined as:

Class 5 Cost Opinion. Generally prepared based on very limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes such as, but not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, long-range capital planning, etc. Some examples of estimating methods used would be estimating methods such as cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. Typically very little time is expended in the development of this estimate. The typical expected accuracy range for this class estimate is -20 percent to -50 percent on the low side and +30 percent to +100 percent on the high side.

CH2M HILL generated a Class 5 Cost Opinion using the factors and assumptions developed with SWA staff. The Class 5 Cost Opinion is summarized here and the details are in

Appendix 5A. Use of this cost estimate shall be for system comparison and range of cost expectations only. CH2M HILL does not imply or guarantee that the ultimate system costs and bidder estimates will fall into these ranges. Many variables can affect the final system costs and bidder costs, including, but not limited to:

- Final P3 structure attractiveness to bidders and balance of risks and benefits between public and private sectors
- Level of private bidder competitiveness
- Final project scope and implementation schedule
- Special design, construction, and operation requirements that result from the permitting process
- Specific and general conditions applied to the design, construction, and operation of the facility
- Actual capital, operating, and maintenance costs
- Location and scale of the facility, and actual site conditions
- Continuity of project staff

5.2.1 Cost Estimate Basis

The planning level cost estimate is based on a number of cost factors. These cost factors were thoroughly reviewed and evaluated by CH2M HILL, IWMC, and SWA staff to best reflect the following parameters:

- **P3 Structure and Process:** Ownership of land and assets, site permitting and development responsibilities, site operations responsibilities, regulatory compliance responsibilities, and a commitment of roughly 101,400 tons per year of member agency green waste to the project
- **Preferred System Configuration:** System components, transfer operations, and functions of operator
- **Basis of Design:** Composting technology, facility infrastructure and utility parameters, and products

A complete listing of the cost factors is contained in Appendix 5A. The most significant cost factors used in this cost estimate are presented in Table 5-3.

Specific capital and operating cost assumptions and elements resulting from the cost factors are presented in Sections 5.2.2 and 5.2.3. A number of elements used in this cost estimate have significant impacts on the overall program cost per ton if they are varied. These variables and their impacts are discussed in Section 5.2.5 and Section 5.2.6.

TABLE 5-3
 Cost Factors and Assumptions
 SWA Regional Garden Refuse Processing Facility Development

Cost Factor	Assumption	Notes
Transportation		
Haul cost	\$65/hour travel time per truck load	Provided by SWA staff
Haul distance	35, 60, and 85 miles round trip	Modeled to estimate the actual range of haul distances
Round trip travel time	1.15 hours for 35 mile round trip 1.65 hours for 60 mile round trip 2.15 hours for 85 mile round trip	Used existing travel time data from NARS, SATS and Folsom PIA MRF to estimate travel times; see Appendix 5A
Payload per trip (average)	22.7 tons	Based on average green waste transfer payloads at NARS
Cost per ton	\$3.29 per ton for 35 mile round trip \$4.72 per ton for 60 mile round trip \$6.16 per ton for 85 mile round trip	Based on unit cost per mile, hourly haul rate, and payload assumptions listed above
Design Rates		
Input basis	260 days per year	Based on 5 days per week delivery
Initial Committed Tonnage (2002)	101,400 tons per year	Tonnage currently committed by member agencies
Total Member Agency Tonnage (2002)	173,000 tons per year	Does not include Elder Creek tonnage
Expansion Tonnage	199,000 tons per year	Total tonnage of member agencies (minus Elder Creek), plus 25 percent of tonnage from other agencies listed in the Regional Green Waste Study (SWA, 2002)
Peak factor (ratio of peak to average month)	1.4	Based on monthly tonnages from SWA member agencies. Peak months are November and December

5.2.2 Private and Public Sector Capital Costs

In a public-private partnership, both the public and the private sectors typically make capital improvement investments. Table 5-4 presents the public and private capital cost elements and cost assumed for this project, per Case 1 defined in Table 4-4.

TABLE 5-4

Public and Private Capital Cost Elements and Amounts at 101,400 tons per year
Sacramento Regional SWA Garden Refuse Processing Facility Development

Capital Cost Element	Public Cost	Private Cost
Land Acquisition	\$250,000	\$0
Engineering and Permitting	\$0	\$80,000
Site Improvements/Utilities/ Infrastructure	\$935,000	\$900,000
Equipment	\$20,000	\$2,200,000
Construction Related Costs		
Contractor Overhead and Profit	\$170,000	\$550,000
Contractor Mobilization/Bond/Insurance	\$50,000	\$150,000
Contingency (10 percent)	\$95,000	\$50,000
Total Cost	\$1,520,000	\$3,930,000
TOTAL PROJECT COST		\$5,450,000

Note: Detailed cost estimate calculations are presented in Appendix 5A. Figures are rounded.

5.2.3 Public and Private Operating Costs

As with the capital cost, some operating costs will be borne by the public sector and some by the private operator. Public and private operating costs include the cost categories outlined in Table 5-5.

TABLE 5-5

Public and Private Annual Operating Cost Elements and Amounts
Sacramento Regional SWA Garden Refuse Processing Facility Development

Operating Cost Element	Public Cost	Private Cost
Utilities and Fuel	\$5,000	\$210,000
Personnel	\$200,000	\$640,000
Equipment Maintenance and Repair	\$40,000	\$440,000
Consumables, Miscellany	\$5,000	\$10,000
ADC Transport, Other Transport	\$10,000	\$45,000
Totals	\$260,000	\$1,345,000
TOTAL PROJECT COST		\$1,605,000

Note: Detailed cost estimate calculations are presented in Appendix 5A. Figures are rounded.

Personnel cost is the most significant public-sector operating cost. It is assumed that the SWA will have personnel onsite to attend the scale house and to oversee contractor operations.

5.2.4 Product Value

Whether product revenue flows to the private or public sector, it plays an important part in the sustainability and economics of the project. For consistency with the recommended

P3 structure, roles, and responsibilities discussed in Section 3 of this report, this estimate assumes product revenue will be controlled and retained by the private partner.

The amount of compost product from the garden refuse processing facility was estimated in terms of product yield, or ton of yield per ton of input. Product yield will vary depending upon the process dynamics and final screen size used at the facility. Typical screen sizes vary from ¼ inch to 1 inch in size. If a 3/8-inch screen size is used, the yield is estimated to be 47,000 tons (99,700 cubic yards) of product from an initial 101,400 tons of waste. If the screen size is ¾ inch, the yield of product will be slightly higher. This cost estimate used a unit value of \$4.00 per cubic yard and a yield of 1 cubic yard per ton. The annual offsetting revenue at 101,400 tons per year (tpy) of input was calculated to be \$400,000.

5.2.5 Cost Summary

To estimate a cost per ton range for the preferred system, CH2M HILL developed a pro forma cost model that includes expected costs. The pro forma uses the capital costs, operating costs, projected product revenue, and total tonnage to calculate cost per ton ranges. The pro forma was used to calculate the per-ton unit cost for a windrow composting facility at three tonnage levels (101,400, 173,000, and 199,000 tpy) presented in the design basis, Section 4.2.1, and three different round trip distances (35, 60 and 85 miles) shown in Table 5-6. Figure 5-1 presents the pro forma results graphically for the same cases.

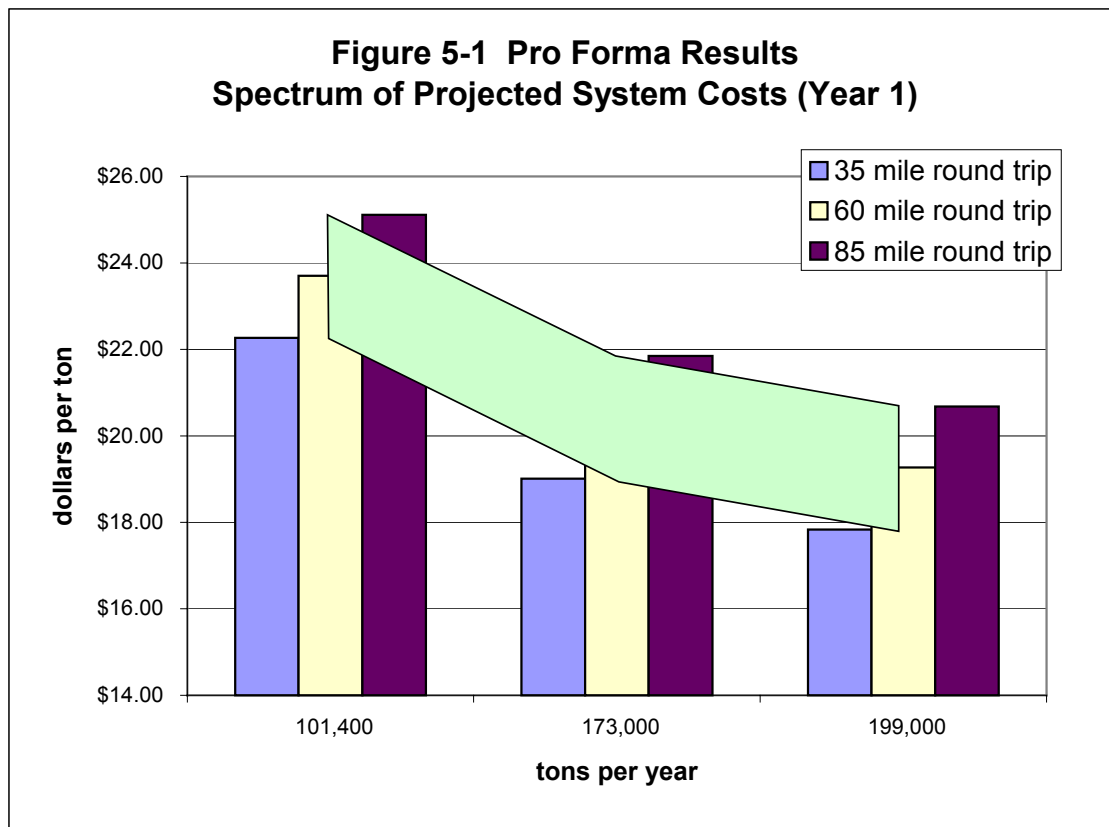


TABLE 5-6

Summary of Pro Forma Cost Estimate
 Sacramento Regional SWA Garden Refuse Processing Facility Development

Round Trip Distance to Facility (miles)	Facility Throughput		
	101,400 tpy	173,000 tpy	199,000 tpy
35	\$22.27/ton	\$19.01/ton	\$17.83/ton
60	\$23.70/ton	\$20.44/ton	\$19.27/ton
85	\$25.11/ton	\$21.85/ton	\$20.68/ton

Note: Values correspond to those presented graphically in Figure 5-1.

The shaded parallelogram in Figure 5-1 represents the estimated range of minimum and maximum costs per ton given the assumptions and factors used in this cost estimate. The lowest value is \$17.83 at a haul distance of 35 miles round trip and operating tonnage of 199,000 tons per year; the highest is \$25.11 at 85 miles round trip and 101,400 tons per year. Impacts of changing key variables in this pro forma analysis are further discussed in the following section.

5.2.6 Cost Variables

A few key variables have the greatest impact on the cost pro forma given the assumptions presented in this report. The most significant variables, in order of cost impact, are:

- **Volume of Garden Refuse**—Variability in the amount of garden refuse to be processed has a significant impact on the economy of scale for the project. As the scale of the facility operations increases, the fixed costs can be distributed over a larger annual tonnage rate. Increasing tonnage from 101,400 tpy to 199,000 tpy results in a \$4.43 per ton cost decrease due to economies of scale.
- **Haul Cost**—Haul cost is primarily affected by changes in distance, average payload hauled, and transfer haul vehicle and operator cost. Figure 5-1 shows the impacts of haul distance on the pro forma, but a similar variation could be achieved by a corresponding change in payload hauled and/or transfer vehicle and operator cost. This analysis shows that a variation from \$3.29 to \$6.16 per ton (difference of \$2.87 per ton) results from the extremes of haul distances evaluated.
- **Technology Implemented**—The per ton cost for garden refuse processing (composting method specifically) is affected by the technology implemented. For this pro forma evaluation, two low technology, highly proven methods—windrow and aerated static pile—were evaluated. Further information on these methods is presented in Section 4.2.3. The windrow technology is about \$1 per ton lower in cost than that of the aerated static pile. Figure 5-1 shows costs for a windrow composting facility.

Some other cost factor issues to consider are:

1. This cost estimate is based on an arrangement to exchange residual material from the proposed regional facility, for clean unprocessed ADC material at Kiefer, to be picked up by the vendor upon delivery of residuals, resulting in no residuals disposal charges.

If the County does not agree to accommodate this request, additional project costs will result. An allowance has been made for transporting the material to Kiefer.

2. Some equipment and site improvement costs will increase as tonnage increases above 101,400 tons per year.
3. The estimated public-sector capital costs include a basic scale house and entrance facility with minimal landscaping. The capital investment may be significantly greater if additional improvements are made, including the addition of paved acreage, landscaping, meeting space, shower facilities, special fire protection, stormwater management, or other public-access facilities or improvements required during permitting.

5.3 Existing Costs and Estimated Costs

One criterion given by the SWA member representatives for acceptability of a new SWA garden refuse processing facility and the P3 structure presented in this report is as follows: The per-ton cost needs to be in line with the current costs to each member agency. The weighted average cost currently paid by each member jurisdiction is:

- City of Citrus Heights = \$23.43 per ton
- City of Sacramento = \$16.89 per ton
- County of Sacramento = \$20.28 per ton

The pro forma prepared for this project indicates a cost range of \$17.83 to \$25.11 per ton. There are several important considerations when comparing these estimated costs with current costs. The current system does not provide many positive attributes of a garden refuse processing system that have been identified as important by the SWA member agencies. The most significant are:

1. The current system does not have readily available redundancy in the event of a failure of one system component.
2. The current system provides little or no ability for local agencies to have sufficient control over day-to-day operations to avoid nuisance problems.
3. The current system does not manage material locally, resulting in comparatively higher transportation costs, greater air quality impacts, and less sustainability in the long term.

The City of Sacramento will soon be seeking proposals for green waste processing since one of its two contracts will expire soon. For several reasons, it is likely that the City will receive cost proposals significantly higher than under its current contracts:

1. The expiring contract has had a fixed price for almost five years.
2. Fuel prices have risen considerably over the last five years.
3. The Lionudakis Wood and Green Waste Recycling facility is no longer in operation. Lionudakis was the low bidder on the Sacramento County green waste contracts over the last several years. Sacramento County closed the Lionudakis operation for nuisance impacts in violation of its use permit. SWA staff have speculated that current contract

rates for garden refuse processing are artificially low due to the exceptionally low rates bid by Lionudakis.

The cost pro forma prepared by CH2M HILL does not guarantee or imply that rates by private bidders for this service will fall within this range. The overall attractiveness of this project to private bidders and the balance of risk and benefits between public and private sectors will dictate the cost range.

5.4 Recommendations

The following recommendations should be considered to reduce costs to SWA member jurisdictions and rate payers for the regional garden refuse processing facility:

1. Increase the total tonnage committed to the facility to improve economies of scale. Increased tonnage could come from current SWA member agencies, from new SWA members, or from non-SWA members.
2. Consistent with the need to site the facility so it can be a good neighbor, reduce transportation costs by locating the facility as close to the metropolitan area as possible.

5.4.1 Other Recommendations

1. In the RFQ/RFP process, leave flexibility for the private sector to propose technically sound, proven technologies that may benefit the SWA members through reduced cost.
2. Further refine the cost estimate and pro forma once a site, technology, and other contributing factors can be identified. Use this cost estimate to further assess the attractiveness of this project to SWA members.
3. Structure the public-private partnership to provide financial incentives and mutually beneficial provisions. Incentives might include items such as a longer-term contract period that allows reasonable amortization schedules or purchase of compost products by public agencies (Parks Departments, Public Works Departments) to help guarantee product markets. Other provisions might include public education and promotion of the products and allowing the private partner to seek other waste streams to improve economy of scale.