

**APPENDIX H**

# **Decision Process Used to Evaluate Options**

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# **Solid Waste Facilities Master Plan**

## **Technical Memorandum No. 1 - Decision Process**

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### **Introduction**

This memorandum is one of a series of memoranda that document technical analysis conducted by the CH2M HILL consultant team in support of the Seattle Public Utility Solid Waste Facilities Master Plan. The consultant team includes Herrera Environmental Consultants, Ecodata, MainLine Management, Triangle Associates, and Environmental Planning Consultants. The memoranda that document the analysis are as follows:

1. Decision Process
2. Design Criteria and Conceptual Layouts
3. Peak Flows and Waste Stream Analysis
4. Rail Cost Modeling
5. Cost Modeling in Support of SPU's System Cost Model
6. Modeling Cost Uncertainty

This memorandum documents the decision process used to develop the preferred system option.

### **Decision Process**

City staff had conducted considerable research and analysis prior to retaining the CH2M HILL consultant team. A planning team was formed that met bi-weekly to report on progress in various areas. A siting study was conducted that investigated potential sites for transfer stations, and in particular, for an intermodal transfer station. A preferred site for an intermodal facility was identified and preliminary design sketches were developed to ensure that the site was adequate in size.

The CH2M HILL team used a series of structured workshops as the key mechanism to developing a preferred system option. Considerable work was done before and after the workshops, but the workshops were the primary means of soliciting new ideas and discussing the pros and cons of various options, evaluation methods and analysis techniques. The 5 main workshops were as follows:

- Workshop 1: Chartering session
- Workshop 2: Develop Screening model and long list of system options
- Workshop 3: Screen long list of options
- Workshop 4: Develop final evaluation model
- Workshop 5: Evaluate short list of options

Parallel to this effort, a series of workshops were held to address facility design issues. Those workshops included:

- Design workshop 1: Design criteria and functional requirements
- Design workshop 2: Layouts for intermodal transfer station
- Design workshop 3: Layouts for South Recycling and Disposal Station
- Design workshop 4: Layouts for North Recycling and Disposal Station

Another key aspect of the decision process was ensuring that senior management was informed and had the opportunity to provide guidance during development of the plan. This was accomplished through briefings held with the SPU director, and regular interaction with members of the project steering committee. This communication served to provide clear direction to staff and the consultant team and minimized the amount of reworking needed.

During the early stages of this project, a schedule was developed that identified the workshops and briefings that would be necessary to meet an aggressive timeline. The schedule also identified the key outcome required from each workshop and the key staff who should be present at each workshop or briefing.

A brief description of the content of each workshop follows. Notes from the workshops and materials presented at the workshops are included at the end of this memorandum.

### **Workshop 1: Chartering session**

This workshop was held on February 20, 2003, soon after the consultant team was brought into the project. The purpose of this meeting was to prepare a statement of the project purpose and project goals, identify critical success factors, clarify the project boundaries, and identify the form of the final work product that will be submitted to the City Council.

Other activities conducted during the workshop included the following:

- An exercise to identify the expectations of meeting participants
- A mind-map exercise to identify persons both inside and outside of City government who will influence the project
- Brainstorming issues and challenges associated with the project
- Discussing and modifying the project schedule

### **Workshop 2: Screening model and long list of system options**

The second workshop was held February 27, 2003. The main purpose of this workshop was to agree on the approach that would be used to screen system options, develop and weight evaluation criteria, and develop an initial list of system options.

In this first iteration of developing screening criteria, the criteria and assigned weights to service levels were as follows:

- Long-run service flexibility = 20
- Customer service = 20
- Waste reduction and recycling goals = 20
- Built environment (community impacts) = 15
- Worker satisfaction = 15
- Natural environment impacts = 5
- Short-term impacts = 5

These criteria and the weights were revised in subsequent workshops.

Some time was spent identifying what constituted an option. Options must consider the entire system of SPU facilities, private facilities, and contract operations; address waste flows by material and customer type, and consider the extent to which new property would be needed to support an option. In the workshop, strategy tables were presented that characterized system options and were used as the main means of describing what was included in each option (see the workshop notes in the attachment for an example strategy table).

During the workshop a few initial system options were developed and team members agreed to use the strategy tables to document their initial ideas for system options. The group met again on March 4, 2003 to compare options and develop a long list of 19 options for screening during workshop 3.

### Workshop 3: Screen long list of options

Workshop 3 was held on March 7, 2003. At this workshop, the long list of options was screened down to a smaller number of options for more detailed evaluation. First the long list was reviewed and a few revisions were made to the list of options. After the options were agreed upon, the list of evaluation criteria and the weights assigned to each criteria were re-examined. A few changes were made to more clearly reflect the group's understanding of the criteria that define quality of service and how those criteria relate to one another.

Performance scales were developed for each criteria that allowed each option to be scored on a 1-5 scale. Accompanying the scales was a verbal description of the meaning of each different numeric score i.e., what circumstances might result in a score of "1" or "5".

Each option was then scored against each criterion on the 1-5 scale and each score was multiplied by its criterion weight. The analysis of scores was conducted on screen using excel spreadsheets and Criterion Decision Plus software. The rank order of options was reviewed with different weightings of cost vs. quality of service with cost being 0, 40%, 50%, 60%, or 100% or the total weight. The sensitivity of the options to changes in weighting was also evaluated by doubling the weight of each sub-criterion while adjusting all other weights proportionally downward. The options proved to be relatively insensitive to changes in criteria weights.

The results of the analysis were presented to members of the project steering committee, and then evaluated with different weightings of cost. At the conclusion of the workshop, five options were selected to form the short list of options for more detailed evaluation.

#### **Workshop 4: Develop final evaluation model**

Workshop 4 was held on March 26, 2003. At this workshop, the team refined the proposed evaluation model, brainstormed ways to measure the performance of criteria and sub-criteria, weighted revised criteria and sub-criteria, developed an approach to address cost risks, and developed an initial influence diagram for those risks.

The evaluation model was revised. Short-term impacts were removed from implicit evaluation in our model: they will be considered on their own merits for each alternative, but will not weigh heavily in the choice of one option versus another. Also, long-run flexibility was removed as its own criteria and was instead made an integral part of other services such as customer service, work environment, and cost.

The group went through a brainstorming exercise to develop methods of quantifying the quality of service scores. It was determined that queue time and distance to facilities were two services that could be monetized if needed. A 1-5 scale would still be used to score the performance of some criteria for which other, more quantitative measures, could not practicably be developed.

The workshop participants went through an exercise to re-estimate weights for criteria and sub-criteria for the revised quality of service model.

CH2M HILL staff made a presentation about how decision analysis could be used to analyze cost risks. It was agreed to use that approach, and the group brainstormed an initial influence diagram. The influence diagram documents events, uncertainties, and results and shows the linkages between them. This is the first step in analyzing the financial risk associated with each option.

#### **Workshop 5: Evaluate short list of options**

After Workshop 4, the team prepared site layouts, developed and applied the system cost model, and conducted various engineering evaluations to assess the performance of options against the evaluation criteria. This information was brought together in Workshop 5 to analyze the cost and service levels provided for each of the short listed options.

In this workshop, the group viewed conceptual layouts for each option, reviewed and revised the weights and performance scales used to measure the service levels provided by the options, reviewed and revised option scores, reviewed the system cost model, presented and discussed the results of the value model, and identified next steps for the analysis.

During the review of the conceptual layouts, a number of good comments were made that were incorporated into subsequent versions of the layouts.

The group reviewed the initial performance scales, then once the performance scales were set, they re-evaluated the criteria and sub-criteria weights to ensure consistency with the performance scales. For some of the performance measures, non-linear value functions were selected for criteria. An example is education facilities, where after you have one or

two facilities the value of adding more facilities is lessened. CH2M HILL staff led the group through a series of exercises to reconfirm the weights placed on criteria.

City staff presented the structure and initial results of the system cost model, and CH2M HILL staff presented the initial quality of service scores for each option. A scatter diagram of quality of service vs. cost was used to evaluate the performance of the options.

It was agreed at the end of the meeting to carry forward a no action option, 4 of the existing options, and add two new options (Options 6 and 7) for additional analysis. A number of action items were identified to complete after the workshop in order to refine the analysis.

At the conclusion of this meeting, the basic framework for analyzing options was complete. The analysis continued for some time afterward, but the methods used to examine the quality of service and cost of the options were essentially complete by the end of the fifth workshop.

### Final Value Model Results

The quality of service analysis was performed a number of times as the mix of options were refined. The value model results for Options 0, 5, 8, and 11 as of July 27, 2003 are shown at the end of this memorandum.

### Design Workshop 1: Design criteria and functional requirements

The initial design workshop was an opportunity for the group to consider the design criteria and functional requirements that establish the basis for design of the facilities for each option. In this workshop, the participants clarified what would be included in each option and various modifications were made to system options.

The group discussed base data, escalation rates, and peaking factors for material quantities and customers. It was agreed to use prior work from Herrera as the basis for establishing peaking factors, and that some additional work would be needed to determine peaks for commercial collected waste.

After reviewing the initial draft list of design criteria and functional requirements, assignments were given to various team members to gather additional information needed to refine those criteria and requirements.

For more information about design criteria and functional requirements, see Technical Memorandum No. 2.

### Design Workshops 2-4: Facility layouts

A series of three workshops were held to present and discuss design criteria, functional requirements, and initial layouts for the short list of options. One workshop was held for each facility: NRDS, SRDS, intermodal. Layouts for each of the options are provided in Technical Memorandum No. 2.