SECTION 5
SECOND-TIER SCREENING OF TECHNOLOGIES

5.1 GENERAL

The purpose of second-tier screening was to short-list the number of technologies being considered for further evaluation. This section contains a description of this second-tier screening process.

5.2 SCREENING CRITERIA FOR SHORT-LISTING TECHNOLOGIES

In order to develop second-tier screening criteria, a review of the reports from previous studies done for the City was conducted. Information was also obtained on the current waste management conditions and requirements on Oahu. The resultant screening criteria included the following:

- **Waste Stream Application.** The waste stream application criterion requires that the selected technology be capable of diverting the waste streams selected for the study. The waste streams selected for inclusion in the NSR study are all wastes that are currently being disposed of at the Waimanalo Gulch Landfill. Waste being sent to H-POWER and ash from H-POWER are excluded from the NSR study. The composition of the Waimanalo Gulch Landfill waste (see Table 3-1) is 31.2 % wood (13.9% treated wood), 8.9% paper, 12.3% metal (6.7% ferrous), 5.0% plastics, 5.1% furniture, 4.5% carpet and 20.0% inorganics (7.0% wallboard). Other listed materials are largely wastes with existing treatment programs, such as composting. This waste composition, particularly the high percentage of treated wood, strongly influenced the selection of technologies.

- **Volume Reduction Performance**. The volume reduction performance screening criterion requires that the selected technology should provide capability for diverting or reducing the volume requiring disposal for a major portion of the waste stream.

- **Past Operating Performance.** The proven past operating performance screening criterion requires that the selected technology have a successful operating record in a municipality that has a similar material processing need as the City. It may be innovative but not experimental.

- **Past Economic Performance**. The proven past economic performance screening criterion requires that the selected technology should be cost effective when compared to the City's existing landfill costs.

- **Environmental Risk.** The environmental risk screening criterion requires that the selected technology should be "Environmentally Friendly," that is, not damage or degrade the environment, be "Island Friendly," readily adapted to the climate, geography, economy, culture and lifestyle of Oahu. The technology must be readily permitted, involving no difficult regulatory hurdles or delays.

5.3 RANKING THE SEVEN TECHNOLOGY ALTERNATIVES

The seven technologies were evaluated against each of the criteria and scored as low, medium or high. A score of one (1) was assigned to a low level of compliance; a score of two (2) was assigned to a medium level of compliance, and a score of three (3) was assigned to a high level of compliance.

The technologies were ranked based on the total score for each. The technologies that had the highest composite score and met the City's selection criteria were selected for further final evaluation in NSR study.

A technical panel reviewed the seven technologies in light of the screening criteria and scored each technology on its advantages and disadvantages relative to each criterion

5.4 TECHNOLOGY ALTERNATIVES REJECTED

Alternatives 1, 2B, 3, 4 and 5 were not short-listed for further evaluation. Key reasons for this are explained below. Evaluations conducted by the NSR staff indicated that even though these technologies were not short-listed, they may be worthy of further consideration in the future.

- **Alternative 1, Plasma Oxidation/Vitrification Followed by Conversion of Heat to Electricity in a Boiler.** This alternative was not short-listed for further evaluation because it uses an oxidation process. Oxidation processes would have a large gaseous waste stream and would need state-of-the-art and expensive air pollution control systems to eliminate the reformation of toxic organic gases (such as dioxins and furans) in their gaseous waste stream. Energy recovery in an oxidation system must be accomplished in steam boilers that have very low heat-to-electricity conversion efficiency.

- **Alternative 2B, Plasma Gasification Followed by Syngas Conversion to Methanol.** This alternative was not short-listed for further evaluation because, while converting syngas to methanol is a common process in refinery plants, it is a novice application in a refuse management system and its economics are not proven at this time.

- **Alternative 3, Rotary Kiln Gasification/Slagging Followed by Syngas Conversion to Methanol.** This alternative was not short-listed for further evaluation because it would require the use of natural gas or oil for converting refuse to syngas. Also, converting syngas to methanol is a novice application in a refuse management system and its economics are not proven at this time.

- **Alternative 4, Low Temperature Pyrolysis and Conversion of Refuse to Oil.** This alternative was not short-listed for further evaluation because it does not meet the past performance criterion and its technical, environmental and economic risks are unknown at this time.

- **Alternative 5, Conversion of Wood and Plastic Waste to ECO-Lumber.** This alternative was not short-listed for further evaluation because of the following key reasons: 1) extensive front-end sorting of the refuse would make the operations impractical and costly; 2) liabilities associated with converting a preservative-containing wood waste to a useful product was unknown; 3) the size of the market for selling eco-lumber was unknown; and 4) the technical, environmental and economic risks are unknown at this time.

5.5 SHORT LISTED TECHNOLOGY ALTERNATIVES

The following alternatives received the highest scores and are recommended for further evaluation.

- **Alternative 2, Plasma Gasification/Vitrification Followed by Converting Syngas to Electricity.** Alternative 2 uses a series of high-temperature plasma torches to decompose all organic components of the bulk waste stream and to melt inorganic residues into a glass-like slag. This alternative was ranked in the top three because of several advantages, including environmentally safe treatment of preservative contaminated wood wastes,

environmental friendliness, production of the much needed electricity for the region, and significant reduction in the City's landfill space requirements

- **Alternative 6, Metal Recycling.** Metals recovery and recycling alternative uses magnetic fields and eddy currents to remove metals from a stream of shredded waste that passes by on a belt conveyor or similar device. Typically, magnets recover ferrous metals and eddy-current devices remove non-ferrous metals. This alternative was short-listed for further evaluation because ferrous metal recovery is a proven recycling method and there is no need for further R&D on this technology. City is already practicing metal recovery at the H-POWER facility and metal recycling application to the Waimanalo Gulch Landfill refuse stream could also be implemented without major difficulty.

- **Alternative 7, Gypsum Recycling**. The scrap gypsum wallboard recycling technology was short-listed for further evaluation because the technology is a proven recycling method and there is a likely market for its product in Hawaii.

Table 5-1. Evaluation and Scoring of Technologies

Alternative	Waste Stream Application	VR Performance	Past Operating Performance	Past Economic Performance	Environ-mental Risk	Total Score
Alt 1 – Plasma Oxidation./ Vitrification	3	2	2	1	1	9
Alt 2A – Plasma Gasification./ Vitrification / Electricity	3	3	1	1	3	11
Alt 2B – Plasma Gasification./ Vitrification / Methanol	3	3	1	1	2	10
Alt 3 – Rot. Kiln Gasification./ Slagging / Methanol	3	3	1	1	2	10
Alt 4 – Low Temp. Pyrolysis	2	2	1	1	2	8
Alt 5 – Wood/Plastic to eco-lumber	1	3	1	1	3	9
Alt 6 – Metals Recycling	2	3	3	2	3	13
Alt 7 -Gypsum Recycling	2	3	3	2	3	13

Scores:
1 = Low level of compliance with evaluation criteria.
2 = Medium level of compliance with evaluation criteria.
3 = High level of compliance with evaluation criteria.