Central Valley Water Reclamation Facility (CVWRF), in Salt Lake City, Utah, utilizes a mesophilic anaerobic digestion system. CVWRF receives on average 52 million gallons per day (MGD) of wastewater and accepts 10,000 to 20,000 gal of liquid food waste daily. CVWRF produces energy from methane gas captured during anaerobic digestion of biosolids and food waste. The focus of this analysis is: 1) to optimize the performance of the anaerobic digestion system, 2) to evaluate the potential to increase the volume of food waste CVWRF accepts.

### DESIGN CRITERIA & CONSTRAINTS

The criteria are based on local and state regulations and national design guidelines. While the digester loading rate of volatile solids (VS) is the only parameter that directly affects the amount of gas produced at the facility, the phosphorus and nitrogen effluent limits must be kept in mind because the return flow from the dewatering process will increase the phosphorus and nitrogen loading on other plant processes.

### ALTERNATIVES

Five alternatives were considered to meet the desired goals of achieving a more efficient anaerobic digestion process, being able to accept and handle larger quantities of food waste, and being able to produce more biogas. The five alternatives are listed in Table 2. In the following subsections, the five design alternatives are outlined.

#### ALTERNATIVES COMPARISON

The costs associated with each alternative are shown in Table 3 below. Alternative 4 has the highest present worth of any alternative.

#### ALTERNATIVE DECISION MATRIX

The alternatives were evaluated for three criteria: cost, ability to handle food waste, and net energy production.

Alternative 4 optimizes the anaerobic digestion process for the least costs, and yields the second highest biogas production rate of all of the alternatives. Furthermore, Alternative 4 allows for CVWRF to greatly increase the volume of liquid food waste it accepts. This alternative does not require adjustments to the temperature of the digesters or additional construction costs for WSS removal. Alternative 4 will have positive present worth of $8,575,000.

The drawback of Alternative 4 is that it will require special permits from the State of Utah to allow CVWRF to operate their mesophilic digesters at higher VS loading rates than is explicitly stated in the State Code. However, CVWRF states that they have the necessary documentation to prove the digesters will be able to operate at the higher VS loading rates and are confident that exemptions will be provided by the State Division of Water Quality to allow this process optimization to proceed.

### CHOSEN ALTERNATIVE & DESIGN

Alternative 4 will operate the digesters under mesophilic conditions with a volatile solids loading of 200 lb VS/1000 ft³. Using an increased VS loading rate above the State of Utah’s design parameters was researched upon request of CVWRF. The applicant must submit pertinent and relevant material in support of a variance from the minimum requirements (Utah Administrative Code 2018). Increasing the volatile solids limit will allow for more liquid food waste to be added to the digestion process.

Alternative 4 will upgrade the current fractionalization tank to a food waste handling facility, incorporating a 343,000 gal. concrete slurry tank, larger pumps, and a receiving building to receive and process the increased quantity of food waste.

### OVERVIEW

Central Valley Water Reclamation Facility (CVWRF), in Salt Lake City, Utah, utilizes a mesophilic anaerobic digestion system. CVWRF receives on average 52 million gallons per day (MGD) of wastewater and accepts 10,000 to 20,000 gal of liquid food waste daily. CVWRF produces energy from methane gas captured during anaerobic digestion of biosolids and food waste. The focus of this analysis is: 1) to optimize the performance of the anaerobic digestion system, 2) to evaluate the potential to increase the volume of food waste CVWRF accepts.

### ALTERNATIVES

Five alternatives were considered to meet the desired goals of achieving a more efficient anaerobic digestion process, being able to accept and handle larger quantities of food waste, and being able to produce more biogas. The five alternatives are listed in Table 2. In the following subsections, the five design alternatives are outlined. The efficiency of energy production was assumed to be 30%, the current efficiency of the cogeneration system at the facility.

### ALTERNATIVES COMPARISON

The costs associated with each alternative are shown in Table 3 below. Alternative 4 has the highest present worth of any alternative.

### ALTERNATIVE DECISION MATRIX

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### CONCLUSION

The recommended alternative is Alternative 4. This alternative includes converting all the conventional digesters to primary digesters and running them at a VS loading rate of 200 lb/1000 ft³ digester volume. This alternative will be able to accept 170,000 gallon per day that will produce 5.9 MWe. The food waste will be constructed in an empty plot near the primary digesters. In Appendix E is a conceptual drawing of the how the food waste receiving facility will be added to the facilities current site and digestion process.

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