

Executive Summary

Approximately 702,000 metric tons of woody biomass waste from local sawmills are transported to the Scotia and DG Fairhaven power plants in Humboldt County, California. Currently, this biomass is incinerated to produce electricity which is then fed into the local power grid. This report investigates alternatives to use this biomass in alternative processes. Community approval and satisfaction was important in the decision-making process of this research as the local community will be affected by any proposed project.

For a solution to be considered feasible, the alternative was required to satisfy the following three constraints: base operations located in Humboldt County, utilization of a minimum of 80% of the biomass, and following all local, state, and federal regulations and standards. The considered alternatives were ranked based on their overall projected performance in carefully chosen social, economic, and environmental aspects. Below are the criteria that were in the Delphi matrix and Pugh method decision-making processes:

- Community Satisfaction
- Cost (Payback Period)
- Ease of Implementation
- Carbon Sequestration
- Aesthetics
- Local Jobs Created
- Air Quality
- Amount of Biomass Utilized

The necessary design process for each alternative was to brainstorm ideas that meet the client and community's needs, gather information, analyze each alternative, choose a solution, and complete a thorough analysis of the final alternative. The alternatives were selected to meet client and community's desired needs, which were to utilize the biomass without combusting the material. Each option was analyzed qualitatively and quantitatively for each criterion. The four alternatives were unique in how biomass was processed, which resulted in an assessment that each option had a variety of strengths and weaknesses. The final step was to assess the solution, and complete with strong recommendations in processing the product.

There were four design alternatives considered to meet the objective of the project. The alternatives were a gasification facility to produce synthetic natural gas, a pyrolysis facility with the primary goal of producing biochar, a construction manufacturing process to make oriented strand board (OSB), and local wastewater treatment utilization along with a commercial-scale composting facility. At least one output from each process was a saleable good, which would be transported to another locale for wider distribution than possible in rural northern California.

The composting with local WWTP implementation alternative proposed the utilization of excess biomass in four different processes: 1) Class A biosolids production, 2) trickling filter media replacement, 3) odor control media replacement, and 4) compost production. Based on the results from the Delphi and Pugh method, this became the recommended alternative because it outperformed the others given its soil benefits, small payback period of less than a year, high

carbon sequestration (approximately 583,000 tons/yr), and negative net CO₂ equivalent emissions (-352,640 tons/yr).

The proposed alternative includes the production of Class A biosolids by mixing a portion of the excess biomass with dewatered sludge at the McKinleyville, Eureka (Elk River), Ferndale, and Fortuna WWTPs along with some purchased hay and manure from regional cattle. It additionally suggests replacing the odor control media at the Eureka and Fortuna WWTPs with the excess biomass as well as the plastic trickling filter media at the Eureka WWTP. Both would be replaced every four months and then composted. A composting facility is proposed to utilize the remaining biomass with 379 windrow piles on a 36-acre lot located on the Samoa Peninsula. The composting mixture was calculated to include 45% biomass, 15% manure, and 40% hay by mass based on required moisture, C:N ratio, and density for quality compost. The product would be transported to Santa Rosa for wider commercial distribution than there is local capacity to support. Figure 1 illustrates how the excess biomass from the local sawmills supplies the four processes.

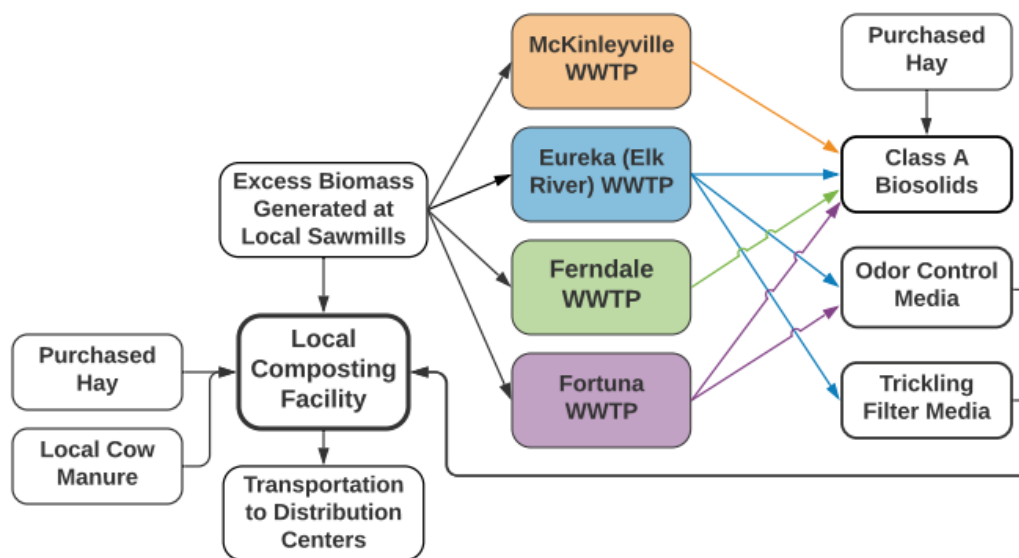


Figure 1. Diagram of recommended alternative utilizing the excess biomass for composting and at local WWTPs.

The following are three primary limitations of the recommended alternative design:

- Collection methods are uncertain for the substantial requirement of 207,000 tons per year of manure from Humboldt County dairy cows.
- The projected regional demand may not meet the supply of compost produced under this alternative. Consequences of this scenario would be adverse financial impact and determining alternate local uses for the unsold compost.
- Eighty percent of the biomass produced by local sawmills is used under this alternative, leaving over 140,000 tons per year unaccounted for.