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# **Food Waste Co-Digestion at East Bay Municipal Utility District (CA)**

## Business Case Analysis Snapshot

## Glossary

CCCSWA	Central Contra Costa Solid Waste Authority
COD	Chemical oxygen demand
CSSO	Commercial source-separated organics
EBMUD	East Bay Municipal Utility District
HSOW	High-strength organic waste
mgd	Million gallons per day
MW	Megawatt
PPA	Power purchase agreement
SSO	Source-separated organics
tpd, tpw	Tons per day, tons per week
WRRF	Water resource recovery facility

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Cover photo is an aerial view of EBMUD facilities, courtesy of EBMUD. Cover design by Evan Odoms.

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# Main Wastewater Treatment Plant

## East Bay Municipal Utility District (EBMUD), California

Located in Oakland, California, the East Bay Municipal Utility District (EBMUD) manages wastewater services for 740,000 customers in an 88-square mile area of Alameda and Contra Costa counties along San Francisco Bay's east shore, extending from El Cerrito in the north to Oakland in the south. Its water resource recovery facility (WRRF), located in W. Oakland, treats an average of 63 mgd (average dry weather flow) and has secondary treatment capacity up to 168 mgd.

EBMUD has been a pioneer in the co-digestion of food waste. With the additional biogas produced through co-digestion, in 2012 it became one of the first WRRFs to produce more energy than it uses on-site. This case study acknowledges EBMUD's long history of accepting a wide variety of co-digestion feedstocks, but focuses on its partnerships for sourcing food scrap feedstocks.

The facility currently accepts hauled-in liquid and solid high-strength organic waste (HSOW) for co-digestion. (Low-strength organic wastes, which represent about two-thirds of trucked-in waste, alternatively enter through the headworks.) Over the course of its experience with co-digestion, EBMUD has pursued various partnerships with the food sector. For food scraps, it has partnered with private resource recovery firms as well as public solid waste utilities.

### Resource Recovery Program Investments

When the last cannery from the once-thriving canning industry in Oakland closed in 1992, EBMUD experienced reduced wastewater flows, and as a result substantial excess capacity in its eleven digesters. To circumvent rising energy costs, the WRRF initiated a Resource Recovery Program in 2002 to haul in HSOW feedstocks to use available digester capacity for co-digestion. It added food scrap co-digestion in 2004 through a pilot with local resource recovery firm Recology (called Norcal Waste Systems at the time). Over the years, EBMUD has made a series of investments in receiving facilities to accommodate co-digestion feedstocks. In 2002, it spent \$1 million on a septage receiving station to begin accepting trucked-in septage wastes. In 2004, EBMUD spent \$7 million installing a solid-liquid receiving facility for feedstocks entering the digesters directly, rather than through the headworks. In 2014, EBMUD spent \$13 million to install a new HSOW receiving and blending facility. Liquid HSOWs, including food scrap slurries, fats, oil and grease (FOG), and food and beverage process waters, are discharged into two underground receiving tanks, then pumped into two concrete blend tanks, along with the wastewater treatment solids streams. The mixture is then blended to ensure a uniform feed to the digesters.

In its solids receiving facility, EBMUD developed an extensive pretreatment system to complement pretreatment by its food scrap suppliers. (See Figure 1.) EBMUD built two below-ground slurry tanks to accept and dilute the food wastes from haulers' trucks. Its initial supplier, Recology, pretreated the scraps with a trommel screen, magnet, and hammermill – to remove metals, reduce scrap size, and remove contaminants. To address the contamination that remained in the feedstocks, EBMUD installed a pretreatment system (subsequently patented). EBMUD upgraded the mixers in the slurry tank where food scraps enter the facility to increase delivery of mixing energy and improve slurry consistency. It also added a rock trap/grinder to allow large pieces of debris to settle out, and a paddle finisher with rotating blades to remove grit and fibrous material.

The pretreatment facility remains in place today, and can reasonably handle up to 50 tpd of food scraps. However, as we highlight below, EBMUD is shifting to a model where its suppliers assume a greater share, or all, of the responsibility for pretreatment.

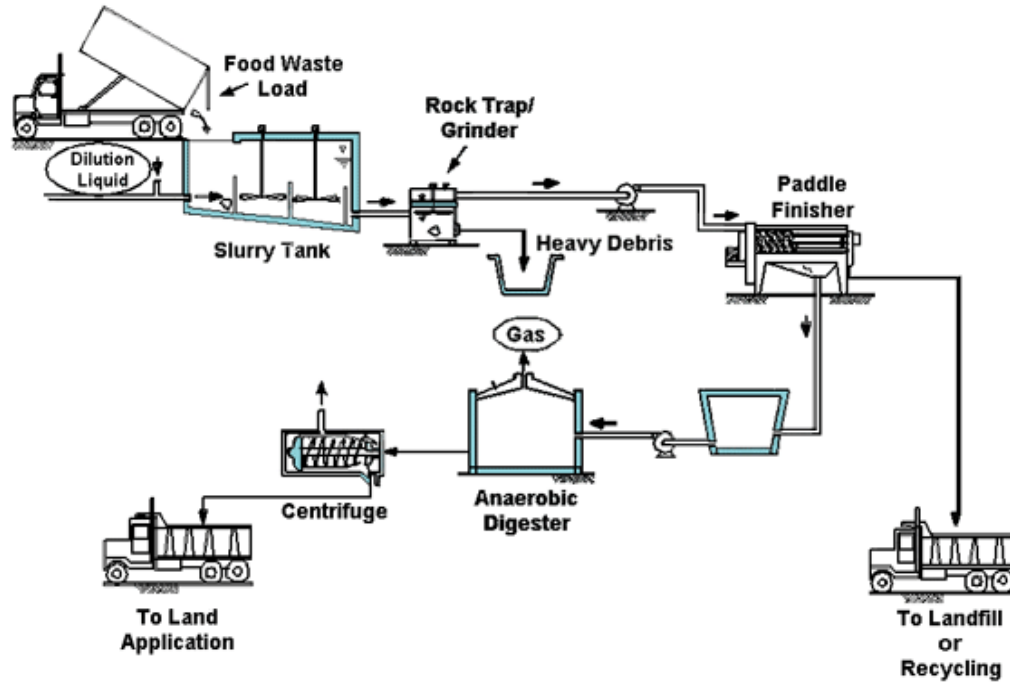


Figure 1. EBMUD solid waste pretreatment facility schematic. Source: USEPA 2014.

## Current Feedstocks and Revenues

Currently the WRRF receives approximately 125 trucks of liquid waste per day sourced from 250 different generators. Two-thirds of the trucked-in waste has low chemical oxygen demand (COD) and goes to the head of the plant; the remaining one-third of accepted waste that is high COD goes directly to the digesters.

Of the food waste directed to digesters, 1% is food scraps, 10% is animal protein waste, 15% is FOG, and 74% to 75% is various types of process effluents from the food processing industry, including dairy and wine industries.

The facility accepts hauled-in liquid wastes 24/7 through a semi-automated system, and charges tip fees of \$0.04/gallon - \$0.125/gallon for clean liquid food waste slurry depending upon percent total solids (TS). Hauled-in solid HSW can only be delivered from 7 AM to 2 PM, five days a week, because staff must be present to operate pre-digestion processing and screening equipment. FY2021 tip fees for solid organic wastes range from \$30-\$75/ton, depending upon factors influencing their financial impact on the facility, including treatment costs, gas production, and volume.

Annual income from tip fees increased substantially over time following the introduction of the co-digestion program in 2002, but leveled off in recent years as more processors are competing for organics supplies. In FY2018-FY2020, EBMUD earned an average of \$4.4 million in HSW tip fees and a total of

\$12 million for all hauled-in wastes. EBMUD is looking to expand its acceptance of food scraps, and anticipates more will become available as enforcement of SB 1383, which among other features established the regulatory authority required to achieve the organic waste disposal reduction targets, is activated in 2024.

## **Energy Production**

EBMUD began beneficially using biogas in 1985 with the installation of three 2.2-MW combined heat and power (CHP) engines. In 1986, EBMUD arranged a power purchase agreement (PPA) with Pacific Gas & Electric (PG&E) to sell the electricity generated from their engines on an as-available basis. The PPA limited EBMUD's ability to receive revenues from Renewable Energy Credits.

With its investment in a new 4.5-MW turbine in 2012, EBMUD added enough capacity to become energy positive, and began looking for opportunities to maximize revenues from energy sales. In 2012, EBMUD terminated its agreement with PG&E and developed a PPA with the Port of Oakland. Over the last five years, with roughly two-thirds of the facility's biogas production from co-digestion wastes, the facility typically produced between 130% -140% of its electric power needs. In FY2020, EBMUD received \$900,000 in revenues from renewable electricity sales. However, in FY2020 EBMUD flared an estimated 12% of its biogas due to the unscheduled nature of biogas production on a day-to-day basis. As a result, EBMUD continues to look for new ways to beneficially use its biogas.

## **Partnerships for Food Scrap Feedstock Supply**

EBMUD has one long-term public partnership for the supply of food scraps with Central Contra Costa Solid Waste Authority (CCCSWA). It has concluded a pilot project where private partner Recology experimented with preprocessing mixed solid waste with a new pretreatment technology, and is anticipating – after commercial organic waste quantities recover from covid-19 related losses – starting a new pilot project with another public sector partner, South Bayside Waste Management Authority. For four months at the end of 2020, EBMUD accepted a digester-ready food scrap slurry from a private resource recovery company, but the company has since found organics processing capacity closer to their preprocessing facility. In its current and pending new partnerships, EBMUD is shifting more responsibility for preprocessing to its feedstock suppliers.

### **Central Contra Costa Solid Waste Authority (with Republic Services)**

In 2008, the WRRF pursued a pilot project with CCCSWA in the San Francisco East Bay (Walnut Creek), CA. CCCSWA and its franchised hauler, Allied Waste Services (which was merged into Republic Services later that year), began a two-year pilot for food waste diversion, funded by a grant from the California Diversion Incentive Fund. In the pilot project, food scraps from commercial source-separated organics collections (CSSO) were hauled to a transfer facility in Martinez for preprocessing and then to EBMUD. Republic Services and CCCSWA engaged 100 customers for the initial pilot. After a successful pilot, the program went into full-scale implementation.

In its current 10-year contract (2016-2025), CCCSWA committed to grind its CSSO collections and then deliver them to EBMUD, and EBMUD agreed to preprocess them to remove contaminants and create a slurry. The operational costs of the program are funded by the 140 commercial entities that participate in the program. The CCCSWA program collaborates closely with food waste generators in order to reduce contamination. EBMUD received on average 12 tpd during 2018-2019, but covid-19 reduced deliveries in 2020 as many commercial establishments that generate food waste were closed or significantly reduced operations.

As part of EBMUD's effort to shift preprocessing to its suppliers, in December 2020 Republic Services upgraded its Martinez transfer station with a Scott Mega-Thor unit, which does depackaging as well as other contaminant removal and size reduction.

### **Recology/San Francisco**

The private resource recovery firm Recology began a food scrap co-digestion pilot at EBMUD in 2004, hauling post-consumer CSSO from San Francisco. From the successful pilot, the program went into full-scale implementation with delivery of 40 tpd. However, Recology subsequently shifted to recycling CSSO through composting, rather than co-digestion.

Some years later, Recology and EBMUD developed a pilot project to explore the potential for preprocessing mixed solid waste to extract the organic content for use as a co-digestion feedstock at EBMUD. In 2015, Recology received a \$3 million CalRecycle grant to install Anaergia's OREX 500 press at their San Francisco Transfer Station, as well as an organics polishing system at their Alameda County processing facility. The OREX technology is designed to remove high levels of contamination, such as in mixed solid waste.

At the peak of the 2016-2017 pilot, Recology delivered 35 tpd to EBMUD. Because San Francisco has SSO collection, the quantity of organics generated from the "black bin" mixed solid waste was small. The small quantity was insufficient to justify investing in the polishing system; as a result, EBMUD sent the scraps received from Recology through their pretreatment system. The pilot concluded in 2018, with the decision not to continue. Recology sold the press equipment to the South Bayside Waste Management Authority (SBWMA), which is developing a pilot for another "urban organics" project, as described below.

### **South Bayside Waste Management Authority**

SBWMA is a joint powers waste management authority in San Mateo County. The authority is planning to implement an "urban organics" project similar to the San Francisco one involving Recology and EBMUD. Recology is the franchise hauler that will bring food scraps to the SBWMA transfer station at the Shoreway Environmental Center for preprocessing, which will include an Anaergia OREX 500 press extruder and a polishing system to reduce contamination. The initial feedstock in the pilot will be CSSO, but the goal is to run "black bin" mixed solid waste through the system. EBMUD anticipates that it will not need to run this slurry through its pretreatment system; it will enter directly into the blend tanks where it will be mixed with other HSOW and wastewater treatment streams. The blend tank mixture will then be pumped into the digester.



**Figure 2. Two above-ground blend tanks at the EBMUD liquid HSOW receiving and blending facility, where food slurry, liquid HSOW, and wastewater treatment streams are blended before entering the digester.**

Photo credit: EBMUD.

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